

3 Receiving Environment

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3.1 Human Beings

3.1.1 Introduction

In order to provide the background for the assessment of the impact of the proposed development on human beings, the socio-economic context was reviewed. A desktop assessment of human beings in the Cork Lower Harbour area and the environs of the proposed development was conducted. Information relating to population and economic trends, transport, tourism, amenities, land use and public utilities was reviewed in order to gauge the positive and negative impacts of the proposed development on human beings.

3.1.2 Methodology

(i) Assessment of Existing Environment

The assessment consisted of a desk study and a visit to the Lower Cork Harbour area and its surrounding towns. As part of the assessment process, consultation was undertaken with appropriate statutory and non statutory organisations. Information on population statistics and employment structures were obtained from the Central Statistics Office (CSO). Specific details on economic development and employment activities in Cork Harbour and its surrounding towns were obtained by consulting government and other relevant websites and electronically available publications. The National Roads Authority (NRA) was consulted as part of the desk based assessment for traffic information in the study area. Details were provided on the most recently available traffic volumes. In addition the *Cork County Development Plan* (2003) and the *Carrigaline Electoral Area Local Area Plan* (2005) and *Amendments* (2006, 2007) were also referenced in this section. Tourism and recreation information was obtained from publications pertaining to Cork County, produced by Fáilte Ireland – The National Tourism Development Authority.

(ii) Impact Assessment

The impact assessment for this section of the report is based on the *Guidelines on the Information to be contained in Environmental Impact Statements* and the *Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)* published by the EPA in March 2002 and September 2003 respectively. The criteria used include the quality, magnitude and duration of impacts.

Criteria for assessing impact quality, magnitude and duration are described in Tables 3.1.1 *Criteria for assessing the quality of impacts*, 3.1.2 *Criteria for assessing impact magnitude* and 3.1.3 *Criteria for assessing impact duration*.

Table 3.1.1: Criteria for assessing the quality of impacts

Impact type	Criteria
Positive impact	A change is likely to improve the quality of the environment.
Neutral	No effect.
Negative impact	The change is likely to adversely affect the quality of the environment.

Table 3.1.2: Criteria for assessing impact magnitude

Impact Magnitude	Definition
No change	No discernible effect on human beings.
Imperceptible Impact	An impact capable of measurement but without noticeable consequences.
Slight Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Impact	An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant Impact	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound Impact	An impact which obliterates sensitive characteristics.

Table 3.1.3: Criteria for assessing impact duration

Temporary Impact	≤ 1 year
Short-term Impact	1 - 7 years
Medium-term Impact	7 - 15 years
Long-term Impact	15 - 60 years
Permanent Impact	≥ 60 years

3.1.3 Existing Environment

(i) Population & Housing

Cork Harbour houses a large number of islands including: Great Island, Fota Island (also known as Foaty Island), Little Island, Haulbowline Island, Spike Island and Rocky Island and small surrounding towns namely Carrigaline, Cobh, Passage West-Monkstown and Ringaskiddy. The proposed site is a greenfield site located approximately 11km south of Cork City, 1.06km north east of Carrigaline and 2.24km west of Ringaskiddy in the townland of Shanbally. It comprises an area of approximately 7.36ha of agricultural land. The village of Shanbally is located approximately 625m to the northeast. Table 3.1.4 *Population of Selected Settlements in the Cork Lower Harbour Area (2002 & 2006)* details the population of selected settlements in the Cork Lower Harbour area.

Table 3.1.4: Population of Selected Settlements in the Cork Lower Harbour Area (2002 & 2006)

SETTLEMENT	POPULATION		
	2002	2006	% CHANGE
Carrigaline Town	11,191	12,835	+ 14.7
Ringaskiddy (or Loughbeg)	407	514	+ 26.3
Crosshaven	1,373	1,669	+ 21.6
Fountainstown	852	887	+ 4.1
Cobh Town	6,767	6,541	- 3.3
Cobh Environs	3,044	4,762	+ 56.4
Monkstown (Urban)/ Passage West	4,184	4,818	+ 15.2
Monkstown (Rural) including Environs of Passage West	411	385	-6.3

(Source: Census 2007 - Local Population Report, County Cork (CSO 2007))

Population statistics given in the following sections relate to the District Electoral Division (DED) of Carrigaline (Cork Rural District) County Cork, where the proposed development will be located. This DED encompasses an area of 2,484ha and includes the following townlands (Refer to Figure 3.1.1 *District Electoral Division of Carrigaline (Cork Rural District)*):

Ardnacloghy	Ballinrea South	Ballinreeshig
Ballintaggart	Ballybricken	Ballynametagh
Barnahely	Carrigaline East	Carrigaline Middle
Carrigaline West	Coolmore	Curraghbinny
Hilltown	Killanully	Kilnahone
Knockmore	Lough Beg	Raheenering
Raheens	Raheens East	Ringaskiddy
Shanbally	Shannon Park	

Based on the census 2006 figures, in 2002 the population of Carrigaline town was 11,191. The 2006 population showed an exponential increase of 14.7%. In 2002, the population of Passage West, Glenbrook and Monkstown was almost 4,600. Planned population growth rates have been greatly exceeded. The population of the three towns is now closer to 5,700 and is expected to increase by a further 1,000 by the end of 2008.

Increased traffic volumes, rising employment, affluence and continued urban sprawl are associated with the growth in population. The proposed WWTP will facilitate further growth in the residential population of the adjoining areas.

Residential dwellings located within 1km of the development site, are shown in Figure 3.1.2 *Proximity of Residential Dwellings*. The nearest existing residential development is located 261m to the east of the WWTP site, along the minor road L6470, however planning permission has been granted for a site approximately 134m to the east of the proposed WWTP site. Residential development to the south of the WWTP site is located 568m to the south, along the R613. Residential dwellings to the north of the site are located along the N28, 433m from the WWTP site. Directly to the west of the site is an ESB substation, approximately 160m from the site boundary and a Bord Gáis substation is present ca. 65m from the WWTP.

(ii) Employment and Economic Activity

Cork Harbour is one of the most important industrial areas in Ireland, providing employment both locally and further afield, and generating significant revenue to the national economy.

Cork Harbour offers employment to people from all areas of the City in over 100 pharmaceutical and chemical firms operating in the Harbour area. These industries are concentrated principally in Ringaskiddy and Little Island. The Harbour also contains Ireland's only oil refinery, situated at Whitegate.

The site for the proposed WWTP is located in the townland of Shanbally in Carrigaline (Cork Rural District). The majority of land immediately adjoining the site is in agricultural use. However, a small Bord Gáis substation is located adjacent to the southwest corner of the site and a large ESB substation is located approximately 160m from the western boundary of the proposed site (refer to Figure 3.1.2 *Proximity of Residential Dwellings* which also illustrates locations of industry, commercial units and service structures). The site is located ca. 1.06km north east of Carrigaline town and ca. 2.24km west of Ringaskiddy.

Carrigaline is one of three satellite towns built around Cork City. The town is situated approximately 11km from Cork City and 5km from Ringaskiddy Ferryport and Cork International Airport. It is located on the Owenboy River which flows into Cork Harbour. Carrigaline offers a very comprehensive range of services and facilities. The retail and services sector have expanded in Carrigaline to provide facilities locally which previously were not available in the town. There are a variety of small to medium sized enterprises and industries around the town.

Shopping facilities include a new large shopping centre (Dunnes Stores), Supervalu supermarket and a Lidl store. Tourist accommodation includes the 4-star luxury Carrigaline Court Hotel and numerous B&Bs and guesthouses. A variety of financial institutions have premises along the main street, including AIB, Bank of Ireland, Permanent TSB and Carrigaline Credit Union (Crosshaven Carrigaline Credit Union Limited) is located on Old Waterpark. Schools in the area include An Charraig Christian School, Carrigaline Boys National School, Carrigaline Girls National School, Carrigaline Community School, Gaelscoil Charraig Ui Leighinn and St. Mary's National School. Sports facilities include Carrigaline GAA Club, Carrigaline United FC, Carrigaline Rugby Club, Carrigaline Tennis Club, Carrigaline Basketball Club and Fernhill Golf and Country Club.

Ringaskiddy is a small village located south-east of Cork City. Ringaskiddy is primarily zoned for industry and the location is of strategic importance for industry due to good access to port facilities, seawater supplies and the national road network. Business is focused on the numerous pharmaceutical production facilities which surround the village. The industrial and tourism sectors provide relatively stable employment, because of their long product life cycle. The National Maritime College of Ireland was officially opened in 2006 and is the only College in Ireland which provides training to Merchant Navy personnel. Ringaskiddy Ferry Terminal, which is located in Cork Lower Harbour, provides an important passenger and freight ferry service with regular connections to the UK and France. It is the largest public port facility in the country dealing with shipments of goods such as car imports, animal feedstuffs and molasses in addition to providing berthing facilities for cruise liners. The Port of Cork has recently advertised its intention to lodge a planning application to An Bord Pleanála under the *Planning and Development (Strategic Infrastructure) Act (2006)* for the proposed development of a new container terminal at Oyster Bank, Ringaskiddy.

Cobh town, the effective southern terminus of the railway line from Dublin to Cork, is located on the south shore of Great Island in Cork Harbour, on slopes overlooking the Harbour. Cobh is gradually becoming a satellite town to the nearby Cork City. Industrial and enterprise activity in the town had diminished with the closure of both the steel and fertiliser plants, however, a variety of smaller industrial undertakings have grown up in redundant buildings formerly associated with Rushbrook docks. Leisure and commercial activities have improved in recent years, with new supermarkets and shopping centres being built.

Passage West, Glenbrook and Monkstown have developed as residential centres in recent years with associated services and small-scale enterprises. A number of boat-related enterprises are based in the area and Cross River Ferries Ltd. has been running a car ferry service from Glenbrook to Carrigaloe since 1993.

Available statistics in relation to employment in the Carrigaline town DED indicate that the largest employment sector is the clerical, managing and government occupational group, followed by the professional, technical and health worker group.

Employment statistics for the Monkstown District Electoral Division indicate that the professional, technical and health worker group is the largest employment sector in the area, followed by the clerical, managing and government sector.

In the Cobh District Electoral Division manufacturing is the largest employment sector followed by the clerical, managing and government sector.

Tables 3.1.5 *Employment Structure of the District Electoral Division of Carrigaline Town for 2002*, 3.1.6 *Employment Structure of the District Electoral Division of Monkstown (Passage West, Glenbrook, Monkstown) Urban for 2002* and 3.1.7 *Employment Structure of the District Electoral Division of Cobh Town* below set out the employment structure of Carrigaline Town, Monkstown (Passage West, Monkstown, Glenbrook) Urban and Cobh Urban District respectively as recorded in the 2002 Census.

Table 3.1.5: Employment Structure of the District Electoral Division of Carrigaline Town for 2002

Sector	Number Employed 2002	Percentage (%)
Farming, fishing and forestry workers	21	0.40
Manufacturing	728	13.75
Building and Construction	338	6.38
Clerical, managing & government	1,169	22.07
Communication and transport	303	5.72
Commerce & Sales	857	16.18
Professional technical & health	1,032	19.49
Services workers	473	8.93
Other	375	7.08
Total	5,296	100

Source: Census of Population, Small Area Population Statistics, 2002

Table 3.1.6: Employment Structure of the District Electoral Division of Monkstown (Passage West, Glenbrook, Monkstown) Urban for 2002

Sector	Number Employed 2002	Percentage (%)
Farming, fishing and forestry workers	16	0.78
Manufacturing	275	13.38
Building and Construction	148	7.20
Clerical, managing & government	377	18.33
Communication and transport	88	4.28
Commerce & Sales	337	16.39
Professional technical & health	406	19.75
Services workers	207	10.07
Other	202	9.82
Total	2,056	100

Source: Census of Population, Small Area Population Statistics, 2002.

Table 3.1.7: Employment Structure of the District Electoral Division of Cobh Town

Sector	Number Employed 2002	Percentage (%)
Farming, fishing and forestry workers	29	0.66
Manufacturing	785	17.99
Building and Construction	279	6.39
Clerical, managing & government	732	16.78
Communication and transport	329	7.54
Commerce & Sales	546	12.52
Professional technical & health	594	13.61
Services workers	670	15.36
Other	399	9.15
Total	4,363	100

Source: Census of Population, Small Area Population Statistics, 2002.

(iii) Land-Use

Land use in the vicinity of the proposed development includes agricultural, residential, recreational and industrial. The land immediately adjoining the development site to the north, east and south consists of open agricultural fields separated by hedgerows. A small Bord Gáis substation borders the southwest corner of the site, with a large ESB substation situated approximately 160m to the west. A sports field is located circa 80m to the northeast of the site. Figure 3.1.3 *Adjacent Land Uses* shows the existing land-uses in the area adjoining the WWTP site. Based on the current configuration of the N28, the sports ground (or part of) to the northeast of the proposed site is likely to be acquired as part of that development.

It is noted that there are proposals to construct a new branch of the N28 National Primary Route to bypass the villages of Shanbally and Ringaskiddy. One of the proposed routes will traverse the lands to the north of the WWTP site. Also there is an area zoned for residential use 134m east of the proposed WWTP site boundary. A Planning application for residential development has been granted in this area (Refer to Figure 3.1.2 *Proximity of Residential Dwellings*). Residential land-use occurs along the minor roads to the north, south, east and west of the development.

Land-uses in the wider area include residential areas in Carrigaline, Shanbally, Raffeen and Ringaskiddy. Other land-uses in the region include the transport activities associated with the Ringaskiddy Ferry and Deepwater Terminal. A number of tourism and recreational related land-uses occur in the vicinity of the proposed development site. These include Bed and Breakfasts and the 18-hole Fernhill Golf and Country Club (in the townland of Ballyhemiken northwest of the site). There are a number of industrial facilities located within a 3km radius of the site. These facilities are primarily concentrated east or northeast of the proposed site.

