Comhairle Contae Chorcaí
Cork County Council

Courthouse,
Skibbereen, Co. Cork.
Tel (028) 21299 • Fax (028) 21995
Web: www.corkcoco.ie
Teach na Cúirte,
An Sciobairín, Co. Chorcaí.
Fón: (028) 21299 • Faics: (028) 21995
Suíomh Gréasáin: www.corkcoco.ie

Administration,
Environmental Licensing Programme,
Office of Climate, Licensing & Resource Use,
Environmental Protection Agency,
Headquarters,
PO Box 3000,
Johnstown Castle Estate,
County Wexford

For the attention of : Marie O'Connor, Senior Inspector

12th October 2009

Re: D0051-01 - Clonakilty Waste Water Discharge Licence Application – Reply to Notice in accordance with Regulation 18(3) of the Waste Water Discharge (Authorisation) Regulations 2007 – Appropriate Assessment

Dear Ms. O'Connor,

I refer to the following regarding the above:

- Item16(1)(l) of Notice from the Agency of 4/4/08 in accordance with Regulation 18(3) of the Waste Water Discharge (Authorisation) Regulations 2007

- Letter of the 23/6/08 from Development Applications Unit, DoEHLG requesting a supplementary assessment addressing the conservation objectives of the two European Sites at Clonakilty Bay

Attached please find hard copy and electronic copy of Appropriate Assessment for the Clonakilty Waste Water Treatment Plant Upgrade carried out by ecologists at White Young Green Consultants. The content of the electronic files is a true copy of the original hardcopy. A hard copy of same is also being sent to The Manager, Development Applications Unit, DoEHLG, Dublin.

Yours sincerely,

Moira Murrell,
Director of Services

Cork County Council

Clonakilty WWTP

Appropriate Assessment

16 July 2009

REPORT CONTROL

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1.0 INTRODUCTION

WYG Environmental and Planning (Ireland) Ltd was commissioned by WYG Engineer (Ireland) Ltd, on behalf of Cork County Council, to undertake an Appropriate Assessment (AA), as per Article 6 of the EU Habitats Directive, of the proposed upgrade of the wastewater treatment plant (WWTP) at Clonakilty, Co. Cork. The AA is required as part of the discharge license for the WWTP. It is intended to discharge the effluent from the WWTP into Clonakilty Bay, which is a candidate Special Area of Conservation (cSAC) and proposed Special Protection Area (pSPA).

1.1 NPWS INSTRUCTION FOR APPROPRIATE ASSESSMENT

The National Parks and Wildlife Service, in a letter dated 23 June 2008 (Appendix A), stated that an Appropriate Assessment of the proposed development was required under Regulation 6(5) of the Waste Water Discharge (Authorisation) Regulations 2007. The letter stated that "the Environmental Impact Statement has sufficient data and interpretation to form the basis of an Appropriate Assessment" and that an "assessment addressing the conservation objective of the two European Sites" be undertaken.

1.2 HABITATS DIRECTIVE

Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora – the 'Habitats Directive' - provides legal protection for habitats and species of European importance. The Directive requires the maintenance or restoration of habitats and species of European Community interest, at a favourable conservation status and provides the legislation to protect habitats and species of community interest through the establishment and conservation of an EU-wide network of sites known as *Natura 2000*. Natura 2000 sites are Special Areas of Conservation designated under the Habitats Directive and Special Protection Areas designated under the Conservation of Wild Birds Directive (79/409/EEC).

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans or projects affecting Natura 2000 sites.

Article 6(3) establishes the requirement for Appropriate Assessment:

> *Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the*

site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Article 6(4) of the Directive deals with alternative solutions, the test of "imperative reasons of overriding public interest" (IROPI) and compensatory measures:

If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

1.3 APPROPRIATE ASSESSMENT

An Appropriate Assessment is an assessment of the potential impacts of a proposed project or plan on the conservation objectives of any Natura 2000 site and where necessary an assessment of the development mitigation and/or avoidance measures to preclude negative effects. The impacts assessed must include the indirect and cumulative impacts of approving the plan or project, considered with any current or proposed activities, developments or policies impacting on the site. The potential impacts of policies outside the Natura 2000 sites, but potentially impacting upon them, must also be included in the assessment.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

An EIA was completed for the proposed upgrade of Clonakilty WWTP as part of the planning permission application. The ecology section of the EIS was prepared and completed by Limosa Environmental Ltd on behalf of WYG. Throughout this AA extracts of the Ecology section of the EIS, in both complete and abridged form, are used and are denoted by quotation marks around extracts in the text of this report.

2.0 METHODOLOGY

In the absence of Irish guidelines, the Appropriate Assessment was undertaken in accordance with the EU issued AA guidelines - "Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC" (EC, 2002). The Appropriate Assessment process follows four stages as outlined below:

Stage 1 – Screening

The Screening Process will identify the likely impacts upon the Natura 2000 site by a plan or project, either alone or in combination with other plans and projects and considers whether these impacts are likely to be significant.

Ultimately, this process determines whether or not an Appropriate Assessment is required *i.e.* whether the proposed development is likely to negatively affect the conservation objectives of Clonakilty Bay Natura 2000 site.

As outlined in the guidelines, in Stage 1 Screening, the impact of the development without appropriate mitigation measures is considered in view of the Precautionary Principle *i.e.* the proposed development and potential impacts are assessed in Stage 1 screening without considering the effects of mitigation measures.

Stage 2 – Appropriate Assessment

The Appropriate Assessment determines the potential impacts of a proposed plan or project on the conservation objectives of the Natura 2000 sites and where necessary, mitigation or avoidance measures to preclude negative effects are recommended. The impacts assessed include the indirect and cumulative impacts of WWTP upgrade, considered with any current or proposed activities, developments or policies impacting on a Natura 2000 site. The potential impacts of policies outside Natura 2000 sites but that potentially may impact upon them (known as '*ex situ*' impacts) must also be included in the assessment.

Stage 3 – Assessment of Alternative Solutions

Stage 3 involves the examination of alternative ways of achieving the objectives and avoiding adverse impacts on the integrity of the Natura 2000 site.

Stage 4 – Assessment of Compensatory Measures

Stage 4 is an assessment of compensatory measures, where, in the light of an assessment of imperative reasons of overriding public interest, it is deemed that a plan or project should proceed.

Stage 1 and 2 above relate to Article 6(3) of the Habitats Directive and Stages 3 and 4 relate to Article 6(4).

In the Appropriate Assessment for Clonakilty WWTP upgrade the following documents were reviewed;

- Clonakilty WWTP Upgrade EIS
- Clonakilty Harbour Tidal Barrage – Inspector's Report to An Bord Pleanala
- Circular Letter SEA 1/087 & NPWS 1/08 Appropriate Assessment of Land Use Plans
- Methodological Guidance on the Provision of Article 6(3) and (4) of the Habitats Directive 92/43/EEC Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites Council Directive 92/43/EEC
- Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC
- Circular L8/08 Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments (Dept. of the Environment 2 September 2008)

3.0 STAGE ONE: SCREENING

3.1 SITE INFORMATION

The proposed development is located at the existing wastewater treatment plant site at the north western corner of Clonakilty Harbour where the River Fealge enters the estuary. The site is bounded by the local Gaelic Athletic Association (GAA) ground to the west, the Model Railway Village tourist attraction to the south, the River Fealge to the north and the harbour to the east. The location of the existing wastewater treatment plant is shown in Figure 1 and has an Irish National Grid reference of W388412.

3.1.1 Description of the Development

The existing Clonakilty WWTP was constructed in 1987 and was designed to treat a population equivalent (PE) of 5,333 with a peak hydraulic flow of 102 l/s. Since the commissioning of the existing WWTP, the load on the plant has increased to a peak of 15,000 PE during the summer period.

The proposed scheme involves the upgrading and expansion of the existing WWTP to treat a wastewater generated from Clonakilty town, the Technology Park, Shannon Vale, Inchydoney and Ring. The existing effluent outlet channel will continue to be used to discharge the effluent into Clonakilty Harbour. The layout of the proposed upgrade is presented in Figure 2.

The proposed WWTP specification has a load of 20,500 PE, peak hydraulic load of 111L/s and biological load of 1,230kg BOD/day. The main upgrades to the plant are as follows;

- Inlet works to be upgraded.
- Additional aeration and settling capacity to be provided.
- Existing mechanical plant to be refurbished.
- Sludge treatment and storage to be upgraded and capacity expanded.
- Odour control and odour removal to be provided both at the sludge treatment plant and on the raw sewage from Inchydoney.

3.1.2 Description of habitats within the WWTP Site

"The site covers an area of approximately 2.2ha and consists predominantly of buildings and artificial surfaces (BL3) set in amenity grassland (GA2). Small areas of recolonising bare ground (ED3) and wet grassland (GS4) were also recorded within the site boundaries. The site is separated from the surrounding environment by either treelines (WL2) or hedgerows (WL1).

Intertidal mudflats lie to the north and east of the site. A strip of scrub (WS1) separates the site from the intertidal mudflats to the east. Clonakilty GAA ground lies to the west of the site, consisting predominantly of amenity grassland (GA2). Clonakilty Model Railway Village lies to the south of the site and comprises amenity grassland (GA2) and buildings and artificial surfaces (BL3)."

3.1.3 Description of habitats in the Natura 2000 sites

"Clonakilty Bay historically comprised two arms of a shallow bay (Clonakilty Harbour and Muckruss Strand) separated by Inchydoney Island. Due to land claim in the early 1900s the southern arm of the bay is now effectively a separate estuary (Inchydoney Estuary) and receives freshwater input from two small streams. The northern arm of the bay (Clonakilty Estuary) is the estuary of the River Fealge. Together, the two estuaries exhibit intertidal mud and sand flat habitats extending over approximately 270ha. Refer to Figure 3 for distribution of sediment in the harbour.

The mouth of Clonakilty Estuary is narrow which has the effect of restricting tidal flow, shortening the flood (incoming) tide and lengthening the ebb (outgoing) tide. Tide levels range from 4.1m (MHWST) to 0.7m (MLWST) (Irish Hydrodata, 2000). At low tide, the entire estuary dries out apart from a narrow river channel on the eastern side and various other smaller low tide channels and creeks."

Further information on Clonakilty Harbour is presented in Appendix B.

3.1.4 Summary of the Natura 2000 site designation

A summary of the qualifying interests of Clonakilty Bay cSAC and pSPA are outlined below:

<u>Clonakilty Bay cSAC (Site Code 91)</u>

Clonakilty Bay is an inter-tidal expanse that stretches from Clonakilty town to the open sea, and comprises two small estuaries separated by Inchydoney Island. Sand flats dominate the inter-tidal area, although

mud flats occur at the sheltered upper end of the inlets. This site is of considerable scientific interest because it contains a good diversity of coastal habitats. These habitats show a succession from salt to freshwater influences and include six which are listed on Annex I of the EU Habitats Directive, namely:

- Mudflats and sandflats not covered by seawater at low tide (270ha in size)
- Annual vegetation of drift lines
- Embryonic shifting dunes
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- Fixed coastal dunes with herbaceous vegetation (grey dunes)
- Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

The NPWS site synopsis sheet is presented in Appendix C.

Mudflats and sandflats habitats are located adjacent to the WWTP and within Clonakilty Harbour. The other five habitats are located primarily outside of the Harbour on the southern side of Inchydoney Island.

Clonakilty Bay pSPA (Site Code 4081)

The qualifying interests of Clonakilty Bay pSPA is primarily the black-tailed godwit, due to the internationally important number of winter wader populations of this species which utilize the Bay. Additionally, there are Nationally Important numbers of Shelduck, Dunlin and Curlew (Annex II of the Birds Directive species); and the presence of 4 species of bird that are listed on Annex I of the Birds Directive namely Golden Plover, Bar-tailed Godwit *Limosa lapponica* and Little Egret *Egretta garzetta*.

"Clonakilty Bay supports major and internationally important numbers of black-tailed godwits during the winter months. Black-tailed godwits are the most important qualifying interest of the site for pSPA designation. Clonakilty Bay is ranked the 6th most important site for black-tailed godwits within Ireland. The four-year average of 958 birds within Clonakilty Bay surpasses the international threshold of 350 birds (international threshold is 1% of the total population of the species). This species however, can occur in numbers of 1400+ especially during the main migratory (staging) period (L. J. Lewis, pers. obs.). Given a current national population estimate of 18,003 (Colhoun *et al*, in prep) and an international population estimate of 35,000 (Wetlands International, 2002), 958 birds represents 5.32% of the national wintering population and 2.7% of the total worldwide population. 1,400 birds represent 7.78% of the estimated national population and 4% of the estimated international population.

Icelandic-breeding, Black-tailed godwits are one of very few wading birds species that are exhibiting population increases (Gunnarsson *et al.,* 2005). They are covered by the following policies and legislation:

- European status listed as 'vulnerable' (Burfield & Bommel, 2004); largely related to the sub-species *Limosa limosa* that is exhibiting population declines.
- Listed on Appendix III of the Bern Convention.
- Listed on Appendix II of the Bonn Convention.
- Listed as 'least concern' under the world status criteria (Birdlife International/IUCN Red List Assessment).

Low-tide data presented within this report shows that Clonakilty Estuary is more important for Black-tailed godwits than Inchydoney Estuary, probably due to sediment and prey distribution and the organically enriched nature of inner Clonakilty Estuary. The head of Clonakilty Estuary is also the low-tide roost of this species".

Low tide distribution of selected estuarine birds, including the Black-tailed godwit is presented in Figure 4.

3.1.5 Summary of Ecological Assessment of Clonakilty Estuary for the EIS

Detailed surveying and reporting on the ecology of Clonakilty Bay was conducted for the EIS. A summary of the relevant section is presented in Appendix A. The key findings of the study were:

- Internationally important populations of the Black-tailed godwits and Nationally Important numbers of Shelduck, Dunlin and Curlew are present within the estuary.
- Sediment sampling in the inner harbour identified areas of anoxic conditions with no macroinvertebrate life immediately down stream of the outfall. Within the inner harbour, close to the WWTP, the sediment was organically-enriched and dominated by the polychaete worm (*Hediste diversicolor*), bivalve (*Scrobicularia plana*) and oligochaete worms (Lewis *et al,* 2002; Lewis *et al,* 2003b). This area coincides with the higher densities of black-tailed godwits and redshanks.
- Annual algal blooms occurring in Clonakilty Estuary with over 31% of the intertidal area covered in 2000. Observed algal cover during 2005 was greater than that recorded during 2000 (L. J. Lewis, pers. obs). This has a negative effect on the biodiversity of the estuary. Wading birds generally avoid feeding in areas with algal mats. The macroinvertebrate community in algae covered areas was generally characterised by low species diversity.

3.2 Assessment Criteria

The assessment criteria below is based on the template outlined in the EU AA methodology and its purpose is to identify elements of the project likely to impact on the Natura 2000 site and determine the significance of any of the identified impacts on the site.

3.2.1 Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.

This section details the potential impacts if **mitigation measures were not** incorporated in the design of the development.

Upgrade of WWTP

Construction Phase

All construction work will be undertaken outside of the Natura 2000 site boundary, on the existing WWTP site. There will be no construction activity within the Natura 2000 site as the existing outfall will be used in the upgraded WWTP. Therefore during construction there will be no impact on the SAC qualifying habitats.

