5.6 NOISE AND VIBRATION

5.6.1 General

The site for the proposed wastewater treatment plant is situated in the townland of Coronea, approximately 1 mile west of the centre of the town of Skibbereen. The site is bounded on the north by the road to Deelish Pier, on the west by the road between the site and the graveyard and on the south and east by farmland. The nearest residences are east of the site at approximately 120 m distance and south of the site at approximately 210 m distance. The graveyard is situated immediately west of the site and the Ballydehob Road is approximately 170 m north of the site.

5.6.2 Noise Survey

To ascertain the impact of the surrounding area due to noise emissions from the wastewater treatment plant, EOLAS (Irish Science and Technology Agency) were employed to carry out a baseline noise survey for the area. This survey was carried out in January 1993 by day and by night and the noise measured was made up of noise from local traffic on the minor road and more regular traffic on the Ballydehob Road, as well as noise from agricultural activities, distant aircraft, bird song, etc. Measurements were taken at three different locations and the weather conditions were calm and dry for the duration of the measurements. The background noise levels or minimum levels and L_{eq} levels were measured for each measurement period. The L_{eq} is an energy based average widely used in the assessment of environmental impact. The resultant background noise levels were thus established as varying between 32 and 47 dB(A) L_{eq}.

The results of the noise baseline study are given in greater detail in the EOLAS Report which is included in the Technical Appendices, Appendix C.

The remainder of the EOLAS Report on the noise impact was based on a particular treatment plant design which was proposed at the time. Although the philosophy for the implementation of the scheme has changed, the design of the indicative plant has not altered so radically as to diminish the findings of the EOLAS Report in any way. In any event, the recommendations of the EOLAS Report to restrict the noise levels to day and night values will still be imposed on the new plant operations.

5.6.3 Noise Emissions

The main sources of noise emissions from the wastewater treatment plant will come from the mechanical plant within the works. The sources of possible noise emissions from the works are as follows:-

(a) Inlet works – no noise emissions.

(b) Aeration tanks.

(c) Secondary sedimentation tanks.

(d) Picket fence thickener.

(e) Dewatering system (equipment enclosed in buildings).

(f) On site activities from general maintenance, grass cutting, occasional overhaul of plant, etc.

To examine the likely noise emissions from the proposed wastewater treatment plant, similar type works were visited which incorporated the same type of equipment. A representative from EOLAS visited the treatment plants at Ballincollig, Clonakilty and Enniscorthy. Most of the noise levels at the visited plants were almost inaudible except for the aeration tanks, air compressors and dewatering equipment. Table 5.2 shows the results of noise levels monitored at Enniscorthy and Clonakilty:-

Table 5.2: Noise Levels at Enniscorthy and Clonakilty

Location	Results
Aeration Tanks (Enniscorthy)	52 dB(A) at 10 m Distance
Compressor Plant with 2 Compressors Running	59 dB(A) at 5 m Distance
Filter Press at Clonakilty	56 dB(A) at 10 m Distance 50 dB(A) at 20 m Distance 47 dB(A) at 30 m Distance

Noise levels from other elements of the treatment plant, such as settling tank, scraper mechanism, picket fence thickener, grit removal, etc., were also measured and can be discarded as negligible.

5.6.4 Acceptable Noise Levels

In general, noise criteria for industrial noise in European countries are related to zones such as residential, industrial, commercial, etc., and these have wide variations. "Acceptable levels" in various countries can vary from 35 to 60 dB(A) at night and 40 to 70 dB(A) during the day, depending on the type of area.

EOLAS experience and precedence set in planning conditions in Ireland by various Local Authorities and An Bord Pleanála have shown that, for general acceptability, noise level criteria outside nearby residences should be selected within the following ranges:-

- Night 35 – 40 dB(A).
- Day 45 – 55 dB(A).

An important aspect of these criteria is the absence of prominent discrete tones or impulses.

It was the conclusion of the EOLAS Report that the following criteria should be accepted for the assessment of noise impact on the existing environment at the Skibbereen Treatment Plant Site:-

- Night 35 dB(A) L_{eq}
- Day 45 dB(A) L_{eq}

These are limited values for the noise from the proposed plant measured outside any permanent dwelling. There should not be any significant pure tones or impulsive elements in the noise spectrum.

5.6.5 Mitigation Measures proposed to reduce Noise Impact

The following options are among those available to reduce noise emissions from the proposed treatment plant:-

(a) Selection of low noise equipment.

(b) The use of silencers and attenuators.

(c) The use of local screenings, barriers and enclosures.

(d) The selection of plant location within the site.

(e) The use of buildings or earth banks for screening.

The development of a treatment works at the Coronea site should not exceed the noise criteria of 35 dB(A) night time and 45 dB(A) day time at any nearby residence. Furthermore, there should not be any significant pure tones or impulsive elements in the noise spectrum.

Where necessary the above or other appropriate noise reduction measures should be employed to ensure that noise emissions from the treatment plant are within the above limits.

5.7 VISUAL AND LANDSCAPE

5.7.1 Introduction

In 1993 Niall Hyde & Associates carried a visual impact assessment of the proposed wastewater treatment plant. In 2004 this assessment was reviewed by RPS McHugh Ltd. with respect to the proposed indicative plant design and the current baseline conditions. A site visit was carried out in January 2004 when tree cover was at its least and the degree of visual impact most apparent.

Furthermore, as part of the Environmental Impact Assessment consultative process Cork County Council Planning Department requested a series of photomontages be prepared to illustrate the indicative wastewater treatment plant. These photomontages have been included in this section of this EIS.

5.7.2 Description of Existing Environment

The proposed development site is located on lands that are presently in agricultural use in the townland of Coronea, approximately 1 mile to the west of the town of Skibbereen.

The site is located on elevated ground that is gently sloping from south to north. The northern boundary of the site is approximately 100m from the Ilen River. The Coronea cemetery, which is the main cemetery for Skibbereen, is located adjacent to the proposed development site's western boundary.

The predominant land use in the area is pasture. Fields are generally quite small (1 to 3 acres enclosed by uneven hedgerows consisting of Hawthorn (Cratageus *monogyna*), Blackthorn (Prunus *spinosa)* Honeysuckle (Lonicera *periclymenum*), dog rose (Rosa *canina*), Ash (Fraxinus *excelsior*), Alder (Alnus *glutinosa*) and bramble (Rubus *fruticosus)*. These hedgerows give considerable screening.

Most of the land on which the plant is proposed is zoned U-01 (Utilities / Infrastructure) in the Cork County Development Plan, 2003. The remainder of the site is currently unzoned. An extract of the plan illustrating the zoning is included in Figure 5.9 included in Section 5.11 of this EIS.

The Skibbereen to Ballydehob (N71) and the Skibbereen to Baltimore via Old Court roads are identified as scenic routes A105 and A106 respectively in the Cork County Development Plan, 2003.

In respect to this designation it should be noted that although entire roads can be identified as a scenic route, scenic routes are particularly concerned with certain views and prospects available from these routes. Therefore sensitive development on or close to the route need not affect the scenic designation of the route.

5.7.3 Site Location

The proposed location of the proposed wastewater treatment plant is on lands at the corner of two minor roads immediately to the east of the Coronea burial ground. The site is bounded on the north, south, east and west by a series of hedgerows and is partially divided in two by a hedgerow consisting of Ash, Sycamore and Hawthorn running on a north south axis.

A narrow paved road (approximately 5m wide) runs along the northern boundary of the site. A narrower road (approximately 3m wide) running on a north – south axis runs along the proposed site's western boundary. This road gives access to the Coronea cemetery[1], one off housing to the south of the site and continues over the hill to Assolas Cross on the main Baltimore Skibbereen Road.

The proposed site is separated from the roads to the north and west by hedgerows consisting mainly of Hawthorn with the occasional Ash. Along the northern boundary, the site is approximately 1.5m higher than the adjoining road. The existing hedgerows will form a framework for the proposed mitigation measures and give valuable protection to the proposed additional tree and shrub planting while they become established.

5.7.4 Site Visibility

North of the site is the River Ilen and the main Skibbereen to Ballydehob Road (N71). The site is not visible from the river due to the steeply sloping riverbank, intervening lands and vegetation cover. From the north a portion of the site is partially visible from the junction of N71 and the New Bridge. Immediately to the north of the New Bridge a narrow road loops up on to higher ground, and runs east – west along the northern boundary of the Abbeystrowry Cemetery to meet the main road again at a point approximately 400 m west of the proposed site. There are four houses along this road beginning 250 – 300 m west of the site. The proposed plant will be visible from this location.

On the higher ground to the south of the site there are a series of one off houses (6No in total – 2No of which are farm houses) and agricultural lands. From the south the lower section of the site is not visible, this is due to the combination of topography and the vegetative cover. The ringfort located to the south of the site, and described in Section 5.12 of this EIS, also provides a degree of screening.

Despite the presence of hedgerow along the western boundary, the proposed development site is visible to varying degrees from all sections of the Coronea Cemetery. The site is not visible from the houses to the west of the cemetery

To the east of the proposed development site there are agricultural lands, a series of one off houses (2No within 300m of the eastern boundary.), and Skibbereen's urban fringe[2]. From this location the site is screened through a combination of topography and vegetative cover, this status quo should be retained, maintained and where appropriate enhanced.

A series of mitigation measures to screen and integrate the proposed treatment plant into the receiving environment should be employed to ensure the following:

- That ring-fort adjacent to the site is not compromised and that the plant is screened from the south.
- That the plant from the north is screened appropriately through the planting of screening vegetation to ensure that the plant will not be visible from the houses on the higher road or Abbeystrowry Cemetery.
- That the plant is visually unobtrusive from the Coronea Cemetery, this can be achieved through a combination of grassy banks and the planting of appropriate vegetation both on the site's boundary and internally.

[1] At the gates to the cemetery this narrow road is considerably wider (7m approximately)
[2] Views from the farmhouse located within 300m to the south east of the site are restricted through a combination of topography and vegetative cover.

- That views of the plant from the east will be screened by hedgerow planting which melts into the existing hedgerow running on a north south axis immediately to the south of the proposed development.

5.7.5 Visual Impact

The site is located on a north-facing slope that faces the N71, the River Ilen, and the Abbeystrowry Cemetery north of the Ilen River; despite this the proposed location of the plant will have little visual impact on the surrounding landscape if it is adequately and appropriately screened.

Therefore it is proposed to create a dense screen of semi-mature planting on all four sides of the plant. This will consist of plants indigenous to the area, namely hawthorn, ash and sycamore. It is also proposed to plant groups of Ilex aquifolium and Pinus *contorta* in the centre of the planting to give additional winter screening.

It should be noted that virtually all of the works in the proposed plant will be at or below ground level and will, therefore, not significantly intrude on the skyline. The control building and inlet works building in the plant will be single storey, plastered finish with stone faced panels and have A-ridged roofs with natural slates. They will be residential or agricultural in scale and character and visually unobtrusive. The sludge dewatering building is agricultural in scale and is the largest building on the site. The cladding and colouring of this building will be appropriate to the area so as to minimise visual impacts.

5.7.6 Proposed Visual Treatment

A series of mitigation measures are proposed to ensure that the plant is integrated as much as is practicable into the existing character of the receiving environment whilst still ensuring that access is restricted to the site.

For safety reasons it will be necessary to have a 2.4 m high dark green plastic covered palisade fence around the boundaries of the site. The existing hedges along the northern and western boundaries will be retained and infilled as required. Along the eastern and northern boundaries a 7 - 10 m wide strip of semi-mature planting should be provided outside the palisade fence with a secondary stockproof fence on the outside. This planting should consist of Hawthorn (Cratageus *monogyna*), Ash (Fraxinus *excelsior*), Sycamore (Acer *pseudoplatanus*) and some Holly (Ilex *aquifolium*).

Additional shrub and small tree planting should be carried out inside the proposed plant to break up any straight or geometrical lines which might be eye catching. Surplus excavated material should be mounded around the perimeter of the site to form irregular banks that will give additional screening.

The entrance to the proposed plant should be located between the two entrances to the cemetery to minimise the view into the plant from the two central pathways through the cemetery and should have curved stone wing walls 2.4 m high. The entrance road shall be designed so that the view from the public road into the proposed site shall be screened by grass banks planting or stonework.

It is proposed to set back the perimeter of the site opposite the cemetery in order to create car parking space for public use at funeral times. This will partly consist of a low (1 m high) uncut stone wall forming the edge of the site with a bank, approximately 2.5 m high running parallel behind this wall providing screening for the treatment plant. This bank would be densely planted as described above. The 1 m high stone wall will continue around the existing ash trees to ensure that the roots and existing ground level were protected as shown in Figure 3.1.

The materials proposed for the control house and dewatering house will further ensure that these buildings will not be obtrusive. It is proposed that these have natural stone panels with natural slate roof. The buildings should be clustered informally rather than linear to resemble a traditional agricultural complex.

The proposed settling tanks which are at ground level require a safety railing 1 m high around them, this railing is to be painted matt black.

Care should be taken to avoid any reflective surfaces throughout the plant. Lighting should be low level down lighters with columns finished in matt black.

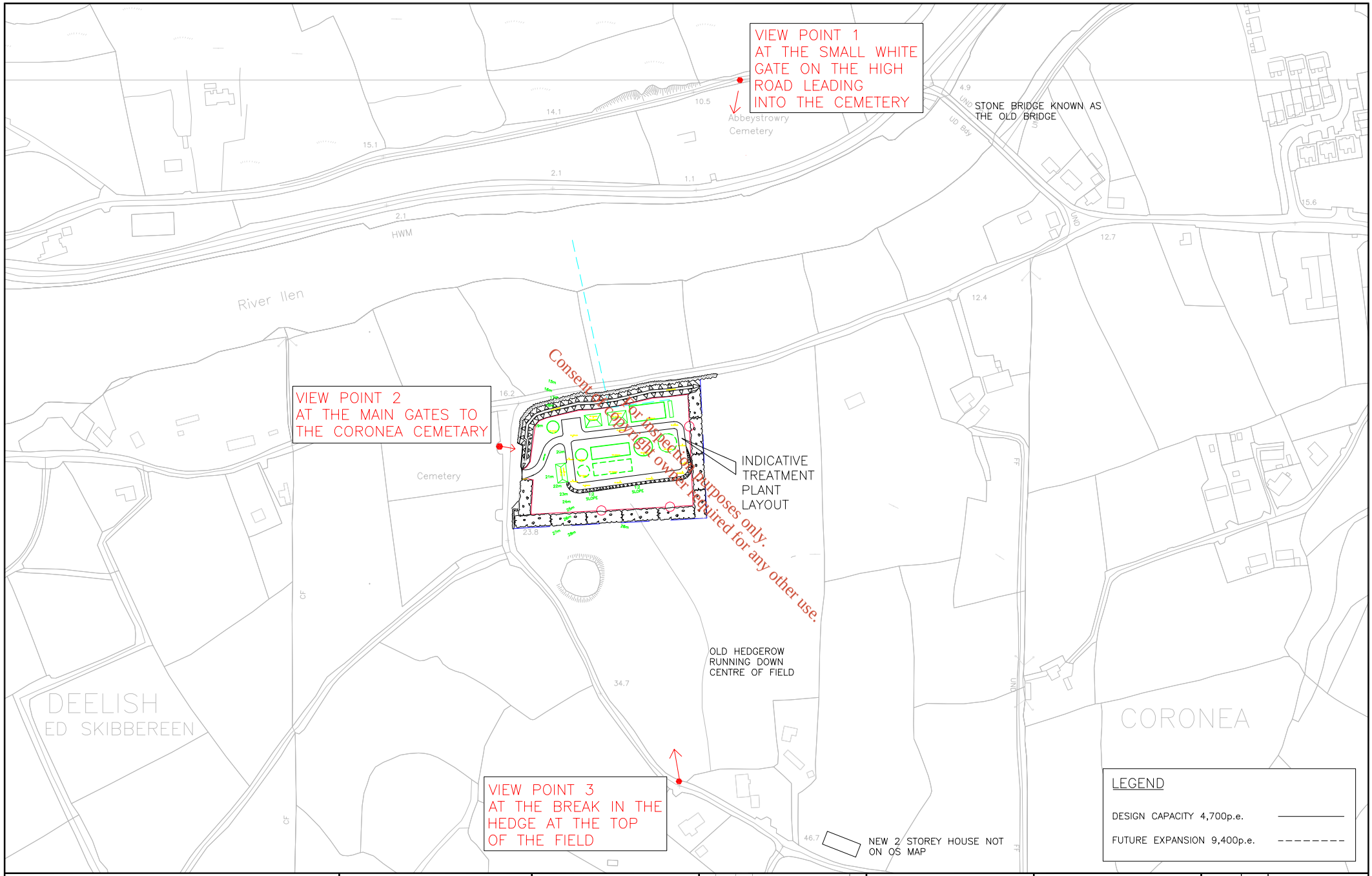
The design considered in this EIS is indicative only and the final design should comply with the Cork Rural Design guide.

5.7.7 Photomontage Series

As part of the Environmental Impact Assessment, a series of photomontages have been prepared to illustrate the proposed Waste Water Treatment Plant. Three view points as shown in Figure 5.1 have been chosen which best illustrate the envisaged visual impact the proposal will have on the receiving environment. Each viewpoint set consists of a series of images depicting the site before construction, post construction, and post completion of mitigation measures.

