



**Irish Water & Wicklow County Council**  
**Arklow Wastewater Treatment Plant**  
**Site Assessment Report – Phase 2**  
**Project No. PH 00857 00**  
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# 1 Executive Summary

Irish Water (IW), working in partnership with Wicklow County Council (WCC) have engaged the services of Byrne Looby PHMcCarthy (BLP) to undertake a Phase 2 Site Assessment Report for the Arklow Wastewater Treatment Plant (WwTP).

A Phase 1 Site Assessment Report published in September 2014 included a land parcel, pipeline route and marine outfall location assessment for the Arklow WwTP. Irish Water subsequently entered a Phase 1 Consultation Period and sought the opinion of the people of Arklow and the relevant stakeholders by inviting them to express opinions on the locations and the criteria used to identify the land parcels.

The Phase 1 Consultation period was initially set to run for seven weeks from Wednesday 15<sup>th</sup> October 2014 to Friday 5<sup>th</sup> December 2014. In light of the interest shown by the people of Arklow and the volume of submissions received, it was later decided to extend this period by another week to Friday 12<sup>th</sup> December 2014.

Irish Water prepared the Phase 1 Factual Report in January 2015. This contained details of the factual submissions received during the Phase 1 consultation process.

One of the major conclusions of the Phase 1 Consultation Process was that lands at the Shelton Abbey/IFI could be made available to Irish Water as a possible site, thus no longer classifying these lands as a “sensitive receptor” which required the application of the appropriate buffer zone. On this basis and further discussions with the landowner and the input from a number of submissions, it was decided that this land parcel should be considered in greater detail.

An assumption was made at the beginning of the process that based on previous evidence, a river discharge would not be suitable hence restricting an outfall to the sea only. Due to the interest raised in the Shelton Abbey/IFI site and other potential sites close to the Avoca River, Irish Water has revisited this assumption and have investigated the preliminary suitability of available sites should a river discharge be a viable option.

An un-calibrated CFRAM flood model was initially used to rule out certain low lying lands surrounding the Shelton Abbey/IFI Site. This exclusive criteria has been re-visited in more detail in order to ascertain the risk associated with construction in this location.

The conclusion of these two studies altered the ranking system of the 10 shortlisted land parcels identified in the Phase 1 Site Assessment Report (September 2014), as the distance to an outfall location has been reduced significantly in the case of some riverside land parcels.

Based on the same criteria used in the Phase 1 Report, that a river outfall can now be considered and flooding risks can be mitigated against, the three remaining shortlisted land parcels have been redefined as:

- Ferrybank (Old Wallboard Factory)
- Kilbride
- Shelton Abbey (IFI Site)



The Phase 2 assessment is based on a qualitative process which assesses the performance of each of the alternative land parcels, transfer pipelines routes and outfall locations against a range of environmental, technical and economic criteria in order to identify three emerging preferred site options.

Environmental Criteria	Technical/Economic Criteria
Ecology	Safety
Cultural Heritage	Planning Policy
Landscape & Visual	Engineering & Design
Hydrology & Hydrogeology	Capital & Operational Costs
Soils & Geology	Land Valuation
Traffic	
Air Quality & Odour	
Agriculture & Agronomy	
Noise & Vibration	
People & Communities	

Table 1.1 Site Assessment Criteria

Each land parcel option was assessed by the relevant technical and environmental specialist under each of these criteria. These assessments were used to identify the differentiating sub-criteria to be used in the identification of the preferred 2 ha site within each of the land parcels and subsequently the identification of the emerging preferred site option. The outcomes of each of these assessments were combined into an overall assessment matrix detailing all potential constraints associated with each of the site options. Through an assessment of most and least favourable constraints in the matrix, the emerging preferred site options were identified.

Based on this qualitative assessment, the Ferrybank (Old Wallboard Factory) site has been identified as the emerging preferred site for the Arklow WwTP with the Kilbride and Shelton Abbey (IFI Site) sites having been identified as viable alternatives.

While the Ferrybank (Old Wallboard Factory) has been identified as the emerging preferred site, Irish Water will not confirm a final site location until the end of the Phase 2 consultation process.

Irish Water will be entering the second (Phase 2) non-statutory public consultation period on the 13<sup>th</sup> of May 2015. This consultation period is set to last for eight weeks and will end on 10<sup>th</sup> July 2015. This consultation process will follow on from the methodologies adopted during the Phase 1 Consultation process and a “Phase 2 Factual Report” will be published later in 2015 reporting on the findings of the process.



## 2 Introduction

### 2.1 Background

The Phase 1 Site Assessment Report published in September 2014 included a land parcel, pipeline route and marine outfall location assessment for the Arklow Wastewater Treatment Plant (WwTP). Irish Water subsequently entered a Phase 1 Consultation Period and sought the opinion of the people of Arklow and the relevant stakeholders by inviting them to express opinions on the locations and the criteria used to identify the land parcels.

The Consultation period was initially set to run for seven weeks from Wednesday 15<sup>th</sup> October 2014 to Friday 5<sup>th</sup> December 2014. In light of the interest shown by the people of Arklow and the volume of submissions received, it was later decided to extend this period by another week to Friday 12<sup>th</sup> December 2014.

Upon completion of the Phase 1 Consultation, Irish Water prepared the Phase 1 Factual Report dated January 2015. This contained details of the factual submissions received during the consultation process.

One of the major conclusions of the Phase 1 Consultation Process was that lands at the Shelton Abbey/IFI could be made available to Irish Water as a possible site, thus no longer classifying these lands as a “sensitive receptor” which requires the application of the appropriate buffer zone. Hence, the shape of the land parcel changed accordingly. On this basis and further discussions with the landowner and the input from the number of submissions, it was decided that this land parcel should be considered in greater detail.

An assumption was made at the beginning of this process that based on previous evidence, a river discharge would not be suitable hence restricting an outfall to the sea only. Due to the interest raised in the Shelton Abbey/IFI site and other potential sites close to the Avoca River, Irish Water has revisited this assumption and have investigated the preliminary suitability of available sites should a river discharge be a viable option. Irish Hydrodata Ltd. carried out an ‘Investigation of the Impact of Treated Wastewater Discharges to the Avoca River & Irish Sea’ report in March/April 2015. Refer to Section 2.3 for more details.

An un-calibrated CFRAM flood model was initially used to rule out certain low lying lands around the Shelton Abbey/IFI Site. This exclusive criteria has been re-visited in more detail in order to ascertain the risk associated with construction in this location. Byrne Looby PHMcCarthy carried out a ‘Flood Risk Assessment & Management Report’ in March 2015. Refer to Section 2.4 for more details.

The conclusion of these two studies altered the ranking system of the 10 shortlisted land parcels identified in the Phase 1 Site Assessment Report (September 2014), as the distance to an outfall location has been reduced significantly in the case of some riverside land parcels. The new ranking system can be seen in Table 2.1 below:





Ranking	Land Parcel	Distance to Load Centre (km)	Distance to Preferred Outfall Location (km)	Total Distance (km)
1	Ferrybank (Old Wallboard Factory)	0.52	0	0.52
2	Kilbride	2.41	0.46	2.87
3	Shelton Abbey (IFI Site)	2.64	0.31	2.95
4	Seabank	2.75	0.35	3.1
5	Lamberton & Ballyraine	2.45	0.7	3.15
6	Tinahask Upper	2.75	0.7	3.45
7	Killiniskyduff	2.5	1.1	3.6
8	Ballymoney	3.5	1.1	4.6
9	Money Big	3.75	1.1	4.85
10	Bogland & Kish	5.2	1.9	7.1

**Table 2.1 Revised Phase 1 Report – Land Parcel Rankings**

Based on the same criteria used in the Phase 1 Report, that a river outfall can now be considered and flooding risks can be mitigated against, the three remaining shortlisted land parcels have been redefined as:

- Ferrybank (Old Wallboard Factory)
- Kilbride
- Shelton Abbey (IFI Site)

A diagram of these parcels, associated pipeline corridors and outfall locations can be seen in Figure 2.1 overleaf.

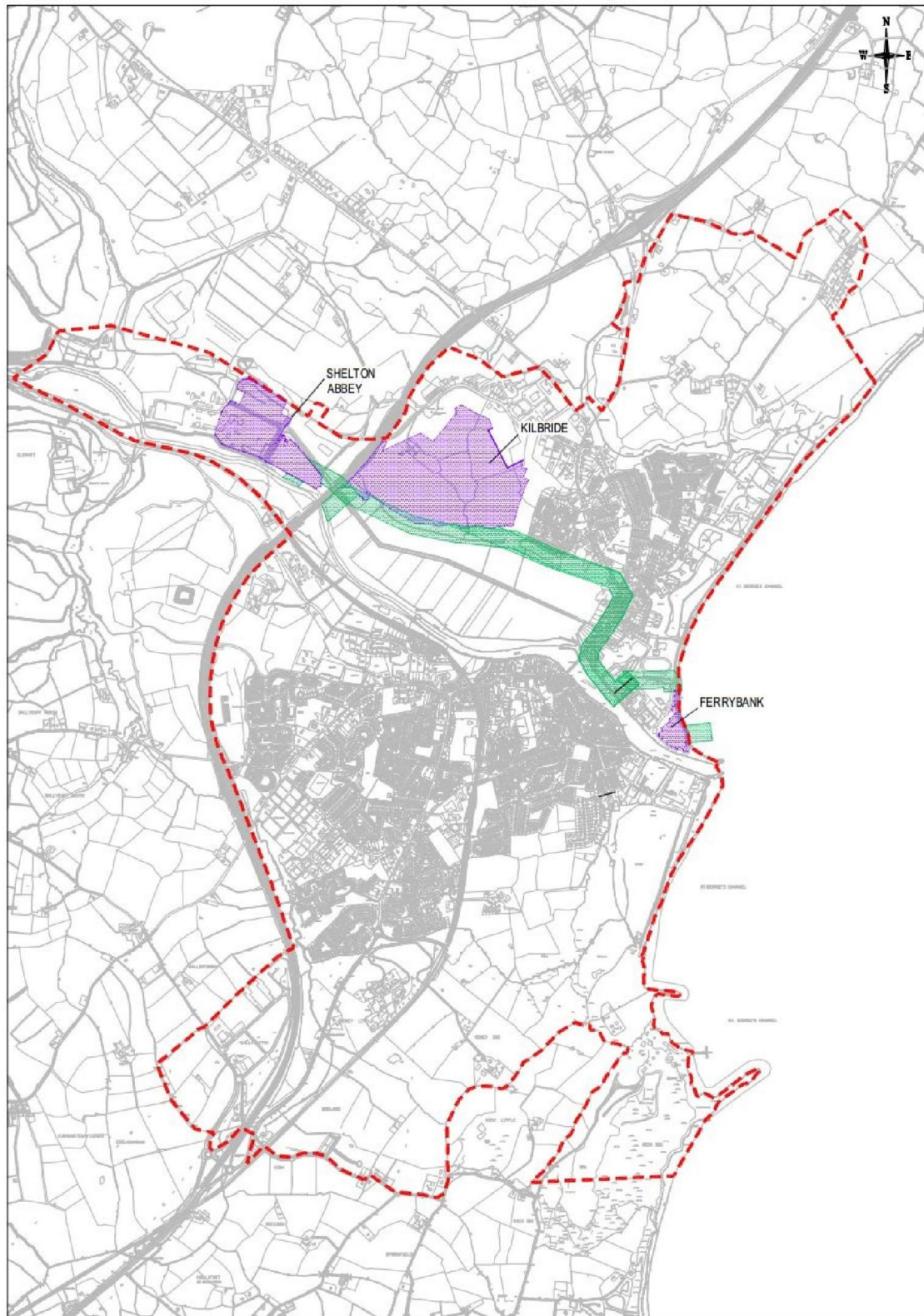


Figure 2.1 Shortlisted Land Parcels for Phase 2 Assessment

The schematic below best illustrates the course of action Irish Water have taken to date to ensure the best possible site is selected for the future Arklow WwTP.

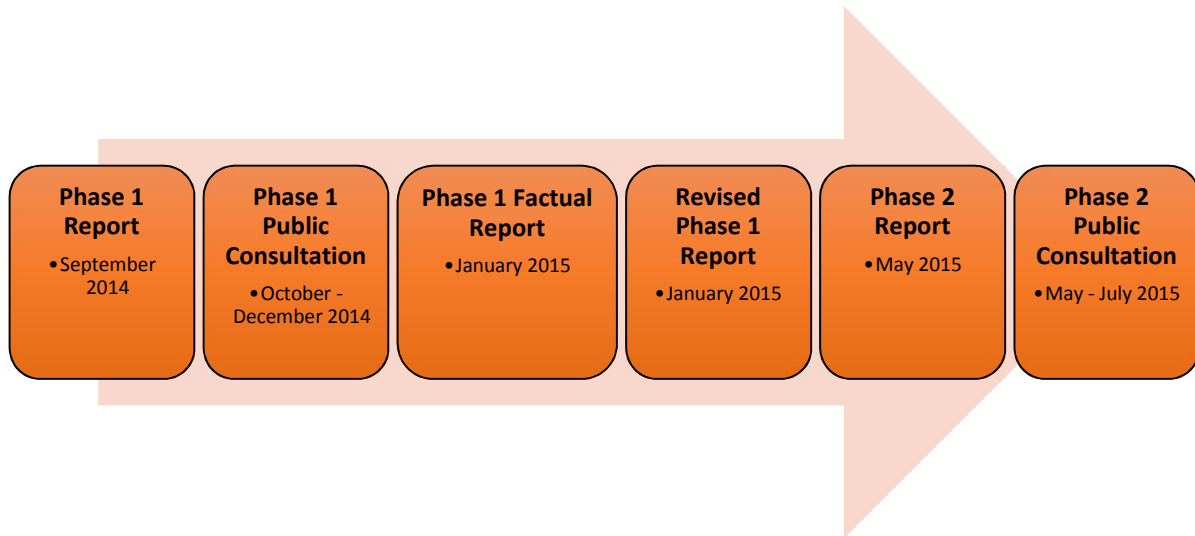


Figure 2.2 Site Selection Process to Date

## 2.2 Phase 2 Report Objectives

This Phase 2 Report consists of an assessment of the performance of each of the three shortlisted land parcels (mentioned above), transfer pipeline routes and outfalls against a range of environmental and technical criteria leading to the identification of emerging preferred sites for the WwTP, outfall location and transfer pipeline routes. The Sites Assessment (SA) includes

- Pipeline corridors and marine outfall study areas
- Desk-top studies
- Site visits and impact assessments by the project consultants including archaeological and ecological specialists

The Phase 2 Report also includes a more detailed examination of the criteria that were examined in Phase 1 of the SA. A higher level of information was needed in advance of the Phase 2 report to assess the criteria of the shortlisted land parcels. Irish Water engaged the services of four specialists to conduct further studies on the remaining preferred land parcels. These services included:

- Ground Investigation Works at the shortlisted brownfield land parcels
- Ecological Surveys
- Archaeological Surveys
- Asbestos Surveys

It is the conclusion of these studies that has enabled the assessment within this Phase 2 report.



## 2.3 Outfall Study

BLP engaged the services of Irish Hydrodata Ltd. to undergo an investigation of the impact of treated wastewater discharges to the Avoca River and the Irish Sea in January 2015. The purpose of the study was to:

- Make an assessment of effects of treated wastewater discharges to the Avoca river and the Arklow coastal area;
- Establish suitable effluent discharge standards;
- Ensure compliance with all EC and national regulations;
- Assess and compare potential outfall locations.

The brief for the studies required a focus on various scenarios to be focused on. In the marine, these include spring/neap tides and calm/windy conditions. The river discharge focused on 95%ile flows in the Avoca.

Under the Urban Wastewater Treatment Regulations 2001 secondary treatment of effluent is mandatory. This will significantly reduce overall biological impacts of discharges from the WwTP. The main concerns regarding the proposed discharges are the impacts on nutrient levels and on bacterial concentrations in nearby bathing waters.

An assessment of the impact of waste water discharges to the Avoca River and the Arklow coastal waters was conducted with the aid of numerical models.

The assessment was conducted for a PE of 36,000 with an average daily flow of 0.127 m<sup>3</sup>/s. The analysis has allowed conclusions to be made regarding the proposed discharges and the level of treatment required in the WwTP to ensure compliance with relevant regulations.

Assessment of the river outfall was made both on the basis of Environmental Protection Agency's (EPA) background water quality data and also taking discharges from the Sigma Aldrich plant into consideration. The proposed range of Emission Level Values (ELV's) are summarised in Table 2.2 overleaf.

Analysis of the marine outfall options has shown that the coastal water depths and current speeds are sufficient to ensure rapid dilution and dispersion of the discharge. Models indicate that a 900m outfall will ensure compliance with the 'Excellent' category of Bathing Water Quality Regulations 2008. The proposed ELV's are summarised in Table 2.2 below.

These findings are provisional and the analyses and proposed ELV's need to be formally discussed with the EPA prior to making a final decision on an emerging preferred WwTP location.

Parameter	River Outfall	900m Marine Outfall
Biochemical Oxygen Demand	10 mg/l	25 mg/l
Suspended Solids	35 mg/l	35 mg/l
Total Ammonia-N	0.7 to 1 mg/l	10 mg/l
TON-N	35 mg/l	35 mg/l
PO4-P	0.7 to 1 mg/l	-
E.coli	1 x 10 <sup>6</sup> ec/100ml	1 x 10 <sup>6</sup> ec/100ml

Table 2.2 Proposed WwTP Discharge ELV's

The full report, as produced by Irish Hydrodata Ltd. can be found in Appendix A.



## 2.4 Flood Feasibility Study

Following the findings of the Phase 1 Consultation process, the IFI site, west of Arklow, was identified as a potential site for the Arklow WwTP. IW decided to further investigate the flood risk associated with this site and hence determine its suitability as a possible WwTP location.

IW Water engaged the services of Byrne Looby PH McCarthy to assess the flood risk to the IFI site in accordance with *The planning Systems and Flood Risk Management – Guidelines for Planning Authorities*, hereafter referred to as ‘the Guidelines’. At this stage, a detailed design of the treatment plant has not been undertaken and the aim of this report is to assess the suitability of the IFI site (or part thereof) for use for a WwTP in relation to flood risk. The study area is set out in Figure 2.3 below:

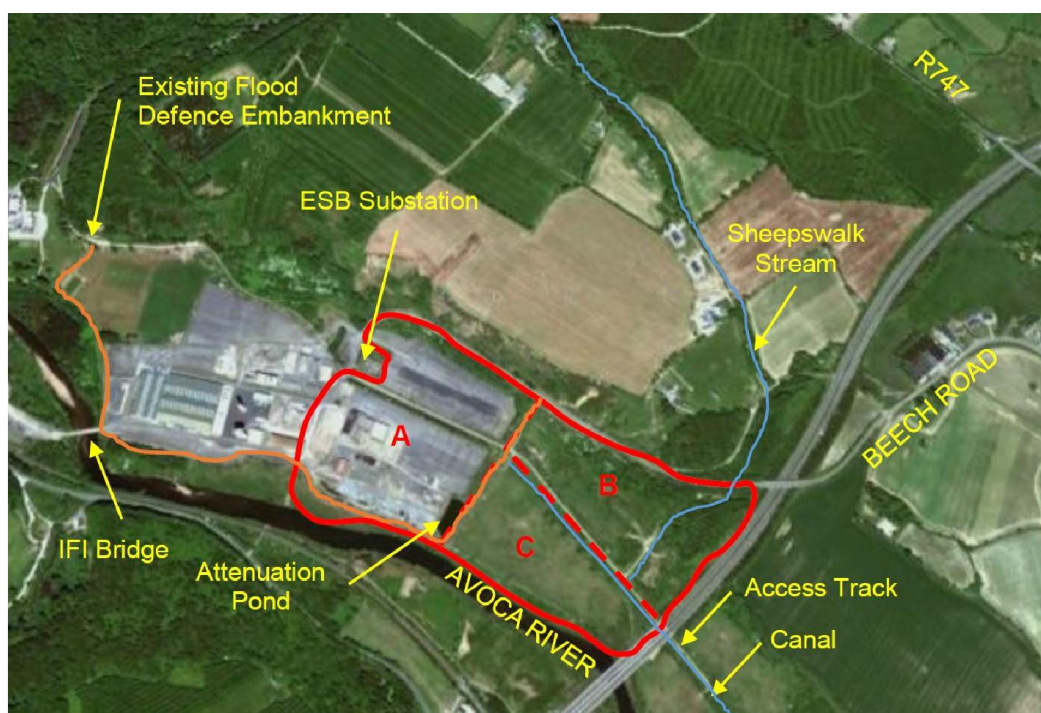


Figure 2.3 Outline of study area and sub-plots A, B & C

An assessment of the flood risk to the site has been undertaken and it has been shown that an adequate area of land is available within the assessment site for the provision of Arklow WwTP which is outside the 0.1% Annual Exceedance Probability (AEP) flood extent. Portions of the suitable land are within flood Zones A or B but are well protected by an existing flood defence embankment. The key points are:

- Adequate lands are available outside the 0.1% AEP flood extent;
- Development in Zone C is the preferred option, but development in Zone A or B where it is defended by the flood defence embankment is also acceptable;
- A justification test has been undertaken that demonstrates that an adequate area within the assessment site is suitable for development in terms of flood risk;
- Site investigations to assess the strength and condition of the existing flood defence embankment, as well as the potential for seepage should be conducted if development in plot A of the site is proposed.



- The development levels (floor and tank) are presented in Table 2.3.

Event	Q100 MFRS Flood Level (m OD)	Allowance for Freeboard (m)	Design Level (m OD)
Plot A	4.88	0.3	5.18
Plots B & C	4.18	0.3	4.48

Table 2.3 Minimum Design Development Levels for the WwTP

The full Flood Risk Assessment and Management Report can be found in Appendix B.





## 3 Phase 2 Process

### 3.1 Methodology for Phase 2 – Site Assessment

The methodology for the Phase 2 Site Assessment has been carried out in eight steps as follows;

- **Step 1** – Production of individual matrices and mapping of impacts on the land parcel options by the environmental and technical specialists based on desktop studies and visual inspections including identification of the relative importance of sub-criteria. A complete set of these matrices has been included in Appendix J.
- **Step 2** – Identification of the best positioned 2 ha. site within the land parcels based on relative technical and environmental constraints.
- **Step 3** – Update individual matrices to reflect the focus from the land parcel to the individual sites
- **Step 4** – Combination of the individual matrices into one overall primary matrix.
- **Step 5** – Identify cells that are most favourable across the sub-criteria. Shade these cells green.
- **Step 6** – Identify the cells which are the least favourable of the sub-criteria considered to be most important by the respective specialists. Shade these cells amber. On subsequent iterations, cells are shaded amber in the same way for the most important sub-criteria.
- **Step 7** – Review the completed matrix to determine whether any site options with ‘least favourable’ classifications are
  - a) - Of such significance that it would be comparatively difficult to secure planning permission on this site option; or
  - b) - Of such environmental disadvantage that with the range of choices available this site option should not be considered further.
- **Step 8** – Review each sub-criteria to determine whether there are any differentiating levels of impact remaining across the site options. If not, these sub-criteria can be parked from the evaluation stage.

Steps 5 to 8 are an iterative process and the steps are repeated until such time as when the matrix has been sufficiently refined so that the differentiating factors between the remaining site options are nuanced such that it is not possible to remove any further site options/sub-criteria.

### 3.2 Site Assessment Criteria

This Phase 2 assessment is based on a qualitative process which assesses the performance of each of the alternative land parcels, transfer pipelines routes and outfall locations against a range of environmental and technical criteria in order to identify three emerging preferred site options.

The criteria used for the assessment are provided in Table 3.1 below. Each land parcel option was assessed by the relevant technical and environmental specialist under each of these criteria. These assessments were used to identify the differentiating sub-criteria to be used in the identification of the preferred 2 ha site within each of the land parcels and subsequently the identification of the emerging preferred site option. The outcomes of each of these



assessments were combined into an overall assessment matrix detailing all potential constraints associated with each of the site options. Through an assessment of most and least favourable constraints in the matrix, the emerging preferred site options were identified.

Environmental Criteria	Technical/Economic Criteria
Ecology	Safety
Cultural Heritage	Planning Policy
Landscape & Visual	Engineering & Design
Hydrology & Hydrogeology	Capital & Operational Costs
Soils & Geology	Land Valuation
Traffic	
Air Quality & Odour	
Agriculture & Agronomy	
Noise & Vibration	
People & Communities	

Table 3.1 Site Assessment Criteria

### 3.3 Specialist Methodology

A generic outline of the methodology followed by each of the environmental and technical specialists for their assessments is outlined below.

#### 3.3.1 Data Collection

Each specialist, where required, undertook a desk-based assessment of the available data collected to date on the scheme. Further data sets, relevant to each specialism were also identified, obtained and reviewed for data relevant to the proposed land parcels, pipeline corridors and outfall locations. In some cases, this involved site surveys and invasive site investigation works.

#### 3.3.2 Site Visits

Site visits and “windshield surveys” of the three land parcels and pipeline route corridors were undertaken in the first few months of 2015. Where required by the relevant specialists, entry onto the land parcels was undertaken, generally to verify or clarify constraints identified as part of the desk based assessment.

#### 3.3.3 Specialist Assessment

Based on the assessments undertaken, the land parcels were initially assessed to identify associated constraints which were then used to determine the best placed 2 ha site within each of the land parcels. The specialist assessments then focused on the sites, pipeline routes and marine outfall locations (site options). In general for the environmental specialists, five categories were used to categorise impacts identified for the site options, as follows:

- Profound
- Significant
- Moderate



- Slight
- Imperceptible

These categorisations are based on the EPA “*Guidelines for the information to be contained in Environmental Impact Statements*” published in 2002 and the National Roads Authority (NRA) “*Environmental Impact Assessment of National Road Schemes – A Practical Guide*”. These guidelines are accepted nationally and have been used previously on similar infrastructure projects. Technical aspects of the site options were determined in a manner which would allow the most and least favourable option for each sub-criterion to be easily identified.

### 3.3.4 Generate Matrix

The assessments under each of the identified criteria by the relevant specialists were reported in a matrix format, which scheduled each of the identified sub-criteria against the land parcel options. The level of environmental impact or technical aspect associated with each sub-criterion for each site option was reported across the matrix. Where relevant, additional brief detail was also included which provided basis and justification for the level of impact accorded to each sub-criterion for each site option.

These matrices were then incorporated into one overall assessment matrix and the full assessment of each of the site options was undertaken.

An extensive list of the matrix criteria can be found in Appendix C.



## 4 Step 1 – Individual Matrices

### 4.1 Cultural Heritage

#### 4.1.1 Introduction

Irish Archaeological Consultancy (IAC) were engaged to undertake a high level archaeological assessment of the three shortlisted land parcels, associated pipeline corridors & effluent outfalls in order to determine what impacts a WwTP development could have on the cultural heritage of the area. The report is summarised below. For the full report, refer to Appendix D.

#### 4.1.2 Ferrybank (Old Wallboard Factory)

##### *Site*

The Ferrybank land parcel (Old Wallboard Factory) option is located within the townland of Ferrybank in the Parish and Barony of Arklow to the east of Arklow town. The parcel is bound to the south by the north quay and the Avoca River, the seashore to the east and the Mill Road to the west. The area is currently comprised of an abandoned factory building and associated tanks and outbuildings and the parcel is partially overgrown. The proposed parcel of land currently comprises c. 7 acres.

There are no RMP sites (Record of Monuments & Places) located within c. 500m of the proposed WwTP land parcel. The boundary of the zone of archaeological potential for the historic town of Arklow (WI040-029) is located c. 420m to the north-west. The nearest recorded site with an accurate location comprises of the Cistercian monastery and graveyard (WI040-029004, 8) c. 620m to the NNW. The receiving environment is considered to possess archaeological potential due to its proximity to the coast. Settlement from the prehistoric periods onwards found coastal regions attractive due to the relatively easy access to a food resource, as well as being able to travel and trade.

The historical mapping indicates that this area was located within the estuarine mud flats in the early 19th century. The area had been partially reclaimed by the late 19th century and was shown as undeveloped marsh land. By the first decade in the 20th century the north quay had been constructed and a chemical works had been developed within the area of proposed development. Tramlines are shown running north linking the quayside with the munitions works located along the coast.

Inspection of the aerial photographic coverage of the proposed development area held by the Ordnance Survey (1995, 2000 & 2005) and Google Earth (2010) revealed no previously unrecorded features of archaeological potential in or within the immediate vicinity of the proposed scheme.

A review of the Excavations Bulletin (1970–2010) has indicated that two programs of archaeological investigation have been undertaken within proximity to the proposed development area. Monitoring of ground works was undertaken at the site of a shopping centre on the North Quay, Ferrybank (Sullivan, 2005; licence ref.: 05E0686) and for the laying of ESB cables between Arklow Harbour and Brittas Road (Campbell, 2003; licence ref.: 03E0737). Whilst reclamation deposits were identified, no features of archaeological significance were identified. Monitoring of site investigations was undertaken along the north and south quays of Arklow Town in May 2013 as part of the current development (Bailey, 2013; licence ref.: 12E309). Nothing of archaeological significance was identified at this time.



### *Pipelines Route Corridor*

Given the relatively short distance between the load centre and the Ferrybank land parcel (Old Wallboard Factory), only a small distance of land excavation will be required. This area of Arklow lies in the estuarine mud flats and any negative effects associated with the pipelines have been deemed imperceptible to the cultural heritage of the area. However, it is advised that if works were to go ahead at the Ferrybank land parcel (Old Wallboard Factory), a full level archaeological investigation would have to be undertaken.

### *Outfall*

Given the coastal location of this land parcel, any negative effects associated with the marine outfall have been deemed imperceptible to the cultural heritage of the area. The nearest shipwreck site located at E = 333751.127, N = 173605.568 is c. 7.5 km from the boundary of the parcel.

### *Evaluation*

The proposed development will not impact on any recorded terrestrial archaeological sites, which are listed within the RMP. No sites or features of previously unidentified archaeological significance were identified on the historic mapping or in the aerial photographs within the area of proposed development. The site was located within estuarine mud flats until reclamation in the later 19th century and early 20th century. The area was built up in order to construct the north quay and has been subject to redevelopment since the early 20th century.

Three previous programs of archaeological monitoring were undertaken within the vicinity of the proposed development area however only reclamation deposits were noted. No features of archaeological significance were identified in these areas.

This land parcel poses the least potential impact to the archaeological resource.

For the full high level archaeological assessment of lands report, as carried out by IAC, please refer to Appendix D.

## **4.1.3 Kilbride**

### *Site*

The Kilbride land parcel is located within the townland and Parish of Kilbride and Barony of Arklow. The site is situated c. 870m north of Arklow town centre to the north of the Avoca River. It is comprised of all or part of approximately five undeveloped green fields surrounding Kilbride House, to the immediate south of the M11.

The receiving environment is considered to possess archaeological potential due to its proximity to the River Avoca and the coast c. 1.2km to the east. Settlement from the prehistoric periods onwards found coastal and riverine landscapes attractive due to the relatively easy access to a food resource, as well as being able to travel and trade.

There are nine previously recorded archaeological sites located within c. 500m of the proposed WwTP option in Kilbride. The nearest of which comprise of a two sites (WI040-048 and WI040-050) excavated in advance of the Arklow Bypass Road in 1997 to the immediate north of the northwest corner of the proposed land parcel. Site WI040-048 comprised the remains of a Bronze Age settlement site - indicated by evidence for an oval structure and postholes associated with lithic artefacts and Bronze Age pottery. Near to this site the remains of an undated isolated furnace (WI040-050) were excavated. Further to the north, a burnt spread and flints (WI040-051) and a burnt mound (WI040-052) were also excavated in



advance of the scheme c. 140 - 450m north of the proposed WwTP land parcel. The find spot of a font (WI040-044) is also recorded c. 80m to the northeast however it is no longer in situ.

The only nearby recorded sites designated as Recorded Monuments, comprise the church, graveyard, enclosure and mausoleum (WI040-021001-4) recorded c. 60m north of the proposed Kilbride WwTP land parcel. These sites are located within a modern enclosure.

A review of the Excavations Bulletins (1970-2014) revealed that no archaeological investigations have been carried out within the footprint of the Kilbride land parcel. Monitoring was carried out for topsoil stripping during the construction of the Arklow Bypass to the immediate north of the site and several sites identified at this time were subject to excavation. The sites located in greatest proximity to the proposed WwTP land parcel are located to immediate north within the footprint of the existing road, including the Bronze Age settlement site (WI040-048, Breen 1997; Licence 97EO324) and furnace site (WIO40-O50, O Riordain; Licence 97E0083).

Analysis of the available aerial photographic coverage of the site (Google Earth 2010 and OSI 2000) failed to reveal any features of archaeological potential within the footprint of this land parcel option.

The following potential negative impacts have been identified:

- Slight potential to impact on cultural heritage sites (previously unrecorded sites)

#### *Pipelines Route Corridor*

Given the extent of excavation required to lay a rising main to the Kilbride land parcel, it is advised that if works were to go ahead, a full high level archaeological investigation would have to be undertaken.

For the purpose of this investigation, the following potential negative impacts have been identified:

- Moderate potential to impact on cultural heritage sites (previously unrecorded sites)

#### *Outfall*

Given the relatively short length of excavation required to lay a river outfall from the Kilbride land parcel to the Avoca River, any potential negative effects have been deemed imperceptible at this stage. Nevertheless, it is advised that if works were to go ahead at Kilbride, a full high level archaeological investigation would have to be undertaken.

#### *Evaluation*

The proposed development will not impact on any recorded archaeological sites, which are listed within the RMP. No sites or features of previously unidentified archaeological significance were identified on the historic mapping or in the aerial photographs within the area of proposed development.

Two previous archaeological excavations have been carried out to the immediate north of the proposed development area which revealed a prehistoric settlement (WI040-048) site and a furnace (WI040-050). While both of these sites have been subject to full archaeological resolution, and as such have no remaining elements in situ, it is possible that associated features associated may be located within their proximity, outside of the M11 footprint and within the current land parcel.





The proposed development is located within a rich archaeological landscape adjacent to the estuary of the River Avoca and the coast. As such the receiving environment is considered to possess high archaeological potential. Settlement from the prehistoric periods onwards found coastal regions attractive due to the relatively easy access to a food resource, as well as being able to travel and trade.

#### 4.1.4 Shelton Abbey (IFI Site)

##### *Site*

The Shelton Abbey site option is located within the townlands of Shelton Abbey and Kilbride, Parish of Kilbride and Barony of Arklow. The site is situated c. 1.4km north - northwest of Arklow town centre on the northern banks of the Avoca River. It is comprised of all or part of three undeveloped green fields and two previously developed plots on the northern banks of the River Avoca, to the immediate west of the M11.

The receiving environment is considered to possess archaeological potential due to its immediate proximity to the River Avoca and the coast c. 2.1km further to the east. Settlement from the prehistoric periods onwards found coastal and riverine landscapes attractive due to the relatively easy access to a food resource, as well as being able to travel and trade.

There are seven previously recorded archaeological sites located within c. 500m of the proposed WwTP option in Shelton Abbey. The nearest of which comprise of a two sites (WI040-048 and WI040-050) excavated in advance of the Arklow Bypass Road in 1997 to the immediate south of [the proposed land parcel. Site WI040-048 comprised the remains of a Bronze Age settlement site - indicated by evidence for an oval structure and postholes associated with lithic artefacts and Bronze Age pottery. Near to this site the remains of an undated isolated furnace (WI040-050) were excavated. Further to the north, a burnt spread and flints (WI040 - 051) was also excavated in advance of the scheme c. 190m north of the proposed WwTP land parcel.

The only nearby recorded sites designated as Recorded Monuments, comprise the church, graveyard, enclosure and mausoleum (WI040-021001-4) recorded c. 320m east of the proposed Shelton Abbey WwTP land parcel. These sites are located within a modern enclosure.