(iv) Tourism and Recreation

The County Cork region is one of the most popular tourist destinations in Ireland. Cork Harbour is the second largest natural Harbour in the world and Ireland's second largest port. Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Owenboy, Douglas and Owenacurra. Cork Harbour is connected to the Atlantic Ocean by a narrow inlet between Roche's Point and Crosshaven, at the south of the Harbour. The Harbour is a major asset to the Cork region and has significant potential with respect to marine leisure activities (*Cork County Development Plan, 2003*). The area hosts a variety of bars, cafés and restaurants offering snacks, lunches and dinners.

The Ringaskiddy Car Ferry Terminal is located approximately 2.24km east of the development site. Two ferries operate out of the deep-water berth at Ringaskiddy. Swansea Cork Ferries operates sailing every second day from Cork to Swansea (Wales) and Brittany Ferries sail from Ringaskiddy to Roscoff, which is the fastest sailing from Ireland to France. The ferry port is linked to Cork City by the N28 national primary route, which is the main route for tourist traffic.

Cork International Airport's new terminal building opened its doors on August 1, 2006 and is located approximately 6km south of Cork City and approximately 8km from the proposed development. Cork International Airport had over 3 million passengers pass through its doors in 2006, making it Ireland's third busiest airport. A number of new airlines are now operating from Cork International Airport and several new European destinations have been recently launched.

The Cork Lower Harbour area has a number of beaches utilised by locals and/or tourists visiting the area. These include Fountainstown, Myrtleville, Church Bay, Robert's Cove and Ringabella Bay on the western shores and White Bay on the eastern shore.

Recreational facilities in Carrigaline include Fernhill Golf and Country Club, Carrigaline GAA club, Carrigaline Badminton Club, Carrigaline Tennis Club and the Royal Cork Yacht Club, based in Crosshaven, is the oldest yacht club in the world. Every second year it hosts Cork Week, a major sailing regatta of international significance. Two additional marinas are available in Crosshaven and a third at East Ferry. Launching and mooring facilities at Ringaskiddy, Monkstown, Cobh, Aghada and Ballinacurra are used for smaller boats and jet-skis. Hibernian AFC and Shamrocks GAA sports grounds are located in Shanbally.

Passage West, Glenbrook and Monkstown are three sister towns on the western shores of Cork Harbour and are popular residential areas with excellent recreational facilities due to their location in the Harbour area. Facilities include Monkstown Bay Sailing Club, Monkstown Rowing Club, Passage West Yawl Rowing Club and Monkstown Golf Club. Glenbrook and Monkstown are fast becoming two of the most popular fishing and recreational locations on the west side of Cork Harbour. A public footpath originates at Monkstown and continues alongside the water as it broadens out into Monkstown Bay. The 2km walk from Monkstown to Monkstown Creek is a popular option for all age groups, whether strolling, walking or jogging. The area also has a local GAA Club and Tennis Club.

Cobh is home to many festivals every year: Cobh Maritime Song Festival, Cobh People's Regatta, and The Cobh International Deep Sea Angling Festival held each September has been well established for many years, and attracts overseas deep sea anglers. Other recreational facilities include Cobh GAA Club, Cobh Pirates Rugby Football Club, Rushbrook Lawn Tennis and Croquet Club and several soccer clubs including Cobh Ramblers F.C.

(v) Health and Safety

At present, the Lower Harbour area has no WWTP and waste water from the area is discharged directly and without treatment into the Lower Harbour. The existing drainage infrastructure within the Lower Harbour area is comprised of sewers, culverts, manholes, pumping stations, overflows and outfalls. Some of these facilities have been in existence for more than 50 years and in some cases are no longer adequate for their intended purpose due to structural damage, excessive infiltration and lack of capacity. Currently public health does not seem to be affected by the discharge of untreated waste water into Cork Lower Harbour; however, the discharge into the marine environment is not a desirable situation due to the high levels of bacteria and micro-organisms in untreated effluent, many of which are pathogenic.

(vi) Traffic

Traffic is the movement of motorised vehicles, un-motorised vehicles and pedestrians on roads. Transport plays a pivotal role in supporting economic growth, regional development and social inclusion.

Road Network

Existing roads in the area surrounding the development site include the N28 National Primary Route, 490m to the north; the Regional R613 circa 610m to the south; the R611 circa 1.7km to the west and a number of minor roads to the east and west of the proposed site. Access to the WWTP site will be via the LS472 (Raffeen/Cogan's Rd.) minor road 405m west of the site. The LS472 is a local road with a speed limit of 80km/hr. The LS472 is a two-lane narrow country road with a narrow grass verge. The road has a tarred surface and there are no bridges or lay-bys on the road. The access road to the site is un-surfaced gravel and is in poor condition and currently provides access to the Bord Gáis substation at the south west boundary of the WWTP site.

The National N28 route connects the port at Ringaskiddy southeast of Cork City to the City itself. The road leaves Cork from an interchange on the N25 Southern Ring road near Douglas. It runs southwards towards Carrigaline and is initially dual carriage-way and then joins the Carrigaline Road (single carriage-way). North of Carrigaline the N28 route branches to the east at a roundabout and proceeds to Ringaskiddy. There is a general speed limit of 100km/hr on the N28 and this limit is reduced to 50km/hr in the Ringaskiddy area. Cork County Council is promoting the development of the Cork-Ringaskiddy Road Scheme. It is proposed to improve the existing N28 from the Bloomfield Interchange at Rochestown to Ringaskiddy village. The improved road will have a greater capacity to cater for high traffic volumes (NRA, 2004). The preferred route will traverse lands approximately 100m north of the WWTP site.

Passage West and Monkstown are 13km south of Cork City and are located on the R610 route running from the south of Cork City along the western shores of Cork Harbour. The R610 continues in a south westerly direction from Monkstown and connects with the N28 route to Ringaskiddy. The R610 is a single-carriage regional road with a general speed limit of 80km/hr.

Glenbrook is located mid-way between Passage West and Monkstown and the cross-river ferry connects Glenbrook to Carrigaloe on the eastern side of Cork Harbour. The cross-river ferry provides easy access from towns in the west of the Harbour (Carrigaline, Ringaskiddy, Monkstown, and Passage West) to Great Island and East Cork.

Exit and Access Routes

The exit and access route from the WWTP site to Cork City, is north along the LS472 to the junction with the N28, turning west at the junction and joining the N28 to Cork City. Exit and access from the site to Ringaskiddy follows the LS472 north to the junction with the N28, turning east and joining the N28 to Ringaskiddy. Exit and access from the site to Carrigaline follows the LS472 south to the junction with the L2490 (Fernhill Rd.), turning south at the junction and following the L2490 to the east of Carrigaline town.

Annual Average Daily Traffic in Area

The estimated traffic flows contained in Table 3.1.8 *Annual Average Daily Traffic (AADT) for the N28 (Cork-Ringaskiddy)* refer to 24 hour two-way flows on an average day; this is known as the Annual Average Daily Traffic (AADT). In tourist areas there is considerable variation from this figure through the year, while in the large urban areas there is little variation from AADT in any season. The AADT for the N28 (Cork-Ringaskiddy) was calculated for the years 2003 and 2004 and the estimated percentage of Heavy Commercial Vehicles (HCV) using the road. The route begins at the ferry port and ends at the junction of the N28 and N25. Every year there is an estimated increase of 5% AADT (NRA, 2007).

Traffic turning data for the minor roads L2490 and LS472 to the west of the WWTP were obtained for June and July of 2001 (Cork County Council, 2002) and for June 1st 2006 (Cork County Council, 2006) and are presented in Table 3.1.9 *Traffic turning data for minor roads L2490 and LS472*.

Table 3.1.8: Annual Average Daily Traffic (AADT) for the N28 (Cork-Ringaskiddy)

Year	Length of Road Section (Km)	Starting Point	Aadt
2003	5.6km	Ferry Junction to Junction with R611	7,055 with 12.0% HCV
2003	4.03km	Junction with R611 to R609 Interchange	17,171 with 7.5% HCV
2003	1.91km	R610 Interchange to Passage West Interchange	14,507 with 9.2% HCV
2003	0.73km	R610 Interchange to N25 Junction	50,523 with 6.8% HCV
2004	5.6km	Ferry Junction to Junction with R611	7,409 with 12% HCV
2004	4.03km	Junction with R611 to R609 Interchange	18,086 with 7.5% HCV
2004	1.91km	R610 Interchange to Passage West Interchange	15,264 with 12% HCV
2004	0.73km	R610 Interchange to N25 Junction	53,180 with 6.8% HCV

(Source: National Roads Authority, 2007)

Table 3.1.9: Traffic turning data for minor roads L2490 and LS472

Turning Point	Total No. of Turning Points: 7.30-9.30 And 16.30-18.30 Periods In 2001	Total No. Of Turning Points: 07.00-10.00 In 2006	Total No. Of Turning Points: 16.00-19.00 In 2006
L2490 → West N28	233	204	75
L2490 → East N28	50	26	36
N28 West → L2490	292	22	85
N28 East → L2490	66	82	235
N28 West → N28 East (at L2490 junction)		2445	1125
N28 East → N28 West (at L2490 junction)		923	2021
LS472 → West N28	87	79	90
LS472 → East N28	27	17	35
N28 West → LS472	137	77	157
N28 East → LS472	46	16	68
N28 West → N28 East (at LS472 junction)		2462	693
N28 East → N28 West (at LS472 junction)		744	2307

(Source: Cork County Council, 2002 and 2006)

Public Transport

Bus Éireann runs a scheduled bus service from Cork City-Monkstown-Ringaskiddy-Haulbowline, with 20 return trips per day from Cork-Monkstown and 14 of these proceed to Ringaskiddy (Bus Éireann, 2007). There has been a call from members of the Cork County Council Carrigaline Area Committee for a bus route between Passage West and Carrigaline. A water bus route and light rail service between Cork City and the Lower Harbour towns is being considered by Cork City Council and Cork County Council (*Passage West/Monkstown News*, 2007).

3.1.4 Impact Assessment

(i) Need for the Development and National Policy

National Spatial Strategy and Sustainable Development

The aim of the National Spatial Strategy is to achieve a better balance of social, economic and physical development across Ireland, supported by more effective planning. To drive development, the Strategy proposes that areas of sufficient scale and critical mass will be built up through a network of gateways and hubs.

The Cork Area Strategic Plan (CASP) 2001-2020

'...seeks to reflect spatial planning guidance that is emerging from initiatives such as the National Spatial Strategy and the National Development Plan which encourages Gateway centres such as Cork to develop as the focus of successful and innovative regions.

The CASP is an initiative jointly sponsored by Cork City Council and Cork County Council in order to provide a vision and strategy for the development of the Cork City-Region up to 2020. It is in response to a Government supported European wide initiative to create a sustainable approach to social and economic development. This is encouraging planning authorities to take a more critical view of settlement patterns, development needs and infrastructure requirements through the preparation of strategic plans.

CASP seeks to ensure that infrastructure, including transport and utility services, are provided in advance or in tandem with housing and other development.

Investment in transport, water and waste water infrastructure is forecast to total €2billion by 2020.'

National sustainable development policy also sets obligations for environmental compliance particularly relating to ever increasing urban development. These obligations include the provision of water and waste water treatment utilities for these areas.

The Water Services Investment Programme (WSIP) is the driving force behind water infrastructure. The Cork County 2007-2009 WSIP identifies Cork Lower Harbour Sewerage Scheme as one of the projects identified for investment during this period.

(ii) Construction Phase Impacts

Population and Housing

WWTP: The construction works associated with this development will involve the construction of a WWTP and associated works. Ancillary works will include the widening of sections of the minor road LS472 to the west of the site and the widening and upgrading of the site access road (which currently only runs as far as the Bord Gáis substation). These works will involve normal construction activities such as excavation, filling, lifting, pumping, pipe laying, concrete works, mechanical installation, etc. Noise, dust and vibration associated with the construction phase of the WWTP may have a slight, short-term negative impact on the population. These impacts will be restricted to daylight hours (on average 08.00-18.00 hrs) and will cease on completion of the construction phase. Impacts related to Air Quality, Noise and Vibration are discussed in Sections 3.6 *Air Quality, Odour and Climate* and 3.7 *Noise and Vibration*. It is expected that the construction phase for the WWTP will extend over a two-year period.

Collection System: Construction works associated with the development of a new waste water collection system will involve a marine crossing, new waste water pumping stations and the laying of rising mains, surface water sewers and gravity waste water sewers to direct the waste water to the new treatment plant. Construction activities associated with these works will involve normal construction activities such as excavation, filling, lifting, pumping, pipelaying, concrete works, mechanical installation, etc. Other more specialised techniques may include piling and marine works. Blasting is not envisaged for this development.

Noise and vibration impacts associated with the construction of the collection system will generally be slight, however, temporary significant noise impacts may be experienced during excavation works by nearby residents. Following the implementation of dust abatement measures, impacts on air quality will not be significant. Impacts related to air quality, noise and vibration are discussed in Sections 3.6 *Air Quality, Odour and Climate* and 3.7 *Noise and Vibration*.

Economic Activity and Employment

Cork Harbour supports a diverse array of industries (e.g. pharmaceutical, tourism, and shipping), which provide high economic productivity. The proposed WWTP is an essential element of the Cork Harbour Main Drainage Scheme and represents a large capital investment in the area.

WWTP: A short-term positive impact of the development will be employment opportunities during the construction phase. An additional positive impact may include an increase in revenue for the local communities due to purchasing of raw materials and plant hire during the construction phase of the project, thus having a positive effect on the economy of the area.

