Drainage Scheme. Water quality parameters generally exhibit a gradient, with concentrations of BOD, nutrients, bacteria, and various contaminants decreasing in water, sediment, and biota from the upper harbour to the mouth (ERU 1989). This pattern is a further indication that the major sources of nutrients and contaminants are located in the upper harbour and that dilution and dispersion act to decrease concentrations with increasing distance from Cork City.

The waters of the lower harbour are generally well mixed as is evidenced by the similarity in water quality between the surface, mid and bottom waters. However, during the autumn survey carried out as part of the Cork Main Drainage Scheme, a freshwater wedge was noted overlaying a saltwater ridge from the Waterworks Weir as far as Blackrock Castle, with the wedge giving way to well mixed water at Marino Point. The effects of the freshwater was seen to extend as far as Marino Point during the corresponding spring survey with good mixing occurring at Black Point. This is attributed to the higher river flows in the spring time and consequently the zone of influence of the freshwater can be expected to extend further downstream.

The effects of the freshwater/saline water wedges can be seen clearly when parameters such as BOD, DO, etc. are studied. It is clearly seen at any given location where the wedge occurs that the freshwater is more heavily polluted with higher BOD levels being recorded in the upper layers corresponding to lower salinity levels, while BOD levels decrease with depth as the salinity increases. This indicates a definite distinction between the freshwater inputs polluted by agricultural run-off and wastewater discharges, etc. and the cleaner coastal saline waters.

Seasonal variation in water quality in Cork Harbour occurs primarily as a result of changes in river flow. During periods of low flow, dilution and dispersion of waste inputs are diminished, particularly in the upper estuary where the current urban wastewater outfalls are located.

While long-term trends in the water quality of Cork Harbour are difficult to establish (based on available data) a comparison of survey results from the early 1970's to the present appears to indicate that the levels of nitrate and ammonia have increased throughout the harbour, with the most significant increases being in the Upper Harbour Area. Levels of organic matter (as indicated by BOD measurements) and the degree of deoxygenation also appear to have increased in the same period, particularly in the Lough Mahon area (Appendix I).

5.5 Climate and Air Quality

5.5.1 Climate

Maximum daily average air temperatures in the vicinity of Cork Harbour are approximately 10.5°C. Sea breezes created by differential heating of air over land and water during these conditions would tend to prevent air stagnation in Cork Harbour (Bailey 1992 - Appendix 4).

The prevailing wind direction in the harbour is from the northwest (occurring approx. 32% of the time). Southwesterly winds occur during 30.5% of the year, generally during the summer when coastal breezes develop during warm, calm weather conditions. This air flow would normally reverse during the cooler night-time conditions (Bailey 1992). Periods of calm or low wind speeds (<2m/s) occur about 10% of the time in Cork Harbour.

Poor air dispersion due to calm or light winds is also indicated by the presence of mist or fog, which was recorded in Cork Harbour 9.8% of the time between 1960 and 1984. The highest incidence of mist or fog occurred during the early morning and the lowest during the afternoon (Bailey 1992).

5.5.2 Air Quality

Ambient air quality in upper Cork Harbour generally is good. Chemical and pharmaceutical manufacturing facilities located in the industrial estates on Little Island have relatively small industrial emissions. However, the Irish Fertiliser Industries plant at Marino Point, located approximately 1km southeast of the Carrigrenan site, is a significant emission source of ammonia, which may be detected in the vicinity of Passage West and Lower Lough Mahon (Bailey 1992).

Background levels of five common air pollutants (carbon monoxide, nitrogen oxides, hydrocarbons, sulphur dioxide, lead) measured at Mahon during August 1991 were well below health protection criteria established by the European Community and the World IHealth Organisation. However, smoke levels measured at Ringmahon House monitoring station from 1988 to 1990 occasionally approached the EC Directive limit (Cork Corporation 1991).

5.5.3 Noise

Noise is generally defined as sound with an intensity greater than the ambient or background sound pressure level (SPL). SPL is determined by measuring the noise emissions in terms of sound pressure in a relationship defined as a decibel (dB). The type of decibel unit commonly used in sound level measurements is the A-weighted decibel dB(A). This scale is almost universally used to describe environmental noise because it simulates the variation with frequency through the audible range of the sensitivity to sound of the typically healthy human ear (Cunniff 1977, Kryter 1970, May 1978).

Outdoor noise levels change continually because of the temporal and spatial variations of noise sources. The temporal variation in the resulting sound levels is described by statistical levels in the form L_x, where L_x designates a sound that exceeds the level L for x percent of the sampling duration, or by equivalent sound levels in the form L_{eq}, defined as the stationary (constant) level with the same acoustic energy as the actual time-varying sound level over the given sampling period.