Figures 5.2 and 5.3 show selected pre and post construction views of the site. A complete set of views is included in Appendix A of this EIS.

These photomontages illustrate the impact of the treatment plant indicative design would have on the visual landscape. It is possible that the final treatment plant design will visible from a number locations including the viewpoints shown in Figure 5.1 and also the New Bridge. Therefore, the final treatment plant design should be sensitive to views from all locations.



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NOTES

1. This drawing is the property of RPS-MCOS Ltd.. It is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, If in doubt ask.

No.	Date	Amendment / Issue	App.
F01	MAR'04	REPORT	A

Project:
SKIBBEREEN SEWERAGE SCHEME WASTEWATER TREATMENT PLANT

Title:
LOCATION OF VIEWPOINTS

Drawn by:	AOC	Job No:	MCW0153
Checked by:	BB	File No:	MCW0153SK0016
Approved by:		Drg. No:	FIG. 5.1
Scale:	NTS	Rev:	F01
Date:	MAR '04		

Figure 5.2: Pre-construction view from Viewpoint A – looking South.

Figure 5.3: Post-construction view from Viewpoint A – looking South.

5.8 FLORA AND FAUNA

5.8.1 Introduction

Roger Goodwillie, CAAS Environmental Services Ltd., undertook a flora and fauna assessment with the assistance of John Lucey, Environmental Research Unit, DOE. References used in the production of this assessment were:

- O'Reilly, P. (1991) *Trout and Salmon Rivers of Ireland*. Merlin Unwin, London.
- Sheppard, R. (1993) *Ireland's Wetland Wealth*. Irish Wildbird Conservancy, Dublin.

5.8.2 Existing Environment

The following is an evaluation of the existing environment at the treatment plant. Information on the main pumping station site in the Marsh and the route of the main pipework from the pumping station to the treatment plant is also included for information.

Main Pumping Station

This site is a field of damp pasture which floods with rainwater and occasionally from the river. The dominant grass species is creeping bent *Agrostis stolonifera* which grows with some crested dogstail *Cynosurus cristatus*, as well as creeping buttercup *Ranunculus repens*, marsh ragwort *Senecio aquaticus* and daisy *Bellis perennis*. A hedge of privet *Ligustrum ovalifolium* with occasional hawthorn *Crataegus monogyna* and willow *Salix cinerea* runs north to south to the river bank, bringing with it nettles *Urtica dioica* and cow parsley *Anthriscus sylvestris*.

The riverbank close to the old railway bridge is overhung with some larger willows above a stony bank with green algae, starwort *Callitriche stagnalis* and water crowfoot *Ranunculus* of *peltatus*.

The site provides feeding for a few wintering thrushes, especially blackbirds, and is occasionally visited by curlew and oystercatcher at high tide.

Pipework to Treatment Plant Site

The route of the pipeline linking the collecting tank with the treatment works runs westwards under the road before crossing the river and rising to the road on the south side of the Ilen Estuary. It runs through similar damp grassland at river level, then crosses the river upstream of where the channel has been modified and its margins reseeded. It rises through somewhat drier ground, with cocksfoot *Dactylis glomerata* and thistles *Cirsium arvense*. Thereafter, the route crosses fields of better but uniform grassland similar to that described below.

Treatment Plant Site

The field in which the treatment plant is to be sited is a reseeded pasture sloping to the south. Ryegrass *Lolium perenne* is the main plant species with some white clover *Trifolium repens*, dandelion *Tarasacum officinale* and daisy *Bellis perennis*. The soil is quite heavy but fertile and has been limed and fertilised in the past. Earthwork numbers are notably high, perhaps from manure spreading. They attract substantial numbers of wading birds which feed particularly when the tide is high. Oystercatcher (60) and curlew (12) were present at the time of the visit and there are likely also to be visiting flocks of redwings and fieldfares in winter.

The banks around the field show the true acidic nature of the soil in its natural form. Hawthorn *Crataegus monogyna* forms a hedge in most places with foxglove *Digitalis purpurea* and pennywort *Umbilious repostris* below. Older hedges along each side of the east to west road have a greater variety of woody plants with blackthorn *Prunus spinosa,* honeysuckle *Lonicera periclymenum* and dog rose *Rosa canina*. The polypody fern *Polypodium vulgare*, lesser celandine *Ranunculus ficaria* and herb robert *Geranium robertianum* add to the herb flora.

The lower field through which the outfall pipe runs is less intensively managed and consists of other grass species, particularly *Agrostis Stolonifera, Festuca rubra* and *Cynosurus cristatus,* with sorrel *Rumex acetosa*. There is seepage towards the base bringing in a little crowfoot *Ranunculus Hederaceus* and flote grass *Glyceria fluitans.* Some bramble *Rubus fruticosus* grows nearby because of the low intensity of grazing. A few trees occur on the riverbank, part of a general band on the south side of the estuary. They consist of hazel *Corylus avellane* and holly *Ilex aquifoloium* grouped around an older alder *Alnus glutinosa* which hangs over the river. Some ivy *Hedera helix,* polypody *Polypodium vulgare* and leafy lichens (e.g., *Ramalina fraxinea, Evernia prunastri, Parmelia caperata*) grown on the trees. To the east, a line of spruce has been planted.

The river itself is estuarine at this point and has a muddy base between edges of loose stone. Occasional outcrops of the local Devonian rock occur which show a slatey cleavage. The brown seaweed *Fucus spiralis* covers most of the hard surfaces with a little green *Enteromorpha* beneath the freshwater inflows. Water starwort *Callitriche* of *stagnalis* is again common, showing that the tidal water is brackish rather than fully marine. Sea aster *Aster tripolium* and scurvy grass *Cochlearia x hollandica* grow towards the top of the bank in conditions where they would be flooded by spring tides.

The river is fished by small numbers of cormorant, while the edges are used by a few redshank, mallard and grey wagtail. Flocks of oystercatcher and black-headed gull congregate either where there are larger areas of silt or, in the case of the gulls, where side streams enter. West of the site, the islands were being used as a high tide roost by lapwing (45), oystercatcher (25), curlew (1), greenshank (1) and cormorant (1).

In summer, the river would attract good numbers of swallows, sand martins, willow warblers and bats to feed on its abundant fly life.

The marine part of the estuary beings some 2 km below the outflow and consists of extensive mudflats at Newcourt and around Inishbeg Island. There are small numbers of shorebirds here in autumn and winter, involving widgeon, knot, curlew and redshank. Significant populations are not recorded in Sheppard (1993).

The Ilen is a noted fishing river and flounder, dogfish and bass frequent its lower parts. Mullet are more widespread and have been caught from the mouth almost to the limit of the tidal flooding above the town. Sea trout, brown trout and salmon are numerous in most years and there are runs of both spring salmon and grilse (O'Reilly, 1991). Having a relatively large catchment means that migratory fish are not dependent on spates.

The town section of the river has been sampled biologically by the EPA since 1971. These sampling visits have detected a high population of the brackish water shrimp *Gammarus tigrinus* and of the spire shell *Potomopyrus jenkinsii*. There is also quite a good range of other invertebrates, e.g., the caddisflies *Polycentropus* and *Hydropsyche*, stonefly *Leuctra*, blackfly *Simulium*, snail *Limnaea periger*, water louse *Asellus*, water mites *Hydracarinae* and tubificid worm. *Enteromorpha* was moderate to abundant on the channel bed but sewage fungus was not seen.

Macroinvertebrate samples were taken at New Bridge as part of the 1997 EIS by RPS Cairns for the Skibbereen Relief Road and Flood Relief Scheme. Here the estuarine element is dominated by crustacean including one, the amphipod *Corophium multisetosum* which had only been recorded at a limited number of sites in Ireland. During the survey for the 1997 EIS this amphipod was also found upstream of the proposed discharge point at the J.F. Kennedy Bridge. Table 5.3 included a list of macroinvertebrates taken in samples at New Bridge. This table also included notional abundances.

Table 5.3: Macroinvertebrates taken in Suber samples (2 per site) at New Bridge on the Ilen River *(ref 1997 RPS Cairns EIS for Relief Road)*

Macroinvertebrate	Abundance
INSECTA	
Baetis rhodani	+
Chironomidae sp.	++
ANNELIDA (segmented worms)	
Oligochaetae	+++
Nereis diversicolor	++/+
Chaetozona setosa	++/+
CRUSTACEA (shrimps etc.)	
Gammarus zadacchi	+++
Corophium multisetosum	++
Jaera nordmanni	++/+
Abdulomelita pellucida	++
Cyathura carinata	++/+
Leptocgnathia sp.	+/+

Note:
1. Abundance Notation: (+ present, ++ few, +++ common, ++++ abundant)

Evaluation

None of the habitats described above are rare or of special ecological interest. In particular, there are no Areas of Scientific Interest in the immediate vicinity and no rare or protected plants on the site.

The Ilen River is significant for its large fish populations. In particular, it is considered to the a significant fishery in the area and its high population of sea trout is particularly significant in view of the much diminished stocks of this species in the west of Ireland.

The numbers of oystercatchers which feed in the agricultural land around the Ilen Estuary may also be of note. Adding those recorded on the ground and others in flight suggest that they could amount to 200-300 in total. Similar numbers occur at Courtmacsherry and Clonakilty with a larger flock in Castlemaine Harbour in Kerry.

The occurrence of a relatively rare plant species *Cochlearia anglica* which has been recorded since 1896 in the general area is also of interest.

Of the macroinvertebrates recorded in the vicinity of the proposed outfall the amphipod *Corophium multisetosum* is particularly notable.

5.8.3 Potential Impacts

The proposed layout of the wastewater treatment system does not impinge on any interesting terrestrial habitat and will only have a marginal impact on the actual river bank. However, the provision of a wastewater treatment plant is likely to have a significant positive impact on the water quality of the river. The removal of untreated discharges to the river from the town's wastewater is likely to cause oxygen levels to rise in the town stretch of the river. This will in turn encourage a more diverse fauna than at present.

The more visible impact on the river will occur at the new outflow where the nutrients will be released at a point rather than over a distance of some hundreds of metres. More significant is the fact that they will be in available ionic form following the treatment process, rather than partly as undegraded organic waste. Previously, the waste would have been mineralised over a considerable distance of the channel spreading out its effects.

The ecological effect may be one of local fertilisation and it is likely that a dense stand of the green algae *Enteromorpha* may occur downstream of the outflow, replacing much of the brown *Fucus* that grows there at present. It will be stimulated both by the freshwater and the nitrate addition. Tidal action will tend to disperse the effects down channel much more so than would occur in a non-tidal river. It seems unlikely, therefore, that there will be enough algal biomass at any point to cause significant deoxygenation. The effects of hydrodynamic dispersion of treated wastewater discharges are discussed in more detail in Section 5.9 of this EIS.

The presence of well oxygenated river and tidal water nearby will mean that mobile animals will be able to move away from any localised patches of low oxygen conditions that might develop during low flows and neap tides. The migratory movements of sea trout or salmon take place at times of higher flows when significant deoxygenation is unlikely to occur. Thus, the biological effects of the outflow will not affect them. Additionally, the outflow stream itself may attract fish of all species.

5.8.4 Mitigation Measures

In order to minimise damage to the riverbank, the outflow should discharge to the east of the group of deciduous trees.

The outflow should be screened to minimise visual impact in consultation with the local regional fisheries board.

5.9 AQUATIC ENVIRONMENT

5.9.1 Baseline Water Quality

Water quality analysis data for the lower Ilen River were obtained from Cork County Council. The EPA take samples from three locations on the Ilen River in the vicinity of Skibbereen. These are located at the Ballyhilty Bridge, 3km upstream of Skibbereen, at J.F. Kennedy Bridge, just downstream of Skibbereen and New Bridge 1.5 km downstream of the town and in the vicinity of the proposed outfall.

Water quality data presented in Table 5.4 cover a sampling period from 1995 to 1997. The Biological Quality Rating (Q-value) for Ballyhilty Bridge is also presented for the period 1971 to 1997. These data indicate that the existing water quality is generally satisfactory with high Dissolved Oxygen (DO) levels and low median levels of Biochemical Oxygen Demand (BOD), ammonia and phosphates. Examination of the maximum and minimum values of the parameters shows that on occasions there have been relatively high and low DO levels and elevated BOD and nutrients. These extremes indicate intermittent reductions in water quality. In general, there is a reduction in water quality at stations within and downstream of the town when compared with the station at Ballyhilty Bridge, 3km upstream of the town. This is probably as a result of the existing untreated discharges to the river of the town's wastewater. It is also noted that the Quality rating of the river has reduced from Q5 (high community diversity, satisfactory condition, good water quality) to Q4 (reduced community diversity, satisfactory condition, fair water quality) since 1971. Studies carried out by the EPA at Ballyhilty Bridge between February 2002 and April 2003 confirmed that the river is currently classified as Q4. Nutrient sampling during this period at Ballyhilty Bridge suggests the following median levels in the Ilen River

- Ammonia 0.023 mg/l N
- $N0_3$ 1.471 mg/l N
- $N0_2$ 0.006 mg/l N

Phosphorus (MPR) 0.013 mg/l P

The Ilen River is considered to be an important fishery. Although the Ilen River is not a designated Salmonid Water under the Salmonid Regulations (SI 293:1988) the water quality limit for BOD of 5 mg/l O_2 is considered a suitable benchmark for the assessment of environmental impacts on water quality within the river.

Based on the samples taken by the EPA and included in Table 5.4 the existing baseline water quality is within the above limits. However, the maximum BOD level within the town at JF Kennedy Bridge of 4.5 mg/l does approach the 5 mg/l limit. This relatively high BOD level is most likely to be as a direct result of the existing wastewater discharges to the river upstream of this location. Following completion of the proposed scheme these untreated discharges will be replaced with a treated discharge downstream of the town. This is likely to considerably improve the baseline water quality of the river within and downstream of town.

5.9.2 Water Quality Standards

The River Ilen is not designated a Salmonid Water under Salmonid Waters Regulations, S.I. 293 of 1988. However, the river is considered to be an important fishery and therefore for the purposes of environmental impact assessment it is considered suitable to use the BOD limit of 5mg/l O_2 in these regulations.

The River Ilen is not a designated Bathing Water under the Bathing Water Regulations, S.I. 155 of 1992 as amended. These regulations specify a level of 2000 No./100ml for faecal coliforms to be complied with by 95% of samples and 1000 No./100ml for 85% compliance. The discharge is

upstream of a Skibbereen Rowing Club which suggests that the river is used as a recreational amenity. Therefore it is considered appropriate to use this standard as a benchmark for the environmental assessment of the proposed discharges.

The River Ilen is not a designated Shellfish Area under the Shellfish Waters Regulations, S.I. 200 of 1994, however Roaringwater Bay is designated under these regulations. There are a number of licensed shellfish areas within the Ilen Estuary downstream of the proposed outfall discharge point. Based on discussions with Bord Iascaigh Mhara the most upstream of these is west of Ringarogy Island, 8km downstream of the proposed outfall point. The Shellfish Regulations define a faecal coliform limit of within the shellfish flesh or intervalvular liquid of 300 No./100ml. However, generally water quality in shellfish areas can be classified by the Shellsan Classification System which is based on US EPA criteria. Waters where the geometric mean faecal coliform concentration of less that 14No./100ml are generally defined as being acceptable for shellfish production.

The sensitivity of the estuary waters to eutrophication is assessed for nitrogen and orthophosphate levels based on the guidelines published by the EPA in their publication "Water Quality in Ireland 1998-2000". This publication suggests criteria which should be assessed to determine whether a water body is eutrophic i.e. exhibits each of the following criteria:-

- enrichment by stated nutrients (Dissolved Inorganic Nitrogen and Orthophosphate levels),
- accelerated growth of algae and higher forms of plants (Chlorophyll levels), and
- undesirable disturbance to the balance of organisms present and to the quality of the water concerned (Dissolved Oxygen levels).

