# Buncrana Sewerage Scheme – Upgrading of WasteWater Treatment Works and Satellite Sludge Dewatering Centre

# Environmental Impact Statement



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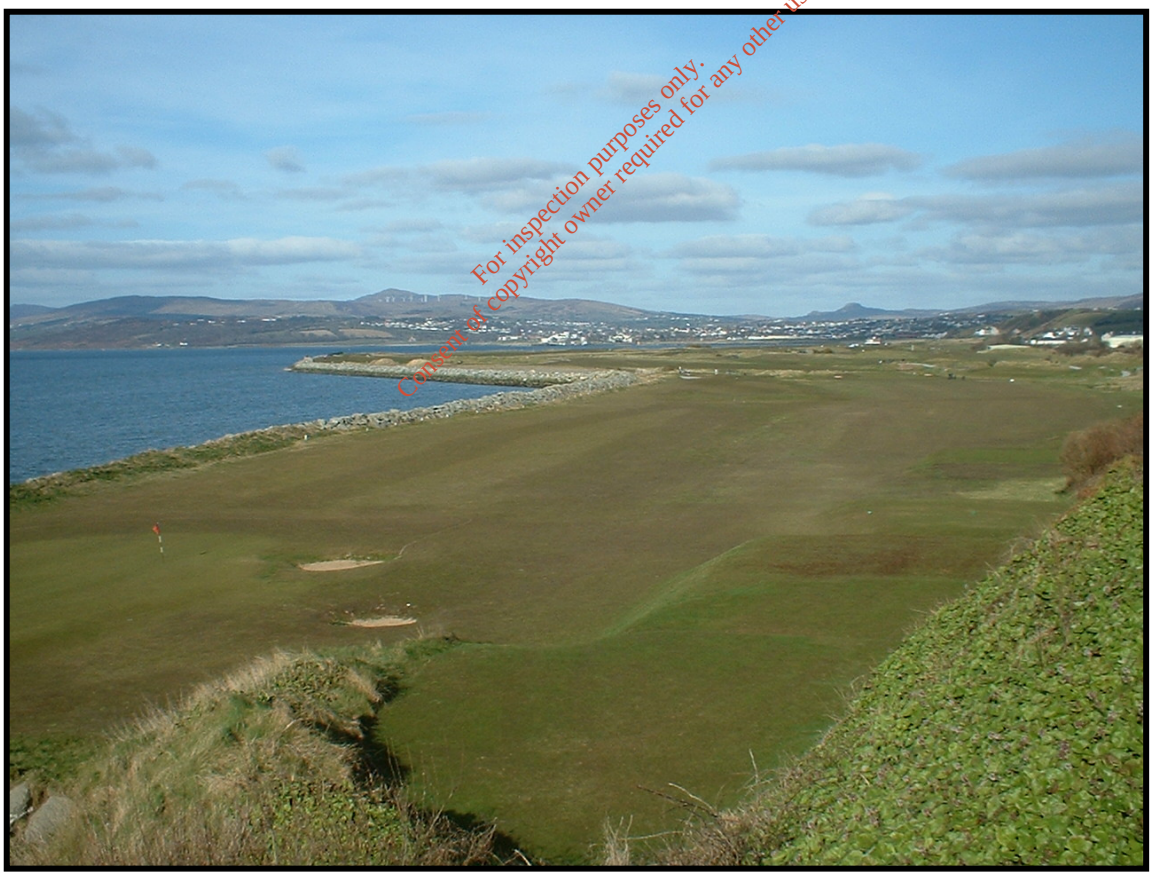
# Donegal County Council

*Comhairle Chontae Dhún na nGall*

# BUNCRANA SEWERAGE SCHEME - UPGRADING OF WASTEWATER TREATMENT WORKS AND SATELLITE SLUDGE DEWATERING CENTRE

## ENVIRONMENTAL IMPACT STATEMENT





**Entec and O'Dwyer**

# DONEGAL COUNTY COUNCIL

# BUNCRANA SEWERAGE SCHEME
# UPGRADING OF WASTE WATER TREATMENT WORKS AND SATELLITE SLUDGE DEWATERING CENTRE



## ENVIRONMENTAL IMPACT STATEMENT

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# Contents

# 1. Background to the project

## 1.1 Buncrana WWTW and SSDC

Buncrana is the largest town in Inishowen with a population in excess of 5,000 people. It is a seaside resort with an established tourism industry as a centre for golf, water sports and other activities. The long sandy beach, White Strand, at Lisfannon on the eastern shore of Lough Swilly, is one of the chief attractions of the town.