During the construction phase of the WWTP site, some higher-level noise disturbance may occur but this is likely to be infrequent and of a short-term nature. Even if birds are displaced for a period, they have the potential to return and utilise the habitat (and prey resource) when the disturbance has ceased. It is therefore unlikely that there will be any long-term impacts on the bird species that utilise this inner estuarine area (Gill *et al.*, 2001). The impact of disturbance during the construction phase is therefore predicted to be imperceptible – slight negative over a relatively short time period."

Operational Phase

"Disturbance from the WWTP is not considered to be a major impact upon estuarine birds within the area. The current operations at the site do not appear to effect estuarine birds within the immediate vicinity. Wading birds and wildfowl are thought to habituate to continuous low-level noise (Hill *et al.,* 1997)."

Discharge from WWTP into Clonakilty Estuary

"The objectives of wastewater treatment in general are to reduce BOD_5, reduce TSS, reduce faecal coliforms and to reduce nitrogen and phosphates of the incoming wastewater before discharging to a water body (Kiely, 1997). The impact of a WWTP outfall on a water body depends on the magnitude and treatment

level of the discharge, the magnitude of inputs to the system from other sources, background concentrations and the rate of exchange (tidal flushing) (Burton *et al.,* 2002). Therefore in order to make impact predictions, information is required with regards the relative nutrient loads to the estuary from the various sources.

A previous study of the Clonakilty catchment found that nitrate was the most abundant nutrient entering the harbour and originated predominantly from riverine inputs (most likely from agricultural run-off). Data from Cork County Council (1998) gives nutrient levels for the River Fealge (downstream of Clonakilty Town but upstream of the WWTP) as ranging between 2.8 – 7.6 mg/l for nitrate and 0.02 – 0.33 mg/l for orthophosphate. Clonakilty WWTP was found to contribute significant levels of ammonium, total phosphate and orthophosphate (Cork County Council, 1998). This water quality data together with previous ecological research carried out by Dr L J Lewis, the results of the current macroinvertebrate sampling and the occurrence of annual and extensive macroalgae growth within Clonakilty estuary, suggest that the estuary is currently eutrophic.

Clonakilty WWTP is currently operating above its design capacity. Therefore it is likely that during times of high wastewater input that the current system is at risk of being overloaded. For example, during times of heavy rainfall, storm overflow may be directly discharged to sea without treatment (RPS, June 2006). Future design capacity is to provide treatment for a maximum PE of 20,500 with an associated greater flow rate. Treatment effluent will at a minimum meet the standard of 25 mg/l BOD_5, 35mg/l SS, 125 mg/l COD, nitrogen 15 mg/l and phosphorous 2 mg/l as set out in the Urban Wastewater Treatment Regulations 2001.

Impact on the mudflats and sandflats habitats

Reduced nutrient inputs impact on mudflats and sandflats

"Measured sediment parameters during the EIS study were generally within 'normal' or acceptable levels. However, areas of organically enriched and anoxic (depleted oxygen) sediments have been recorded from Clonakilty inner estuary (Lewis *et al.,* 2002).

Improvements in waste water treatment and reductions in organic loading (reduced BOD) to Clonakilty Estuary are likely to improve dissolved oxygen concentrations in the water column and promote re-oxygenation of sediments in impacted (anoxic) areas. Reduction in BOD generally promotes an improvement in sediment quality (*e.g.* lower levels of hydrogen sulphide, methane and ammonia). Improvements to

Clonakilty WWTP may therefore result in a slight -moderate positive impact upon mud and sand flat qualifying habitats."

Algal Bloom

"Nitrogen is often identified as the major limiting factor to macroalgal growth (Jeffrey *et al.,* 1995) and sewage treatment plants are identified as the major source of ammonium (NH_4) to estuarine systems (O'Higgins & Wilson, 2005). It is therefore predicted that long-term nutrient reductions, including both nitrogen and phosphorus removal during waste water treatment and a reduction in nutrients in river flows, will result in a reduction in algal mats over a long time-scale. Therefore, an improvement of the Clonakilty WWTP is likely to contribute to a moderate-major positive impact in terms of macroalgal reduction over time with subsequent benefits for SAC qualifying habitats of mud and sand flats."

Impacts on wader populations

"The proliferation of tolerant and opportunistic macroinvertebrates in response to organic enrichment is thought to benefit wading birds by increasing the abundance of their prey within certain areas (Van Impe, 1985; Burton *et al.,* 2002). Studies in the UK have suggested potential relationships between the nutrient status and numbers of wading birds within an estuary (Hill *et al.,* 1993) *i.e.* increases in organic and nutrient inputs equals increases in bird numbers. This suggests that reductions in the nutrient and organic loading of estuaries and subsequent reductions in macroinvertebrate densities could result in reductions in the number of birds or changes in the species composition of wading birds and wildfowl (see Section 7.3.4.7). Indeed, several studies have postulated links between reductions in organic loadings and declines in bird numbers (*e.g.* Bryant, 1987) however confounding factors often preclude conclusive associations.

Burton *et al.* (2002) suggest that declines in BOD concentrations and the subsequent changes to macroinvertebrate populations are linked to declines in bird numbers. Burton *et al.* (2002) suggested that the following species (that also occur at Clonakilty in reasonable numbers) may decline as a result of reductions in organic loading to estuaries: Shelduck *Tadorna tadorna*, Wigeon *Anas penelope*, Teal *Anas crecca*, Oystercatcher *Haematopus ostralegus*, Lapwing *Vanellus vanellus*, Dunlin *Calidris alpina*, Black-tailed godwit, Bar-Tailed Godwit, Curlew *Numenius arquata*, Redshank *Tringa totanus* and Turnstone *Arenaria interpres* .

The following scenarios could potentially result from a reduction in BOD/nutrient loading to the estuary following the proposed upgrade of Clonakilty WWTP:

1. The area of macroinvertebrate proliferation within inner Clonakilty Estuary is characterised by high densities of ragworm *H. diversicolor*, bivalves *S. plana*, oligochaetes and other invertebrate species, that

thrive within the organically enriched sediment (Lewis 2002, 2003b). It is postulated that the effluent from the WWTP is adding to this organically enriched sediment. A reduction in organic loading may lead to a reduction in the densities of these prey species. This would result in a negative impact on bird species that feed on these invertebrates within this area of the estuary. The impact would be primarily upon Black-tailed godwits and Redshank that occur within higher densities within this area. Any significant decline in bird numbers (worst case scenario), especially of Black-tailed godwits, would be considered a serious negative impact given the SPA status of the estuary and the qualifying status of the Black-tailed godwit.

2. Even with the reduction in organic matter being discharged from the upgraded WWTP, other sources of organic and nutrient inputs to the estuary (*e.g.* Fealge River) may contribute sufficient organic matter to maintain benthic fauna abundance, in which case impacts upon birds would be reduced.
3. A reduction in organic matter may bring about changes in macroinvertebrate species diversity or density and may even bring about increases in those species that are intolerant of organic enrichment. This could benefit those bird species that feed upon them.
4. Macroalgal mats have been shown to have negative effects on the foraging and distribution of most estuarine bird species studied (*e.g.* Tubbs & Tubbs, 1980; 1983; Cabral *et al.,* 1999; Lewis, 2003). Given that a long-term reduction in nutrient loadings to an estuary may lead to a reduction in macroalgal biomass and cover, a reduction in nutrient loadings could have knock-on beneficial effects for birds. Areas of the estuary that are currently affected by high macroalgal biomass and cover and experience the greatest negative effects (anoxic sediments, defaunation of sediments) could undergo an improvement in sediment quality and subsequent re-colonisation by macroinvertebrates. This could increase foraging habitat for birds across some areas of the estuary while partially mitigating any decrease in invertebrates brought about by a reduction in BOD loading.

To summarise, scientific studies suggest that reductions in the nutrient and organic loading of estuaries and subsequent reductions in macroinvertebrate densities may potentially result in declines in the number of wintering estuarine birds and/or changes in their species composition. However there is currently no conclusive evidence that allows accurate impact prediction especially when impacts are likely to vary considerably from site to site. Therefore, the current impact potential upon birds is undeterminable without on-going studies."

Summary of predicted impacts

A summary of the predicted impacts on the qualifying interests of the Natura 2000 site is presented below:

Qualifying interests	Action/activity	Predicted Impact
Mudflat and Sand flats	Reduced nutrient inputs impact on mudflats and sandflats	Slight -moderate positive impact
	Reduction in algal mats	Moderate-major positive impact
Waders	Reduction in algae mats	Moderate positive
	Reduction in organic and nutrient load on densities of prey for waders	Undeterminable
	Operation of upgraded WWTP	No impact

Cumulative elements

Tidal barrage

A tidal barrage, intended to prevent flooding of Clonakilty town during extreme high tide episodes, has been proposed. This would involve the construction of a tidal barrage across the harbour at a location downstream of the WWTP outfall. While planning permission was granted for the tidal barrage it has since lapsed and it is unknown if it will be constructed in the future.

The potential cumulative effect of the tidal barrage and the upgrade of the WWTP are:

"Inner Clonakilty Estuary is shallow and sheltered and building of a tidal barrage will increase the sheltered nature of this area, potentially promoting poorer mixing of waters and decreased tidal flushing as a consequence of altering the natural tidal flow and circulation. It is predicted that the barrage construction could lead to increased sediment deposition within the inner harbour with a subsequent increase in organic matter content of the sediments. Despite improvements in waste water treatment, organic matter and nutrients could still potentially be concentrated within the sheltered upper estuary as a result of decreased flushing. The full impacts upon habitats and species are difficult to predict. Output from the WWTP together with organic and nutrient loading from river sources could still potentially lead to an organically over-enriched inner estuarine area. This could maintain high densities of tolerant macroinvertebrates such as detrivorous worms that are an important food source for birds. Growths of annual macroalgal mats may be maintained in the short-term but a long-term reduction of nutrient inputs (including from freshwater sources) is likely to result in a reduction in growth over time."

3.2.2 Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of following headings

Size and scale

The construction activity will occur outside the Natura 2000 site boundary. The existing WWTP outfall will be used.

Land-take

No land take from the Natura 2000 site will occur.

Distance

The WWTP is located on the boundary of the Natura 2000 site and the WWTP outfall is located within the Natura 2000 site.

Resource Requirements

The waters in the estuary will act as a receptor for the effluent from the WWTP.

Emission

The WWTP will discharge treated effluent into the estuary. The design loadings for the upgraded WWTP are 20,500 PE, peak hydraulic load of 111 L/s and biological load of 1,230 kg BOD /day. The wastewater treatment processes for the Clonakilty WWTP will be required to result in a treated effluent which, at a minimum, meets the following standards:

- BOD: 25 mg/l
- TSS: 35 mg/l
- COD: 125 mg/l
- Nitrogen: 15 mg/l
- Phosphorous: 2 mg/l

These compliance levels will be as required by the EU Urban Waste Water Treatment Directive and the Urban Waste Water Treatment Regulations 2001.

Excavation requirements

There are no excavation requirements within the boundary of the Natura 2000 sites. All excavation will occur within the adjacent WWTP site.

Transportation requirements

Transportation of construction material to the WWTP site will be required.

3.2.3 Describe any likely impacts on the Natura 2000 site as a whole in terms of: Interference with the key relationships that define the structure of the site; Interference with key relationships that define the function of the site

Interference with the key relationships that define the structure of the site

All of the new WWTP infrastructures will be constructed on the existing WWTP site which is outside the Natura 2000 site boundary. The existing outfall pipe, which is laid within the estuary and Natura 2000 site, will be used in the upgraded plant. The construction phase upgrade of the WWTP structure itself will have no significant impact on the Natura 2000 site.

It is predicted that an improvement in the effluent quality will result in a reduction in the organic and nutrient load being discharged into the estuary system. This will have a potential positive impact on the mud and sand flats, both qualifying habitats and a key structure of the site. There is a predicted reduction in the anoxic condition in the sediment immediately downstream. A reduction of organic load in the inner harbour. This may result in a return of more natural pollution intolerant benthic macroinvertebrates which are currently scarce in the inner harbour. It is predicted that a reduction in nutrient load will contribute to a reduction in the eutrophic status of the harbour and a reduction in the extent and frequency of occurrence of algal blooms in the estuary. These factors would have a positive impact on the structure of the site.

Interference with key relationships that define the function of the site

The key function of the Natura 2000 site is the use of the mudflats and sandflats as a feeding ground for over-wintering waders, in particular an internationally important population of black-tailed godwits. Currently the function of the mudflats and sandflats is being impacted by excessive nutrient enrichment, resulting in anoxic sediments with no macroinvertebrates immediately downstream of the WWTP outfall and an abundance of pollution tolerant macroinvertebrates in the inner estuary. The predicted reduction in organic and nutrient loading may result in normal macroinvertebrate communities returning to the mudflats of the inner harbour.

However, the high abundance of pollution tolerant macroinvertebrates in the inner estuary provides a food source winter waders. There is a correlation between the high numbers of foraging waders, in particular black-tailed godwits and redshank, and the area of abundance of pollution tolerant macroinvertebrates. The consequences of a change in the organic inputs into the estuary system on the wader population cannot be determinable without on-going studies. However a number of scenarios are postulated:

1. The worst-case scenario is that a reduction in organic loading may lead to a reduction in the abundance of these pollution tolerant benthic fauna, which is the prey species for waders. This

could result in a negative impact on number of birds that the inner estuary can support.

2. Other input sources to the estuary (*e.g.* Fealge River) may still input sufficient organic load to maintain the abundance of pollution tolerant prey, in which case impacts upon birds would be reduced.
3. A reduction in organic matter may bring about changes in macroinvertebrate species diversity or density and may bring about increases in those species that are intolerant of organic enrichment. This could benefit those bird species that feed upon them.
4. A decrease in nutrient load could reduce the extent of algal mat cover in the estuary. This would increase foraging habitat for birds across some areas of the estuary and partially mitigate any decrease in invertebrates brought about by a reduction in BOD loading. A positive significant impact.

3.2.4 Provide indicators of significance as a result of the identification of effects set out above in terms of the following headings:

Habitat Loss

The reduction in the organic content of the WWTP effluent discharge may result in a change in composition of benthic macroinvertebrate abundance in the inner harbour, thus impacting of the number of waders the estuary can support. Thus would effectively result in a partial loss of feeding habitat for waders. The potential impact on waders is undeterminable although a number of scenarios have been considered as outlined in Section 3.2.1 and 3.2.3.

Fragmentation

There will be no habitat fragmentation as a result of the upgrade of the WWTP plant.

Disruption and Disturbance

There will be minimal direct disruption or disturbance to waders during the construction phase or by the operation of the upgraded WWTP.

Change to key elements of the site

A key element of the site is the availability of benthic macroinvertebrates in the mudflats as a food source to wader. As outlined in the 'Loss' section above, there are a number of possible scenarios as to the effects on the food source caused by the reduction in organic and nutrient loads discharging into the estuary from the WWTP.