Table 5.4: Ilen River Water Quality (ref EPA Publication - Water Quality in Ireland 1995-1997, May 1999)

River and Code: ILEN
Tributary of: Sea - Baltimore Bay
OS Grid Ref: W 073 315

Biological Q-rating evaluation

Sampling Location	Station No.	EPA Biological Quality Rating (Q values)						
		1971	1976	1981	1985	1989	1994	1997
Ballyhilty Bridge, north of Skibbereen	0300	5	4-5	4-5	4	3-4	3-4	4
JF Kennedy Bridge, Skibbereen	0350	-	-	-	-	-	-	-
New Bridge, Skibbereen	0400	-	-	-	-	-	-	-

Results of Chemical Analyses 1995 to 1997

Hardness Range: 0-929 mg/l $CaCO_3$
Data Set: 1 20I01 Cork County Council

Parameter	Station No. 0300				Station No. 0350				Station No. 0400			
	No.	Min.	Med.	Max.	No.	Min.	Med.	Max.	No.	Min.	Med.	Max.
PH	32	6.7	7.3	7.7	33	6.8	7.3	8.3	31	7.0	7.3	8.5
Conductivity (µS/cm)	29	112	152	170	28	5	164	646	27	3	167	980
Temperature (deg C)	32	3.5	11.2	19.0	33	3.5	11.5	19.0	31	3.0	11.5	19.0
Dissolved Oxygen (% sat.)	31	77	100	122	33	69	96	122	31	61	102	137
Dissolved Oxygen (mg/l O_2)	31	8	11	17	33	7	11	14	31	6	12	15
BOD (mg/l O_2)	30	0.1	1.4	3.6	30	0.3	1.6	4.5	30	0.3	1.5	3.4
Total Ammonia (mg/l N)	31	0.004	0.024	0.204	31	0.008	0.056	0.282	30	0.008	0.042	0.236
Un-Ionised Ammonia (mg/l NH_3)	31	<0.0001	0.0001	0.0008	31	<0.0001	0.0002	0.0015	30	<0.0001	0.0002	0.0015
Oxidised Nitrogen (mg/l N)	32	0.710	1.960	3.790	33	0.660	2.070	4.600	31	0.490	1.970	4.670
Ortho-Phosphate (mg/l P)	31	0.010	0.017	0.060	32	0.009	0.025	0.249	30	0.010	0.026	0.219
Colour (Hazen)	28	5	20	85	29	5	20	85	29	5	20	85

5.9.3 Assessment of Proposed Discharge - General

The following is an assessment by Irish Hydrodata Ltd. of the impact of the proposed discharge from the wastewater treatment plant on background water quality parameters during operation of the plant and the removal of all untreated discharges to the Ilen River from the town. This assessment is based on surveys of dispersion characteristics and mathematical modelling of the Ilen River. In this assessment Faecal Coliform, BOD and nutrient concentrations are used as indicator parameters for environmental impacts.

The Ilen River forms a long narrow estuary stretching from the sea at Baltimore to Skibbereen town and beyond. Maximum estuary channel depths range from approximately 4 m below Ordnance Datum Poolbeg (OD) at the seaward end to zero at approx 2km upstream of Oldcourt. Further upstream the river bed lies above tidal datum and thus dries fully (except for river flow) during spring tides. At the proposed outfall site the bed level is approximately +1.5 mOD. Tidal influences can be observed for some 4 km upstream of the town on large spring tides, though a more typical distance would be 3 km. Admiralty Tide Tables suggest a mean high water spring level of 3.7 mOD and a mean high water neap level of 3.0 mOD for Baltimore.

The location of the proposed discharge to the Ilen River is shown in Figure 5.4 which is extracted from Admiralty Chart No. 2424. This proposed discharge point is approximately 330 m downstream from New Bridge and 2 km downstream of the town of Skibbereen.

The findings of a dye study and mathematical modelling assessment of proposed discharges from the wastewater treatment plant are presented in this section. The original study, included as Appendix B to this EIS, was carried out in 1993 by Irish Hydrodata Ltd. based on the design population and anticipated concentrations from the treatment plant at that time. Since completion of the 1993 study the design loadings have been updated, as presented in Table 5.5, to reflect the current proposals and the modelling and assessment have been revised. Therefore, the remainder of Section 5.9 is based on the results of this updated modelling and assessment.

The immediate Stage 1 design caters for a population equivalent (PE) of 4,700 persons while in the longer term (Stage 2) this may increase to 9,400 persons. Therefore, the design dry weather flow (DWF) from the outfall thus ranges from 12.5 l/s to 25 l/s for Stage 1 and Stage 2 respectively. In order to minimise the impact of the discharge upstream of the outfall it is proposed to discharge the treated wastewater over a 4-hour period on the ebbing tide. Therefore, 12 hours flow through the treatment plant will be discharged over this 4 hour period twice daily. On occasion, the instantaneous flow through the treatment works will exceed the DWF due to stormwater, natural variations in water usage etc. This represents a further short-term increase in flow rates and is taken to be 3 x DWF which represents the maximum daily flow through the treatment plant. Therefore, this dispersion assessment investigates the following two scenarios:

a) the “longer term” where contaminants are best represented by the modelling a discharge equivalent to 1 x DWF and contaminant concentrations as shown in Table 5.5, and

b) the “short term local impacts” where the flows can increase to 3 x DWF for shorter periods of time.

Table 5.5: Outfall Loadings

Stage	PE	DWF [2]	BOD	Mean Faecal Coliform	Total Nitrogen	Total Phosphate [1]
1	4,700	12.5 l/s	25 mg/l	$10.5x10^4$ No/100ml	30 mg/l N	5.7 mg/l P
2	9,400	25 l/s	25 mg/l	$10.5 x10^4$ No/100ml	30 mg/l N	5.7 mg/l P

Note: 1. Orthophosphate accounts for approx 59% of Total Phosphate.
2. DWF represents the daily flow from the design PE. Actual discharge flows may be greater than this. Maximum design discharge flow rates are 112.5 l/s and 225 l/s for Stage 1 and 2 respectively.

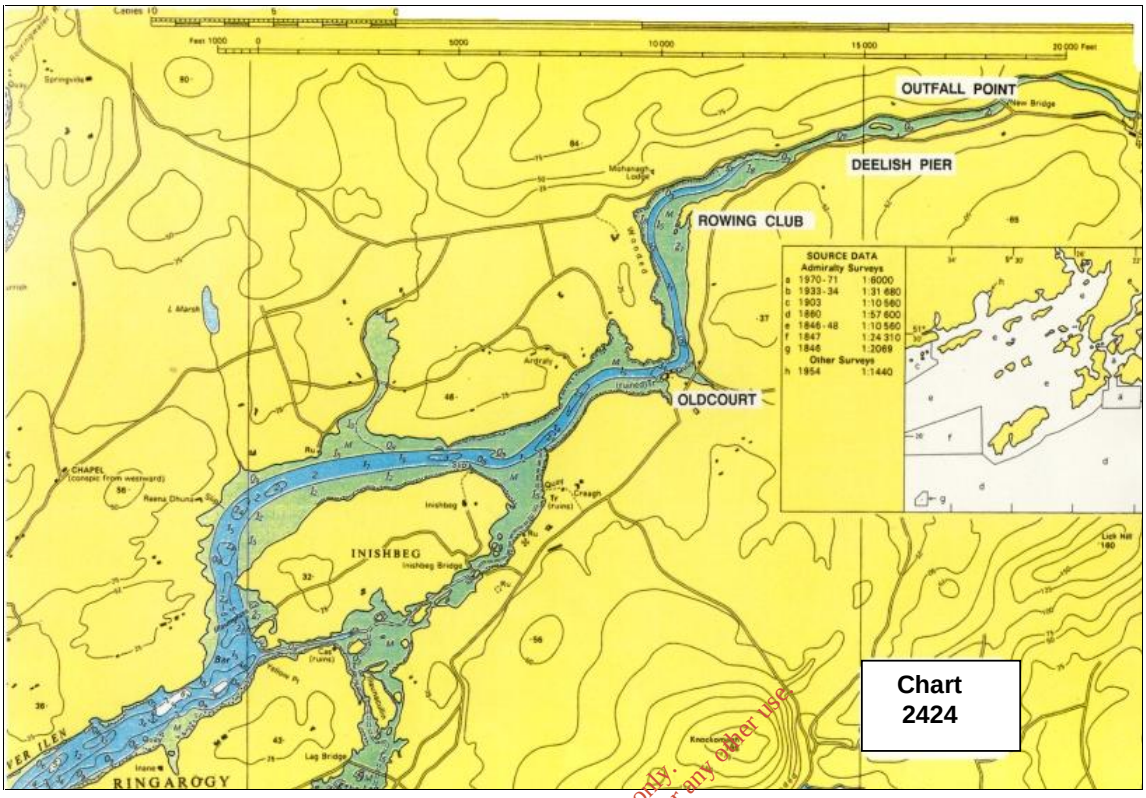


Figure 5.4: Extract from Admiralty Chart 2424 of Study Area

5.9.4 Methodology

Irish Hydrodata Ltd. carried out extensive hydrodynamic and dispersion surveys during the period from the 3rd to the 18th of February 1993. The detailed survey approach and results are included in Appendix B of this EIS. The following surveys were carried out:

- Continuous recording of current, tidal elevation, salinity and temperature at the proposed discharge site.
- Dispersion surveys using Rhodamine B dye discharged to simulate the effects of a treated wastewater discharge on both neap (3rd February 1993) and spring (8th February 1993) tides from the proposed tidal holding tank discharging on the ebb tide.
- Discrete monitoring of temperature and salinity in parallel with the dye survey to determine the extent of the saltwater wedge.

The results of these surveys were used in combination with various numerical modelling techniques to assess the impact of the proposed treated wastewater discharges on receiving water quality. The following summarises the modelling / predictive techniques used for this assessment:-

- ***Dye Results*** Normalised dye concentrations measures during the fieldwork outlined above were used to predict background BOD concentrations from the proposed discharge. These predictions were valid for the spring and neap tide and river flow conditions that prevailed during the survey. Both 1DWF and 3DWF discharges from the proposed outfall were assessed.

Normalised dye results were used to predict the peak increase to BOD and Faecal Coliform concentrations at high water upstream of the outfall.

- ***Near Field Mixing*** This models predicts the maximum initial dilutions available in the River Ilen within than 0.5km from the outfall point during low flow periods from a 3DWF discharge (Stage 1 and 2) over 4 hours as proposed.

- ***Mid Field Dispersion*** Downstream concentrations of BOD and Faecal Coliform were predicted for times between HW + 1 hour and HW + 5 hours using diffusion calculations for both spring and neap tides. Average river flows and maximum Stage 1 (3DWF) discharge rates for the proposed 4 hours duration were analysed.

  Upstream faecal coliform concentrations and High Water were estimated using a box model for Stage 1 and 2 (3DWF) discharges over the proposed 4 hour duration assuming spring and neap tidal conditions were analysed for average river flow. This method was not considered suitable for the prediction the equivalent BOD concentrations.

- ***Tidal Averaged Model*** Simulations of the longer term fate of parameters for low and average river flows, Spring and Neap tides conditions and Stage 1 and 2 discharges were carried out. BOD, Faecal Coliform, Orthophosphate and Total Nitrogen concentrations were modelled. As short term variations are accounted for using this technique 1DWF daily discharge flows were modelled.

5.9.5 Dye Dispersion Survey

Both spring and neap tide dye releases were carried out.

Dye Release No. 1 - 3/2/1993

A general description of dye movement following release during neap tides is contained in Section 4.1 of the 1993 report included as Appendix B to this EIS. Quantitative data are included in Figures 4.1 and 4.2 of Appendix B. Tracking of the dye plume was carried out until Release + 96 hours.

Dye Release No. 2 - 8/2/1993

A general description of dye movement following release during spring tide is contained in Section 4.2 of Appendix B. Quantitative data are included in Figures 4.3 and 4.4 of Appendix B. Tracking of the dye plume was carried out until Release + 72 hours.

5.9.6 River Flow

River levels were recorded during the survey period by observing the staff gauge at Ballyhilty Bridge. Rating curves for the Ilen (based on 1977 – 1989 data) allowed the readings to be converted directly to flow. The river flow during the survey period was approximately 5.6 m^3/s on average. Flow exceedances for this gauge are given in Appendix B. These data show that the flow prevailing during the survey period equates approximately to the 50% exceedance flow for the Ilen River. Furthermore, based on these data the 3-day sustained low flow is estimated to be 0.25 m^3/sec (approximately 5 MGD).

5.9.7 Tide & Current Data

Tidal Information

A recording tide gauge was deployed near the proposed outfall discharge point at the start of the field work and left in position for 16 days. A plot of the tidal curve recorded is presented in Figure 5.5.

The gauge data compares favourably with the Admiralty Tide Table predictions for Baltimore when allowances are made for distance (approx. 15 km) and river flow. Mean high water spring is approximately 3.8 m and mean neap high water approximately 3.1 m. Measured times of high water are within about 10 minutes of those computed for Baltimore from the tide tables. The data plot shows that at about HW + 4 hours the tide had fallen to the level of the river flow in the channel. This was approximately 0.5 m for the 6 m^3/s, which prevailed during the survey. Under the very low river flow conditions the channel will almost dry out at low tide. Extrapolation of the measured data shows that this would occur between HW + 4.5 hours and HW + 5 hours.

Recording Current Meter

The fixed recording current meter was located at about 0.3 m above the bed in mid-channel just upstream of the proposed discharge location. This provided data on current speed, temperature and salinity variations. These trends are illustrated in Figures 5.5 and 5.6.

In summary, the peak velocities at the outfall site were approximately 0.5 m/s. These occurred on the ebbing tide about 1.5 hours after high water. For the remainder of the tide a constant speed of 0.4 m/s prevailed due to the river flow. Maximum temperature and salinity data at this site during the period were 9.2^{o}C and 12 ppt respectively.

The position of the mixing zone is not fixed but depends on the tidal level and the river flow. The dye data suggests that the limit of the mixing zone, the point at which full cross-sectional mixing has occurred, will lie somewhere between Deelish Pier and the Rowing Club bend.

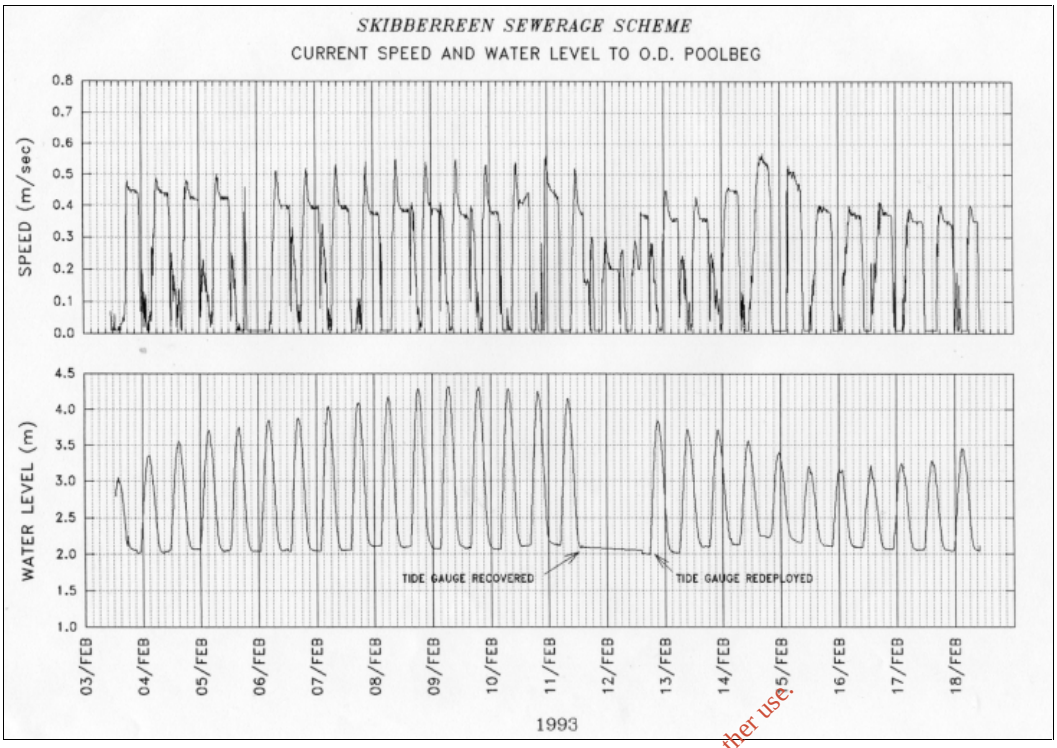


Figure 5.5: Current Speed and water level recorded in the vicinity of the proposed discharge point, February 1993

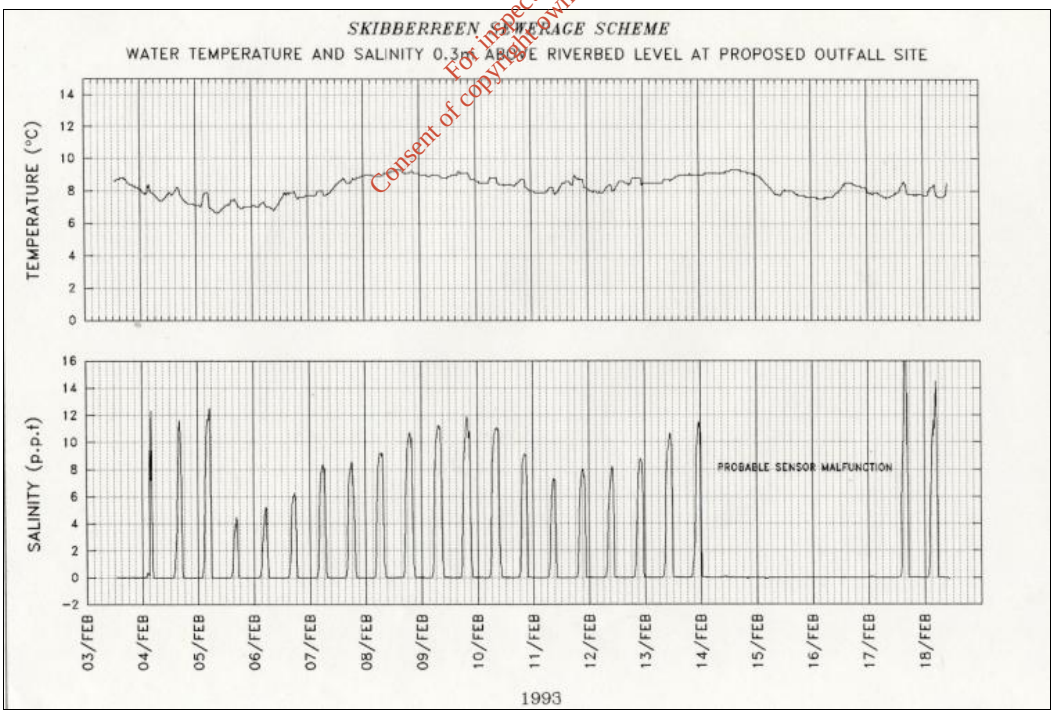


Figure 5.6: Temperature and Salinity data recorded in the vicinity of the proposed discharge point, February 1993

5.9.8 Dispersion Assessment – based on Dye Survey Results

The normalised dye concentrations recorded during the dye survey and presented in Appendix B have been used to estimate the maximum concentrations of relevant water quality parameters from the proposed treated wastewater discharge. Note that these are representative of the river flow conditions that prevailed during the survey (average 5.6m^3/sec) and are similar to the 50% exceedance river flow.