Inishowen is a largely rural peninsula located on the North Donegal coast, where the population is mostly centred around three medium sized towns – Carndonagh, Moville and Buncrana. Buncrana, the largest of the towns, is located on the western side of Inishowen, on the east bank of Lough Swilly (see **Figures 1.1** and **6.1** for site location).

There is currently a wastewater treatment plant in Buncrana with primary treatment. There is a requirement under the Urban Wastewater Treatment Regulations, by 31st December 2005, to provide appropriate treatment of wastewater for wastewater treatment plants with a population equivalent of 2,000 - 10,000 and secondary treatment for population equivalents greater than 10,000 for discharge to coastal waters. The proposed upgraded wastewater treatment plant will have a Stage 1 design capacity of 8,800 p.e. and a Stage 2 design capacity of 13,200 p.e It is therefore proposed to provide secondary treatment of the wastewater As the main town in the Inishowen region Buncrana was identified in the Donegal County Council Sludge Management Plan as a satellite sludge dewatering centre. It is likely that the work will be carried out as a single scheme under a Public Private Partnership (PPP) model. The WWTW expansion/upgrade and SSDC will be constructed entirely within the boundary of the existing WWTW site at Buncrana .



## 1.2 Buncrana Satellite Sludge Dewatering Centre

In April 2003 Entec & O'Dwyer Ltd prepared a report for Donegal County Council entitled 'Inishowen Sludge Treatment Centre – Review of Sludge Management Plan' (SMP Review). The report presented a review of the Donegal County Council Sludge Management Plan (SMP) with regard to the Inishowen region, the objective being to confirm the volumes and nature of the sludge produced in the region. The document also included a review of the proposed satellite sludge dewatering centres and transport plan for the region.

In February 2004 Nicholas O'Dwyer prepared a draft preliminary report entitled 'Inishowen Sludge Treatment Centre – Preliminary Report'. This report was based on the findings of the SMP Review (April 2003) and reviewed the existing sludge treatment facilities at Buncrana and examined the options for the development of the proposed satellite sludge dewatering centre (SSDC) at Buncrana. This report also

reviewed the existing wastewater treatment facilities at Buncrana and looked at various options for the upgrading and/expansion of the wastewater treatment works (WWTW). The report also looked at the options available for developing the WWTW and SSDC simultaneously.

Since the SMP was published in 1999 the sludge arisings profile has been revised in the light of the 2002 census data. In addition to these changes, the 3rd draft proposal of the European Sludge to Land Directive was published, which includes the proposal that all rural septic tank sludge will require treatment prior to reuse or disposal. The likely acceptance of this Directive means that it is a material consideration in sludge management within the Region.

In the last 6 years population growth in Buncrana has average 1.25% per annum (p.a.), with the rest of the region averaging 1.39% p.a. Over the next 20 years the growth rate is predicted to slow to about 0.23% (O'Dwyer, 2003). Using the 1999 population figures presented in the SMP as the correct base figures, the arisings profile was adjusted to reflect the predicted growth in the region. **Table 1.1** presents a summary of the revised arisings profile.