A review of the Excavations Bulletins (1970 - 2014) revealed that no archaeological investigations have been carried out within the footprint of the Shelton Abbey land parcel. Monitoring was carried out for topsoil stripping during the construction of the Arklow Bypass to the immediate east of the site and several sites identified at this time were subject to excavation. The sites located in greatest proximity to the proposed WwTP land parcel are located to immediate south within the footprint of the existing road, including the Bronze Age settlement site (W1040-048, Breen 1997; Licence 97E0324) and furnace site (WI040-050, O Riordain; Licence 97E0083).

Cartographic analysis of the historic maps failed to identify any previously unidentified sites of archaeological potential. The proposed land parcel is shown as being located within the southern portion of the extensive demesne landscape that was associated with Shelton Abbey on the first edition OS map. As such the area would have been subject to a certain level of landscaping and ground works. The line of an old east-west running access road, which also formed the townland boundary between Kilbride, is shown on the mapping and this is preserved within the southern limit of the current land parcel. A gate lodge is shown on the later 25-inch OS maps which is no longer extant.



Analysis of the available aerial photographic coverage of the site (Google Earth 2010 and OSI 2000) failed to reveal any features of archaeological potential within the footprint of the WwTP land option. The southeast quadrant of the proposed WwTP land parcel is currently covered in rough scrub vegetation which would hamper the identification of archaeological features.

The northern half of the proposed development has been subject to a large amount of disturbance during the construction of the existing industrial facility (since at least 1995). Any archaeological features that may have existed in this area are likely to have been removed.

#### *Pipelines Route Corridor*

Given the extent of excavation required to lay a rising main to the Shelton Abbey (IFI Site) land parcel, it is advised that if works were to go ahead, a full high level archaeological investigation would have to be undertaken.

For the purpose of this investigation, the following potential negative impacts have been identified:

- Moderate potential to impact on cultural heritage sites (previously unrecorded sites)

#### *Outfall*

Given the relatively short length of excavation required to lay a river outfall from the Kilbride land parcel to the Avoca River, any potential negative effects have been deemed imperceptible at this stage. Nevertheless, it is advised that if works were to go ahead at Kilbride, a full high level archaeological investigation would have to be undertaken.

#### *Evaluation*

The proposed development will not impact on any recorded archaeological sites, which are listed within the RMP/SMR. No sites or features of previously unidentified archaeological significance were identified on the historic mapping or in the aerial photographs within the area of proposed development.

Aerial photography has indicated that the northern half of the land parcel has been subject to significant disturbance associated with the construction of the existing industrial complex, since at least 1995. Any archaeological features that may have existed in this area are likely to have been removed.

Two previous archaeological excavations have been carried out to the immediate south of the proposed development area which revealed a prehistoric settlement site (WI04O-048) and a furnace (WI04O-050). While both of these sites have been subject to full archaeological resolution, and as such have no remaining elements in situ, it is possible that associated features associated may be located within their proximity, outside of the M11 footprint and within the current land parcel.

The proposed development is located within a rich archaeological landscape adjacent to the estuary of the River Avoca. As such the receiving environment is considered to possess archaeological potential. Settlement from the prehistoric periods onwards found coastal regions attractive due to the relatively easy access to a food resource, as well as being able to travel and trade.

For the full high level archaeological assessment of lands report, as carried out by IAC, please refer to Appendix D.



<b>1.0 Cultural Heritage</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
<b>1.1</b>	<b>Cultural Heritage - Land Parcels</b>			
1.1.1	Potential to impact (direct/indirect) on National Monuments (designated sites)	Imperceptible	Imperceptible	Imperceptible
1.1.2	Potential to impact (direct/indirect) on RMPs* (designated sites)	Imperceptible	Imperceptible	Imperceptible
1.1.3	Potential to impact (direct/indirect) on RPS/NIAH** (designated sites)	Imperceptible	Imperceptible	Imperceptible
1.1.4	Potential to impact (direct/indirect) on CH*** sites (previously unrecorded sites)	Imperceptible	Slight – greenfield land parcel	Slight – greenfield land parcel
1.1.5	Potential to impact (direct) on water courses and environs (areas of archaeological potential)	Imperceptible	Imperceptible	Imperceptible
1.1.6	Potential to impact (direct/indirect) on historic designed landscapes	Imperceptible	Imperceptible	Imperceptible
1.1.7	Potential to impact (direct) on townland boundaries (cultural heritage significance)	Imperceptible	Imperceptible	Imperceptible
<b>1.2</b>	<b>Cultural Heritage - Route Corridors</b>	<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
1.2.1	Potential to impact on RMPs	Imperceptible	Imperceptible	Imperceptible
1.2.2	Potential to impact on National Monuments	Imperceptible	Imperceptible	Imperceptible
1.2.3	Potential to impact on RPS/NIAH	Imperceptible	Imperceptible	Imperceptible
1.2.4	Potential to impact on CH sites	Imperceptible	Moderate – corridor though greenfield lands	Moderate – corridor though greenfield lands
1.2.5	Potential to impact on historic designed landscapes	Imperceptible	Imperceptible	Imperceptible
1.2.6	Potential to impact on ACA****	Imperceptible	Imperceptible	Imperceptible
<b>1.3</b>	<b>Cultural Heritage - Outfalls</b>	<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
1.3.1	Potential to impact on RMPs	Imperceptible	Imperceptible	Imperceptible
1.3.2	Potential to impact on National Monuments	Imperceptible	Imperceptible	Imperceptible
1.3.3	Potential to impact on RPS/NIAH	Imperceptible	Imperceptible	Imperceptible
1.3.4	Potential to impact on CH sites	Imperceptible	Imperceptible	Imperceptible
1.3.5	Potential to impact on Recorded shipwreck sites	Imperceptible	Imperceptible	Imperceptible
1.3.6	Potential to impact on inter-tidal archaeology (previously unknown)	Imperceptible	Imperceptible	Imperceptible

Table 4.1 Cultural Heritage

- \* Record of Monuments & Places
- \*\* Record of Protected Structures/National Inventory of Architectural Heritage
- \*\*\* Cultural Heritage
- \*\*\*\* Architectural Conservation Area



## 4.2 Landscape & Visual

### 4.2.1 Introduction

The Landscape and Visual section of the site assessment for the Arklow WwTP project compares the predicted landscape and visual impacts in relation to each of the three shortlisted land parcels. It also assesses potential impacts with respect to the pipeline routes and outfall locations. The assessment is based on desktop studies and ‘windshield’ site surveys and it is presented in the form of impact matrices.

The basis for the assessment is the “*Guidelines for Landscape and Visual Impact Assessment: Second Edition*” Landscape Institute (LI)” and “*Institute of Environmental Management and Assessment (IEMA), 2002*”. Also considered are the guidelines laid out by the Environmental Protection Agency (EPA) in the publications “*Guidelines on the Information to be contained in Environmental Impact Statements (2002)*”, the accompanying “*Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*” (September 2003) and the methodologies adopted by the “*Greater Dublin Drainage - ASA Phase Two Sites Assessment and Route Selection Report*”

These Guidelines note in the ‘Landscape in the Existing Environment’ Chapter that landscape impact is a combination of two separate, but closely related, aspects: ‘The first aspect to be considered is visual impacts focusing on the extent to which developments can be seen, the second aspect is impacts on the character of the landscape, examining responses which are felt towards the combined effects of the new development’. The EPA Guidelines recommend the following to be included in any assessment.

- **Context:** Areas from which the existing site can be seen are generally noted with particular attention given to views from roads, residences and designated tourism routes and viewpoints. Areas from beyond the site boundary from which the site can be seen should be noted. If the site and its environs have areas of distinctive and different character, those are mapped and described.
- **Character:** A description of the landscape character differentiates between subjective assessments and objective description. A description of the character of the site as perceived both within the site and in the wider landscape is important, as is a description of the intensity and character of land use.
- **Significance:** This entails the level of visual intrusion upon designated views, designated landscape and designated landscape amenity areas.
- **Vulnerability:** The extent to which the existing landscape or views are capable of being changed in such a way as not to alter the perceived character.

Also key to this assessment, particularly given that the pipeline routes and outfall aspects will be laid underground, is the duration of any landscape and visual impacts. The EPA guidelines define the duration of impacts as follows:

- **Temporary:** One year or less -
- **Short-term:** One to seven years
- **Medium-term:** Seven to twenty years
- **Long-term:** Twenty to fifty years -
- **Permanent:** Over fifty years -



## 4.2.2 Methodology

### 4.2.2.1 Desktop Study

The desktop study was the first aspect of the SA to be undertaken by the landscape and visual assessors. One of the key aspects of the desktop study was a review of the Wicklow County Development Plan (2010 - 2016) principally in relation to the location of designated areas of Highly Sensitive Landscape, scenic views and scenic routes.

The landscape of the County is a national asset. The Wicklow County Development Plan (2010 – 2016) incorporates the landscape characterisation for Wicklow, which identifies a range of six landscape character types. County Wicklow is richly endowed with a variety of landscape ‘types’ and human interaction with the natural heritage has produced a variety of characteristic landscapes and landscape features. The increasing development pressure of recent years has caused changes in the natural landscape, which are unprecedented in scale and nature, and has led to the Government setting out guidelines for landscape appraisal. This assessment of the landscape is to ensure that *“the environment and heritage generally are maintained in a sustainable manner, while at the same time enabling a proactive approach to development”*.

Each landscape type is assigned a ‘value’ through the consideration of such elements as aesthetics, ecology, historical, cultural, religious or mythological. The corresponding vulnerability ratings range from ‘low’ to ‘very high’.

The landscape character types and respective vulnerability ratings are listed below:

- Mountain and Lakeshore Areas of Outstanding Natural Beauty - Very High
- Coastal Areas of Outstanding Natural Beauty - Very High
- Areas of Special Amenity - High
- Access Corridor Area - Medium
- Rural Area - Medium
- Urban Area - Low

The Wicklow County Development Plan (2010 – 2016) classes Arklow and its environs as an “urban” area for the purpose of landscape classification. Urban areas are defined below:

*“All locations designated as ‘settlements’ in the County settlement hierarchy are considered ‘urban’ areas for the purpose of landscape classification, although it is acknowledged that many of the smaller towns and villages are not ‘urban’ in the same sense as settlements such as Bray or Arklow. In terms of landscape classification, these settlements have already been deemed suitable for development (of the type allowed by the settlement strategy and the development standards of this plan) and the impacts on the wider landscape of such development has already been deemed acceptable. Therefore it will not be necessary for developments in urban areas to have regard to the surrounding landscape classification or to carry out landscape or visual impact assessment”*.

The output from the desktop study phase was a preliminary assessment of likely landscape and visual impacts. This was generated using an impact matrix format of land parcels, pipeline routes and effluent outfall locations versus a range of potential landscape and visual constraints.



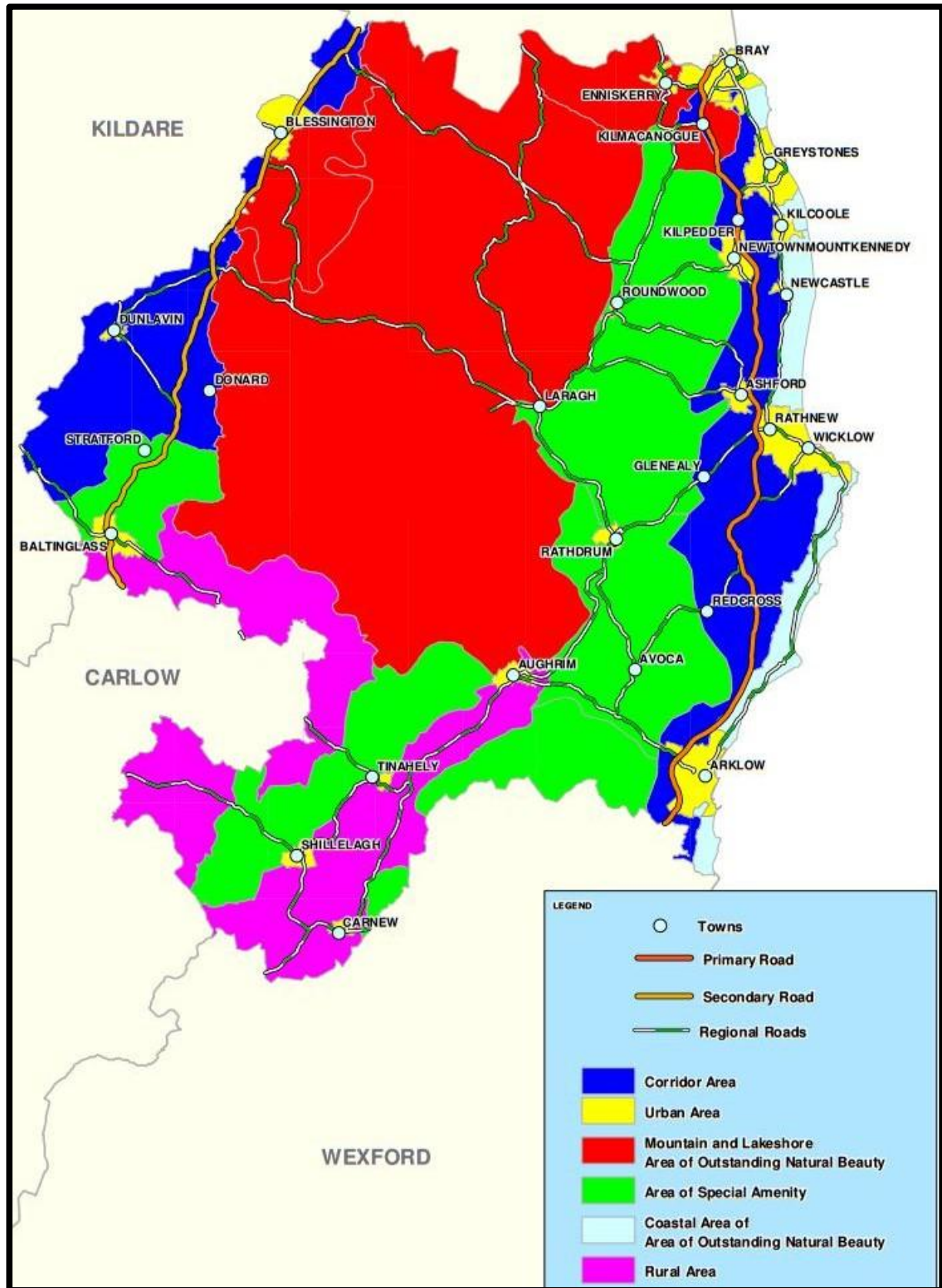


Figure 4.1 Map No. 17.09 taken from the Wicklow County Development Plan (2010-2016) – Landscape Classifications





#### 4.2.2.2 Site Visits

Following the desktop study phase, ‘windshield’ site surveys were undertaken to confirm or refute the initial impact predictions. These surveys took account of such factors as the relative elevation of the land parcel and surrounding receptors as well as the level of terrain and/or vegetation screening.

The site visits afforded the landscape and visual assessors an opportunity to become familiar with the landscape character of the study area generally and more specifically, the areas subject of potential development in relation to the Arklow WwTP.

#### 4.2.3 Predicted Impacts

This section highlights any landscape and visual impacts that are likely to occur as a result of the proposed development. These impacts might occur in relation to the construction phase or the ongoing operational phase of the development.

##### 4.2.3.1 Construction Phase

All aspects of the proposed development will result in landscape and visual impacts during the construction phase. However, in the case of the subsurface pipeline routes and the effluent outfall aspects, the construction phase will be the likely extent of any impacts. The Wastewater Treatment Plant, by contrast, will also result in permanent operational phase impacts. The predicted nature and duration of impacts are discussed below in relation to each aspect of the project.

###### 4.2.3.1.1 Wastewater Treatment Plant

The WwTP is likely to be the only aspect of the project that will result in both, temporary construction, and, permanent operational, landscape and visual impacts. The visible elements of the WwTP at construction phase are likely to consist of;

- Construction traffic to and from the site
- Excavation and construction machinery on site
- Temporary fencing at the perimeter of the site
- Health and safety signage and fencing within and around the site
- Stockpiles of excavated material
- Stockpiles of construction materials
- Temporary site offices

###### 4.2.3.1.2 Pipeline Routes

For the construction phase of the pipeline routes, temporary negative visual impacts are likely to occur as a result of construction traffic, excavation machinery, health and safety signage and fencing, stockpiles of excavated material and stockpiles of construction materials (pipeline sections and backfill material). The pipeline will run along some sections of road and will also pass through farmland and other undeveloped sites. Given that the time for laying the underground pipeline is relatively short, and that the impacts are restricted to receptors at the working face, the impacts described are only likely to be in the higher order of magnitude with respect to any particular receptor for a period of weeks before the works have moved on.

In terms of landscape impacts the pipeline route will inevitably encounter tree lines and hedgerows, short sections of which will need to be removed and then replaced or replanted



depending on the nature of the vegetation affected. Where well established vegetation must be replaced the negative landscape and visual impact may extend from temporary (less than one year) to the short term (one to seven years).

Other than along road sections of the pipeline route, a line of bare earth will also remain following construction, indicating the path of the pipeline. This will only be a temporary landscape and visual impact until such time as the prevailing land cover becomes re-established.

#### **4.2.3.1.3 Outfall**

The outfall aspect of the project is likely to generate similar type of temporary landscape, seascape, and visual impacts to the pipeline routes as it is essentially an extension of the land based subterranean pipeline. A river outfall is considered to be of a similar construction to the land based subterranean pipelines, however there is potential for a permanent visual effect. It is envisaged at this stage that an outfall to the river will involve the construction of a headwall at the outfall location.

In the case of a marine outfall and given the interface of land and sea, a more complex construction scenario is envisaged. In addition to the construction elements described above for the land based pipelines, some form of marine craft will be required for laying of the pipeline below the seabed in the vicinity of the shoreline. The other key consideration is the generally higher level of sensitivity of receptors in coastal areas, which includes for example, beaches, coastal walks and bathing locations.

#### **4.2.3.2 Operational Phase**

Permanent, operational phase, landscape and visual impacts will result from a combination of the following visible elements of the WwTP.

- Site entrance and access road
- Administration buildings (modest scale to accommodate staff offices, reception, canteen etc.)
- Treatment works: Preliminary treatment, primary treatment, secondary treatment, & sludge treatment. These processes will involve the construction of screens, settlement tanks, main biological process tanks, sludge processing buildings, sludge storage buildings, odour control units, pumps and associated pipework.
- Permanent site fencing and boundary treatments
- Access and circulation roads including site traffic
- Lighting

This includes, for example, the potential for loss of field patterns, hedgerows and drainage ditches with a resultant impact on the landscape character of the surrounding area. Permanent visual impacts will also occur in relation to surrounding receptors such as dwellings and roads where views of the WwTP are afforded. The magnitude of any impacts is a factor of the composition and integrity of the existing landscape context, as well as the sensitivity of receptors in the vicinity and the potential for mitigation.

The visual impacts associated with the brownfield land parcels may not be as severe when compared to the existing landscape.



#### 4.2.4 Evaluation

In all instances a worst case scenario is assumed in terms of potential impacts, for example, screening vegetation devoid of leaves during the winter and clear views being available beyond rear property boundaries. The predicted impact levels hereunder are also pre-mitigation. Therefore, no level of landscape screening at the site boundary or ameliorative site configuration is assumed.

#### 4.2.5 Ferrybank (Old Wallboard Factory)

##### *Site*

The Ferrybank land parcel (Old Wallboard Factory) is located on the mouth of the Avoca River on the site of an old and derelict gypsum factory. The factory is roughly 25 m in height and has a large chimney flue extending 44 m vertically on the west side of the building. The lower walls are a blockwork construction while the majority of the factory is constructed from steel and corrugated sheet asbestos. The land parcel has 4 large disused storage tanks situated to the west and several smaller abandoned buildings. The terrain is relatively flat with an elevation of approximately 2.5 mOD.

The following negative impacts were identified:

- Moderate potential to impact on views from dwellings/roads (Mill Rd, North Quay & South Quay)

It should be noted that while the construction of a WwTP on the Ferrybank land parcel (Old Wallboard Factory) would cause the above negative impacts, it can be argued that the existing factory is much more visually obtrusive to the landscape and its demolition would improve views from the dwellings and roads listed above.

##### *Pipelines Route Corridor*

Given that all pipework will be laid underground, any potential negative impacts associated with the pipelines would be temporary, lasting only for the construction phase. Therefore, any negative effects associated with the pipelines have been deemed imperceptible to the landscape of the area.

##### *Outfall*

Similarly to above, any negative impacts associated with the marine outfall have been deemed imperceptible to the landscape of the area.

#### 4.2.6 Kilbride

##### *Site*

The Kilbride land parcel is located roughly 1.5 km North West of the centre of Arklow town. The land has a central elevation of approximately 30.0 mOD falling to 20.0 mOD as it descends downwards towards the Avoca River. The land parcel is bounded to the north by Local secondary road L-6179 Ticknock – Kilbride (the Kilbride – old IFI plant road) to the east by existing developed areas mainly in residential and community / educational use and to the south by Arklow Marsh. This parcel is bordered by the M11 motorway to the East but existing trees and shrubbery provides screening from the road.

The following negative impacts were identified:



- Slight potential to impact the character of the landscape
- Slight potential to impact on views from dwellings/roads
- Slight potential to impact on views from M11 motorway
- Slight potential to impact on views Dublin-Rosslare railway line
- Slight potential to disrupt landscape structure (hedgerows / field pattern etc.)

#### *Pipelines Route Corridor*

Given that all pipework will be laid underground, any potential negative impacts associated with the pipelines should be temporary, lasting only for the construction phase. However, given that the pipeline corridor for this land parcel passes through various fields and hedgerows, a potential slight impact to disrupt landscape structure has been recognised. Appropriate reinstatement would have to be employed to minimise this impact.

The following potential constraints were identified along the transfer pipeline corridors:

- Slight potential to impact or disrupt landscape structure (treeline/hedgerows/field patterns etc.)

Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within the corridors to minimise impacts.

#### *Outfall*

This assessment has assumed that the construction a headwall will be requirement for a river outfall. Nevertheless, given this land parcel's close proximity to the modelled Avoca River outfall location, any negative impacts associated with the outfall have been deemed imperceptible to the landscape of the area.

### **4.2.7 Shelton Abbey (IFI Site)**

#### *Site*

The Shelton Abbey land parcel is located along the banks of the Avoca River on the site of the old IFI factory. Over the last few years, the landowner has commenced clearing the site and few sheds/store buildings remain standing. The terrain is relatively flat with an elevation of approximately 0 -10 m OD.

The following negative impacts were identified:

- Slight potential to impact on views from M11 motorway
- Moderate potential to impact on views Dublin-Rosslare railway line
- Slight potential to disrupt landscape structure (hedgerows / field pattern etc.)

#### *Pipelines Route Corridor*

Given that all pipework will be laid underground, any potential negative impacts associated with the pipelines should be temporary, lasting only for the construction phase. However, given that the pipeline corridor for this land parcel passes through various fields and hedgerows, a potential slight impact to disrupt landscape structure has been recognised. Appropriate reinstatement would have to be employed to minimise this impact.

The following potential constraints were identified along the transfer pipeline corridors:

- Slight potential to impact or disrupt landscape structure (treeline/hedgerows/field patterns etc.)



Landscape and visual impacts associated with the pipeline corridors will be temporary and route alignments will be selected within the corridors to minimise impacts.

*Outfall*

This assessment has assumed that the construction a headwall will be requirement for a river outfall. Nevertheless, given this land parcel's close proximity to the modelled Avoca River outfall location, any negative impacts associated with the outfall have been deemed imperceptible to the landscape of the area.





2.0	Landscape & Visual	Ferrybank	Kilbride	Shelton Abbey
2.1	Landscape & Visual - Land Parcels			
2.1.1	Potential to impact on views from scenic routes (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.1.2	Potential to impact on areas of 'Highly Sensitive Landscape' (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.1.3	Potential to impact on views from heritage/tourist/amenity features	Imperceptible	Imperceptible	Imperceptible
2.1.4	Potential to impact on the character of the landscape	Imperceptible	Slight - existing 'rural' character	Imperceptible
2.1.5	Potential that landscape screening will be ineffective or contribute to landscape and visual impacts	Imperceptible	Imperceptible	Imperceptible
2.1.6	Potential to impact on views from settlements	Imperceptible	Imperceptible	Imperceptible
2.1.7	Potential to impact on views from dwellings / local roads	Moderate - Closest land parcel to Arklow town centre	Slight - Elevated land parcel visible from surrounds	Imperceptible
2.1.8	Potential to impact on views from M11 motorway	Imperceptible	Slight - visible from M11 bridge (northbound)	Slight - visible from M11 bridge (northbound)
2.1.9	Potential to impact on views from Dublin - Rosslare rail line	Imperceptible	Slight - visible from railway line	Moderate - visible from railway line
2.1.10	Potential to impact on views from other major roads (national or regional roads)	Imperceptible	Imperceptible	Imperceptible
2.1.11	Potential to disrupt landscape structure (hedgerows / field pattern etc.)	Imperceptible	Slight - Site placing will determine extent of disruption	Slight - Site placing will determine extent of disruption
2.1.12	Potential to impact on historic designed landscapes	Imperceptible	Imperceptible	Imperceptible
2.1.13	Potential to impact on woodlands and significant tree groups	Imperceptible	Imperceptible	Imperceptible



2.2	Landscape & Visual - Route Corridors - Pipelines	Ferrybank	Kilbride	Shelton Abbey
2.2.1	Potential to impact on views from scenic routes (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.2.2	Potential to impact on areas of 'Highly Sensitive Landscape' (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.2.3	Potential to impact on views from settlements	Imperceptible	Imperceptible	Imperceptible
2.2.4	Potential to impact on views from dwellings / local roads	Imperceptible	Imperceptible	Imperceptible
2.2.5	Potential to impact on views from motorways	Imperceptible	Imperceptible	Imperceptible
2.2.6	Potential to impact on views from other major roads (national or regional roads)	Imperceptible	Imperceptible	Imperceptible
2.2.7	Potential to impact on views from Dublin - Rosslare rail line	Imperceptible	Imperceptible	Imperceptible
2.2.8	Potential to impact on views from heritage/tourist features	Imperceptible	Imperceptible	Imperceptible
2.2.9	Potential to disrupt landscape structure (treelines / hedgerows / field pattern etc.)	Imperceptible	Slight - Changes during construction phase along route	Slight - Changes during construction phase along route
2.2.10	Potential to impact on woodlands and significant tree groups	Imperceptible	Imperceptible	Imperceptible
2.2.11	Potential to impact on rivers and streams	Imperceptible	Imperceptible	Imperceptible
2.2.12	Potential to impact on historic designed landscapes	Imperceptible	Imperceptible	Imperceptible
2.3	Landscape & Visual - Outfalls (Landward side)	Ferrybank	Kilbride	Shelton Abbey
2.3.1	Potential to impact on views from scenic routes (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.3.2	Potential to impact on 'Highly Sensitive Landscape' (designation in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.3.3	Potential to impact on coastal walks (indicated in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.3.4	Potential to impact on bathing locations (indicated in Wicklow CDP)	Imperceptible	Imperceptible	Imperceptible
2.3.5	Potential to impact on views from settlements	Imperceptible	Imperceptible	Imperceptible
2.3.6	Potential to impact on views from dwellings / local roads	Imperceptible	Imperceptible	Imperceptible
2.3.7	Potential to impact on views from major roads (national or regional roads)	Imperceptible	Imperceptible	Imperceptible
2.3.8	Potential to impact on views from Dublin - Rosslare rail line	Imperceptible	Imperceptible	Imperceptible
2.3.9	Potential to impact on views from heritage/tourist features	Imperceptible	Imperceptible	Imperceptible
2.3.10	Potential to Impact on Character of the Coastal Landscape	Imperceptible	Imperceptible	Imperceptible

Table 4.2 Landscape & Visual



## 4.3 Ecology

### 4.3.1 Introduction

Byrne Looby PHMcCarthy engaged the services of Senior Ecologist, Eleanor Mayes, to undertake a high level ecological assessment of the three shortlisted land parcels, associated pipeline corridors & effluent outfalls in order to determine what impacts a WwTP development could have on the ecology of the area. The report is summarised below. For the full report, refer to Appendix E.

### 4.3.2 Methodology

Three land parcels have been identified by Byrne Looby PHMcCarthy as options for potential alternative sites for the proposed WwTP. A desk top review of existing ecological information was carried out, and included a review of areas subject to nature conservation designations. The Natura 2000 network comprises sites that are designated as Special Areas of Conservation (SACs) under the Habitats Directive, and/or Special Protection Areas (SPAs) that are designated under the Birds Directive. Existing information on Natura 2000 sites in the vicinity of Arklow was reviewed. The DoEHLG (NPWS now within DAHG) guidance on Appropriate Assessment indicates that Natura 2000 sites within 15 km of a plan area should be considered in the assessment of plans or projects.

The location, type and extent of a plan or project will determine whether impacts on Natura 2000 sites may have a potential to arise; this will be decided on a case-by-case basis. In the case of water dependant habitats and species, plans or projects that may impact on water quality and quantity may need to be assessed over a greater radius, taking factors such as downstream effects, currents and plume dispersion into account. A 15 km radius of the three alternative WwTP land parcels under consideration at Arklow, was taken as a starting point in this assessment.

The occurrence of Habitats Directive Annex 2 listed species, and of Birds Directive Annex 1 listed species, in the vicinity of Arklow was reviewed, and information on other sites subject to nature conservation designations, was collected. Data sources included the original Arklow WwTP EIS (May 1999), and more recent project documentation including the Natura Impact Screening Statements for the waste water discharge licence (2012), the interceptor sewers and the siphon under the Avoca River Estuary (2012), and the Alps storage tank and CSO at Arklow, Co. Wicklow (2013). EPA reports, and NPWS documentation were reviewed, and an internet search for any other relevant information. Recent documentation on the Conservation Status of Habitats Directive Annex listed habitats and species was reviewed (NPWS 2013).

Walkover surveys of the Shelton Abbey and Kilbride land parcels, and of pipeline corridors, were carried out in April 2015, during which habitats, flora and fauna were noted, in order to provide an overview and summary comparison of the ecology of the sites. Habitats present were classified in accordance with Fossitt (2000). The Ferrybank land parcel (Old Wallboard Factory) and surrounding area had been reviewed in 2014, and was re-visited in April 2015 although the parcel itself was not accessed.



### 4.3.3 Ferrybank (Old Wallboard Factory)

#### Site

The Ferrybank parcel is located on the northern side of Avoca River estuary, which is retained by the quay walls of Arklow Harbour in this area. The land parcel includes a derelict gypsum factory and the following habitats are present:

- Buildings and artificial surfaces - BL3 -
- Spoil and bare ground - ED2 -
- Recolonizing bare ground - ED3 -
- Amenity grassland (improved) - GA2 -
- Scrub - WS1 -

Derelict buildings and tanks occupy c. 60% of the land parcel area. *Ivy Hedera Helix* is present on some walls, and gutters are overgrown with grasses. The derelict buildings are otherwise un-vegetated.

Spoil and bare ground, comprising paved and gravel surfaces, is vegetated with common colonising plant species. At the eastern end of the parcel adjoining the quay wall of Arklow Harbour, a marine influence is evident and a sparse flora includes *Buck's-Horn Plantain Plantago Coronopus*, *Stonecrop Sedum* and *Sea Mayweed Tripleurospermum Maritimum*.

Elsewhere within the parcel colonising plant species include mosses, *Creeping Bent-Grass Agrostis Stolonifera*, *Annual meadow-grass Poa Annua*, *Willowherb Epilobium species*, *Ribwort Plantago Lanceolata*, *Common Ragwort Senecio Jacobaea*, *White clover Trifolium Repens*, *yellow clover T. Dubium*, *Hairy Bittercress Cardamine Hirsuta*, and *Dandelion Taraxacum Officinale Agg.*

Recolonizing bare ground is more densely vegetated with more than 50% plant cover, and includes the species listed above with additional grass species *Red fescue Festuca rubra*, *Cock's-foot grass Dactylis Glomerata*, and *Yorkshire Fog Holcus Lanatus*.

A narrow strip of abandoned amenity grassland lies to the east between the main building and the rock armour along the shore at Ferrybank. This vegetation is dominated by *Red Fescue Grass*, with occasional *Creeping thistle Cirsium arvense*, *Dock Rumex species*, and *Bush vetch Vicia Cracca*.

Scrub is developing in parts of the parcel, and is dominated by *bramble Rubus Fruticosus Agg.*, *Gorse Ulex Europaeus*, with occasional *Alder Alnus Glutinosa*, *Grey willow Salix Cinerea* and *Elder Sambucus Nigra*.

There is evidence that feral pigeons breed in the main building, 12 birds were present during the site visit in 2014. Birds recorded in scrub habitat and as probable breeding species within the parcel were Great tit, Blue tit, Chaffinch, Goldfinch, House sparrow, Wren, and Blackbird. A Hooded crow carrying nest materials was also recorded. A Mallard pair was recorded landing briefly on the roof of a building and in flight over the parcel.

A bat survey has not been completed at the parcel; there may be limited potential for buildings and tanks to be used as bat roosts. Fox signs were recorded, and rodents are likely to occur.

In summary, the habitats, flora, and fauna present at the Ferrybank parcel are typical of derelict urban sites.



### *Pipelines Route Corridor*

Given the relatively short distance between the load centre and the Ferrybank land parcel (Old Wallboard Factory), only a small distance of land excavation will be required. The corridor of land is mainly urban in nature and no ecological constraints have been identified along its path.

### *Outfall*

Marine mammals sensitive to noise are likely to occur in the vicinity of a marine outfall associated with the Ferrybank option under consideration. A Marine Mammal Observer (MMO) would be required to be employed during any geophysical survey or piling operations for the protection of individual marine mammals from noise-related injury or disturbance. With regard to the operational phase, the shallow marine waters within which marine mammals have been recorded are currently assessed, and are expected to remain at, High Status. Potential impacts are therefore assessed as neutral for the marine outfalls for each of Ferrybank land parcel (Old Wallboard Factory) under consideration.

## **4.3.4 Kilbride**

### *Site*

Kilbride land parcel covers an area of 0.45km<sup>2</sup>, the principal land cover is Arable crops BC1. Field boundaries in the immediate area range from fences to treelines. Within the land parcel most field boundaries are earth banks with associated drainage ditches; these were generally overgrown with Bramble Scrub, with occasional *Gorse* and *Elder*. There are two small woodland areas within the Kilbride land parcel. To the south west of the site adjoining the M11, a Mixed broadleaved /conifer woodland WD2 includes *Cypress*, *Birch*, *Ash*, *Holly* and *Grey willow*, with *Bramble* and *Bracken Pteridium Aquilinum* extending southwards into a previously land-filled and capped area with flora similar to that of the Shelton Abbey (IFI Site ) land parcel. A small area of mixed broadleaved woodland WD1 adjoins a partially derelict group of farm buildings in the central western part of the lands (Figure 6); this includes *Sycamore*, *Ash*, *Holly* and *Elder*, with a shrub layer of *Elder* and *Bramble* and some *Laurel*. Treelines WL2 dominated by *Sycamore* and *Ash* with *Holly*, *Elder*, *Bramble* and occasional *Gorse* extend westwards from the mixed broadleaved woodland. A small stream arises from drainage ditches adjoining these treelines, and flows south eastwards to Arklow Town Marsh in a channel that is largely overgrown with bramble. The stream substrate is initially silty but cobble and gravel further along the channel bed suggest permanent water flow. Great *Willowherb Epilobium Hirsutum* and Fool's watercress *Apium Nodiflorum* grow in unshaded sections of the stream, with *Celandine*, *Bracken*, *Nettle*, *Hogweed* and *Alexanders Smyrniolus Olusatrum* on the banks among grasses and occasional trees of *Oak*, *Ash* and *Sycamore*. Treelines of *Oak*, *Ash* and *Holly* with *Hawthorn*, *Blackthorn*, *Gorse* and *Bramble* occur in the eastern part of the land parcel and extend northwards outside the site boundary; these are the most diverse treelines in the immediate area.