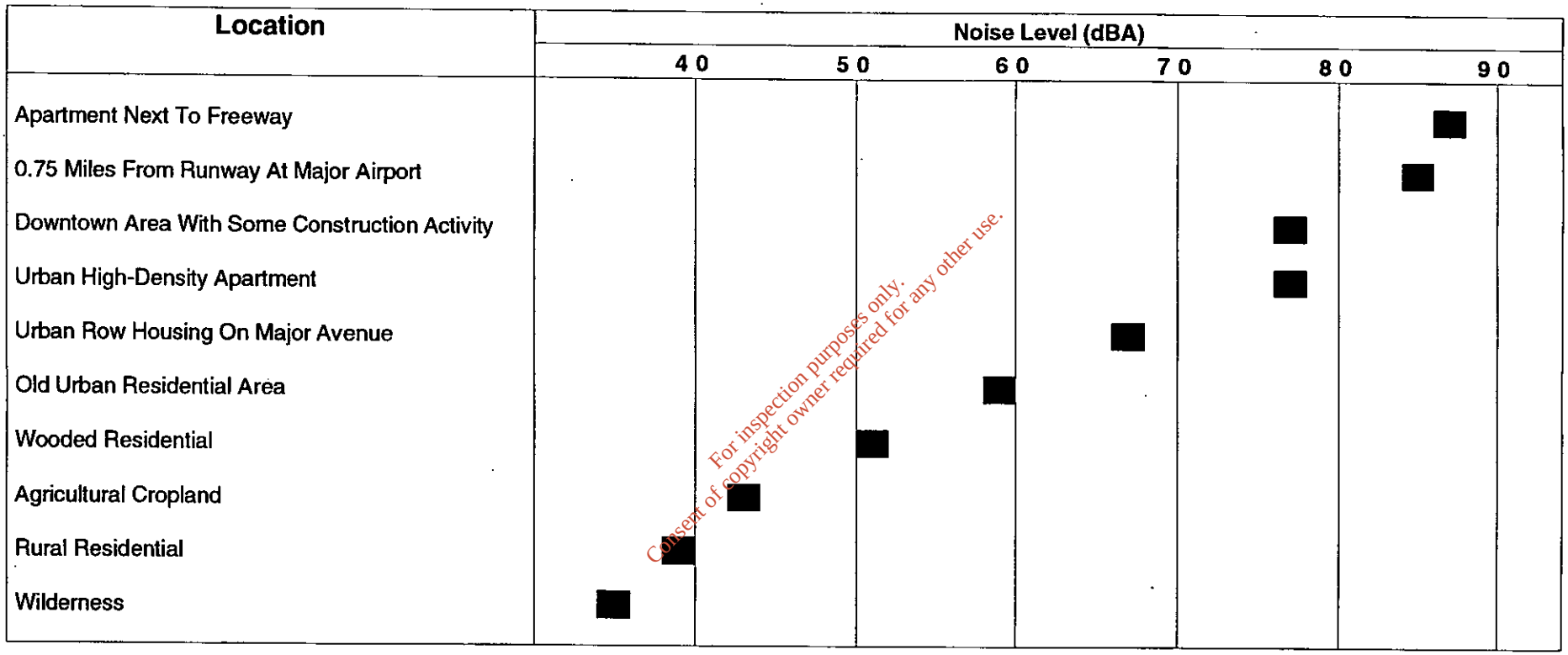
Areas that will be traversed by the proposed collection sewers include urban, commercial, industrial, and rural residential lands. Typical outdoor sound levels for these areas are shown in Fig. 5.5.1. As the figure indicates, ambient sound levels in the land uses that will be affected by construction of the sewers range from 38 dBA in rural residential areas to 79 dBA in heavily urbanised areas.

The proposed treatment plant site is located on pastureland; adjacent and nearby land uses include rural residential, light industrial, and recreational golf courses. The nearest noise-sensitive areas to the proposed treatment plant site are residences located approximately 200m from the nearest treatment plant unit. In addition, golfers on the golf course to the north of the site would be considered temporary noise-sensitive receptors as they would only be present during daylight hours.

Noise measurements were conducted at the nearest residence to the proposed treatment plant site at Carrigrenan on17th.-18th. December 1992 and 21st.-22nd. December 1992. The wind speed was stronger than that acceptable for noise measurements during most of the first 11 or 12 measurement hours on Thursday 17th December. The recorded values were therefore not taken into consideration. The measurement microphone was approx. 1.5m above ground level at 12m from the front of the residence. An integrating sound level meter, Cirrus model type

Figure 5.5.1

Outdoor Day-Night Average Sound Levels at Various Locations



Source : USEPA 1978

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CRL 702 (serial No. 16487), an outdoor microphone, type MK425, and sound level calibrator, type SIID, were used for the measurements. Values of the Leq for the day (07h-20h), intermediate period (6-7h, 20-22h) and night 22h-06h) are shown on Table 5.5.1 for the 24 hour period starting at 10h on 21.12.'92. These time-averaged measurements indicate background noise levels (leq) of 45.0 dBA during the day and 39.3 dBA during the night. Fig No.s 5.5.2 and 5.5.3 present the calculated hourly values of the Leq, L1, L10, and L95 for the period of measurement. Plots of the Leq are shown on Fig. No.s 5.5.2 and 5.5.3 for the period of measurement on the 17-18 December '92 and 21-22 December 92 respectively.

Table 5.5.1

Noise Measurements (Leq) at the nearest noise sensitive receptor to the Treatment Plant Site at Carrigrenan

Period	Leq (dBA)
Day (0700-2000)	45.0
Intermediate (0600 - 0700 2000 - 2200)	40.2
Night (2200-0600)	39.3

Source: Department of Civil and Environmental Engineering, University College, Cork, 1992.

TABLE 5.5.2

Calculated Hourly Noise Values (dBA) from Baseline Noise Measurements (17/18 December '92)

Period	Leq	s	L1	L10	L95
1h 00mn	48.8	2.9	56.0	51.1	44.0
2h 00mn	48.4	3.2	56.5	50.4	43.7
3h 00mn	48.6	2.9	56.5	50.7	44.0
4h 00mn	51.6	3.5	61.5	53.1	46.5
5h 00mn	52.1	3.7	60.8	54.1	46.1
6h 0mn	49.9	3.7	59.8	51.7	44.3
7h 00mn	50.4	2.9	57.6	52.6	45.1
8h 00mn	52.0	3.2	60.3	54.5	46.8
9h 00mn	52.5	3.6	60.9	54.7	46.4
10h 00mn	49.1	3.9	57.7	51.4	42.2
11h 00mn	43.0	5.7	52.9	44.3	35.6
12h 00mn	56.9	20.5	71.9	39.4	35.6
13h 00mn	39.3	4.1	51.3	35.6	35.6
14h 00mn	36.9	1.6	35.8	35.6	35.6
15h 00mn	35.9	0.8	36.2	35.6	35.6
16h 00mn	38.5	3.0	35.7	35.6	35.6
17h 00mn	35.7	0.5	37.1	35.6	35.6
18h 00mn	38.4	2.9	37.4	35.6	35.6
19h 00mn	35.6	0.2	35.6	35.6	35.6
Overall	**49.5 dBA**				

Source: Department of Civil and Environmental Engineering, University College, Cork 1992

Table 5.5.3

Calculated Hourly Noise Values (dBA) from Baseline Noise Measurements - (21/22 December '92)

Period	Leq	s	L1	L10	L95
11h 04mn	39.3	3.7	46.6	38.3	35.6
12h 04mn	36.5	1.2	39.1	35.7	35.6
13h 04mn	41.5	6.0	52.7	36.5	35.6
14h 04mn	44.1	8.5	52.2	35.7	35.6
15h 04mn	44.7	8.8	59.6	38.2	35.6
16h 05mn	43.7	8.0	58.6	37.2	35.6
17h 04mn	43.4	7.7	55.4	35.7	35.6
18h 04mn	49.7	13.5	64.4	38.2	35.6
19h 04mn	44.1	8.4	56.4	36.4	35.6
20h 04mn	42.7	7.0	54.9	38.6	35.6
21h 04mn	40.9	5.4	53.0	36.0	35.6
22h 04mn	41.4	5.8	51.6	35.8	35.6
23h 04mn	38.5	3.1	39.7	35.6	35.6
0h 04mn	36.6	1.5	41.3	35.6	35.6
1h 04mn	38.6	3.2	35.8	35.6	35.6
2h 04mn	35.6	0.1	35.7	35.6	35.6
3h 04mn	40.5	5.0	43.0	35.6	35.6
4h 04mn	38.2	2.9	40.1	35.6	35.6
5h 04mn	40.0	4.5	44.8	35.6	35.6
6h 04mn	36.7	1.7	41.5	35.6	35.6
7h 04mn	43.8	8.0	55.7	38.2	35.6
8h 04mn	46.4	10.0	59.4	44.1	35.6
Overall;	**42.8**	**dBA**			

Source Department of of Civil and Environmental Engineering, University College Cork 1992.