**Table 1.1 Revised arisings profile to year 2020 for the Inishowen region**

| 2002 tonnes dry solids/annum | | 2020 tonnes dry solids/annum | |
|---|---|---|---|
| **SMP** | **SMP Review** | **SMP** | **SMP Review** |
| 225 | 239 | 777 | 634 |



A more detailed breakdown of the arisings can be found in the 'Review of Sludge Management Plan, Inishowen Region' (O'Dwyer, April 2003). A recent population review (O'Dwyer, June 2005) has determined that the design population equivalent for the Sludge Dewatering Centre is 36,766 for the year 2027, and the total sludge arisings will be 680 tonnes dry solids/annum.

The SMP Review considered two options for the treatment and beneficial reuse of sludge:

Option 1: Transfer all sludge generated in the Inishowen region from the proposed satellite sludge dewatering centres as cake to Letterkenny.

Option 2: Treat and reuse Inishowen sludge locally at the proposed sludge treatment centres to be developed at Buncrana or Carndonagh.

Following a detailed examination of the above options it was concluded that Option 1 was the most economically advantageous option.

The SMP recommended that new sludge thickening and dewatering facilities should be installed at Carndonagh and Moville/Greencastle which, together with Buncrana, would form three Satellite Sludge Treatment Centres from which dewatered sludge cake would

be transferred to the proposed Drying Plant at Letterkenny for further treatment. The SMP Review assessed the transport strategy for sludges in the Inishowen region and concluded that Buncrana and Carndonagh should be used as sludge dewatering centres with dewatered sludge cake being transferred to Letterkenny from the two locations for further treatment. It was also concluded that sludge thickening facilities be installed at Moville/Greencastle with thickened sludge being transferred to Letterkenny. With regards to Buncrana it was concluded that it should accept liquid sludges from Quigley's Point, Fahan, Inch Island and Bridgend/Burnfoot. Using these findings it was possible to quantify the sludge arisings at Buncrana.

As mentioned previously, the Draft Preliminary Report (February 2004) is based on the findings of the SMP Review. The Draft Preliminary Report looked at a number of options available for the development of a SSDC at Buncrana, it also looked at a number of options for the expansion/upgrade of the WWTW and assessed the option of developing both together as one contract.

The draft Preliminary Report concluded that the most economically advantageous option was the development of the SSDC and expansion/upgrade of the WWTW as one contract through the provision of imported sludge reception facilities, picket fence thickeners and centrifuges for the SSDC and upgraded inlet works, storm tank and a secondary treatment system for the WWTW.



## 1.3 Existing WWTW

The current level of sewage treatment at Buncrana WWTW is termed 'primary'. This is where the sewage is settled and the solids are removed from the effluent.

Wastewater from the town of Buncrana enters the WWTW through a 600mm diameter gravity sewer and flows through the inlet channel/storm overflow chamber. The storm overflow chamber consists of a storm overflow weir and manually raked coarse bar screen. Flows in excess of the design flow are diverted via the overflow weir through the storm screen. Flows of up to the design flow are directed through the inlet channel which consists of a concrete control plume to the inlet works. The layout of the existing WWTW is shown on **Figure 1.2**.

The inlet works consist of two comminutors and one grit trap. Both comminutors are operational, however only one is operated at any given time. From the grit trap the wastewater passes through the flow measurement chamber to a distribution chamber and into two primary settling tanks.

The treated effluent from the settling tanks flows to the main pumping station. A 675mm diameter concrete / 800mm diameter HDPE pipeline discharges final effluent and storm flows to the discharge location in Buncrana Bay. The treated effluent from the settling tanks normally flows by gravity through the outfall to its discharge point in Buncrana Bay. At times of high tide the treated effluent is pumped into a chamber in the main pumping station to increase the head and allow discharge by gravity. Stormwater overflows from the storm overflow chamber gravitate to the main pumping

station. The main pumping station also contains a 600 mm diameter overflow pipeline for surface water and emergency overflows during power failure at high tides. The overflow pipeline discharges to the Mill River. Screens are provided in the main pumping station to provide screening of the emergency overflows prior to discharge.

Supernatant from the picket fence thickener, sludge digester and sludge holding tank and drainage from the site buildings flow to the site drainage pumping station and are returned via a rising main to the inlet chamber for full treatment.