3.2.5 Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts are not known
The main element of the project which may have a significant impact is a potential impact on the available food sources for waders. As outlined above (Section 3.2.1 and 3.2.3), a reduction in organic and nutrient loads from the WWTP effluent may reduce the abundance of pollution tolerant benthic macroinvertebrates in the inner harbour, thus impacting on the food source for waders in the inner harbour. The internationally important population of black-tailed godwits, along with the redshank, utilise the inner harbour to the greatest extent. A number of scenarios have been presented as to the potential severity of the impact, although further scientific studies would be required to fully determine the consequence.

4.0 STAGE 2: APPROPRIATE ASSESSMENT

4.1 Assessment of the effects of project or plan on integrity of the site

4.1.1 Describe the elements of the project or plan (alone or in combination with other projects or plans) that are likely to give rise to significant effects on the site (from screening assessment)
The current excessive input of organics and nutrients into the estuary, from the WWTP, Fealge River and diffuse pollution from the agricultural lands which surround the harbour, have led to an area in the inner estuary which has an un-naturally high abundance of pollution tolerant benthic macroinvertebrates. This benthic fauna is the main food source of wader birds. There is a correlation between the abundance of benthic macroinvertebrates and of higher densities of black-tailed godwits and redshank in the inner harbour. A reduction in the organic load by upgrading the WWTP may impact on the abundance and composition of the benthic fauna. The potential impact on the wader population which utilises the harbour cannot be determined without further studies, although a number of scenarios have been postulated: 1. The worst-case scenario is that a reduction in organic loading may lead to a reduction in the abundance of these pollution tolerant benthic fauna, which are the prey species for waders. This could result in a negative significant impact on number of birds that the inner estuary can support. 2. Other input sources to the estuary (*e.g.* Fealge River) may still input sufficient organic load to maintain the abundance of pollution tolerant prey, in which case impacts upon birds would be reduced.

3. A reduction in organic matter may bring about changes in macroinvertebrate species diversity or density and may even bring about increases in those species that are intolerant of organic enrichment. This could benefit those bird species that feed upon them. A positive significant impact.
4. A decrease in nutrient load could reduce the extent of algal mat cover in the estuary. This would increase foraging habitat for birds across some areas of the estuary and partially mitigate any decrease in invertebrates brought about by a reduction in BOD loading. A positive significant impact.

4.1.2 Set out the conservation objectives of the site

The conservation objective of Clonakilty Bay Natura 2000 site are summarised below:

<u>The Conservation objective of Clonakilty Bay cSAC (91) are:</u>

According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, is stable or increasing, and
- The ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.

Objective 1:

To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Atlantic decalcified fixed dunes (Calluno-Ulicetea).

Objective 2:

To maintain the extent, species richness and biodiversity of the entire site.

Objective 3:

To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

<u>The Conservation objective of Clonakilty Bay pSPA (4081) are</u>:

"The main conservation objective for the Clonakilty Bay pSPA is to maintain the special conservation interests for this SPA at favourable conservation status: black-tailed godwit; shelduck; dunlin; curlew; wetlands and waterbirds."

Correspondence with the NPWS regarding the conservation objectives of the Natura 2000 sites is presented in Appendix A.

4.1.3 Describe how the project or plan will affect key species and key habitats. Acknowledge uncertainties and any gaps in information

SAC Qualifying Habitats

Clonakilty Bay has been designated a cSAC for six priority habitats and no priority species. Five of these habitats are located on Inchydoney Island over 3km from the WWTP outfall in the outer harbour and it is not anticipated that there will be an impact on them:

- Annual vegetation of drift lines
- Embryonic shifting dunes
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- Fixed coastal dunes with herbaceous vegetation (grey dunes)
- Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

The habitat type "mudflats and sandflats not covered by seawater at low tide" is currently suffering from negative impact from algal mats forming on the surface due to summer algal blooms. These mats form over up to 31% of the low tide area and cause a change in the macroinvertebrate communities. Benthic fauna is displaced and fauna living within the algae are more common.

The excessive concentrations of organics and nutrients are resulting in anoxic conditions occurring close to the WWTP outfall. Also down estuary of the outfall and within the inner harbour pollution tolerant benthic fauna dominate and the more pollution sensitive species are less common.

While there is organic and nutrient pollution entering the estuary from sources other than the WWTP (*e.g.* from agricultural sources entering Feagle River or septic tanks), the upgrading of the WWTP will reduce the overall load of nutrients and organics into the system. The extent of the improvement of sediment conditions and reduction in the occurrence of algal blooms brought about by the upgrading of the WWTP has not been quantified but it is anticipated that there will be a long term positive significant impact of a reduction in algal mats forming across the bay.

SPA Qualifying Species

A reduction in organic load from the WWTP may result in a reduction in benthic fauna, the food source of waders. An internationally important population of black-tailed godwits rely on the feeding grounds in the inner harbour. As outlined in Section 3.1.1, the potential effects on the wader population has not been fully determined but worst case scenario may result in a decrease in black-tailed godwit populations in the harbour.

4.1.4 Describe how the integrity of the site (determined by structure and function and conservation objectives) is likely to be affected by the project or plan (e.g. loss of habitat, disturbance, disruption, chemical changes, hydrological changes and geological changes, etc.). Acknowledge uncertainties and any gaps in information.

It has been identified that the upgrade of the WWTP will have both positive and potentially negative impacts on the integrity of the Natura 2000 site.

In terms of mudflats and sandflats, due to a high organic load on the estuary there are currently areas in the inner harbour which are anoxic and with no benthic macroinvertebrate life, as well as other areas with an abundance of pollution tolerant benthic macroinvertebrate life. A reduction in BOD and nutrient inputs into the estuary system from the upgrade of the WWTP is likely to improve these conditions and return them to more acceptable quality with pollution intolerant fauna being present.

The algal blooms, which occur annually in the estuary, form macroalgal mats on up to 31% of the mudflats and sandflats. An improvement in the effluent quality will contribute to a reduction in the eutrophic status of the harbour and a long term reduction of the occurrence of algal mats, thus improving the mudflat and sandflat habitats.

Therefore in terms of the impact on the integrity of the SAC, the upgrading of the WWTP will have positive significant impact.

The function of the SPA, in terms of supporting internationally important and nationally important populations of winter waders, may be impacted by an improvement in effluent discharge. As outlined above, the worst-case scenario would be for a reduction in the population of wader, in particular the black-tailed godwits and redshank which feed within the inner harbour.

4.1.5 Describe what mitigation measures are to be introduced to avoid or reduce the adverse effects on the integrity of the site. Acknowledge uncertainties and any gaps in information.

"A European conservation priority is to protect and maintain internationally important populations of migratory shorebirds that over winter on estuaries of north-west Europe. To this end, qualifying sites are designated as SPAs which requires member states to undertake measures to 'preserve, maintain or re-establish a sufficient diversity and area of habitats for all species listed (Article 3). In terms of the Habitats Directive, member states are required to 'take appropriate steps to avoid…the deterioration of natural habitats and the habitats of species, as well as the disturbance of the species, for which the areas have been designated.'

There is thus conflict between (1) the EU Birds and Habitats Directives and (2) the EU Urban Waste Water

Treatment Directive (Directive 91/271/EEC) and the Bathing Water Directive (EU Directive 76/160/EEC); the latter aiming to maintain the quality of bathing water and protect public health and the environment. Further the objectives of the Water Framework Directive may be in conflict with the Birds Directive due to the potential impacts on birds as a result of improvements in estuarine water quality.

Estuaries are important for migratory wintering birds because of the abundance of prey (macroinvertebrates) found within the mudflats (McClusky, 1981). Previous research however, suggests there is a potential for negative impacts upon wading birds and wildfowl due to reductions in prey densities brought about by reductions in organic loadings to estuaries. Given that the impacts are likely to vary considerably from site to site, definitive impact prediction is also difficult. Furthermore, there are currently no European or national guidelines that give recommendations for the mitigation of this potential deterioration of intertidal habitats for birds. The Ramsar Convention Bureau made reference to this issue in 1994 and stated that the importance of organically-enriched areas for birds should not prevent the upgrading of treatment in the interests of the wider environment (Ramsar Convention Bureau, 1994) but there are no updated reviews or guidelines.

It should be noted that a decrease in nutrient load could reduce the extent of algal mat cover in the estuary. This would increase foraging habitat for birds across some areas of the estuary and partially mitigate any decrease in invertebrates brought about by a reduction in BOD loading.

There are no other direct measures that can mitigate for a potential reduction in prey density. An example of progressive mitigation would be the use of constructed wetlands that could provide wastewater treatment but also offer potential in terms of wildlife habitat. However, constructed wetlands are not considered to be an option for the Clonakilty WWTP due to the wastewater load and the extent of area required for the wetlands.

Monitoring of the SPA/SAC is therefore strongly recommended, particularly in relation to the population of black-tailed godwit. As prey density is one of the most important factors determining estuarine bird distribution and abundance, it has been suggested that baseline monitoring of estuarine SPAs should involve monitoring of macroinvertebrate densities and diversity (Durrell *et al.*, 2005). However, it is also known that macroinvertebrate densities alone cannot determine how many birds can be supported (Goss-Custard, 2003). A combination of macroinvertebrate sampling, low-tide bird counts with distribution studies and nutrient studies would ensure adequate sampling. A Before-After-Control-Impact study (*i.e.* both before and after the proposed WWTP upgrade) would be the best approach (*e.g.* Lewis *et al.,* 2002) in order to assess impacts conclusively."

4.2 CONSULTATION

The results of consultation are presented in Table X below. The Full consultation response is presented in Appendix A.

Name of agencies & bodies consulted	Summary of Response
BirdWatch Ireland NewtownMountKennedy Co. Wicklow	No response to date
Ms. Sharon Casey Heritage Officer, Cork County Council, Millview House, Victoria Cross, Cork.	In correspondence with Cork County Council, Ms Casey requested that "At a minimum, Stage 1 screening would be required for this development and depending on how this turned out it might be necessary to carry out a full AA. Much of the information required may already be in your EIS."
Ms. Sharon Casey Heritage Officer, Cork County Council, Millview House, Victoria Cross, Cork.	Ms Casey read a draft of the report and commented that she was "satisfied that this has been completed in accordance with proper procedure and I concur with the findings of the report." She was "satisfied that the construction of the WWTP can proceed". She recommended that "in accordance with the conclusions of the assessment that a programme be put in place to monitor the impacts of the upgrade of the WWTP on the status of protected species in the estuary. The duration of this monitoring programme as well as its parameters should be agreed with the NPWS prior to the commencement of construction."
Development Applications Unit, Heritage Division, Dept. of Environment Heritage & Local Government, Dunsceine, Harcourt Lane, Dublin 2.	The NPWS stated that an Appropriate Assessment of the proposed development was required under Regulation 6(5) of the Waste Water Discharge (Authorisation) Regulations 2007. The correspondence letter stated that "the Environmental Impact Statement has sufficient data and interpretation to form the basis of an Appropriate Assessment" and that an "assessment addressing the conservation objective of the two European Sites" be undertaken.
Dr. Jervis Good, Munster Regional Ecologist, NPWS, Little Island, Co. Cork	In a telephone conversation with Dr. Good in November 2008, he stated that a full AA was required for the project and that the EIS contained sufficient information to form the basis of the AA.

5.0 STAGE 3: ASSESSMENT OF ALTERNATIVE SOLUTIONS

5.1 ASSESSMENT OF ALTERNATIVE SOLUTIONS MATRIX

Assessment of Alternative Solutions

5.1.1 The description and objectives of the project or plan
The objective of the project is to: ▪ Under the obligations of Urban Wastewater Treatment Directive and associated Irish regulations, there is a legal obligation for the effluent discharged from the WWTP to meet standards for effluent discharge. The existing WWTP is operating above its design capacity and therefore does not meet the Urban Wastewater Treatment Directive standards. ▪ The WFD requires that all transitional waters are of 'good status'. Clonakilty harbour does not achieve this status currently due to eutrophication ▪ The Bathing Waters Directive also requires that water quality meet prescribed standards. Inchydoney Blue Flag Beach is located down stream of the WWTP outfall. ▪ By upgrading the existing WWTP it is anticipated that there will be an improvement of water quality in Clonakilty Estuary.
5.1.2 The 'do nothing' alternative
Given no change to the current operations of Clonakilty WWTP, nutrient and organic loadings to Clonakilty Estuary would be expected to remain at current levels and to increase over time as the population levels expand. Over time, the water and sediment conditions within the estuary could potentially decline, as the estuary becomes more eutrophic. A greater proportion of estuarine sediment could become anoxic and devoid of all macroinvertebrate life. Annual growths of macroalgae are predicted to continue and have the potential to increase. The estuary would become a mosaic of good and poor feeding areas for wintering wading birds and wildfowl.
5.1.3 Predicted adverse effects of the project or plan on the Natura 2000 site following the appropriate assessment
An improvement in the effluent quality may result in a reduction in the quality of abundance of benthic fauna in the inner estuary. The highest concentration of black-tailed godwits and redshank coincides with the high abundance of benthic fauna. Clonakilty Harbour supports 5.32% of the national wintering population and 2.7% of the total worldwide population of black-tailed godwits. The worst case scenario is for a reduction in the number of black-tailed godwits feeding in this area and in Clonakilty Harbour as a whole.

Comparison with chosen project or plan

A number of EU Directives directly or indirectly require that the Clonakilty WWTP is upgraded. The EU Urban Waste Water Treatment Directive (91/271/EEC) requires that effluent from WWTP treating a prescribed PE threshold must meet discharge standards (as outlined in Section 3.2.2). Thus the PE Clonakilty town requires that Urban WWT Directive is applied in this case.

The Bathing Water Directive (76/160/EEC) requires that waters are suitable for public swimming and that coliform counts are at a prescribed level. The 'Blue Flag' beach, Inchydoney Strand, is located within the Clonakilty Bay SAC and approximately 3.5km down estuary of the WWTP outfall at the mouth of the Estuary. There is an obligation to ensure that wastewater from Clonakilty WWTP is treated to a sufficient degree to ensure compliance with the Bathing Water Directive.

The Water Framework Directive (2000/60/EC) requires that all transitional waters within the EU are of 'good status' by 2015. The current eutrophic status of Clonakilty Harbour does not comply with this. The current concentrations of nutrient output from the WWTP, in particular nitrogen compounds, are likely to be contributing to the algal blooms and eutrophic status of the harbour. The upgrade of the WWTP is likely to reduce the nitrogen input into the harbour and in the long term lead to a reduction in the occurrence of algal bloom and thus help achieve the 'good status' of water quality for Clonakilty Harbour.

The objectives of the Directives may be in conflict with the Birds Directive due to the potential impacts on birds as a result of improvements in estuarine water quality. Previous research suggests there is a potential for negative impacts upon wading birds and wildfowl due to reductions in prey densities brought about by reductions in organic loadings to estuaries. There are currently no European or national guidelines that give recommendations for the mitigation of this potential deterioration of intertidal habitats for birds. The Ramsar Convention Bureau made reference to this issue in 1994 and stated that the importance of organically-enriched areas for birds should not prevent the upgrading of treatment in the interests of the wider environment (Ramsar Convention Bureau, 1994) but there are no updated reviews or guidelines.