No. of channels: 1
No. of Leqs: 43229
Elementary duration: 2 s
start: 10h 04mn01s 21/12/1992
end: 10h 04mn59s 22/12/1992
Channel 1: Civ. Eng.Dept,UCC dBA min: 35 max: 95.
Code 3: Pause

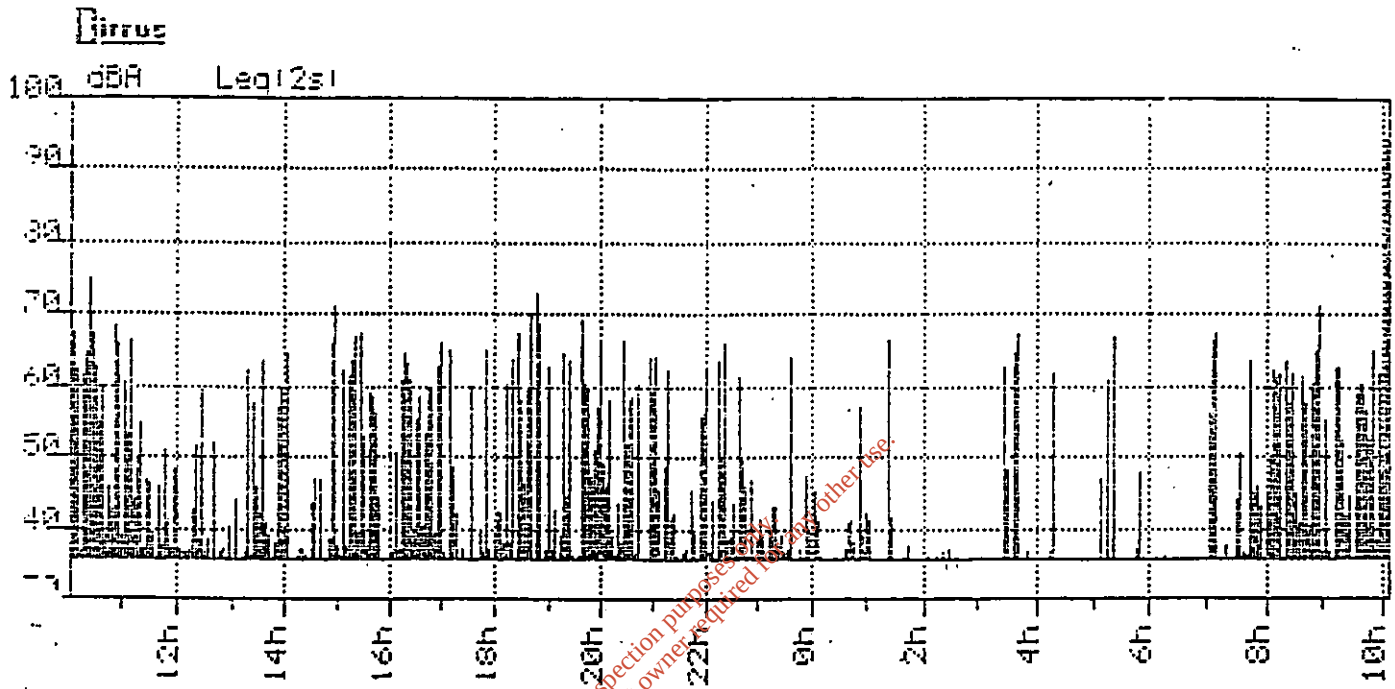

Fig 5.5.2 Plot of Leq 21/22 - 12 - 1992

No. of channels: 1
No. of Leqs: 36403
Elementary duration: 2 s
start: 11.00 Thursday 17/12/1992
end: 07.00 Friday 18/12/1992
Channel 1: Civ.Eng.Dept,UCC. dBA min: 35 max: 110