## 1.4 The EIA Process

Environmental Impact Assessment (EIA) is a process by which information about the environmental effects of a project is collected, evaluated and presented in a form that provides a basis for consultation. Decision-makers can then take account of these effects when determining whether or not a project should proceed. The process also defines environmental monitoring and other work to be carried out following any decision to allow a development to proceed (e.g. monitoring carried out during the construction or operation phases). The results of the study are reported in an Environmental Impact Statement (EIS), which accompanies the applications for planning permission. The EIS is made available to consultees in a statutory consultation process regarding the application.



The EIA process has a number of key characteristics:

- it is systematic, comprising a sequence of tasks defined by regulation and practice;
- it is analytical, requiring the application of specialist skills from the environmental sciences;
- it is impartial, its aim being to inform the decision-maker rather than to promote the project;
- it is consultative, with provision being made for obtaining feedback from interested parties including local authorities and statutory agencies; and
- it is interactive, allowing opportunities for environmental concerns to be addressed during the planning, design and implementation of a project.
- A significant part of the EIA process involves identifying ways in which effects can be reduced and minimised (mitigated) and, where it is not possible to fully achieve this, ways of compensating for the effect. In certain circumstances a particular development may result in an improvement in the local environment, i.e. an enhancement. The terms mitigation, compensation and enhancement are adopted within the EIS to describe the effects of the proposed development, as defined in **Box 1**.

| **Box 1 Definitions of mitigation/compensation/enhancement** |
|---|
| **Mitigation**:<br>• Avoidance: Measures taken to avoid adverse effects.<br>• Reduction: Measures taken to reduce adverse effects.<br>**Compensation:**<br>• Measures taken to offset/compensate for residual adverse effects that cannot be entirely mitigated. These usually take the form of replacing what will be lost.<br>**Enhancement:**<br>• The genuine enhancement of environmental interest. |

## 1.5 Regulatory Context

EIA's are carried out under the European Communities (EIA) Regulations (1989 – 2001), as required by the Local Government (Planning and Development) Regulations 2001, which relate to the planning control system administered by the Local Planning Authority. This EIA and the resulting EIS were undertaken and prepared with due regard to the criteria in the Regulations.

The proposed WWTW extension at Buncrana has a Stage 1 design capacity of 8,800 p.e. and a Stage 2 design capacity of 13,200 p.e. As such the development falls within the threshold criteria for the provision of an EIS as set out within the European Communities (EIA) (Amendment) Regulations 2000 (i.e. Wastewater Treatment Plants with result in an increase in size greater than 25 per cent, or an amount equal to 50 per cent of the appropriate threshold, whichever is the greater. However in determining the need for an EIA account must be taken *inter alia* of a number of issues.



In addition, when determining the need for EIA account must be taken, *inter alia*, of the sensitivity of the environment. In the case of Buncrana the surrounding environment is subject to a number of designations, reflecting the ecological sensitivity of the area.

As the project could potentially affect an area designated under the Habitats Directive[1], this provides additional justification for the completion of an EIA. The project includes the use of the existing outfall pipe that will discharge treated effluent into Lough Swilly, part of which is designated as a Special Area of Conservation and a Special Protection Area (Lough Swilly cSAC - **see Figure 6.8**). The Lough also supports a number of commercial aquaculture facilities and the beach at Buncrana currently has Blue Flag status as a bathing beach. Bathing Waters, Shellfish Waters and Habitats Directive sites are specifically defined as 'protected areas' under Annex IV of the Water Framework Directive[2].

[1] EC Directive 92/43/EEC

[2] EC Directive 2000/60/EC

Also, in accordance with the Sludge Management Plan for County Donegal (2001) and the SMP Review, the proposed Buncrana SSDC and extended WWTW has been identified as a satellite sludge dewatering centre, which will have thickening and dewatering facilities. In essence this will involve the on-site dewatering of sludge produced at the Buncrana WWTW and the dewatering of imported liquid sludge from a number of surrounding towns and villages in the region, before transfer off-site for further treatment and disposal. The development of the satellite sludge dewatering centre is considered to have the potential to result in a significant environmental impact, and for this reason an EIA is considered necessary.