The only alternative solution is a 'do-nothing' option. However, as outlined above, this is not practical due to obligations of other EU directive. Therefore, there are no alternative solutions provided for this project.

6.0 STAGE 4: ASSESSMENT OF COMPENSATORY MEASURES

No compensatory measures have been proposed for the project. It has been assessed that there are no feasible compensatory measures for the project. "An example of progressive mitigation would be the use of constructed wetlands that could provide wastewater treatment but also offer potential in terms of wildlife habitat. However, constructed wetlands are not considered to be an option for the Clonakilty WWTP due to the wastewater load and the extent of area required for the wetlands.

Monitoring of the SPA/SAC is therefore strongly recommended, particularly in relation to the black-tailed godwit. As prey density is one of the most important factors determining estuarine bird distribution and abundance, it has been suggested that baseline monitoring of estuarine SPAs should involve monitoring of macroinvertebrate densities and diversity (Durrell *et al.*, 2005). However, it is also known that macroinvertebrate densities alone cannot determine how many birds can be supported (Goss-Custard, 2003). A combination of macroinvertebrate sampling, low-tide bird counts with distribution studies and nutrient studies would ensure adequate sampling. A Before-After-Control-Impact study (*i.e.* both before and after the proposed WWTP upgrade) would be the best approach (*e.g.* Lewis *et al.,* 2002) in order to assess impacts conclusively."

7.0 CONCLUSION

The proposed upgrade of the WWTP will have potentially both positive and negative impacts on the Clonakilty Bay Natura 2000 site. There will be a positive impact for the mudflats and sandflats habitats. A reduction in the organic and nutrient loads may improve the condition of the sediment in the inner harbour, resulting in a return of more pollution intolerant benthic fauna. In addition, there will be a positive impact from a reduction in extent of algal blooms across the harbour.

A reduction in organic load may have, in a worst-case scenario, a negative impact on the feeding opportunities of winter-waders, in particular the black-tailed godwit, by reducing the quantity of invertebrates in the sediment. However, this would be partially mitigated by a reduction in the extent of algal mat cover in the estuary would increase foraging habitat for birds.

The Habitats Directive requires that listed habitats and species are protected. However, there is a conflict with other EU Directive (Urban WWT, Bath Water and WFD) with regards to water quality standards.

There are currently no European or national guidelines that give recommendations for the mitigation of the potential deterioration of intertidal habitats for birds caused by upgrading of WWTPs. The Ramsar Convention Bureau (1994) stated that importance of organically-enriched areas for birds should not prevent the upgrading of treatment in the interests of the wider environment. Therefore, it is recommended that the proposed project is proceeded with.

A tidal barrage in Clonakilty Bay, located downstream of the WWTP outfall, has been proposed. It is predicted that the barrage could increase sediment deposition within the inner harbour with a subsequent increase in organic matter content of the sediments. Despite improvements in waste water treatment, organic matter and nutrients could still potentially be concentrated within the upper estuary as a result of decreased flushing. This could maintain high densities of tolerant invertebrates, an important food source for birds.

No feasible alternative solutions have been considered and no compensation has been proposed. It is recommended that a programme be put in place to monitor the impacts of the upgrade of the WWTP on the status of protected species in the estuary. The scope and duration of this monitoring programme should be agreed with the NPWS prior to the commencement of construction.

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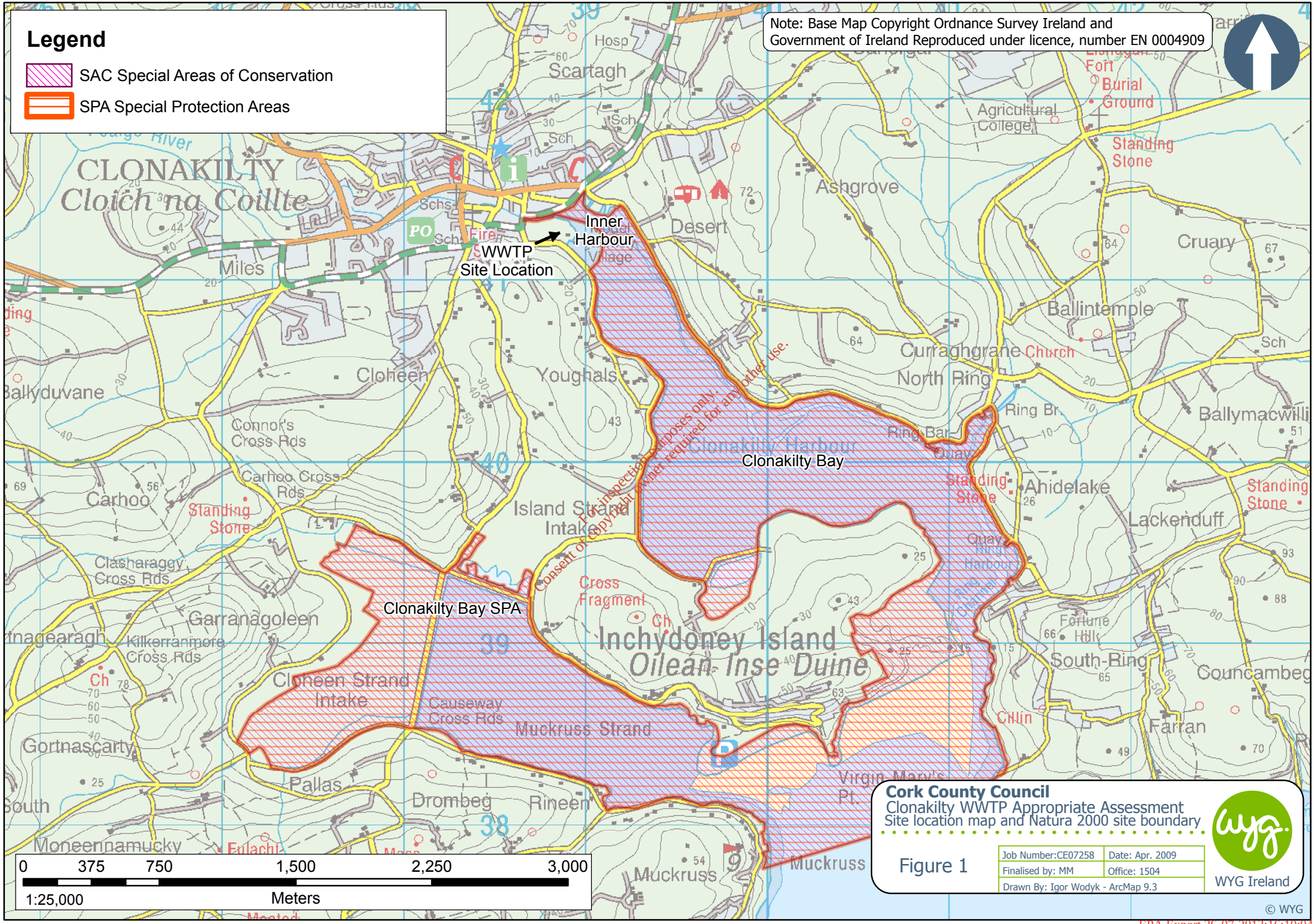
Figures


Legend
SAC Special Areas of Conservation
SPA Special Protection Areas
Note: Base Map Copyright Ordnance Survey Ireland and Government of Ireland Reproduced under licence, number EN 0004909
Inner Harbour
WWTP Site Location
Clonakilty Bay SPA
Clonakilty Bay
Inchydoney Island
Oilean Inse Duine
CLONAKILTY
Cloich na Coillte
Scartagh
Ashgrove
Desert
Cruary
Ballintemple
Curraghgrane Church
North Ring
Ballymacwilli
Cloheen
Youghals
Island Strand Intake
Ahidelake
Lackenduff
Carhoo
Clasharaggy Cross Rds
Garranagoleen
Kilkerranmore Cross Rds
Cloheen Strand Intake
Causeway Cross Rds
Muckruss Strand
Gortnascarty
Pallas
Drombeg
Rineen
Muckruss
Moneennamucky
Farran
Councambeg
South-Ring
Fort
Burial Ground
Standing Stone
Agricultural College
Ballyduvane
Connor's Cross Rds
Carhoo Cross Rds
Cross Fragment
Fortune Hill
Cillin
Virgin Mary's Pt.
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Cork County Council
Clonakilty WWTP Appropriate Assessment
Site location map and Natura 2000 site boundary
Figure 1
Job Number:CE07258
Date: Apr. 2009
Finalised by: MM
Office: 1504
Drawn By: Igor Wodyk - ArcMap 9.3
WYG Ireland
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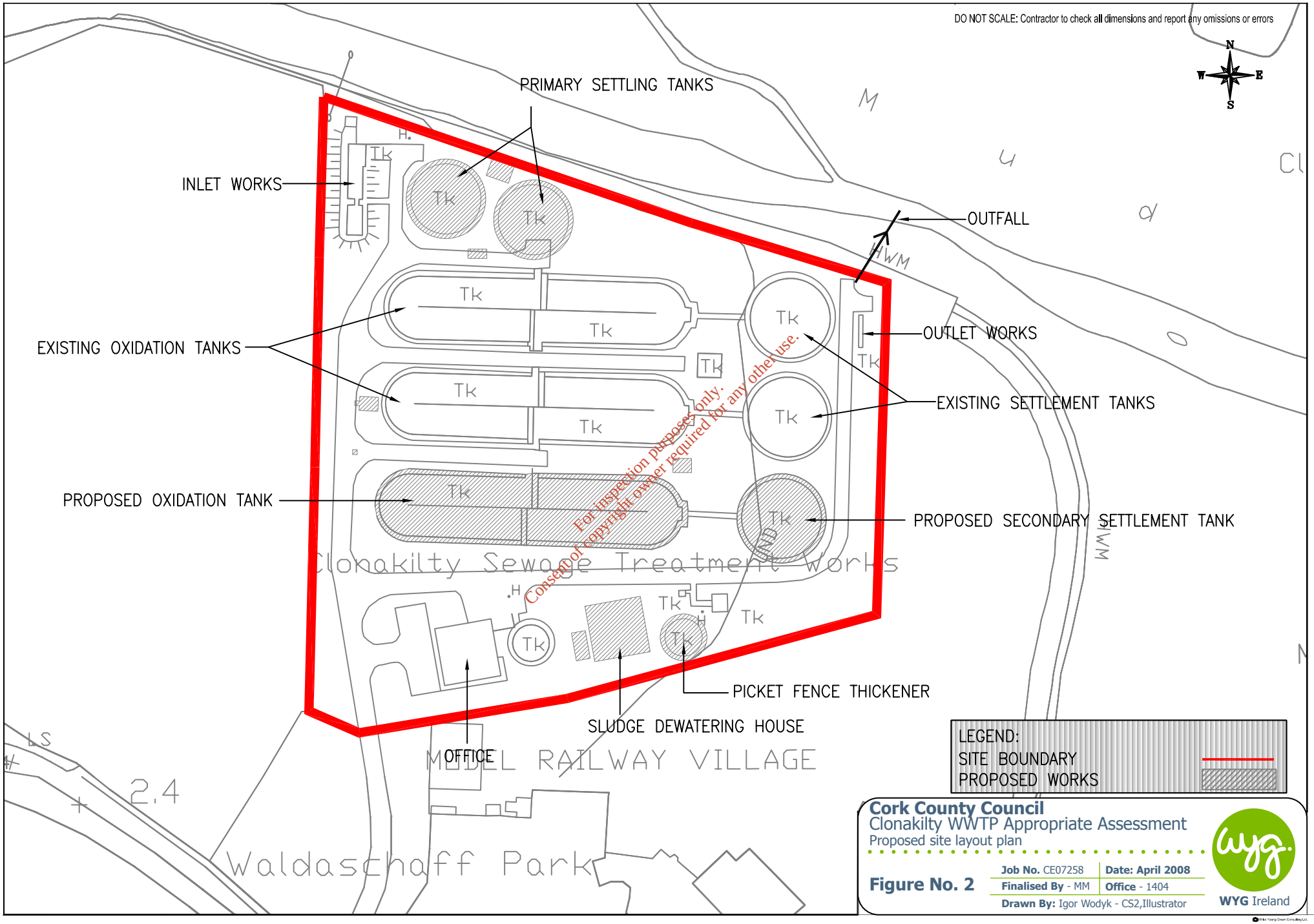
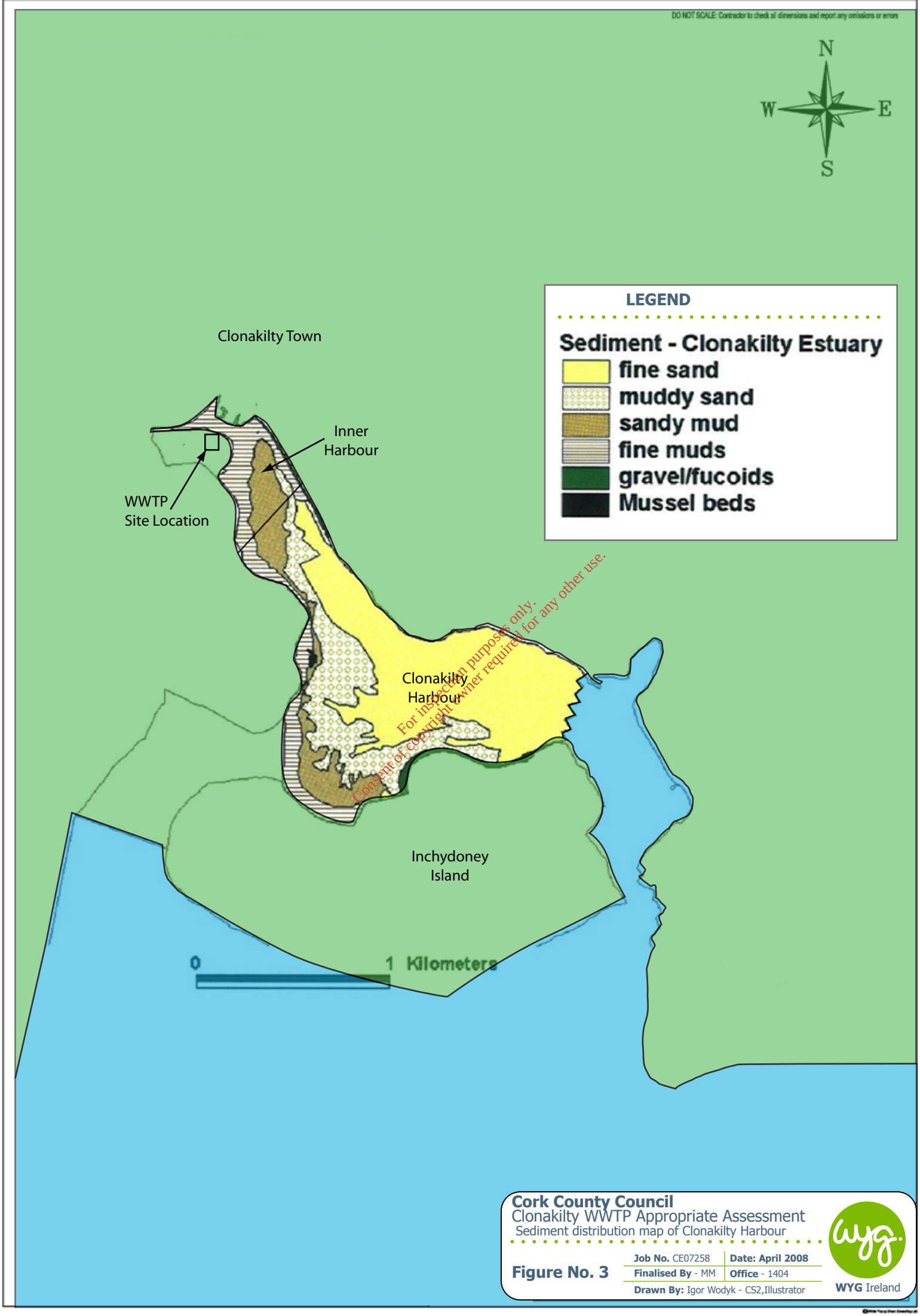