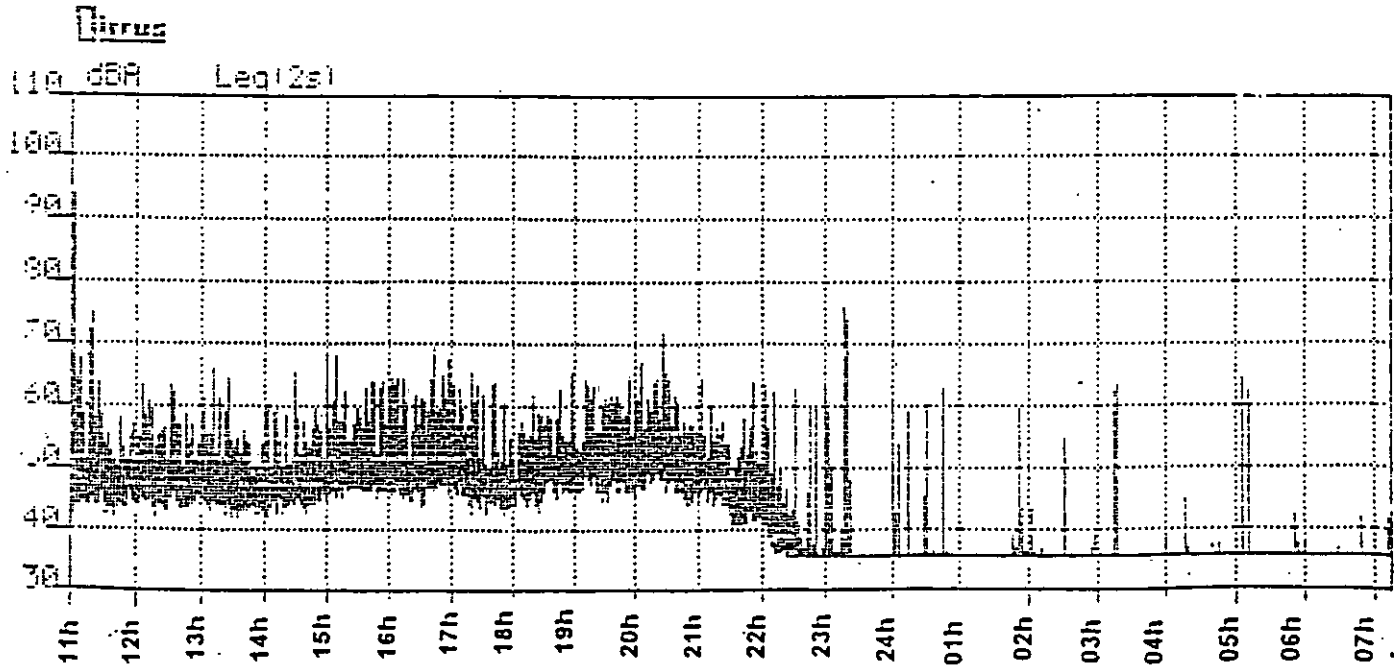

Fig 5.5.3 Plot of Leq 17/18 - 12 - 199

5.5.4 Odours

Ambient odours in the project vicinity include hydrocarbon emissions from internal combustion engines (particularly from diesel-driven vehicles), which are most noticeable in Cork City and along major roads. Burning of coal in fireplaces and furnaces also produces widespread sulphurous odours, most noticeable during cold periods. Emissions of organic compounds from chemical and pharmaceutical manufacturing plants on Little Island and Marino Point also generate detectable odours in the Lough Mahon vicinity. In addition, naturally occurring sulphurous odours emanate from the expansive mud flats throughout Lough Mahon when exposed during low tides, especially during warm conditions (Bailey 1992). The proposed treatment site at Carrigrenan is surrounded on three sides by extensive mud flats.

A detailed odours study, including air quality dispersion modelling, for the proposed treatment plant was carried out. This report is included as Appendix 4 .

5.6 Landscape

The purpose of this section of the EIS is to describe the context and character of the project area, its significance, and its vulnerability to visual impacts. This section focuses primarily on the treatment plant site at Carrigrenan in that this is the primary part of the proposed scheme with any significant aboveground structures that may influence existing aesthetic resources. Reference is also made to the Atlantic Pond Pumping Station.

The Atlantic Pond site, near the Marina, has a low situation and is suitably located between the City and the Upper Estuary of the Harbour. The site is bounded by the Old Passage Railway line on the northern perimeter and by private residential property on the southern perimeter. The site is low lying and is disused. The area of disuse extends eastwards parallel to the Old Railway Line beyond the extent of the proposed site, amounting to 1.5 hectares. The envisaged site for the proposed pumping station is 1.2 ha. in area.

The Carrigrenan site is located at the south eastern tip of Little Island and is surrounded on the west, south, and east by Lough Mahon. Little Island is flat to gently rolling in nature and characterised by a predominance of industrial uses and open space with scattered residential development. Much of the open space consists of grazing lands and two golf courses. The land area throughout Little Island is, however, not used as extensively for agricultural and grazing purposes as other areas within the Cork region.

Given the location of the site, both the context of the area and the character of the site are heavily influenced by Lough Mahon and the upper Cork Harbour. In this area, Lough Mahon dominates the

landscape and tends to diminish the visual and aesthetic conspicuousness of specific terrestrial resources.

The character of the Carrigrenan site itself is defined by a rolling topography and a mixture of vegetation types and habitats, and provides aesthetically pleasing views to the west and southwest. Within the boundaries of the site are the remains of Carrigrenan House, which are surrounded and sheltered by mature vegetation. The predominant topographic feature of the site is a hillock approx. 22m in elevation that allows views of Cork Harbour in all directions.

The following provides a more detailed discussion of the prominent components of the landscape.

5.6.1 Topography

The topography of the Carrigrenan site is as previously illustrated in Map 4.5.1. As shown, the site is rolling in nature, with elevations ranging from less than 2m to approx. 22m. Topographic relief of the site is dominated by two hillocks: one of approximately 16m in elevation located in the centre portion of the site, and the second, more dominant feature, being approx. 22m high located in the southern portion of the site. Due to its proximity to the edge of the site along Lough Mahon, the shoreline in this area is composed of cliffs approx. 12m in elevation.

5.6.2 Natural Feature

The predominant natural features of the site are:

- Topographic relief that provides an area of high ground at the southern end of the site.
- The extensive waterfront boundary on three sides of the site.
- A low area (less than 2m) at the northern portion of the site that is covered by spring tides.
- The range of natural habitats ranging from open fields to mature trees and intertidal zones.

It should be noted, however, that the range of habitats is due, in part, to the development and use of the site for agricultural and grazing purposes. This diversity of habitat is reflective of the sites use, which is common throughout the Cork region, and as such is not considered unusual or highly significant.

5.6.3 Man-Made Features

The site is bordered on the north side by a local service road serving several private houses. Tower View Cottage, located near the southeastern corner of the area covered by spring tides, is occupied. Other significant man-made features within the site vicinity are dwellings and industrial/commercial uses along the road from Ballytrasna to Clashavodig, golf courses to the north and northwest of the site, and the IFI plant located south of the site on Marino Point.

Man-made features on the proposed site include Carrigrenan House and associated outbuildings located in the centre of the site. Carrigrenan House is in an advanced state of disrepair and is not inhabited. A stone tower is also located along the rocky shoreline at the extreme westernmost point of the site. These man-made structures are addressed in further detail in Section 5.7 (Cultural Heritage) of this EIS.

5.6.4 Aesthetic Resources

The aesthetic resources of the site, as with any area, are a subjective component of the landscape. As opposed to the more objective nature of the topography, or natural and man-made features of the site, the aesthetic or visual resources are somewhat dependent upon individual perceptions and responses. Aesthetic resources can be discussed in terms of internal (i.e. within the site) and external (i.e. off-site) views. External views include views from the site to other areas, and from other areas toward the site.

Aesthetic resources within the confines of the site are somewhat limited and unremarkable given the context of the site in relation to the remainder of Little Island and the Cork area. Due to the topographic relief, views from any particular point within the site are limited in scope. The entire Carrigrenan site is not completely visible from any one point. The aesthetic resources present within the site include rolling open fields with scattered trees and hedgerows. The aesthetic quality of the site itself is common to the semi-rural landscape of much of the Cork area and as such is not considered significant.