## 1.6 The Assessment Method

The content of this EIS will be in accordance with the European Communities (Environmental Impact Assessment) Regulations, 1989 to 2001, and is structured as follows.

1. Background to the project.
2. The regulatory and national and local planning policy context (including a summary of relevant elements from the Donegal County Development Plan).
3. Alternatives considered.
4. Description of the WWTW upgrading and SSDC including infrastructure, processes, and emissions.
5. The results of the scoping exercise.
6. A description of the existing environmental conditions in relation to:

   a) Impacts principally affecting the human population:

   - air quality (odour)
   - noise and vibration
   - visual and landscape
   - traffic
   - socio-economic effects

   b) Impacts principally affecting the natural and built environment:

   - flora and fauna
   - cultural heritage
   - water
   - soil

7. A description of significant impacts of the scheme.

8. Methods for mitigation or avoidance of adverse impacts and residual impacts.
9. A non-technical summary of the EIA process and conclusions (also available as a separate document).

Different methodologies are required to assess the effects relating to each of the environmental topics that are investigated as part of the EIA. Individual methodologies are outlined at the start of each topic subsection and are based upon recognised good practice.

The assessment is based on a thorough understanding of the proposed development with each of the environmental topics being appraised against existing 'baseline' data. A description of the situation that exists at present is covered in **Section 6**.

For each type of effect, the temporary effects (mainly construction) and the long-term effects of operation of the plant have been assessed separately. The EIA has taken account of both beneficial and adverse effects, as well as covering direct, indirect and cumulative effects.

Effects have been evaluated using a matrix approach, taking account of the type of effect (positive or negative), its magnitude, the probability of its occurrence and the policy importance or sensitivity of the receptor, using standard criteria, as far as possible.

The EIA Regulations state that significant effects should be assessed and these are identified in this report. The report also identifies effects of minor and no significance, in order that consultees and decision-makers are provided with a complete picture.



### 1.6.1 Temporal Scope

The temporal scope of the EIA covers the period from commencement of the first phase of construction through to the operational phase, and, where appropriate, to a date some years after the commencement of operation. This date will vary according to the nature of the environmental aspect concerned.

### 1.6.2 Spatial Scope

In its broadest sense, the spatial scope of the EIA is the area over which changes to the environment may occur as a consequence of the development. As required by the Regulations, the EIA focuses on those areas where these effects are likely to be significant.

The spatial scope varies between both effects and specialist topic areas. For example, the effect of a proposed development upon the surrounding landscape is likely to be experienced over greater spatial area than, for example, the effects on soils. The spatial extent of each part of the assessment is made clear under each individual technical heading.

## 1.7 Overall appreciation

This EIS sets out the proposed project and covers both the construction and operation phases of the project, considering its impact on a range of local receptors, including local residential and commercial properties, as well as Lough Swilly, which will receive treated effluent from the proposed wastewater treatment works.

### 1.7.1 Construction phase

The EIS considers impacts during the construction phase of the proposed facility. The construction impacts are assessed on the basis of the worst-case scenario, i.e. the expansion of the WWTW to its Stage 2 capacity.

### 1.7.2 Operation phase

In relation to the operational phase, the EIS addresses both static impacts, such as visual impact, and progressive impacts arising from operational activities, particularly emissions (to air and water) and traffic.

### 1.7.3 Extensions and decommissioning

The requirement for treatment will continue for the foreseeable future, thus no overall decommissioning requirement is likely to arise. The concrete components of the plant will be designed for a life of at least 40 years. It is unrealistic at present to predict what upgrading may be undertaken so far ahead, therefore this has not been considered in this EIA. Any major rebuilding may require a further EIA. Routine replacement and upgrading of electrical and mechanical equipment is considered to be part of normal operation. These activities are unlikely to have any effect on the environment and will therefore not require further EIA.