Rabbit burrows were found in all field boundary earth banks. Badger feeding signs and tracks were recorded frequently within the site, with one latrine; active setts were not found but could not be ruled out because of extensive bramble scrub that could not be thoroughly searched. Fox scats were found. A bat survey was not carried out. Treelines were identified as including trees with bat roost potential, and the stone built farm buildings within the site may also have bat roost potential. Treelines and scrubby field boundaries have potential as feeding and commuting corridors for bats. A Buzzard pair and a Red Kite pair were recorded hunting and soaring over the general area. Bird species recorded as probable breeders within the site hedgerows and treelines were Robin, Blackbird, Chaffinch, Wren, Wood pigeon, Pheasant, Magpie, and Great tit.





In Summary, the Kilbride land parcel has arable crops of low diversity with regard to plant species but these crops provide feeding habitat for birds and mammals. Treelines, woodland and scrub, and the small stream channel, within and adjoining the Kilbride land parcel are of high local importance for biodiversity and as ecological corridors between features of higher ecological value.

#### *Pipelines Route Corridor*

The pipeline corridor indicated for the transfer of foul flows to the WwTP at the Kilbride land parcel runs along the northern margins of Arklow Ecologically, the main pipeline design constraint is the avoidance of any diversion of existing surface and ground water flows to Arklow Town Marsh since these could have hydrological impacts on the wetland.

#### *Outfall*

A river outfall option from the Kilbride land parcel will be subject to appropriate treatment levels and licencing requirements in order to maintain or improve the conservation status of Habitats Directive Annex II listed fish species that occur in the Avoca river and its estuary; Salmon, Sea lamprey and River lamprey.

### **4.3.5 Shelton Abbey (IFI Site)**

#### *Site*

The Shelton Abbey land parcel includes two areas of made ground with paved or stone chip surfaces which are separated by an access track and drainage ditches including a wider feature to the south of the access track which is better described as a canal. A third area, is a former land filled area that has been capped with soil and supports grassland currently in use for horse grazing.

The areas of made ground are almost entirely un-vegetated Fossitt habitat BL3 Buildings and paved surfaces. Small areas of stone chip surface within the plot are sparsely vegetated with colonising mosses, *Annual Meadow Grass Poa Annuua*, *Willowherb Epilobium spp.*, and *Common Ragwort Senecio Jacobaea*, classified as ED2 Spoil and bare ground. A Drainage ditch FW4 outside the palisade fence at the western end of the plot supports wetland vegetation of *Sweet-grass Glyceria spp. with Bulrush Typha Latifolia and Soft rush Juncus Effusus*, with *Reed Canary Grass Phalaris Arundinacea*, *False Oat Grass Arrhenatherum Elatius* and *Cock's-Foot Grass Dactylis Glomerata* growing along the banks, with occasional *Grey Willow Salix Cinerea* and *Bramble Rubus Fruticosus agg.* A narrow strip of mixed broadleaved woodland WD1 of planted origin is included in the land parcel; this includes *Grey Willow and Silver Birch Betula Pendula*, with a shrub layer of *Elder Sambucus Nigra* and *Bramble* with little ground flora. A narrow strip of mown Amenity grassland GA2 lies between this woodland strip and the access road to the overall former IFI site.

A portion of this land parcel is a land filled area that has been capped with soil and supports grassland currently in use for horse grazing. Colonising mosses of bare ground are frequent in a closely grazed grassy sward of improved agricultural grassland GA1. Creeping bent grass *Agrostis stolonifera* and *Yorkshire Fog Holcus Lanatus* are the dominant grasses, with *Ryegrass Lolium Perenne*, *False Oat Grass* and *Cock's-Foot Grass* also occurring occasionally. Broad-leaved herbs present include *White clover Trifolium Repens*, *Red clover T. Pratense*, *Ribwort Plantago Lanceolata*, *Creeping Buttercup Ranunculus Repens*, *Creeping Thistle Cirsium Arvense*, *Common Mouse-Ear Cerastium Fontanum*, *Common Ragwort Senecio Jacobaea*, *Dandelion Taraxacum Agg.*, *Daisy Bellis Perennis*, and occasional *Soft Rush*. Occasional small shrubs of Laurel *Prunus Laurocerasus* occur in a broken line close to the western boundary of the landfill area, while closely planted groups of *Lodgepole Pine Pinus Contorta* occur with *Gorse Ulex Europaeus*, *Birch* and *Grey Willow* along the northern



boundary of the landfill area. Bramble dominated Scrub WS1 with occasional willow forms the northern boundary of the landfill area and adjoins the Canal.

*Bramble Scrub* with *Gorse, Birch, Ash* and *Oak* occurs on sloping ground near the M11. Higher mounded ground adjoining the eastern end of the landfill area has been planted with *Ash Fraxinus Excelsior, Pine and Larch Larix Decidua, Gorse* and *Willow* have colonised the area.

Rabbits, Wood Pigeon and Pheasant occur in this land parcel, fox and badger signs were also recorded. Birds were associated principally with the immediately adjoining scrub where Blackbird, Song thrush, Robin, Wren, Chiffchaff, Willow warbler, Coat tit and Chaffinch were recorded. Mallard were recorded on the Avoca River and on the canal; a Grey heron was recorded feeding at the canal. Buzzards were recorded soaring over the general area.

In summary, Shelton Abbey (IFI Site) is largely un-vegetated and of low value for flora and fauna. It is assumed that there is some connectivity between the drainage ditches at the plot margins and those present elsewhere in the Shelton Abbey land parcel. The woodland strip along the northern margin of the site has moderate local value as a wildlife corridor.

The landfill area of Shelton Abbey (IFI Site) supports common plant species; biodiversity is higher in the adjoining scrub and aquatic habitats of the Avoca River and of the canal which is hydrologically linked to Arklow Town Marsh pNHA.

#### *Pipelines Route Corridor*

The pipeline corridor indicated for the transfer of foul flows to the WwTP at the Shelton Abbey land parcel runs along the northern margins of Arklow Ecologically, the main pipeline design constraint is the avoidance of any diversion of existing surface and ground water flows to Arklow Town Marsh since these could have hydrological impacts on the wetland.

#### *Outfall*

A river outfall option from the Shelton Abbey (IFI Site) land parcel will be subject to appropriate treatment levels and licencing requirements in order to maintain or improve the conservation status of Habitats Directive Annex II listed fish species that occur in the Avoca river and its estuary; Salmon, Sea lamprey and River lamprey.

For the full ecological report, including recommendations, please refer to Appendix E.



3.0	Ecology	Ferrybank	Kilbride	Shelton Abbey
3.1	Ecology - Land Parcels			
3.1.1	Potential to impact on Natura 2000 Sites	Imperceptible	Imperceptible	Imperceptible
3.1.2	Potential to impact on Habitats Directive Annex II listed species in freshwater	Imperceptible	Imperceptible	Slight - Disturbance of previously land-filled areas may have a potential to mobilise contaminants that could enter watercourses connected to Arklow Town Marsh and the Avoca river and may require additional geotechnical site investigation
3.1.3	Potential to impact on Habitats Directive Annex II listed species in coastal and marine waters	Imperceptible	Imperceptible	Imperceptible
3.1.4	Potential to impact on pNHAs and Conservation Zones	Imperceptible	Imperceptible	Slight - Disturbance of previously land-filled areas may have a potential to mobilise contaminants that could enter watercourses connected to Arklow Town Marsh and the Avoca river and may require additional geotechnical site investigation
3.1.5	Potential to impact upon ecological corridors, nature development area or high value habitats	Imperceptible	Slight - Arklow Town and Environs Development Plan 2011-2017 Objectives: BD1, BD2, BD3, BD4, BD5, BD6 are considered to be capable of being implemented given the size of individual field areas within the land parcel.	Imperceptible
3.1.6	Potential to impact on breeding habitat for Annex 1 bird species	Imperceptible	Imperceptible	Imperceptible
3.1.7	Potential to impact on IWeBS identified areas of importance	Imperceptible	Imperceptible	Imperceptible



3.2	Ecology - Route Corridors/Pipelines	Ferrybank	Kilbride	Shelton Abbey
3.2.1	Potential to impact on Natura 2000 sites	Imperceptible	Imperceptible	Imperceptible
3.2.2	Potential to impact on Habitats Directive Annex II listed species in freshwater	Imperceptible	Imperceptible	Slight - Disturbance of previously land-filled areas may have a potential to mobilise contaminants that could enter watercourses connected to Arklow Town Marsh and the Avoca river and may require additional geotechnical site investigation
3.2.3	Potential to impact on Habitats Directive Annex II listed species in coastal and marine waters	Imperceptible	Imperceptible	Imperceptible
3.2.4	Potential to impact on pNHAs and Conservation Zones	Imperceptible	Slight - Arklow Town and Environs Development Plan 2011-2017 Objectives BD2, WS2 require avoidance of construction within Arklow Town Marsh, and avoidance of hydrological impacts on the Marsh.	Slight - Arklow Town and Environs Development Plan 2011-2017 Objectives BD2, WS2 require avoidance of construction within Arklow Town Marsh, and avoidance of hydrological impacts on the Marsh. Disturbance of previously land-filled areas may have a potential to mobilise contaminants that could enter watercourses connected to Arklow Town Marsh and the Avoca river and may require additional geotechnical site investigation
3.2.5	Potential to impact upon ecological corridors, nature development area or high value habitats	Imperceptible	Arklow Town and Environs Development Plan 2011-2017 Objectives: BD1, BD2, BD3, BD4, BD5, BD6 are considered to be capable of being implemented in the context of a revised pipeline corridor	Imperceptible
3.2.6	Potential to impact on breeding habitat for Annex 1 bird species	Imperceptible	Imperceptible	Imperceptible
3.2.7	Potential to impact on IWeBS identified areas of importance	Imperceptible	Imperceptible	Imperceptible



3.3	Ecology - Outfalls	Ferrybank	Kilbride	Shelton Abbey
3.3.1	Marine Outfall; Coastal Natura 2000 sites	Slight - Potential impacts on the coastal SACs Magharabeg Dunes SAC, Buckronev – Brittas Dunes and Fen SAC, and Kilpatrick Sandhills SAC and their conservation interests.	Slight - Potential impacts on the coastal SACs Magharabeg Dunes SAC, Buckronev – Brittas Dunes and Fen SAC, and Kilpatrick Sandhills SAC and their conservation interests.	Slight - Potential impacts on the coastal SACs Magharabeg Dunes SAC, Buckronev – Brittas Dunes and Fen SAC, and Kilpatrick Sandhills SAC and their conservation interests.
3.3.2	Marine Outfall; Marine Natura 2000 sites	Imperceptible	Imperceptible	Imperceptible
3.3.3	Marine Outfall; Habitats Directive Annex II listed species	Imperceptible - Observer (MMO) is to be employed during any geophysical survey or piling operations for the protection of individual marine mammals from noise-related injury or disturbance	Imperceptible	Imperceptible
3.3.4	Marine Outfall; Birds Directive Annex 1 listed species	Imperceptible	Imperceptible	Imperceptible
3.3.5	Potential to impact on IWeBS identified areas of importance	Imperceptible	Imperceptible	Imperceptible
3.3.6	River outfall; Habitats Directive Annex II listed species in freshwater	Imperceptible	Imperceptible - A river outfall option from the Kilbride land parcel will be required to be subject to appropriate treatment levels and licencing requirements in order to maintain or improve the conservation status of Habitats Directive Annex II listed fish species that occur in the Avoca river and its estuary; Salmon, Sea lamprey and River lamprey.	Imperceptible - A river outfall option from the Shelton Abbey land parcel will be required to be subject to appropriate treatment levels and licencing requirements in order to maintain or improve the conservation status of Habitats Directive Annex II listed fish species that occur in the Avoca river and its estuary; Salmon, Sea lamprey and River lamprey.
3.3.7	Potential to impact on breeding habitat for Annex 1 bird species	Imperceptible	Slight - Kingfisher survey of river banks near outfall location required at detailed design stage	Slight - Kingfisher survey of river banks near outfall location required at detailed design stage

Table 4.3 Ecology





## 4.4 Hydrology & Hydrogeology

### 4.4.1 Introduction

This section outlines the existing hydrological and hydrogeological environment at each of the three shortlisted land parcels, the corresponding transfer pipeline corridors and outfall locations. It identifies the environmental constraints, predicts and evaluates the impacts of the scheme on the existing hydrology and hydrogeology and outlines measures to mitigate these impacts.

### 4.4.2 Methodology

#### 4.4.2.1 Hydrology

In considering the implications of the overall scheme on the hydrological environment, the WwTP land parcels, the transfer pipeline corridor routes, the outfall locations and their environs should be considered in terms of sensitive surface water receptors and potential to impact upon them. This element is concerned with potential effects on the surface water regime (flooding, water quality and flow).

The assessment was based on the following:

**Proximity to water bodies in terms of flooding and as an indicator of sensitive water receptors** - The proximity to water bodies and their water quality (based on the EPA quality results) provides an indication of the sensitive surface water receptors potentially associated with each option, assuming pathways exist.

**Culverting requirement** – The requirement for culverting over a stream or bridging a river is used as an indication of the potential to reduce the conveyance capacity of the watercourse and the associated increase to flood extent and frequency.

**Area prone to flooding** – The review of existing datasets to determine if the site is prone to flooding. The OPW records of historic floods maps available to view on [www.floodmaps.ie](http://www.floodmaps.ie) and the extensive studies that have been carried out as part of the Arklow Flood Relief Scheme were used to assess whether the proposed sites and route options are at risk of flooding and whether extensive flooding (historic and/or predicted) occurs immediately upstream or downstream.

**Potential impact on ecologically important and designated sites** – The proximity to any Natura 2000 environmental designated sites such as Special Protection Areas (SPA), Natural Heritage areas (NHA), Proposed Natural Heritage Areas (pNHA) and Special Areas of Conservation (SAC).

The overall environmental impacts are a combination of the above. The risk is a combination of the assessment of the presence of a sensitive receptor (streams and sensitive water bodies) and the pathway (drainage channels) by which the receptor can be affected.

#### 4.4.2.2 Hydrogeology

In considering the implications of the overall scheme on the hydrogeological environment, the WwTP land parcels, the transfer pipeline corridor routes, the outfall locations and their environs should be considered in terms sensitive groundwater receptors and the potential to impact. This element is concerned with potential effects on the groundwater regime (flow and quality).

The assessment was based on the following:



**Aquifer classification** – Aquifer Classification is based on the hydrogeological characteristics and the value/ importance of the groundwater resource in a given area. The GSI have classified all the aquifers in Ireland into three main categories namely regionally important, locally important, or poor aquifers. This information including the extent of the aquifer is provided on the GSI aquifer classification maps.

**Groundwater vulnerability** – Groundwater Vulnerability determines the ease with which groundwater in a given area may be contaminated. The GSI has classified GW vulnerability into low, moderate, high, extreme and rock near the surface categories. This information is provided on the GSI groundwater vulnerability maps.

**Groundwater Supplies** – The identification of water supply springs and bored wells in the vicinity of the proposed sites. These include supplies for public, domestic, agricultural or industrial use. This information is taken from the GSI database.

**Source Protection Areas and Zones of Contribution** – The objective of source protection areas (GSI mapping) and zones of contribution (EPA mapping) is to provide protection to groundwater sources by placing tighter controls on activities within all or part of the area that contributes to the groundwater source. These therefore provide information on the location and importance of groundwater sources.

**Identification of Hydrogeological Features from the Karst Database** – Karst features are natural hydrogeological features. These are formed in areas of limestone or other highly soluble rock, in which the landforms are of dominantly solutional origin, and in which the drainage is usually underground in solutionally enlarged fissures and conduits. Karst features include caves, swallow holes, turloughs and springs. Information on the location of all known karst features in Ireland is provided on the GSI karst data maps.

The overall environmental impact implications are a combination of the above. The risk is a combination of the assessment of the presence of a sensitive receptor (aquifer abstraction) and the pathway (proximity, vulnerability etc.) by which the receptor can be effected. In the context of groundwater quality we also need the presence of a hazard. In sewerage scheme projects the hazard is often the result of leakage or an accidental spillage.

#### **4.4.3 Ferrybank (Old Wallboard Factory)**

##### *Hydrology*

The Ferrybank land parcel (Old Wallboard Factory) is situated at the mouth of the Avoca River, on the coast of the Irish Sea. Access to the parcel would not require the construction of any culverts. Surface water from the proposed WwTP development could be discharged either into Avoca River or directly into the Irish Sea.

The National flood hazard mapping website, [www.floodmaps.ie](http://www.floodmaps.ie), shows no recorded instance of flooding of this land parcel, even during Hurricane Charlie in 1986. The nearest historic flooding location is on the South Quay, which is known to flood regularly. Areas to the north of the land parcel have also been known to flood, Mill road (Hurricane Charlie 1986) and Worsborough Terrace (reports as recent as 2004).

The EPA surface water quality monitoring data 2012 shows the coastal water as “Unpolluted”, the transitional water quality (Avoca River from the harbour to the stone arch bridge) as “Intermediate” and the Avoca Lower River as “Unassigned”. The nearest recreational water bodies (e.g. bathing sites) in the vicinity of the proposed land parcel is Brittas Bay (North and South) and Clogga beach, which are approximately 11 km and 4 km away respectively.



### *Hydrogeology*

The Geological Survey of Ireland (GSI) 100k Bedrock mapping indicates that the land parcel is underlain entirely by the Kilmacrea Formation which consists of dark grey slate and minor pale sandstone. The eastern portion of the Ferrybank land parcel (Old Wallboard Factory) is also underlain by the Maulin formation which consists of Dark blue-grey slate, phyllite & schist. Refer to Figure 4.2 for further details.

According to the GSI bedrock aquifer mapping, the land parcel is underlain by a locally by a locally important bedrock aquifer (LI) which is moderately productive in local zones only. The GSI sand and gravel aquifer mapping was also consulted but no sand or gravel aquifers were present in the vicinity of the land parcel. Refer to Figure 4.3 for further details.

The GSI groundwater vulnerability mapping shows the area in the vicinity of the land parcel to have a groundwater vulnerability rating of low. After consulting the GSI groundwater mapping, 1 no. groundwater source well was found to be within the vicinity of the land parcel. However given the accuracy of this well mapping is to within 2 km, it is difficult to ascertain the exact location of this groundwater source well. Refer to Figure 4.5 for further details.

A review of the GSI Karst and Hydrogeological features mapping did not identify any features within 2km of the land parcel. The Source Protected Areas and the Zones of Contribution mapping were also consulted however neither were found to be within close proximity of the land parcel.

#### **4.4.4 Kilbride**

### *Hydrology*

The Kilbride land parcel is offset c. 500m from the Avoca River. The surface water from the land parcel drains naturally to the Arklow Marsh and down to the Avoca River.

The National flood hazard mapping website, [www.floodmaps.ie](http://www.floodmaps.ie), shows no recorded instance of flooding of this land parcel. The natural elevation and profile of this land parcel has ensured helped to ensure this.

The EPA surface water quality monitoring data 2012 shows the coastal water as “Unpolluted”, the transitional water quality (Avoca River from the harbour to the stone arch bridge) as “Intermediate” and the Avoca Lower River as “Unassigned”. The nearest recreational water bodies (e.g. bathing sites) in the vicinity of the proposed land parcel is Brittas Bay (North and South) and Clogga beach, which are approximately 11 km and 5 km away respectively.

### *Hydrogeology*

The Geological Survey of Ireland (GSI) 100k Bedrock mapping indicates that the land parcel is underlain entirely by the Kilmacrea Formation which consists of dark grey slate and minor pale sandstone. Refer to Figure 4.2 for further details.

According to the GSI bedrock aquifer mapping, the land parcel is underlain by a locally by a locally important bedrock aquifer (LI) which is moderately productive in local zones only. The GSI sand and gravel aquifer mapping was also consulted but no sand or gravel aquifers were present in the vicinity of the land parcel. Refer to Figure 4.3 for further details.

The GSI groundwater vulnerability mapping shows the area in the vicinity of the land parcel to have a groundwater vulnerability rating from “High” to “Extreme” to “Rock at near surface or Karst”. After consulting the GSI groundwater mapping, 1 no. groundwater source well was found to be within the vicinity of the land parcel. The location of this groundwater source well is to within 100 m and can be seen in Figure 4.5.



A review of the GSI Karst and Hydrogeological features mapping did not identify any features within 2km of the land parcel. The Source Protected Areas and the Zones of Contribution mapping were also consulted however neither were found to be within close proximity of the land parcel.

#### **4.4.5 Shelton Abbey (IFI Site)**

##### *Hydrology*

The Shelton Abbey land parcel lies in the natural floodplain of the Avoca River. Access to the parcel is achieved via an existing road and as such, there is no requirement for any new culverts to be constructed.

Surface run-off from the high ground to the north drains to the floodplain and into the river. The poorly draining lands at the margins of the flood plain have been drained to improve the lands locally up and downstream of the land parcel. The Shelton Abbey Canal runs through the site, parallel to the river and enters the Avoca River downstream in Arklow.

The existing flood defences have ensured that there has been no recorded instance of flooding on the land parcel (refer to [www.floodmaps.ie](http://www.floodmaps.ie)). However, this does not mean the land parcel is free from risk of flooding if these defences were to fail. Refer to the flood study report included in Appendix B of this report for further details.

The EPA surface water quality monitoring data 2012 shows the coastal water as “Unpolluted”, the transitional water quality (Avoca River from the harbour the stone arch bridge) as “Intermediate” and the Avoca Lower River as “Unassigned”. The nearest recreational water bodies (e.g. bathing sites) in the vicinity of the proposed land parcel is Brittas Bay (North and South) and Clogga beach, which are approximately 11 km and 5 km away respectively.

The small canal which flows alongside this land parcel flows through the Arklow Marsh, a pNHA area.

##### *Hydrogeology*

The Geological Survey of Ireland (GSI) 100k Bedrock mapping indicates that the land parcel is underlain entirely by the Kilmacrea Formation which consists of dark grey slate and minor pale sandstone. Refer to Figure 4.2 for further details.

According to the GSI bedrock aquifer mapping, the land parcel is underlain by a locally by a locally important bedrock aquifer (LI) which is moderately productive in local zones only. The GSI sand and gravel aquifer mapping was also consulted and Arklow Gravels (Lg), a locally important gravel aquifer was present throughout the land parcel. These types of aquifers are generally described as poor aquifer that are only capable of supplying water to individual dwellings or farm holdings and typically are poorly yielding in drier periods of the year. Refer to Figure 4.3 for further details.

The GSI groundwater vulnerability mapping shows the area in the vicinity of the land parcel to have a groundwater vulnerability rating of moderate. After consulting the GSI groundwater mapping, no groundwater source well was found to be within the vicinity of the land parcel.

A review of the GSI Karst and Hydrogeological features mapping did not identify any features within 2km of the land parcel. The Source Protected Areas and the Zones of Contribution mapping were also consulted however neither were found to be within close proximity of the land parcel.



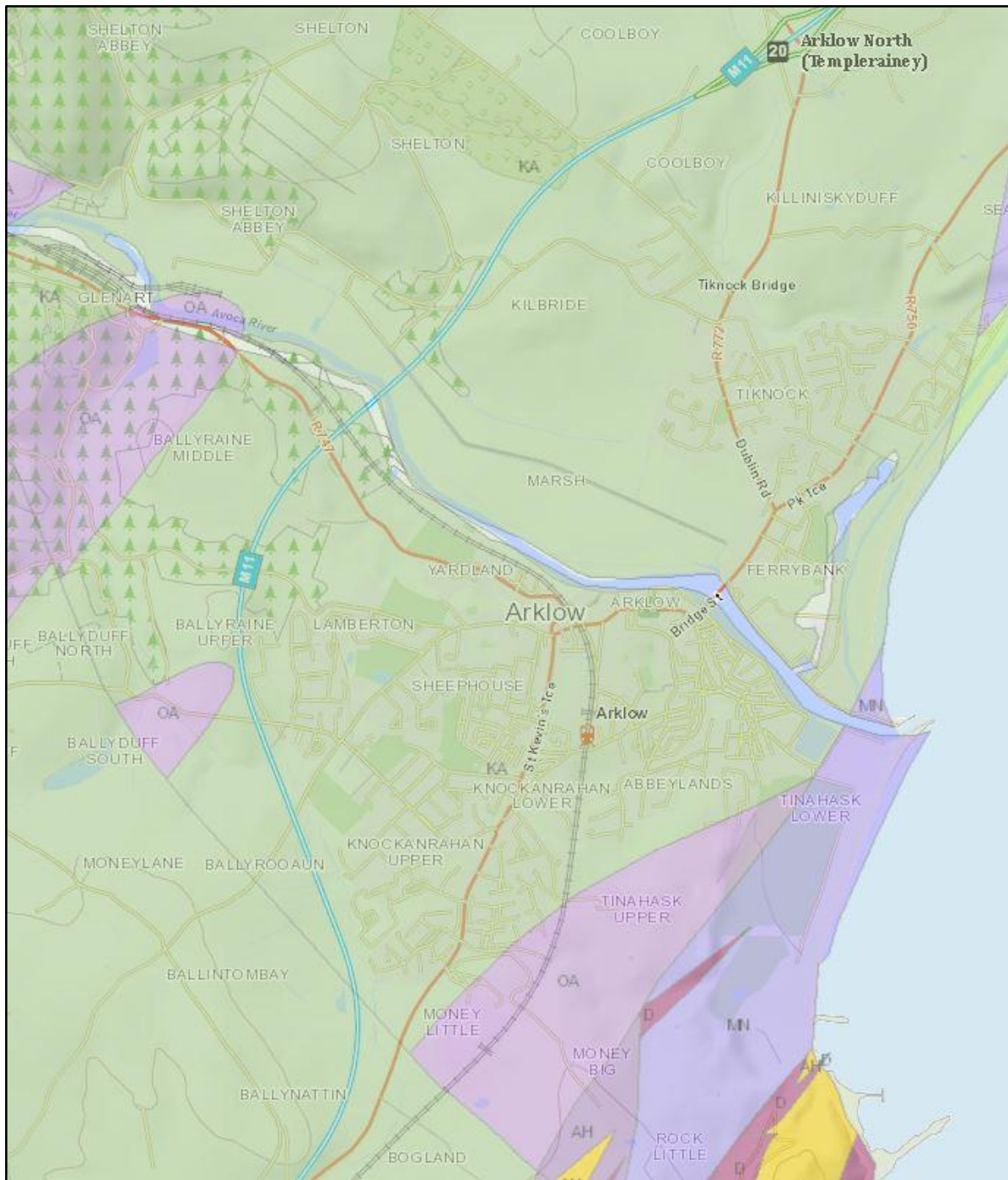


Figure 4.2 Bedrock Formations – Sourced from GSI Data Viewer



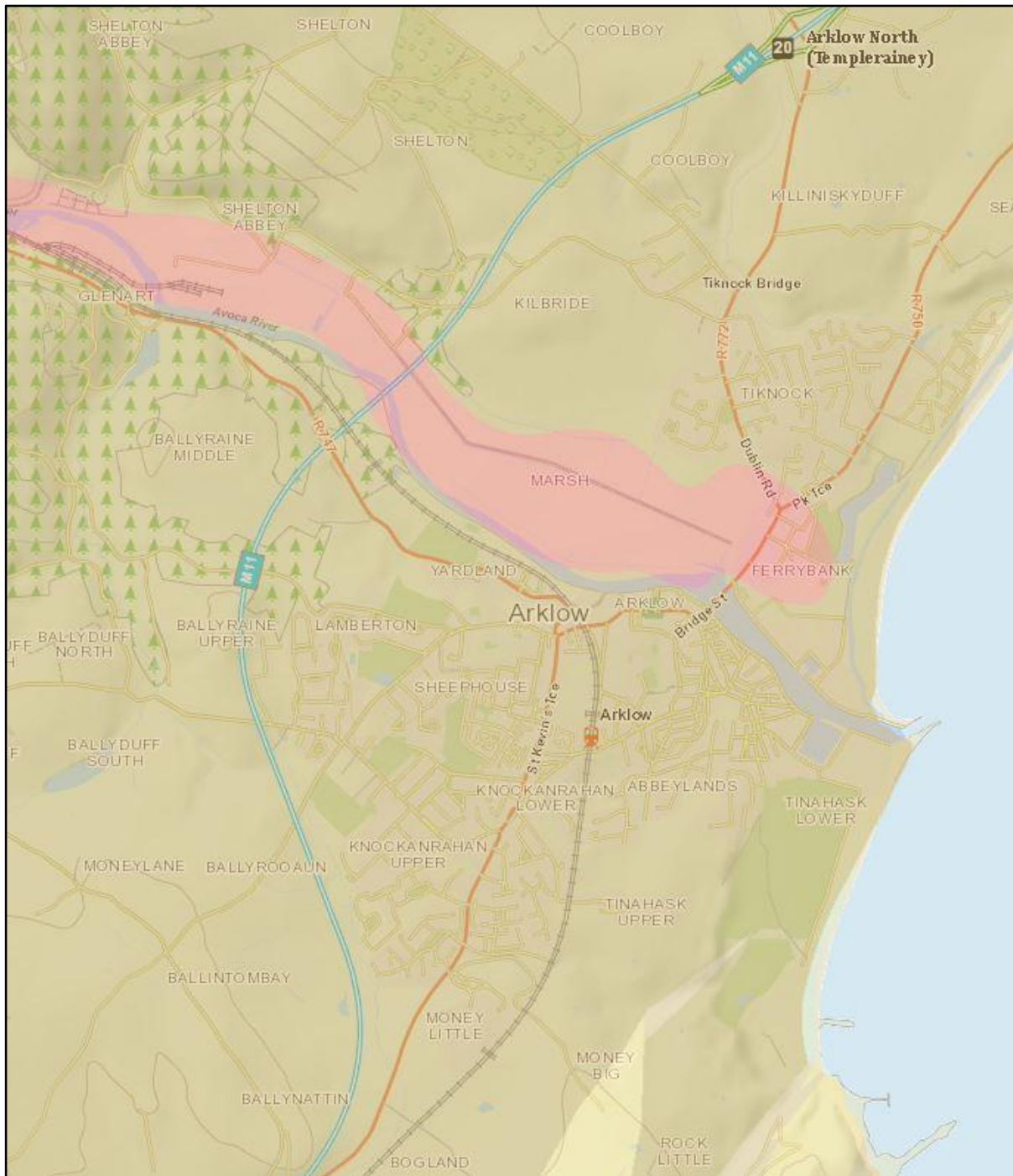


Figure 4.3 Groundwater Resources – Gravel & Bedrock Aquifers – Sourced from GSI Data Viewer

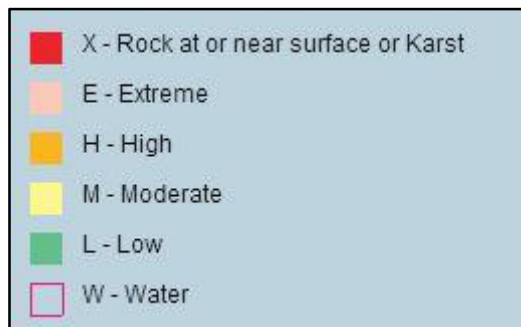
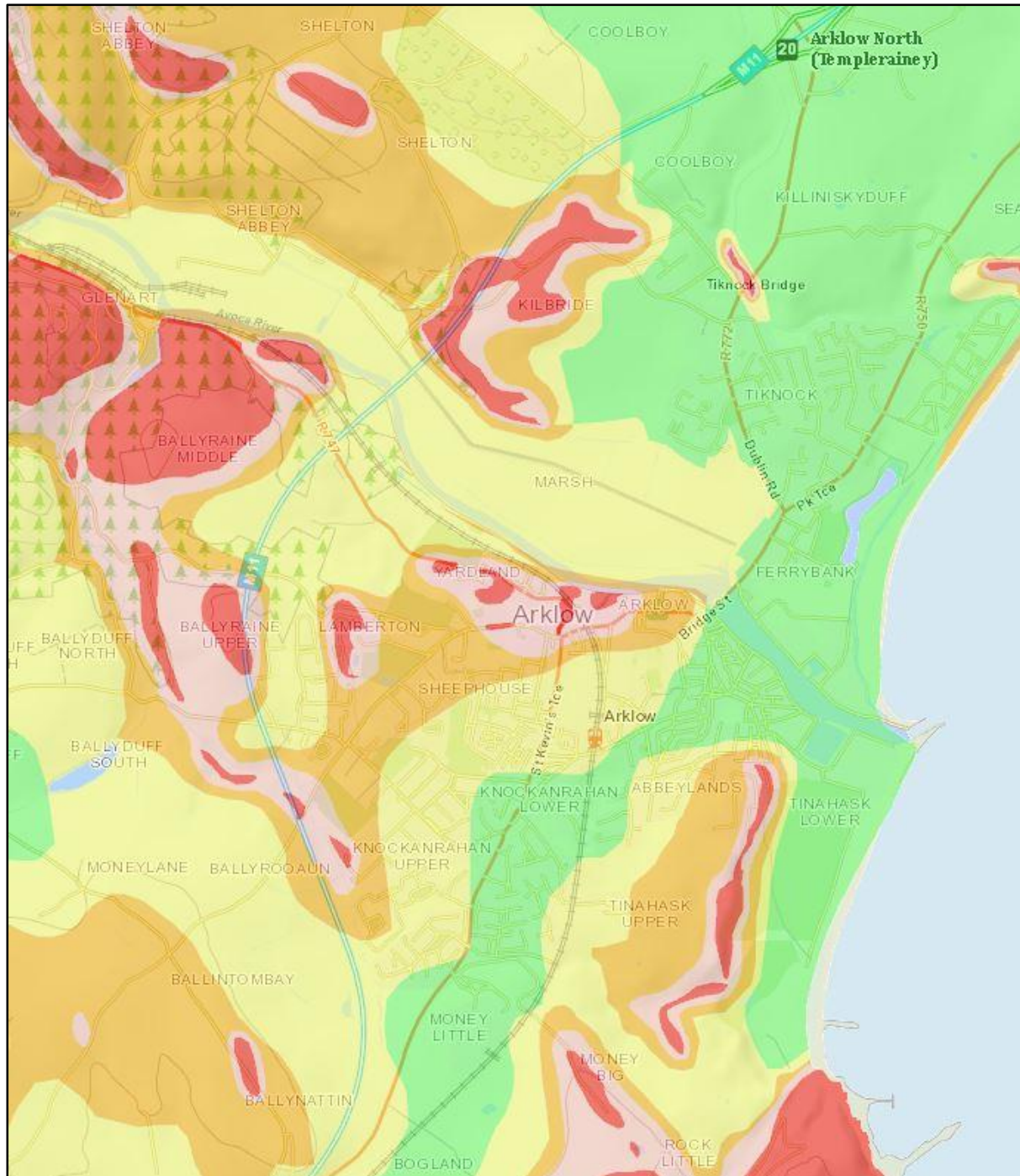