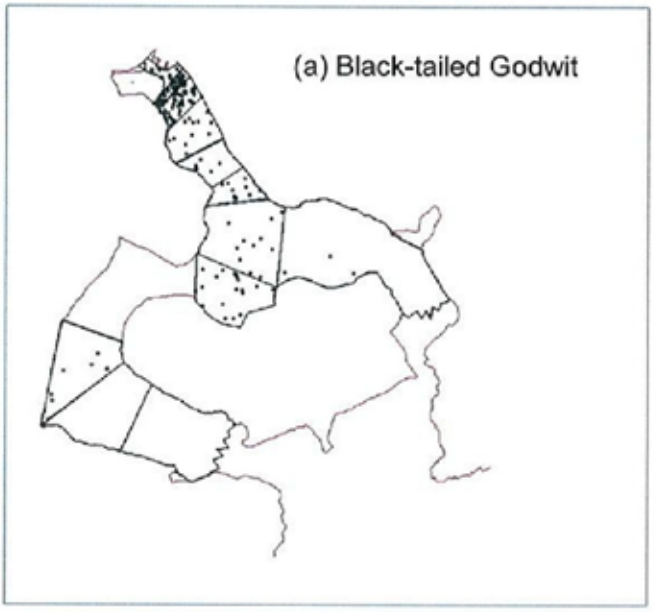


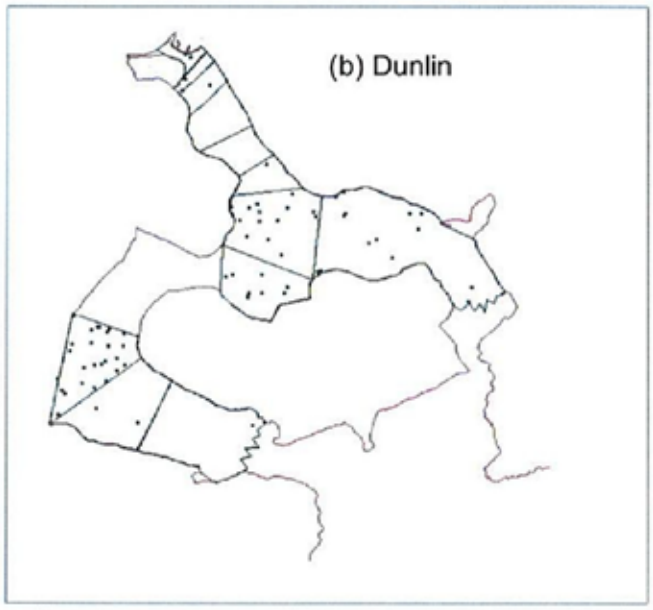
Cork County Council
Clonakilty WWTP Appropriate Assessment
Sediment distribution map of Clonakilty Harbour

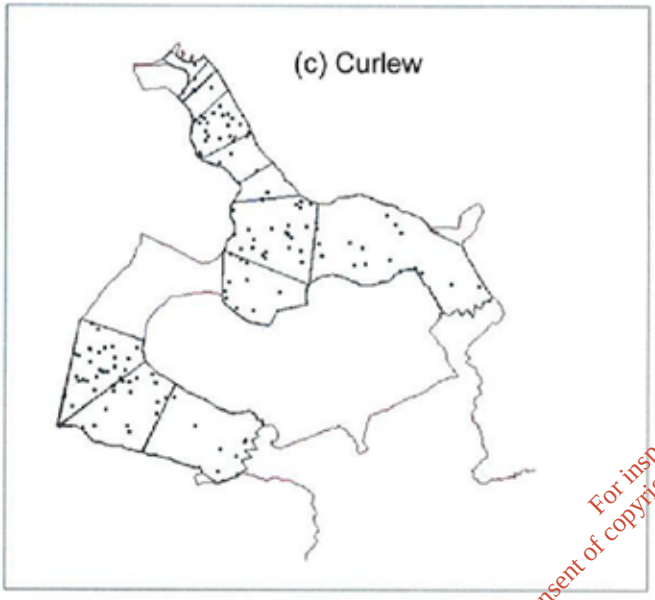
Figure No. 3

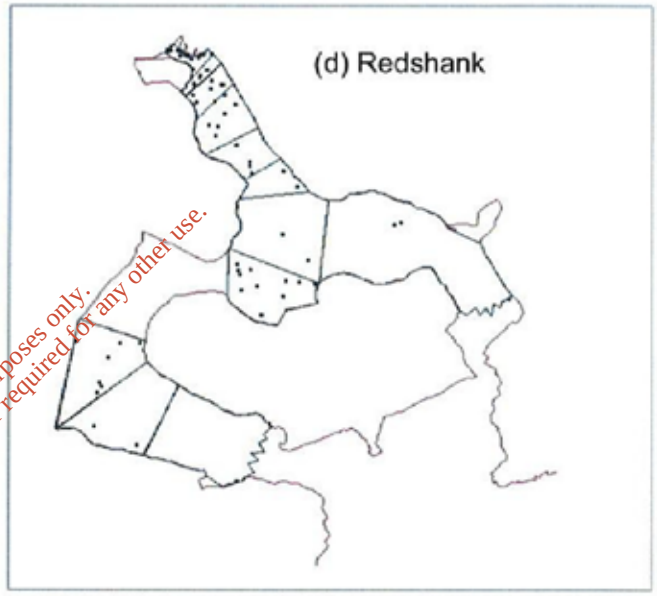
Job No. CE07258 | **Date: April 2008**
Finalised By - MM | **Office** - 1404
Drawn By: Igor Wodyk - CS2,Illustrator

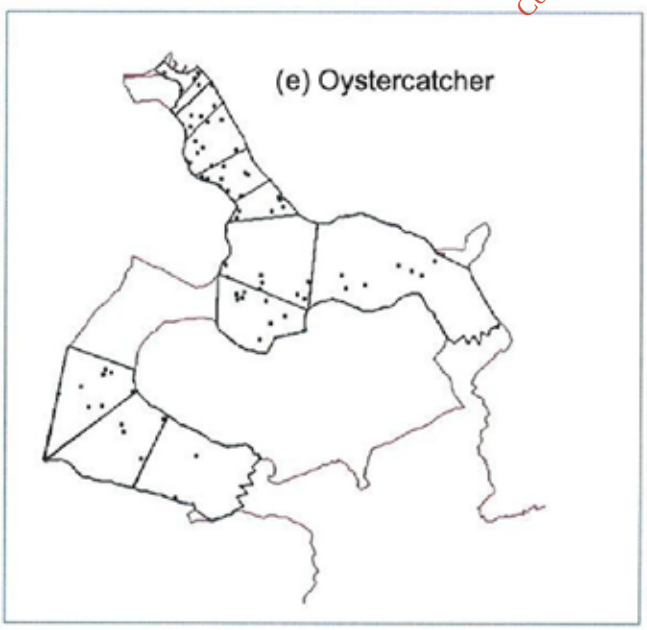
WYG Ireland

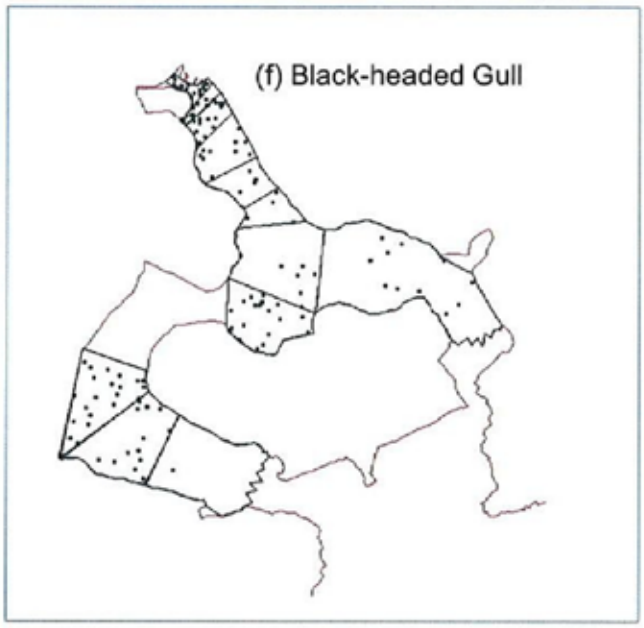












Cork County Council
Clonakilty WWTP Appropriate Assessment
Low tide distribution of selected estuarine birds

Figure No. 4

Job No. CE07258 | **Date: April 2008**
Finalised By - MM | **Office** - 1404
Drawn By: Igor Wodyk - CS2,Illustrator

WYG Ireland

Appendix A

AN ROINN COMHSHAOIL, OIDHREACHTA AGUS RIALTAIS ÁITIÚIL
DEPARTMENT OF THE ENVIRONMENT, HERITAGE AND LOCAL GOVERNMENT

23rd June 2008

Our Ref: G2008/468e
(EPA ref. D0051-01)

Valerie Hannon,
Senior Executive Scientist,
Cork County Council,
County Hall,
Cork.

AN ROINN COMHSHAOIL,
OIDHREACHTA AGUS
RIALTAIS ÁITIÚIL
DEPARTMENT OF THE
ENVIRONMENT, HERITAGE AND
LOCAL GOVERNMENT

DÚN SCÉINE
LÍNA FHEARCAIR
BAILE ÁTHA CLIATH 2

DÚN SCÉINE
HARCOURT LANE
DUBLIN 2

Tel: +353 1 888 3109
Fax: +353 1 478 0806

RE: Clonakilty WWTP discharge licence (D0051-01) (Consultation under Regulation 18 of the Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007))

A Chara,

We refer to your letter dated 6th June 2008 in relation to the above-proposed development. Outlined below are the nature conservation recommendations of the Department of the Environment, Heritage and Local Government.

The proposed discharge is located within or upstream of the following European sites: Clonakilty Bay cSAC (91); Clonakilty Bay pSPA (4081).

The Environmental Impact Statement has sufficient data and interpretation to form the basis of an Appropriate Assessment as required under Article 6 of the Habitats Directive, but it does not explicitly address the conservation objectives of the site as required in Regulation 6(5) of the Waste Water Discharge (Authorisation) Regulations 2007. It is therefore recommended that the author of the EIS Ecology Section, using the conclusions and interpretation in the EIS, prepares a supplementary assessment addressing the conservation objectives of the two European Sites. These objectives can be obtained from Dr Rebecca Jeffrey, Management Planning Unit, NPWS, 7 Ely Place, Dublin 2.

Please note that the licence consultation has been forwarded to the NPWS Marine Ecologist for further comments regarding marine habitats listed for the cSAC, and these, if any, will be forwarded separately.

Should you require any further assistance please do not hesitate to contact this Department at the following address.

The Manager,
Development Application Unit,
The Department of the Environment, Heritage and Local Government,
Dún Scéine,
Harcourt Lane,
Dublin 2.

27 JUN 2008

Thank you for your Co-operation

Mise le meas,

Ciara Beddy
Developments Applications Unit

SITE SYNOPSIS

SITE NAME: CLONAKILTY BAY

SITE CODE: 000091

Clonakilty Bay in west Cork is an inter-tidal expanse that stretches from Clonakilty to the open sea, and comprises two small estuaries separated by Inchydoney Island. The site also includes adjacent sand dunes and inland marshes, and therefore is a coastal complex with a good diversity of habitats including several habitats listed on Annex I of the EU Habitats Directive.

Sand flats dominate the inter-tidal area, although mud flats occur at the sheltered upper end of the inlets. The vegetation consists of algal mats (*Enteromorpha* spp.) with brown seaweeds (*Fucus* spp.) occurring where the coast is rocky. The invasive Cord-grass (*Spartina* sp.) occurs in places. The intertidal flats have a typical diversity of macro-invertebrates, including *Arenicola marina, Scrobicularia plana, Hediste diversicolor, Nephtys hombergii, N. cirrosa, Hydrobia ulvae* and *Cerastoderma edule.*

Sand dunes grade from a strandline, colonised by Frosted Orache (*Atriplex laciniata*), Sea Sandwort (*Honkenya peploides*) and Sea Rocket (*Cakile maritima*), through to fixed dunes vegetated by grasses, small herbs and several species of orchid. They also support an interesting array of introduced plants, amongst which Great Mullein (*Verbascum thapsus*), Viper's-bugloss (*Echium vulgare*) and Teasel (*Dipsacus fullonum*) are the most noticeable. Embryonic shifting dunes and white *Ammophila* dunes are also represented. Of particular interest is a small area of decalcified dune heath with some *Ulex europaeus*.

Inland of the western estuary, an extensive area of wetland occurs, which in itself contains a fine range of habitats from saline lagoons, to brackish grasslands, open freshwater marsh and Alder (*Alnus glutinosa*) scrub. Species found here are characteristic of marshy areas and include Creeping Bent (*Agrostis stolonifera*), Water Horsetail (*Equisetum fluviatile*), Marsh Cinquefoil (*Potentilla palustris*) and Marsh Willowherb (*Epilobium palustre*). The saline influence is evident by the occurrence of species such as Saltmarsh Rush (*Juncus gerardii*) and Sea Rush (*J. maritimus*).

The site contains a good diversity and density of waterfowl, with over 7,000 waders and wildfowl occurring regularly. Seven species have populations of national importance: Shelduck (168), Grey Plover (76), Lapwing (2,509), Dunlin (1,508) Curlew (1,231), Redshank (263) and Greenshank (27). The site is most noted, however, for its population of Black-tailed Godwit (866), which is of international importance and comprises over 10% of the national total. Amongst the other species which occur, there are notable populations of Golden Plover and Bar-tailed Godwit, both of which are listed on Annex I of the EU Birds Directive. All counts given are average winter peaks over either two or three seasons from 1994/95 to 1996/97. Herons commonly use the site and a heronry exists in the trees near Clonakilty.

Otter spraints were found frequently during a recent survey of the marsh area.

The site is under pressure from a number of sources, notably recreation and tourism developments and agricultural improvements, including drainage and fertiliser application.

This site is of considerable scientific interest because it contains a good diversity of coastal habitats. These habitats show a succession from salt to freshwater influences and include six which are listed on Annex I of the EU Habitats Directive. Its value is enhanced considerably by the birdlife it supports. The occurrence of Black-tailed Godwit in internationally important numbers is particularly significant. The site also supports nationally important numbers of seven other species of waterfowl as well as two species listed on Annex I of the EU Birds Directive.