## 1.8 Terminology used in this EIA

In some EIAs, the terms ‘impact’ and ‘effect’ are used interchangeably, whilst in others the terms are given different meanings. Some use ‘impact’ to mean the cause of an ‘effect’ whilst others use the converse meaning. This variety of definitions has led to a great deal of confusion over the terms ‘impact’ and ‘effect’, both among the environmental specialists that undertake EIAs and those who read the resulting EIS.

The convention used in this document is to use ‘impact’ only within the context of the term environmental impact assessment, which describes the process from scoping through EIS preparation to subsequent monitoring and other work. Otherwise, this document uses the phrase ‘environmental effect’ when describing the implications of the development.

## 1.9 Significance assessment

The EIS must define the significance of the consequences that it has assessed. The approach adopted is to define significance based on the interaction between two factors, namely the:

- magnitude of environmental change; and,
- value of the resource or sensitivity of the receptor affected.
- The magnitude of change is defined where possible in quantifiable terms. The different dimensions of magnitude might include variables such as the area of a particular resource or number of receptors that are affected, or the duration, frequency or extent of a consequence. Examples might include the area of land-take, the increase in noise levels or the extent of visibility of new infrastructure.

Resource value is determined by reference to criteria such as rarity or sensitivity, or to a geographical hierarchy of designations (e.g. Special Areas of Conservation, designated in relation to the EC Habitats Directive, are of international wildlife conservation value while Natural Heritage Areas are of national importance).

Receptor sensitivity is related to the type of human use, for example residential dwellings are generally considered more sensitive than commercial premises; schools and hospitals are considered to be especially sensitive.

These considerations, together with any relevant environmental standards or guidelines, form the basis upon which each specialist bases their definition of significance. The scale presented in **Box 2** is used in the assessment of significance.



| **Box 2** | **Assessment of significance** |
|---|---|
| Major significance: A consequence that is of such significance that it should be considered as a major factor that should influence whether or not the development should be allowed to proceed. | |
| Minor significance: A consequence that merited detailed assessment because it might have been of major significance - such consequences are not normally considered to of sufficient significance to influence whether or not the development should be allowed to proceed. | |
| Not significant: In the vast majority of cases, consequences that are not significant will have been scoped out of the EIA at the Scoping Report stage. | |

# 2. Project Context

## 2.1 The Need for a Satellite Sludge Dewatering Centre

The SMP Review presented a breakdown of the projected sludge arisings for the Inishowen region at 239 tds/annum rising to 634 tds/annum in the year 2022. A population review undertaken in June 2005 identifies that a SSDC is required to cater for increased sludge throughput and should be designed to produce 680 tds/annum in 2027 (Review Report, Nicholas O'Dwyer, 2005) based on a contributing population of 36,766 p.e.

The predicted rise in sludge arisings is principally due to sludge produced at Buncrana itself but also includes an increase in imported sludge from the wastewater treatment works at Bridgend/Burnfoot, Inch Island, Fahan and Quigley's Point, as identified in the SMP Review.

## 2.2 The Need for Waste Water Treatment Works Expansion



Population in Buncrana is predicted to rise from 5,156 p.e. (domestic) in 2005, to 6,972 p.e. in 2026 (Population Review Report, Nicholas O'Dwyer, 2005). Non-domestic population equivalent is predicted to rise from 1,393 to 1,800 p.e. over the same period.

The Urban Wastewater Treatment Regulations 2001 (SI No. 254 of 2001) Section 4 (1)(b) states that secondary treatment shall be provided in respect of all discharges from agglomerations with a p.e. of between 10,000 and 15,000. As Buncrana WWTW currently only has 'primary' treatment of wastewater, it will be necessary to provide 'secondary' treatment for the Stage 2 population equivalent to comply with this Directive. Providing secondary treatment will mean that as well as settling the solids additional processes to biologically treat the sewage and reduce its organic content will be provided.