Existing views from the Carrigrenan site to areas off site are more aesthetically pleasing, particularly given the presence of Lough Mahon which adds the water element to the rolling residential/agricultural patchwork that comprises the countryside within the existing viewshed.

Views from the site to the south include the IFI Fertiliser plant at Marino Point, a view past Passage toward the lower harbour, and the gently rolling countryside above Marino Point and Passage. In this latter direction, the IFI plant dominates the view.

Views from the site to the west are across Lough Mahon toward Hop Island and Mahon. Due to the relatively large distance between the sites and these land forms (nearly 3km), they are not dominant features of the visual landscape (in fact, Hop Island is barely distinguishable from the background relief of Rochestown). The mouth of the Douglas River is also barely visible. Cork City is located over 5km to the west and is not readily visible from the Carrigrenan site.

Views to the north of the Carrigrenan site, towards the remainder of Little Island, are dependent on where the viewer is situated on the site (i.e. his or her elevation). From much of the site, views to the north are limited and extend only to the hedgerow along the northern part of the site. From the highest point of the site, other parts of Little Island are visible, but the view of this area is dominated by scattered industrial facilities. As such, the aesthetic value of this portion of the viewshed is limited.

Views to the east of the Carrigrenan site are obtainable only from the eastern portion of the site. Notable features in this direction are the railroad lines across the mouth of the Belvelly River, a Martello Tower, storage yards for the IFI Fertiliser plant, and portions of Fota Island. Fota Castle is barely visible from the extreme northeastern corner of the site.

Views of the Carrigrenan site are available from areas around Lough Mahon. In general, the scale of these views is highly influenced by distance across an expanse of water, which tends to focus aesthetic perceptions on larger features such as hills, large open fields, and wooded areas rather than on specific features such as individual houses or structures. The Carrigrenan site is most visibly apparent, at a distance where the scale allows recognition of specific features, from points along the amenity walkway between Hop Island and Passage (1 to 2km) and from the railway line between the Belvelly River and Marino Point (900m). While views of the site from these areas are notable, there is no existing feature at the site that significantly contributes to or dominates the visual or aesthetic nature of the Little Island shoreline. The site appears as an open area with some trees. The topographic

relief provided by the promontory at the southern part of the site is distinguishable from many points within Lough Mahon.

Much of the Carrigrenan site is visible from the adjacent area to the north of the site. This area includes several residential houses and a portion of the Harbour Point Golf Course. In particular, views of the site from these areas extend from the sloped area between the ruins of Carrigrenan House outbuildings to the east to the 22-metre-high promontory to the west. It should be noted, however, that due to the heights of the existing hedgerow in this area, the density of the existing natural vegetation and maintaining an embankment along the northern side of the developed site, grade-level views from the road into the site are severely limited and restricted to only a few isolated locations - (Ref. Sectional Elevation A-A - Fig. 4.5.3).

In general, the aesthetic resources and scenic views both toward the site and from the site are considered attractive due to the interrelationship of water (Lough Mahon) and land (Little Island, Mahon, Rochestown). However, the distance between viewpoints, particularly across Lough Mahon, tends to influence the scale of visual resources so that the visual landscape is dominated by large land forms and features and specific sites or areas appear less noticeable. While aesthetic resources of Lough Mahon/Carrigrenan are considered valuable assets to local landscape, they are not of an unusual, unique, or highly significant nature.

5.7 Cultural Heritage

Despite its accessibility and extent, Cork Harbour has never been the site of any significant military or naval exploit; consequently, its historical associations are of less national interest and importance than other protected harbours of County Cork, such as Bantry Bay and Kinsale Harbour. Nonetheless, Cork Harbour has been an important centre for trade and commerce for more than 800 years (Coleman 1914).

A 1975 inventory of existing archaeological monuments lists 96 sites within 176 square miles of land surrounding Cork Harbour (O'Kelly and Shea 1976). These sites range in date from the Late Neolithic (c. 2000 B.C.) to the 19th. Century, and include ringforts, churches, castles, shell middens, and 17th to 19th. century fortifications and towers. The *County Cork Sites and Monuments Record* (Cork Archaeological Survey) of the Office of Public Works, 1988 is more comprehensive, including less significant sites such as walls, gates, piers, and wells.

Historical references to the townlands were checked in the Journal of Cork Historical and Archaeological Society, *"Cork Harbour Archaeology"*

by the Department of Archaeology U.C.C., and in *"Cork and County Cork in the 20th. Century"* by Hodges and Pike. Based on these sources, 19 sites are located within 1km of the proposed facilities.

Notable cultural resources within close proximity of the proposed collection mains include Blackrock Castle (1829) and Ringmahon Castle (age unknown), both located in the Townland of Mahon; a shell midden at Harty's Quay near the Tramore Valley Pumping Station; and a circular tower (17th to 19th century) on Hop Island (Coleman 1914; O;Kelly and Shea 1976; Office of Public Works 1988).

Several well-preserved towers from the 17th to 19th century are located in the vicinity of the proposed treatment plant at Carrigrenan, due to the site's strategic location within the upper harbour. A circular tower with an attached rectangular structure is located on the northwestern shore of Carrigrenan at the cove near the access road. In the vicinity, a well-preserved Martello Tower and Foaty Castle are both located across Foaty Channel to the east of Carrigrenan, approx. 800m and 1km from the site, respectively.

The proposed treatment plant will include the site currently occupied by Carrigrenan House, an abandoned 19th century farmhouse and associated outbuilding. This site is not included in the *County Cork Sites and Monuments Record* or in *"Cork and County Cork in the 20th Century"* due to its relatively recent age. Cultural resources of this sort are common in the region and generally not considered of major cultural importance.

As defined by the 1987 National Monuments (Amendment) Act, a "historic monument" is defined as "a prehistoric monument and any monument associated with the commercial, cultural, economic, industrial, military, religious, or social history of the place where it is situated or of the country and also includes all monuments in existence before 1700 AD or such later date as the Minister may appoint by regulations". In terms of this Act, there are no known archaeological monuments at the site of the treatment plant.