Figure 4.4 – Groundwater Vulnerability – Sourced from GSI Data Viewer



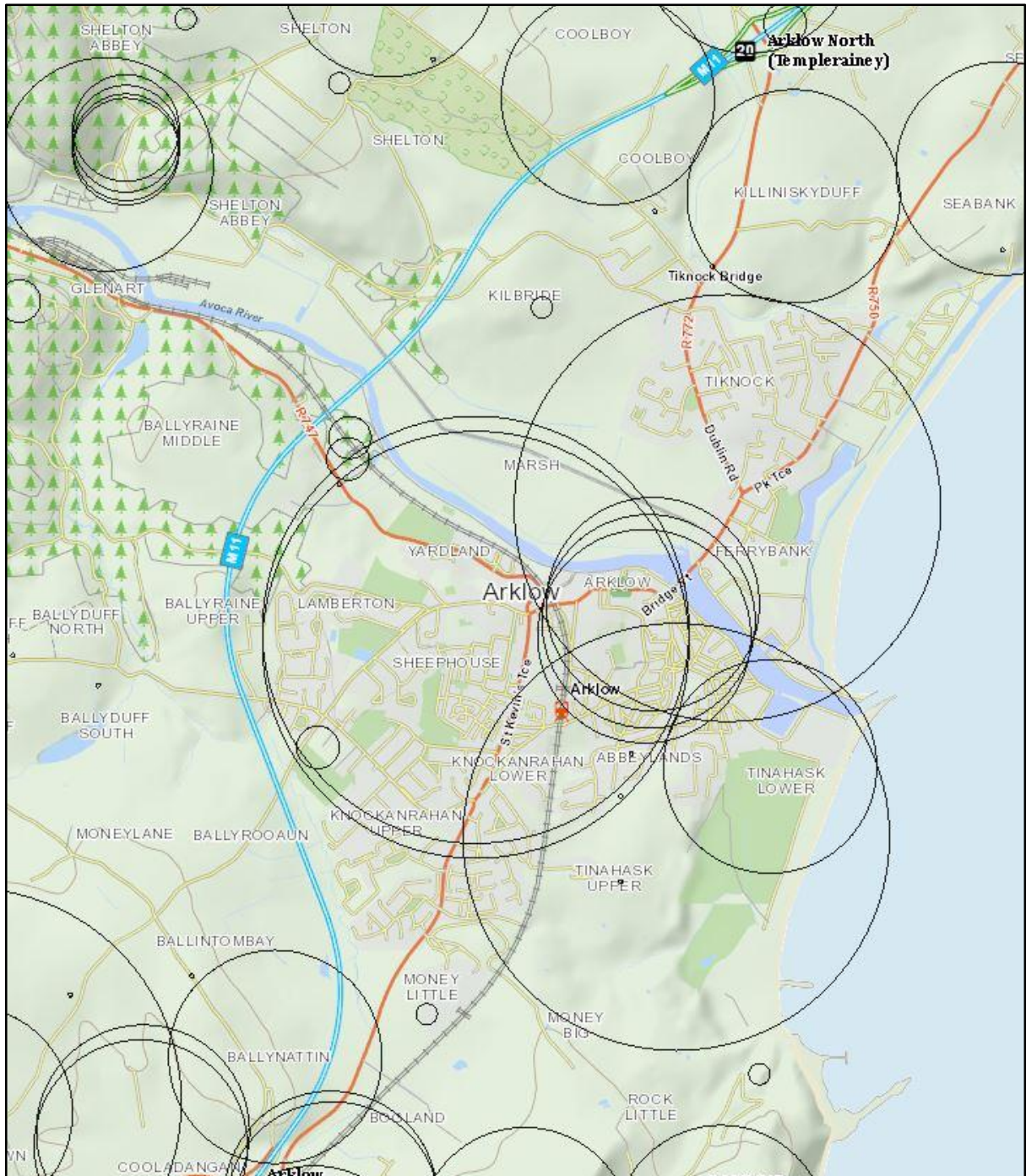


Figure 4.5 - Groundwater Wells & Springs – Sourced from GSI Data Viewer

*\*Note: The size of the circles above are indicative of the accuracy of the location of the groundwater wells & springs and have no bearing on the abstraction volumes.*



<b>4.0 Hydrology</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
<b>4.1 Hydrology - Land Parcels</b>				
4.1.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
4.1.2	Culverting requirement - used to indicate impact on flood-prone watercourses due to reduced conveyance.	Imperceptible - no culverting requirement envisaged	Imperceptible - no culverting requirement envisaged	Imperceptible - no culverting requirement envisaged
4.1.3	Area prone to flooding (based on historical data and predicted flood extents adjacent to the land parcel as well as up and downstream locations)	Imperceptible. No recorded instance of flooding	Imperceptible. No recorded instance of flooding	Imperceptible. No recorded instance of flooding
4.1.4	Potential Impact on ecologically important and designated sites.	Imperceptible	Imperceptible	Imperceptible
<b>4.2 Hydrology - Route Corridors</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
4.2.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
4.2.2	Culverting requirement - used to indicate impact on flood-prone watercourses due to reduced conveyance.	Imperceptible - no culverting requirement envisaged	Imperceptible - no culverting requirement envisaged	Imperceptible - no culverting requirement envisaged
4.2.3	Area prone to flooding (based on historical data and predicted flood extents adjacent to the land parcel as well as up and downstream locations)	Slight - historic instances of flooding along route of pipeline corridor	Slight - historic instances of flooding along route of pipeline corridor	Slight - historic instances of flooding along route of pipeline corridor
4.2.4	Potential Impact on ecologically important and designated sites.	Imperceptible	Slight - Arklow Marsh - pNHA	Slight - Arklow Marsh - pNHA
<b>4.3 Hydrology - Outfalls</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
4.3.1	Proximity to water bodies in terms of flooding and as an indicator of sensitive surface water receptors	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
4.3.2	Potential to impact Shellfish Waters	Imperceptible. Study Area is not located within the designated shellfish waters	Imperceptible. Study Area is not located within the designated shellfish waters	Imperceptible. Study Area is not located within the designated shellfish waters
4.3.3	Area prone to flooding (based on historical data and predicted flood extents adjacent to the land parcel as well as up and downstream locations)	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
4.3.4	Potential Impact on ecologically important and designated sites	Imperceptible	Slight - Arklow Marsh - pNHA	Slight - Arklow Marsh - pNHA

Table 4.4 Hydrology



<b>5.0 Hydrogeology</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
<b>5.1 Hydrogeology - Land Parcels</b>				
5.1.1	Aquifer Classification - importance of the groundwater resource to a given area	Slight - Locally Important Bedrock Aquifer	Slight - Locally Important Bedrock Aquifer	Slight - Locally Important Bedrock Aquifer & Locally Important Gravel Aquifer
5.1.2	Vulnerability Classification - potential for groundwater contamination	Imperceptible - "Low"	Moderate - "High" to "Extreme" to "Rock at near Surface or Karst"	Slight - "Moderate"
5.1.3	Groundwater Supplies - identification of water supply springs and bored wells based on GSI records.	Imperceptible - 1 no. well - ID:3217SWW051 Accuracy: 2km	Imperceptible - 1 no. well - ID:3217SWW043 Accuracy: 100m	Imperceptible - No wells
5.1.4	Groundwater Source Protection Area's and Zones of Contribution as per available GSI data	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity
5.1.5	Identification of hydrogeological features from the GSI karst database	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km
<b>5.2 Hydrogeology - Route Corridors</b>		<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
5.2.1	Aquifer Classification - importance of the groundwater resource to a given area	Slight - Locally Important Bedrock Aquifer	Slight - Locally Important Bedrock Aquifer & Locally Important Gravel Aquifer	Slight - Locally Important Bedrock Aquifer & Locally Important Gravel Aquifer
5.2.2	Vulnerability Classification - potential for groundwater contamination	Imperceptible - "Low"	Imperceptible - "Low"	Imperceptible - "Moderate" to "Low"
5.2.3	Groundwater Supplies - identification of water supply springs and bored wells based on GSI records.	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
5.2.4	Groundwater Source Protection Area's and Zones of Contribution as per available GSI data	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity
5.2.5	Identification of hydrogeological features from the GSI karst database	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km



5.3	Hydrogeology - Outfalls	Ferrybank	Kilbride	Shelton Abbey
5.3.1	Aquifer Classification - importance of the groundwater resource to a given area	Slight - Locally Important Bedrock Aquifer	Slight - Locally Important Bedrock Aquifer & Locally Important Gravel Aquifer	Slight - Locally Important Bedrock Aquifer & Locally Important Gravel Aquifer
5.3.2	Vulnerability Classification - potential for groundwater contamination	Imperceptible - "Low" rating	Imperceptible - "Moderate" rating	Imperceptible - "Moderate" rating
5.3.3	Groundwater Supplies - identification of water supply springs and bored wells based on GSI records.	Imperceptible - No groundwater supplies	Imperceptible - No groundwater supplies	Imperceptible - No groundwater supplies
5.3.4	Groundwater Source Protection Area's and Zones of Contribution as per available GSI data	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity	Imperceptible - No SPA's of ZOC's in close proximity
5.3.5	Identification of hydrogeological features from the GSI karst database	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km	Imperceptible - No karst feature within 2 km

Table 4.5 Hydrogeology





## 4.5 Soils & Geology

### 4.5.1 Introduction

This section concentrates on identifying constraints within the shortlisted WwTP land parcels, the associated pipeline corridors, and the effluent outfall locations with regard to the soils and geology of the study area. BLP engaged the services of Ground Investigation Ireland Ltd. to undertake environmental ground investigation works at the shortlisted brownfield sites (Ferrybank and Shelton Abbey). Since Kilbride is a greenfield land parcel, a review of the existing information available (GSI database, Teagasc mapping etc...) was deemed adequate.

It should be noted at this point that while every effort was made to investigate the Ferrybank land parcel (Old Wallboard Factory), permission to enter the site was not obtained by the land owner and site investigation works never took place. Nevertheless, previous site investigation reports for the Ferrybank land parcel (Old Wallboard Factory) have been made available to BLP which will be discussed in more detail later in this chapter.

### 4.5.2 Methodology

The assessment methodology was developed in line with best practice and included a review of desk top data, wind shield surveys, consultations and a review of guidance.

A desk top study was undertaken of all publically available relevant information and data gathered by the Arklow Sewerage Scheme and BLP project teams. The sources of information utilised in the assessment included:

- Site investigation data from previous BLP projects in or around the shortlisted land parcels
- Bedrock Mapping (Geological Survey of Ireland)
- Karst Database (Geological Survey of Ireland)
- Quarternary Maps (Geological Survey of Ireland)
- Teagasc Subsoil Mapping (2004)
- Teagasc Topsoil Mapping (2007)
- Corine Land Cover datasets, (European Environment Agency, 2012)
- Proposed / Designated NHA Sites (Geological Survey of Ireland)
- National Parks and Wildlife Service
- Office of Licensing and Guidance, Environmental Protection Agency - <http://www.epa.ie/>
- Historical Maps (Ordnance Survey of Ireland)
- Aerial Photographs (Geological Survey of Ireland / Ordnance Survey of Ireland/Google/Bing)
- Previous site investigation reports

### 4.5.3 Landfill Sites

There is a long history of landfill operations at the Shelton Abbey (IFI Site) land parcel. They can generally be separated into three main categories as follows:

- Disposal of phosphogypsum wastes from the production of phosphoric acid:
- Disposal of carbon from the ammonia plant; and
- Disposal of general plant wastes

See Figure 4.6 overleaf for more details. The Landfill Areas occupy an area of approximately 13.5 hectares (34 acres).

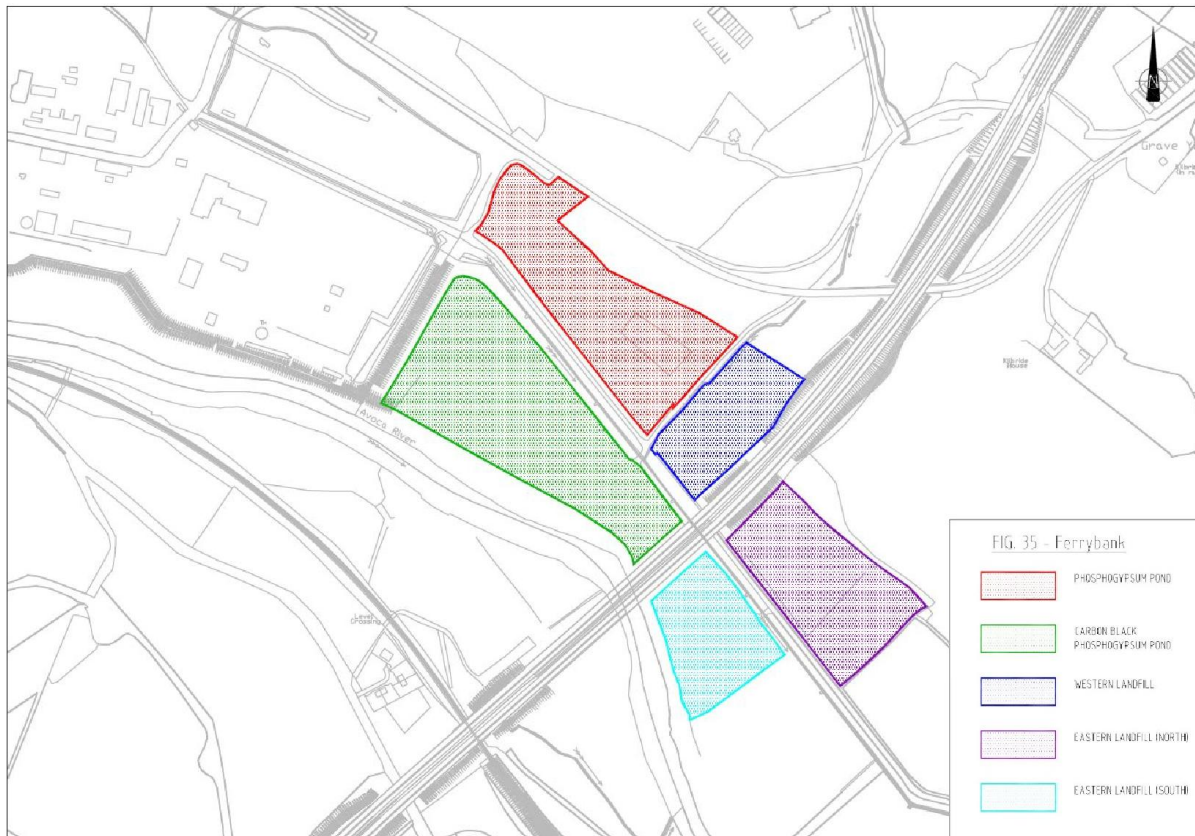


Figure 4.6 Landfill Locations

#### 4.5.3.1 Phosphogypsum Wastes

Phosphogypsum wastes were produced during the manufacture of phosphoric acid. The phosphogypsum pond was constructed by the use of soil bunds around the perimeter of the pond and the natural alluvial clay and peat deposits formed the base of the pond. The phosphogypsum slurry was pumped to the pond where the phosphogypsum was allowed to settle with the water being drained from the pond by a series of drainage pipes through the bund and discharging into the drainage canal running through the landfill area. The gypsum pond was used for approximately 6 years (1967 - 1973) until the capacity was exhausted. At this time phosphogypsum wastes were diverted to the carbon pond which had been constructed by similar means immediately to the south of the phosphogypsum pond. The pond was covered with up to 0.6 metres of shale and topsoil and grassed.

#### 4.5.3.2 Carbon Wastes

Carbon wastes, produced during the manufacture of ammonia, were diverted in slurry form to the carbon pond that had been constructed in the south-western corner of the landfill area. The carbon pond was constructed in a similar fashion to the phosphogypsum pond with soil embankments and the surface water was disposed of by drainage to the canal and by seepage into the ground. When exhausted the carbon pond was covered with up to 0.6 metres of shale and topsoil and grassed. Additional material made available during construction of the Arklow by-pass has been added bringing the total depth of cover material to 1 to 2 metres.



#### 4.5.3.3 General Site Wastes

General solid wastes from the IFI Site have been disposed of in two landfill areas immediately to the east of the phosphogypsum and carbon ponds, the Eastern Landfill, North and South. Wastes disposed of in these areas have historically included excavated clay, plastic bags, insulating materials, concrete blocks, bricks, canteen wastes, dredgings from the drainage canals and effluent lagoon. The Northern Section also includes quantities of iron oxide cinder arising from the manufacture of sulphuric acid from local iron pyrite from the Avoca mines during the period 1972 to 1980. The Eastern Landfill areas were constructed with either clay or shale embankments around the perimeters and the base being provided by the natural alluvial clay and peat deposits. The Northern Section was closed and capped with shale and topsoil in 1984, after which time waste disposal activities started in the Southern Section. The western half of the Southern Section was completed in 1994/95 to allow construction of the Arklow by-pass with the Eastern Section in use until May 2001 for disposal of inert Site wastes. Capping work on the Eastern Section was completed in September 2002.

#### 4.5.3.4 Western Landfill (Phase I)

The Eastern Landfill is located immediately alongside, and is visible from, the Bypass. IFI therefore submitted proposals to the EPA for the termination of disposal activities within the landfill and for re-location of landfill operations to a newly engineered cell within the (former) Phosphogypsum Pond, to be called the Western Landfill. The Western Landfill (Phase I) was completed according to an agreed construction plan in May 2001. Landfill activities to the east of the Arklow Bypass then ceased and the active cell was closed off. Landfilling in the Western Landfill commenced on 27 May 2001.

At end of June 2006, the following are estimates of the extent of waste in the landfill area:

- Phosphogypsum Pond - 55,847 m<sup>3</sup> of gypsum
- Carbon/Phosphogypsum Pond - 137,801 m<sup>3</sup> of gypsum and approx. 19,080 m<sup>3</sup> of carbon black
- Eastern Landfill (North) - approx. 130,000 m<sup>3</sup> of waste
- Eastern Landfill (South) - approx. 59,588 m<sup>3</sup>
- Western Landfill (Phase 1) - approx. 2,501 m<sup>3</sup>

All of the site landfills have now ceased accepting waste. As part of the maintenance of the landfill site, remediation works were carried out in 2014. The scope of the works included:

- Provision of additional capping to existing landfill site
- Grub out existing drainage channels
- Excavate a section of new drainage channel
- Install additional ground water monitoring wells
- Install gas ventilation Wells
- Decommission some existing disused groundwater monitoring wells

If construction were to go ahead at the Shelton Abbey land parcel, extensive remediation works will be required if the landfill were to be disturbed. A portion of the pipeline corridor passes through the landfill site. The challenges affected with this option are reflected in Section 4.12 – “Engineering Design” of this report.

#### 4.5.4 Evaluation

Refer to matrix Table 4.6.



#### 4.5.5 Ferrybank (Old Wallboard Factory)

##### *Site*

The topography of the Ferrybank land parcel (Old Wallboard Factory) is generally flat, lying roughly 2.5 mOD. The land parcel is bounded by the Avoca River to the south and the Irish Sea to the East.

The Quaternary mapping has noted the subsoil to be an alluvium gravel deposit consistent with the nature of soils located near rivers, in this case the Avoca River. Again, adjacent to the coastline an Aeolian Sand is noted in the GSI Quaternary mapping.

Copper mining in the Avoca Mines has been undertaken for centuries. It is highly probable that the material used to infill the River Avoca estuary and build up a harbour wall was sourced from mine waste/stripped overburden generated from the Avoca Mines. This hypothesis is proposed as a large volume of material would be required for infilling and there was a ready supply of mine waste/surplus overburden available from the Avoca mines. Also, there is no other land scar in the Arklow area to indicate such quarrying/mining. The creation of a harbour at Arklow would have greatly facilitated and significantly decreased costs for export of ore from Ireland to Britain.

The bedrock lithology mapped beneath the land parcel is the Kilmacrea formation and the Maulin Formation. This Kilmacrea formation is composed of dark grey slate and minor pale sandstone while the Maulin Formation is composed of dark grey slate which is rich in mica. The rock unit group has been identified as Ordovician Metasediments. This is composed of a series of layered sandstones, siltstones and shales with minor volcanic rocks.

The groundwater vulnerability of the land parcel is classified as low. The groundwater beneath the site is considered to be significantly impacted by a tidal water level fluctuations. During periods of low tide, groundwater from the site discharges to the marine environment. However, during high tide, the marine environment is considered to backflow into the site and infilled material; i.e. seawater intrudes beneath the site. The effect of this tidal water level fluctuation is that material infilled within the site has been effectively washed periodically (i.e. approximately twice daily) since it was deposited within the site.

A site investigation report was carried out in November 2005 for the Ferrybank land parcel (Old Wallboard Factory) to facilitate an assessment of the presence and significance of contaminants in the ground. This land parcel was previously in the ownership of IFI and was used as a storage depot for Heavy Fuel Oil, Sodium Hydroxide and Nitric Acid. These materials were stored in the tanks still existing within the site. However, it is understood that these tanks have not been in use for approx. 22 - 32 years.

The site investigation report carried out in 2005 consisted of a walk over survey, asbestos survey, window sampling trial pits, 2-3m borehole drilling and chemical analysis of all soil samples taken. The position of these investigations concentrated on the most likely location for contamination to exist; i.e. in close proximity to the chemical storage tanks.

Made ground comprising brown to orange sandy to gravelly material. With inclusions of red bricks, glass and coal slag was encountered from depth ranges 0.2m to 1.8m bgl. All sampling points continued to a sufficient depth to intercept natural subsoil material, which comprised a sequence to sands and gravels.





The chemical analysis of the samples taken from 0.5m to 1.5m was conducted to determine the contaminant potential presented by past IFI activities and the contaminant potential presented by the infilling of materials during the construction of the Harbour Wall. This analysis did not suggest that the soil had been impacted upon by the storage of materials within the site. The analysis did suggest that the composition of made ground presents a contamination potential due to elevated concentrations of heavy metals (Copper, Zinc, Lead and Arsenic), and Polycyclic Aromatic Hydrocarbons (PAH) compounds.

#### *Pipelines Route Corridor & Outfall*

Previous site investigations have taken place along the pipeline route corridor. Boreholes were completed in 2012 as part of the Arklow Sewerage Scheme. One such borehole (E = 325300.624 N = 173473.24) which is approximately 270 m from the boundary of the Ferrybank land parcel (Old Wallboard Factory) indicated that bedrock was deeper than 10 m, the depth of the borehole and the soil consisted mainly of a medium dense, brown fine to coarse sand and gravel. Given the relatively short distance of pipeline required for Ferrybank, this soil type can generally be expected to be encountered for the entire length of the pipeline corridor.

#### **4.5.6 Kilbride**

##### *Site*

The Kilbride land parcel slopes gently from north to south and the topography ranges between approximately 25m to 35mOD.

Topsoil mapping indicates an acidic deep poorly drained mineral (derived from mainly non-calcareous parent materials) within the land parcel. To the west of the land parcel, near the M11 motorway, surface water/groundwater gleys (shallow poorly drained mineral derived from mainly calcareous parent materials) have been mapped.

The subsoil mapping indicates a sandstone and shale till (Lower Palaeozoic) with matrix of Irish Sea Basin origin. To the west of the land parcel, near the M11 motorway, bedrock at the surface has been identified.

The bedrock lithology mapped beneath the land parcel is the Kilmacrea formation. This lithology is composed of dark grey slate, minor pale sandstone. The rock unit group has been identified as Ordovician Metasediments. This is composed of a series of layered sandstones, siltstones and shales with minor volcanic rocks. A minor fault had been mapped within the southern portion of the land parcel boundary, trending west - east.

The groundwater vulnerability of the land parcel is classified as extreme indicating that the bedrock is shallow within the land parcel. This coincides with the bedrock outcrops.

There are no other geological features shown within the Kilbride land parcel.

#### *Pipelines Route Corridor & Outfall*

Topsoil mapping along the pipeline route corridor indicates an acidic deep poorly drained mineral (derived from mainly non-calcareous parent materials). The west of the corridor, near the M11 motorway, surface water/groundwater gleys (shallow poorly drained mineral derived from mainly calcareous parent materials) and mineral alluvium have been mapped. The east of the corridor, near closer to the centre of the town, the Teagasc topsoil has been identified as "Made/Built Land".

The subsoil mapping indicates a sandstone and shale till (Lower Palaeozoic) with matrix of Irish Sea Basin origin. The west of the pipeline route corridor, near the M11 motorway, subsoil





mapping indicates “Alluvium Undifferentiated”, typical of riverside locations. To the east of the pipeline route corridor, closer to the centre of the town, the Teagasc subsoil mapping indicates “Made Ground”.

The bedrock lithology mapped beneath the pipeline route corridor is the Kilmacrea formation. This lithology is composed of dark grey slate, minor pale sandstone. The rock unit group has been identified as Ordovician Metasediments. This is composed of a series of layered sandstones, siltstones and shales with minor volcanic rocks.

The groundwater vulnerability of the pipeline route corridor is classified as moderate to low. There are no other geological features shown within along the pipeline corridor route.

#### **4.5.7 Shelton Abbey (IFI Site)**

##### *Site*

IFI was a joint venture company formed by state company Nitrigin Eireann Teoranta (NET) and ICI plc, which operated three manufacturing facilities in Cork, Belfast and Arklow. The main products manufactured at Arklow were Calcium Ammonium Nitrate (CAN) and blends. Other nutrients, which complemented the range of fertiliser products were imported and blended as required. Nitric acid was produced mainly as an intermediate, although there was a minor acid sales business.

Facility operations required a typical range of services, including water treatment, steam generation, laboratory activities and storage of raw materials, intermediates, products and ancillary materials.

IFI was granted the IPC Licence in January 1997. A revised Licence (Register No. 495) was issued in March 2000, which approved significant process changes. In 2002, fertiliser manufacturing stopped and in 2005, following the purchase of the site, the Licence was transferred to the current owner.

The Shelton Abbey land parcel is generally flat, with elevations ranging from approx. 6.5 mOD at the top of the flood defences along the southern bank to approx. 2 mOD in the centre of the parcel.

Topsoil mapping indicates a split between mineral alluvium (in the western portion of the land parcel) and made/built ground in the developed section of the land parcel. These characteristics are to be expected with a brownfield site alongside a river. The subsoil mapping indicates alluvium (undifferentiated) subsoil in the western portion of the land parcels and again, made ground in the developed section of the land parcel.

The bedrock lithology mapped beneath the land parcel is the Kilmacrea formation. This comprises Ordovician metasediments primarily dark, grey slate, with minor pale sandstone from the Kilmacrea Formation. The bedrock outcrops in the high ground to the north of the land parcel and the bedrock surface slopes from the north to south beneath the river valley.

A minor fault had been mapped within the traversing west to east across the middle of this land parcel.

The groundwater vulnerability of the land parcel is classified as moderate. This coincides with the findings of the bedrock not being particularly deep in this area.



Previous reports carried out in the Shelton Abbey (IFI Site) land parcel are available for inspection from the EPA website. These reports indicated that the site is underlain with by drift material typical of deposition in a fluvial environment. The upper 1 to 3 metres is occupied by a layer of fill material which generally comprises a mixture of topsoil and coarse gravel and cobbles. Underlying the fill material is a clay layer which varies in thickness across the site. The clay varies from a brown grey gravely sandy silty type to a yellow grey, often organic, silty variety.

IW and BLP engaged the services of Ground Investigations Ireland Ltd. to undergo invasive site investigation works and WAC (Waste Acceptance Criteria) analysis (Murphy Suite) at the Shelton Abbey (IFI Site) land parcel in order to verify the findings of the historical reports. The GII trial pits locations, logs and laboratory analysis can be found in Appendix F. These findings concluded that the extent of the landfill site did not extend to the developed portion of the site and ground contamination in the soil would not pose an issue if construction were to go ahead at this location.

#### *Pipelines Route Corridor & Outfall*

Topsoil mapping along the pipeline route corridor indicates an acidic deep poorly drained mineral (derived from mainly non-calcareous parent materials). The west of the corridor, near the M11 motorway, surface water/groundwater gleys (shallow poorly drained mineral derived from mainly calcareous parent materials) and mineral alluvium have been mapped. The east of the corridor, near closer to the centre of the town, the Teagasc topsoil has been identified as “Made/Built Land”.

The subsoil mapping indicates a sandstone and shale till (Lower Palaeozoic) with matrix of Irish Sea Basin origin. The west of the pipeline route corridor, near the M11 motorway, subsoil mapping indicates “Alluvium Undifferentiated”, typical of riverside locations. To the east of the pipeline route corridor, closer to the centre of the town, the Teagasc subsoil mapping indicates “Made Ground”.

The bedrock lithology mapped beneath the pipeline route corridor is the Kilmacrea formation. This lithology is composed of dark grey slate, minor pale sandstone. The rock unit group has been identified as Ordovician Metasediments. This is composed of a series of layered sandstones, siltstones and shales with minor volcanic rocks.

The groundwater vulnerability of the pipeline route corridor is classified as moderate to low. There are no other geological features shown within along the pipeline corridor route.



6.0 Soils and Geology		Ferrybank	Kilbride	Shelton Abbey
6.1 Soils and Geology - Land Parcels				
6.1.1	Potential to impact on Geological Heritage Sites / County Geological Sites	Imperceptible - No such sites in close proximity	Imperceptible - No such sites in close proximity	Imperceptible - No such sites in close proximity
6.1.2	Potential to interact with contaminated land	Moderate - Chance of encountering heavy metals & PAH Compounds	Imperceptible - greenfield land parcel	Significant - Brownfield Site. EPA Landfill & history of industrial activities.
6.1.3	Potential to sterilise mineral resource	Imperceptible - No known mineral sources or registered quarries in close proximity	Imperceptible - No known mineral sources or registered quarries in close proximity	Imperceptible - No known mineral sources or registered quarries in close proximity
6.1.4	Potential to encounter shallow bedrock during construction (interactions with other disciplines during construction - noise, dust etc...)	Imperceptible - Bedrock estimated at 10m bgl	Significant - Outcrop in western portion of the land parcel	Slight - Moderate vulnerability indicates moderately deep bedrock
6.1.5	Potential impact on karst features	Imperceptible	Imperceptible	Imperceptible
6.1.6	Potential to encounter soft ground	Moderate - Quaternary mapping has noted the subsoil to be an alluvium gravel deposit consistent with the nature of soils located near rivers	Imperceptible - No alluvial deposits mapped within land parcel	Slight - Alluvial deposits which may include soft silts mapped in eastern portion of land parcel
6.1.7	Soils Types	Made Ground	Acidic deep poorly drained mineral	Made Ground
6.1.8	Sub Soil Types	Made Ground/Alluvial Gravel Deposits	Sandstone and shale till	Made Ground
6.1.9	Depth to rock	~10m	0 - 10m	5-10m



6.2	Soils and Geology - Route Corridors	Ferrybank	Kilbride	Shelton Abbey
6.2.1	Potential to impact on Geological Heritage Sites / County Geological Sites	Imperceptible	Imperceptible	Imperceptible
6.2.2	Potential to interact with contaminated land	Slight - Chance of encountering heavy metals & PAH Compounds (associated with made ground)	Significant - Pipeline route near existing EPA landfill site	Significant - Pipeline route near existing EPA landfill site
6.2.3	Potential to sterilize mineral resource	Imperceptible - No known mineral sources or registered quarries in close proximity	Imperceptible - No known mineral sources or registered quarries in close proximity	Imperceptible - No known mineral sources or registered quarries in close proximity
6.2.4	Potential to encounter shallow bedrock during construction (interactions with other disciplines during construction - noise, dust etc...)	Imperceptible	Moderate - Outcrop shown on GSI Mapping in the vicinity of M11 motorway	Moderate - Outcrop shown on GSI Mapping in the vicinity of M11 motorway
6.2.5	Potential impact on karst features	Imperceptible	Imperceptible	Imperceptible
6.2.6	Potential to encounter soft ground	Slight - Quaternary mapping has noted the subsoil to be an alluvium gravel deposit consistent with the nature of soils located near rivers	Moderate - Quaternary mapping has noted the subsoil to be an alluvium gravel deposit consistent with the nature of soils located near rivers/marsh	Moderate - Quaternary mapping has noted the subsoil to be an alluvium gravel deposit consistent with the nature of soils located near rivers/marsh



6.3	Soils and Geology - Outfalls	Ferrybank	Kilbride	Shelton Abbey
6.3.1	Potential to impact on Geological Heritage Sites / County Geological Sites	Imperceptible	Imperceptible	Imperceptible
6.3.2	Potential to interact with contaminated land	Imperceptible - Ensure avoidance of river dredge dump site offshore	Imperceptible - Negotiate exact location away from gypsum/carbon ponds	Imperceptible - Negotiate exact location away from gypsum/carbon ponds
6.3.3	Potential to sterilize mineral resource	Imperceptible	Imperceptible	Imperceptible
6.3.4	Potential to encounter shallow bedrock during construction (interactions with other disciplines during construction - noise, dust etc...)	Imperceptible	Imperceptible	Imperceptible
6.3.5	Potential impact on karst features	Imperceptible	Imperceptible	Imperceptible
6.3.6	Potential to encounter soft ground	Moderate - Banks of Avoca River/ Coastal Location	Moderate - Banks of Avoca River	Moderate - Banks of Avoca River

Table 4.6 Soils & Geology





## 4.6 Agronomy & Landuse

### 4.6.1 Introduction

This report is a study of the potential agricultural impact of the construction of the WwTP, pipeline routes and effluent outfall. It involves an assessment of the three potential land parcels for construction of the wastewater treatment plant.

Only one of these parcels, Kilbride, is located in an area predominately used for agriculture. Whilst this land parcel is currently used for agricultural purposes, it should be noted that it is zoned as an “Action Area” in the “*Arklow Town and Environs Development Plan (2011 -2017)*”. This is discussed in further detail in section 4.11. The other two land parcels are brownfield sites although Shelton Abbey (IFI Site) land parcel, though zoned as “Employment (E1)” in the “*Arklow Town and Environs Development Plan (2011 -2017)*”, is occasionally used to hold equine stock. The area to be acquired from agricultural production is approximately 2 hectares.

### 4.6.2 Methodology

An assessment of the existing agricultural environment was carried out through a desktop survey of available mapping, and walk over surveys of three land parcels.

The impact on agriculture is the overall potential effect of the construction of the wastewater treatment plant and associated infrastructure on a farm holding. The degree to which the wastewater treatment plant impacts upon an individual farm depends on:

- Landtake
- Land quality
- The type of farm enterprises carried out
- Farm Size
- Impact on farm buildings and/or facilities
- Impact on shelter

#### 4.6.2.1 Landtake

##### *Individual Fields*

In general the larger the field size the more useful the field. This is particularly because of the ease of use of machinery in larger fields. Reduction in the field size results in increased costs to the farmer.

##### *Farm Holdings*

The land take is one of the main impacts on a farm holding. The degree of the impact varies with the area of the land taken, the land quality, location and farm type. The greater the landtake and the higher the quality of the affected lands the greater will be the impact.

Landtake on the main land holding will have a greater impact on a fragmented farm holding than landtake from an outfarm i.e. land removed from the main land holding. Landtake on a dairy farm on lands used as grazing paddocks adjacent to a milking parlour may have a larger impact than taking land located on a beef farm. The size of the affected farm holding is also a factor with landtake on a smaller farm generally having a greater impact.



### *Intensity of Land Use*

Farming systems can vary with regard to the intensity of use to which the land is put. In general, the impact will be greater on more intensively farmed lands. Only one of the land parcels is intensively farmed.

#### **4.6.2.2 Farming Enterprise**

The farm enterprise types that will be most severely affected by a proposed development are those of high stocking rates, which are intensively farmed. These would frequently be dairy farms and intensive beef farms. Dairy farming is one of the most profitable farming enterprises in the country. A reduction in the available forage area may result in a reduction in the number of dairy cows that can be maintained on the farm holding. Significant landtake, or severance of the grazing paddocks from the farm buildings, may result in the farmer being forced to change the farm enterprise type to a less profitable enterprise.

Certain farm enterprises may be impacted to a greater extent by a proposed development. Horses are of a more nervous disposition than other stock types. They are prone to stress caused by irregular noise and moving vehicles. Land take and severance of land holdings may result in fields of an irregular shape (e.g. triangular shaped fields with sharp / narrow corners), which may be unsuitable for grazing with equine stock. Horses risk injury when galloping around such fields.

Drystock enterprises such as beef and sheep are generally less affected by a proposed scheme than dairy farms. Livestock on these farm holdings are not moved from field to field as frequently as on a dairy farm. Although there is a significant impact, the farming practices on these enterprises can be adapted to mitigate the overall impact.