## 2.3 Limitations on the EIA Process

In accordance with the regulations, and with accepted good practice, the EIA must identify any limitations due to lack of know-how or lack of engineering detail available. At this stage, the detailed specifications of the SSDF and WWTW extension are not fully known, as it is likely that the work will be procured under a PPP, where the bidders will submit their tenders on individual design options for the proposed works. However, preliminary indicative layout plans have been prepared based on Options 3, 4,

5 and 6 as identified in the Draft Preliminary Report (see **Section 3.3**). These layouts are shown on **Figures 3.1, 3.2., 3.3** and **3.4** respectively.

In those cases where assumptions have had to be made, the EIS has considered the 'worst case scenario' and/or has specified design limits on emissions (including noise) necessary to meet environmental standards. The specific environmental limits will be incorporated into the Contract Documents for the scheme in terms of 'design envelopes'. These design envelopes shall clearly define the range of impacts and emissions that will be permitted and each submitted proposal shall be robustly examined to ensure strict adherence with these design envelopes. No transgressions whatsoever from these envelopes will be permitted in the finally accepted proposal.

In summary therefore any treatment process offered by the Contractor will be considered appropriate provided its negative impacts are of lesser significance than those to be outlined in this EIS.

The treatment process offered by the Contractor will also be subject to operation limits for effluent, noise, odour and air quality, i.e. the process should operate without exceeding specified limits for noise and odour levels and ground levels of atmospheric pollutants.



## 2.4 Planning and Regulatory Context

### 2.4.1 Methodology and Sources of Information

**Introduction**

This Section assesses the relevant planning policy governing the proposal at national, strategic and local levels.

**Section 2.4.2** sets out the National and European wastewater management policy context whilst **Section 2.4.3** outlines the current planning system in Ireland. **Section 2.4.4** sets out the Development Plan policy context and describes the policies to be considered in assessing this proposal. The key issues are highlighted and a summary is provided at the end of this Chapter.

The Development Plan is of particular importance to the process of considering the suitability of a site for a specific development. Any proposal will be considered on its merits having regard for the Development Plan and all other material considerations.

### 2.4.2 National and European Waste Management Policy

County Donegal is embarking on a major programme for the provision of new wastewater treatment facilities to ensure compliance with the European Union Directive on Urban Wastewater Treatment (UWWTD) 91/271/EEC, which was adopted in 1991, and sets standards for wastewater treatment and emissions. Implementation of this Directive is by means of the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations 1994.

EU Environmental Directives have set the context for waste disposal proposals in Ireland in recent years and are likely to continue to be a major driving factor in the future. New standards for waste disposal are being included in Irish legislation, most recently under the Waste Management Act 1996.

This Act provides for a comprehensive and modern regulatory framework for the application of higher environmental standards in response to EU and national waste management requirements and specifically requires local authorities to produce a plan to deal with waste arisings within their areas. The Act and Waste Management (Planning) Recommendations 1997 specify in some detail the matters to be addressed in County Donegal's Waste Management Plan (October 2000), which must include a Sludge Management Plan. Recommendations for the treatment, reuse and disposal of sludge within County Donegal are set out in detail in the Sludge Management Plan for the County. The relevant policies of these Plans are appraised later on within this section of the report.

### 2.4.3 National Planning Framework

The planning system in Ireland is based on the Local Government (Planning and Development) Act 1963. Legislation and regulations regarding planning matters are formulated by the Department of the Environment and Local Government.

The Planning and Development Act 2000 consolidates all previous Planning Acts and much of the EIA legislation. Where a local authority (that is a planning authority) provides an EIS, as required under the EIA Regulations, they must have due regard to Part X (Section 175) of the Act. Provision is made here for the supply of the EIS to Buncrana Town Council for approval.



Regard should be had to the provisions of the development plan, the provisions of any special amenity area order relating to that area, any European or other site, Government Policy and/or any provision or requirement of the 2000 Act.

The Environmental Protection Agency (EPA) advises independently, or at the request of Government Ministers, on environmental protection for any area of the functions and responsibilities of the Minister or local authorities. It can advise local authorities on the environmental content of the development plan.