Collection System: A positive temporary short-term impact of the construction of the pipelines, marine crossing and substations will be employment opportunities. The construction phase should also have a positive impact on the economy of the area due to increased purchasing of raw materials and plant hire. The marine crossing may have temporary moderate-significant negative impacts on the cross-river ferry service and the transportation of goods by boat through the Harbour. The impacts will be temporary; however, the magnitude of the impacts will depend on the method of construction. An application will be made to the DAFF for approval of this work and a schedule and method of works will be drawn up in consultation with the DAFF and other relevant stakeholders, including the Port Authority and Cross River Ferries Ltd.

Land-Use

WWTP: Existing land-use at the WWTP site is agricultural pasture; however, the land is zoned for Utility and Infrastructure development by the *Carrigaline Electoral Area Local Area Plan (2005)* and adopted amendments (January 2007). The proposed WWTP site consists of approximately 7.36ha of agricultural land and is located between two overhead high voltage power lines to the north and south of the site, which excludes any possibility for residential development. Existing industrial activities are present within 200m west of the site and it is proposed to re-route the N28 across the northern boundary of the WWTP site. The construction phase of the development will result in an initial moderate negative impact on the landscape character of the area, however, this should be reduced to a slight negative impact as the proposed woodland landscaping around the perimeter of the site matures. The loss of agricultural land is not considered significant, from an ecological perspective, due to its low conservation importance (refer to Section 3.2 *Terrestrial and Marine Ecology*). Also, due to the prevalence of agricultural land in the area, the loss of 7.36ha of agricultural land for community purposes is not considered to be a significant impact. Noise, dust and vibration associated with the construction phase may have slight, short-term negative impacts on livestock grazing on lands immediately adjacent to the site.

Collection System: The routes of the pipelines are primarily concentrated along existing road infrastructure. The laying of pipes in these areas will result generally in slight temporary negative impacts, due to traffic disruption, noise, dust and vibrations associated with road works. During excavation for the pipelines, temporary significant noise and vibration impacts may be experienced by nearby residences. The construction of the pumping stations at Raffeen and West Beach, Cobh will result in the permanent loss of reclaimed land. However, the impact is deemed neutral with respect to land-use, due to the extremely low ecological and economic value of this land.

Tourism and Recreation

WWTP: If the proposed development did not proceed, untreated discharge would continue to negatively impact on the Lower Harbour. Construction of the new WWTP may result in slight short-term negative impacts on recreation in the area, due to the proximity of a sports field to the north-east of the site. Noise and vibration impacts will be negligible and significant impacts on air quality are not anticipated following the implementation of mitigation measures. Construction of the WWTP should not have any impact on tourism in the area.

Collection System: Cork Harbour is a major asset to the Cork region and has significant potential with respect to marine leisure activities (*Cork County Development Plan, 2003*). At present there are many waste water outfalls to the receiving waters at locations used for recreational activities (refer to Figure 2.1 *Location of Existing Outfalls and Proposed Outfall*). The construction of the pipelines, associated pumping stations and rising mains will eliminate these outfalls. During the construction phase, the laying of pipelines along the shoreline and the marine crossing may have temporary moderate-significant negative impacts on tourism and recreation. The impacts will be temporary; however, the magnitude of the impacts will depend on the method of construction. An application will be made to the DAFF for approval of this work and a schedule and method of works agreed with the DAFF and other relevant bodies and stakeholders, including the Port Authority and Cross River Ferries Ltd.

Health and Safety

WWTP: *The Safety, Health and Welfare at Work (Construction) Regulations 2006* will be implemented during construction. Contractors employed on site will be required to prepare their own health and safety plan for their specific work. The Contractor will be required to provide sanitary facilities adequate for construction personnel. Sanitary facilities will include proper wash down WCs with sewer connections, or if this is impracticable, chemical closets. All temporary buildings associated with construction of the development will comply with the *Health, Safety and Welfare at Work (Construction) Regulations 2006*. On completion of the works, contractors will remove them entirely with all slab, drains and water mains and restore the surface of the land to its original or otherwise reasonable condition.

Collection System: *The Safety, Health and Welfare at Work (Construction) Regulations 2006* will be implemented during construction. Contractors employed on site will be required to prepare their own health and safety plan for their specific work.

Traffic

WWTP: There will be an increase in traffic volumes associated with the construction phase of the development, which will have a short-term slight negative impact on human beings. Access to the site will be via the LS472 (Carrigaline Middle/Cogan's Road). Increased traffic volumes will be due to deliveries to site or disposal of surplus excavated material off-site by Heavy Goods Vehicles (HGVs). Increased movements will also be generated by construction employees travelling to and from work. Impacts will include increased levels of noise and vibration, visual impact, and dust from HGVs. At this stage of the process, the precise details are not available on the construction traffic volumes and therefore a nominal assumption of 10 HGV traffic movements per hour is assumed (travelling to/from the site). There are also likely to be construction workers arriving and leaving the site during peak hours.

Collection System: The routes of the pipelines are primarily concentrated along existing road infrastructure. At this stage of the process, the precise details are not available on the construction traffic volumes and therefore a nominal assumption of 10 traffic movements per hour is assumed (travelling to/from the pipeline route sites). The laying of pipes in these areas will result in slight temporary negative impacts due to traffic disruption. During the construction phase, the laying of pipelines along the shoreline and the marine crossing may have temporary moderate-significant negative impacts on river/Harbour traffic. The impacts will be temporary; however, the magnitude of the impacts will depend on the method of construction. An application will be made to the DAFF for approval of this work and a schedule and method of works agreed with the DAFF and other relevant bodies and stakeholders, including the Port Authority and Cross River Ferries Ltd.

(iii) Operational Phase Impacts

Population and Housing

WWTP: The proposed WWTP will facilitate further growth in the residential population of the adjoining area. The proposed capacity of the WWTP is for a population equivalent of circa 80,000 PE. The census figures from the 2006 survey estimate the population of the catchment as 32,411. Positive and significant impacts of the development of a WWTP include enhancing and facilitating the potential for increased residential and commercial development in the environs of the Lower Harbour. Currently waste water is untreated and discharged into the Harbour and therefore a significant positive impact of the development will be improved waste water quality into Cork Lower Harbour. Upon implementation of mitigation measures, it is anticipated that the operation phase of the WWTP should have no negative impacts on the population. Sections 3.6 *Air Quality, Odour and Climate*, 3.7 *Noise and Vibration* and 3.9 *Landscape and Visual Assessment* address the mitigation measures for dealing with Air Quality and Odour, Noise and Vibration and Landscape and Visual impacts respectively.

Collection System: It is considered that the operational phase of the development will have a moderate positive impact due to good quality water being discharged. The emergency operation of these stations is essential to minimise the risk of untreated effluent being discharged into Cork Harbour. It is essential that the pumping stations include for Standby power arrangements to prevent the overflow discharge of raw effluent to the Harbour. Note that the potential impact on the receiving waters from emergency overflows from the Carrigaloe, Monkstown and Raffeen pumping stations is likely to be more negative than the current situation. Overflow discharges from the pumping stations at Monkstown and Raffeen will include waste water from Cobh and Passage West. Therefore at a minimum an automated control operating system should be put in place to ensure that if a downstream pumping station fails to operate, the upstream pumping station will cease pumping. Noise, vibration and visual impacts are not anticipated on implementation of appropriate mitigation as specified in Sections 3.6 *Air Quality, Odour and Climate*, 3.7 *Noise and Vibration* and 3.9 *Landscape and Visual Assessment*.

Employment and Economic Activity

WWTP: The development is likely to have a significant positive long-term impact in terms of enhancing and facilitating the potential for residential, commercial and recreational development in Cork Lower Harbour and its surrounding towns. It is considered that the development of a WWTP will promote economic activity in the Cork Lower Harbour area. Permanent employment opportunities will be created when the plant is in operation (3-5 positions) and this will have a slight positive long-term impact.

Collection System: It is considered that the operational phase of the development will indirectly have a positive impact on employment and economic activity in the area due to the potential for increased housing and development in the area, as a result of the WWTP and collection system.

Land-use

WWTP: The WWTP will result in the permanent loss of approximately 7.36ha of agricultural land, which has been zoned for Utility and Infrastructure development by the *Carrigaline Electoral Area Local Area Plan* (2005) and adopted amendments (January 2007).

Collection System: The pipelines are predominantly running along existing road infrastructure and will not result in a significant change in land-use. The pumping stations at Raffeen and White Beach, Cobh will be located on reclaimed land and therefore will result in a change of land-use. All other pumping stations will be constructed in areas of existing artificial surfaces.

Tourism and Recreation

WWTP: The proposed WWTP will facilitate the improvement of water quality in Cork Harbour. The improved water quality will have also a long-term positive impact on beaches utilised by locals and tourists. It is concluded that the proposed development will have a positive long-term impact on tourism and recreation.

Collection System: At present there are many waste water outfalls to the receiving waters at locations used for recreational activities (refer to Figure 2.1 *Location of Existing Outfalls and Proposed Outfall*). The construction of the proposed WWTP and associated pumping stations and rising mains will eliminate these outfalls. Where outfalls are to be retained, these shall operate only during storm conditions.

Health and Safety

WWTP: At present, the untreated waste water contains high levels of bacteria and micro-organisms, which are very dangerous and pathogenic, and may be deleterious to human health. The proposed WWTP is a new secondary modern type of treatment plant and can remove up to 90% of bacteria from waste water. It is considered that the WWTP will have a very beneficial impact for public health and safety and for water quality in Cork Harbour. The proposed WWTP is away from major centres of population and it is considered that the proposed development will have a neutral impact with regard to public safety. Access to the site will be restricted and appropriate security fencing will be erected. A comprehensive Health and Safety Statement will be prepared for the operational phase of the development and will comply with all Health and Safety Regulations.

Collection System: The existing pumping station at Carrigaline will be upgraded to accommodate future demand and to meet current Health and Safety Regulations. The construction of new pumping stations and collection system will eliminate the existing scenario of regular discharges of untreated waste water to Cork Lower Harbour. A comprehensive Health and Safety Statement will be prepared for the operational phase of the development and will comply with all Health and Safety Regulations.

Traffic

WWTP: The WWTP will be operational 24hr/day, 365 day/year. During the operational phase truck movements will arise from the removal of sludge from the site and occasional delivery vehicles. The number of sludge trucks will depend upon the nature of the final sludge product. If the sludge is dewatered, this is likely to require two truckloads leaving the site each day. If the sludge is dried, the truck movements should reduce to two to three per week. Where possible the sludge will be recycled to agricultural lands (nutrient recovery). Car parking is required for a maximum of five permanent employees and potential visitors to the WWTP. The estimated increase in traffic movements during the operational phase of the development will be in the range of six to ten additional car/light good vehicles (LGVs) movements per day and a maximum of four HGV movements per day.

The preferred new route for the upgraded N28 from Cork to Ringaskiddy (which will run directly north of the site) will provide a buffer between the site and industrial lands to the north and improve transport infrastructure in the area. Communications with the relevant road authorities (NRA) indicate that it is not envisaged to provide direct access from the WWTP to the N28. This will result in the decommissioning of the northern Section of the LS472 (Cogan's Rd.) and access to the site from the N28 will be from the south via the L2490 (Fernhill Rd.) to the junction with the LS472. This will cause a permanent increase in traffic movements along the L2490, at the junction of the L2490 and LS472 and also along the southern section of the LS472. However, the impact is considered to be slight due to the low number of employees accessing the site (approx. five persons) and a maximum of four HGV movements per day. During consultation with the NRA, it was agreed that a detailed Traffic Impact Assessment (TIA) was not necessary due to the minor increase in daily traffic movements during the operational phase of the development.

Collection System: Maintenance of the pumping stations will result in occasional additional traffic movements of light goods vehicles and this will have a neutral impact on traffic in the areas affected.

(iv) 'Do Nothing' Impact

The 'do nothing' scenario would result in the continued discharge of untreated waste water into Cork Lower Harbour which is not a desirable situation due to the high levels of bacteria and micro-organisms present in untreated waste water. The 'do nothing' scenario could also potentially have a significant negative impact on population, economic activity, tourism and recreation. The population of the Cork Lower Harbour area has exhibited a significant increase in the last few years and is projected to increase further. Without development of a WWTP, the area could suffer development restrictions due to inadequate waste water treatment facilities, and thus impact negatively on economic growth. As the population increases, the quantity of untreated waste water discharging into Cork Lower Harbour will increase and negative impacts on flora, fauna and water quality could affect tourism and recreation in the area and further affect economic growth.

(v) 'Worst Case Scenario' Impact

The 'worst case scenario' impact would arise from ineffective traffic and construction management and not implementing mitigation measures. This could lead to the WWTP posing a safety risk, generating significant odours, uncontrolled effluent discharges or noise impact. However, these situations are unlikely to occur on effective construction and operational management of the development and the implementation of the mitigation measures proposed hereunder.

3.1.5 Mitigation Measures

(i) Construction Phase

Population and Housing

WWTP: The construction phase for the WWTP is expected to extend over a two-year period. Any impacts will be restricted to daylight hours (on average 08.00-18.00 hrs) and will cease on completion of the construction phase. A detailed Construction Environmental Management Plan (CEMP) will be drawn up for all construction activities to be carried out on site. This CEMP will address activities likely to affect aspects of the environment e.g. noise, dust, odour, traffic, run-off, spillages, effluents etc. and will include environmental protection measures such as monitoring, protection barriers, operational procedures and contingency measures.

Collection System: The construction phase for the collection system will involve the laying of pipelines, sewers, marine crossing and pumping stations. A detailed CEMP will be drawn up for all construction activities to be carried out on these sites.