Rhodamine B dye acts like a conservative contaminant and therefore the results can be used to estimate the concentrations arising from effluent discharging from the outfall. At any given time the total concentration will be a summation of all contributions from previous releases. The peak concentration in the estuary during neap tides can thus be expressed as:-

C = [Plume Concentration + Peak Background Concentration] units/m^3

C = [Plume Concentration + 0.34] units/m^3

Outside the immediate plume the peak background concentration will be approximately 0.34 units/m^3. This is based on a source of 1 unit per second. Therefore, the background BOD concentration resulting from a continuous effluent discharge equivalent to 54 kg of BOD over 24 hours, i.e. Stage 2, 9400PE @ 25mg/l BOD (excluding the immediate plume) will be:

Cp = 0.34 x 54/(24 x 3,600) kg/m^3

Cp = 0.21 mg/l

A similar calculation based on the spring tide release of 8/2/1993, gives a peak value Cp = 0.09 mg/l (0.13 units/m^3 for a unit source) for 54kg BOD per day. Therefore, the average increase in peak background BOD concentration would be approximately 0.15 mg/l.

Table 5.6 presents results for the Stage 1 and Stage 2 flow rates and associated concentrations. Note that as the background levels will develop over several days it is thus appropriate to consider effluent discharges at the 1DWF. The concentrations associated with a sustained 3DWF discharge are also presented as an indication of worst-case conditions.

The position of the peak background concentration will be influenced primarily by the previous ebb tide release and therefore occur within 2km downstream of the outfall as shown by the axial concentration profiles in Figures 4.2a and 4.4aof Appendix B.

Table 5.6: Peak increase to background BOD Concentrations based on dye survey results

	BOD discharge conc. (mg/l)	Daily Flow	Peak Background Concentration mg/l		
			Neap Tide	Spring tide	Mean
Stage 1 – 4700 PE	25	1DWF	0.11	0.04	0.07
Stage 2 – 9400 PE	25	1DWF	0.21	0.09	0.15
Stage 1 – 4700 PE	25	3DWF	0.33	0.12	0.22
Stage 2 – 9400 PE	25	3DWF	0.64	0.24	0.44

Note:- Based on river flow of 5.6m^3/s.

On the flooding tide, waters mixed with recently discharged effluent will be pushed upriver towards the town. In a worst case scenario the outfall may have been discharging at 3DWF for the preceding ebb tide while at best the discharge will have been at 1DWF. The upstream concentrations will thus vary significantly. Contaminant concentrations in these waters can also be estimated from the dye test results. The profile at Release + 12 hours in Figure 4.4a in Appendix B (spring tide) shows a peak of 0.041 for a unit discharge. Based on these results this peak occurs approximately 1km upstream of the proposed outfall.

Therefore, for the Stage 1 discharge of 112.5 l/s (3DWF in 4 hours) the spring tide dilution is approximately 213 and thus the BOD concentration will be 25/213 = 0.12 mg/l. No profile was recorded at Release + 12 hours during the neap tide. However, by scaling the concentration peaks at later times with the corresponding spring tide values the dilution is found to be of the order of 99. Thus, the BOD concentration will be 25/99 = 0.25 mg/l.

A similar assessment for the Stage 2 discharge of 225 l/s (3DWF in 4 hours) equates to a dilution of 107 for a spring tide and 49 for a neap tide. These dilutions represent BOD concentrations of 0.23 mg/l and 0.51 mg/l respectively for spring and neap tide. These results are summarised in Table 5.7.

Estimates of bacterial concentrations can also be obtained from the dye results although as the dye is conservative, decay is not readily accounted for. Reliable estimates of the background levels are therefore not possible although good indications of the short-term concentrations, such as those that occur at high water on the flooding tide, can be made. From the dilutions outlined above and a discharge concentration of 10.5 x 10^4 No/100ml upstream concentrations at high water are presented in Table 5.7. The location of these "upstream" concentrations will vary depending on tidal range and river flow however based on the normalised dye profiles presented in Figure 4.2a of Appendix B these concentrations will occur within 1km upstream of the outfall.

The concentration in the plume itself will vary depending on the state of the tide and the river flow. The likely dilutions, based on the recorded current speeds and model simulations are presented in Section 5.9.9 below.

Table 5.7: Upstream BOD and Coliform Concentrations based on dye survey results at High Water

	Parameter	Peak Upstream Concentration		
		Neap Tide	Spring tide	Mean
Stage 1 – 4700 PE				
1 DWF	BOD mg/l	0.08	0.04	0.06
	Coliform No./100ml	105	49	77
3 DWF	BOD mg/l	0.25	0.12	0.19
	Coliform No./100ml	315	148	232
Stage 2 – 9400 PE				
1 DWF	BOD mg/l	0.17	0.08	0.13
	Coliform No./100ml	210	98	154
3 DWF	BOD mg/l	0.51	0.23	0.37
	Coliform No./100ml	631	294	463

Note:-
1 Discharge Concentrations: BOD (25mg/l), Faecal Coliform (10.5x10^4 No./100ml).
2. Assuming 70% decay of bacteria over the period from discharge to high water.
3. River flow = 5.6m^3/s.

5.9.9 Dispersion Assessment – Numerical Models

To assist with the evaluation of the proposed effluent discharges and to provide further indications of how the dilutions/concentrations will vary with distance from the source various numerical models were employed. These models comprised principally a mid-field dispersion model and a tidally averaged model. The near-field effects were examined in a more qualitative way. The results, together with details of the models, are outlined in the following paragraphs.

Near-Field Mixing and Initial Dilution

An indication of the probable concentration ranges of effluent contaminants, for example BOD, in the immediate area of the outfall can be derived from simple physical arguments.

During periods of low river flow (i.e. 5 MGD or 0.25 m^3/sec) the effluent concentrations in the near field will be increased particularly in the later stages of the discharge period as the volume of the tidal water upstream of the outfall site reduces to zero. The worst case will occur when the tide level has fallen below the bed level leaving only river water available for mixing. The maximum dilution achieved when the effluent (3 x 3 DWF) mixes with the river flow is

D = (River Flow +Discharge Flow Rate)/(Discharge Flow Rate)

i.e. D = (0.25 + 0.225) / 0.225 = 2.11

Therefore, the maximum low flow dilution for Stage 1 is 3.22 and Stage 2 is 2.11. Thus, if the effluent BOD concentration is 25 mg/l then the maximum diluted BOD concentration in the river would be 7.7 mg/l and 11.8 mg/l above any existing background level for Stage 1 and 2 respectively. This level will be reached when full cross-sectional mixing is achieved, probably just downstream of Deelish Pier.

High tides combined with low river flows will produce more immediate dilutions due to the mixing of the effluent jet with ambient water. A near-field model was used to investigate the likely initial dilutions available under such conditions. The model solves the steady state equations describing various conservation equations which define the trajectory, dimensions and dilution factor of the effluent stream. Current data recorded upstream of the outfall site were used as model input and results for spring and neap tides are presented in Table 5.8. These values are indicative and may vary slightly depending on the final outfall design.

The initial dilution of the 3DWF Stage 1 discharge at high water neap tide is estimated to be 5, and therefore the peak BOD concentration will be 25/5 = 5 mg/l in the mixing zone. Near-field faecal coliform concentrations can be similarly estimated as 2.1 x 10^4 No/100ml. The Stage 2 equivalents will be 10 mg/l and 4.2 x 10^4 No/100ml respectively.

Table 5.8: Predicted Maximum Initial Dilutions (HW + 1h) at the Outfall Site

Flow	Spring Tide	Neap Tide
Stage 1 - 3DWF (112.5 l/s)	9.5	5.0
Stage 2 - 3DWF (225 l/s)	4.5	2.5

Mid-Field Dispersion

Effluent concentrations downstream of the outfall were estimated using an analytical model based on differential equations which define the processes of diffusion of a contaminant in flowing waters. The model assumes that the effluent is well mixed over the water column and is developed using representative depth and current data recorded at the site. Diffusion coefficients were calculated from the empirical approximation $K = 0.5uh$ where u, h are local speed and depth respectively. The model was used to predict typical BOD and faecal coliform concentrations for times between HW + 1 hour and HW + 5 hours using a Stage 1 flow rate of 112.5 l/s. The results are presented in Table 5.9 and are representative of the average river flow and tide conditions which prevailed during the survey. The restriction of average river flow is only significant for predictions near the source (i.e. <3,000m). Further downstream where the river flow comprises only a small fraction of the tidal flow the differences would be small and thus the results can be taken as indicative of the probable concentrations.

Table 5.9: Mid–Field Model of Effluent Mixing on the Ebb Tide (Stage 1 discharge)

Distance Downstream (m)	BOD (mg/l)		Coliform (No/100ml) T_{90} = 12 hr	
	Spring	Neap	Spring	Neap
1,000 m	0.300	0.440	810	1323
3,000 m	0.070	0.095	450	735
5,000 m	0.015	0.022	40	61
10,000 m	0.010	0.013	< 20	< 20

Estimates of the contaminant concentrations upstream of the outfall site were made with a box model. With this method the effluent is assumed to discharge into a box whose volume is defined by the tidal prism upstream of the outfall. The 'steady state' concentrations can be estimated using the equation: $C_b = Q*E_c/(V*k)$, where Q, E_c are the outfall flow and concentration, V is the box volume (100,000 m^3 for mean neap tides) and k a decay rate. The method is conservative, as it does not account for downstream mixing. River influx over the decay period is accounted for by increased dilution. The only manner by which effluent can leave the box is through decay. Therefore, BOD with a decay rate (T_{90}) of 5 days cannot realistically be estimated by this method.

Table 5.10 presents upstream coliform concentrations based on the box model. Note that these concentrations are comparable with those calculated from the dye results and previously presented in Table 5.7. The concentrations presented in Table 5.10 are generally greater than those presented in Table 5.7 due to the conservatisms inherent in the box model approach.

Table 5.10: Estimated Upstream Faecal Coliform Concentrations

Discharge Flow Rate	Faecal Coliform (No/100ml) T_{90}=12hr	
	Spring	Neap
Stage 1 – 112.5 l/s	171	215
Stage 2 - 225 l/s	342	430

Note: River flow = 5.6 m^3/s

Tidally Averaged Model

Simulations of the longer term fate of contaminants discharged to the estuary and the effects of river flow were made within an estuarine contaminant model, ECOS.

In this model, the estuary is divided into equal-length segments, within which the water column is assumed to be perfectly mixed. The model allows inputs of fresh water and contaminants into any one of the estuary segments. The various physical processes to which contaminants are subjected can be simulated. ECOS determines the tidally-averaged movements of material between these segments. The movements are represented as two separate components – advection (flow) and dispersion (mixing). The advective component represents the average transport of material and round this average flow, the dispersive component embodies the stirring and mixing processes of the estuary. The concentrations calculated within the model are thus tidal averages. Typical output from the model is included in Figure 5.7.

The development of this model is described more detail in Irish Hydrodata's report included in Appendix B of this EIS. The model was used to simulate the dispersion of a Stage 2 DWF average daily discharge of 25 l/s under varying river flow rates and the resultant concentrations of BOD, faecal coliform, total nitrogen and ortho-phosphate were noted. The existing background river levels of various parameters were incorporated in the model as listed in Table 5.11. These are based on recent Cork County Council sampling conducted at Ballyhilty Bridge, approx 3km upstream of Skibbereen, during 2002/2003. Marine boundary data were based on typical coastal values. The daily input of nutrients to the estuary from the Ilen river and the proposed outfall are summarised in Table 5.12.

Due to the tidal averaging approach adopted in this model the predictions are generally lower than that predicted by earlier methodologies, however, they were found to compare favourably with the estimates calculated from the dye surveys. Model results for 4,700PE and river flows of 5.6m^3/s and 0.25m^3/s are presented in Tables 5.13 and 5.14 with corresponding results for a 9,400PE in Tables 5.15 and 5.16. Based on the results of the ECOS modelling using the background water quality data included in Table 5.11 nutrient levels are predicted to be below the EPA eutrophication criteria (*ref EPA publication Water Quality in Ireland 1998-2000*) for average river flows (5.6m^3/s) and to slightly exceed allowable guideline levels under low flow conditions.

Table 5.11: Background Water Quality Parameters (based on Cork Co. Co. 2004 data).

Parameter	River Water (mg/l)	Marine Boundary (mg/l)
$P0_4$	0.013	0.01
$N0_3$	1.47	0.10
$N0_2$	0.006	0.0
NH_4	0.023	0.05

Table 5.12: Daily Nutrient Input to Ilen Estuary.

Source	Total Nitrogen (kg/d)	PO_4 (kg/d)
River @ mean flow, 5.6m^3/s	725	6.3
River @ low flow, 0.25m^3/s	32.4	0.28
Outfall, 4700PE	32.4	3.63
Outfall, 9400PE	64.8	7.26

Table 5.13: Tidally Averaged Model of Effluent Mixing, Stage 1 (4,700PE), River Flow =5.6m^3/s.

Distance Downstream	BOD (mg/l)		FC (No/100ml)		OP (mg/l)		TN (mg/l)		Salinity (ppt)	
	Sp	Np	Sp	Np	Sp	Np	Sp	Np	Sp	Np
1,000 m	0.06	0.075	90	105	0.030	0.033	1.4	1.6	5.0	3.0
3,000 m	0.016	0.020	23	33	0.024	0.025	0.80	0.85	18.0	16.0
5,000 m	0.006	0.006	10	12	0.018	0.016	0.50	0.40	24	26
10,000 m	0.002	0.002	< 5	< 5	0.012	0.012	0.25	0.20	29	30

Note:
Sp represents spring tide conditions
Np represents neap tide conditions
FC represents Faecal Coliform data
OP represents Orthophosphate data
TN represents Total Nitrogen (ammonia and oxidised nitrogen)

Table 5.14: Tidally Averaged Model of Effluent Mixing, Stage 1 (4,700PE), River Flow =0.25m^3/s.