Horticultural enterprises are impacted to a greater extent than other enterprises because they are generally very intensive units. The farm infrastructure, such as irrigation pipes and bore holes can be affected. Interruption of a water supply can have a serious impact on a horticultural enterprise. Land may prove difficult to replace for horticulture as not all land is suited for this enterprise. Many horticultural growers spend many years getting the soil, pH balance and fertilizer levels to an optimum level to be able to grow vegetable crops.

#### **4.6.2.3 Impact on Farmyard Buildings And/ Or Facilities**

The removal of farm buildings and / or facilities on the farm will contribute towards the overall impact on the farm. This will depend on the type of farm buildings affected and extent that the facilities are affected.

#### **4.6.2.4 Impact on Shelter**

The removal of mature trees and strong hedgerows, which provide shelter to crops and livestock, especially younger stock, will have an adverse impact on a farm holding. The level of impact will depend on the extent of the shelter removed and the type of enterprise. It should be noted that this impact can be mitigated against in certain cases by the replanting of boundary hedgerows and replanting of suitable tree species.



### 4.6.3 Predicted Impacts - Construction & Operation Phase

#### 4.6.3.1 Noise

The activity of earth moving machinery, transport lorries and other ancillary vehicles will generate additional noise emissions in the immediate vicinity of the construction of the wastewater treatment plant. Noise can be of significance for farm animals (i.e. when noise becomes excessively loud). In general, animals become accustomed to regular noises and sounds. Intermittent noises can cause fright and distress. Blasting activity for rock excavations can be of particular concern with certain farm enterprises such as breeding and training of horses. Intermittent noises close to farm buildings, particularly milking parlours, can also distress livestock.

#### 4.6.3.2 Dust

Dust generated from the exposure of soil to the atmosphere during construction may cause annoyance or nuisance to the farmer and farm animals. The proliferation of dust during construction has a nuisance effect and, if produced in high volumes near milking parlours or on-farm bulk milk storage tanks, may constitute a risk as a source of contamination to the milk. Dust may accumulate on vegetable crops growing adjacent to the construction site. Livestock are at risk of eye irritations from high levels of windblown dust particles. This stress may reduce productivity and increase management difficulties, especially on dairy and equestrian farms.

#### 4.6.3.3 Field Drainage

Field drainage systems currently in situ may be disturbed and in places severed by the construction. These systems will be restored as part of the completed works, but there may be impaired drainage in the period of time between initial disturbance and final reinstatement of such drainage works.

#### 4.6.3.4 Malfunction of the Plant during Operation

If the WwTP malfunctioned during operation there is a danger that spillages and leakages could occur and contaminate produce grown in proximity to where a spillage or leakage occurred. In addition to this spillages and leakages could contaminate surface and groundwater sources. Growers have to adhere to strict environmental conditions in order to maintain contracts with buyers. Any leakages or spillages could have environmental consequences and could impact on the ability of the farmers to sell their produce.

### 4.6.4 Evaluation

#### *Sites*

The evaluation of the sites was based on percentage reduction in overall farm holding, farming enterprise, number of landowners impacted, land quality, severance, impact on shelter, impact on farm buildings, and impact on farm roadways. Intensive farming is carried out on one of the three sites. Approximately 2ha of potential farmland could be lost to agricultural production as result of the construction of the proposed wastewater treatment plant. This loss while significant to individual farmers is insignificant on a county or national level.

#### *Pipeline Routes & Outfall Locations*

A desktop survey of mapping was used to examine land use and constraints within the pipeline corridors and the land based areas of the outfall locations.



#### **4.6.5 Ferrybank (Old Wallboard Factory)**

The Ferrybank land parcel (Old Wallboard Factory) is a 2.7 ha in size. The land parcel houses an abandoned gypsum factory and is not suitable to farming enterprise. Hence, the overall impact has been deemed imperceptible to the agronomy and landuse section of this report.

#### **4.6.6 Kilbride**

Kilbride is a 44.8 ha land parcel, however, only approx. 2 ha would be required for the WwTP site. The land quality is good, suited to a wide range of farming enterprises. Some of the land in the land parcel is currently being leased. There are no farm buildings located within the land parcel area except for an old abandoned farmhouse. There are a small amount of trees and hedgerows within the land parcel.

The following potential negative impacts were identified:

- Approx. 6.5 % reduction in overall farm holding
- Overall Impact – Moderate

#### **4.6.7 Shelton Abbey (IFI Site)**

Shelton Abbey (IFI Site) is a 12.2 ha land parcel, however, only approx. 2 ha would be required for the WwTP site. There is one landowner within the land parcel and some of the land parcel is currently being leased to hold equine stock. There are no farm buildings located within the land parcel and there are a small number of trees and hedgerows present within the land parcel boundary. Given the lack of farming enterprise present on the Shelton Abbey (IFI Site) land parcel, the overall impact has been deemed imperceptible to the agronomy and landuse section of this report.



7.0	Agronomy & Landuse - Land Parcels	Ferrybank	Kilbride	Shelton Abbey
7.1	Approximate % Reduction in overall farm holding	Imperceptible	Slight - approx. 6.5% reduction	Imperceptible
7.2	Farming Enterprise	Imperceptible - no farming enterprise	Moderate - farming enterprise	Imperceptible - no farming enterprise
7.3	Number of landowners impacted within land parcel boundary	Slight - 1	Moderate - >1	Slight - 1
7.4	Land Quality	Imperceptible - Poor Land Quality	Slight - Good Land Quality	Imperceptible - Poor Land Quality
7.5	Severance based on site location within overall land holdings	TBC - Step 2/3	TBC - Step 2/3	TBC - Step 2/3
7.6	Potential Impacts on landholdings	Imperceptible	Reduction in farm size	Imperceptible
7.7	Crop rotation practiced	No	Yes	No
7.8	Overall Impact	Imperceptible	Moderate	Imperceptible

Table 4.7 Agronomy & Landuse





## 4.7 Noise and Vibration

### 4.7.1 Introduction

A preliminary assessment of the potential noise and vibration impacts on the three shortlisted land parcels was undertaken to aid in the process of the selection of an emerging preferred WwTP site location. The assessment takes cognisance of the proximity of sensitive receptors. This study has been compiled in the form of a desk top study comprising of industry guidance documents and OSI mapping.

### 4.7.2 Methodology

The potential for noise and vibration impact associated with the proposed WwTP at each of the three shortlisted land parcels has been assessed with reference to the National Roads Authority document entitled: "Guidance for the treatment of Noise and Vibration in National Road Schemes".

The guidance document states that all receptors within 300m of each route option should be identified and put into one of four "bands". These bands are defined by their distance to either side of the centre line of each route option. Band 1 is from 0 to 50m of the centre line, Band 2 is from 50 to 100m, Band 3 is from 100 to 200m and Band 4 is from 200 to 300m. For this purpose, a receptor is defined as being any dwelling house, hotel, hostel, health building, educational establishment, places of worship, entertainment venue or any other facility or area of high amenity which benefits from, or requires the absence of, high noise levels.

The total number of receptors in each band is multiplied by an arbitrary rating factor. The rating factor is 4 for Band 1, 3 for Band 2, 2 for Band 3 and 1 for Band 4. The resultant values are summed to give a single number for each route option, termed the Potential Impact Rating (PIR). The PIR values may be used to assess the potential impact of each route option, the larger the PIR the greater the potential impact.

In terms of the land parcels assessment there are no receptors within 50m/100m of the boundary as this was a constraints stage criterion. As such, in order to classify each of the potential WwTP sites this methodology has been expanded out to 500m. Receptors in the 100-200m band have a rating factor of 2, while those in the 200-300m band have a rating factor of 1.

#### 4.7.2.1 Desktop Study

The desktop study used the data as described above to calculate PIR rating for each of the three shortlisted land parcels and their associated sites. These were then ranked as having the potential for a Low, Medium or High noise and vibration impact for both the construction and operational stages of the proposed scheme.

### 4.7.3 Predicted Impacts

Noise and vibration impacts will occur during both the construction and operational phases of the proposed scheme.

#### 4.7.3.1 Construction Phase

In the construction phase the noise and vibration impacts will be due to earth moving, rock breaking and general civil and structural engineering works. These activities will require to be



planned and controlled to minimise potential noise and vibration impact to the closest sensitive receptors. The nature of this sensitivity can be seen from the relative PIR ratings received by each of the three shortlisted land parcels and associated sites assessed in Table 4.8 underneath.

#### **4.7.3.2 Operational Phase**

During the operational phase the potential for noise and vibration impact should be more or less equal for all of three of the proposed WwTP sites as the operating facility will be required to meet standard noise and vibration emission criteria at the closest sensitive receptor, regardless of the proximity of that receptor. The proposed WwTP will be required to adhere to *SI No. 287/2005 - European Communities (Waste Water Treatment) (Prevention of Odours and Noise) Regulations 2005*.

#### 4.7.4 Ferrybank (Old Wallboard Factory)

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Ferrybank land parcel (Old Wallboard Factory):

- 204 dwellings (PIR Weighted) within 300 m of the parcel boundary -
- The existing ambient noise climate is close to Arklow town centre. -
- Overall construction phase impact rating is imperceptible
- Overall operational phase impact rating is imperceptible -

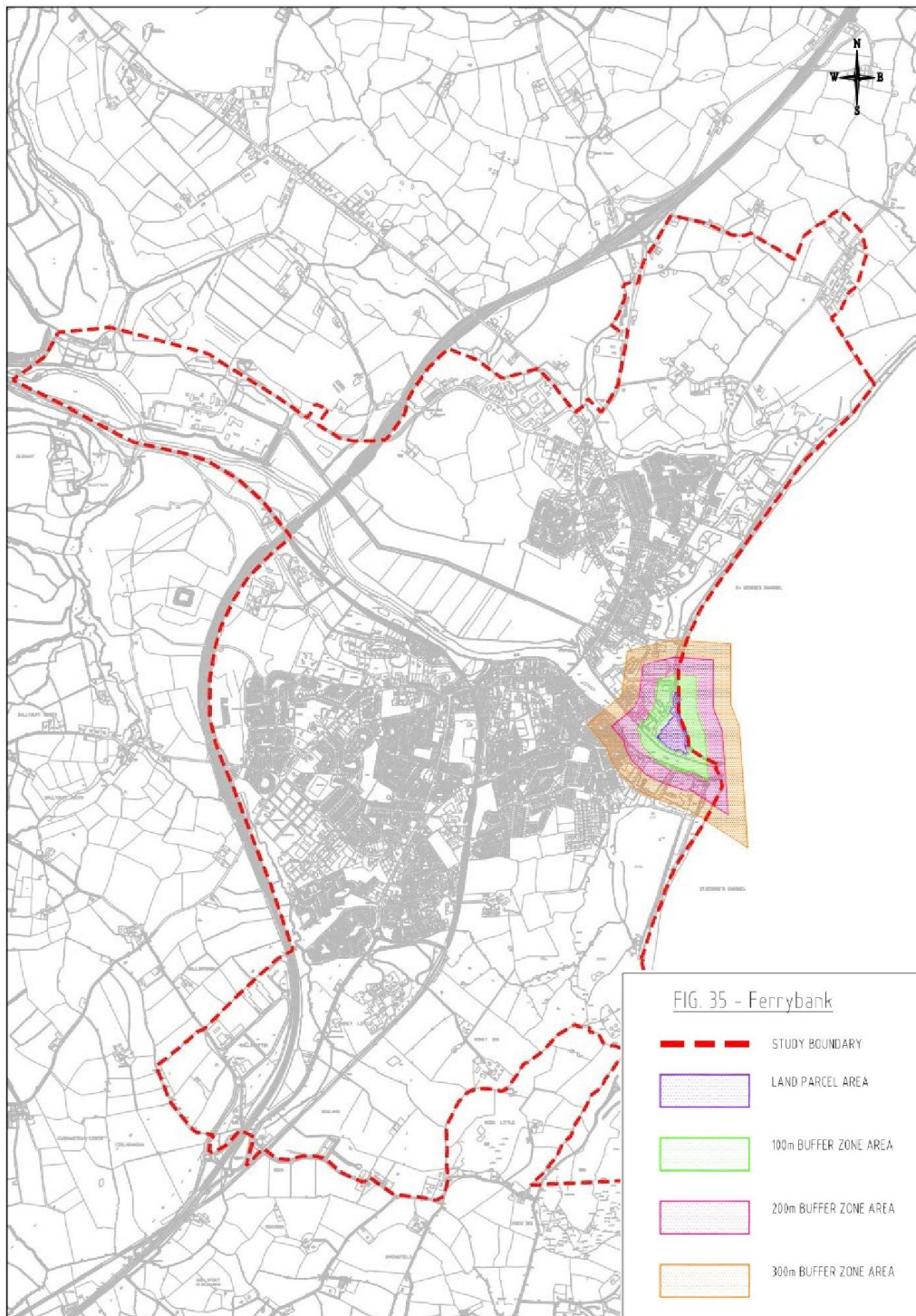


Figure 4.7 Ferrybank (Old Wallboard Factory) Noise & Vibration Buffer Zones



#### 4.7.5 Kilbride

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Kilbride:

- 365 dwellings (PIR Weighted) within 300 m of the parcel boundary
- The existing ambient noise climate is relatively rural farmland area. The parcel borders M11 motorway
- Overall construction phase impact rating is imperceptible
- Overall operational phase impact rating is imperceptible

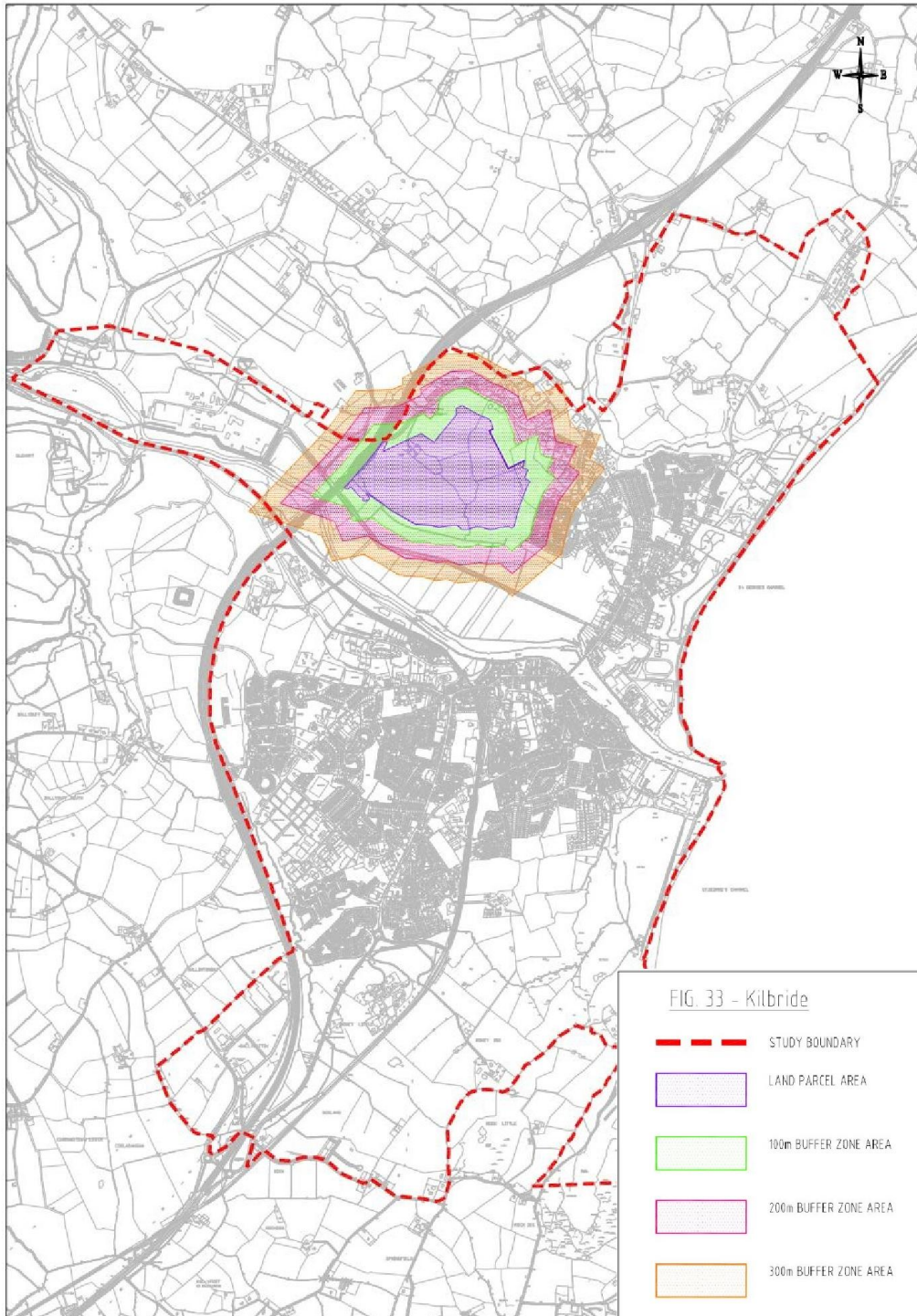


Figure 4.8 Kilbride Noise & Vibration Buffer Zones

#### 4.7.6 Shelton Abbey (IFI Site)

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Shelton Abbey (IFI Site):

- 26 dwellings (PIR Weighted) within 300 m of the parcel boundary -
- The existing ambient noise climate is close to M11 motorway. -
- Overall construction phase impact rating is imperceptible
- Overall operational phase impact rating is imperceptible -

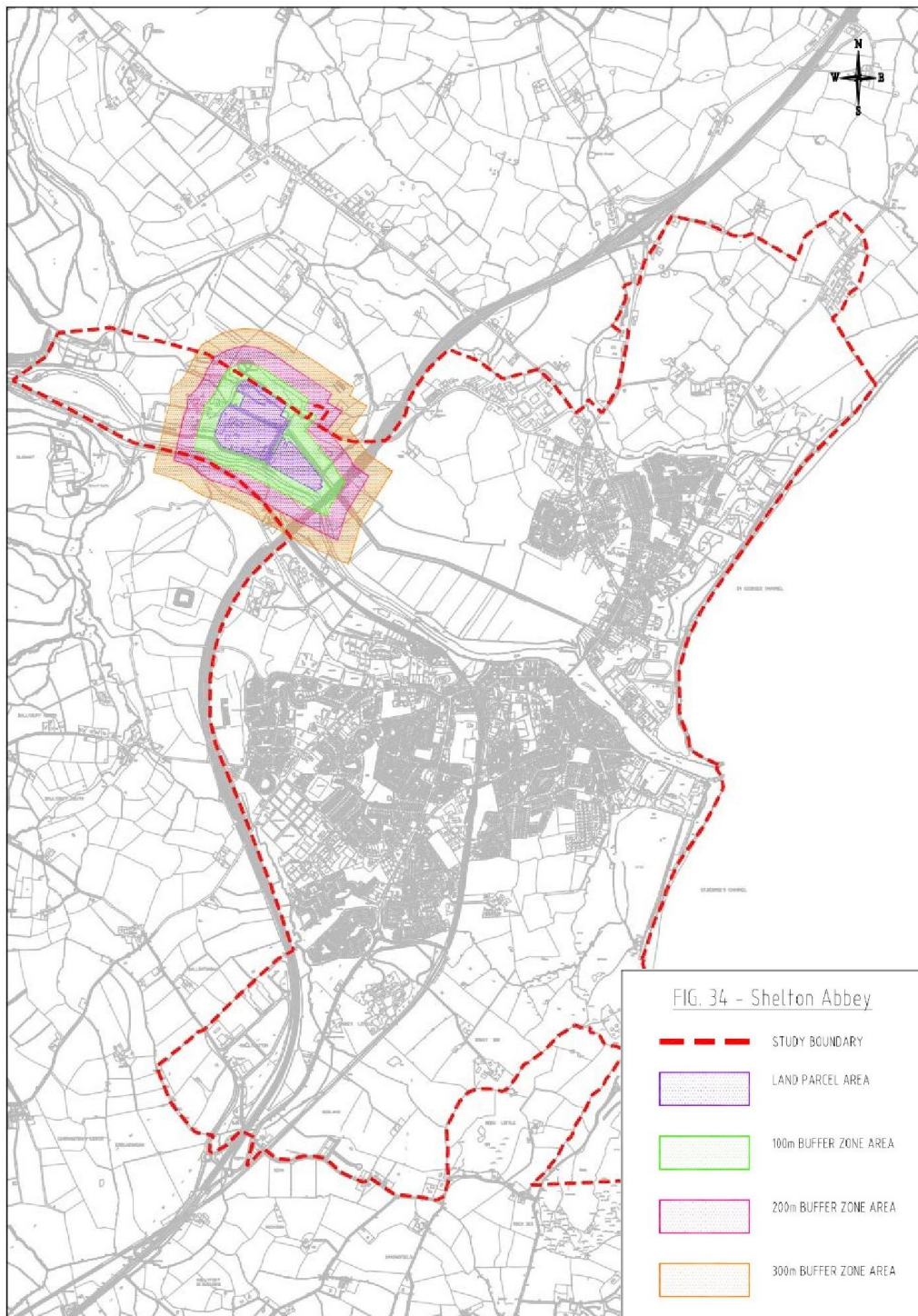


Figure 4.9 Shelton Abbey Noise & Vibration Buffer Zones





8.0	Noise & Vibration	Ferrybank	Kilbride	Shelton Abbey
8.1	Potential for Construction phase noise impact at Sensitive receptors	Significant - 204 dwellings (PIR Weighted) within 300 m	Significant - 365 dwellings (PIR Weighted) within 300 m	Slight - 26 dwellings (PIR Weighted) within 300 m
8.2	Potential for Operational phase noise impact at Sensitive receptors	Slight - Facility shall reach 55db(A) Daytime and 45 db(A) night at closest receptor	Slight - Facility shall reach 55db(A) Daytime and 45 db(A) night at closest receptor	Slight - Facility shall reach 55db(A) Daytime and 45 db(A) night at closest receptor
8.3	Existing Ambient Noise Climate in the Area (significant noise sources)	Close to Arklow Town Centre	Relatively rural farmland area. Borders M11 motorway	Relatively rural farmland area. Borders M11 motorway
8.4	Construction Phase Impact rating	Imperceptible	Imperceptible	Imperceptible
8.5	Operational Phase Impact rating	Imperceptible	Imperceptible	Imperceptible

Table 4.8 Noise & Vibration



## 4.8 Air and Odour

### 4.8.1 Introduction

A preliminary assessment of the potential air quality and odour impacts associated with locating the proposed WwTP on the three shortlisted land parcels and their associated sites was undertaken in order to aid in the design process and the emergence of a preferred site for the WwTP. The assessment takes cognisance of the proximity of sensitive receptors, existing ambient air quality and potential sources of odour.

S.I. 787 of 2005, “European Communities (Waste Water) Prevention of Odours and Noise Regulations requires that wastewater treatment plants are so designed, constructed, operated, and maintained as to avoid causing nuisance arising from odours or noise. However, the regulations do not define “nuisance” by any numerical means. A nuisance odour event is generally regarded as interfering with a person’s normal activities on a reasonably frequent basis.

Therefore, to guard against creating a nuisance, an odour limit that combines a stringent boundary fence standard with very infrequent exceedances of that standard must be adopted. Meeting a stringent standard with very infrequent exceedances of that standard will undoubtedly achieve the requirements of S.I. No. 787.

The proposed scheme is not expected to cause any significant air quality or odour emissions impacts, as the facility will be designed and constructed to limit any such releases to a set boundary limit value in accordance with best practice.

With specific regard to odour, detailed design, and diligent operational phase management will be required in order to minimise the potential for any odour impact to sensitive receptors.

### 4.8.2 Methodology

The potential for air quality and odour impact associated with the proposed WwTP at each of the three shortlisted land parcels has been assessed by use of the National Roads Authority document entitled: “Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes” (National Roads Authority, 2011).

There are no residential receptors within 100m of the proposed boundary as this was a constraints stage criterion. As such, in order to classify the potential WwTP sites this methodology has been expanded out to 500m. Odour concentrations generally decline exponentially with distance from the odour source. This assessment employs a simple quantitative analysis of the existing dwellings within 500 m of the shortlisted land parcels with a view to carrying out a much more detailed odour assessment when a final site is chosen.

In addition, EPA documentation from [www.EPA.ie](http://www.EPA.ie) has been consulted in order to establish the local ambient air quality climate in the surrounding areas of each of the three proposed land parcels as per item 9.7 in matrix Table 4.9 overleaf.

The EPA records and a desktop survey of mapping has also been carried out in order to establish the location of any pre-existing licensed waste or intensive agriculture activities in each of the areas which may have a predisposition to odour impact in the area.



### **4.8.3 Predicted Impacts**

#### **4.8.3.1 Operational Phase**

During the operational phase there should be no sources of dust emission. There will be however, the potential for odour emissions and the magnitude of potential impact will be influenced by the relative proximity of sensitive receptors.

With regard to air quality emissions the proposed facility will be required to operate to standard EPA air quality limits and as such should not harbour any significant air quality impacts.

There is the potential for odour impact to sensitive receptors, from all the proposed WwTP sites. Distance separation from the nearest residential receptors of a minimum of 100m will serve to further reduce the impacts of odour nuisance. The setting of strict emissions from the plant and the effective design, construction and operation of the odour control would ensure that this meets the no nuisance criteria set out in SI 787 of 2005.

#### **4.8.3.2 Construction Phase**

During the Construction phase an odour impact is not envisaged other than a slight potential for odour nuisance during the plant commissioning phase. However, this can be mitigated against by testing the odour control units in advance of plant setup. The potential for Air Quality impact will be comprised of the emissions from road lorries and on site construction plant, which would be the same for all three locations, and the potential for dust generation should the site clearance and earth moving phases of the build occur during dry periods.

### **4.8.4 Mitigation Measures**

#### **4.8.4.1 Operational Phase**

An odour limit that combines a stringent boundary standard and stack emission with very infrequent exceedances of that standard will be adopted for the proposed WwTP. Meeting this criteria would satisfy the requirements of S.I. No. 787. Therefore, the operational phase of the proposed WwTP should not to cause any significant air quality or odour emissions impacts.

To achieve this stringent standard it is proposed that potential odour generating units will be covered and vented through odour scrubbing / treatment systems prior to emission to atmosphere. The level of odour treatment required to achieve the stringent boundary fence odour standard will be determined for the preferred site of the WwTP during the EIA Phase of the project. This will include an assessment of baseline air quality data and odour and ambient air quality modelling.

#### **4.8.4.2 Construction Phase**

Mitigating potential construction phase air quality and odour impacts involves the management and prevention of particulate releases and the generation of dust. Standard mitigation measures are described in the NRA's Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (National Roads Authority, 2011). Mitigation measures should be incorporated into the Construction Environmental Management Plan (CEMP), which will be developed during the construction stage

#### 4.8.5 Ferrybank (Old Wallboard Factory)

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Ferrybank land parcel (Old Wallboard Factory):

- Approx. 714 Dwellings within 500m of land parcel boundary at potential risk of air quality impacts during construction
- Approx. 714 Dwellings within 500m of land parcel boundary at potential risk of odour nuisance during operation should the odour control system fail
- No Odour Impacts Anticipated During Construction Phase
- No EPA Waste Licensed Facility within 1km of the Land Parcel
- No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel
- Zone D Rest of the Country (Rural Air Quality Classification)
- Given the small study area, the wind rose assessment for air quality & odour is considered to be the same for all 3 Shortlisted Land Parcels

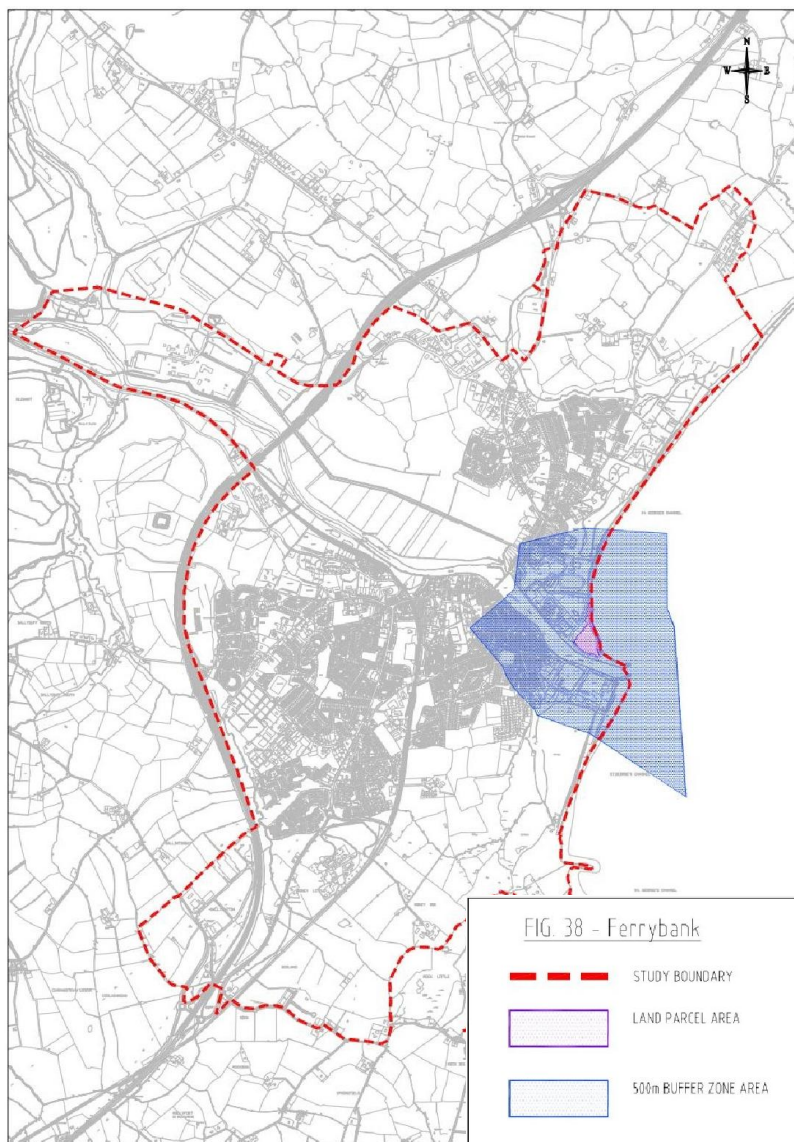


Figure 4.10 Air & Odour Buffer Zones – Ferrybank (Old Wallboard Factory)



#### 4.8.6 Kilbride

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Kilbride:

- Approx. 415 Dwellings within 500m of land parcel boundary at potential risk of air quality impacts during construction
- Approx. 415 Dwellings within 500m of land parcel boundary at potential risk of odour nuisance during operation should the odour control system fail
- No Odour Impacts Anticipated During Construction Phase
- No EPA Waste Licensed Facility within 1km of the Land Parcel
- No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel
- Zone D Rest of the Country (Rural Air Quality Classification)
- Given the small study area, the wind rose assessment for air quality & odour is considered to be the same for all 3 Shortlisted Land Parcels

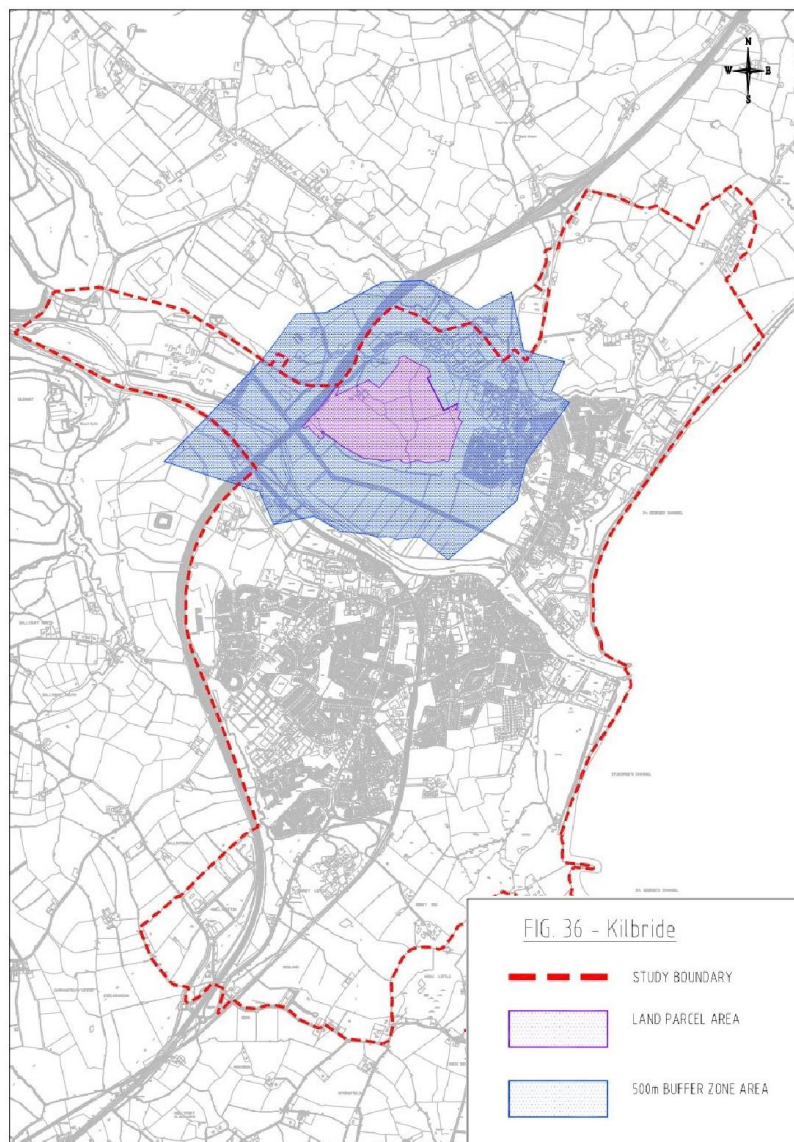


Figure 4.11 Air & Odour Buffer Zones - Kilbride



#### 4.8.7 Shelton Abbey (IFI Site)

For the purposes of differentiating between parcels at the SA stage, the following can be identified for Shelton Abbey (IFI Site):

- Approx. 66 Dwellings within 500m of land parcel boundary at potential risk of air quality impacts during construction
- Approx. 66 Dwellings within 500m of land parcel boundary at potential risk of odour nuisance during operation should the odour control system fail
- No Odour Impacts Anticipated During Construction Phase
- No EPA Waste Licensed Facility within 1km of the Land Parcel
- No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel
- Zone D Rest of the Country (Rural Air Quality Classification)
- Given the small study area, the wind rose assessment for air quality & odour is considered to be the same for all 3 Shortlisted Land Parcels