Employment and Economic Activity

WWTP: It is considered that no negative impacts will be associated with the WWTP, with regard to employment and economic activity and therefore mitigation is not required.

Collection System: Temporary negative impacts on economic activity may be associated with the marine crossing. However, the magnitude of the impacts will depend on the method of construction. In order to mitigate for this a schedule and method of works will be drawn up in consultation with the DAFF and other relevant stakeholders, including the Port Authority and Cross River Ferries Ltd.

Land-use

Prior to construction landowners whose lands are directly adjacent to the site will be consulted and any appropriate measures will be taken to minimise disturbance to livestock.

Tourism and Recreation

WWTP: A detailed CEMP will be drawn up for all construction activities to be carried out on site. This CEMP will address activities likely to affect aspects of the environment e.g. noise, dust, odour, traffic, run-off, spillages, effluents etc. and will include environmental protection measures such as monitoring, protection barriers, operational procedures and contingency measures.

Collection System: In order to mitigate for any negative impacts during construction of the marine crossing, a schedule and method of works will be drawn up in consultation with the DAFF and other relevant bodies and stakeholders, including the Port Authority and Cross River Ferries Ltd.

Health and Safety

WWTP and Collection System: Access to all sites by unauthorised persons will be prevented. The *Safety, Health and Welfare at Work (Construction) Regulations (2006)* will be implemented during construction. Contractors employed on site will be required to prepare their own health and safety plan for their specific work.

Traffic

WWTP: A Traffic Management Plan will be implemented to ensure the control of movements of materials, plant and labour to and from the site in order to minimise disruption to other road users and local residents.

Collection System: A Traffic Management Plan will be implemented to ensure the control of movements of materials, plant and labour to and from the site during the construction phase in order to minimise disruption to other road users and local residents. To minimise disruption to river traffic, a schedule and method of works will be drawn up in consultation with the DAFF and other relevant bodies and stakeholders, including the Port Authority and Cross River Ferries Ltd.

(ii) Operational Phase

Population and Housing; Tourism and Recreation

WWTP: The preliminary treatment at the WWTP must include for septicity control in addition to Screening and Grit Removal due to the length of the conveyance system. It is recommended that Preliminary treatment facilities be incorporated within a building with air extraction to an odour control system. The appointed contractor will be required to comply with the *Waste Water Treatment (Prevention of Odours and Noise) Regulations (2005) (S.I. No. 787 of 2005)*.

Collection System: It is essential that the pumping stations include for Standby power arrangements to prevent the overflow discharge of raw effluent to the Harbour. At a minimum an automated control operating system should be put in place to ensure that if a downstream pumping station fails to operate, the upstream pumping station will cease pumping. There is a strong potential for septic conditions to arise in the collection and conveyance systems en route from the waste water sources in the different towns to the WWTP due to the length of the conveyance system and the distance from the population centres to the treatment plant. Due to the odour nuisance associated with septicity and the long residence times of raw waste water in the conveyance systems it is essential that the inlet channels and chambers be covered, vented and connected to an odour control system. The appointed contractor will be required to comply with the *Waste Water Treatment (Prevention of Odours and Noise) Regulations, 2005 (S.I. No. 787 of 2005)*.

Employment and Economic Activity

WWTP and Collection System: It is considered that no negative impacts will be associated with the WWTP, with regard to employment and economic activity and therefore mitigation is not required.

Land-use

As there are no significant impacts, no mitigation measures are proposed relating to land-use.

Health and Safety

WWTP and Collection System: Access to the site by unauthorised persons will be prevented. Safety features for minimising risk to all plant personnel/visitors/intruders will include the following:

- Handrails to uncovered tanks, where appropriate
- Handrails and toe-boards to access platforms, walkways, etc.
- Controlled access to all stairs and platforms
- Safety chains/cages to units/ladders, where appropriate
- Safety grid flooring to all ducts and channels
- Local emergency stop buttons on all machinery
- Life buoys at strategic locations around all tanks
- Hand rails and harnesses for maintenance personnel

- Perimeter security fence with an intruder alarm system linked to the central control station
- Portable gas monitor and breathing apparatus for use by site personnel

Facilities for diverting flows from the various treatment units will be provided to effect ease of maintenance and to facilitate isolation of any integral unit should breakdown occur, without significantly impairing the overall treatment efficiency. A comprehensive Health and Safety Statement will be prepared for the operational phase of the development and will comply with all Health and Safety Regulations.

Traffic

WWTP and Collection System: As there are low volumes of traffic associated with the operational phase and no significant impacts, no additional mitigation measures are proposed in relation to traffic.

3.1.6 Residual Impacts

No residual negative impacts on human beings are anticipated from the proposed development provided that the development is managed effectively during the construction and operational phases and all mitigation measures are implemented.

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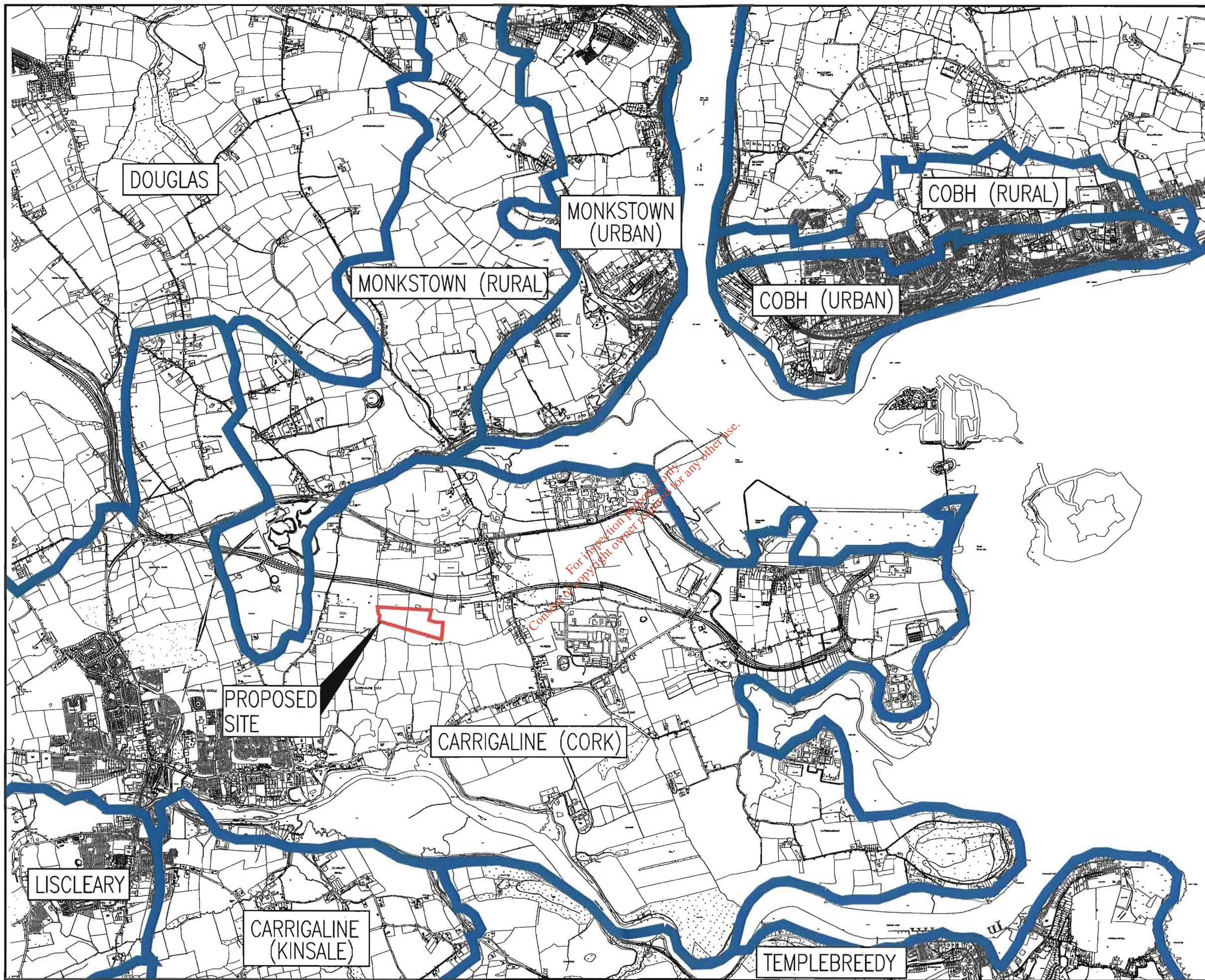


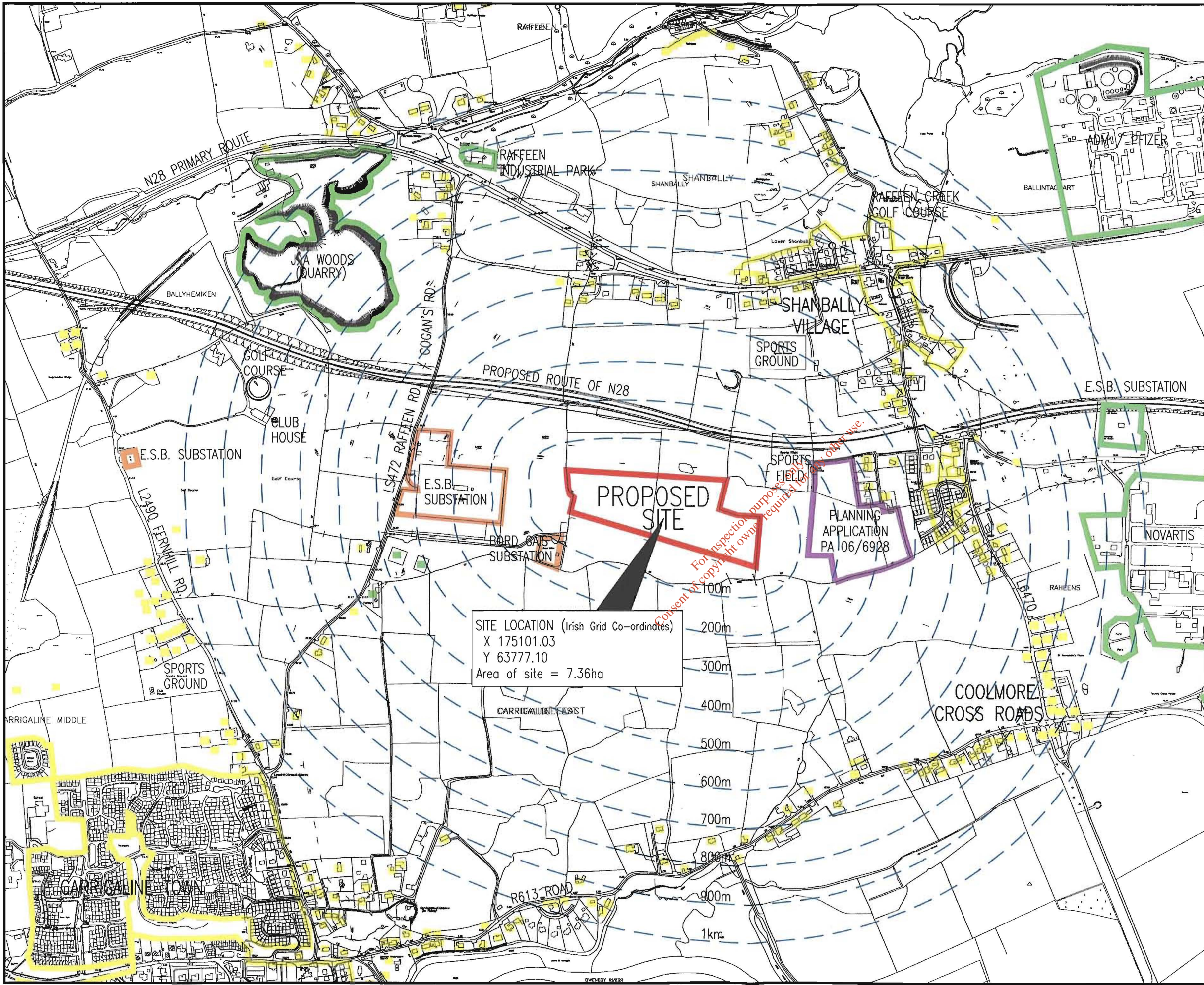
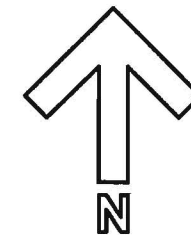
FIGURE 3.1.1 DISTRICT ELECTORAL DIVISION OF CARRIGALINE (CORK RURAL DISTRICT)