7.8.1999

From: Sharon Casey
Sent: 15 December 2008 17:00
To: Declan Groarke
Subject: RE: Clonakilty Waste Water Discharge Licence

Attachments: water services circular letter L8_08.doc
Declan

Clonakilty Bay is designated as a Special Area of Conservation (SAC) under the EU Habitats Directive. It is also designated as a Special Protection Area (SPA) under the EU Birds Directive. The Habitats Directive provides for the designation of area of high nature conservation value that support habitats and /or species that have been identified to be threatened or rare in a European context. The Directive has a number of annexes that list the habitats (annex I) and species (annex II) for which sites can be designated. The Birds Directive also contains annexes or lists of bird species of conservation concern, with different conservation measures applying depending on which annex the birds occur on. Each site (both SACs and SPAs) will have a list of qualifying interests (habitats and species) that occur on these annexes for which the site is specifically designated.

Appropriate Assessments are required to be carried out in respect of all Special Areas of Conservation (Habitats Directive Sites) and Special Protection Areas (Birds Directive Sites) where a plan or project is proposed in or near the site. The purpose of this assessment is to examine what if any impact a proposed plan or project pertaining to land within or near the designated site will have on the qualifying interests of the site. It is on these habitats and species that the AA should specifically focus, whereas an EIS may be looking at broader issues.

The qualifying interests (ie species for which the SPA is designated) for Clonakilty Bay pSPA are:
Internationally Important numbers of Black-tailed Godwit (Annex II of the Birds Directive);
Nationally Important numbers of Shelduck, Dunlin and Curlew (Annex II of the Birds Directive);
and the presence of 4 species of bird that are listed on Annex I of the Birds Directive namely Golden Plover, Bar-tailed Godwit, Little Egret and Short-eared Owl.

The qualifying interests (ie habitats for which the SAC is designated) for Clonakilty Special Area of Conservation (SAC) are:
Fixed Dunes
Decalcified Dune Heath
Drift Lines
Embryonic Shifting Dunes
Marram Dunes
Tidal Mudflats

All of these habitats occur at the site and are listed on Annex I of the Habitats Directive.

I attach a circular letter that came from the Department which should provide some guidance as to how the Appropriate Assessment should be done. There is also a European guidance document that can be downloaded at …
http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pd

There are a number of stages to Appropriate Assessment. At a minimum, Stage 1 screening would be required for this development and depending on how this turned out it might be necessary to carry out a full AA. Much of the information required may already be in your EIS.

Please give me a call if you want to discuss any further.

Kind regards and apologies for not getting back to you sooner…I had missed the email.;

Sharon

Heritage Officer, Cork County Council, Millview House, Victoria Cross, Cork. ph 021 4818000, fax 021 4818010. www.corkcoco.ie/heritage

From: Declan Groarke
Sent: 01 December 2008 14:05
To: Sharon Casey
Subject: Clonakilty Waste Water Discharge Licence

Hi Sharon,

Niall O'Mahony, Senior Engineer, Water Services mentioned that you might be able to help me.

We've had to apply to the EPA for a Discharge Licence for the Clonakilty Waste Water Treatment Plant. As part of the proposed upgrade of the plant an EIS was carried out by White Young Green Consulting Engineers and this was submitted as part of the Licence Application.

The National Parks and Wildlife Service were consulted as part of the licence process and a reply dated 23rd June 2008 on their behalf was received from the DOEHLG (copy attached). In this reply it is requested "that the author of the EIS Ecology Section, using the conclusions and interpretation in the EIS prepares a supplementary assessment addressing the conservation objectives of the two European Sites" – Clonakilty Bay cSAC (91) and Clonakilty Bay pSPA (4081). "These objectives can be obtained from Dr. Rebecca Jeffrey, Management Planning Unit, NPWS, 7 Ely Place, Dublin 2."

I have been in contact with White Young Green concerning this matter and I attach their reply. Apparently the EIS of other developments may have to be taken into account even though sewage from these will be catered for in the upgrading Clonakilty Waste Water Treatment Plant for which the EIS was prepared.

I would be grateful for any guidance you could provide regarding this matter.

Regards,

Declan Groarke,
Senior Executive Engineer,
Water Services,
Cork County Council,
Courthouse,
Skibbereen

E-mail: declan.groarke@corkcoco.ie
Phone: 028 21299
Fax: 028 21995

Mr. Declan Groarke,
Cork County Council,
Western Division Office,
Skibbereen,
Co. Cork

09/07/2009

Re: Clonakilty WWTP, Appropriate Assessment.

Dear Declan,

I have read the Appropriate Assessment Report for the WWTP at Clonakilty. I am satisfied that this has been completed in accordance with proper procedure and I concur with the findings of the report.

While there may be a possibility that a reduction in prey species arising from reduced nutrient levels will have some impact on bird species for which the SPA is designated, the overall impacts of the upgrade on the estuary will be positive. In accordance with the Ramsar Convention Bureaus recommendation that the importance of organically-enriched areas for birds should not prevent the upgrading of treatment in the interests of the wider environment, I am satisfied that the construction of the WWTP can proceed.

I recommend that in accordance with the conclusions of the assessment that a programme be put in place to monitor the impacts of the upgrade of the WWTP on the status of protected species in the estuary. The duration of this monitoring programme as well as its parameters should be agreed with the National Parks and Wildlife Service prior to the commencement of construction.

Is mise le meas,

Sharon Casey,
Heritage Officer

Appendix B

SUMMARY OF ECOLOGICAL ASSESSMENT OF CLONAKILTY BAY

The following information was originally presented in the Flora and Fauna section of the Clonakilty WWTP upgrade EIS (Section 3.2).

1 Estuary Sediment

"Granulometry tests showed that the sediment of Clonakilty Estuary becomes sandier in nature as one progresses from the head of the estuary towards the mouth. Sampling locations are presented in Figure A and results are summarised in Table 1 below. A sediment distribution map of Clonakilty Bay is presented in Figure B.

Measured parameters generally fall within 'normal' or acceptable levels but there was a general trend for higher levels (i.e. total coliforms, faecal coliforms, TOC, Ammoniacal Nitrogen, Ortho phosphate, Kjeldhal Nitrogen and metals: Chromium, Copper, Lead, Nickel and Zinc) within Site 1, just downstream of the WWTP outfall. This suggests that nutrients and pollutants are entering the estuarine water column and sediments from the WWTP although riverine inputs (e.g. run-off) will also be involved".

Table 1. Physical Characteristics of Sampling sites

Site Characteristics	Site 1	Site 2	Site 3	Site 4	Site 5
General Sediment Classification	Fine Mud	Muddy-Sand	Muddy-Sand	Sand	Sand
Average % Algal Cover	0	2%	0	2%	0
Average Number of Lugworm Casts per 0.25m^2	None	2	4	11	0
Visible sediment surface invertebrates	None. Sediment very black and anoxic, visible leaf litter and detritus	None, but surface signs of *Scrobicularia plana* (benthic bivalve)	Tubes of *Sphiophanes bombyx*	None	None

2 Benthic macroinvertebrates

Benthic macroinvertebrates comprise those species that either live within (infauna) or upon (epifauna) the sediment surface. Table 2 gives the results of the benthic macroinvertebrate survey.

Table 2: Macroinvertebrate species/taxa recorded within Clonakilty Estuary together with their maximum recorded densities (numbers per m^2) and some notes on habitat preferences and characteristics.

Species/Taxa	Max densities recorded per m^2	Habitat/sediment preferences & other notes (after Pearson & Rosenberg, 1978 and Hayward & Ryland, 1998)
Annelid worms: Class Polychaeta		
Arenicola marina	127	Sand and muddy-sand sediments.
Hediste diversicolor	1604	Very tolerant of anoxic conditions, organic enrichment and a degree of algal cover. Typical of reduced salinity mud shores. Varied feeding methods including detritivore and carnivore.
Nereis virens	33	Muddy-sand
Nephtys caeca	100	Widespread muddy-sand, sandy-muds.
Scoloplos armiger	100	Muddy-sand, tolerant of organic rich sediments
Spiophanes bombyx	267	Sandy-mud
Spionid indent.	-	-
Eteone longa	318	Often prefers muddy areas. Tolerant of organic pollution.
Malacoceros fulignosus	230	Tolerant of organic rich sediments
Phyllodoce maculata	153	Muddy-sand
Pygospio elegans	548	Widespread muddy-sand, sandy-muds.
Class Oligochatea		
Oligochaete spp.	1939	e.g. tubifex spp. Detritivores. Organic pollution indicators, highly tolerant of anoxic conditions.
Molluscs: Class Bivalvia		
Cerastoderma edule	340	May be widespread but prefers sandier sediments e.g. muddy- sand. Filter feeder.
Scrobicularia plana	480	Typical of reduced salinity mud shores.
Macoma balthica	66	May be widespread but prefers sandier sediments e.g. muddy- sand. Tolerant of organic enrichment, anoxic conditions.
Molluscs: Class Gastropoda		
Hydrobia ulvae	6366	Widespread. muddy sand and mud sediments. grazer on e.g. algae, feeding on diatoms.
Litttorina littorea	204	Widely distributed, usually associated with rocky shores but also found in estuaries. A grazer i.e. grazes on microorganisms and detritus.
Crustaceans: Order Amphipoda		
Corophium volutator	4953	Widely distributed within estuaries, muddy sediment. Detritivore, tolerant of organic rich sediments.
Gammarus spp.	356	Widespread, distribution linked to primarily to salinity
Melita palmata	535	Widespread, sandy and muddy sediments
Socarnes erythrophthalamus	500	Sandy sediments.
Crustaceans: Order Isopoda		
Eurydice spp.	167	Widespread but sandier sediments.
Crustaceans: Order Decapoda		
Carcinus maenas	535	Common and widespread within estuaries.
Crangon crangon		Common and widespread within estuaries.

The sediment within sampling Site 1 (approx 20m downstream of the WWTP outfall) was black and anoxic and supported no live Macroinvertebrates at all. Further down estuary, previous research has found that organically-enriched sediments between the current sampling Sites 1 and 2 are dominated by the polychaete worm (*Hediste diversicolor*), bivalve (*Scrobicularia plana*) and oligochaete worms (Lewis *et al,* 2002; Lewis *et al,* 2003b). These species are typical within upper-estuarine organically enriched sediments and within this area of Clonakilty estuary may reach densities of over 1200, 500 and 3000 m^{-2}, respectively (Lewis *et al,* 2002; Lewis *et al,* 2003b).

Sites 2 and 3 within the current sampling programme, exhibit greater species diversity and the species are predominantly detritivores (i.e. feeding on detritus or organic matter). Site 4 samples were still dominated by detrivorous polychaete worm species. Site 5 was located approximately 900m from the WWTP outfall in sandy sediment. This site is influenced by more marine (rather than freshwater) conditions and species considered more marine in nature were recorded here.

3 Wading Birds and Wildfowl

"Review of Data from Irish Wetland Bird Survey (I-WeBS)

Estuaries and other wetlands of north-west Europe support vast numbers of migratory wading birds and wildfowl each winter that migrate from their breeding grounds in the arctic and north-temperate zones and either over-winter at these sites or stop off (stage) on-route to further destinations. During winter, the main strategy of these bird species is to stay alive and to build up the reserves required to fuel their return to the breeding grounds. High densities of benthic macroinvertebrates (i.e. prey) are therefore the main attraction of these sites although disturbance-free roosting and resting areas are a further important ecological requirement.

Clonakilty Bay has approximately 270 ha of intertidal mud and sand flats that form an important wintering area for migratory birds on the south coast of Ireland. The site qualifies for designation as a Special Protection Area (SPA) (EU Birds Directive 79/409/EEC) (Site Code 081) because it supports wintering populations of species listed on Annex I of the directive and also supports internationally important numbers of bird species. Clonakilty Bay is therefore classed as an internationally important wetland site.

Waterbirds are counted annually during winter as part of the Irish Wetland Bird Survey (I-WeBS). These are high-tide counts. The EIS was completed using I-WeBS data for Clonakilty Bay up to 2002/03 and is given in Table 3. This data is for the period 1998/99 – 2002/03 (4 winters) and covers Clonakilty Estuary,

Inchydoney Estuary and associated wetland habitats. The data shows that Clonakilty Bay regularly supports three species that are listed on Annex I of the Birds Directive: Little Egret (*Egretta garzetta*), Golden Plover (*Pluvialis apricaria*) and Bar-tailed godwit (*Limosa lapponica*). Little Egrets were also confirmed as breeding birds within Clonakilty Bay in 2004. As many as 33 adults of this Annex I species have also been observed within the bay (Watson, 2004). Other Annex I species observed at times within the wider Clonakilty Bay habitat complex include Sandwich Tern (*Sterna sandvicensis*), Arctic Tern (*Sterna paradisaea*), Common Tern (*Sterna hirundo*) and Kingfisher (*Alcedo atthis*).

Table 3. Shows the 1% National thresholds, 1% International thresholds and the most recent count data together with species peak numbers and average numbers. Note: No data is available for 1999/2000.

I-WeBS

Clonakilty Bay

Species name	1% national	1% international	1998/99	2000/01	2001/02	2002/03	Peak	Mean
Great Northern Diver	20	50		1			1	0
Little Grebe	40	3,400	1				1	0
Cormorant	150	1,200	5	11	10	5	11	8
Grey Heron	105	2,700	10	7	8	7	10	8
Little Egret		1,300	7	9	8	5	9	7
Mute Swan	210	210	48	66		35	66	37
Light-bellied Brent Goose	200	200	5	20			20	6
Shelduck	150	3,000	127	189	91	78	189	121
Wigeon	900	15,000	467	467	240	195	467	342
American Wigeon				1			1	0
Gadwall	20	600	1				1	0
Teal	570	4,000	420	235	178	6	420	210
Mallard	840	20,000	108	113	74	24	113	80
Shoveler	40	400	1				1	0
Red-breasted Merganser	40	1,700	7	8		6	8	5
Moorhen	20	20,000	5				5	1
Oystercatcher	700	10,200	332	368	163	89	368	238
Ringed Plover	150	730	143	75	58		143	69
Golden Plover	1,500	9,300	1,129	205	550		1,129	471
Grey Plover	75	2,500	53	52	25	3	53	33
Lapwing	2,000	20,000	1,521	2,108	440	70	2,108	1,035
Knot	340	4,500	131	100	3		131	59
Little Stint		2,100	2				2	1
Curlew Sandpiper		4,500	18	1			18	5
Dunlin	1,400	13,300	940	807	761	118	940	657
Ruff			2				2	1
Snipe		20,000	30				30	8
Black-tailed Godwit	180	350	1,182	985	1,600	65	1,600	958
Bar-tailed Godwit	180	1,200	70	59	25		70	39
Whimbrel		8,400	1				1	0
Curlew	660	4,200	1,100	967	304	92	1,100	616
Spotted Redshank		1,000	1	1			1	1
Redshank	330	1,900	328	262	208	60	328	215
Greenshank	20	3,100	42	40	13	4	42	25
Turnstone	140	1,000	57	44	12	15	57	32
Kingfisher				1			1	0

Clonakilty Bay currently supports one species in internationally important numbers - Icelandic Black-tailed godwits (*Limosa limosa islandica*), a four-year average of 958 birds surpassing the international threshold of 350 birds. This species however, can occur in numbers of 1400+ especially during the main migratory (staging) period (L. J. Lewis, pers. obs.).