The occurrence of shell midden all around Cork Harbour dating from prehistoric times to the 19th Century was recorded by McCarthy (1987 unpublished M.A. thesis UCC), and by the Department of Archaeology UCC Cork Harbour Study (1976). A known prehistoric shell midden is located along the western shore of the Carrigrenan site, south of the stone tower. The date of this midden is not known, but the site does merit protection. Field reconnaissance identified another area of shell

(predominantly clam and scallop) deposition at the extreme southern tip of Carrigrenan Point to the west of the quay. The origins of this shell deposition are not known, as it is not identified as a shell midden in work conducted by McCarthy (1987) or the Department of Archaeology UCC. The determination of this area as a shell midden should be made by a qualified archaeologist. Due to its location at the Carrigrenan site, this area will not be affected by construction or operation of the facility.

No known archaeological sites, monuments or historic structures will be directly impacted (i.e. removed) by the collection mains or outfall main.

5.8 Material Assets

In general, the identification of specific material assets is open to interpretation, and there is little consensus on components of the environment that may be regarded by society as being of value for production, development, maintenance, recreation, and well-being (Bradley, Walsh, and Skehan 1991). For the purpose of the proposed Cork Main Drainage Scheme, significant material assets include sustainable development and severance.

5.8.1 Sustainable Development

The concept of sustainable development is advocated in the report of the World Commission on Environment and Development (The Brundtland Report),. These principles are:

- Concept of Sustainable Development as advocated in the Report of the World Commission on Environment and Development (the Brundtland Report). This concept envisages a reasonable balance in man's interest between development and nature.

- The principle of precautionary action even where there is no definite scientific evidence of both emissions or discharges with detrimental environmental effects.

- The integration of environmental considerations in all policy areas.

In the context of the Cork Harbour area, sustainable development must have its basis on the development plans of the local authorities and on the LUTS Review, as these documents contain the most solid information on existing conditions and strategies for future development.

If the Cork Main Drainage Scheme is to contribute positively to sustainable development in the greater Cork area, the treatment plant should be located as far downstream as is economically feasible. The reasons for this are:

- The area likely to benefit most from a development viewpoint is that in the Little Island/Glounthaune/Carrigtwohill corridor

- Location of the site in the limited available land bank in the city area would interfere with projected development proposals initiated in the City Development Plan (i.e. Mahon) and in the County Development Plan (i.e. Douglas/Rochestown area).

The following paragraphs from the LUTS Review 1991 are relevant:

East Harbour Area

The main employment potential lies in the corridor extending from Tivoli and Little Island to Midleton. Careful management of this area will be required to ensure that its potential is not destroyed through commercial strip development along the existing road. (The need for such control also arises in relation to new roads on the study area, particularly near junctions). Little Island has potential to benefit from the new road through the creation of a wholesaling/industrial support services park. Housing development should be carefully controlled to avoid compromising privately owned land which may be suitable for industry in the longer term. Little Island has potential for accommodating a major industry requiring 100 acres or so, and a reservation for this purpose is proposed.

Carrigtwohill may also have potential for a major stand-alone industry and land should be reserved for this, using agricultural/possible (longer term) industry zoning to keep the options open. Carrigtwohill also has some 80 acres of publicly owned industrial land, capable of accommodating several significant industries. An extension of the City and Harbour Water Scheme is likely to be required in the short to medium term to allow for water-using industry. There may be savings in coordinating the extension of the scheme from Little Island to Carrigtwohill with the construction of the corresponding section of the N.25 road improvement.

5.8.2 Severance

Severance deals with the possibility that a development may disrupt activities, linkage between activities, such as journeys to work or shopping trips, or divide land to the detriment of the whole. Particularly for pedestrians, severance may be a psychological feeling and thus difficult to define (Cork Corporation 1991).

Regarding the proposed Cork Main Drainage Scheme, the issue of severance is potentially relevant regarding the treatment plant site and the collection mains. Severance impacts of the proposed scheme are addressed in detail in Section 6.8.2 of this EIS.

5.8.2.1 Treatment Plant Site

The preferred treatment plant site is located at the southernmost tip of Little Island. The site is surrounded on the east, south, and west by Lough Mahon, and on the north by terrestrial portions of Little Island. Although the foreshore area around Carrigrenan Point is accessible to the general public, it is not heavily used due to its distance from more developed areas, the lack of a public walkway (as found around the Mahon site), and the rocky nature of the shoreline to the southwest portion of the site (which makes access more difficult).

Other resources potentially susceptible to severance-related impacts in the vicinity of the treatment plant site include the residential dwellings located along the access road and other developed and undeveloped lands in the vicinity, in particular future roadway access/connection to the Courtstown Industrial Estate located on the eastern side of Little Island.

Severance impacts of large development can be both short-and long-term in duration and can be mitigated in most instances.

5.8.2.2 Collection Mains

Due to the location of collection mains on the Lough Mahon shoreline, a potential exists that pedestrian activities and linkages to the waterfront may be disrupted. This could be particularly pronounced where a collection main follows the route of an existing walkway or path utilised by pedestrians (i.e. Blackrock/Mahon area).

Clearly, construction of the collection mains would also disrupt road surfaces and traffic flows in some areas and thus temporarily restrict or

block access to such places as work, shopping, etc. It is in these areas where construction will be overtly apparent to pedestrians and motorists that severance-related impacts may be perceived to be the greatest.

Chapter 6

ENVIRONMENTAL IMPACT

CHAPTER 6

Environmental Impacts

This section describes the impacts that could result from the construction and operation of the Cork Main Drainage Scheme. Ameliorative measures are identified and discussed in Chapter 7.

6.1 Human Environment

6.1.1 Land Use

Construction and operation of the wastewater treatment plant will result in a change in the existing use of the Carrigrenan townland site. The entire 32 ha will not be directly affected because the northern portion of the site affected by spring tides (approx. 7 ha) and the 22m hillock at the extreme southern tip of the site will remain undeveloped. However, approximately 20 ha. of the site will be permanently converted to use as an urban wastewater treatment plant facility.

The planning objectives for the site as expressed in the County Development Plan and the LUTS Review of 1991 call for industrial usage, particularly harbour or waterfront-related industry that will utilise the deepwater channel at Marino Point. The wastewater treatment plant will utilise the deepwater channel at Marino Point. In addition, the plant will facilitate the industrial development of Little Island. As such, the treatment plant is compatible with land use policies and objectives regarding industrial land use at Little Island.