SCALE 1:35,000

LEGEND

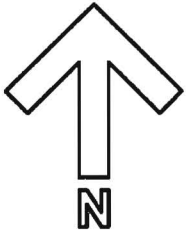
PROPOSED SITE













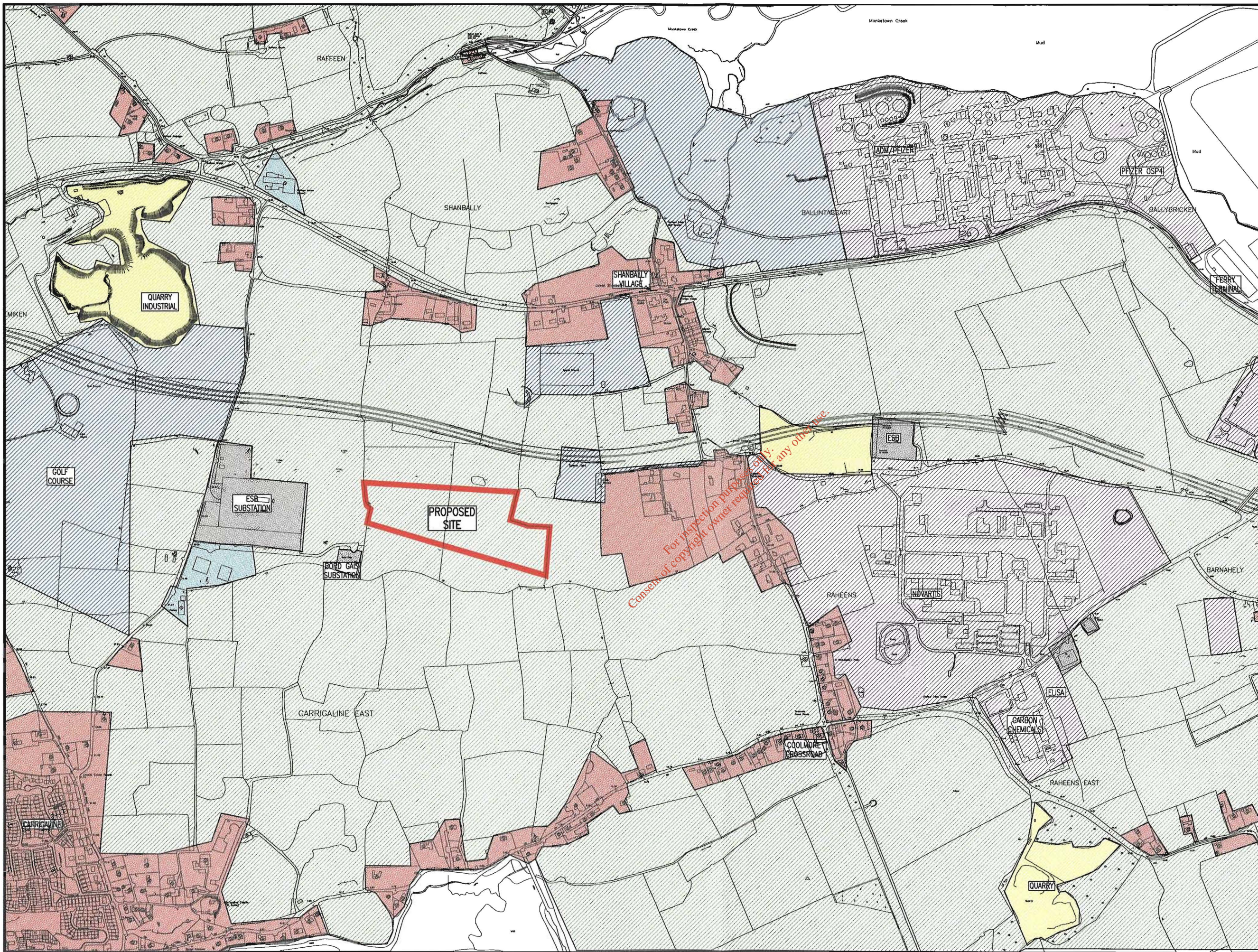
LEGEND	
PROPOSED SITE	
RESIDENTIAL DWELLING AREA	
COMMERCIAL / INDUSTRIAL PROPERTY	
E.S.B. OR BORD GAIS SUBSTATION	
PROPOSED LOCAL DEVELOPMENT	

FIGURE 3.1.2 PROXIMITY OF RESIDENTIAL DWELLINGS SCALE 1:10,000



LEGEND

-  AGRICULTURE
-  AMENITY LAND
-  EXTRACTIVE INDUSTRY
-  MANUFACTURING INDUSTRY
-  COMMERCIAL USE
-  HOUSING
-  PUBLIC UTILITIES
-  PROPOSED SITE



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FIGURE 3.1.3. ADJACENT LAND USES

SCALE 1:10,000

3.2 Terrestrial and Marine Ecology

3.2.1 Introduction

A terrestrial and marine ecology assessment and report was prepared by Ecofact Environmental Consultants Ltd. on behalf of MMP to address the potential impacts of the proposed WWTP and upgraded collection system on the ecology of the receiving environment. The terrestrial and marine ecology report is presented in full in *Volume III, Appendix 2A*.

3.2.2 Methodology

The current study consisted of a desk study and a field assessment. The field survey comprised a systematic walk over of the proposed site, pumping stations and collection system. Much of the pipeline route comprises existing road or built ground. A Phase 1 habitat survey of the site, pipeline routes and pumping stations was conducted during June 2007 using methodology developed by the Joint Nature Conservation Committee (JNCC, 1993). Habitats were classified and mapped using habitat descriptions and codes published in the Heritage Council's *A Guide to Habitat Types in Ireland* (Fossitt, 2000). Plant species nomenclature follows Stace's *New Flora of the British Isles* (1997). All birds encountered during the course of the surveys were noted and the habitats present on the site were assessed as to their suitability for breeding and wintering bird species. The affected areas were also examined for signs of/or the presence of mammals (including potential bat roosts and badger setts). The marine field survey comprised a systematic walk over and boat survey of the areas that would be potentially affected by the proposed development (i.e. outfalls, areas adjoining pipeline routes etc.). Habitats were classified and mapped using habitat descriptions and codes published in the Heritage Council's *A Guide to Habitat Types in Ireland* (Fossitt, 2000) and the JNCC *Marine Habitat Classification for Britain and Ireland* (O'Connor, 2004). A marine fauna assessment of the affected areas was undertaken using JNCC Marine Monitoring methods (Davies *et al*, 2001).

Shore (littoral) and sub-littoral sampling was undertaken at 23 stations during low spring tides with a further 4 stations sampled from a boat. Sampling involved the use of quadrates (quadrates area 0.25m²), cores (0.01m²) and a hand held grab (AMS type, 0.023 m³) and conformed to JNCC methodology. Specimens were identified to the lowest possible taxonomic level, counted and weighed. Marine fauna nomenclature follows Barnes' *the brackish-water fauna of North-western Europe* (1994).

This study was carried out with reference as applicable to the EPA's *Guidelines on the Information to be Contained in Environmental Impact Statements* (March, 2002) and *Advice Notes on Current Practice* (2003), the Institute of Environmental Assessment's *Guidelines for Baseline Ecological Assessment* (1995), along with experience of 'best practice' in the ecological assessment.

Preparation of this section included consultation with:

- National Parks and Wildlife Service (NPWS);
- Environmental Protection Agency (EPA);
- Cork County Council;
- Botanical Society of the British Isles (BSBI);
- South Western Regional Fisheries Board (SWRFB);

- Department of Communications, Energy and Natural Resources (formally DCENR and now Department of Agriculture, Fisheries and Food (DAFF));
- Marine Institute (MI);
- Bat Conservation Ireland (BCI);
- BirdWatch Ireland (BWI);
- Irish Whale and Dolphin Group (IWDG);
- National Roads Authority (NRA);

The results of the ecological survey were evaluated to determine the significance of identified features located in the study area on an importance scale ranging from international-national-county-local. The criteria used are shown in Table 3.2.1 *Criteria used in assessing the ecological importance of ecological features.*

The means of assessing impact significance is based on the Institute of Ecological and Environmental Management (IEEM) *Guidelines for Ecological Evaluation and Assessment-Draft Guidelines (2002)*. Impact type and magnitude are defined in Tables 3.2.2 *Criteria for assessing impact type* and 3.2.3. *Criteria for assessing impact magnitude.*

Impacts during both the Construction and Operational Phases of the proposed development are considered, in the Short, Medium and Long term (as per the EPA *Guidelines on the Information to be Contained in Environmental Impact Statements, 2002*) where considered appropriate.

Table 3.2.1: Criteria used in assessing the ecological importance of ecological features.

Importance	Criteria
International	An internationally designated site or candidate site (SPA*, pSPA, SAC, pSAC, Ramsar Site, Biogenetic Reserve). Also sites which qualify for designation as SACs or SPAs – this includes sites on the NGO shadow list of SAC's.
National	A nationally designated site or candidate site (NHA**, pNHA) (unfortunately there is no published criteria used in selecting these areas). Sites which hold Red Data Book (Curtis and McGough, 1988) plant species.
County	Sites which hold nationally scarce plant species (recorded from less than 65 10km squares), unless they are locally abundant. Sites which hold semi-natural habitats likely to be of rare occurrence within the county. Sites which hold the best examples of a semi-natural habitat type within the county.
High Local Importance	Sites which hold semi-natural habitats and/or species likely to be of rare occurrence within the local area. Sites which hold the best examples of a high quality semi-natural habitat type within the local area.
Local Importance	Sites which hold high quality semi-natural habitats
Local Value	Any semi-natural habitat

*SPA - Special Protection Area; pSPA - Proposed Special Protection Area; SAC – Scientific Area of Conservation; pSAC – Proposed Scientific Area of Conservation

**NHA – Natural Heritage Area; pNHA – Proposed Natural Heritage Area

Table 3.2.2: Criteria for assessing impact type

Impact type	Criteria
Positive impact:	A change is likely to improve the ecological feature in terms of its ecological value.
Neutral	No effect.
Negative impact:	The change is likely to adversely affect the ecological value of the feature.

Table 3.2.3: Criteria for assessing impact magnitude

Impact magnitude	Definition
No change:	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	A change in the ecology of the affected site, the consequences of which are strictly limited to within the development boundaries.
Minor Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution or abundance of species or habitats of conservation importance.
Moderate Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area.
Major Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in the wider area is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).

3.2.3 Existing Environment

Background

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Owenboy, Douglas and Owenacurra. It is connected to the Atlantic Ocean by a narrow inlet between Roche's Point and Crosshaven, at the south of the Harbour. The River Lee which flows through Cork City enters the Harbour at the north-west, via the west passage. The Owenboy River flows through Carrigaline, to the south-east of Cork City, and enters the Harbour at Crosshaven, to the south-west of the Harbour.

Cork Harbour has a surface water area of around 100km² and is a large, sheltered, naturally deepwater Harbour. Strong estuarine influences dominate the upper reaches of the Harbour and the coastline is mixed, consisting of built infrastructure, shallow cliffs, intertidal mudflats, reedbeds, shingle and rocky foreshores, which are exposed by the tide. Owing to the sheltered conditions, the inter-tidal flats are often muddy in character (King, 2002).

Designated Areas

Designated areas in the vicinity of the proposed development works are shown in Figure 3.2.1 *Conservation Designated Sites in the Study Area*. Sections of the proposed development are located within the Cork Harbour Special Protection Area (SPA) for birds (Site Code 004030). The Cork Harbour SPA is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl. Several of the species which occur regularly within Cork Harbour are listed on Annex I of the E.U. Birds Directive (*Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds*), i.e. Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff and Common Tern. Proposed works associated with the development are located within 2km of the Great Island channel Special Area of Conservation (SAC) (Site Code: 0001058). The Great Island Channel stretches from Little Island to Midleton. It is designated due to the presence of the Annex I habitats; mudflats and Atlantic salt meadows. Sites designated as SACs and SPAs are recognised as being of international importance. Monkstown Creek Natural Heritage Area (pNHA) (Site Code 001979) and the Owenboy River pNHA (Site Code 001990) are designated areas of national importance due to wintering water birds. The study area includes areas within designated SPAs and pNHAs which are of international importance due to the abundance of important bird species and also the presence of internationally important coastal habitats.

Flora and habitats

Following the Phase 1 habitat survey and marine habitat survey of the study area, the different habitat types (as classified according to Fossitt, 2000 and O'Connor, 2004) were identified. The following is a description of the various habitats found within and adjacent to the study area. The habitat code according to Fossitt is in brackets after the habitat name. The habitats present in both terrestrial and coastal areas recorded in the study during the June 2007 survey are discussed below. The habitats of selected marine areas are indicated in Figure 3.2.2 *Habitat Map of Selected Marine Areas* and the habitat map of the WWTP is presented in Figure 3.2.3 *Habitat Map of WWTP site*.

Terrestrial Habitats

Improved Agricultural Grassland (GA1): The proposed site for the WWTP and the majority of the proposed pipeline routes running through fields are located in improved agricultural grassland. This grassland is species poor and is dominated by rye grass *Lolium perenne*, meadow grasses *Poa* spp., Yorkshire fog *Holcus lanatus* and white clover *Trifolium repens*. Agricultural herbaceous species such as the common sorrel *Rumex acetosa*, broad leaved dock *Rumex obtusifolius*, thistles *Cirsium arvense*, *C. vulgare* and nettles *Urtica dioica* also occur frequently within this habitat. These areas have reduced plant biodiversity. The plant community is influenced by nutrient enrichment which results primarily in a monoculture of grass species. Consequently this area is of **local importance**.

Amenity Grassland (GA2): Areas of amenity grassland are located nearby the site of the proposed Monkstown pumping station. Amenity grassland is dominated by grass species such as plantains; in particular ribwort plantain *Plantago lanceolata* and meadow grasses *Poa* spp. Broadleaf herbs are dominated by clovers *Trifolium* spp. dandelion *Taraxacum* spp and daisy *Bellis perennis*. This habitat is commonly used for recreational activities and is generally managed through frequent fertiliser application and mowing. This is a habitat of **local ecological importance**.

Hedgerows (WL1): Hedgerows are located around the field boundaries (with a field boundary located through the centre of the proposed site) and access road of the proposed WWTP site. The hedgerow located through the centre of the site appears to be planted and is dominated by hawthorn *Crataegus monogyna*. However at the northern end of this hedgerow gorse *Ulex europeaus*, bramble *Rubus fruticosus* and cleaver *Galium aparine* become more common. The hedgerow located around the boundary of the site is dominated by gorse and hawthorn with abundant bramble and nettles. Hedgerows are located nearby the pipeline routes on the nearby agricultural land areas. These habitats are dominated by hawthorn and blackthorn with species such as bramble, elder, honeysuckle, dog rose and ivy *Hedera helix* also occurring frequently. Large deciduous trees also occur occasionally on the hedgerows situated within the proposed pipeline routes. These habitats are important aspect of the Irish landscape, as well as being of value as wildlife corridors. Hedgerow habitats are of **high local ecological importance**.