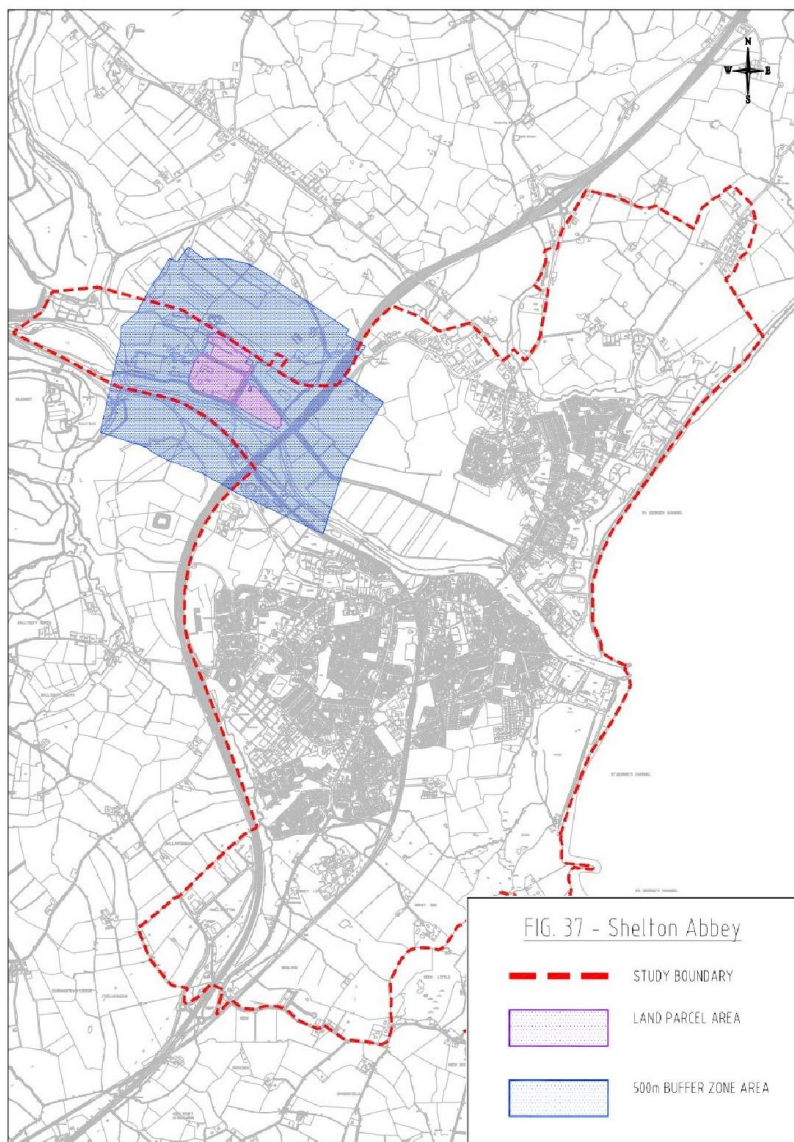


Figure 4.12 Air & Odour Buffer Zones – Shelton Abbey

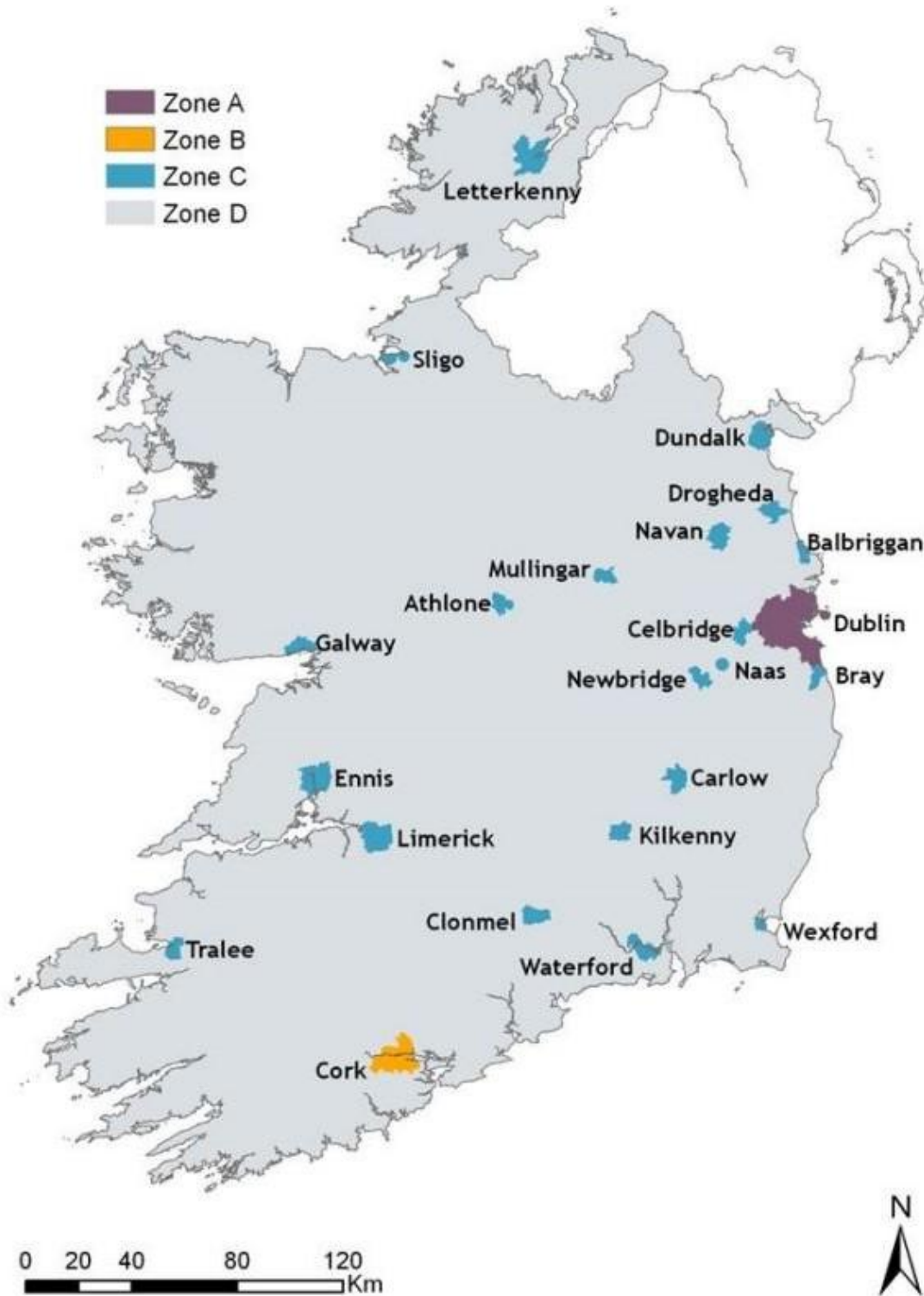


Figure 4.13 Air Quality Classification as per EPA Document - "Air Quality in Ireland 2013"



9.0	Air and Odour	Ferrybank	Kilbride	Shelton Abbey
9.1	Potential for Construction Phase Air Quality Impact at Sensitive Receptors	Significant - Approx. 714 Dwellings within 500m of Land Parcel Boundary	Significant - Approx. 415 Dwellings within 500m of Land Parcel Boundary	Slight - Approx. 66 Dwellings within 500m of Land Parcel Boundary
9.2	Potential for Operational Phase Air Quality Impact at Sensitive Receptors	Facility shall reach Appropriate Air Quality Standards at Emission Points	Facility shall reach Appropriate Air Quality Standards at Emission Points	Facility shall reach Appropriate Air Quality Standards at Emission Points
9.3	Potential for Odour Impacts at Operational phase	Significant - Approx. 714 Dwellings within 500m of Land Parcel Boundary	Significant - Approx. 415 Dwellings within 500m of Land Parcel Boundary	Slight - Approx. 66 Dwellings within 500m of Land Parcel Boundary
9.4	Potential for Odour impacts at Construction phase	Slight – Potential to cause odour during plant commissioning	Slight – Potential to cause odour during plant commissioning	Slight – Potential to cause odour during plant commissioning
9.5	Proximity to EPA Waste Licensed facility	Imperceptible - No EPA Waste Licensed Facility within 1km of the Land Parcel	Imperceptible - No EPA Waste Licensed Facility within 1km of the Land Parcel	Imperceptible - No EPA Waste Licensed Facility within 1km of the Land Parcel
9.6	Proximity to EPA IPPC Licensed Intensive Agriculture Facility	Imperceptible - No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel	Imperceptible - No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel	Imperceptible - No EPA Licensed Intensive Agricultural Facilities within 1km of the Land Parcel
9.7	EPA Air Quality Zone Classification	Zone D Rest of the Country (Rural Air Quality Classification)	Zone D Rest of the Country (Rural Air Quality Classification)	Zone D Rest of the Country (Rural Air Quality Classification)
9.8	Wind Rose Assessment	Given the Small Area, the Wind Rose Assessment is considered to be the same for all 3 Shortlisted Land Parcels	Given the Small Area, the Wind Rose Assessment is considered to be the same for all 3 Shortlisted Land Parcels	Given the Small Area, the Wind Rose Assessment is considered to be the same for all 3 Shortlisted Land Parcels

Table 4.9 Air & Odour



## 4.9 People and Communities

### 4.9.1 Introduction

The People and Communities section of this report seeks to identify the local amenities in close proximity to the shortlisted land parcels and assess how they could be potentially negatively affected.

### 4.9.2 Evaluation

Refer to Matrix Table 4.10 below.

### 4.9.3 Ferrybank (Old Wallboard Factory)

The Ferrybank land parcel (Old Wallboard Factory) is on a coastal location on the outskirts of Arklow Town. The area is predominately commercial with a tradition of boat building and trade. Specific features which can be identified for this parcel include the following:

- Approx. 29 residential dwellings located 100 – 200 m from the parcel boundary ie: outside the 100m buffer zone (3 commercial dwellings within the bufferzone).
- Approx. 714 residential and commercial buildings within 500 m of the parcel boundary
- Arklow town centre is located c. 700 m to the west.
- Amenities include the Arklow leisure centre, skate/BMX park, running track & playing pitches is c. 200 m to the north and the golf links is c. 500 m to the south

Bridgewater shopping centre is located c. 520 m from the boundary of the parcel while the Marina Village residential development lies 200 m from the parcel boundary

### 4.9.4 Kilbride

As indicated in the “*Arklow Town & Environs Development Plan (2011 – 2017)*”, the Kilbride land parcel lies outside of the town (See Figure 4.14 overleaf). Specific features which can be identified for this parcel include the following:

- Approx. 127 residential dwellings located 100 – 200 m from the parcel boundary ie: outside the 100m buffer zone
- Approx. 415 residential and commercial buildings within 500 m of the parcel boundary
- Arklow town centre is located c. 1.5 km south east of the land parcel
- Amenities include the Kilbride historic graveyard, which borders this land parcel and the Arklow Town Marsh c. 600 m to the south.

### 4.9.5 Shelton Abbey (IFI Site)

The Shelton Abbey (IFI Site) land parcel lies outside of the town as per the “*Arklow Town & Environs Plan (2011 – 2017)*”. See Figure 4.14 overleaf. Specific features which can be identified for this parcel include the following:

- Approx. 6 dwellings located 100 – 200 m from the parcel boundary
- Approx. 66 residential and commercial buildings within 500 m of the parcel boundary
- Arklow town centre is located c. 1.7 km south east of the land parcel.
- Amenities include the Kilbride historic graveyard which lies c. 600 m North East of this land parcel and the Arklow Town Marsh c. 700 m to the East.



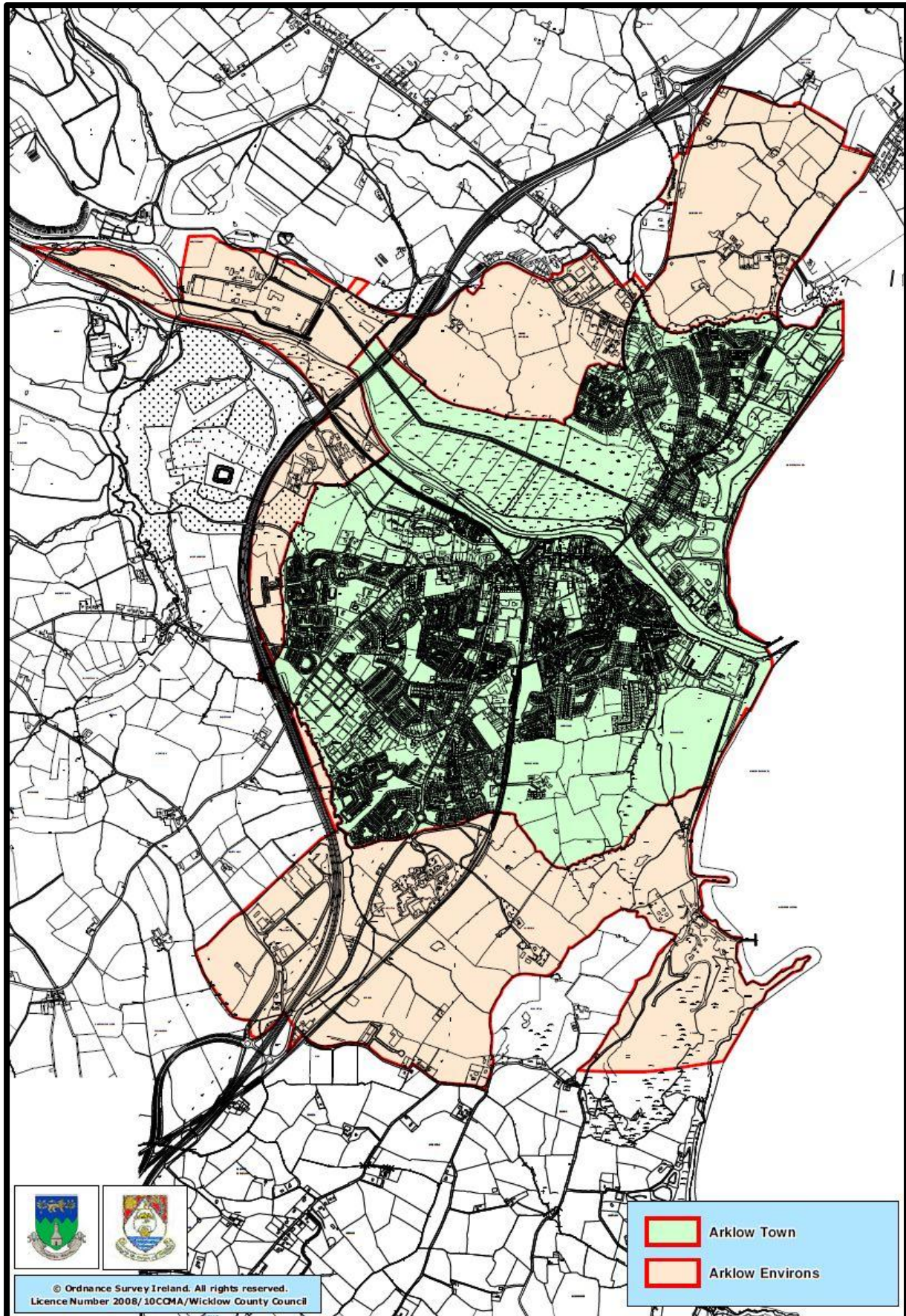


Figure 4.14 Arklow Town/Environs Border as per Map No. 1.01 - Arklow Town Development Plan (2011-2017)





10.0	People and Communities – Land Parcels	Ferrybank	Kilbride	Shelton Abbey
10.1	Number of residential & commercial buildings 100-200m from parcel boundary	Slight – Approx.29	Moderate – Approx. 127	Slight – Approx. 6
10.1	Number of residential & commercial buildings within 500m from parcel boundary	Significant – Approx. 714	Significant – Approx.415	Slight – Approx. 66
10.1	Potential to impact on known community amenities and facilities within 1km from parcel boundary.	Moderate - Arklow leisure centre, skate park/BMX, running track & playing pitches is c. 200 m to the north and the golf links c. 500 m to the south. Bridgewater shopping centre is located c. 520 m from the boundary of the parcel while the Marina Village residential development lies 200 m from the parcel boundary	Slight - The Kilbride historic graveyard borders this land parcel and the Arklow Town Marsh is c. 600 m to the south.	Slight - The Kilbride historic graveyard lies c. 600 m North East of this land parcel and the Arklow Town Marsh is c. 700 m to the East.
10.1	Potential to impact on areas of Significant Population Densities	Slight	Imperceptible	Imperceptible

Table 4.10 People & Communities



## 4.10 Traffic

### 4.10.1 Introduction

This section considers the relative merits of the three land parcels currently being considered as the site for the WwTP in terms of the ability to achieve suitable vehicular access. In comparing the potential sites, the requirements for a new access onto the public road network, the construction of a new access road leading to the facility and the suitability of the public road network to cater for traffic associated with the facility are taken into consideration.

The pipe route options for transporting effluent to and from the site also have relative merits in terms of traffic impact and this is also considered in this report. The choice of location for the outfall pipeline does not have any traffic implications and so this is not discussed.

### 4.10.2 Methodology

#### 4.10.2.1 Desktop Study

In preparing this chapter, the following documents have been referred to:

- *'Wicklow County Development Plan 2010 – 2016'*
- *'NRA Traffic and Transport Assessment Guidelines September 2007'*
- *'NRA DMRB'*
- *'NRA Policy Statement on Development Management and Access to National Roads'*

The main source of data used to carry out this desktop study has been mapping and aerial photography which has been obtained from the OSI and other online satellite mapping. Other data sources included road accident data which was obtained from Wicklow County Council.

Using the available data, an access to the public road network was selected for each of the three land parcels taking into account the suitability of roads surrounding the parcel. When choosing the location of each access the physical characteristics of the receiving road such as carriageway width, horizontal and vertical alignment and visibility were considered along with the frequency of road accidents in the area. From the access point an access route to the land parcel was then generated while attempting to minimise the impact on the surrounding landscape. Similar criteria were then used to compare all the sites.

Traffic generation has not been fully considered at this stage as the volumes of traffic that the construction and operation stages will generate will not differ between sites. This will be dealt with in greater detail during the EIS planning process.

For the pipe routes, traffic generation is a factor, however in general, the longer the pipe route, the more traffic that will be generated. The only other factor from a roads or traffic viewpoint is the number and type of road crossings for the pipelines, as temporary traffic management measures or road closures would be required at these locations.

#### 4.10.2.2 Site Visits

A site visit was carried out to each of the three land parcels in order to assess the location of the proposed accesses identified within the desktop study. The site visit further confirmed that the mapping and other data used in the desktop study accurately reflected the situation on the ground.



### 4.10.3 Predicted Impacts

#### 4.10.3.1 Construction Phase

##### 4.10.3.1.1 Land Parcels

The principal form of transport that will be used in the construction of the proposed facility will be by road. The construction of the facility will generate a temporary but sizeable increase in traffic. Although there will be some variance resulting from differing quantities of excavations etc. the volumes of movements generated by each site will be of a similar order. It is not possible to produce an accurate estimate of the volumes of traffic that the construction stage will generate and this will be carried out at the EIS planning stage. As there are similar volumes of traffic being generated at each site however, for the purposes of selecting a site, this has not been considered as a differentiating issue.

The traffic generated by a site can be categorised into two types, staff traffic and construction traffic. Staff traffic will generally be light vehicles such as cars or vans and will be generated over more condensed time periods which may coincide with existing peak traffic flows on the road network. The impact of staff traffic will therefore be primarily related to potential increases in congestion. No traffic surveys have been carried out at present so this cannot be numerically quantified, but the sites located closer to built-up areas or accessed by roads used by large volumes of commuters would be those most impacted upon – eg: Ferrybank land parcel (Old Wallboard Factory).

Construction traffic will typically be made up of heavy vehicles transporting materials to and from site. These vehicles would be making journeys throughout the site operating hours and as a result would be unlikely to have a significant impact on congestion. The impacts associated with the increase in heavy vehicles operating on the road network, are; a greater potential for accidents associated with slow moving vehicles and the greater wear on road pavements leading to potential defects.

Other traffic related impacts during the construction phase of the facility are the construction of the entrance and any associated works such as localised road widening or service diversions. It is likely these elements would require temporary traffic management perhaps resulting in temporary lane or road closures. Temporary closures would result in reduced capacity of the road, exacerbating any existing congestion issues. As such, the sites with accesses located on less trafficked roads would have a lesser impact.

##### 4.10.3.1.2 Pipe Routes

Due to the long, linear nature of pipe routes, they are generally constructed in sections. This will result in localised impacts on the road network which will move when one section of work is complete and another commences. The impacts that are associated with the construction of the pipe is the increased vehicular traffic consisting of both construction traffic and site staff vehicles. Traffic management measures that may be required and road crossings reducing road capacity i.e. temporary road/lane closures.

As the pipe construction will take place in different sections, the criteria adopted to separate the different options is the length of pipe, the number of road crossings and the nature of the road crossings (i.e. how heavily or lightly trafficked these routes are).



The only major route specific impact would be the crossing of the M11 Motorway. This only applies to the Shelton Abbey pipe route sections. The use of tunnelling techniques or other no-dig techniques would be investigated to achieve the crossing of the M11.

#### **4.10.3.2 Operational Phase**

##### **4.10.3.2.1 Sites**

The bulk of the traffic generated by the proposed facility will occur during the construction phase with operational phase traffic being limited to staff accessing the facility and vehicles transporting by-products of the waste treatment process for disposal off site. The quantity of traffic generated during this phase is anticipated to be negligible in terms of existing traffic flows on the surrounding road network.

##### **4.10.3.2.2 Pipe Routes**

There will be no regular traffic generated by the chosen pipe route during the operational phase. Any traffic movements will be related to maintenance and will be of short duration and infrequent occurrence.

#### **4.10.4 Evaluation**

Refer to matrix Table 4.11 below.

#### **4.10.5 Mitigation Measures**

##### **4.10.5.1 Construction Phase**

Recommended construction phase mitigation measures are as follows:

- Development and implementation of a construction traffic management plan outlining haul routes using the most suitable roads for vehicles arriving at and departing site.
- Photographic survey of haul roads prior to commencement of construction
- Continuous monitoring of haul roads throughout the construction phase
- Wheel wash facilities at all site entrances
- Appropriate warning signage along haul routes alerting traffic to slow moving vehicles
- Designing of any temporary accesses to NRA DMRB standard ensuring adequate visibility and sufficient turning radii and tapers to allow vehicles turn into and out of the facility without crossing the centre of the public road
- Consider constructing the entrance to the Waste Water Treatment Facility prior to commencement of the main works
- Ensure sufficient space for parking of site staff and HGV within construction sites
- All temporary traffic management should be designed in accordance with the current version of Chapter 8 of the Traffic Signs Manual
- Consideration of deliveries outside of peak morning hours

##### **4.10.5.2 Operational Phase**

Recommended operational phase mitigation measures are as follows:

- Construction of entrance to NRA DMRB standard ensuring adequate visibility and sufficient turning radii and tapers to allow vehicles turn into and out of the facility without crossing the centre of the public road



- Ensuring sufficient parking for vehicles within the site
- Ensuring sufficient space for HGV's to park within the entrance prior to opening security gates
- Provision of signage warning of the presence of slow moving vehicles on the approaches to the facility entrance
- Development and implementation of a transportation plan outlining haul routes using the most suitable roads for vehicles arriving at and departing site.
- Locate access chambers along the pipeline route away from the middle of the road in order to reduce the traffic impacts associated with the operational phase.

#### **4.10.6 Ferrybank (Old Wallboard Factory)**

The Ferrybank land parcel (Old Wallboard Factory) is bordered by the Mill Road and North Quay, both of which are or of an appropriate standard to facilitate access. Despite being local roads, both Mill Road & North Quay are reasonably wide with a carriageway width of approximately 6m. There is no recorded accident data for either of these roads (Refer to Figure 4.15 overleaf). Mill road and North Quay link the Ferrybank land parcel (Old Wallboard Factory) to the R772 and on the M11 motorway. It must be noted that this section the R772 is urban in character and provides access to and from the Bridgewater Shopping Centre, the Arklow Marina Village and some other local businesses.

Given its coastal location and proximity to the load centre, the proposed pipeline corridor route for this parcel has only 1 road crossing and approximately 390 m of pipeline will be laid in the road.

#### **4.10.7 Kilbride**

The Kilbride land parcel is bounded to the west by the M11 Motorway. This is not suitable for direct access due to NRA policy, and would require a dedicated grade separated interchange. Thereafter, the L-6179 Ticknock – Kilbride, is the only road upon which a suitable access could be located. This local road links the Kilbride site to the R772 to the M11. Despite being a local road, it is reasonably wide with a carriageway width of approximately 7m. The 2002 – 2012 road accident data indicates infrequent minor accidents (Refer to Figure 4.15 overleaf).

Given the length of pipeline required to pump from the load centre to this land parcel, it is inevitable that this route will cause more traffic disruption than the Ferrybank land parcel (Old Wallboard Factory). The pipeline route has been routed in fields/grassland wherever possible to offset road disruptions however approximately 800 m of pipeline will still have to be laid in road. Two road crossings will be required.

#### **4.10.8 Shelton Abbey (IFI Site)**

Similar to the Kilbride land parcel, The Shelton Abbey (IFI) land parcel is bounded to the east by the M11 Motorway. This is not suitable for direct access due to NRA policy and would require a dedicated grade separated interchange. The Shelton Abbey land parcel would be best accessed along the L-6179 Ticknock – Kilbride which links the IFI site to the R772 to the M11. Despite being a local road, it is reasonably wide with a carriageway width of approximately 7m. The 2002 – 2012 road accident data indicates infrequent minor accidents (Refer to Figure 4.15 overleaf).

Given the length of pipeline required to pump from the load centre to this land parcel, it is inevitable that this route will cause more traffic disruption than the Ferrybank land parcel (Old



Wallboard Factory). The pipeline route has been routed in fields/grassland wherever possible to offset road disruptions but approximately 800 m of pipeline will still have to be laid in road. Three road crossings will be required, including the M11 motorway. There is also one short river crossing on the proposed route.

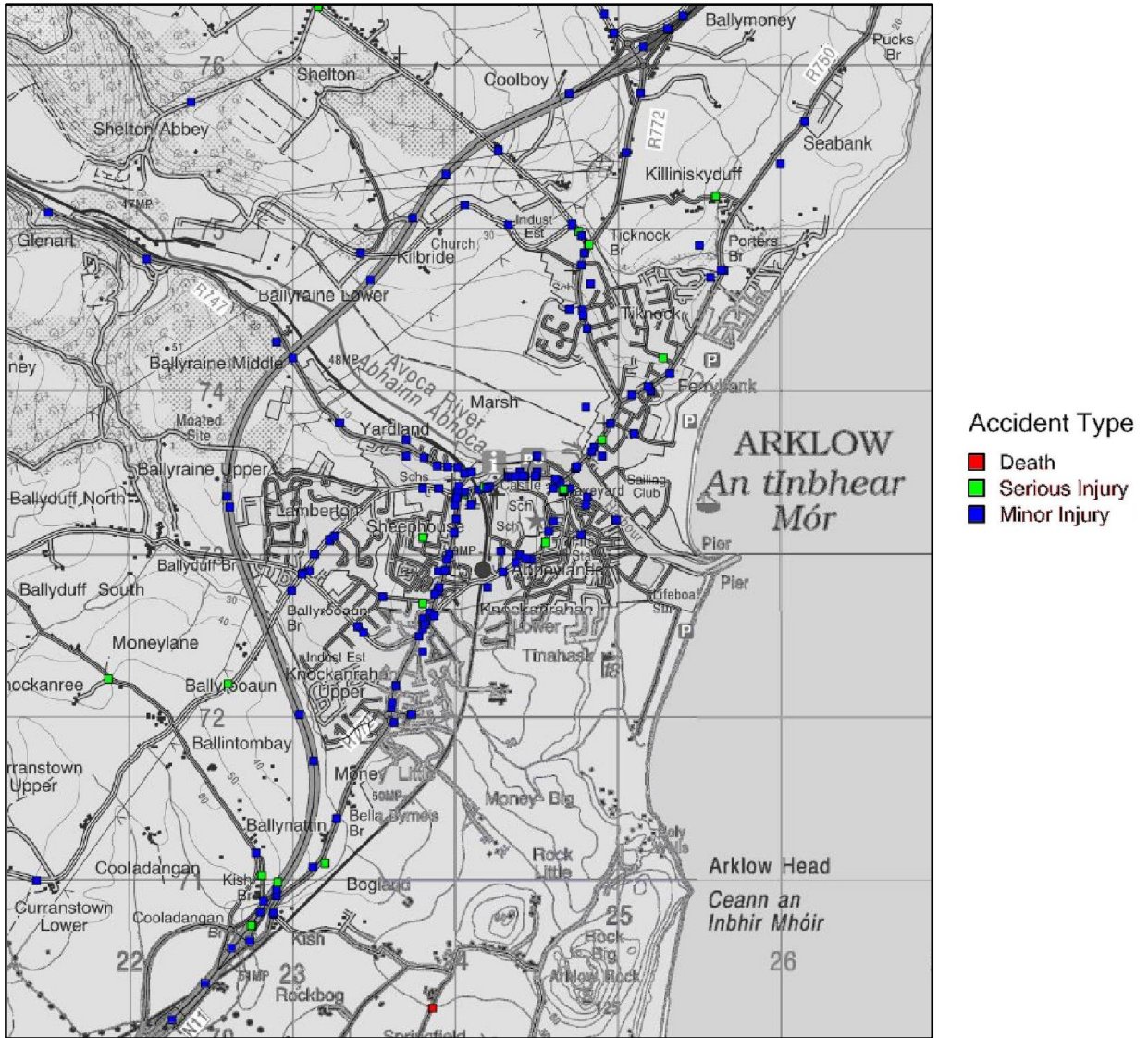


Figure 4.15 Road Collision Data – Arklow 2002 – 2012. Sourced from Wicklow County Council



11.0	Traffic – Land Parcels	Ferrybank	Kilbride	Shelton Abbey
11.1	Length of access road required	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
11.2	Number of major crossings required	0	1- R772	2 – M11 Motorway & R772
11.3	Potential Impact on landowners <sup>1</sup>	Moderate - Construction Phase	Slight - Construction Stage	Slight - Construction Stage
11.4	Works required to provide safe access entrance	Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
11.5	Potential impact on surrounding local road network	Imperceptible	Imperceptible	Imperceptible
11.7	Frequency of accidents near entrance	Low	Low	Low
11.8	Frequency of accidents on surrounding network (indication of general road safety issues)	Low	Low	Low
11.9	Road link impacted upon by all construction traffic (excluding major routes)	Moderate	Moderate	Moderate

Table 4.11 Traffic

<sup>1</sup> It must be noted that there will be significant disruption on North & South Quay regardless of the WwTP location to facilitate the siphon crossing of the Avoca River. This is being carried out under a different Contract



## 4.11 Planning Policy

### 4.11.1 Introduction

This section of the report aims to investigate potential planning policy and land use implications associated with each of the three parcels selected as part of the SA process for the Arklow WwTP.

### 4.11.2 Methodology

The methodology adopted for the preparation of this report entailed a detailed review of relevant planning and land use considerations as set out in the *Arklow Town & Environs Development Plan (2011 – 2017)*.

It should be noted that while this report does provide an overview of the strategic planning issues associated with each site it does not address the detailed development management standards which may be relevant to a project of this type. This will be reviewed in more detail when a final site is chosen.

It is also highlighted that any of further development in Arklow is currently constrained due to the lack of WwTP facility for the town and many of the objectives, and in particular the Core Strategy of both the *Wicklow County Development Plan* and the *Arklow Town and Environs Development Plan 2011-2017* are subject to a WwTP being constructed. Arklow is identified as a Large Growth Town II in the Regional Planning Guidelines for Dublin and as a Level 3 Town in the Wicklow County Development Plan. Wicklow County Council has allocated approximately 22% of its population growth to 2022 in its Core Strategy to Arklow.

### 4.11.3 Evaluation

Refer to matrix Table 4.12 below.

### 4.11.4 Ferrybank (Old Wallboard Factory)

The Ferrybank (Old Wallboard Factory) land parcel is located in an area zoned Objective WZ Waterfront Zone: 'to provide for the development and improvement of the waterfront zone including residential, commercial, leisure and amenity use' in the *Arklow Town and Environs Development Plan 2011-2017*.

The *Arklow Town and Environs Development Plan 2011-2017* includes an objective to target the delivery of up to 800 residential units in this area (both north and south of the river), at intensities up to a plot ratio of 1:2.5 and heights of 3-4 storeys.

The WZ area in totality measures 32.9ha, of which the plan indicates up to 8.25ha may be suitable for development. The plan goes on to state that this area of development land could generate up to 2,000 units at the densities allowed, but that '*it is considered somewhat unrealistic to plan for thousands of apartment units in Arklow, given its location in the region and the County, and the demographic make-up of the town*'. For the purposes of this plan, and given the amenity/leisure potential of some of these lands, this will be reduced to **800 units**'.

In this context, Wicklow County Council and Irish Water has evaluated the development potential of the area, in the scenario that c. 2ha would be required for the delivery of a WWTP and therefore would not be available for future residential / mixed use development:



- (a) - It is estimated that of the 32.9ha in WZ, the lands that are either undeveloped, derelict, underutilised or suitable for redevelopment is realistically likely to be in the order of 18ha (11.5 ha to the south of the river and 6.5ha to the north)
- (b) - Omitting the c. 2ha site for the potential WwTP, would leave c. 16ha potentially available. Assuming 50% of these lands would remain in their existing uses or not come to the market, or would be developed for alternative, non-residential uses this would leave c. 8ha available for development.
- (c) - Even assuming a much lower plot ratio than that envisaged by the plan (e.g. 1:1), such 8ha would easily accommodate 800 units.

On this basis, Wicklow County Council and Irish Water is of the opinion that the development of c. 2ha of the WZ lands for a WwTP would **not** be **inconsistent** with the housing targets of the development plan and would not impede the delivery of the Core Strategy.

#### 4.11.4.1 Waterfront Zone Objectives

The intention for the waterfront zone in Arklow is *'to provide for the development and improvement of the waterfront zone including residential, commercial, leisure and amenity use'*.

More specifically it is identified that *'this area has significant potential for development given the large blocks of land available, the proximity to the town centre and town amenities, the open aspect of the land with water on at least one side of most sites and the overall attractiveness of the area for a range of uses including residential, hotel, leisure and other commercial uses. It is however important that this area is developed in such a way that maintains the river and coast as an attractive amenity area to which there is public access'*.

The specific objectives for this area are:

- **WZ1** To support in-depth development of the waterfront zone, for a mix of residential, commercial, leisure and tourism uses. Applications for the development of such lands shall include a detailed survey of the existing site conditions, proposals for demolition and remediation of previous site activities and a management plan for the disposal of such materials.
- **WZ2** To support existing and proposed water related and maritime activities in the area including sailing, fishing, other water sports and commercial shipping activities, including the development of jetties, marinas and other support infrastructure.
- **WZ3** Further retail development in the waterfront zone shall be restricted to that required to meet the everyday convenience needs of future residents or niche comparison uses such as those related to tourism and the maritime function of the area.
- **WZ4** To require any new developments to be suitably set back from the water's edge and to provide public routes and places along waterfronts; to support the development of a footbridge across the entrance to south dock.
- **WZ5** To ensure that access to the water, such as steps / slipways / river beaches etc. are maintained and improved.
- **WZ6** To allow high-density development (up to a plot ratio of (2.5:1) up to 4 storeys in height along water frontages and 3 storeys elsewhere.
- **WZ7** All new residential developments shall comply with the development standards set out in this plan, unless otherwise agreed by the Planning Authority.

It is considered that the development of a Wastewater Treatment Plant at the Ferrybank (Old Wallboard Factory) site, which has significant frontage onto both the river and the coast, could





fulfil these objectives outlined above provided the development was designed to a high architectural standard and quality, such that it becomes an ‘anchor’ for the area and also contributes to the public realm surrounding the site by providing improved access to the shore adjacent to the plant and potentially links to adjacent the sports ground.

Public Services, (A building or part thereof or land used for the provision of ‘Public Services’. ‘Public Services’ include all service installations necessarily required by electricity, gas, telephone, radio, television, drainage and other statutory undertakers; it includes public lavatories, public telephone boxes, bus shelters, bring centres, green waste composting facilities etc.), are permitted in principle within the zoning matrix.