The average number of total waterbird (wading birds and waterfowl) species found at Clonakilty Bay (based on the four most recent winter counts) is 5285 individuals (Table 4). Unfortunately, this data must be viewed with some caution as data collection was not consistent in the latter two years, for example counts in 2002/03 were made in February and March only and therefore are unlikely to represent the whole wintering period.

Table 4: Total waterbird numbers for Clonakilty Bay (1998/99 – 2002/03) (BWI)

	1998/99	2000/01	2001/02	2002/03	Mean (1998/99 – 2002/03)
Wildfowl & Waders	8294	7201	4768	877	5285
Wildfowl	1212	1127	606	361	827
Waders	7082	6074	4162	516	4459

The most recent I-WeBS data was therefore consulted (September 2004 – March 2005) and Table 5 shows the data for Clonakilty Estuary only. This gives an average number of 1811 birds within the estuary (minimum count 540; maximum count 3276 birds).

Table 5: Preliminary I-WeBS Data for the 2004/05 season (Clonakilty Estuary only).

	Sep 04	Oct 04	Nov 04	Dec 04	Jan 05	Feb 05	Mar 05
Total Waterbirds	2786	540	1397	1863	3276	2289	526

Peak numbers for each waterbird species during the I-WeBS period September 2004 – March 2005 are also given in Table 6

Table 6. Shows preliminary data for Clonakilty Estuary for the most recent winter season September 2004 – March 2005 (data kindly provided by the Clonakilty I-WeBS Coordinator (M Cobley) and BirdWatch Ireland).

SPECIES	Peak Numbers recorded during any one count during the period Sep 04 – Mar 05.	Listed on Birds Of Conservation Concern (Newton et al., 1999)	Annex I Species EU Directive 79/409/EEC 'Birds Directive'.
Great Northern Diver *Gavia immer*	2		*
Cormorant *Phalacrocorax carbo*	15	Amber List	
Little Egret *Egretta garzetta*	16	Amber List	*
Grey Heron *Ardea cinerea*	5		
Mute Swan *Cygnus olor*	57		
Shelduck *Tadorna tadorna*	20	Amber List	
Wigeon *Anas Penelope*	155	Amber List	
Teal *Anas crecca*	25	Amber List	
Mallard *Anas platyrynchos*	55		
Pintail *Anas acuta*	1	Amber List	
Red-breasted Merganser *Mergus serrator*	9	Amber List	
Moorhen *Gallinula chloropus*	1		
Oystercatcher *Haematopus ostralegus*	623		
Ringed Plover *Charadrius hiaticula*	138		
Golden Plover *Pluvialis apricaria*	82	Amber List	*
Grey Plover *Pluvialis squatarola*	50	Amber List	
Lapwing *Vanellus vanellus*	501	Red List	
Knot *Calidris canutus*	9	Amber List	
Turnstone *Arenaria interpres*	21		
Dunlin *Calidris alpina*	697	Amber List	
Redshank *Tringa totanus*	363	Amber List	
Greenshank *Tringa nebularia*	19		
Black-Tailed Godwit *Limosa limosa*	874	Amber List	
Curlew *Numenius arquata*	397	Red List	
Snipe *Gallinago gallinago*	2	Amber List	
Kingfisher *Alcedo atthis*	1	Amber List	*
Black-headed Gull *Larus ridibundus*	447	Amber List	
Common Gull *Larus canus*	130	Amber List	
Lesser Black-backed Gull *Larus fuscus*	132		
Herring Gull *Larus argentatus*	60		
Great Black-backed gull *Larus marinus*	64		

Analysis of previous data – wading bird abundance and distribution within Clonakilty Estuary

"Monthly low-tide bird counts were undertaken within Clonakilty Estuary between July 2000 and February 2002 (L. J. Lewis, unpublished data). The average numbers of birds recorded within Clonakilty Estuary during the low-tide survey period are given in Table 7.

Low-tide counts are useful in assessing the use of the estuary by foraging waterbirds. For example, Bar-tailed godwits are recorded sporadically during high-tide counts yet usually occur during low-tide surveys. This is most likely because their high-tide roost sites are not found during high-tide surveys. Similarly

Golden Plover do not occur in large numbers during high-tide counts as they move onto fields to forage and roost.

Table 7. Average numbers of bird species recorded within Clonakilty Estuary during winter low-tide surveys (July 2000 – February 2002)

Species	No. of counts	Average Number	Peak Number
Black-tailed godwit	23	300	702**
Bar-tailed Godwit	13	13	32
Lapwing	9	65	153
Dunlin	13	96	342
Curlew	23	158	477
Redshank	23	109	223
Golden Plover	8	105	568
Oystercatcher	23	105	209
Black-headed Gull	23	191	582
All Gulls	23	265	678
All Waterbirds (excl gulls)	23	863	1371
Total Birds	23	1128	1804

** indicates number surpassing international threshold.

Black-tailed godwits, Redshank (*Tringa totanus*) and Black-headed Gulls (*Larus ridibundus*), although distributed across a wide area of the estuary, show a tendency to aggregate within the inner reaches of Clonakilty Estuary. As wading bird distribution is highly correlated with the densities of their prey (Yates *et al.*, 1993) it is likely that this observed distribution is linked to the high densities of worm Ragworms (H. *diversicolor*) and bivalves (*S. plana*) found there (Lewis, 2003). Of note is the observation that Clonakilty Estuary is more important then Inchydoney Estuary for Black-tailed Godwits probably related to the muddier nature of Clonakilty Estuary. The head of Clonakilty Estuary is also a well-known low-tide roost of Black-tailed Godwits where they roost together with other species beside the low water channel (Hutchinson & O'Halloran, 1994).

Low-tide data therefore shows that Black-tailed godwits, Redshank and Black-headed Gulls are strongly associated with the inner, muddy estuarine sediments; Oystercatcher and Curlew while occurring within the inner estuary are widely distributed."

Littoral (Intertidal) Flora and Algae

"Flowering plants (angiosperms) are not abundant within Clonakilty Estuary or the wider Clonakilty Bay. Small patches of Eelgrass (*Zostera* spp.) occur in association with small beds of Blue Mussel (*Mytilus edulis*) in the west of Clonakilty Estuary. Glasswort (*Salicornia* spp.) occurs in an extensive patch within Inchydoney Estuary.

Macroalgae are dominant upon the mud and sand flat habitats during the spring, summer and autumn months. These form 'macroalgal mats' and are comprised predominantly of the filamentous green macroalga *Enteromorpha muscoides* (Lewis, 2003). Other species include *E. clathrata*, *E. intestinalis*, *E. compressa* and *Ulva lactuca* (Note that separate genera are still widely used for *Enteromorpha* and *Ulva* although recent evidence suggests that they are one single genera (Hayden *et al.,* 2003)).

Brown seaweeds (Class Phaeophyceae) (e.g. *Fucus* spp) also occur along the shorelines."

The effects of organic enrichment on coastal and marine waters and its known or likely impacts on the ecology of Clonakilty Bay

"The position of estuaries at the foot of the watershed and their open connection to the sea makes estuaries subject to an almost continuous input of nutrients (Neilson & Cronin, 1981). But although estuaries cycle large quantities of nutrients, the same nutrients, if input in excessive amounts, can be highly detrimental to the estuarine and coastal ecosystem (Neilson & Cronin, 1981). Over half of the Irish population live within 10-km of the coastline and most major towns and cities in Ireland are situated on estuaries (Stapleton *et al.*, 2000). As a consequence, estuaries receive sewage and other wastes from expanding populations and industrial activities. Organic enrichment of marine waters is most often attributed to sewage inputs and is considered one of the most universal of environmental disturbances resulting in a change in chemical, biological and physical factors that in turn have direct or indirect effects of the fauna (Pearson & Rosenberg, 1978).

Benthic fauna

Previous academic research describes a pattern of faunal change along a gradient of decreasing organic enrichment. The extent of this gradient depends on the size of the discharges but can range from a few 100m to over 1000m. Sediments in the vicinity of an outfall are usually devoid of benthic macrofauna due to the high enrichment and BOD (Biochemical Oxygen Demand) causing anoxic sediments (low oxygen). From about 200 – 600m further downstream, however, a proliferation of macroinvertebrates occurs caused

by the aggregation of a few highly tolerant and opportunistic invertebrate species. This gives an 'unnatural' peak in macroinvertebrate densities. Following this peak, the invertebrate community gradually returns to a more usual level of species abundance. In terms of diversity, the number of macroinvertebrate species generally increases with increasing distance from the source of the organic input (Pearson & Rosenberg, 1978).

Assessment of the macroinvertebrate data for Clonakilty Estuary suggests that there is a macrofaunal response to organic enrichment from Clonakilty WWTP. Areas of black, anoxic mud close within 50m of the sewage outfall are devoid of macroinvertebrate fauna (EIS and previous pers obs, L. J. Lewis). Macroinvertebrate sampling throughout 2000 and 2001 (approximately 200 - 400m away from the outfall) found low species diversity but high densities of three very tolerant macroinvertebrate species: *Hediste diversicolor,* S*crobicularia plana* and oligochaete species. Organic enrichment has also been shown to increase growth of the ragworm (e.g. Hylland *et al.,* 1996).

Further down the estuarine gradient, species abundance appears to return to a more steady state while species diversity increases. However, coupled with organic enrichment is the annual occurrence of macroalgal mats which also exerts pressures on macroinvertebrate fauna causing changes in distribution, abundance and diversity and subsequent knock-on effects on their predators.

Raw sewage is also believed to enter the estuary at various points (pers. obs L. J. Lewis) and at these points, a similar increase in BOD, decrease in oxygen and response of macroinvertebrates as discussed above, is highly likely.

Estuarine birds and organic enrichment

Previous research has shown how some bird species benefit from waste matter released in effluent from waste water treatment plants.

It has long been established that the foraging distribution of wading birds is largely related to the densities and availability of their macroinvertebrate prey (e.g. Goss-Custard *et al.,* 1990; Zwarts & Blomert, 1992; Yates *et al.,* 1993). In terms of the organic enrichment gradient described above, it is therefore most likely that proliferation of tolerant and opportunistic macroinvertebrates downstream of an outfall will benefit wading birds by increasing the abundance of their prey within certain areas (Van Impe, 1985; Burton *et al.,* 2002). This may explain higher densities of some bird species within the head of Clonakilty Estuary (e.g. Black-headed Gulls, Black-tailed godwits).

Organic enrichment (eutrophication) and macroalgal blooms

Photos: algal blooms in Clonakilty Bay (by L J Lewis)

Organic enrichment or 'eutrophication' may lead to excessive growth of macroalgae within shallow estuaries and coastal areas. The growth of macroalgal mats is attributed to the availability of nitrogen or phosphorus, the major sources of which are sewage and agricultural run-off (Raffaelli *et al.*, 1998). However other factors such as topography, local changes in hydrography (Raffaelli *et al.,* 1998), light attenuation (Lavery *et al.*, 1991), phytoplankton dynamics (Lavery *et al.,* 1991) and degree of exposure (Pihl *et al.,* 1999) all influence macroalgae abundance and spatial distribution.

The sheltered nature of Clonakilty Bay, together with its position within a 'basin' surrounded by agricultural land, undoubtedly influences its susceptibility to macroalgal blooms. Macroalgal mats have been observed within the bay for over a decade but their distribution and extent varies from year to year. Previous research at Clonakilty Bay examined the distribution, abundance and ecological effects of macroalgal between 2000 and 2002 (Lewis, 2003). Results include:

- Macroalgal mats start to grow each year during spring, extend through the summer months and begin to decay or break-up during autumn. Autumn storms facilitate mat breakdown. Some macroalgal mats may persist throughout the winter – especially within Inchydoney Estuary.
- Clonakilty Estuary recorded a peak algal cover of 31% of the intertidal area during 2000, an estimated 54 ha of algal cover. Inchydoney Estuary exhibited a peak cover of 44% in 2000, an estimated 44 ha of algal cover.
- Observed algal cover during 2005 was greater than that recorded during 2000 (L. J. Lewis, pers. obs).

- Algal cover is generally confined to muddier sediments although the very head of Clonakilty Estuary has seen a low occurrence of algae in recent years. A typical example of algal cover is shown in Figure C.
- The alga species identified as the major contributor to macroalgal mats within Clonakilty Bay was *Enteromorpha muscoides*.

Algal blooms have a complex and broad range of ecological effects on coastal systems and may completely alter the function and structure of affected ecosystems (Valiela *et al.*, 1997). These effects include:

- Macroalgae may effectively out-compete seagrasses for nutrients and by the effects of shading and so induce the replacement of seagrass beds with macroalgal mats (e.g. Cabral *et al.*, 1999).
- Macroalgae are capable of the fast uptake and storage of nutrients, including those regenerated from the sediments. Acting as 'nutrient sinks' they alter biogeochemical cycles at the sediment-water interface and sequester nutrients that would otherwise have entered the water column (Valiela *et al.*, 1997). Algal burial and decay also leads to higher concentrations of N and C in the sediment.
- Dense algal presence reduces the flow of water at the sediment-water interface, increases sedimentation rates (Hull, 1987) and increases the organic matter content of the sediment (Bolam *et al.*, 2000).
- Algal cover also reduces oxygen exchange between sediment and water column, resulting in anoxic conditions that are accentuated by enhanced bacterial activity during algal decay (Hull, 1987).

These factors all add up to a significant ecological disturbance (Lewis, 2003) with subsequent complexity and some negative effects, as research within algal-affected areas within Clonakilty Bay (2000 – 2002) (Lewis, 2003, 2003b) found:

- The macroinvertebrate community within study sites was generally characterised by low species diversity and by species associated with organically enriched sediments such as *H. diversicolor*, *S. plana*, *Hydrobia ulvae*, oligochaetes and *Malacoceros fulignosus.*
- A high proportion of the macroinvertebrates within algal-affected areas are found within the algae itself (epifaunal species) as opposed to the sediment (benthic species).
- Sensitive species such as bivalve *M. balthica* and amphipod *C. volutator* were generally absent within algal-affected sites.
- Significant negative relationships were found for the densities of *C. volutator*, *S. plana* and *H. diversicolor* with algal cover.