Mixed Broad leaved woodland (WD1): An area of mixed broad leaved woodland is present along the southern area of Cobh, a route taken by the proposed pipeline. This area of woodland which appears to be planted is dominated by sycamore *Acer pseudoplatanus*. Ash, sessile oak and beech *Fagus* sp. also occur occasionally. The shrub layer of the woodland contains many garden escapes. This is a fragmented area of woodland, possibly planted as part of a nearby demesne. It is dominated by the non-native sycamore in addition to a shrub layer that contains many non native garden escapes. However this area of woodland may act as a wildlife corridor for mammals and a nesting area for bird species. This habitat is of **high local ecological importance**.

Treelines (WL2): Treelines are located nearby the proposed Monkstown pumping station. Tree species present within this habitat include beech, ash, horse chestnut *Aesculus hippocastanum*, sycamore and poplar *Populus* spp. Treelines are located along many of the proposed pipeline routes, both beside roadways and around field boundaries. Many of these treelines were also planted as shelter belts near dwellings. Tree species present within this habitat include beech, ash and oak, while Scots pine *Pinus sylvestris*, horse chestnut, sycamore and poplar are also common. Treelines are usually planted for aesthetic or shelter purposes. They may be of some use to birdlife for feeding and nesting. Treelines are of **local ecological importance**.

Arable crops (BC1): Fields of wheat *Triticum* spp are located to the south of the WWTP site. Other areas located nearby the proposed pipeline routes contain arable crops such as barley *Hordeum vulgare*, oats *Avena sativa* and potatoes *Solanum tuberosum*. In general these habitats are highly modified and use of herbicides ensures that plant diversity is kept to a minimum. This habitat is of **local ecological importance**.

Tilled land (BC3): An area of tilled land is located to the south of the WWTP site. This habitat is of **local ecological importance**.

Stones walls (BL1): Stone walls are located on some road and field boundaries throughout pipeline routes. The stone walls in these are generally composed of shale and sandstone that typifies the geology of this area of Ireland. The common plant species include ivy, navelwort *Umbilicus rupestris*, hedge bindweed *Calystegia sepium*, bryophytes and ferns *Asplenium* spp, *Polypodium* spp. Stone wall habitats that are not bound with mortar often contain diverse macroinvertebrate communities. These in turn are utilised as a food source by many birds and small mammals. As a result these habitats are an important food source for terrestrial animals and are of **local ecological importance**.

Artificial surfaces (BL3): The existing pumping station at Church Rd, Carrigaline is located upon artificial surfaces. Three of the proposed pumping stations are situated on artificial surfaces (the fourth, West Beach, Cobh is situated on sheltered rocky shore (LR3)). This is a habitat of low ecological value which supports little or no plant species due to consistent anthropogenic activity. Artificial surfaces are located throughout the proposed development areas and include the roadways located along and the buildings located beside the proposed pipeline routes. Most of these roadways are not vegetated. The centre of the roadway leading to the WWTP site is vegetated by meadow grasses and plantains. These areas contain little or no plant species and are therefore of **low ecological importance**.

Grassy verges (GS2): Grassy verges are present beside most of the proposed pipelines located upon roadways. These habitats are dominated by grass species such as ribwort plantain *Plantago lanceolata*, cocksfoot *Dactylis glomerata*, bent grasses *Agrostis* spp, meadow grasses *Poa* spp and hairy brome *Bromopsis ramosa*. Herbaceous species such as vetch *Vicia* spp., cow parsley *Anthriscus sylvestris*, hogweed *Heracleum sphondylium*, nettles, thistles *Cirsium* spp., black knapweed *Centaurea nigra* and foxglove *Digitalis pupurea* are common along the roadside verges of the proposed pipeline routes. Wetter roadside areas contain abundant silverweed *Potentilla anserina*. Some shrubs and tree saplings also grow within this habitat and include ash, sycamore, hawthorn, blackthorn and gorse. These habitats are generally located beside areas of intense anthropogenic use i.e. roads. However they generally support a moderately diverse assemblage of grasses and herbs due to an absence of fertilisation and repeated mowing. Like hedgerows, grassy verges may act as a corridor for wildlife present in the nearby area. This habitat is of **local ecological importance**.

Ornamental/ non native shrub (WS3): This habitat is located within garden areas that will be impacted by the proposed development works, east of the Cobh to Cork roadway R624 and opposite the dockyard area. These habitats are present in garden areas of private dwellings. Plants include *Griselinia* spp., *Escalonia* spp, fuschia *Fuschia magellanica*, Portugese laurel *Prunus lusitanica* and Lawson's cypress *Chamaecyparis lawsoniana*. This habitat contains many non native species introduced into garden and park areas for aesthetic purposes. Therefore this habitat is of **local ecological importance**.

Spoil and bare ground (ED2): Areas of spoil are located nearby two of the proposed pipeline routes near the centre of Great Island. Spoil heaps have been created through the excavation of soil to possibly facilitate the laying of a pipeline. These habitats contained little plant diversity as they were recently excavated and colonisation of ruderal species has not yet occurred. This habitat contains no plant species and is considered to be of **low ecological importance**.

Rare flora: During the field survey, the habitats were also assessed as to their potential suitability for rare plants that are listed as occurring in the *New Atlas of British and Irish Flora* (Preston *et. al.*, 2002) in grid squares W 76, W 77 and W 86. However, none of these species were recorded during the current survey and habitats recorded are generally sub-optimal for the above species.

Marine Habitats

The marine habitats present in and adjacent to the study area are described below with an assessment of their ecological value. Areas of the following habitats which are present within a pNHA are evaluated as being of national importance due to their presence within pNHAs. Habitats which are present within an SPA are evaluated as being of international importance due to their presence within SPAs. At this stage of the process, the finalised design for the WWTP and collection system is not complete and therefore the design and exact location of e.g. emergency storm outfalls is not finalised. The existing environment is described below as per the indicative design, however, it should be noted that at the final design and construction stage, that any habitats impacted within pNHAs are ecologically evaluated as being of national importance and habitats within SPAs of international importance.

Estuaries (MW4) and Sea inlets and Bays (MW2): Cork Harbour and the River Lee channel at Passage West/Monkstown is a continuum between the above habitats. The Owenboy and Monkstown Creeks are estuaries. These habitats are located nearby the existing Church Rd. and the proposed Raffeen pumping stations. The salinity of these areas is variable due to riverine inputs and tidal currents. This habitat type corresponds loosely with the EU Annex I Habitats 'Estuaries (1130) and 'Large shallow inlets and bays' (1160) and so is of **international importance**.

Infralittoral gravels and sands (SS1): This habitat is present in Cork Harbour at Haulbowline and also along the existing IDA pipeline in a moderately exposed to sheltered environment. The faunal communities here are influenced by high levels of disturbance from wave action or tidal currents and include robust fauna such as bivalve molluscs, anemones and robust polychaete worms. This habitat has links to the Annex I habitat 'Sandbanks which are slightly covered by seawater all the time' (1110) and therefore is of **international importance**.

Infralittoral muds (SS3): This habitat occurs in the river channel at Monkstown/Passage-West and consists of sandy muds and soft muds, with conditions ranging from fully marine to estuarine. The only plant or animal life recovered from this area during grab sampling were ragworms (*Hediste diversicolor*). This habitat is of **high local importance**.

Sea walls, piers and jetties (CC1): Sea walls are situated along the R610, the road leading to Monkstown and Passage West, at Rushbrook and at Cobh. This roadway is on one of the proposed pipeline routes. This habitat generally contains few species. Polypody fern *Polypodium* spp, herb robert *Geranium robertianum* and the salt tolerant grass red fescue *Festuca rubra* were recorded in sections of this habitat. This is a highly modified habitat but is of **local importance**.

Shingle and gravel shores (LS1): This habitat is present at East Beach, Cobh. This is a moderately exposed shore with accumulations of mobile rocky material. Sediments here comprise mainly shingle, gravel and shells. Coarse mobile sediments typically support little marine life other than opportunistic amphipod and isopod crustaceans and oligochete worms. This habitat is evaluated as being of **high local importance**.

Mud shore (LS4): Mud shore habitat occurs immediately south of the proposed Raffeen pumping station, at Carrigaline, at Crosshaven, to the east of the town centre on the southern shore, at Passage-West at both sides of the river and at Rushbrook and Whitepoint, both on Great Island. These mud shores are formed primarily of very fine sediment and are present along the most sheltered sections of coastline. They are subject to variable, reduced or low salinity. The mud shores were found to support communities of polychaete worms (e.g. estuary ragworm and *Nephytes spp.*). One Oligochete worm was found at the uppermost site at Carrigaline. These worms are usually present where there is significant freshwater influence. This habitat is dominated by open areas of mud and is a feeding area for estuarine birds. This habitat occurs south of the Raffeen pumping. This habitat is evaluated as being of **national and international importance** at the area south of the **Raffeen** pumping station due to being within a pNHA and SPA. At all **other sites** mud shores are evaluated as being of **high local importance**.

Sand Shore (LS2): This habitat occurs at Ringaskiddy, on the east facing beach. This is a sheltered shore of medium and fine grained sand, with a small proportion of mud. Scattered stones or shells occur on the surface. Mobile sand of the upper shore is typically impoverished of animal and plant life with the lower shore characterised by amphipod and isopod crustaceans, with some polychaete worms and bivalve mussels. This habitat is of **high local importance**.

Mixed sediment shore (LS5): This habitat occurs at Crosshaven, east of the town centre on the southern shore. It also occurs within the Owenboy estuary, to the south of the Great Island, on the eastern shore of Ringaskiddy and on the margins of Lough Beg. This habitat is a sheltered shore with poorly sorted mixes of sediments of different grades. It supports some fucoids (*Fucus serratus*), Carragheen (*Chondrus crispus*) and sea lettuce (*Ulva lactuca*). The habitat did not hold an abundance of fauna with Gammaridae, shore crabs and flat periwinkles found. This habitat is dominated by open areas of mixed substrate. Areas of this habitat are present within a pNHA and SPA along the **Owenboy Estuary** and the habitat at this site is evaluated as being of **national and international importance**. **Other sites** with mixed sediment shores are of **high local importance**.

Moderately exposed rocky shore (LR2): This habitat occurs at the eastern end of Cobh and at the east facing beach at Ringaskiddy and consisted of moderately exposed shores of bedrock, boulders and stable cobbles. These shores were dominated by communities of barnacles (*Eliminus modestus*), molluscs such as periwinkles (*Littorina spp.*), with bivalves also present. Common mussel (*Mytilus edulis*) beds occurred at Cobh. Furoid cover was incomplete at these habitats. This habitat forms shelter for a variety of marine/estuarine organisms. This habitat is of **high local importance**.

Sheltered rocky shore (LR3): Sheltered rocky shore habitat occurs at Passage West, near the bottom of the slipway at the end of a public green and at Whitepoint (at the southern tip of Great Island) and at the proposed West Beach pumping station. These habitats include sheltered to extremely sheltered rocky shores of bedrock, and stable accumulations of boulders, cobbles and pebbles. Dense growths of fucoids occurred at these sites. The sheltered rocky shores surveyed were found to contain a diverse range of macro-fauna with barnacles (*Eliminus modestus*) and keel worms (*Pomatoceros lamarcki*) especially abundant. This habitat is of **high local ecological importance**.

Mixed substrata shore (LR4): Mixed substrata shore occurs near the proposed Carrigaloe pumping station, at Crosshaven, just east of the town centre on the southern shore, at Ringaskiddy, on the north facing beach opposite Whitepoint and at Monkstown/Passage West and Carrigaloe (both sides of the river near the proposed marine crossing). The shore comprises a mixture of rock and sediment; the sediments included gravel sand and mud. These shores occurred in moderately exposed to sheltered locations. Furoid cover was incomplete at these habitats in Carrigaloe and Crosshaven. Macro-fauna at other locations included the common mussel, starfish, periwinkles and barnacles. Furoid cover was incomplete at these habitats. This habitat is of **high local importance**.

Fauna-Birds

Estuarine birds: Cork Harbour is an area of international importance for wintering waterfowl (i.e. wildfowl and waders). A wetland qualifies for international importance if it regularly holds at least 20,000 waterfowl or at least 1% of the population of a species. Of particular note is that the site supports an internationally important population of Redshank and Black-tailed Godwit. A further 15 species present in the site have populations of national importance (Crowe, 2005). The importance of Cork Harbour for wintering waterfowl (i.e. wildfowl and waders) has been recognised through the designation of sections of Cork Harbour as a SPA for birds (site code 4030) under the *EU Birds Directive (79/409/EEC)*. Sections of the Harbour are also designated as SACs and pNHAs. The SPA site synopsis for Cork Harbour is provided in *Volume III, Appendix 2A* along with a description of estuarine species occurring in the area. The bird populations of Cork Harbour are of International importance and much of the Harbour is designated as a SPA.

Inland bird populations: During the walkover study a wide range of relatively common species were noted including skylark, starling, blackbird, dunmuck, pied wagtail, jackdaw, rook, wren, robin, chaffinch, blue tit, song thrush, great tit, wood pigeon, collard dove, sparrow, stonechat, swallow, pheasant, kestrel, and song thrush. The bird populations of the proposed WWTP site and areas affected by pipelines are of local importance.

The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991 by Gibbons *et al* (1993) was used to generate a list of inland bird species of conservation concern previously recorded breeding in the study area. A list of bird species of conservation concern and the likelihood of them breeding in the areas affected by the proposed development is provided in *Volume III, Appendix 2A*. According to Birdwatch Ireland Peregrine falcons nested at a quarry located approximately 600m northwest of the proposed WWTP site in 2002. This species is listed under Annex 1 of the *EU Birds Directive* and is a species of very high conservation importance. These birds have quite large territories and may use parts of the study area for foraging.