#### 4.11.5 Kilbride

The Kilbride land parcel is zoned AA Action Area: ‘To provide mixed use development in accordance with Action Area 1, 2 & 3’ in the *Arklow Town & Environs Development Plan 2011-2017*. The development plan seeks that this Action Area to be developed as a mixed residential, community and open space zone in accordance with the following criteria:

- Vehicular access to the Action Area shall be provided L-6179, with the roads configuration of the development providing / facilitating a possible future third Avoca river crossing; other, secondary access routes from the adjacent road network shall also be provided as may be possible;
- A number of pedestrian access routes into the action area shall be provided where possible from adjacent developed areas;
- A maximum of 1,500 residential units shall be provided, in a range of development formats, densities, unit sizes and designs. To achieve a sense of place and allow for visual diversity any residential application should provide for a number of identifiable and distinct housing estates (not exceeding 200 units), each containing materially different house designs within an overall unified theme.;
- A minimum of 7ha shall be reserved for the provision of primary and post primary schools, which may be located on a single campus, subject to consultation and agreement with relevant stakeholders, including the Department of Education and Skills;
- A neighbourhood centre, of scale commensurate with the needs of the future population of the Action Area shall be provided, on a site of c. 1.2ha. Such a centre may provide for one supermarket / discount retailer of up to 1,500sqm and a number of smaller local shops and services, including non-retail and professional services, in the order to 1,000sqm;
- A minimum area of 9ha shall be developed as public open space, of which a minimum area of 6.75ha shall be laid for active sports uses in a range of track, pitch and court types suitable for a variety of sports and shall include necessary car parking, lighting and changing facilities; remaining open areas shall be laid out as informal parks and walks, and shall include a number (minimum 2) of equipped children’s play areas;
- Any development proposals shall have regard to the setting and curtilage of structures and sites of heritage value, and habitats of biodiversity value and appropriate buffer zones-/mitigating measures shall be provided as required.

Future development in the Kilbride Action Area will be subject to comprehensive integrated schemes that will be determined by a future masterplan. The Action Area comprises approximately 60ha and future development will include residential, community and educational uses, local retail, and open space. Wicklow County Council envisages that the area will accommodate 1500 units at an average density of 40 dwellings per hectare. Given the scale of the lands, the number of units and density proposed together with the likelihood





for the requirement to buffer future residential development from the M11 it is considered that the delivery of a Wastewater Treatment Plant on a site within these lands would not impede delivery of the Core Strategy.

The major Accidents Directive (Seveso II) is an EU Directive that seeks to prevent major industrial accidents involving dangerous substances and to limit the consequences of such accidents on people and the environment. The Seveso Directive applies to one site in the Action Area, the Sigma Aldrich, Vale Road which has a consultation distance or radius of 1000m from its site boundaries. A portion of the Kilbride land parcel lies within this 1000m buffer. Advice and technical support will be requested from the Health and Safety Authority (HSA) and relevant legislation where planning applications are affected by the 1000m buffer.

A portion of the pipeline route corridor for the Kilbride land parcel is zoned Objective CZ Conservation Zone: *“To protect the proposed Natural Heritage Areas and lands which are integral to the management of this zone from inappropriate development and to retain existing public access”* in the *Arklow Town and Environs Development Plan 2011 – 2017*. The pipeline route corridor has been carefully selected to avoid the pNHA marsh as established by the NPWS.

#### **4.11.6 Shelton Abbey (IFI Site)**

This site is zoned Objective E1: *“To provide for appropriate office, R+D, etc. industrial, light industrial, transport, distribution, warehouse or retail warehouse development of good architectural design, layout and landscaping. The provision of retail facilities will not be at the expense of facilities in the town centre”* in the *Arklow Town and Environs Development Plan 2011 – 2017*. Residential development is not permitted within this zoning matrix. Public Services, (A building or part thereof or land used for the provision of ‘Public Services’. ‘Public Services’ include all service installations necessarily required by electricity, gas, telephone, radio, television, drainage and other statutory undertakers; it includes public lavatories, public telephone boxes, bus shelters, bring centres, green waste composting facilities etc.), are permitted in principle within the zoning matrix.

It should be noted that the Flood Feasibility Study (Refer to Section 2.3) had identified a large portion of the Shelton Abbey (IFI Site) Land Parcel to be in Zone B as per section 2.23 of *“The Planning System and Flood Risk Management Guidelines for Planning Authorities”* – November 2009. ‘Highly Vulnerable Development’ such as wastewater treatment plants would generally be considered inappropriate in this zone, unless the requirements of the ‘Justification Test’ can be met. The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that, are being considered in areas of moderate or high flood risk.

The major Accidents Directive (Seveso II) is an EU Directive that seeks to prevent major industrial accidents involving dangerous substances and to limit the consequences of such accidents on people and the environment. The Seveso Directive applies to one site in the plan area, the Sigma Aldrich, Vale Road which has a consultation distance or radius of 1000m from its site boundaries. The Shelton Abbey (IFI) land parcel lies within this 1000m buffer. Advice and technical support will be requested from the Health and Safety Authority (HSA) and relevant legislation where planning applications are affected by the 1000m buffer.

A portion of the pipeline route corridor for the Shelton Abbey (IFI Site) land parcel is zoned Objective CZ Conservation Zone: *“To protect the proposed Natural Heritage Areas and lands which are integral to the management of this zone from inappropriate development and to*



*retain existing public access” in the Arklow Town and Environs Development Plan 2011 – 2017.*

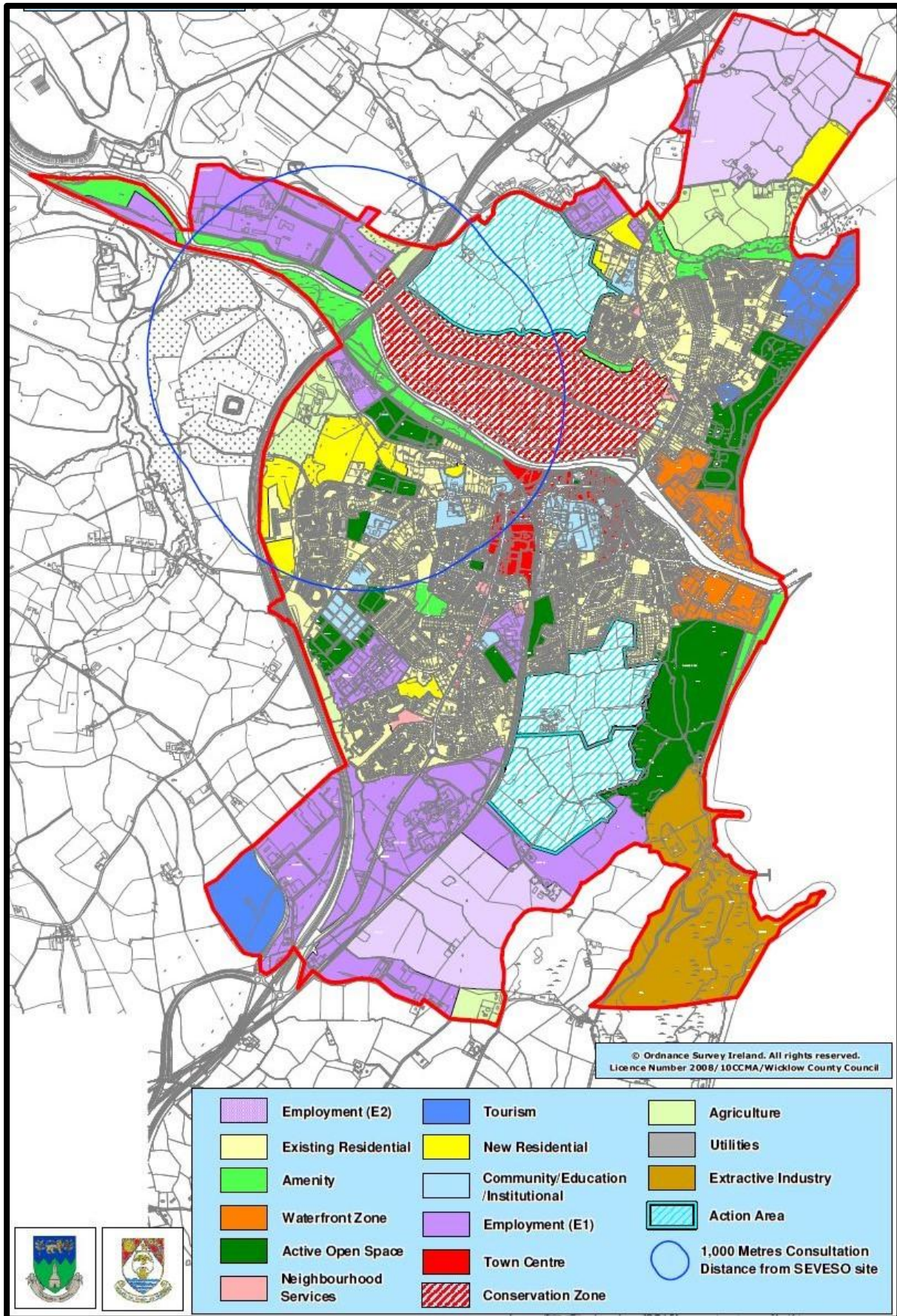


Figure 4.16 Land Use Zoning as per Map No. 11.01 - Arklow Town & Environs Plan (2011-2017)





12.0	12.0 Planning Policy – Land Parcels	Ferrybank	Kilbride	Shelton Abbey
12.1	Existing Land Use on land parcel	Derelict (former gypsum factory) fronting Avoca River at end of Arklow Harbour	Open Agricultural Land (Tillage and Grassland) M11 to the east; marsh to the south, existing development to east and north	Derelict (comprises portion of former IFI plant / covered landfill) and open grassland (partial forestation). 1.8km from Arklow Town Centre and separated from town by M11
12.2	Land parcel zoning	Slight: Objective WZ Waterfront Zone: <i>'to provide for the development and improvement of the waterfront zone including residential, commercial, leisure and amenity use'</i> .	Slight: Objective AA Action Area: 'To provide mixed used development in accordance with Action Area 1, 2 & 3'	Imperceptible: Objective E1 Employment: <i>"To provide for appropriate office, R+D, etc. industrial, light industrial, transport, distribution, warehouse or retail warehouse development of good architectural design, layout and landscaping. The provision of retail facilities will not be at the expense of facilities in the town centre"</i>
12.3	Impact of WwTP on Land Parcel use on Core Strategy	Slight: Delivery of a WwTP would not impede realisation of Core strategy housing targets.	Slight: Delivery of a WwTP would not impede realisation of Core strategy housing targets	Imperceptible
12.4	Local Area Plan Objectives relevant to land parcel	Moderate – WwTP could meet objectives WZ1 to WZ7	Slight - SEVESO II – Inside 1000m buffer. Consultation required	Significant -Zone B – Flood Plain. Justification Test Required & SEVESO II – Inside 1000m buffer. Consultation required

Table 4.12 Planning Policy



## 4.12 Engineering Design - Pipelines

### 4.12.1 Introduction

The pipeline corridors to and from each of the three potential WwTP parcels are evaluated under the following technical criteria:

- Topography
- Engineering Design
- Health and Safety
- Access / Rights of Way / Wayleaves
- Crossings – Waterways, Rail, etc.
- Physical Infrastructure
- Strategic Utility Services
- Land Ownership and Titles
- Route Traffic Management
- Construction Risk
- Carbon Footprint

### 4.12.2 Topography

The topography for the shortlisted land parcels and associated pipeline corridors is shown in Figure 4.17 overleaf.

#### *Ferrybank (Old Wallboard Factory)*

The topography rises from the load centre (approx. 0 mOD) to approx. 2.5mOD. The topography between the load centre and Ferrybank will necessitate a pumped solution, requiring the construction of a pumping station and approximately 520 m of rising main installed utilising open cut and/or trenchless techniques.

#### *Kilbride*

The topography rises from the load centre (approximately 0 mOD) to an elevation of approximately 30 to 40mOD at the northern most point of the land parcel. The topography between the load centre and Kilbride will necessitate a pumped solution, requiring the construction of a pumping station and approximately 2870 m of rising main installed utilising open cut and/or trenchless techniques.

#### *Shelton Abbey (IFI Site)*

The topography rises from the load centre (approximately 0 mOD) to an elevation of approximately 2.5mOD. The topography between the load centre and Shelton Abbey (IFI Site) will necessitate a pumped solution to overcome the natural rise and fall of the land (approximately 30 mOD at the highest point). This will require the construction of a pumping station and approximately 2950 m of rising main, installed utilising open cut and/or trenchless techniques.



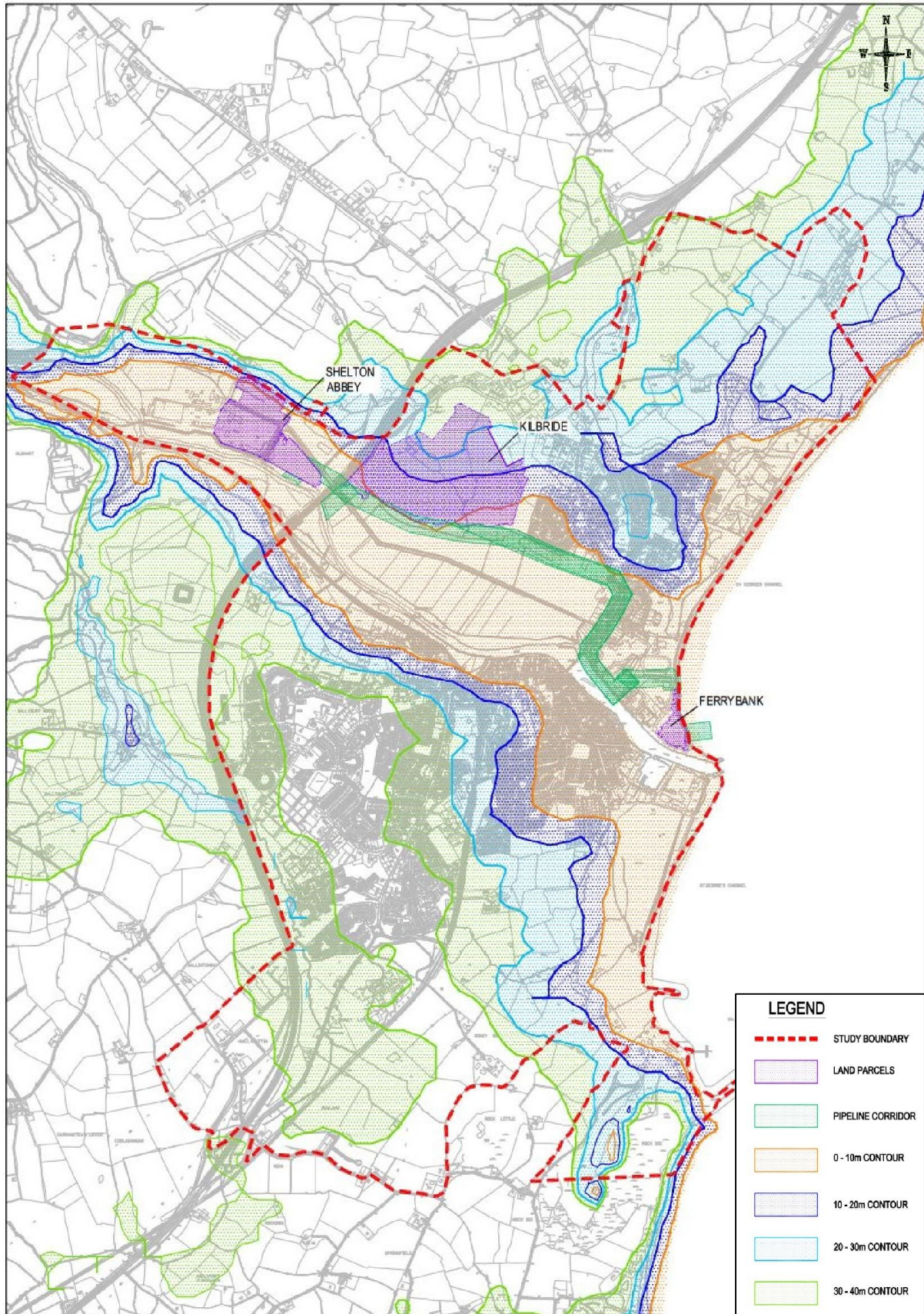


Figure 4.17 Arklow Town & Environs Topography



### 4.12.3 Engineering Design

A gravity sewer system from the Arklow load centre to any of the three potential WwTP sites would be the preferred design solution for the transfer pipelines. However, due to the low lying elevations of the town load centre and varied topography, a gravity solution is not a feasible option without laying extremely deep pipework.

It is feasible to provide a pumped system to transfer wastewater loads from the load centre to any of the three potential WwTP parcels. The pumped element of the system, comprising pumping station and pumped rising main, will transfer flows over any elevated topography directly to the potential WwTP sites.

#### *Ferrybank (Old Wallboard Factory)*

- Pumped Main Length = approx. 520 m
- Treated Effluent Outfall (Marine) Length = approx. 900 m

#### *Kilbride*

- Pumped Main Length = approx. 2870 m
- Treated Effluent Outfall (River) Length = approx. 25 m

#### *Shelton Abbey (IFI Site)*

- Pumped Main Length = approx. 2950 m
- Treated Effluent Outfall (River) Length = approx. 25 m

The shortest total length of pipeline to and from the potential sites is associated with the Ferrybank land parcel (Old Wallboard Factory). This is followed by Kilbride in second, and Shelton Abbey (IFI Site) in third.

### 4.12.4 Health and Safety

All construction projects have associated Health and Safety risks. A number of risks can be designed out while remaining risks have control measures implemented to eliminate or mitigate risks to acceptable levels. The following particular risks, as set out in the Health and Safety Regulations, can typically arise on construction projects:

- Work which puts persons at risk of falling from height, burial under earthfalls, or engulfment in swampland
- Work which puts persons at work at risk from chemical or biological substances
- Work with ionizing radiation
- Work near high voltage power lines
- Work exposing persons at work to the risk of drowning
- Work on wells, underground earthworks and tunnels
- Work carried out by divers at work having a system of air supply
- Work carried out in a caisson with a compressed air atmosphere
- Work involving the use of explosives
- Work involving the assembly or dismantling of heavy prefabricated components
- Working in marine conditions – tidal, wind, high seas

With respect to the pipeline corridors and the pipeline construction methods likely to be employed the following are the Particular Risks most likely to arise:

- Work which puts persons at risk of falling from height or burial under earthfalls -
- Work near high voltage power lines -





- Work exposing persons at work to the risk of drowning
- Work on wells, underground earthworks and tunnels
- Work carried out by divers at work having a system of air supply
- Work carried out in a caisson with a compressed air atmosphere
- Work involving the assembly or dismantling of heavy prefabricated components

Tunnel construction works would have the following additional particular risks:

- Work on wells, underground earthworks and tunnels
- Work carried out in a caisson with a compressed air atmosphere
- Work involving the assembly or dismantling of heavy prefabricated components

Tunnelling and underground construction works impose risks on construction workers as well as third parties. Due to the inherent uncertainties, including ground and groundwater conditions, there may be significant health and safety risks as well as environmental risks associated with tunnelling.

In general, there are more potential health and safety risks associated with tunnelling as opposed to shallower open trench excavation. On this project there are options for design and construction of pipelines using open trench excavation methods to each of the potential WwTP sites with only limited use of no-dig technologies which could include tunnelling.

The marine outfall option for the Ferrybank (Old Wallboard Factory) land parcel poses a Health and Safety risk during the construction phase of the outfall pipeline. Marine works are subject to high tides, rough seas and strong winds when compared to a river outfall option.

#### **4.12.5 Access / Rights of Way / Wayleaves**

The pipeline corridors, for all three potential WwTP Sites, are located partially off road, in private land, and access will be required for construction purposes and future maintenance.

The longer the pipeline route the likelihood of more issues will arise regarding access and right of ways.

The width of wayleave and work strip required for pipeline construction is dependent on the size of pipeline, the type of pipeline and the construction methods.

Wider wayleaves and working strips will result in more economical construction methods being employed.

In general the pipeline corridors are routed through open agricultural lands with some restrictions as follows:

##### *Ferrybank (Old Wallboard Factory)*

- Existing services & development along North Quay
- Existing services & development along Mill Road

##### *Kilbride*

- Existing services & development along R772
- Existing services & development along North Quay

##### *Shelton Abbey (IFI Site)*

- Existing services & development along R772



- Existing services & development along North Quay

The restrictions to construction described above can be overcome by refinement of the route selection at design stage and selection of appropriate construction methods.

#### **4.12.6 Crossings – Waterways, Rail, Motorways etc.**

The pipeline infrastructure, necessary to serve any of the potential WwTP Sites, is made up of a number of the pipeline corridors. The pipeline corridor required for the Ferrybank land parcel (Old Wallboard Factory) will not involve any significant crossings.

The pipeline corridor required for Kilbride will involve the following significant crossings:

- R772
- Canal Crossing

The pipeline corridor required for Shelton Abbey (IFI Site) will involve the following significant crossings:

- M11 Motorway Crossing
- Stream Crossing
- Canal Crossing
- R772

#### **4.12.7 Physical Infrastructure**

It is not anticipated that the construction of pipelines to and from any of the potential WwTP Sites would result in any significant impacts on the physical infrastructure in Arklow, following the implementation of appropriate controls and mitigation measures.

Infrastructure such as the M11 Motorway could be crossed using tunnelling techniques which when adequately designed will have no significant impacts either during the construction stage or during the operational stage.

Road / laneway crossings would be required but when properly reinstated there will be no lasting impacts.

Access points may have to be established off local roads to the pipeline for maintenance / repair, resulting in some alteration to existing road layouts. The impact of access points will be dictated by the length of the pipeline route, the density of local roads, the nature of the local roads and the condition of the local roads.

#### **4.12.8 Strategic Utility Services**

##### **4.12.8.1 Gas**

There is a 315 OD PE 4 Bar gas transmission pipeline in Arklow which runs the length of the R775. The pipeline route would have to be carefully designed in consultation with Bord Gais to avoid conflict with this transmission main in the cases of the Kilbride and Shelton Abbey land parcels. Refer to the “*Gas Networks Ireland – Gas Network Information*” drawing included in Appendix G.

#### 4.12.8.2 Electricity

There are a number of 220Kv, 110Kv and 38Kv overhead transmission power lines, in the Arklow Town and Environs area. It would be desirable to avoid having to cross under the transmission lines but, failing this, the risks can be minimised through the appropriate coordination during design and construction stages with the relevant utility owner. There is a 38Kv station in close proximity to the Ferrybank land parcel (Old Wallboard Factory). Careful selection of the pipeline route, detailed design and liaison with the ESB during the design and construction phases should reduce all technical issues at this land parcel. The location of this substation and associated underground high voltage cable can be found in Appendix H and in Figure 4.18 below.

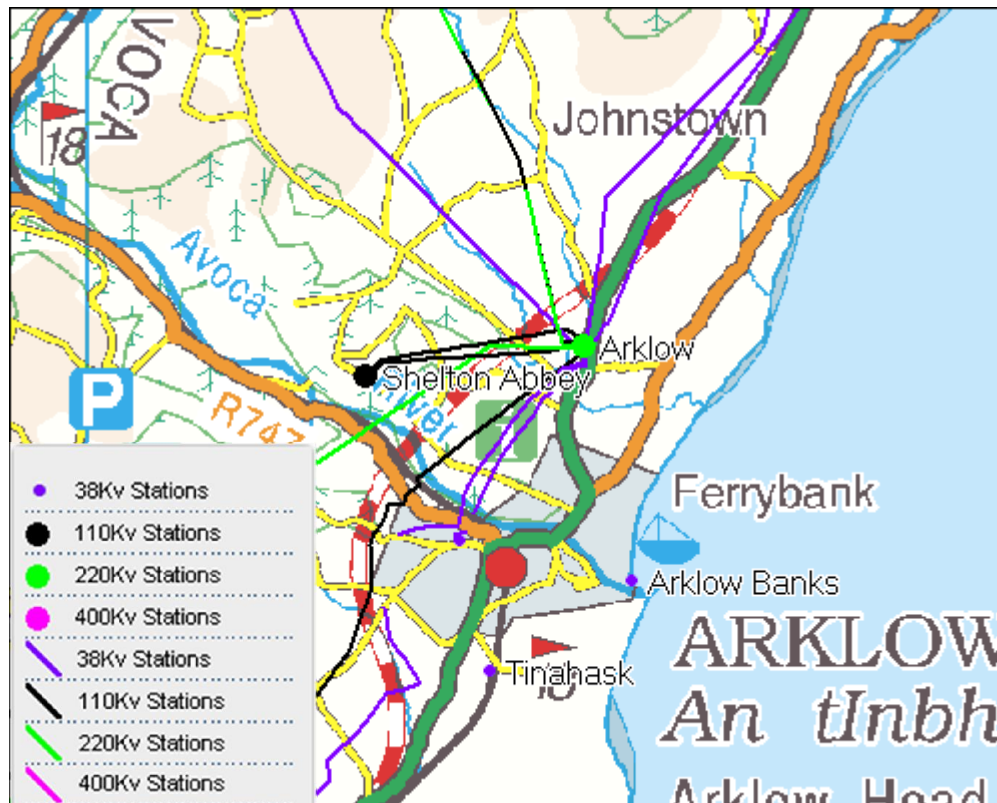


Figure 4.18 ESB Network Infrastructure

There is therefore no significant engineering design difference between any of the potential WwTP sites with regard to strategic utility services.

#### 4.12.9 Land Ownership and Titles

A land registry search has not been conducted along the pipeline corridors. However, longer pipeline routes would be expected to have the greater number of landowners and titles.

#### 4.12.10 Construction Risk

Construction risks are related to subsurface and geotechnical issues, utilities and buried structures and differing site conditions. There are also risk issues with water inflows and settlement.





Apart from the crossing of the M11 Motorway, it is not envisaged that tunnelling works will be required for any of the pipeline corridor routes. The Ferrybank land parcel (Old Wallboard Factory) has the shortest linear length of pipeline required and hence the lowest risk of encountering unforeseen ground conditions.

The Ferrybank land parcel (Old Wallboard Factory) is the only land parcel subject to a marine outfall which poses a higher construction risk when compared to a river outfall.

#### 4.12.11 Carbon Footprint

##### 4.12.11.1 Background

An initial carbon footprint exercise has been carried out to compare the likely emissions impacts of the various land parcel options. This has been confined to a comparison of the transfer pipelines as the WwTP itself will be essentially similar for all three options and is based on pumped flow for a set distance from the load centre with the remainder of the route (in the case of Shelton Abbey) via gravity.

This is not a precise and accurate embodied and operational CO<sub>2</sub> footprint, due to limited data availability at this stage. It is presented to provide a comparison using a common currency (CO<sub>2</sub>) of the currently available options, applying necessary assumptions and approximations equally to all options. Embodied carbon, defined here, is the CO<sub>2</sub> released from material extraction, transport, manufacturing, and related activities. The following section outlines the approach, data requirements and key assumptions made.

These include emissions of CO<sub>2</sub> related to:

1. Construction
  - a. Embodied carbon associated with material production
  - b. Emissions from plant associated with tunnelling / open cut pipe laying etc.
2. Operation
  - a. Energy associated with pumping requirements.

The relevant data inputs are the length of open-cut pipeline, length of tunnelled pipeline, length of river/marine pipeline, the power demand for pumping and estimates of the time that the systems would be in pump operation based on growth projections.

##### 4.12.11.2 Materials

Embodied carbon emissions factors for materials have been sourced from the Inventory of Carbon & Energy (ICE) Version 1.6a database (University of Bath 2011)

• Concrete	–	0.13	kgCO <sub>2</sub> /kg -
• GRP	–	1.53	kgCO <sub>2</sub> /kg -
• HDPE	–	1.6	kgCO <sub>2</sub> /kg -
• Ductile iron	–	1.91	kgCO <sub>2</sub> /kg -

For the purpose of this assessment, it has been assumed that all categories of pipeline are manufactured with HDPE and a uniform diameter of 450mm for comparison.



#### 4.12.11.3 Transport

The emissions associated with transport of materials have not been included at this stage due to the varied locations of manufacturers and suppliers across the globe. For example, based on other recent projects, concrete pipes are available from Ireland, GRP pipes available from Scandinavia and ductile iron pipes available from Europe/China. Other material origins and related transport solutions may be identified at design and build stage. Obviously the choice of material will have implications on the total embodied carbon emissions; however since the same pipe material has been assumed across all options, the omission of transport emissions will not significantly affect the comparison of options relative to each other.

#### 4.12.11.4 Construction

To account for emissions from plant associated with open-cut versus tunnel pipe laying, emissions factors were sourced from the UKWIR guidance on carbon accounting in the water industry. For pipe diameters >1200mm, on-site plant and labour emissions for open cut pipe laying range from 410 to 1098 kgCO<sub>2</sub>/m depending on the depth and whether laying under fields or roads.

For the purpose of this assessment a factor of 609 kgCO<sub>2</sub>/m has been applied for open cut pipeline. This reflects the upper bound range of the factors for open-cut installation in fields.

There are currently no equivalent published emissions factors available for tunnelled pipeline construction; therefore for the purpose of this assessment it is assumed that it is as energy intensive as the open cut construction.

#### 4.12.11.5 Operation

It should be noted that the Phase 1 population equivalent (PE) for the wastewater treatment plant of 18,000 is only for comparison purposes at this stage. The Phase 1 treatment plant size will be refined during the planning and detailed design stage to meet the immediate needs of Arklow.

Approximate annual energy consumption has been estimated by multiplying the energy requirements for transferring the wastewater volumes by the average pumping time required from first construction through to 2060. According to the 2012 WCC Scheme Review Report

- The 2011 Census report indicated a population 13,009 for Arklow town and surrounds
- The “*Arklow Town and Environs Development Plan 2011 – 2017*” predicts an increase in population of approximately 4.3% per year,
- The CSO projections for 2011 - 2026 predict a growth rate of approximately 1.8% for the south east of the country,
- The Regional Planning Guidelines (RPG’s) predicts a growth rates of approx. 1.6% for 2010 – 2016 and 1.2% for 2016 – 2022

As an estimation of lifetime operational costs, the average power requirements for an 18,000 PE and 36,000 PE loadings have been used over a 40 year period. The carbon footprint of this energy use is calculated by using the latest available grid emissions factor published by Sustainable Energy Ireland. This is considered to hold across 40 years, to give an approximation of lifetime operational emissions. Whilst not precise this method is equally applied across all options to give an indicative figure for comparison purposes only.



**4.12.11.6 Results**

The assumptions and estimated carbon emissions can be summarised in Table 4.13 below.

<b>Embodied &amp; Operational Carbon Calculator - Arklow Sewage Scheme</b>			
<b>Assumptions</b>			
Inland Pipe Material	-	HDPE	
Average Pipe Size	-	450 mm	
Outfall Pipe Material	-	HDPE	
Total System Annual Operating Hours	-	8760	
Total System Asset Lifetime (years)	-	40	
Open Cut/Tunnelling Total Embodied Carbon (kgCO <sub>2</sub> )	-	609	
Embodied Carbon Emissions - HDPE (kgCO <sub>2</sub> /kg)	-	1.6	
Weight - PE100 SDR11 PN16 HDPE Pipe (kg/m)	-	52.8	
	<b>Ferrybank</b>	<b>Kilbride</b>	<b>Shelton Abbey</b>
Total Length of Rising Main	520	2870	2950
Total Length of Outfall Pipe	900	25	25
Power Requirement from Load Centre to Parcel	4.2	42.35	42.35
Hours of operation per Year	8760	8760	8760
Annual Energy Consumption - kWh	36792	370986	370986
Annual CO <sub>2</sub> at 2009 Emissions Factor (tonnes)	19.60	197.63	197.63
Total Lifetime Operational Carbon	783.98	7905.09	7905.09
Total Embodied Carbon - Inland Pipes	44246.28	244205.43	251012.55
Total Embodied Carbon - Outfall Pipes	76580.1	2127.225	2127.225
Total Embodied Carbon	120826.38	246332.66	253139.78
Grand Total Carbon (tonnes CO <sub>2</sub> )	121610.36	254237.75	261044.87

Table 4.13 Embodied & Operational Carbon - Arklow Sewage Scheme

**4.12.12 Ferrybank (Old Wallboard Factory) Summary**

*Site*

It was noted that the Ferrybank land parcel (Old Wallboard Factory) includes a derelict gypsum factory incorporating disused buildings and tanks. The buildings are primarily blockwork with a corrugated asbestos cladding. These buildings and the existing tanks will need to be demolished to clear the site for development. The shape of the parcel will provide layout design challenges however these are not significant to justify a negative potential impact. As the elevation of the Ferrybank land parcel (Old Wallboard Factory) is less than 10m, there will be reduced energy costs required to pump the flows from the load centre at North Quay when compared to the remaining two parcels. The total power requirements is estimated to be approximately 22,000 kWh/annum for the Phase 1 development (18,000PE) and 51,000 kWh/annum for the Phase 2 development (36,000PE).



### *Pipelines*

The inlet sewer from North Quay Pump Station will enter the site on the west side. There is approximately 520 m of rising main required from North Quay to the parcel and this can be partially located within the existing road network.

The area around the Ferrybank land parcel (Old Wallboard Factory) and North Quay was identified as an uncontrolled landfill area so there is the potential risk of encountering contaminated ground along the route. Following full site investigations mitigation measures can be identified and implemented.

### *Outfall*

It is envisaged that the proposed outfall will enter the Irish Sea to the north of the estuary. This will be constructed under the existing rock armour coastal defence system. It is not anticipated to impact on the existing coastal defence. The outfall will be constructed by a float and sink or bottom dredge and pull technique.

A submarine electrical cable, running from the Arklow Bank wind farm to the mouth of the harbour, will also have to be avoided when selecting the exact location of the marine outfall. This cable has a 300 m exclusion zone either side of it which require detailed investigation and consultation if works are to progress inside this zone. As part of maintenance works to the Avoca River, a dredge spoil dumpsite is located to the North East of Arklow Harbour.

The Arklow shipping channels are set out by a series of buoys listed below:

- North Arklow Cardinal
- South Arklow Cardinal
- Arklow Lanby
- Arklow Buoy
- No. 2 Glassgorman Buoy

While it is not envisaged that a sea outfall would potentially be an issue in relation to shipping channels further investigation should be undertaken if this option were selected and appropriate mitigation measures put in place.

## **4.12.13 Kilbride Summary**

### *Site*

The shape and size of the Kilbride Land parcel offers a flexible site layout. As the elevation of the Kilbride parcel is approx. 20- 40m, there will be increased energy costs required to pump the flows from the load centre at North Quay when compared to the Ferrybank land parcel (Old Wallboard Factory). The total power requirements is estimated to be approx. 235,000 kWh/annum for the Phase 1 development (18,000PE) and 507,000 kWh/annum for the Phase 2 development (36,000PE).

### *Pipelines*

The inlet sewer from load centre will enter the site on the east side. There is approx. 2870 m of rising main required from North Quay to the parcel. This can be partially located within the existing road network.

### *Outfall*

Based on the river outfall modelling that was conducted as part of this report, it is envisaged that the proposed outfall will enter the Avoca River upstream of the M11 motorway bridge.



Early engagements with the EPA have indicated that this is a viable option. However, a more detailed investigation will be required once a final site is selected.

The area around Shelton Abbey (IFI Site) has been identified as a licenced EPA landfill so there is high risk of encountering contaminated ground along the outfall route. A fully detailed site investigation of the pipeline route will have to be carefully selected with mitigation and remediation measures implemented.

#### **4.12.14 Shelton Abbey (IFI Site) Summary**

##### *Site*

The shape and size of the Shelton Abbey (IFI Site) Land parcel offers a flexible site layout. Despite the elevation of the Shelton Abbey land parcel being approx. 0-10m OD, there is a need to pump influent over the rising topography of the lands in between the load centre and the site. This will result in increased energy costs when compared to the Ferrybank land parcel (Old Wallboard Factory). The total power requirements is estimated to be approx. 235,000 kWh/annum for the Phase 1 development (18,000PE) and 507,000 kWh/annum for the Phase 2 development (36,000PE).

##### *Pipelines*

The inlet sewer from load centre will enter the site on the east side. There is approx. 2950 m of sewer required from North Quay to the parcel and this can be partially located within the existing road network.

##### *Outfall*

Based on the river outfall modelling that was conducted as part of this report, it is envisaged that the proposed outfall will enter the Avoca River upstream of the M11 motorway bridge. Early engagements with the EPA have indicated that this is a viable option. However, a more detailed investigation will be required once a final site is selected.

The area around Shelton Abbey (IFI Site) has been identified as a licenced EPA landfill so there is high risk of encountering contaminated ground along the outfall route. A fully detailed site investigation of the pipeline route will have to be carefully selected with mitigation and remediation measures implemented.