Distance Downstream	BOD (mg/l)		FC (No/100ml)		OP (mg/l)		TN (mg/l)		Salinity (ppt)	
	Sp	Np	Sp	Np	Sp	Np	Sp	Np	Sp	Np
1,000 m	0.07	0.09	100	175	0.050	0.065	0.60	0.75	28.0	26.0
3,000 m	0.012	0.015	15	25	0.030	0.035	0.35	0.40	31.5	31.0
5,000 m	0.007	0.010	< 5	< 5	0.022	0.023	0.26	0.25	33.0	33.0
10,000 m	0.005	0.005	< 5	< 5	0.015	0.015	0.20	0.19	33.0	33.0

Note:
Sp represents spring tide conditions
Np represents neap tide conditions
FC represents Faecal Coliform data
OP represents Orthophosphate data
TN represents Total Nitrogen (ammonia and oxidised nitrogen)

Table 5.15: Tidally Averaged Model of Effluent Mixing, Stage 2 (9,400PE), River Flow =5.6m^3/s

Distance Downstream	BOD (mg/l)		FC (No/100ml)		OP (mg/l)		TN (mg/l)		Salinity (ppt)	
	Sp	Np	Sp	Np	Sp	Np	Sp	Np	Sp	Np
1,000 m	0.11	0.15	180	210	0.045	0.045	1.8	1.9	5.0	3.0
3,000 m	0.033	0.040	45	65	0.035	0.033	1.05	1.10	18.0	16.0
5,000 m	0.012	0.013	20	25	0.028	0.022	0.60	0.50	24	26
10,000 m	0.004	0.004	< 10	< 10	0.018	0.014	0.35	0.25	29	30

Note:
Sp represents spring tide conditions
Np represents neap tide conditions
FC represents Faecal Coliform data
OP represents Orthophosphate data
TN represents Total Nitrogen (ammonia and oxidised nitrogen)

Table 5.16: Tidally Averaged Model of Effluent Mixing, Stage 2 (9,400PE), River Flow =0.25m^3/s

Distance Downstream	BOD (mg/l)		FC (No/100ml)		OP (mg/l)		TN (mg/l)		Salinity (ppt)	
	Sp	Np	Sp	Np	Sp	Np	Sp	Np	Sp	Np
1,000 m	0.13	0.18	200	350	0.055	0.095	0.65	1.05	28.0	26.0
3,000 m	0.025	0.03	30	50	0.035	0.045	0.35	0.50	31.5	31.0
5,000 m	0.015	0.020	<10	<10	0.025	0.030	0.26	0.35	33.0	33.0
10,000 m	0.010	0.010	<10	<10	0.020	0.020	0.25	0.25	33.0	33.0

Note:
Sp represents spring tide conditions
Np represents neap tide conditions
FC represents Faecal Coliform data
OP represents Orthophosphate data
TN represents Total Nitrogen (ammonia and oxidised nitrogen)

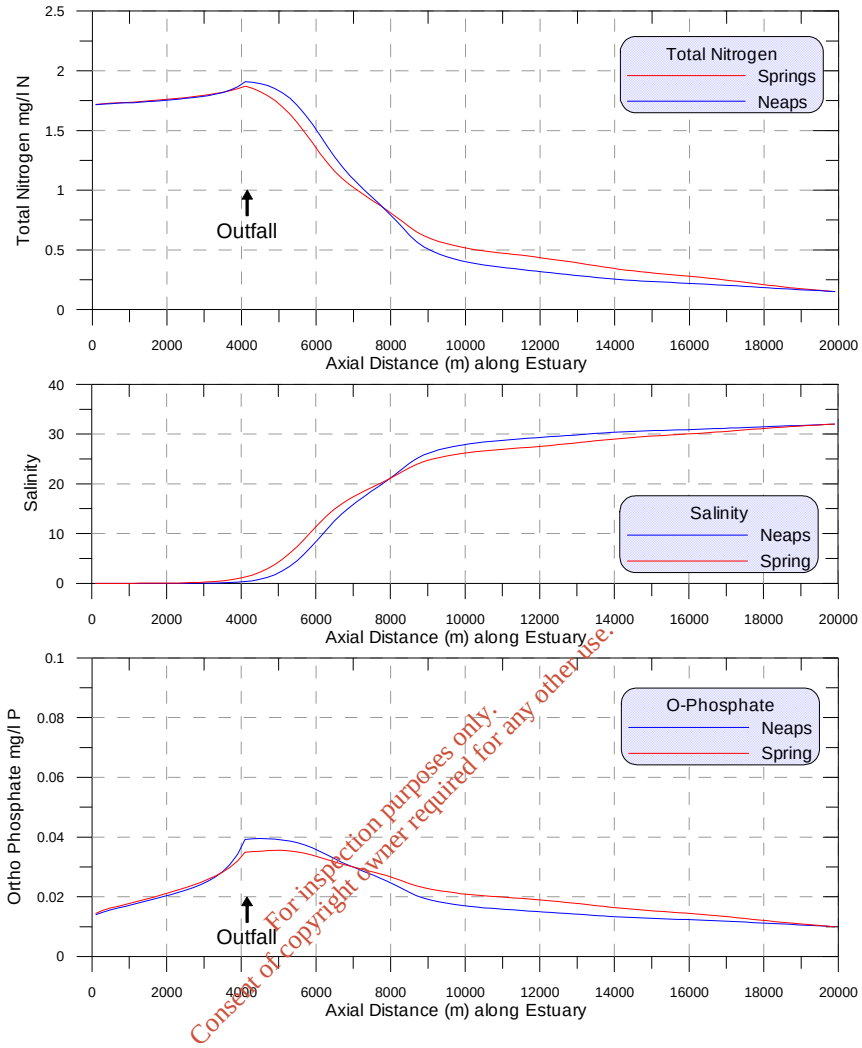


Figure 5.7: Example of ECOS model output.

5.9.10 Discussion on water quality impact assessment

This water quality impact assessment presents the results of dye dispersion tests conducted on the Ilen Estuary during neap and spring tides and average river flows. Dye released from the proposed outfall site on the ebb tide was found to mix rapidly and peak concentrations to reduce below measurable levels within eight tidal cycles.

The recorded tidal data confirmed the general patterns given in the Admiralty Tide Tables for Baltimore Harbour. However, analysis of the results showed that the tide level will fall below the bed level at the proposed discharge site sometime between High Water + 4.5 hour and High Water + 5 hour. Therefore, as described in Section 3.3 of this EIS the proposed treated wastewater discharge should take place during the 4 hour period from High Water plus 0.5 hour to High Water plus 4.5 hour.

Effluent plume concentrations in the near-field mixing zone were estimated for the various combinations of flow and water level. The limits of the mixing zone are variable depending on the

state of the tide and the river flow. Typically full mixing will occur between Deelish Pier and the Rowing Club bend.

The results of the dye surveys enabled peak contaminant concentrations to be estimated (Table 5.6). These show that a 1DWF discharge for Stage 2 the proposed outfall would produce a peak increase in the background BOD level of about 0.21 mg/l during the neap tides and 5.6 m^3/s river flows. The corresponding spring tide increase to the background level is 0.15 mg/l. Stage 1 predicted increases are 0.11 mg/l and 0.07 mg/l for the spring and neap tides respectively.

The flooding tide will carry discharged wastewater upstream towards the town. Table 5.7 presents estimates of the likely increase in BOD and faecal coliform levels in this region at high water. In summary, these are 0.08 – 0.51 mg/l and 98 to 631 No/100 ml respectively for Stage 2. Following completion of Stage 1 the estimated upstream concentration increases from the proposed discharge are 0.04 – 0.25 mg/l and 49 – 315 No/100ml for BOD and faecal coliforms respectively. The location of these peak concentrations is likely to be within 1km upstream of the outfall. These estimates were compared with the predictions of various numerical models and found to be in close agreement thus confirming the reliability of the approach.

Compliance with Water Quality Standards

The relevant water quality standards for the purposes of this Environmental Impact Assessment are outlined in Section 5.9.2 above.

Based on the dispersion assessment presented in Section 5.9.8 predicted faecal coliform concentrations indicate that the peak increase to baseline levels at high water upstream of the proposed outfall from the proposed discharge will be generally less than 631 No/100ml outside of the initial mixing zone for Stage 2. Outside the initial mixing zone downstream of the discharge short term coliform concentrations are predicted to be less than 2000No./100ml within 3km of the discharge point, Table 5.9. This is based on certain conservative assumptions including 3DWF discharges. Detailed modelling using tidal averaging techniques predict longer term maximum coliform concentrations of 350No./100ml at 1km downstream of the outfall. These results would suggest that the levels defined in the Bathing Water Regulations would be complied with for the proposed treated wastewater discharge.

The nearest licensed shellfish area to the proposed outfall is located more that 8km downstream in the River Ilen. The dispersion model results from the tidal average model presented in Sections 5.9.9 (Tables 5.13 to 5.16) suggest that the faecal coliform concentrations at this location from the proposed treated wastewater will be less than 14 No./100ml for conservative Stage 2 discharge conditions. Therefore, the Shellsan criterion of 14No./100ml for an acceptable geometric mean coliform concentration in the water column of shellfish areas would not be exceeded from the proposed discharge.

Although not designated under the Quality of Salmonid Waters Regulations, the River Ilen is a good quality waterway and an important local fishery. As discussed in Section 5.9.1 the EPA have rated the water quality of the Ilen river as Q4 therefore the water is relatively unpolluted with a high level of biodiversity. As stated in Section 5.9.2 the Salmonid Waters Regulations define a limit of 5 mg/l O_2 for BOD. The peak BOD concentration increase from the proposed discharge is 0.64 mg/l as estimated in Section 5.9.8. BOD concentrations predicted by the numerical modelling presented in Section 5.9.9 indicate generally lower BOD concentrations. Therefore, adding these predictions to the background levels presented in Table 5.4 the resulting maximum BOD levels outside the initial mixing zone will be below the limit of 5 mg/l O_2. Outside the initial mixing zone the median BOD levels would be significantly lower, being in the order of 2 mg/l O_2.

The EPA guidelines referenced in Section 5.9.2 defined three criteria that must be satisfied for a water body to be considered eutrophic. These relate to nutrient levels, dissolved oxygen levels and algal

growth. For the purposes of this study there are no data available on algal growth in the River Ilen, however, the following is an assessment with respect to the two other eutrophication criteria:-

- During average river-flow conditions total nitrogen and ortho-phosphate levels will remain below EPA criteria for nutrient enrichment referenced in Section 5.9.2. However, during low flow periods, such as the 0.25m^3/s situation modelled, the results indicate that both total nitrogen and ortho-phosphate levels may exceed the eutrophication criteria up to a distance of approximately 2 to 3km downstream of the outfall for the 9,400PE Stage 2 design scenario. At the reduced loadings associated with the 4,700PE design the criteria may be exceeded for a distance of approx 1 to 1.2km downstream of the outfall. It should be noted that the predicted nutrient levels are strongly influenced by the background levels in the Ilen River as can be seen from the relative daily nutrient inputs presented in Table 5.12. The median nutrient level based on data collected in 2002 and 2003 has been selected as the background level for all river flow conditions and this assumption may be conservative. However, the model results do predict that there is a risk of exceeding current EPA guidelines for enrichment in the vicinity of the outfall under certain combinations of river flow and tidal range.

- The data presented in Table 5.4 also shows that upstream of the town the minimum Dissolved Oxygen (% Saturation) levels recorded in the River Ilen approach the limits defined in these EPA guidelines.

Although there are no data available on algae levels the above shows that, under certain conditions, there is a risk of exceeding at least two of the three eutrophication criteria defined in the EPA guidelines. Therefore in order to minimise this risk of enrichment from the treatment plant discharges, it is considered prudent to include additional nutrient reduction facilities within the detailed design of the treatment plant. The selected DBO contractor will determine the design of the required processes, however, processes may include extended aeration, the use of anoxic zones, recycling of flows etc. The final wastewater treatment processes should reduce nutrients in the final effluent to the levels defined in Table 5.17 below.

Table 5.17: Recommended Nutrient Discharge Requirements based on S.I. 254 of 2001

Parameter	Nutrient Concentration	Alternative Percentage Reduction
Total Phosphorous	2 mg/l	80%
Total Nitrogen	15 mg/l	70 – 80%

5.9.11 Final Effluent & Water Quality Monitoring

Long term monitoring of the Ilen River and the final effluent from the treatment plant will determine compliance or otherwise with the quality objectives set for the scheme. Monitoring of the River Ilen macroinvertebrates and water quality should be conducted. This will facilitate a quantitative assessment of the river quality and the impacts of the proposed wastewater treatment plant discharge.

Ongoing monitoring of the final effluent quality will be carried out at least in accordance with the requirements the Fifth Schedule of S.I. 254 of 2001. This defines the minimum annual number of samples to be tested as determined by the size of the treatment plant as follows:-

"2000 – 9999 PE - 12 samples during the first year; four samples in subsequent years if it can be shown that the water during the first year complies with the provisions of these regulations; if one sample of the four fails, 12 samples must be tested in the year that follows"

5.9.12 Conclusion

The proposed project will have a positive impact on the overall quality of the water in the River Ilen. At present there is no treatment of wastewater discharged to the river. The negative impact of this is seen from the decrease in water quality within the town. Following completion of the project treated wastewater will be discharged to the River Ilen and the discharge regime from the plant, using a tidal holding tank, will maximise the dispersion and hence minimise any potential negative impacts on background water quality.

The water quality in the Ilen has decreased since the 1970's. If the project does not proceed the quality of the water in the Ilen River may decrease even further. The removal of existing untreated wastewater discharges and the discharge of treated wastewater at the target final effluent standards outlined in the EIS will have a net positive water quality.

Long term monitoring of the water quality should be used as a means to confirm that the water quality of the river meets statutory requirements. The scheme as proposed and incorporating the mitigation measures outlined in Section 5.9.10 will meet current statutory water quality requirements.

5.10 GEOLOGY, HYDROGEOLOGY AND SOILS

5.10.1 Introduction

This section comprises a desktop study of the potential impacts on geology and soils and is on available information provided in the Geological Survey of Ireland, Bedrock Geology Map Series No. 24 (Geology of West Cork) and accompanying handbook. In addition, preliminary site investigation data obtained from the previous Skibbereen Flood Works Study have been reviewed and incorporated where appropriate.

5.10.2 Description of Existing Environment

5.10.2.1 Bedrock Geology

Figure 5.8 shows the Bedrock Map for the Skibbereen area of west Cork. The rocks of West Cork are considered less varied than in other parts of the country. The majority of rocks in the area Devonian or Carboniferous in age (between 370 to 310 million years ago) and are sedimentary in nature. All these sedimentary rocks have been to some degree metamorphosed, the finer grained rocks usually forming slates. The mountain forming period at the end of the Carboniferous caused this metamorphisis due to the associated heat and pressure.

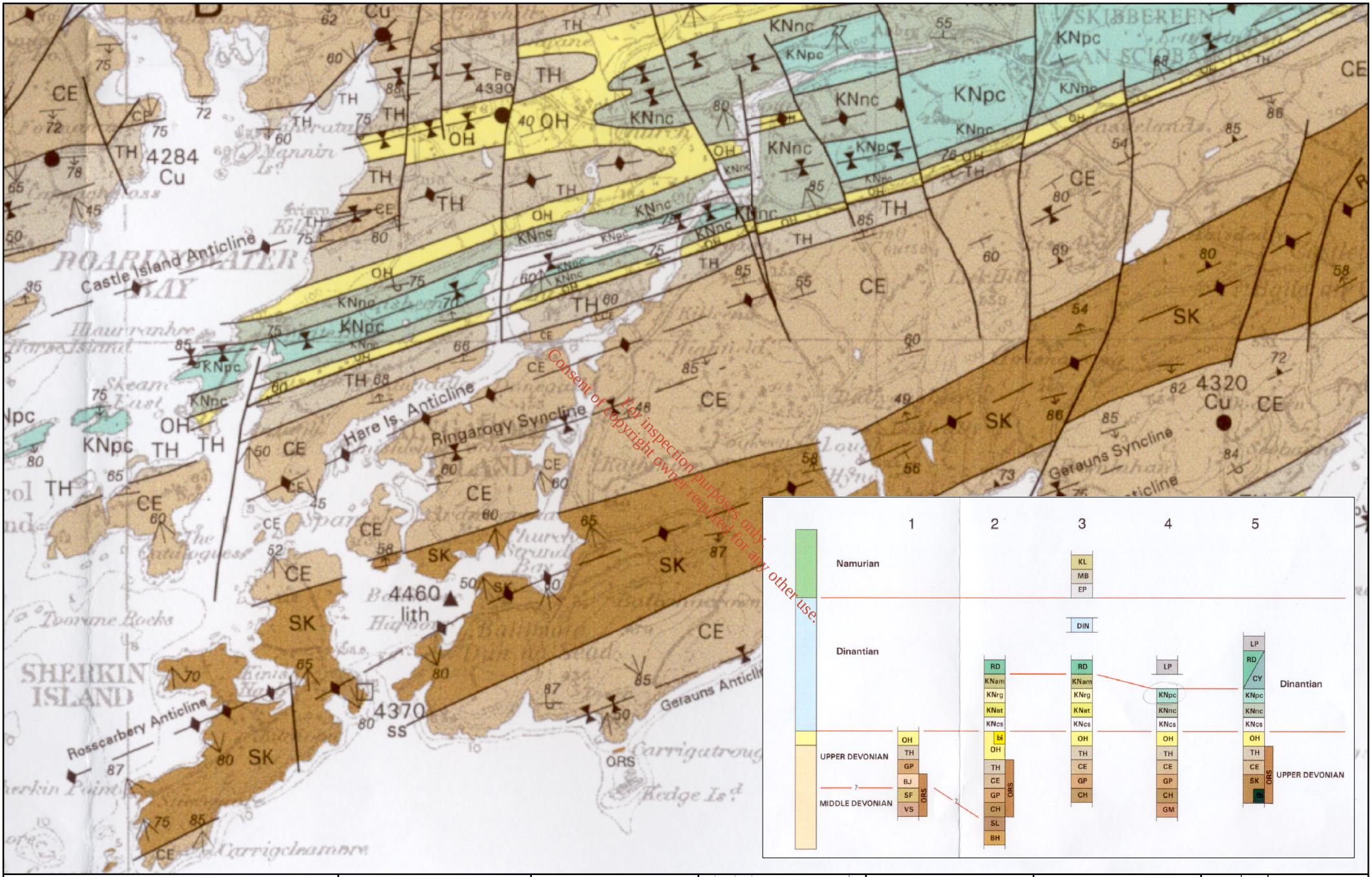
Skibbereen is located in what is known in Geological terms as the South Munster Basin. Within this depositional feature lies the Kinsale Formation. The Kinsale formation can be divided into three members, the Castle Slate Member, The Narrow Cover Member and the Pig's Cove Member. The bedrock lying directly beneath the site in Skibbereen is thought to be the Pig's Cove Member.

From the Geological Survey of Ireland, Bedrock Geology Map Series No. 24 (Geology of West Cork) and accompanying handbook - "The member is mud-dominant and characterised by grey linsen-bedded mudstones or silty mudstones, and a lack of massive sandstones. The member is uniform in appearance and gradational from the Narrow Cove Member below. Occasional parallel-bedded or lensoid sandstones up to 1m think are found. Small discoid phosphatic nodules and small-scale scour features are common. Naylor (1975)[3] suggested that the decrease in sandstone in the Pig's Cover Member was indicative of gradually deepening water, further from the strand line".