Fauna-Mammals

Badger *Meles meles* is common in this part of County Cork. One badger sett was recorded on the west side of the hedgerow located along the eastern boundary of the proposed WWTP site (at IG W75265 63901). This sett was located away from the footprint of the proposed WWTP but within the same field. It is located within 30m of the proposed development. This sett had three entrances and was considered to be active at the time of the survey. Badger hair was found on a barbed wire fence nearby. No other setts were recorded during the survey along the pipeline routes; although it must be noted that not all areas could be viewed in detail due to land access restrictions. The badger is protected in Ireland under the *Wildlife Act (1976)* and *Wildlife (Amendment) Act (2000)* (hereafter called the *Wildlife Acts (1976 and 2000)*).

Otter *Lutra lutra* is listed in Annex II of the *EU Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and amendments)* and is protected under the *Irish Wildlife Acts (1976 and 2000)*. No otters holts or evidence of otters was found in the immediate vicinity of the proposed/existing outfall sites or foreshore pipeline routes. However, otters are present in the area and are known to forage along the affected areas of shoreline. Persistent wet weather during the current foreshore survey may have made signs of otters (i.e. spraints, footprints) difficult to detect.

All Irish Bats are protected by the *Bonn Convention (1992) (Agreement on the Conservation of Bats)*, the *Bern Convention (1982)* and the *Wildlife Acts (1976 and 2000)*. Bats are present in the area, however no roosts were identified. Due to the presence of bats in the area, hedgerows and treelines in the study area are likely to be used by bats for foraging and commuting.

Other protected species likely to be present in the study area are hedgehog *Erinaceus europaeus*, pygmy shrew *Sorex minutus*, and Irish hare *Lepus timidus hibernicus*. These species are protected under the *Wildlife Acts (1976 and 2000)*. No direct observations or evidence was observed, however suitable habitat for these species is present within the study area.

Cork Harbour is known to contain both resident and vagrant populations of common dolphins *Delphinus delphis*. The Annex II listed Harbour porpoise *Phocoena phocoena* and bottlenose dolphin *Tursiops truncatus* have also been recorded in Cork Harbour as well as common, striped and Risso's dolphin and killer whales (IWDG, pers. comm.). Seals have been observed in Cork Harbour (Ecofact, unpublished) and reference has been made to the presence of both Harbour and grey seals occurring here in the scientific literature (e.g. Smiddy, 1998). *Volume III, Appendix 2A* lists details of protected mammals which occur within the 10km grids of the study area.

Fauna-Reptiles and Terrestrial Invertebrates

Two reptile species occur in Ireland; the viviparous lizard *Lacerta vivipara* and the slow worm *Anguis fragilis*. The viviparous lizard occurs in County Cork, however, no direct observations were made but suitable habitat occurs in the study area and this species may be present. Terrestrial invertebrates in general are an understudied group. However, it is likely that the invertebrate populations present within the proposed development area are typical of Irish farmland and urban areas. It is unlikely that any rare species occur due to the generally highly modified nature of the habitats present.

Fauna-Crustaceans

Crustaceans: Arthropods are the most numerous animal group. Arthropods have an external skeleton and paired, jointed limbs. Phylum Arthropoda includes crustaceans, insects and spiders. Crustaceans include crabs, lobsters, shrimp, krill and barnacles (Hayward and Ryland, 2005). From the sampling of 23 sites along the intertidal part of the shore in Cork Harbour, a total of 7 species of crustacean were recorded. Only 2 species were recorded from core sampling; the mud shrimp *Corophium volutator* was found at the upper site on the Owenboy Estuary (C1) at Carrigaline and also at Cobh (C8) while the green shore crab *Carcinus maenas* was found at the lower site on the Owenboy Estuary (C3). The small numbers of crustaceans recorded by core sampling was expected due to the nature of this sampling technique i.e. sampling to depths on mudflats where crustaceans cannot live.

In the quadrat sampling, crustaceans were recorded at all sites with the exception of the barren site (Q13) at Cobh. Where there was suitable habitat such as rocks and boulders, barnacles were present in their hundreds. *Elminius modestus* was well distributed (found at 9 sites) and was the dominant sedentary crustacean species. *Semibalanus balanoides* was found at two sites on the western channel; Q4 at Ringaskiddy and Q6 at Monkstown. Also recorded at sites adjacent to these was *Balanus crenatus*, as well as at Site Q11 on Great Island south of the ferry crossing. The habitats where barnacles were recorded were 'Moderately exposed rocky shore' (LR2) and 'Mixed substrata shore' (LR4). The ubiquitous green shore crab was generally common throughout the intertidal area and the highest densities were recorded at Sites 7 (38/m²) and 9 (28/m²) on the Monkstown/Passage West side of the channel, and at Sites 14 (24/m²) and 15 (28/m²) at the eastern end of Cobh town on Great Island. The preferred habitat for the crab was 'Mixed substrata shore' (LR4), 'Sheltered rocky shore (LR3)' and 'Moderately exposed rocky shore' (LR2). Through macroalgae, stones and other invertebrates, these habitats offer refuge and feeding opportunities to these scavengers.

The freshwater shrimp *Gammarus deubeni* was recorded at 4 sites and was most common at Site 14 in Cobh. It was sparsely distributed around other parts of the Harbour, occurring at Passage West and Ringaskiddy. Fair numbers of mud shrimp were recorded at the eastern side of the channel at Site Q11. Another gammarid, *Chaetogammarus marinus* was present on 'Mixed Sediment shore' at Crosshaven. This species was only found at this site.

Crustacean food supply is probably the most important factor in determining the distribution of fish. Some fish, such as flounder fish feed on benthic infauna. For example, the flounder consumes *Corophium*, snails such as *Hydrobia* and some bivalve species and is generally found where these dominate the benthos. Bass specializes on the shrimp *Crangon* and mysids while whiting feeds on *Crangon*, mysids, amphipods and cumaceans (Henderson *et al*, 1992). In winter, most crustaceans migrate out to deeper water; so generally, numbers are higher in estuaries in summer.

Fish and Fisheries

The majority of fish found in estuaries feed primarily on the benthos (organisms living on or at the bottom of a body of water). Estuarine opportunist species typically enter estuaries from the sea for a period each year, but do not stay there permanently. The majority drift into estuaries as larvae from eggs spawned in coastal waters and as young fish they take advantage of the rich benthic food sources of the Harbour. The Harbour is therefore deemed important as a nursery ground for juvenile fish before they return to the sea as recruits to their adult population. Adult mullet were seen grazing on algal films from the soft substrata at the Owenboy estuary and also on the River Lee western passage near Cobh during the current survey.

A marine fisheries survey of Cork Harbour was undertaken by the Central Fisheries Board during 2001 (King, 2002). A total of 33 sites were examined over a five-day period. No specimens of the Annex II listed juvenile twaite shad (*Allosa fallax*) or lamprey species were recorded during the assessment. The most commonly encountered groups were juvenile sprat/herring, flounder, gobies, mullet, sand smelt and the 15-spined stickleback. The highest species diversity was found in the Lower Harbour area. A total of 13 species were taken at the north most point of Ringaskiddy, directly south of Haulbowline. As well as the commonly recorded species, this site yielded two species of pipefish, two wrasse species, blenny, bullhead and butterfish. Species diversity was also higher at the stations at Rushbrook, Cuskinny Beach and the slipway at Crosshaven.

Cork Harbour is also used by a number of anadromous and catadromous fish species migrating to and from rivers which flow into the Harbour. Species important in this respect are Atlantic salmon, river lamprey and sea lamprey (anadromous) and the European eel (catadromous). The main river of fisheries importance flowing into Cork Harbour is the River Lee which is known to contain all of these species (O'Halloran *et al*, 1998). Table 3.2.4 list the fish species expected to occur in areas which may be affected by the proposed development.

Table 3.2.4: Fish species expected in areas affected by the proposed development.

Location	Fish species expected to be present
Crosshaven.	Flounder, mullet, electric ray, eel, common goby, plaice, Pollack, mackerel, garfish, wrasse, bull huss, bass, salmon, sea trout, sea lamprey, river lamprey.
River Lee West Channel (Ringaskiddy, Monkstown, Cobh)	Pipefish, wrasse species, blenny, bullhead and butterfish, sprat/herring, flounder, common goby, sand goby, mullet, sand smelt, 15-spined stickleback, scad, pipefish, bull huss, coalfish, bass, mackerel, turbot, electric ray blonde ray, homelyn ray, thornback ray, grey mullet, conger, plaice, dab, rockling, whiting codling, dogfish, eel, sea lamprey, river lamprey, salmon, sea trout.
Owenboy River Estuary	Mullet, flounder, salmon, sea trout, eel, stickleback, sea lamprey, river lamprey

Adapted from Dunlop and Green (1992) on SWRFB website www.swrfb.com

Shellfish

Cork Harbour is a shellfish production area (Code CK-CH). This area lies north of a point from Roberts Head (coordinates -8.30375 51.74379) to Roches Point (coordinates -8.25113 51.79285) up to and including the mean high water mark. In Ireland the main bivalve species are mussels, native and pacific oysters, razorfish, scallops, clams and cockles. Shellfish areas are classified by the microbiological quality of the water. Areas are assigned a classification of A, B or C by the DAFF based on microbiological monitoring. Table 3.2.5 *Designated Bivalve Mollusc Production Areas in Ireland (October, 2005)* lists the shellfish production areas in Cork Harbour based on information contained on the FSAI (Food Safety Authority of Ireland) website.

Table 3.2.5: Designated Bivalve Mollusc Production Areas in Ireland, (October 2005)

I	II	III	IV	V	VI
Production Area	Boundaries	Bed Name	Species	Previous Classification	Current Classification
Cork Harbour	Between 8°16.4' W and 8° 15.6' W.	North Channel West	Oysters	B	B
Cork Harbour	Between 8°14.6' W and 8°13.2' W.	North Channel East	Oysters	B	B
Cork Harbour	Aghada Pier to Gold Point	Rostellan	Oysters	B	B

Figure 3.2.5 *Sites with oyster aquaculture licences and oyster order sites in Cork Harbour* illustrates the location of shellfish production areas.

Water quality

The EPA undertakes an annual survey of the water quality of estuaries and near shore coastal waters. In the latest *Water Quality in Ireland 2005* report, which covers the period 2001-2005, a total of 10 estuaries or less than 15% of those waters surveyed were classified as eutrophic. The most recent information available rates the estuarine and coastal water quality for Cork Harbour in the period 2001-2005 as being 'Intermediate' (EPA's *Estuarine and Coastal Water Quality 2001-2005 Map*).

The Intermediate status of water quality in Cork Harbour is reflected by growths of *Enteromorpha* and *Ulva*. These arise from high concentrations of nutrients such as nitrates and phosphates. Currently, there are active raw sewage outfalls at Carrigaline/Crosshaven, Passage West, Glenbrook, Monkstown, Ringaskiddy village and Cobh. A hydrodynamic model and EIA conducted by O' Kane and Barry (2007) found that for the year 2010, the untreated discharge from the Cork Lower Harbour area will be contributing a concentration of 1500fc/ml to parts of Passage West, Cobh, and Ringaskiddy shores.

3.2.4 Impact Assessment

(i) Construction Phase Impacts

WWTP Site

Flora and Habitats

Improved agricultural grassland habitats will be permanently lost at the site of the proposed WWTP. This habitat is of low conservation importance and the loss of this habitat is not of ecological significance. Site development and boundary treatments will result in the permanent loss of hedgerows within and on the margins of the site. Loss of all of these hedgerows would be of imperceptible negative impact in a local context.

Fauna-Terrestrial

The machinery and noise associated with construction could have a short-term negative impact upon terrestrial mammals such as badgers. Disturbance to the sett (located within 30m of the WWTP site) during construction would be a short-term significant negative impact for the badger social group involved. However, with appropriate mitigation measures this sett could be fully protected during the construction phase of the proposed development.

No known bat roosts will be affected by the proposed development. However, some trees along the pipeline route may be used to some degree by bats. With the mitigation measures proposed (i.e. checking any trees to be felled for bats) no direct negative impact on bats would occur, although there will be a negative impact on bats due to loss of habitat.

According to Birdwatch Ireland Peregrine falcons nested at a quarry located approximately 600m northwest of the proposed WWTP site in 2002. However, no potential nest sites or important areas for this species would be in any way affected by any aspect of the proposed development.

Collection System

Flora and Habitats

Hedgerow habitats (refer to Figure 3.2.3 *Habitat Map of WWTP Site*) and stonewall habitats will be temporarily disturbed during the construction phase of the development at locations where the pipeline passes and/or runs along field boundaries. Sections of hedgerow habitats may be permanently disturbed during the widening of the access road into the site. Where possible, stone walls will be reinstated following the installation of the sewer network and hedgerows re-planted. Impacts on these habitats would be considered as minor negative impacts. Disturbance of hedgerows, particularly with mature trees, would be of slight to moderate negative significance, where such disturbance results in either direct habitat loss through hedgerow removal, or indirect effects such as dieback through severance or restriction of tree roots.

The route of the proposed pipeline network is mainly restricted to the existing road infrastructure. The impacts associated with the laying of the sewer network in these locations will be negligible. This habitat type is of no ecological interest. Therefore, the general potential impact on flora is rated as imperceptible negative. However, the installation of pipelines along the existing road network could also have impacts on the adjacent habitats that fauna use due to contaminated runoff and potential damage e.g. to the roots of hedgerows and tree lines. Birds nesting in hedgerows could be disturbed and their young left abandoned. However, with the mitigation measures proposed this should not occur.