<b>13.0 Engineering Design - Pipelines</b>			
<b>13.1 Pipeline Length</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Total Length as Open Cut		520 m	2870 m
Total Length as Tunnel		0 m	0 m
Total Length in Marine Outfall		1000 m	0 m
Total Length in River Outfall		0 m	25 m
Total Pipeline Length		1520 m	2895 m
			2975 m
<b>13.2 Power Requirements</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Power Requirement from Load Centre to WwTP Parcel (Phase 1)		22000	235000
Power Requirement from Load Centre to WwTP Parcel (Phase 2)		51000	507000
Total Average Power Requirements		36500	371000
<b>13.3 Carbon Emissions</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Total embodied Carbon		925.68	1763.06
Total Lifetime Operational Carbon		783.98	7905.09
Total Carbon (tonnes CO <sub>2</sub> )		1709.66	9668.15
			9716.87
<b>13.4 Health and Safety - Pipeline Construction</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Health & Safety		Moderate - Construction of long sea outfall.	Imperceptible - no significant difference
			Imperceptible - no significant difference
<b>13.5 Access / Right of Way / Wayleaves along Pipeline Corridors</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Restrictions Along Pipeline Corridors to WwTP Parcels		2	2
			2
<b>13.6 Crossings - Waterways, Rail, etc. along Pipeline Corridors</b>		<b>Ferrybank</b>	<b>Kilbride</b>
			<b>Shelton Abbey</b>
Main River Crossings		0	0
Stream Crossings		0	0
Canal Crossings		0	1
Motorway Crossings		0	0
National Road Crossings		0	0
Regional Road Crossings		0	1
Railway Crossings		0	0
Total Crossings		0	2
			4



13.7	Potential to Impact on Physical Infrastructure along Pipeline Corridors	Ferrybank	Kilbride	Shelton Abbey
		More Impact on Local Roads	More Impact on Regional Roads	More Impact on Regional Roads
13.8	Potential to Impact on Strategic Utility Services along Pipeline Corridors	Ferrybank	Kilbride	Shelton Abbey
		Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
13.9	Presence of Public Utilities within Land Parcels	Ferrybank	Kilbride	Shelton Abbey
	Public Utilities within the Land Parcel	38kV station & associated underground/submarine power cables in close proximity to land parcel	No major public utilities within the land parcel	220 kV overhead power cables
13.10	Land Ownership and Titles along Pipeline Corridors	Ferrybank	Kilbride	Shelton Abbey
		Least Ownerships	Most Ownerships	Most Ownerships
13.11	Route Traffic Management	Ferrybank	Kilbride	Shelton Abbey
		No Significant Impact after Construction Stage	No Significant Impact after Construction Stage	No Significant Impact after Construction Stage
13.12	Construction Risk along Pipeline Corridors	Ferrybank	Kilbride	Shelton Abbey
		Imperceptible - tunnelling works not necessary	Imperceptible - tunnelling works not necessary	Imperceptible - tunnelling works not necessary
13.13	Operation	Ferrybank	Kilbride	Shelton Abbey
		Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference

Table 4.14 Engineering Design - Pipelines



## 4.13 Engineering Design – WwTP Site

### 4.13.1 Introduction

The potential WwTP site locations, within the respective land parcels, are evaluated under the following technical criteria:

- Engineering Design/Treatment Processes Required
- Health and Safety
- Remediation Works
- Capital & Operational Costs
- Carbon Emissions

### 4.13.2 Engineering Design/Treatment Processes Required

Due to the more stringent effluent requirements of a river outfall, a higher level of treatment will be required at the Kilbride and Shelton Abbey (IFI Site) land parcels. To meet the estimated discharge consent (ELV's), it is envisaged that tertiary treatment will be required. This typically involves chemical dosing, filtration and UV disinfection. This will significantly add to the capital and operational cost of a WwTP on the Kilbride or Shelton Abbey (IFI Site) land parcels.

Similarly, due to the proximity of the Ferrybank land parcel (Old Wallboard Factory) to Arklow town centre, more stringent odour control systems will be required. This would typically involve chemical scrubbers and/or an activated carbon system. This will add to the capital and operational cost of a WwTP at Ferrybank land parcel (Old Wallboard Factory).

As highlighted in the flood study report included in Appendix B, a large portion of the Shelton Abbey (IFI Site) lies in the Zone B flood risk zone. If the final site is located within this zone, and a justification test for this land parcel is not acceptable, there would be a need to introduce mitigation measures including raising the ground level above anticipated flood levels. This will significantly add to the capital cost of WwTP construction at Shelton Abbey (IFI Site).

Due to the 'made ground' (reclaimed land) conditions of both the Ferrybank (Old Wallboard Factory) and Shelton Abbey (IFI Site) land parcels, specialist load bearing techniques, such as piled foundations will be required for some or all of the structures at the site. This will add to the capital cost of WwTP construction at both the Ferrybank (Old Wallboard Factory) and Shelton Abbey (IFI Site).

### 4.13.3 Health and Safety

All construction projects have Health and Safety Risks. Some risks can be designed out and with others control measures need to be put in place to eliminate and mitigate risks as far as reasonably practical. The following Particular Risks, as set out in the Health and Safety Regulations, can arise on construction projects:

- Work which puts persons at risk of falling from height, burial under earthfalls, or engulfment in swampland
- Work which puts persons at work at risk from chemical or biological substances
- Work with ionizing radiation
- Work near high voltage power lines
- Work exposing persons at work to the risk of drowning
- Work on wells, underground earthworks and tunnels
- Work carried out by divers at work having a system of air supply



- Work carried out in a caisson with a compressed air atmosphere
- Work involving the use of explosives
- Work involving the assembly or dismantling of heavy prefabricated components

With respect to the WwTP site construction, the following Particular Risks most likely to arise:

- Work which puts persons at risk of falling from height or burial under earthfalls
- Work near high voltage power lines
- Work exposing persons at work to the risk of drowning
- Work on wells, underground earthworks and tunnels
- Work involving the assembly or dismantling of heavy prefabricated components

It is generally considered that these particular risk can apply to all three land parcels. These particular risks will be considered when determining the preferred WwTP site location within each land parcel option.

#### 4.13.4 Remediation Works

A large EPA registered landfill exists along the banks of the Avoca River both upstream and downstream of the M11 Bridge. Depending on the location within the land parcel, extensive remediation costs could be incurred for the Shelton Abbey (IFI Site).

Similarly, the Old Wallboard Factory on the Ferrybank land parcel is clad in corrugated asbestos which would need to be disposed of in accordance with the Health & Safety Authority's "Practical Guidelines on ACM Management and Abatement". The remediation costs associated with this will add to the capital cost of the WwTP at this location.

#### 4.13.5 Capital and Operational Costs

Both capital and operational costs have been considered when reviewing the economic parameters during the preferred site selection process. The results of the river outfall modelling in Section 2.3 have indicated that a higher level of treatment will be required should a river outfall site be selected. The treated effluent standards for both river and marine outfall are set out in Table 4.15 below.

Parameter	River Outfall	900m Marine Outfall
Biochemical Oxygen Demand	10 mg/l	25 mg/l
Suspended Solids	35 mg/l	35 mg/l
Total Ammonia-N	0.7 to 1 mg/l	10 mg/l
TON-N	35 mg/l	35 mg/l
PO4-P	0.7 to 1 mg/l	-
E.coli	1 x 10 <sup>6</sup> ec/100ml	1 x 10 <sup>6</sup> ec/100ml

Table 4.15 Proposed WwTP Discharge ELV's as per River Outfall Study

The more stringent effluent quality and sludge treatment requirements, the higher the capital and operational cost of treatment processes to achieve these standards. This will generally cost more in either capital or operating expenditure. In practise there is an associated capital cost penalty with apparently small increases in effluent quality.

Wastewater treatment processes are varied each with its own particular merits dependent on site constraints and final treated effluent standards to achieve environmental requirements.



Processes typically used in the treatment of sewage include activated sludge, biological filters, membrane bio-reactors, oxidation ditches and sequence batch reactors.

For the purpose of comparison, a Sequence Batch Reactor (SBR) treatment process has been selected for all three land parcels.

SBR systems have been successfully implemented within the wastewater industry for treatment plants similar in size to that considered for Arklow WwTP. In conventional plant the operations are carried out sequentially in different tanks arranged in series. The SBR process involves performing a series of different operations in the same tank. There is no separate settling tank in an SBR system. Consequently all SBR systems include parallel tanks to ensure that there is always a tank available to receive the continuous inflow of wastewater. Many sub-variants of the basic system have been developed commercially.

The start of each treatment cycle is the filling stage, where wastewater is introduced into the process tank. Filling can be carried out while the contents of the tank are being aerated or it may occur in the absence of aeration (anoxic or anaerobic fill, depending on the effluent quality required of the system). After filling, the contents of the tank are aerated for a given period until the required degree of treatment has been achieved. The aeration system is then switched off and the settling phase is initiated. In the absence of aeration, the suspension of activated sludge solids will gradually settle, leaving behind a surface layer of treated effluent. The effluent is removed for discharge during the decanting stage, which usually involves the physical movement of mechanical equipment through the effluent towards the settling sludge interface. Following decanting there is usually an “idling” phase while the tank waits to receive the next batch of influent during the filling stage. The whole sequence therefore repeats itself indefinitely with parallel tanks at different stages of the treatment cycle at any instant.

#### 4.13.5.1 Capital Costs

The capital costs associated with an SBR are broken down as follows:

<b>Capital Costs - WwTP</b>		
<b>Process</b>	<b>Outfall Type</b>	
	<b>Marine Outfall</b>	<b>River Outfall</b>
<b>Screening &amp; Grit Removal</b>	930,000.00	930,000.00
<b>Sequence Batch Reactor</b>	6,100,000.00	9,386,000.00
<b>Sand Filters</b>	-	2,016,000.00
<b>Total</b>	<b>7,030,000.00</b>	<b>12,332,000.00</b>

Table 4.16 Capital Costs – WwTP





#### 4.13.5.2 Operational Costs

The operational costs associated with an SBR are broken down as follows:

Annual Energy Costs of SBR (€'000)			
PE Band	Process	Outfall Type	
		Marine Outfall	River Outfall
10,001 - 50,000	Sequence Batch Reactor	161	-
	Sequence Batch Reactor + Sand Filter	-	313+6

Table 4.17 Annual Energy Costs of SBR

Annual Labour & Maintenance Costs of SBR (€'000)			
PE Band	Process	Outfall Type	
		Marine Outfall	River Outfall
10,001-50,000	Sequence Batch Reactor	289	289

Table 4.18 Annual Labour & Maintenance Costs of SBR

Annual Sludge Disposal Costs for SBR (€'000)			
PE Band	Process	Outfall Type	
		Marine Outfall	River Outfall
10,001-50,000	Sequence Batch Reactor	364	284

Table 4.19 Annual Sludge Disposal Costs for SBR

Taking the above annual costs into consideration, the annual costs associated with an SBR for both a marine and river outfall can be summarised as follows:

Total Annual Operating Costs of SBR (€'000)			
PE Band	Process	Outfall Type	
		Marine Outfall	River Outfall
10,001 - 50,000	Sequence Batch Reactor	814	-
	Sequence Batch Reactor + Sand Filter	-	892

Table 4.20 Total Annual Operating Costs of SBR



**4.13.6 Carbon Emissions**

The energy costs in Table 4.21 have been converted into carbon emission values for a carbon footprint assessment. These values can be seen in below.

<b>Annual Carbon Emissions of SBR (kg/year)</b>			
<b>PE Band</b>	<b>Process</b>	<b>Outfall Type</b>	
		<b>Marine Outfall</b>	<b>River Outfall</b>
10,001 - 50,000	Sequence Batch Reactor	824	-
	Sequence Batch Reactor + Sand Filter	-	1631

Table 4.21 Annual Carbon Emissions

**4.13.7 Evaluation**

Refer to matrix Table 4.22 below.



14.0	Engineering Design - WwTP	Ferrybank	Kilbride	Shelton Abbey
14.1	Treatment Processes Required - WwTP			
		Moderate - Assumed need for further odour control	Significant - Assumed need for tertiary treatment	Profound - Assumed need for tertiary treatment & flood mitigation works
14.2	Health & Safety - WwTP Construction	Ferrybank	Kilbride	Shelton Abbey
		Imperceptible - no significant difference	Imperceptible - no significant difference	Imperceptible - no significant difference
14.3	Remediation Works -WwTP & Pipelines	Ferrybank	Kilbride	Shelton Abbey
		Moderate - asbestos removal required	Moderate - EPA landfill remediation required (outfall pipeline)	Moderate - EPA landfill remediation required (rising main)
14.4	Capital & Operational Costs	Ferrybank	Kilbride	Shelton Abbey
	Annual Energy Costs - SBR Treatment Process	€161,000.00	€319,000.00	€319,000.00
	Annual Sludge Disposal Costs - SBR Treatment	€364,000.00	€284,000.00	€284,000.00
	Annual Labour & Maintenance Costs - SBR Treatment	€289,000.00	€289,000.00	€289,000.00
	Total Annual Operational Costs	€814,000.00	€892,000.00	€892,000.00
	Capital Costs of WwTP	€7,030,000.00	€12,332,000.00	€12,332,000.00
14.5	Carbon Emissions - WwTP	Ferrybank	Kilbride	Shelton Abbey
	Annual Carbon Emissions Associated with SBR Treatment Process	824,000 kg/year	1,631,000 kg/year	1,631,000 kg/year

Table 4.22 Engineering Design – WwTP Site



## 4.14 Land Valuation

### 4.14.1 Introduction

GVA Donal O' Buachalla Property Advisors were engaged to undertake a land valuation assessment of the three shortlisted land parcels and associated pipeline corridors. The full assessment can be found in Appendix I and is summarised below:

### 4.14.2 Ferrybank (Old Wallboard Factory)

- Town centre location
- Located to the east of Arklow town centre and Bridgewater shopping centre
- High profile waterside location
- Lands zoned waterfront zone which is to provide for mixed use development. This zone permits high value use such as hotels, offices, residential, shopping.

### 4.14.3 Kilbride

- The lands at Kilbride are located between the public road and the Avoca River, immediately to the east of the N11 and are zoned as an Action Area 3, Kilbride.
- The Kilbride Action Area extends to approx. 70 ha and envisages mixed development including up to 1,500 residential units, neighbourhood centre, community services etc... The development specifies that piecemeal development will not be permitted and an overall plan must be agreed for the entire area before development commences unless a proposed development delivers commensurate facilities and infrastructure.
- While the zoning is generally positive the scale of development required do get planning permission is restrictive in a market which is only beginning to see new development in Dublin and the immediate environs.
- The length of wayleaves required for the Kilbride lands is approximately 1897 linear metres.

### 4.14.4 Shelton Abbey

- The Shelton Abbey site is located to the west of the N11 adjacent to the former chemical plant.
- The lands are zoned as employment one in the development plan which generally permits more industrial type uses such as heavy vehicle parking, industrial light, laboratories, motor sale outlets, offices, public service buildings, retail warehousing, service garages, warehouses, wholesale outlets.
- The location is somewhat removed from the town centre, however it does enjoy a profile to the existing N11.
- Given its proximity to the former chemical plant there may be issues with development, extra over development costs of a potential brownfield site.



#### 4.14.5 Site Assessment

In considering the cost assessment an estimation of the compensation based on a current CPO and Notice to Treat (March 2015) has been assessed in each case based on the statutory heading of claim which include the following;

- Market Value of Land to be Acquired
- Injurious Affection / Severance
- Disturbance

In terms of assessing the injurious affection / severance it is difficult to properly consider as the details of land ownership is unknown and the extent of land held with the property acquired does have a material impact on the level of compensation under this particular heading.

It has been assumed that the acquiring authority will provide property accommodation works to the affected parties and that the Plant will be properly screened.

If we consider the foregoing and rank the sites only (that is ignoring the wayleave element) and ranking the most expensive as number one and least expensive as number three, Donal O' Buachalla have concluded the following:

1. - Ferrybank (Old Wallboard Factory) – This land parcel is considered to be the most high cost land parcel to be acquired, having regard to its town centre waterfront location. It is anticipated that this site will be over four times more expensive to acquire than Shelton Abbey (IFI Site) and at least twice as expensive as Kilbride.
2. - Kilbride – This land parcel is zoned for mixed use although given the requirements of the action area plan it is unlikely that they will be developed in the short term. The presence of the plant on mixed use zoned lands may give rise to larger claims for injurious affection and it is expected that such a site would be at least twice as expensive as Shelton Abbey (IFI Site).
3. - Shelton Abbey (IFI Site) – This land parcel is zoned for industrial use. However, it is situated to the west of the N11, removed from the town centre and close to the river Avoca. This could restrict the types of development permitted. Given the previous heavy industrial nature of the surrounding lands there may be issues with contamination etc. which would have to be dealt with prior to any new development. However, with the industrial type uses the injurious affection is limited.

#### 4.14.6 Wayleave Assessment

Given that the Shelton Abbey and Kilbride wayleaves follow the same route and that Shelton Abbey is marginally longer it stands to reason that the cost of acquiring wayleaves for the Shelton Abbey (IFI Site) land parcel will be nominally more costly than for Kilbride.

Refer to Table 4.23 overleaf for a summary of the assessment.





15.0	Land Valuation	Ferrybank	Kilbride	Shelton Abbey
15.1	Land Valuation – Land Parcels & Wayleaves			
	Price per area - Land Parcel	Most Expensive – 4 times more than Shelton Abbey	Lower than Ferrybank, Higher than Shelton Abbey – 2 times more expensive	Least Expensive
	Price - Wayleaves Required for Pipelines	Least Expensive (Smaller pipe lengths all laid in public roads)	Higher than Ferrybank, lower than Shelton Abbey (Longer pipe lengths)	Most Expensive (Longest pipe lengths)
	Summary	Most Expensive	Higher than Shelton Abbey, Lower than Ferrybank	Least Expensive

Table 4.23 Land Valuation



## 5 Step 2 – Position Site within Land Parcel

Due to the preliminary screening process undertaken at up to this point, the land parcels identified were, in some cases, significantly larger than the site area of approximately 2 ha required for the WwTP. It was not considered appropriate at the preliminary screening stage to identify the best positioned and best orientated site for the WwTP within each of the land parcels. It was considered more appropriate to wait until the environmental and technical assessments had been completed on the land parcels in order to ensure that the policy of avoidance of impacts was continued through to this phase.

Following completion of their assessments, each of the technical and environmental specialists produced a matrix of sub-criteria which provided differentiating factors across each of the land parcel options. That information was used to determine the most suitable location within each land parcel for the WwTP site and also the most appropriate access route to that site.

The optimum location for a site within a land parcel is as close as possible to the centre of the land parcel, as that provides the greatest possible distance from sensitive receptors. However, potential impacts identified within each land parcel resulted in a number of other considerations also being taken into account. These included topography, access road routing, and avoidance of flood plains, land ownership, farm viability, existing field boundaries, land severance and adjacent watercourses.

It should be noted that the site layouts featured in Appendix K show an oxidation treatment process as opposed to an SBR process which was discussed in section 4.13.5 above. Oxidation ditch treatment processes typically feature a larger footprint than an SBR and so using it in the site layout gives a “worst case” scenario. Further refinement of the site will occur as landowner consultations are progressed and as further indicative site layouts are developed.

### 5.1 Ferrybank (Old Wallboard Factory)

The Ferrybank land parcel (Old Wallboard Factory) never offered much flexibility for the placing of a 2 ha site within it. Nevertheless, a suitable location has been chosen which satisfies all criteria and seeks to avoid the high voltage power cables which come in from the off shore wind farm. The nearest sensitive receptor is situated approximately 50 m away. The total pipeline length required for this site is approximately 510 m and the access road required to this location is approximately 100 m. There is sufficient space available on the remaining portion of the land parcel to provide screening to the plant.

The proposed position of the Ferrybank site can be seen in Appendix K.

### 5.2 Kilbride

The placing of the 2 ha. Kilbride site has satisfied all restrictive criteria and can be found in Appendix K. While this site position requires a longer rising main than elsewhere on the land parcel, it minimises the outfall length to the river and shortens the access road distance required. The pipeline route corridor for this site also avoids the pNHA Arklow Marsh. This site location increases the distance to nearest sensitive receptor to 410 m. The total pipeline length required for this site is 2870 m and the access road required to this location is approximately 180 m. The site location utilises one field within the land parcel and therefore minimises the



effect on the agronomy & landuse of the area. Existing screening to the east of this site should minimise views from the M11 motorway and Dublin-Rosslare rail line.

### 5.3 Shelton Abbey (IFI Site)

The placing of the 2 ha. Shelton site has satisfied all restrictive criteria and can be found in Appendix K. While this site position requires a longer rising main than elsewhere on the land parcel, it minimises the outfall length to the river. There is no need to construct an access track as the site is already somewhat developed, however there may be a need to raise the access track to mitigate against the flooding risk. The pipeline route corridor for this site avoids the pNHA Arklow Marsh. This site location increases the distance to nearest sensitive receptor to 250 m (site security kiosk). The total pipeline length required for this site is 3375 m. The site location utilises only the developed section of the land parcel and hence minimised the effect on agronomy & landuse of the area.

It was decided not to position the final site location on the Zone C flood zone. The Zone C portion of the land parcel is the site of the old carbon black & phosopgypsum landfill and extensive remediation works would be required if construction works were to go ahead here. The flood risk report has already identified that development on the chosen site location would not impact flood risk elsewhere significantly as the site is already protected. A minor loss of existing flood plain storage would occur if the embankment was raised upstream of the site to protect against the 1 in 1000 year (0.1% AEP) event. However, the volume is a tiny fraction of the overall flow rate (peak overspill flows are less than 1m<sup>3</sup>/s compared to the 894m<sup>3</sup>/s peak flow rate) and as a result raising the embankment would not significantly impact flood levels downstream.



## 6 Step 3 – Updated Matrices

The matrices were updated to reflect the site options as opposed to the land parcel options. This narrowing of land area enabled a more specific assessment to be completed.

These matrices can be found in Appendix L.



## 7 Step 4 – Combined Matrix

Completion of steps 1 – 3 above has resulted in the identification of three site options from the three short listed land parcel options and the combination of the individual matrices as developed by the environmental and technical specialists into one overall primary assessment matrix. This matrix was cross referenced and refined to remove sub-criteria which were determined as non-differentiating across all three site options. The resulting matrix can be seen in Appendix M.





## 8 Steps 5 – 8: Iteration Process

### 8.1 First Iteration matrix

The first iteration on the matrix involved the application of step 5 (identification of ‘most favourable’ cells – assignment of green colour) of the SA Methodology to the primary assessment matrix.

The sub-criteria for the site options were reviewed to determine which cells could be identified as ‘most favourable’. Environmental sub-criteria which had no impact or where relevant, an imperceptible impact were highlighted green. Similarly the ‘most favourable’ cells across each of the technical sub-criteria were also coloured green.

The resulting matrix can be seen in Appendix N.

### 8.2 Second Iteration matrix

The second iteration of the matrix involved the application of the following steps from the SA Methodology to the primary assessment matrix.

Step 6 - Each environmental and technical specialist identified their worst or ‘least favourable’ cell and these cells were assigned an amber colour. The resulting matrix can be seen in Appendix O.

Step 7 – The matrix was reviewed to determine whether any site option with ‘least favourable’ classifications could be removed. It was determined that the ‘least favourable’ classifications assigned to the Shelton Abbey (IFI Site) site option were of such significance that it would be comparatively difficult to secure planning permission on this site. Also, the energy requirements for the Shelton (IFI Site) site option were considerably higher than that of the other two options. The Shelton Abbey (IFI Site) site option was therefore removed from the matrix and from further consideration.

The second iteration matrix resulted in the site option at Shelton Abbey (IFI Site) being ruled out for further consideration.

### 8.3 Third Iteration matrix

Similar to above, the third iteration on the matrix involved the application of the following steps from the SA Methodology to the primary assessment matrix.

Step 6 - Each environmental and technical specialist identified their worst or ‘least favourable’ cell and these cells were assigned an amber colour. The resulting matrix can be seen in Appendix P.

Step 7 – The matrix was reviewed to determine whether any site option with ‘least favourable’ classifications could be removed. It was determined that the ‘least favourable’ classifications assigned to the Kilbride option were of such significance that it was removed from the matrix and from further consideration. Refer to the third iteration matrix in Appendix P for reference.



## 9 Conclusions

Based on this assessment, the Ferrybank (Old Wallboard Factory) site has been identified as the emerging preferred site for the Arklow WwTP with the Kilbride and Shelton Abbey (IFI Site) sites having been identified as viable alternatives.

It must be noted that while Ferrybank (Old Wallboard Factory) has been identified as the emerging preferred site, Irish Water will not choose a final site location until the end of the Phase 2 consultation process, which is due to commence on 13<sup>th</sup> May 2015.

### 9.1 Next Steps

#### 9.1.1 Phase 2 Consultation Process

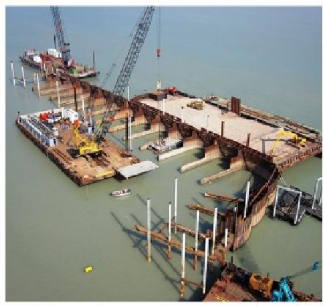
The second non-statutory public consultation period commenced on the 13<sup>th</sup> of May 2015 for an 8 week duration. Since this consultation period an update to the planning criteria has been undertaken and this update will be included in the “Phase 2 Factual Report” to be published later in 2015 with the findings of the process.

#### 9.1.2 Environmental Impact Assessment

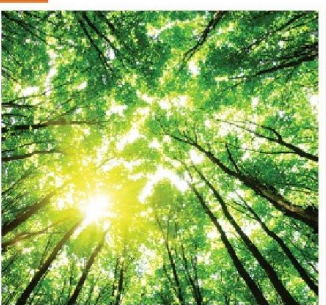
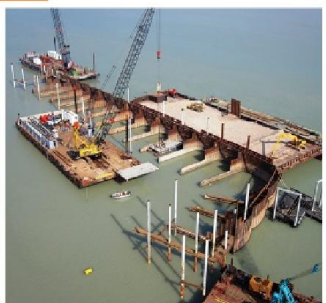
An Environmental Impact Assessment (EIA) should be carried out by the competent authority. The EIA Directive, Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment as amended by Council Directive 97/11/EC of 3 March 1997, Directive 2003/35/EC of 26 May 2003 and Directive 2009/31/EC of 23 April 2009, now codified in Directive 2011/92/EU of 13 December 2011, is designed to ensure that projects likely to have significant effects on the environment are subject to a comprehensive assessment of environmental effects prior to development consent being given (See Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, Department of the Environment, Community and Local Government, March 2013 which also refers to the applicable EU and Irish law provisions).

#### 9.1.3 Appropriate Assessment

An Appropriate Assessment (AA) arises from the requirement under Articles 6(3) and 6(4) of Council Directive 92/43/EEC of 21 May 1992 (the “*Habitats Directive*”). See also Part X of the Planning and Development Act 2000 (as amended and substituted). The potential for the development to have a likely significant effect either individually or in combination with other plans or projects on Natura 2000 sites (i.e. Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) shall be considered as part of an Appropriate Assessment process which is required under the Habitats Directive.

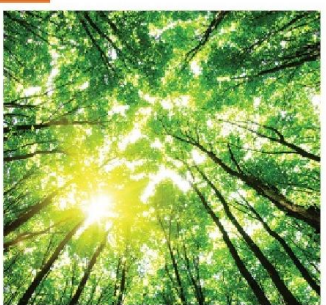
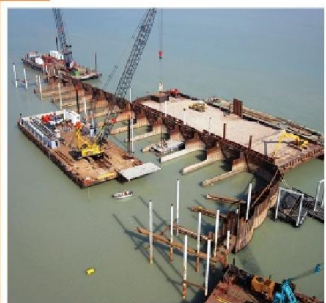


## Appendix A – Marine & River Outfall Modelling



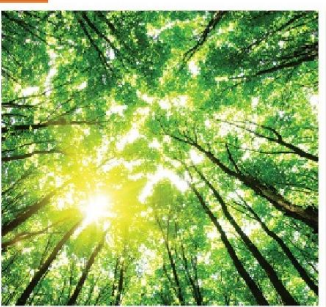
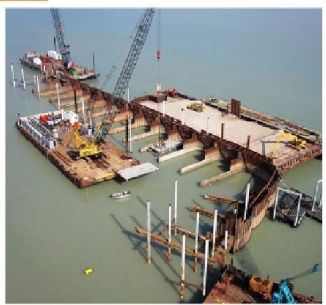
**Appendix B – Flood Risk  
Assessment &  
Management  
Report – Shelton  
Abbey (IFI Site)**



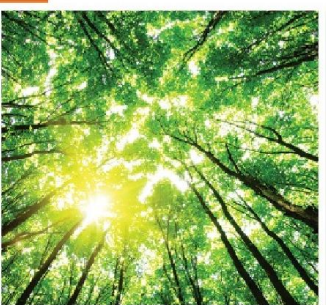
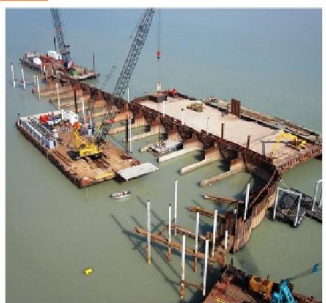


## Appendix C – Extensive List of Matrix Criteria

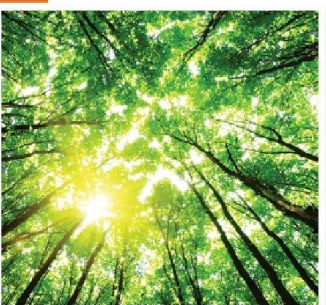
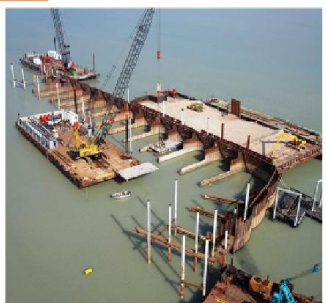




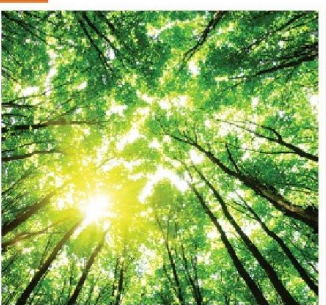
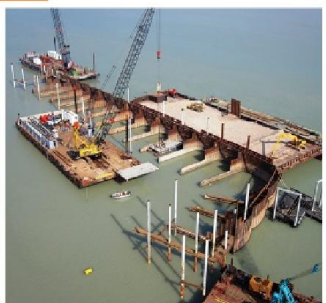
## Appendix D – Cultural Heritage Report



**Appendix E – Ecological Report -**

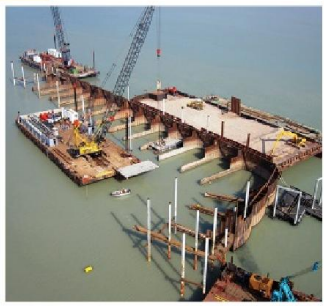


## Appendix F – Site Investigation Reports



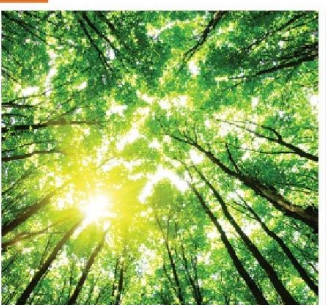
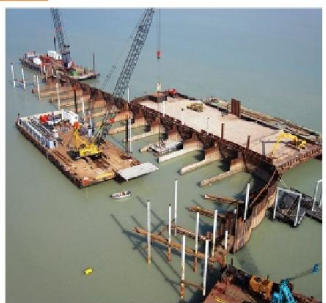
**Appendix G – Bord Gais Strategic  
Networks Map-  
Arklow**



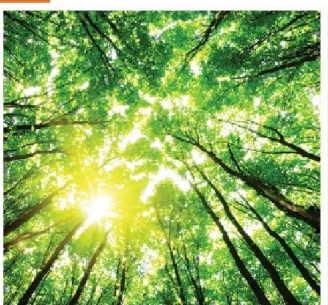
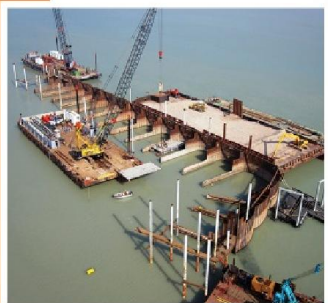


## Appendix H – Arklow Bank Wind Farm; On-Shore Electric Cable & Sub-Station

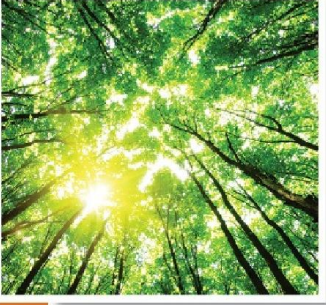




**Appendix I – Property Valuation  
Report**

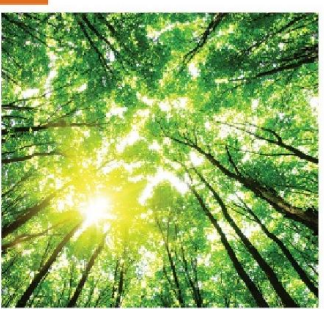
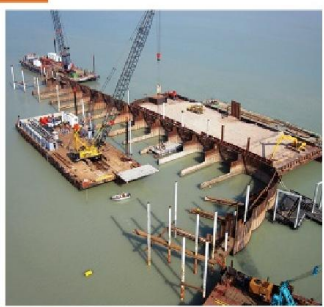


## Appendix J – Land Parcel Matrices



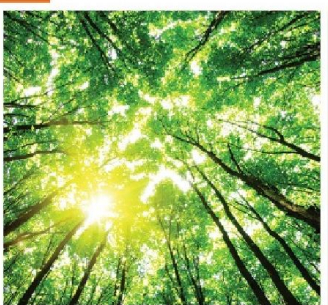
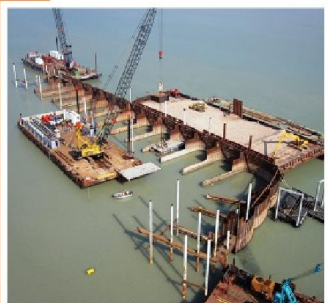
## Appendix K – WwTP Site Locations

K -



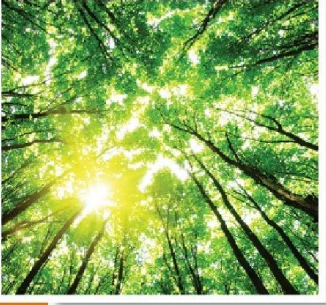
## Appendix L – Updated Matrices -





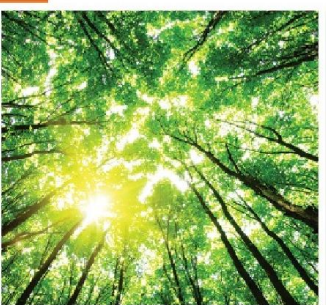
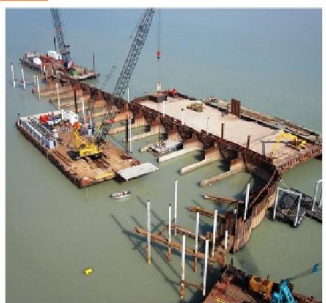
**Appendix M – Combined Matrix -**





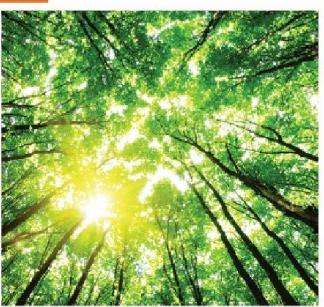
## Appendix N – First Iteration Matrix

N -



## Appendix O – Second Iteration Matrix

O-



## Appendix P – Third Iteration Matrix