5.10.2.2 Structural Geology

The Variscan Orogeny brought about the end of the basinal sedimentation with uplift and compression. The main structural features associated with this Orogeny are demonstrated in the area around Skibbereen by the presence of a Syncline.

[3] Naylor (1975), Upper Devonia – Lower Carboniferous stratigraphy along the south coast of Dunmanus Bay, Co. Cork. Proc. Of the Royal Irish Academy, 75, Sect B 317-337.



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No.	Date	Amendment / Issue	App.
F01	MAR'04	REPORT	A

Project:
SKIBBEREEN SEWERAGE SCHEME WASTEWATER TREATMENT PLANT

Title:
BEDROCK MAP FOR SKIBBEREEN

Drawn by:	AOC	Job No:	MCW0153
Checked by:	BB	File No:	MCW0153SK0017
Approved by:		Drg. No:	FIG. 5.8
Scale:	NTS	Rev:	F01
Date:	MAR '04		

In south-central Cork five major fold axes dominate the structure of the bedrock. They are the Ballydehob Anticline, the north and south branch of the Skibbereen Syncline, separated by the Castle Island Anticline, and the Horse Island and Roscarbery Anticlines. All of these folds have axial planes dipping steeply to the north and are generally asymmetric. The mud dominant rocks of the Kinsale Formation commonly show tight third order symmetric folds and these rocks occupy the axial zones of the major Syncline.

In the Roaringwater Bay area northeast trending cross-faults are present, some displaying horizontal and vertical displacement. On the Roaringwater River Fault a displacement of 600m has been demonstrated. Strike parallel faulting can be difficult to establish in this area but one such fault truncated the Southern limb of the South Skibbereen Syncline.

5.10.2.3 Hydrogeology

The area covered by Sheet 24 and accompanying handbook is relatively poor in groundwater resources. There are no large public groundwater sources in the area. In addition there are no regionally important aquifers. However many rural dwellings are known to depend on boreholes drawing groundwater from locally important or poor aquifers.

The Cork Group Rocks (of which the Kinsale Formation is one) are generally classified as locally important Aquifers. Conductivities in the Cork Group Rocks are quite similar across the rock types with a range from 160 to 450 mS/cm and an average of 380 mS/cm. The water is generally soft to moderately hard.

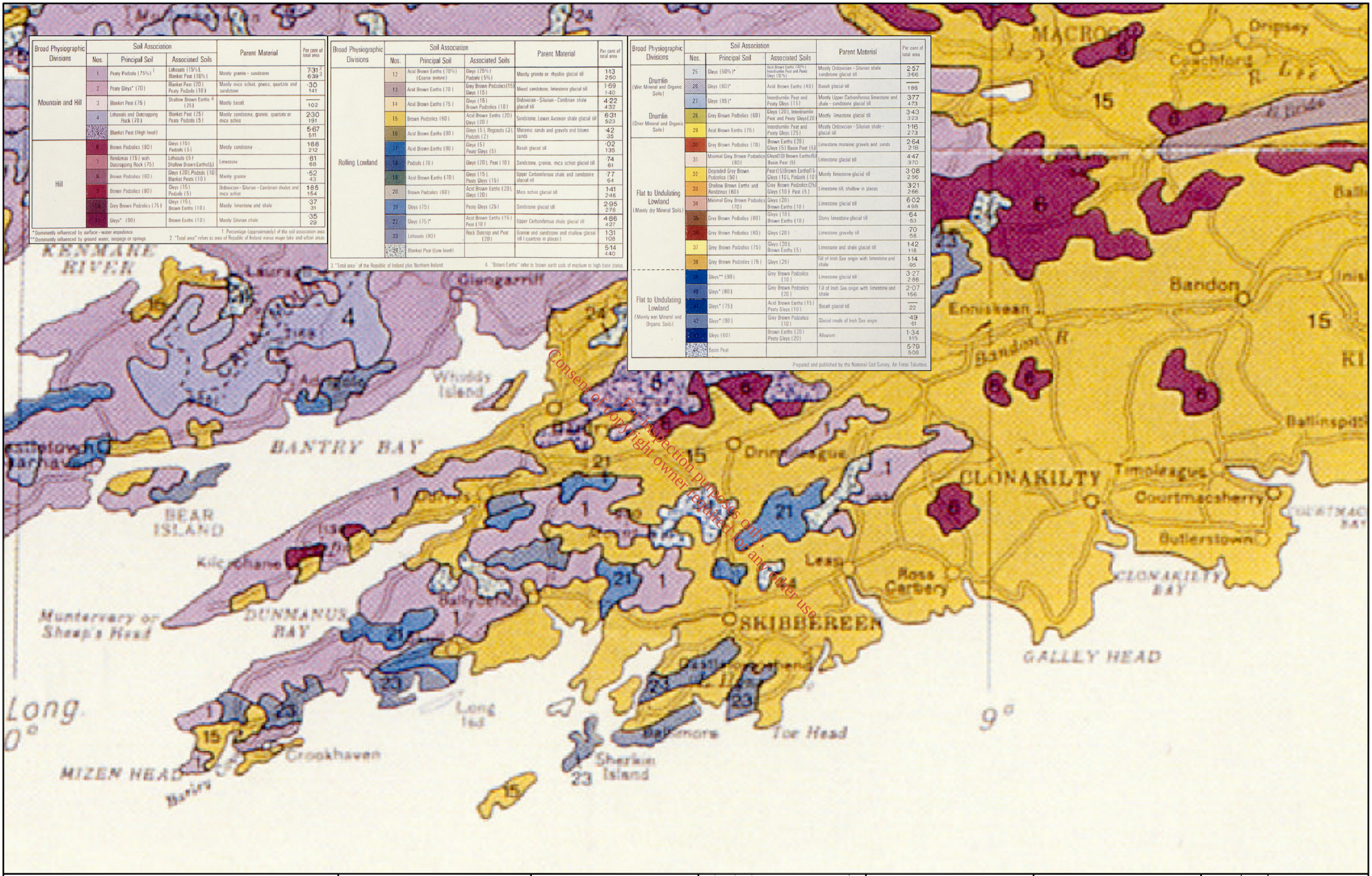
The Geological Survey of Ireland reports that, annual rainfall averages around 1200mm in lowland areas but this rises to over 2800mm on the Mountain tops. Potential recharge to the main aquifers is over 700mm per year, but since the aquifers are effectively full to overflowing for part of the year much of the potential recharge is probably rejected in most years.

5.10.2.4 Quaternary Deposits

The Soils Map for west Cork is Shown in Figure 5.9. The Quaternary Period extended from the beginning of the Ice Age (1.6 million years ago) to the present day and is responsible for the soil deposits which can be seen today. Most of the surface deposits of West Cork were deposited during the Quaternary Period, largely during the Ice Age. They were deposited either directly from glacier ice or by glacial melt-water flowing over the ice. In the former case it became till or boulder clay (which is a mixture of sediments of all sizes from clay to boulders), and in the latter case it was sorted and deposited separately as gravel, sand and clay. The composition of these sediments reflects the type of rock over which the glacier passed. Following the last glaciation the sea level rose, relative to the landsurface, and flooded the valleys. These flooded areas are now seen as the marine inlets of Kenmare River and the bays of Bantry, Dunmanus and Roaringwater.

Post-glacial deposits take the form of river alluvium along the valleys of the main rivers, coastal beaches and a small amount of blanket peat.

The quaternary deposits of the area have provided the parent material for almost all agricultural soils and building materials.



Broad Physiographic Divisions	Nos.	Soil Association: Principal Soil	Soil Association: Associated Soils	Parent Material	Per cent of total area
Mountain and Hill	1	Peaty Podzols (75%) [1]	Lithosols (15%) Blanket Peat (10%)	Mostly granite – sandstone	7·31 [2] 6·39 [3]
	2	Peaty Gleys* (70)	Blanket Peat (20) Peaty Podzols (10)	Mostly mica schist, gneiss, quartzite and sandstone	·30 1·41
	3	Blanket Peat (75)	Shallow Brown Earths [4] (25)	Mostly basalt	——— 1·02
	4	Lithosols and Outcropping Rock (70)	Blanket Peat (25) Peaty Podzols (5)	Mostly sandstone, granite, quartzite or mica schist	2·30 1·91
		Blanket Peat (High level)			5·67 5·11
Hill	6	Brown Podzolics (80)	Gleys (15) Podzols (5)	Mostly sandstone	1·88 2·12
	7	Rendzinas (15) with Outcropping Rock (75)	Lithosols (10) Shallow Brown Earths(5)	Limestone	·81 ·69
	8	Brown Podzolics (60)	Gleys (20) Podzols (10) Blanket Peats (10)	Mainly granite	·52 ·43
	9	Brown Podzolics (80)	Gleys (15) Podzols (5)	Ordovician – Silurian – Cambrian shales and mica schist	1·85 1·54
	10	Grey Brown Podzolics (75)	Gleys (15) Brown Earths (10)	Mostly limestone and shale	·37 ·31
	11	Gleys* (90)	Brown Earths (10)	Mostly Silurian shale	·35 ·29

* Dominantly influenced by surface – water impedence.
** Dominantly influenced by ground water, seepage or springs.
1. Percentage (approximately) of the soil association area
2. "Total area" refers to area of Republic of Ireland minus major lake and urban areas

Broad Physiographic Divisions	Nos.	Soil Association: Principal Soil (Coarse texture)	Soil Association: Associated Soils	Parent Material	Per cent of total area
Rolling Lowland	12	Acid Brown Earths (70%)	Gleys (25%) Podzols (5%)	Mostly granite or rhyolite glacial till	1·13 2·50
	13	Acid Brown Earths (70)	Grey Brown Podzolics (15) Gleys (15)	Mixed sandstone, limestone glacial till	1·69 1·40
	14	Acid Brown Earths (75)	Gleys (15) Brown Podzolics (10)	Ordovician – Silurian – Cambrian shale glacial till	4·22 4·32
	15	Brown Podzolics (60)	Acid Brown Earths (20) Gleys (20)	Sandstone, Lower Avonian shale glacial till	6·31 5·23
	16	Acid Brown Earths (90)	Gleys (5), Regosols (3), Podzols (2)	Marinine sands and gravels and blown sands	·42 ·35
	17	Acid Brown Earths (90)	Gleys (5) Peaty Gleys (5)	Basalt glacial till	·02 1·35
	18	Podzols (70)	Gleys (20), Peat (10)	Sandstone, granite, mica schist glacial till	·74 ·61
	19	Acid Brown Earths (70)	Gleys (15), Peaty Gleys (15)	Upper Carboniferous shale and sandstone glacial till	·77 ·64
	20	Brown Podzolics (60)	Acid Brown Earths (20), Gleys (20)	Mica schist glacial till	1·41 2·46
	21	Gleys (75)	Peaty Gleys (25)	Sandstone glacial till	2·95 2·78
	22	Gleys (75)*	Acid Brown Earths (15) Peat (10)	Upper Carboniferous shale glacial till	4·86 4·27
	23	Lithosols (80)	Rock Outcrop and Peat (20)	Granite and sandstone and shallow glacial till (quartzite in places)	1·31 1·08
	24	Blanket Peat (Low level)			5·14 4·40

3 "Total area" of the Republic of Ireland plus Northern Ireland.
4. "Brown Earths" refer to brown earth soils of medium to high base status.

Broad Physiographic Divisions	Nos.	Soil Association: Principal Soil	Soil Association: Associated Soils	Parent Material	Per cent of total area
Drumlin (Wet Mineral and Organic Soils)	25	Gleys (50%)*	Acid Brown Earths (40%) Deep Peat and Peaty Gleys (10%)	Mostly Ordovician – Silurian shale sandstone glacial till	2·57 3·66
	26	Gleys (60)*	Acid Brown Earths (40)	Basalt glacial till	——— 1·86
	27	Gleys (95)*	Interdrumlin Peat and Peaty Gleys (15)	Mostly Upper Carboniferous limestone and shale – sandstone glacial till	3·77 4·73
Drumlin (Drier Mineral and Organic Soils)	28	Grey Brown Podzolics (60)	Gleys (20), Interdrumlin Peat and Peaty Gleys (20)	Mostly limestone glacial till	3·43 3·23
	29	Acid Brown Earths (75)	Interdrumlin Peat and Peaty Gleys (25)	Mostly Ordovician – Silurian shale – glacial till	1·16 2·73
Flat to Undulating Lowland (Mainly dry Mineral Soils)	30	Grey Brown Podzolics (70)	Brown Earths (20) Gleys (5) Basin Peat (5)	Limestone moranic gravels and sands	2·64 2·18
	31	Minimal Grey Brown Podzolics (80)	Gleys(10) Brown Earths(5) Basin Peat (5)	Limestone glacial till	4·47 3·70
	32	Degraded Grey Brown Podzolics (50)	Peat (5) Brown Earths(5) Gleys (10), Podzols (10)	Mostly limestone glacial till	3·08 2·56
	33	Shallow Brown Earths and Rendzinas (60)	Grey Brown Podzolics (25) Gleys (10) Peat (5)	Limestone till, shallow in places	3·21 2·66
	34	Minimal Grey Brown Podzolics (70)	Gleys (20) Brown Earths (10)	Limestone glacial till	6·02 4·98
	35	Grey Brown Podzolics (80)	Gleys (10), Brown Earths (10)	Stony limestone glacial till	·64 ·53
	36	Grey Brown Podzolics (80)	Gleys (20)	Limestone gravelly till	·70 ·58
	37	Grey Brown Podzolics (75)	Gleys (20), Brown Earths (5)	Limestone and shale glacial till	1·42 1·18
	38	Grey Brown Podzolics (75)	Gleys (25)	Till of Irish Sea origin with limestone and shale	1·14 ·95
Flat to Undulating Lowland (Mainly wet Mineral and Organic Soils)	39	Gleys** (90)	Grey Brown Podzolics (10)	Limestone glacial till	3·27 2·86
	40	Gleys* (80)	Grey Brown Podzolics (20)	Till of Irish Sea origin with limestone and shale	2·07 1·56
	41	Gleys* (75)	Acid Brown Earths (15) Peaty Gleys (10)	Basalt glacial till	——— ·22
	42	Gleys* (90)	Grey Brown Podzolics (10)	Glacial muds of Irish Sea origin	·49 ·61
	43	Gleys (60)	Brown Earths (20) Peaty Gleys (20)	Alluvium	1·34 1·15
		Basin Peat			5·79 5·08

Prepared and published by the National Soil Survey, An Foras Talúntais

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No.	Date	Chk	Amendment / Issue	App.
F01	MAR'04		REPORT	A

Project: SKIBBEREEN SEWERAGE SCHEME WASTEWATER TREATMENT PLANT

Title: SOILS MAP FOR SKIBBEREEN

Drawn by:	AOC	Job No: MCW0153	
Checked by:	BB	File No: MCW0153SK0018	
Approved by:		Drg. No: FIG. 5.9	Rev: F01
Scale: NTS			
Date: MAR '04			

5.10.3 Potential Significant Impacts

During the construction phase of the proposed development the soil and geology environment will have to be locally disturbed. This will involve the excavation of topsoil and sub surface fill material. There is also a potential for contamination of soil during construction. Also there will be a loss of the soil profile and structure.

It is not envisaged that there will be any requirement for the importation of soils for the purpose of landscaping in this project. It is envisaged that the topsoil and fill material will be re-used in this capacity. A contractor will dispose of any soil that is not required at the site itself, through a licensed waste collector.

During the normal usage of the site there will be no expected emission to the soil. The soil environment is not considered unique in any respect. Therefore there will be no significant impact on the soil environment.

5.10.4 Mitigation Measures

Construction

Topsoil and subsurface material, which will be removed during construction, will be stored for later use in landscaping. The re–use of material will ensure minimisation of environmental impacts, the most significant of these being the transport of material on to and off of the site. Also the generation of excess waste material will be reduced. This will greatly reduce the impact on air quality in the area by reducing the need for transportation of these materials.

The likelihood of historical soil contamination at this site is low. There are no visible above ground signs of soil contamination. Any soil removed from the site will most likely therefore be classified as non-hazardous and therefore suitable for re-use as mentioned previously. Should the amount of soil to be removed exceed the amount required for later use then it will be removed by a contracting firm licensed under the Waste Management Act of 1996 and Section 5 of the Waste Management (Permit) Regulations of 1998. It should be noted that the permitted contractor would then be allowed to use the topsoil and fill material in other landscaping projects as part of their license agreement.

Possible contamination due to the refuelling of construction vehicles is a potential source of soil contamination. All possible contaminants such as hydrocarbons should be stored in double skinned tanks on pallets or in a bunded area. Refuelling and on-site repairs will, where possible, be undertaken in a designated area, and each operative involved in the construction phase of the development will be trained in the use of, and have access to, spill kits.

Operation

No impact on soil is envisaged during the operation phase of this development.

5.10.5 Conclusion

There are no soils or geological features of note in this area and the impact of the proposed scheme on soils/geology is considered to be minor. Any impacts will be mainly limited to construction activities at the site.

5.11 MATERIAL ASSETS - LANDTAKE

The study area comprises land currently in agricultural use and measures approximately 1.6 ha (4 acres). There are no residential properties or other buildings within the proposed site area for the development.