The disturbance of improved agricultural grassland, arable and horticultural land, artificial surfaces and drainage ditches along the pipeline network is of imperceptible negative impact, as these are all modified habitat types. Discharge into a designated area via drainage ditches could potentially occur on the pipeline route located in agricultural land to the south of the Owenboy Estuary pNHA.

Fauna-Marine animals

A pipeline is proposed to run along a section of the foreshore at the Owenboy River (within the Owenboy River pNHA and Cork Harbour SPA). Excavation of the foreshore will result in the disruption of macrofaunal communities in this area. However the extent of the area is relatively limited and disturbance to the foreshore area will be reduced as far as possible. Works associated with the installation of this section of pipeline could result in significant habitat loss and increase the risk for suspended solids laden runoff. This would result in a substantial negative impact.

It is predicted that there will be a short term increase in the turbidity of the water column as increased suspended solids enter the water column. However, the pipeline in the Owenboy River will be placed along the upper shore, thereby reducing the level of suspended solids (due to decreased flushing from high tides). An increase in turbidity could result in increased siltation, smothering of organisms and a reduction of light for phytoplankton over the construction period. High levels of suspended solids settling on the estuary bed could potentially alter habitats resulting in a potential loss of feeding and spawning grounds. Mobile species may move away from unfavourable conditions, however sessile, benthic fauna may be smothered and lost. However, estuarine habitats have very high natural levels of suspended solids so this impact is likely to be negligible with suitable mitigation. Moreover, the benthic faunal community in affected areas such as the Owenboy River is considered to be a very tolerant one.

Other types of animals may also be affected by increased suspended-sediment concentrations. An increased flux of sediment settling on the bed is likely to affect animals that feed on deposited sediment. Lower water clarity may affect the quantity, type and depth to which bottom-living microscopic algae and seaweeds can grow, thus affecting feeding and distributions of grazers such as limpets. Lower water clarity may also affect feeding abilities of visual fish feeders such as mullet. However, it must be noted that no macroinvertebrate grazers were recorded in the Owenboy River in the current survey and the community identified would be very tolerant to increased suspended solids levels. Mullet were recorded in the Owenboy River at Carrigaline and probably occur throughout the estuary, but their ability to relocate with ease would decrease the chances of a decline in their status. Any suspended solids released during the construction phase of the current project would also be short-term in nature and this would also reduce the potential for significant effects.

The machinery and noise associated with construction could have a short-term negative impact upon mammals such as otters and perhaps seals using the shoreline. Construction activity will be responsible for an increase in the noise levels in the water near all areas under construction.

Marine Crossing

Fauna-Marine Animals

The single largest marine construction is the installation of the marine crossing across the River Lee west passage. It is envisaged that the marine crossing will be tunnelled or laid by open cut techniques. The open cut technique is considered to have more potential environmental impacts associated with it and so impacts associated with the open cut technique are considered in this section. With the open cut technique, the pipelines will be laid below the river bed and backfilled to the original river bed profile. It is likely that the pipes will be encased in concrete for protection in shallower sections. Temporary anchors may be installed in the river bed in order to place the pipeline correctly. The disturbed area would be protected so as to reduce potential bed erosion by tidal movements during construction.

It is not envisaged at this stage that the construction of the marine crossing will involve particularly invasive underwater construction works such as blasting and so significant impacts on dolphins, porpoises and other marine mammals are not expected. This area is already continually disturbed as a result of the existing ferry moving back and forward at this location.

Localised sediment plumes may present a small level of habitat disturbance to seals foraging in the River Lee west channel while installing the marine pipeline but is not considered to be significant as areas nearby will remain unaffected. It is most likely that any effects of the proposed excavation work at the marine crossing on seals will have a temporary minor negative impact on seals and other marine mammals. As such, these communities would be acclimatised to episodic increases in turbidity levels associated with living in estuarine conditions.

Limpets, a keystone species are not present at the proposed crossing and populations to the south are not expected to be affected. The activities associated with the open cut technique would result in the disruption and removal of parts of the mussel beds and starfish colony in the vicinity, which would be a moderate negative impact for these species. However, the impacts on mussels, starfish and other fauna would be more than compensated for by the cleaner conditions brought about by the proposed development.

Benthic excavation activity can result in damage to the biological environment but a relatively small area of the River Lee west channel would be disturbed. The disturbed area would be protected so as to reduce potential bed erosion by tidal movements during construction. Since the substrate will not undergo any major changes, no change in the redox potential discontinuity (RPD) depth, and therefore no consequences for the infauna outside the construction area are envisaged. In addition, the dominant infauna of the mudflats (ragworms) are versatile creatures and could cope with minor environmental changes. With the placement of anchoring devices, flows could be impeded and oxygen availability to fauna nearby reduced but considering the relative size of the proposed devices and flow rates in the channel this is not expected to be a significant impact. It can be concluded that due to the adaptability of the organisms present in this area and the flow regimes in the channel, at most minor negative impacts are envisaged from this part of the scheme.

Should the tunnelling option be used rather than the open cut technique for the marine crossing, the impacts on the marine ecology will be significantly reduced as there will be no interface between the tunnelling environment and the marine environment other than minimal vibrations. These would not be considered to have a significant impact on the marine ecology.

Fauna-Birds

Impacts on the foreshore of the Owenboy River could reduce the foraging areas for wintering birds and have an impact on the local macrofaunal community in this area. Construction works near the shore area could deter birds from using the affected areas due to physical intrusion and indirect effects such as noise. However these impacts can generally be avoided with careful site management and appropriate timing of the proposed works (these points are described in Section 3.5.2 *Mitigation Measures*). The pipeline in the Owenboy River will run along the upper shoreline near the existing road and this area is already disturbed and would not be used extensively by birds. With the mitigation measures proposed the lower shore should not be directly or permanently affected.

One of the pipelines associated with the scheme will also run along the road bordering the Monkstown Creek pNHA (included in Cork Harbour SPA). Noise, disturbance and runoff from these areas could also have significant impacts in the absence of mitigation. However again, the road corridor is already disturbed and all the significant potential impacts can be mitigated.

Water Quality

The road network where the proposed pipelines will be installed is mainly older road, which does not have the pollution control of the modern highway systems currently being built in Ireland under the strict NRA environmental guidelines (NRA, 2005) e.g. interception of run-off prior to entering the sewer system. Water and other substances which find their way onto these roads would run untreated into the nearest drain/stream or river. Machinery working on the road during the excavation, laying, backfilling and installation of the pipeline has the potential to produce pollutants both directly (i.e. leaking fuels, oils etc.) and indirectly as a result of the construction work (i.e. suspended solids, leached pollutants etc.).

During the construction phase, pollutants and chemicals used could contaminate the area. Potential contamination of sediments and marine flora/fauna from the accidental release of organic polymers or heavy metals associated with cementing and/or grouting materials from the foundations may occur. These materials are toxic to marine organisms in sufficient quantities and in the event of an accidental release; it could potentially contaminate the estuarine sediments adjacent to the development, inhibiting recolonisation of the area after construction. However, with the mitigation measures proposed potential impacts would be reduced to imperceptible.

The following sources of pollution are included on the Scottish Environmental Protection Agency (SEPA, 1996) list of the main sources of pollution from construction sites:

- The discharge or entry into waters of contaminated site run-off or pumped contaminated surface/ground waters
- Loss of oil from machinery or storage areas
- Cement and cement wash from batching plants, storage areas and other areas where cement grout or concrete is being applied
- Silty water arising from exposed ground, stockpiles of soil, plant and wheel washing, and site roads

In the absence of suitable mitigation, all the above impacts could occur during the construction of the proposed scheme.

(ii) Operational Phase Impacts

WWTP

Fauna-Mammals

There is a possibility that the long-term operation of the WWTP could cause further disturbance to local mammal communities such as badgers due to an increase in human activity. However, disturbance is anticipated to be minimal and mammal species using the areas around the WWTP can be expected to continue to do so during the operational phase. Any significant maintenance works on the scheme (including pipeline network) will be preceded by further consultation with NPWS, where impacts on habitats or species subject to legal protection are predicted to occur.

Fauna-Invertebrates

Current nutrient inputs by foul water outfalls into the affected aquatic areas would be significantly reduced during the operation of the proposed scheme. Such inputs result in increased primary production and turbidity, indirectly suppressing filter feeder activity. Phytoplankton blooms are expected to be less frequent with the expected reduction in nutrient loading due to the proposed development and restrictions on the edibility of shellfish would ease considerably due to the reduction in associated biotoxins. Water quality around the shorelines within the Harbour and along the Owenboy Estuary is expected to improve, encouraging an increase in diversity of infauna (polychaete worms, bivalves, etc.) and epifauna (crabs, crustaceans, snails, etc.). A reason for this increase in diversity is that algal mats would be less frequent and associated anoxic conditions would be deeper than is currently the case. This would influence the macroinvertebrate population by allowing animals to penetrate deeper into sediments – increasing the available habitats three dimensionally. This would also allow for greater biomass and diversity and would be expected to offset any loss of diversity as a result of reduced nutrient inputs. For example, a reduction in ragworm densities would not be a negative impact for feeding birds on mudflats because ragworms would be replaced by other species such as lugworms and catworms.

Water Quality

An accidental release of untreated effluent may affect water quality in the receiving water to which the outfall is discharging. This may result in temporary but significant eutrophication of the water and harmful algal blooms may occur. These harmful algal blooms can cause fish kills, contaminate seafood with toxins, pose a direct risk to human health, or otherwise alter ecosystems in ways that are perceived as harmful. The magnitude of the effect would depend on a variety of factors including the components of such a discharge, the dispersion of these components (related to currents) and the length of time between the operation of the proposed development and a pollution episode (diversity of the aquatic community would be expected to increase with time following operation of the proposed development). However, the risk of such a large scale eutrophication event occurring is extremely low in a modern well managed plant as is proposed. The proposed WWTP will require a discharge licence from the EPA, under the *Waste Water Discharge (Authorisation) Regulations 2007*, which will ensure the protection of human, animal and plant life. In addition, the large size of Cork Harbour along with tidal currents would mean that the receiving waters would have a high resilience to such unlikely events.

The potential impact on the receiving waters from emergency overflows from the Carrigaloe, Monkstown and Raffeen pumping stations is likely to be more negative than the current situation. Overflow discharges at these pumping stations will include the waste water from Cobh, and from Passage West in the case of the pumping stations at Monkstown and Raffeen. However, the normal operating quality of the proposed discharge into Cork Harbour will be much improved from the existing discharges it would replace. This would result in a long-term moderate beneficial impact for Cork Harbour and its associated flora and fauna communities. The reduction in nutrient inputs into the Harbour during the operational phase of the scheme would lead to a decrease in algal mats and *Enteromorpha* plants which thrive on high nutrient loading. This would be a moderate positive impact.

The ecosystem around the outfall would continue to change until a sustainable balance is eventually reached where organisms suited to the new environmental conditions would thrive. The maintenance of this balance would be dependent on a generally unchanging environment such as the one that the proposed discharge would provide. The diversity of organisms would be expected to increase with distance from the proposed outfall.

The value of Cork Harbour as nursery for young fish would increase with improved water quality and the consequences of this would extend beyond the mouth of the Harbour, with increased recruitment to the open sea. Adult mullet would not be as concentrated around previously present outfalls. However, this is considered to be a neutral impact. The reduction of nutrients into the affected aquatic areas would improve water quality, habitats and diversity, and consequently add to the conservation status of Cork Harbour SPA, Owenboy River pNHA and Monkstown Creek pNHA.

Hydrodynamic modelling conducted as part of the engineering design for the proposed development predicted that the concentration of faecal coliforms in effluent from the Lower Harbour catchment area will be significantly reduced (80 to 95% reduction on the current scenario). In addition the hydrodynamic modelling identified that the concentration of *Norovirus* in the Harbour and outside Roche's point (from the Lower Harbour catchment area) would be reduced by 90-95% compared to the existing scenario. Additionally, the study showed that the proposed scheme may reduce considerably the forcing on primary production in Lough Mahon and in the North Channel behind Great Island as a result of decreased levels of organic nitrogen, nitrate and ammonia. The study also predicted a relative decrease in primary production in the outer Harbour, with the possible exception of the immediate vicinity of the diffuser, to be located inside the mouth of the Harbour. This improvement in water quality will have a long-term moderate and positive impact on marine flora and fauna in Cork Lower Harbour.

Collection System

Flora and Habitats

The scheme has been designed to ensure that minimum maintenance of the collection system will be required. Any such maintenance works would be preceded by further consultation with NPWS where impacts on habitats or species subject to legal protection are predicted to occur.

(iii) 'Do Nothing' Impact

The 'do nothing' impact would result in continued discharging of untreated effluent into Cork Lower Harbour. The provision of a modern WWTP in this region is expected to result in moderate significant benefits for water quality in Cork Lower Harbour compared with the "do nothing scenario".

(iv) 'Worst Case Scenario' Impact

In the worst-case scenario (i.e. a failure of the mitigation measures proposed) habitat loss, pollution and disturbance of avifauna in pNHA/SPA areas could occur. However, such worst-case scenario impacts are considered unlikely and would at worst affect only a small area of these sites. During the operational phase a worst case impact would be an accidental release of untreated effluent from the WWTP or the emergency discharge of storm water at the pumping stations. This would affect water quality in the receiving water to which the outfall is discharging. However, the risk of such an event occurring is extremely low in a modern well managed plant as is proposed. The large size of Cork Harbour along with tidal currents would mean that the receiving waters would have a high resilience to such unlikely events. It should be noted that the risk of such an event happening with the proposed WWTP scheme would be much lower than is currently the case. Indeed, at present untreated raw sewage is being released into the Harbour.