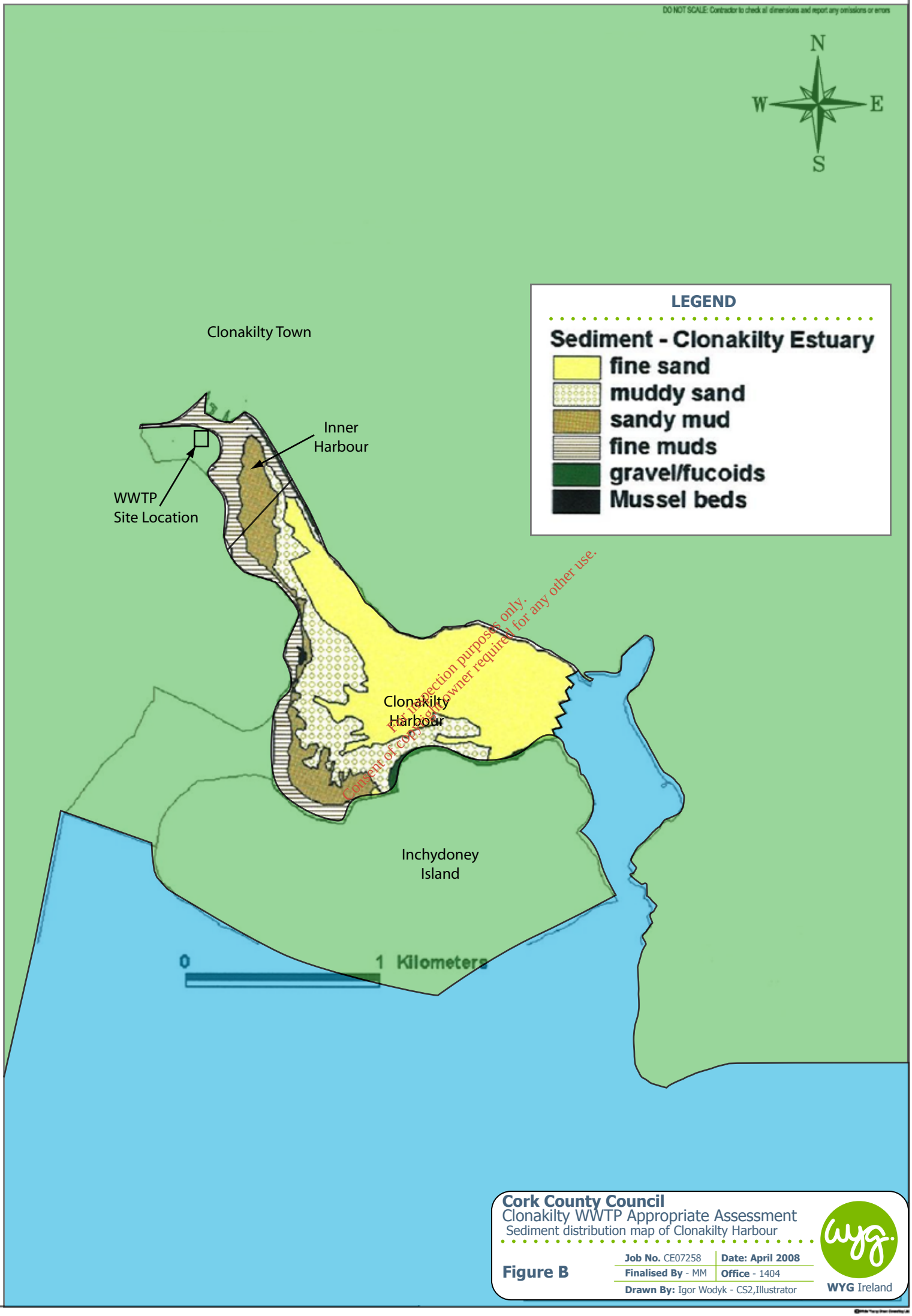
- Some 'black-spots' occur where the biomass of algal cover or the effects of organic enrichment (e.g. anoxia) are so great that the sediment supports no live fauna at all.
- Rapid recolonisation of previously algal-covered areas by some species (e.g. *C. volutator*) and increases in densities of some species (e.g. *H. ulvae*) suggests that the presence of macroalgae (and increased levels of organic matter) benefits some tolerant species after the mats have disappeared.

Estuarine birds

- Wading birds generally avoid areas with algal mats (Tubbs & Tubbs, 1980; Murias *et al.,* 1996; Cabral *et al.,* 1999).
- Some individuals may forage within algal areas to prey on the fauna within the algae (e.g. Redshank at Clonakilty Bay during a short-term study by Lewis & Kelly, 2001). However, longer-term studies (Lewis, 2003) found that this prey source was not utilised to any great extent.
- Habitat selection studies at Clonakilty Bay (Lewis, 2003) found that within patchy algal areas, Black-tailed godwits and Redshank showed a clear preference for clear patches of sediment.
- Avoidance of algal-covered areas therefore amounts to a form of habitat loss. Lewis (2003) calculated that if one excludes areas of Clonakilty Bay that are coarse sand sediment and are less important areas for foraging shorebirds, 63% of the remaining intertidal area was affected by macroalgal mats (Lewis, 2003). This therefore amounts to a considerable, albeit temporary, loss of foraging habitat.
- Foraging distribution of Black-tailed godwits is related to prey distribution (birds perhaps 'learning' that there is a lower prey density beneath algal mats) (Lewis, 2003).
- Foraging distribution of Redshank is negatively related to the amount of algal cover (Lewis, 2003).
- Algal mats negatively affect the foraging success of Black-tailed godwits and Redshank but this negative impact is mitigated to some extent by macroinvertebrate recolonisation of previously algal-covered areas during mid-late winter.
- Macroalgal mats have been linked to declines of Dunlin within estuaries (Lopes et al, in press). An apparent decline in Dunlin between the years 1994/95 and 2001/02 at Clonakilty Bay may be related to macroalgal mats although this is difficult to prove and a national decline is also evident (Crowe, 2005) (Table 9).

Table 8. I-WeBS Data for Dunlin at Clonakilty Bay 1994/95 – 2001/02 showing apparent declines.

1994/95	1995/96	1996/97	1997/98	1998/99	2000/01	2001/02
1827	1000	1696	1051	940	807	761

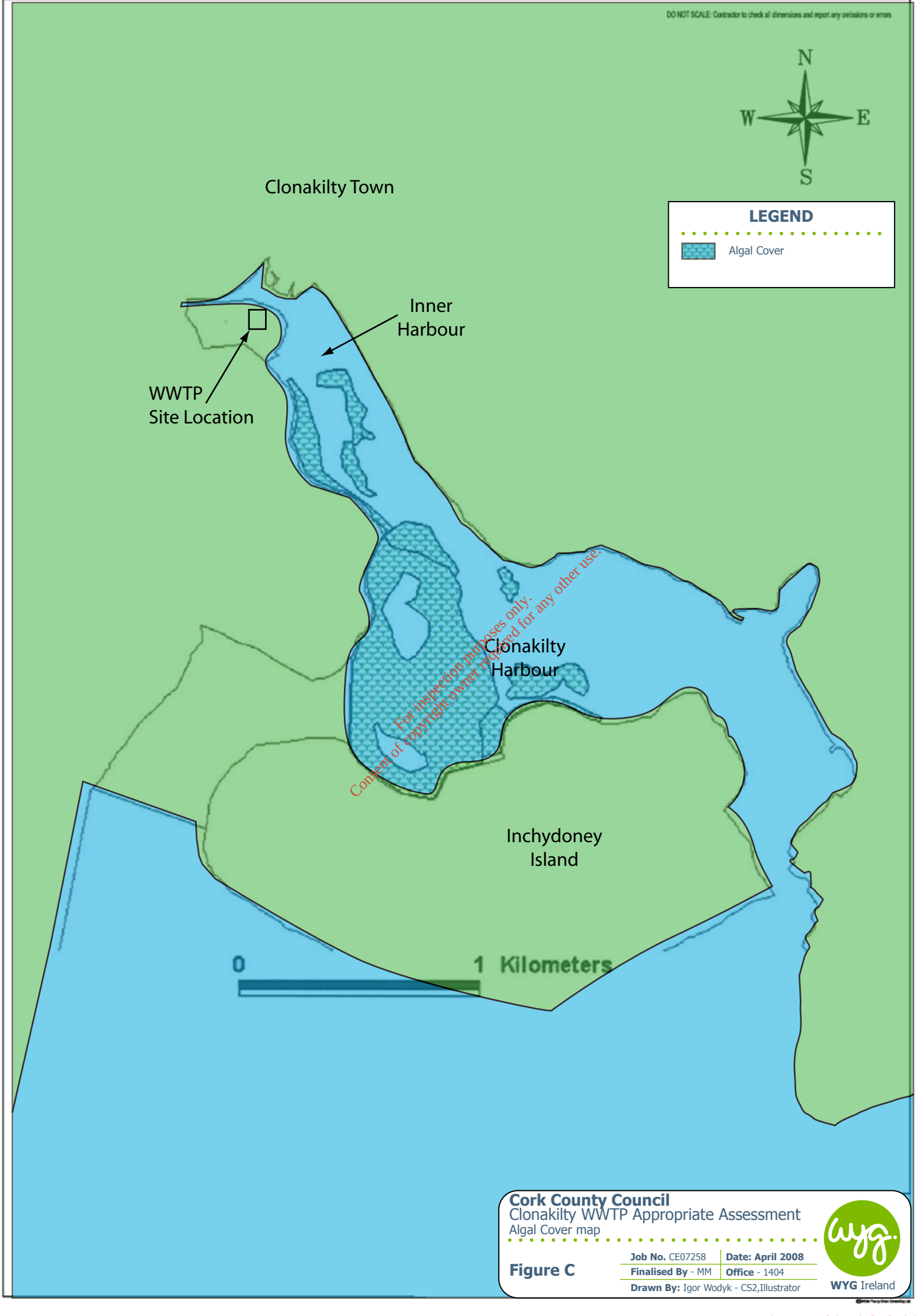


Cork County Council
Clonakilty WWTP Appropriate Assessment
Sediment distribution map of Clonakilty Harbour

Figure B

Job No. CE07258	**Date: April 2008**
Finalised By - MM	**Office** - 1404
Drawn By: Igor Wodyk - CS2,Illustrator	

WYG Ireland



Cork County Council
Clonakilty WWTP Appropriate Assessment
Algal Cover map

Figure C

Job No. CE07258	**Date: April 2008**
Finalised By - MM	**Office** - 1404
Drawn By: Igor Wodyk - CS2,Illustrator	

WYG Ireland

Appendix C

SITE SYNOPSIS

SITE NAME: CLONAKILTY BAY

SITE CODE: 000091

Clonakilty Bay in west Cork is an inter-tidal expanse that stretches from Clonakilty to the open sea, and comprises two small estuaries separated by Inchydoney Island. The site also includes adjacent sand dunes and inland marshes, and therefore is a coastal complex with a good diversity of habitats including several habitats listed on Annex I of the EU Habitats Directive.

Sand flats dominate the inter-tidal area, although mud flats occur at the sheltered upper end of the inlets. The vegetation consists of algal mats (*Enteromorpha* spp.) with brown seaweeds (*Fucus* spp.) occurring where the coast is rocky. The invasive Cord-grass (*Spartina* sp.) occurs in places. The intertidal flats have a typical diversity of macro-invertebrates, including *Arenicola marina, Scrobicularia plana, Hediste diversicolor, Nephtys hombergii, N. cirrosa, Hydrobia ulvae* and *Cerastoderma edule.*

Sand dunes grade from a strandline, colonised by Frosted Orache (*Atriplex laciniata*), Sea Sandwort (*Honkenya peploides*) and Sea Rocket (*Cakile maritima*), through to fixed dunes vegetated by grasses, small herbs and several species of orchid. They also support an interesting array of introduced plants, amongst which Great Mullein (*Verbascum thapsus*), Viper's-bugloss (*Echium vulgare*) and Teasel (*Dipsacus fullonum*) are the most noticeable. Embryonic shifting dunes and white *Ammophila* dunes are also represented. Of particular interest is a small area of decalcified dune heath with some *Ulex europaeus*.

Inland of the western estuary, an extensive area of wetland occurs, which in itself contains a fine range of habitats from saline lagoons, to brackish grasslands, open freshwater marsh and Alder (*Alnus glutinosa*) scrub. Species found here are characteristic of marshy areas and include Creeping Bent (*Agrostis stolonifera*), Water Horsetail (*Equisetum fluviatile*), Marsh Cinquefoil (*Potentilla palustris*) and Marsh Willowherb (*Epilobium palustre*). The saline influence is evident by the occurrence of species such as Saltmarsh Rush (*Juncus gerardii*) and Sea Rush (*J. maritimus*).

The site contains a good diversity and density of waterfowl, with over 7,000 waders and wildfowl occurring regularly. Seven species have populations of national importance: Shelduck (168), Grey Plover (76), Lapwing (2,509), Dunlin (1,508) Curlew (1,231), Redshank (263) and Greenshank (27). The site is most noted, however, for its population of Black-tailed Godwit (866), which is of international importance and comprises over 10% of the national total. Amongst the other species which occur, there are notable populations of Golden Plover and Bar-tailed Godwit, both of which are listed on Annex I of the EU Birds Directive. All counts given are average winter peaks over either two or three seasons from 1994/95 to 1996/97. Herons commonly use the site and a heronry exists in the trees near Clonakilty.

Otter spraints were found frequently during a recent survey of the marsh area.

The site is under pressure from a number of sources, notably recreation and tourism developments and agricultural improvements, including drainage and fertiliser application.

This site is of considerable scientific interest because it contains a good diversity of coastal habitats. These habitats show a succession from salt to freshwater influences and include six which are listed on Annex I of the EU Habitats Directive. Its value is enhanced considerably by the birdlife it supports. The occurrence of Black-tailed Godwit in internationally important numbers is particularly significant. The site also supports nationally important numbers of seven other species of waterfowl as well as two species listed on Annex I of the EU Birds Directive.

7.8.1999

Appendix D

mark.masterson

From: Rebecca Jeffrey [Rebecca_Jeffrey@environ.ie]
Sent: 03 December 2008 12:20
To: mark.masterson
Subject: Re: Clonakilty SAC, SPA objectives

Draft_Cons_Obj_00 0091.pdf (23 ...

ATT336327.txt (1 KB)

Hi Mark

Apologies for the delay in responding to your request.

Please find attached the draft conservation objectives for Clonakilty Bay cSAC (091).

The qualifying interests for SPAs are not as clear-cut. Clonakilty Bay SPA (4081) is selected for black-tailed godwit. Additional special conservation interests (SCIs) are shelduck, dunlin, curlew and wetlands and waterbirds.

The main conservation objective for the SPA is:

To maintain the special conservation interests for this SPA at favourable conservation status: black-tailed godwit; shelduck; dunlin; curlew; wetlands and waterbirds.

I hope this is of some assistance.

All the best,

Rebecca

Dr Rebecca Jeffrey
National Parks & Wildlife Service
7 Ely Place
Dublin 2

353-1-8883259

www.npws.ie

>>> "mark.masterson" <mark.masterson@wyg.com> 25/11/2008 09:43 >>>
Rebecca,

Following on from our telephone conversation, can you please forward me the conservation objectives for Clonakilty Bay SAC/SPA?

Regards

Mark Masterson
Senior Scientist
ENVIRONMENTAL SERVICES

WYG IRELAND

Conservation Objectives

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, is stable or increasing, and
- the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below.

The favourable conservation status of a species is achieved when:

- population data on the species concerned indicate that it is maintaining itself, and
- the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective 1: To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Atlantic decalcified fixed dunes (Calluno-Ulicetea)

Objective 2: To maintain the extent, species richness and biodiversity of the entire site

Objective 3: To establish effective liaison and co-operation with landowners, legal users and relevant authorities.