According to the Cork County Development Plan, 2003 *"There is no sewage treatment plant in the town at present. Effluent is discharged to the river via a number of outfalls. There is a proposal for a new sewerage scheme including a collection system, a treatment plant and a tidal holding tank and discharge to the Ilen estuary."*

The land designated for this Wastewater Treatment Plant is identified within the County Development Plan. The majority site of the proposed wastewater treatment plant as shown in the indicative design included in Figure 3.1 is zoned as U-01 (Utilities and Infrastructure). The remainder of the site is unzoned. Figure 5.10 is an extract from the Cork County Development Plan 2003 showing the zoning in the area. The use of the U-01 zoned site for the proposed wastewater treatment plant is specifically mentioned in the County Development Plan, 2003.

Cork County Council will acquire the land required for the development from the relevant landowner. Furthermore, wayleaves will be acquired for the outfall route to the river. Due to the overall scale of the development the potential impact of the proposed development on land is not considered to be significant.

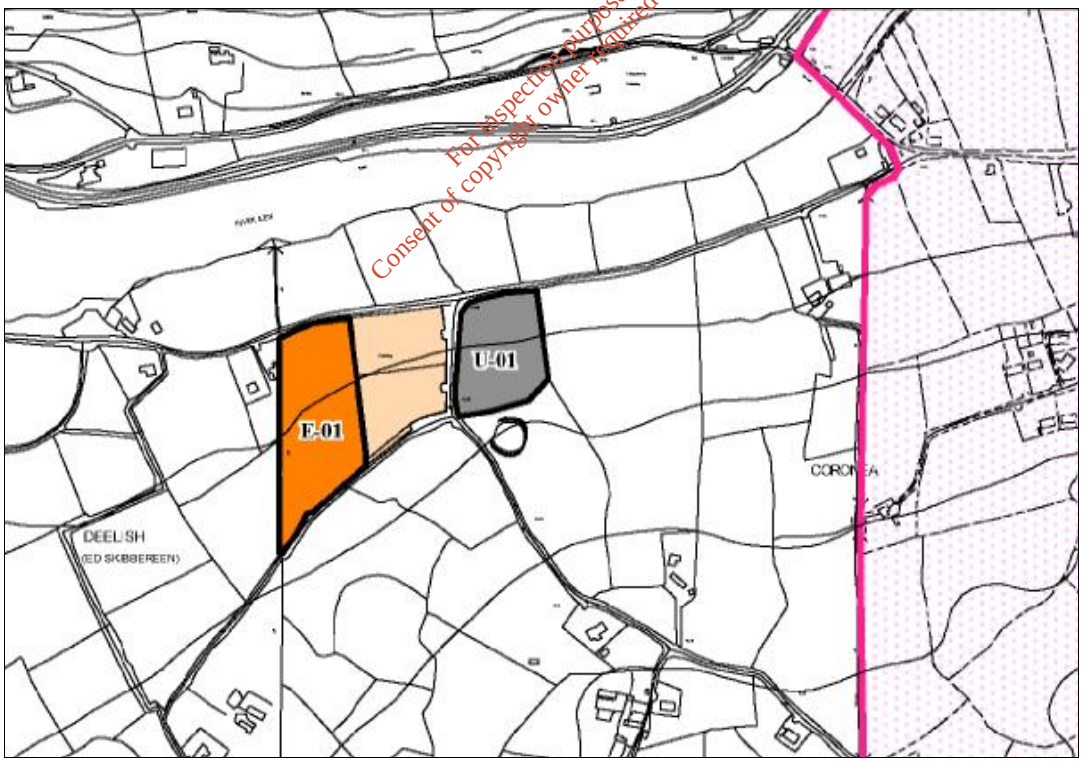

Figure 5.10: Extract from the 2003 Cork County Development Plan showing the zoning at the Coronea wastewater treatment plant site (U-01)

5.12 CULTURAL HERITAGE – ARCHAEOLOGY

5.12.1 Introduction

Archaeological Services Unit, UCC (ASU) have assessed the impact of a proposed wastewater treatment works facility and outfall pipe on the archaeological landscape of Coronea townland, Skibbereen, County Cork. This section comprises a synopsis of the archaeological assessment of the site however a full copy of the ASU report is included in Appendix D of this EIS.

The proposed development is directly south of the River Ilen, which flows through Skibbereen town. The proposed area for the wastewater treatment works is a greenfield site and is partially within the *zone of constraint* around one known archaeological site and is within the environs of at least eight others as shown in Figure 5.11. The development will involve ground disturbance during the site preparation works and the construction phases of the proposed wastewater treatment works facility and outfall pipe. The outfall pipe will extend into the River Ilen and this area will be subject to an underwater and metal detection survey.

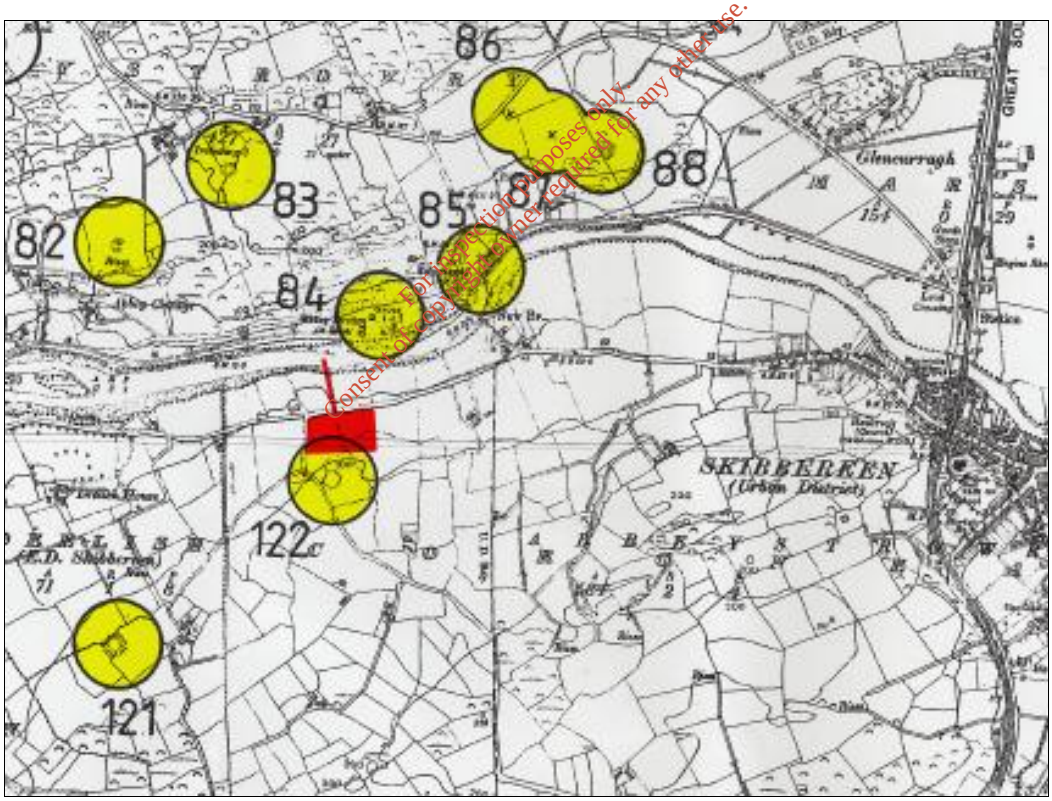

Figure 5.11: Extract from RMP CO141 showing proposed development area and known archaeological sites in the environs.

5.12.2 Study Methodology

This archaeological assessment comprised the following:

Desktop study

A desktop study of the proposed development area was carried out in order to assess the developments impact on the archaeological potential of Abbeystrowry townland and the surrounding area. The desktop study included a review of the first and second editions of the six inch scale Ordnance Survey (OS) maps, the Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) for County Cork. All of the available archaeological and historical literature for the area was also consulted. All local historical and archaeological journals were checked to establish if any new information on the area was published in the recent past.

Field-walking

Field-walking was carried out in February 2004 by Rose M. Cleary and Kerri Cleary on behalf of the Archaeological Services Unit UCC. The conditions for field walking were good in that the vegetation cover was relatively low.

5.12.3 The Receiving Environment

Skibbereen or the 'little boat harbour' is a thriving market town regarded as the capital of the area known as 'The Carberies'. Standing on the River Ilen, at a point where the river widens into a creek, it was founded after Algerian pirates sacked the neighbouring port of Baltimore in 1631. The growth of Skibbereen therefore seemed to stem from an influx of inhabitants who moved up river to safer homesteads.

The proposed treatment plant and outfall pipe are located in Coronea townland, within the Barony of West Carbery, on the western side of Skibbereen town. The Great Southern Railway is to the east where it cuts through the western side of Skibbereen town, while the Ilen River forms the northern boundary of the town. Abbeystrowry church and cemetery (RMP[4] CO141-084/01 and 02) are to the north-east of the proposed development site, separated from it by the River Ilen.

The proposed site of the treatment plant is in the north-western corner of a greenfield site with a public roadway at the northern and western boundaries. The adjacent southern and eastern areas are under pasture. A ringfort (RMP CO141-122) is visible to the south, Figure 5.12, and an old stone and earth field boundary runs north-south to the east of the proposed development and ringfort. A cemetery is located directly west of the proposed development site but is separated from it by a roadway. The outfall pipe will extend from the treatment works facility in a northern direction, crossing the public roadway and a greenfield site that steeply slopes down to the River Ilen, from south to north.

[4] Record of Monuments and Places

Figure 5.12: Raised area in interior of ringfort RMP CO141-122, looking north.

5.12.4 Archaeological and Historical Background

The proposed treatment plant and outfall pipe are located in the townland of Coronea, in the barony of West Carbery, west of Skibbereen town. The proposed development incorporates the constraint circle around one known archaeological site, a ringfort (RMP CO141-122). There are also at least eight other known archaeological sites in the vicinity of the development.

The town of Skibbereen is synonymous with the Famine period but much earlier settlement activity in the area is also evident. There is one recorded standing stone (RMP CO141-087) in the environs of the development. Single, upright stones are a frequent element of the Irish countryside. They are known by a variety of names such as *gallán*, *dallán*, long stone etc (Power *et al* 1992, 45) and may have had a variety of functions and although many may be Bronze Age span a wide dating range. Some excavated examples have marked prehistoric burials while others may have had a commemorative or ritual function, or served as boundary markers or positions along ancient route ways. A second unrecorded standing stone was discovered during field-walking, *c*.500m to the east of the proposed site. It was 0.50m high and triangular in shape, leaning to the north. The ground surrounding the site slopes into the monument.

There are five ringforts in the environs of the proposed development (RMP CO141-083, 086, 088, 121 and 122). Ringforts are the most widespread archaeological field monument in Ireland. They are usually known by the names *rath* or *lios* and are circular or sub-circular areas enclosed by a single or multiple earthen bank(s) formed of material thrown up from a concentric fosse (ditch) on its outside. Variations on the enclosing element include stone facing or stone banks (*caher*). Archaeological investigation has shown that the majority of ringforts were enclosed farmsteads, built in Early Medieval times. Although comparatively few ringforts have been excavated, it is accepted that they have a long period of use, from about 600-900 AD. Sites may have re-occupied in the medieval and post-medieval period (*ibid*, 131). The proposed wastewater treatment works facility includes the *zone of constraint* around one of these ringforts (RMP CO141-122). The interior of this ringfort contains a raised area which may mark the location of structures, a souterrain or may simply be the result of field clearance, which was noted during the Archaeological Survey Office's work in 1985.

An earthwork (RMP CO141-082) is located to the north-west of the proposed development site and although this no longer survives above ground it was hachured on the 1844 OS map. It is therefore not possible to classify it to a specific archaeological site type; however, due to the density of ringforts in the environs of the site it may originally have been one of these monuments.

There are also some ecclesiastical sites in the vicinity of the proposed development. A church and graveyard (RMP CO141-084/01 and 02) are located to the north of the proposed site on the northern bank of the Ilen River. This church probably dates to the fifteen or sixteenth century and it was recorded as being in 'repair' by 1695 and in 'bad repair' by 1806. It was reportedly on the site of a 'Cell', which was affiliated, with the Cistercian monastery of Abbeymahon. The graveyard contains many nineteenth and twentieth-century headstones but also a famine plot in the south-western quadrant adjacent to a derelict keeper's house. To the north-east of this church and graveyard is a holy well (RMP CO141-085), however no surface trace is visible today but the site is marked 'Tobernasool' on the 1842 OS map. These sites are frequently found close to early ecclesiastical sites and there origins probably date to pre-Christian times.

The town of Skibbereen to the east is itself a historically and culturally important area. The name Skibbereen is itself open to interpretation as an article by historian James M. Burke in the Southern Star in January 1914 demonstrated:

> "The name Skibbereen has been the despair of etymologists. Conor Lyons suggests it may be formed from *Sgiobreidhe* (many skiffs). Dr Joyce says *Scibrin* means a place frequented by skiffs. Some say it is *Sciobadh ar drion* (the sweeping away of thatch). There is also a story about a person snatching '*sciobadh*' – a cake – (*bairin*) from another."

It is also suggested that the name may derive from '*Uisce Brean*' meaning fowl water, after the stagnant pools in the lowland areas on the southern perimeter of the town, however at present the name Skibbereen is widely acknowledged as meaning 'little boat harbour'. It is known locally that a quay wall once existed in the town, although no above water remains of it are visible today.

The earliest historical record of the town is 1615 when Sir Walter Coppinger was granted a Royal Patent to hold fairs in the townland of Gortnaclohy, the eastern side of the town. Prior to 1600 most of the surrounding land belonged to the native MacCarthy tribe, but they were dispossessed during the Cromwellian Wars of 1649-1652. The land was then divided into two manors, New Stapleton and Bridgetown and these were granted to William Prigg and Samuel Hall who attempted to rename the town, New Stapleton, but failed and subsequently the titles fell to the Bechers. In the early 1800s extensive trade in the manufacture of woolen and linen cloth as well as basic agricultural products. In the 1815 records of Rev. H. Townshend he mentions that the town had 'bolting mills, porter and beer breweries and an extensive distillery of whiskey'. However, after the Napoleonic Wars (1792-1815) industries across Ireland, particularly textile industries, fell into decline, although Skibbereen still boasted a large brewery and a steam corn mill. The Temperance Hall (now the Fire Station on Townshend Street) was the site of the foundation of the first Temperance Society in Europe and was constructed in 1833.

The Great Famine of the 1840s devastated Skibbereen town as the communal grave in the Abbeystrowry Cemetery north-east of the proposed development site attests to. This large plot of ground reserved for them near the entrance to the graveyard now has a Famine Memorial which contains the inscription 'Precious in the sight of the Lord is the death of his saints Ps.CXV-5 Erected to the memory of those departed ones who fell victims to the awful famine of 1846 and 1847'. Depending on the source, the figures for the amount of people buried in this plot range from 4,000 to 10,000, proving that the number of famine victims was devastating and that few records were kept in this time of chaos. In the very bad autumn of 1846 a soup kitchen was established in the town, despite the claim that there was Government food stored in the town that would only be handed out at high fixed prices. The workhouse in Skibbereen was built to hold only 800 people but was extensively over-crowed and eventually had 1449 inmates, with the death rate reaching sixty-five in one week in early 1847. The victims were buried in the Workhouse grounds, in the Old Chapel Yard, and even in the cabins and gardens where they died.

Law Commissioners directed local guardians to obtain additional workhouse accommodation in December 1846 and as a result of this directive three small timber sheds were also utilized in Skibbereen. Many of the buildings occupied at the time of the famine are still in existence today, albeit in various states of repair.

On a more culturally historical note, Jeremiah O'Donovan Rossa founded the Phoenix Society at Skibbereen in 1856 to promote national freedom and a separate identity for Ireland. Naturally the society was suppressed and many of its members ended up in Mountjoy jail. The Gaelic League, founded in 1893, also enjoyed extensive support in Skibbereen and led to the establishment of local industries. In 1889 the local newspaper the Southern Star was established as a strongly nationalist paper and eventually in 1929 it took over its imperialist counterpart the Skibbereen Eagle.

The 21st July 1877 saw the opening of the extension of the Railway line to Skibbereen (Creedon 1986, 32). This added an importance to the town as a trading centre and the extensions of the line to Schull and Baltimore further enhanced outside business. Unfortunately by the early twentieth century and with the Civil War, industry and trade in Skibbereen and a lot of West Cork diminished greatly.

Many archaeological sites are low visibility monuments and these include ancient (prehistoric) settlements, souterrains, ceremonial and burial sites. Remains of these types of sites may lie buried under the surface. Sites have also been levelled in the past and the sub-surface evidence for these may still remain below the modern surface. Stray finds, dropped or lost in the past can also be recovered when the ground is disturbed. The present inventories of sites and monuments (SMR and RMP) indicates only sites that are now visible above the ground and there remains the possibility that other buried sites exist below the surface.

5.12.5 Impact of Proposed Development on the Archaeological Landscape

Visual impact

The proposed development will not have any visual impact on the known archaeological sites in the environs of Coronea townland.