The proposed treatment plant is consistent with the predominantly industrial and manufacturing uses on Little Island. However, the location of approximately 12 residential dwellings at over 100m from the site does provide a generally noncompatible land-use mix. In selecting a site for the treatment plant, a concerted effort was made to avoid residential areas to the maximum extent practical, and in particular to avoid densely developed residential areas. Although these 12 dwellings in their current context are not considered a high-density residential area, their existence is a concern that will be addressed and ameliorated to the extent practical.

These residential houses are all located along the north side of the access road from Clashavodig to Tower View Cottage. At the closest point, the nearest treatment plant unit will be more than 200m from the

nearest residence. Tower View Cottage, which is located on the 32 ha. Carrigrenan site, will need to be purchased.

From a land-use perspective, the construction and operation of the treatment plant will not impact the future use of either the Harbour Point Golf Course or the Little Island Golf Course. In addition, it will not adversely affect the operation of industrial or manufacturing uses in Little Island.

The construction of the proposed collection mains will result in temporary disturbances to land uses directly traversed (i.e. roads, amenity walkways, mudflats), but these disturbances will cease with the termination of construction and subsequent restoration activities. Operation of the collection mains will not affect land use or land use patterns except that future permanent structures (i.e. houses, buildings) will not be permitted directly above the mains for obvious safety and maintenance reasons.

Construction and operation of the proposed outfall main from the Carrigrenan site to the outfall at Marino Point will not affect land use given the current route of the main east of the man-made quay along the southern boundary of the site.

Construction and operation of the Atlantic Pond Pump Station will result in the conversion of 1.2 ha. of undeveloped land to an urban use comprising pumphouse service building and administration building. This use is consistent with the existing fabric of this part of Cork City. Although the access road to this facility will traverse the public amenity walkway (i.e. old railway line), operation of the pump station will not adversely affect the use of the walkway by the public.

In addition to the Atlantic Pond Pump Station, ten other pump stations will be required as part of the Cork City Main Drainage Scheme. Of these, five are existing wastewater pump stations or septic tank facilities that will only be upgraded. The remaining five will require new construction encompassing 0.1 hectares - 0.2 hectares. These pump stations are located throughout Cork City, Blackrock, Mahon, Tivoli and Little Island, and each is located in an area of urban or industrial development. Additional information regarding these pump stations, including specific locations and sizes, is provided in Section 2.2.2.2 (Associated Developments) of this EIS.

6.1.2 Population and Housing

The construction and operation of the proposed Cork City Main Drainage Scheme will not result in any significant impacts to current population or projected population growth patterns for Cork City, Cork County, or Little Island. The treatment plant has been designed to accommodate a population equivalent of 448,350 which will account for population growth for the next 30 years.

Construction and operation of the proposed treatment plant will result in adverse impacts to the approximately 12 residential dwellings located at over 100m from the proposed plant and to new residential construction in the area. These impacts would likely include a reduction of new home construction in the immediate vicinity due to a reduced desirability to live in close proximity to a wastewater treatment plant. It should be noted, however, that residential land use in general on Little Island is currently affected by the predominance of significant industry and manufacturing uses there. In addition, it should be noted that new residential construction on Little Island is not entirely consistent with the County Development Plan and the LUTS Study, which call for encouraging industrial use and developments on Little Island.

Construction of the treatment plant will require that Tower View Cottage be purchased from its current owner and demolished. As such, the proposed action will result in the direct loss of one active residence.

Construction and operation of pumping stations will not impact on population and housing resources.

Construction and operation of the collection mains and treated effluent outfall will not impact population or housing resources.

Measures to ameliorate potential impacts to these housing units are addressed in Section 7 of this EIS.

6.1.3 Recreation

Construction and operation of the Main Drainage Scheme is not anticipated to result in any significant adverse impacts to recreational activities or opportunities in the Cork area.

Construction will result in the temporary disturbance of foreshore areas and part of the public amenity walkway (Old Railway Line), which will result in the temporary loss of access and/or visual impacts and thereby affect the recreational (i.e. aesthetic) value of the area. However, these

impacts would be temporary and would last for the duration of construction only, and the amenities would be fully restored following construction.

6.1.4 Transportation

Construction of the treatment plant at the Carrigrenan site will result in an increase in traffic in the vicinity of the site as a result of construction workers and construction vehicles (i.e. trucks, graders, etc.) accessing the site. Access to the site will be via an extension of the existing Industrial Estate Road from Courtstown Industrial Estate to Carrigrenan. As existing traffic levels are low, this increase in traffic will likely be significant. Traffic flow will be particularly heavy in the morning (8am to 9am) from the Industrial Estate Road south to Carrigrenan and in the late afternoon (5pm to 6pm) from Carrigrenan north to the Industrial Estate Road. This new road will be designed to accommodate the types of heavy vehicles associated with industrial development.

Actual traffic flows resulting from construction of the wastewater treatment plant are dependent on the specifics of the construction plan (i.e. phasing, timing of activities, methods of construction etc), and as such are difficult to accurately predict at this time. It should be noted that actual traffic flow increases will vary over the period of construction depending on ongoing construction activities. Any increases in traffic associated with construction workers and vehicles will be short term, temporary, and occur only for the duration of construction.

Space will be adequate for construction workers to park automobiles on the Carrigrenan site so as not to block the road or restrict access to the existing houses. The parking area should accommodate one vehicle per worker.

Actual traffic flow per day to and from the wastewater treatment plant after construction is estimated to be 11 automobiles for workers and an estimated 2 heavy vehicles for sludge/grit/screening transportation off site, and sufficient parking area to accommodate these vehicles on the Carrigrenan site is provided.

Construction of the collection mains will result in traffic-related impacts to existing roadways that will severely limit vehicle access. In some instances, a road may be closed to allow for safe and efficient

construction. In all cases where vehicle access will be restricted or prohibited, detour routes will be clearly marked.

Construction in roadways will be temporary, and following surface reinstatement, vehicle movement will be restored. Specific roads to be impacted, appropriate detour routes, and a projected timeframe for construction in these areas will be developed during the final design phase.

Operation of the wastewater treatment plant will result in a minimal traffic increase. Due to the extensive automation of the plant a maximum of 11 employees will be required. As such, access to the site by these employees should not be significant. Actual projections as outlined above, are one vehicle per employee.

Operation of the plant will also produce sludge residue (from the thermal drying process and also screenings and grit which will need to be removed. It is estimated that approximately 18m^3 per day of sludge product (16.7 t/d at 93% TS) , 4/5m^3 screenings and 4/5m^3 of grit would need to be disposed of off site. This volume would be removed every one to two days by 2 no. trucks. As such, operation of the plant will result in the long-term increase in large truck traffic on Little Island. This increased volume is not significant given the other industries and associated truck traffic on Little Island.