Archaeological Impact

The proposed wastewater treatment works facility is partially located within the zone of one recorded archaeological site and there are eight more in the surrounding environs. The proposed development includes the zone of constraint around the ringfort CO141-122 and is located close to the north of the monument. It is also possible that formerly unrecorded sites will be uncovered during topsoil stripping, particularly of the previously undeveloped areas of the greenfield sites. Buried archaeological sites may range from small-scale sites such as isolated burials to extensive evidence for habitation. These sites will only be detected by archaeological monitoring during ground disturbance. In order to prevent accidental damage to or loss of such features, a suitably qualified archaeologist should supervise the removal of topsoil in the development area. The proposed outfall pipe will also enter the Ilen River. The Ilen River is tidal with substantial mud-flats exposed at low tide. This area will be subject to an underwater and metal detection survey in advance of construction.

Impact Summary

The impact of the proposed wastewater treatment works facility and outfall pipe on the archaeological landscape of the area was assessed using all of the available documentary and cartographic sources. There are nine recorded monuments surrounding the proposed development area, which is incorporated into the *zone of constraint* around one of these known sites. It is also possible that previously unrecorded monuments may be uncovered during topsoil stripping and the underwater survey associated with the outfall pipe.

5.12.6 Mitigation Strategies

In order to prevent any potential loss to the archaeological record a series of mitigation strategies are recommended.

1. All topsoil removal should be monitored by a suitably qualified archaeologist to record any archaeological deposits and to recover any artefacts. The archaeologist will require a licence for this work as issued by the Department of the Environment, Heritage and Local Government. Fifteen working days advance notice is required to apply for and obtain the necessary licence.

2. The monitoring archaeologist should be empowered to halt the development if buried archaeological features or finds are uncovered. Provision should be made to resolve any newly exposed archaeological sites.

3. Provision, including financial and time should made be at the outset of the project to facilitate any excavation or recording of archaeological material that may be uncovered during the developmental works.

4. In advance of commencement of construction an underwater survey of the area where the outfall pipe enters the River Ilen must be carried out under licence by a suitably qualified archaeologist.

5. A metal detection survey of the riverbed must also be undertaken under licence. This will record the location of all ferrous and non-ferrous materials on and beneath the inter-tidal zone and riverbed. Each contact should be plotted, facilitating the development of a metal detector contact distribution pattern.

5.12.7 Conclusion

Implementation of the mitigation measures outlined in Section 5.12.6 of this EIS will ensure that there will be minimal impact from the development on the archaeological environment.

The underwater investigations recommended in Items 4 and 5 of Section 5.12.6 were carried out in June 2004. These investigations comprised a Dive Survey and Metal Detection Survey of the proposed outfall route and were carried out under licence from the Dept of the Environment Heritage & Local Government. A full copy of the report prepared by Mr. Eoghan Kieran is included as Appendix E to this EIS. In summary, this report recommended that the following additional mitigation measure should be implemented as part of the development:

- Archaeological monitoring of the removal of all riverine overburden down to bedrock should be considered particularly in light of the presence of faunal remains on the northern bank.

5.13 CONSTRUCTION

5.13.1 Introduction

It is anticipated that it will take some 18 months to construct the wastewater treatment plant at Skibbereen. This process will give rise to a temporary impact which will be largely unavoidable because of the scale and scope of the work to be undertaken. The main impacts of the construction process will be:-

(a) Construction traffic on adjacent roads.

(b) Additional noise from plant, machinery and vehicles.

(c) Dust emissions from the construction site during dry weather.

(d) The transportation of mud or soil from the site by vehicles leaving it.

(e) The visual impact of the construction site on the surrounding areas.

(f) The disruption due to the construction of the rising mains to the works and the outfall pipe from the works to the Ilen Estuary.

These environmental impacts resulting from the construction of the treatment plant will be confined to the period when construction is taking place. Every effort will be made to reduce and minimise the temporary impact of the construction process and these are set out in greater detail in the following paragraphs.

5.13.2 Effects on Human Beings and proposed Mitigation Measures

5.13.2.1 Residential Property

Occupiers of properties in close proximity to the proposed works will be subject to some nuisance resulting from construction activity. This nuisance may consist of noise, vibration, mud or dust and it is difficult to quantify the extent of such nuisances. Determining factors will include meteorological conditions, type of construction plant employed and the phasing of the works. This nuisance will be minimised by keeping construction to the normal working hours as detailed in the following sections and by implementing traffic management procedures as detailed above. Construction nuisance is generally a localised issue.

5.13.2.2 Coronea Burial Ground

The proposed wastewater treatment plant site is located adjacent to the Coronea Burial Ground. The times when ceremonies are ongoing at the burial ground are particularly sensitive. In view of these sensitivities construction activities will be curtailed on the site to ensure that there is no intrusion upon the activities at the graveyard. In particular, mitigation measures to be implemented on the site will include:-

- No heavy vehicle movements to and from the site during funeral ceremonies.
- No parking outside the site boundaries to ensure that access and parking at the cemetery are maintained.
- No construction activities that may entail elevated noise levels to take place during ceremonies.

5.13.2.3 Noise and Vibration

The use of heavy plant machinery during the construction process is unavoidable. However, good site management, plant maintenance and communications with adjoining property owners during calm weather or late working periods should minimise the temporary impact of this development on the surrounding areas. In as far as possible, it is intended to restrict working to normal working days and hours. However, this may not be possible due to time constraints and construction operations.

The impacts associated with noise and vibration arise form construction plant such as excavators, dump trucks, compaction equipment etc.

Contract documents will clearly specify that the contractor undertaking the work will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228 (1997), "Noise Control on Construction and Demolition Sites" and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988. This will ensure noise impacts are kept to a minimum during the construction period.

Significant ground vibration from construction work is not expected to cause undue disturbance or structural damage. The contractor will be expected to limit vibrations, measured as peak particle velocity to less than 3 mm/s for vibrations from mechanical plant activity.

5.13.2.4 Working Hours

During construction normal working hours will be 08.00-20.00 hours Monday to Friday and 08:00 to 16:00 on Saturday. The Safety, Health and Welfare at Work (Construction) Regulations of 2001 will apply and other safety legislation in place at the time of the works will also apply. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside of these working hours without the written permission of Cork County Council. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

The same proviso applies to working outside normal working hours and Sunday working. When overtime and shift working is permitted, the hauling of spoil and delivery of materials outside of working hours is prohibited and the noise limits mentioned above will apply. No work may be carried out on Sundays or public holidays except in the case of emergencies.

Emergency work includes replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences and repair of water supplies and other services which have been interrupted.

5.13.3 Effects on Flora and Fauna

The proposed development would temporarily disturb habitats on site. The presence of a work force along with plant and machinery may disturb habitats in the adjacent areas. The sensitivity of flora and fauna on the site is discussed in Section 5.8 of this EIS.

A comprehensive planting programme will mitigate any adverse effects and restore habitats and in the process enhance the existing flora and fauna.

5.13.4 Effects on Soils and Land Use

The installation of rising mains and outfall pipework will be carried out strictly in accordance with normal wayleave maintenance and restoration requirements. Under these requirements, the required wayleave width along the pipeline length will be fenced off, the topsoil stripped and stored on site for reuse, the pipeline installed and the whole area reinstated, fertilised and subsequently cultivated. The land will then be handed back for the property owner's use at the earliest possible opportunity.

The construction of the proposed wastewater treatment plant is unlikely to have any significant adverse impact of soils.

5.13.5 Effects on Watercourses

Construction works have the potential to impact on the Ilen River and Estuary. Measures will be taken to ensure that effects, if any, on the Ilen River are avoided. For example no pump-outs will be discharged directly to the River.

The contractors will be required to implement all necessary precautionary measures to prevent the erosion of river banks, the silting up of the pollution of the Ilen River or other watercourses. The provisions of the 'Local Government (Water Pollution) Act, 1977' and its subsequent amendments will be complied with throughout the course of the contract.

In the event of water having to be discharged from excavations into any streams/surface water systems settling ponds will be constructed in order to significantly reduce any sediment load prior to discharge. This will be most important during low flow conditions.

Waste products associated with the works will not be permitted to enter water bodies adjacent to the works and all necessary precautions will be made to prevent spillage of diesel fuel or other solvents used during the construction process.

5.13.6 Effects on Air

Due to the nature and scope of the work which will be undertaken on the site, dust from the construction work may be blown by prevailing winds across adjoining lands near the siteworks. The Contractor will be required to keep dust emissions to a minimum as part of his site management plan. If dust emissions from the site become a problem, water sprays during dry weather will be utilised to ensure that dust does not cause problems for local landowners or residents in the area.

Dust is considered as one of the main environmental nuisance problems arising from construction sites. Tracked plant will not be permitted on road surfaces outside the boundaries unless the approval of Cork County Council has been obtained. The following measures will also mitigate for mud layers on the road and will minimise the volume of dust produced:

These will include, but not necessarily be limited to:

- The provision of easily cleaned hardstandings for vehicles entering, parking and leaving the site;
- The provision of wheel washing facilities including, where practicable, mechanical wheel spinners.
- The use of an approved mechanical road sweeper to clean the site hardstanding or any mud or debris deposited by site vehicles on roads or footpaths in the vicinity of the site. The road

sweeper is to be readily available whenever the need for cleaning arises and will be properly used and maintained;

- The adequate sheeting of each lorry load of spoil removed to prevent spoil falling off during its journey to the tip concerned;
- The contractor will also comply with the requirements regarding dust control; and
- The contractor undertaking the works will be obliged to provide, maintain and keep available plant and equipment necessary to minimise the formation, accumulation and airborne pollution of dust arising from the works.

5.13.7 Effects on Landscape

Even though the proposed works is set well away from built-up areas, there will be slight visual impact on the surrounding countryside due to construction work being carried out within the site. The use of cranes, excavators and heavy earth moving machinery is unavoidable, but the remoteness of the site will help to minimise the visual impact of heavy plant on the surrounding countryside.

The early planting of appropriate trees in advance of the commencement of construction would help to screen the works and Contractor's compound, offices and huts could be painted matt green to blend in with the surroundings.

Good site management, control and supervision will ensure a clean and tidy site and will minimise the visual impact of the site on the surrounding countryside.

5.13.8 Traffic

The access route to the proposed wastewater treatment site will be along the road to Deelish Pier and turning into the site opposite the graveyard. No traffic counts were taken on this road as it was felt that the impact of construction traffic would be minimal.

The level of traffic generated by the construction process will vary over the period of construction, but it is felt that, on average, the following increases in traffic movements would be typical:-

(a) A labour force of 20 men producing an extra 40 traffic movements due to cars.

(b) 8 material deliveries to the construction site per day resulting in 16 heavy commercial vehicle traffic movements.

(c) Disposal of excavated spoil resulting in an increase in heavy commercial vehicles moving along the public roadways, though this traffic source is expected to be low as most of the spoil will be retained on site.

It is felt that the increase in traffic movements due to cars and light commercial vehicles will not have a major impact on the traffic movements on the public roads. The traffic movements due to heavy commercial vehicles will have a slight impact on the traffic along the narrow road to Deelish Pier but this will not be severe particularly if these movements do not take place while ceremonies are ongoing at the cemetery.

The disposal of surplus spoil from the excavations within the wastewater treatment plant site will cause a general increase in the heavy commercial vehicles on the public roads adjoining the site. The routes to be taken by these commercial vehicles will be largely dependent on the availability of a suitable spoil tip. The volume of surplus spoil, however, will be small as it is intended to use most of the excavated material to form landscape mounds within the site.

Parking at the site will be restricted to within the site boundaries and no parking will be permitted in the public parking spaced outside the Coronea Burial Ground.

5.13.9 Transportation of Mud and Spoil onto Public Roads

Vehicles leaving the wastewater treatment plant site or working on the site perimeter may result in the deposition of mud or spoil on adjacent public roads. This will occur mainly during the start of the project when substantial spoil shifting is taking place. As it is intended to reuse most of the excavation spoil within the site in the formation of low mounds and landscaped rises, the transportation of spoil onto the public road will be kept to a minimum.

During the construction operation, it is intended to have a network of hardstanding aprons and roadways within the site to ensure clean working areas for the site vehicles. Prior to the commencement of work on the site, it is intended to construct the site access road such that vehicles entering and leaving the site will have a sound and level surface to travel across.

The steps taken to ensure that the access road and the site development will have hardcore access roads and hardstanding areas will ensure that there will be a minimal deposition of mud and soil on the adjacent roads from vehicles leaving the site. In addition, the site supervision team will ensure that, if mud or soil is deposited on the adjacent public roads, these areas would be cleaned off on a daily basis.

5.13.10 Privately and Publicly owned Services

Private and publicly owned services such as water supply pipelines, wastewater pipelines, surface water drainage pipelines, E.S.B. overhead and underground cables which may pass through the lands affected by the proposed scheme may have to be diverted or relocated in the process of executing the construction works associated with the works.

Prior to the diversion of relocation of any service, discussions will be held with the owner of the said service to reach agreement in relation to the planning and carrying out of the diversion or relocation works. A primary objective will be to keep disruption of services to a minimum.

5.13.11 Conclusion

It is inevitable that the construction of the wastewater treatment plant will have varying degrees of impact on the environment in the vicinity of the proposed works. However, Cork County Council intends to minimise these effects by;

- The setting and implementation of rigid standards relating to noise levels, working hours, discharges into watercourses and the control of dust and emissions during the execution of the works;
- The siting of equipment and plant vehicles having due regard to the proximity of residential properties and their visual intrusion on the landscape;
- The control of traffic movement within the relevant residential areas; and
- The proper maintenance of roads and parking facilities at the site during the period of construction.

Careful consideration will be given to reducing impacts and accommodating local concerns where possible during the construction phase.

6 SUMMARY

6.1 GENERAL

This EIS has assessed the proposed development and its impact on the environment. Based on the preceding sections of this document the significant impacts of this development have been identified and are summarised in Table 6.1.

6.2 CONCLUSION

The overall scheme will help to improve the general economic conditions through the provision of wastewater infrastructure capable of supporting a significant increase in residential, commercial and recreational development in Skibbereen Town and its environs.

Using Best Available Technology (BAT) in the wastewater treatment plant there will be no significant adverse impacts on the water quality of the River Ilen.

The proposed development will have no significant visual and landscape impact on the area. Any effects that can be foreseen will be mitigated with effective screening and design.

The odour emission levels at the wastewater treatment will be controlled to negligible levels and should not present a significant impact with proper management of the plant.

The noise level from the wastewater treatment plant will be minimal and where necessary controlled to below generally acceptable levels.

Careful consideration should be given to reducing and accommodating the impacts of local concerns, where possible, during the construction phase.

In general, by removing current untreated discharges to the water course and replacing these with a treated discharge downstream of the town it is envisaged that the proposed wastewater treatment plant will have a net positive impact on the physical, biological and aesthetic environment of Skibbereen Town and its environs.

Table 6.1: Summary of Significant Environmental Impacts

KEY

None | Slight | Moderate | Significant

Section	Category	Environmental Impact	Potential Impact (negative/positive)	Summary Mitigation [1]	Residual Impact
Human Beings	Health and Safety	Boundary Security	Negative	Secure gates and fencing and mature planting to exclude members of the public	None
	Amenity	Loss of recreational area	Negative	Not applicable as the site is currently agricultural in usage	None
	Traffic	Public safety and disturbance	Negative	Speed and parking restrictions, low volume, truck washing	Slight
Air & Odour	Odour	Nuisance	Negative	Provision of Odour Control Facilities	Slight/Not Significant
Climate	Greenhouse Gas	Increase in greenhouse effect	Negative	Plant design options will result in negligible effect	Slight
Noise & Vibration	Nuisance	Background noise levels	Negative	Specified criteria for noise emissions	Slight
Landscape	Visual	Aesthetics	Negative	Appropriate walls, screening and planting Sensitive design of structures	Moderate
		Land take	Negative	Not significant	None
Flora & Fauna	Habitats	Removal of on-site habitats	Negative	Not significant	None
Aquatic Environment	Water Quality	Physiochemical and bacteriological Levels	Positive	Removal of untreated discharges and provision of a secondary treated effluent discharge using tidal balancing and nutrient reduction.	Significant Positive
Geology, Hydrogeology & Soils	Site Development	Earth Disturbance	Negative	Re-use of soils within the site landscaping	None

Section	Category	Environmental Impact	Potential Impact (negative/positive)	Summary Mitigation [1]	Residual Impact
Material Assets	Landtake	Change of land use	Negative	Acquisition of land	None
Cultural Heritage	Archaeology	Disturbance of Archaeological Material	Negative	Archaeological Monitoring during ground disturbance	None or positive
Construction	Human Beings	Noise, Air, Traffic, & Working Hours	Negative	Defined standards relating to noise levels working hours, control of dust and emissions, siting of equipment. Traffic management plan and monitoring of noise and vibration	Moderate
	Flora & Fauna	Removal of Habitats	Negative	Not significant	None
	Watercourses	Siltation, erosion and pollution	Negative	No direct discharge to the Ilen River	Slight
	Landscape	Visual	Negative	Visual Intrusion will fluctuate according to location and type of activity	Slight
	Material Assets	Land take	Negative	None	None
	Road Conditions	Damage to existing roads and mud on roads.	Negative	Provision of appropriate daily maintenance systems	Slight

Note:-

1. Additional mitigation measures may be specified in the detailed sections of this EIS and this "Summary Mitigation" should not be considered to be a full description. Please refer to the relevant section of this EIS for any additional mitigation measures.