Many of these traffic-related impacts along the access road from Carrigrenan to Ballytrasna (i.e. traffic congestion, large vehicles, noise, etc) will be avoided due to the extension of the Industrial Estate Road from its current terminus at the Courtstown Industrial Estate to the Carrigrenan site as proposed in the Cork County Development Plan (Cork Co. Council 1989). The extension of this widened and improved roadway would provide excellent site access for employees and truck traffic, avoid the residential areas near Clashavodig, and promote industrial development in the area between Courtstown Industrial Estate and Carrigrenan.

Public Transportation

Construction and operation of the proposed wastewater treatment plant will not affect the availability of public transportation modes. Bus traffic may be affected by construction of collection mains in roadways, but this would be neither long term nor significant. Buses would merely follow

established detour routes.

Cork Harbour and Shipping

Construction of the collection main across Lough Mahon from Mahon to Carrigrenan and across the River Lee at Kennedy's Quay may result in temporary inconveniences to shipping traffic due to the presence of construction barges and trenching equipment. However, this construction can be conducted so as to avoid times when ship traffic to Cork City is anticipated. Inconveniences would only result in the crossing of the dredged channel at high tide when shipping traffic is more likely to occur. Following completion of these river/harbour crossings, operation of the collection mains will not affect shipping activities.

Construction and operation of pumping stations will not affect shipping or harbour activities.

Construction and operation of the treatment plant will not affect shipping or harbour activities.

6.2 Flora and Fauna

This section discusses the potential effects on flora and fauna caused by the construction and operation of the proposed Cork Main Drainage Scheme. The discussion addresses the effects on both terrestrial and marine resources.

6.2.1 Terrestrial Environment

Construction and operation of the proposed facilities will result in both long-and short-term minor impacts to terrestrial flora and fauna. Construction of the proposed treatment plant will require the permanent removal of approx. 20 ha. of native vegetation at the proposed treatment plant site. This impact will be relatively minor due to the previously altered nature of the existing plant communities (Active pastureland, hedgerows, and ornamental trees) and the relative abundance of similar habitat in the general vicinity of the treatment plant site. The proposed facility will be configured and sited so as to minimise clearing of large trees near the southern end of the site. In addition, woody hedgerows bordering the site will be retained to the best degree possible to minimise ecological and aesthetic impacts. Following construction of the treatment plant, open spaces remaining within the site will be revegetated with grass, consequently, a significant portion of the present grassland will be functionally replaced.

Construction of the proposed wastewater transmission mains and pumping stations will have

minor temporary effects on terrestrial vegetation. Most of the mains will follow existing roads and wayleaves and will not require clearing of vegetation. Where mains traverse early successional fields and hedgerows on Little Island and Mahon, approximately 3.0 ha. of vegetation will be removed. Because of the local predominance of these types of vegetational communities, impacts to flora will be minor. In addition, the vegetation will be allowed to revert to its original condition following construction.

Construction of the proposed facilities will have minor short-and long-term impacts of fauna habitat, causing localised impacts to fauna populations. During construction, the clearing and grading of the treatment plant site, pumping stations' sites and transmission main wayleaves will result in a loss of vegetative cover that could cause limited mortality to less mobile forms of wildlife, such as small rodents, which are unable to escape the construction area. In addition, physical disturbance of the site and noise from construction activities will likely cause the temporary displacement of most fauna from the immediate vicinity of the construction zone and adjacent areas. Following construction, displaced species are expected to resume their normal habits consistent with the availability of post-construction habitats.

Construction of the treatment plant on the 20-hectare site will result in the long-term conversion of native vegetation to maintained industrial use. This will preclude the use of this area for some fauna. Small rodents, rabbits, and songbirds may continue to derive benefit from the maintained grassy areas and early-successional hedges retained around the perimeter of the site. Demolition of Carrigrenan House and clearing of adjacent trees at the treatment plant site will remove potential roosting sites for bats. However, the stand of large trees near Carrigrenan Point will be retained as a visual buffer and may provide suitable roosting locations for bat populations. Other mammal species currently occupying the site will be able to find suitable undeveloped habitat generally found in abundance adjacent to the disturbance area.

Of the protected species that may occur in the project vicinity, only the pygmy shrew is likely to be affected by construction and operation of the proposed facilities. Some mortality may occur during construction of the wastewater mains and treatment plant. Loss of habitat will be temporary, and post-construction revegetation of construction areas will provide prime habitat for recolonisation.

6.2.2 Marine Environment

Implementation of the proposed Cork Main Drainage Scheme will have short-term minor adverse effects and long-term beneficial effects on marine flora and fauna.

The new wastewater transmission main that will convey wastewater from the proposed head chamber at Mahon to the treatment plant at Carrigrenan will cause short-term impacts to littoral and pelagic marine resources and the waterfowl that utilise these resources. This transmission main will traverse approx. 3.5km of the floor of Lough Mahon, including the dredged navigation channel.

Operation of heavy equipment for trenching and pipe installation during construction will result in direct and indirect impacts to benthic fauna such as polychaetes, molluscs, and crustaceans. Sedentary organisms such as mussels, oysters, clams, snails, limpets and various algae will experience direct mortality and disruption-of-substrate impacts.

Nearby benthic and pelagic communities may be affected by sedimentation resulting from disturbance and suspension of marine sediments in the water column. Increased sedimentation may smother fauna and sedentary epifauna located adjacent to the dredging area.

Suspended sediment particles may clog the tentacles, fine filters, and gills of suspension feeders and may lead to localised reductions in population of these species (Gay et al 1991). In addition, increased turbidity can cause attenuation of light, thus lowering the rate of photosynthesis by macroalgae and phytoplankton.

However, such effects of suspended solids on benthos are generally restricted to areas that experience extremely high turbidity for a prolonged period of time. Most marine benthic organisms can withstand exposure to high concentrations of suspended solids for short time periods (Saila et al 1972).

Sediment plumes resulting from construction will have a minor effect on demersal and pelagic finfish. High concentrations of very fine sediment particles can coat the respiratory epithelium of fishes, thereby interfering with respiration (Sherk et al 1974).

In addition, suspended solids can affect juvenile and larval fish and cause siltation of spawning beds. However, unlike most benthic fauna,