### 2.4.4 Development Plan Provisions

The responsibility for planning at both strategic and detailed level lies with Donegal County Council.

The existing Development Plan provisions that cover the subject land comprise the County Donegal Development Plan (Adopted July 2000), the Waste Management Plan for County Donegal (October 2000) and the Sludge Management Plan for County Donegal (Draft Revision 2, Executive Summary 2000).

### 2.4.5 County Donegal Development Plan (Adopted 2000)

**Goals and Objectives**

County Donegal has a predominantly rural population and a small urban base. Buncrana electoral area and Buncrana Town have shown significant population growth (i.e. 36% in the period 1971 – 1996). One of the key population issues facing the County has been the shift in population to the east. Buncrana lies to the east of the County.

One of the Plan's goals is "to provide a focus and support for a living countryside and quality built environment which support a viable and sustainable local population" (Para 2.1.2). The Plan's key objectives include:

- *"to underpin a satisfactory range of public services in rural areas;*
- *to facilitate local urban and rural development by more integrated delivery of Council service; and*
- *to create the highest quality built environment where every part of the physical fabric reflects a pride in place which demands only the best" (Para.2.1.3)."*

**Sustainable Development**

The overall strategy for the County set out in the Plan focuses on achieving sustainable development. The Plan places strong emphasis on sustainable development for environmental protection, quality of life, the interaction between the environment and development and provision for the future *(Para. 2.0.3).*



**Environmental Issues**

Since adoption of the previous County Development Plan in 1988, the growing awareness of environmental issues has increased further. The 2000 Plan recognises these issues are now expressed in many more areas and activities of the Council. Waste management is identified as one of these issues:

"*Waste management, Blue Flag Beaches, EU Directives on Water Quality and Drinking Water and Local Agenda 21 are now amongst the many environmental areas which form part of the Council's activities*" (Para 1.2.3).

In recognising waste management as a key policy area, the County has produced a new Waste Management Plan under the Waste Management (Planning) Regulations 1997. This is appraised later in this section of the EIS.

**Environmental Services and Protection**

- The Plan provides for wastewater and waste management in its environmental services and protection strategy, which is highly influenced by EU policies and programmes, EU Directives and EU Structural and Cohesion funding frameworks. The expansion of services and the provision of a quality, cost effective waste management service which reflects and meets the needs of the county are key objectives of the Council. These objectives highlight the need for further facilities for wastewater treatment within the County.

*Policy 2 Provision of Waste Water Services*

The Plan recognises that the existing issue of poor to non-existent waste water services for small towns and villages needs to be addressed by a specific policy and programme, if rural development objectives are to be achieved. The Council therefore proposes to prepare a policy, with a 10-15 year programme for small Towns and Villages Wastewater Services. This will include provision for community involvement and Council contribution from an overall fund.

*Policy 4 Waste Management*

As highlighted above, the Council has embarked on the development of a new Waste Management Plan under the Waste Management (Planning) Regulations 1997.

**Development in Towns and Villages**

- In accordance with the Council's strategic development control policies, land is not generally zoned for development in villages. New development within the village development control points will be guided by the "good neighbour" principle in terms of appropriate scale and use.

**Conservation of the Natural and Built Environment**

One of the Plan's goals is "*to conserve the uniqueness of Donegal's natural and built environment for future generations while optimising its contribution to sustaining local communities and the overall development of the County*" (Para 2.6.2). A key objective of the Plan is "*to promote shared responsibility for conservation amongst the wide range of individuals and organisations who impact on the natural and built environment*" (Para. 2.6.3).



*Policy 1 Landscape Conservation*

The scenic landscape of the County is divided into three categories for development control purposes. Category 1 comprises areas of lower quality landscape whilst Category 3 areas are of the highest quality landscape. Whilst adopting a positive attitude to development proposals, policy seeks to protect the landscape of each category area.

*"In Landscape Category 1 Areas, it is the Council's policy to adopt a positive attitude to development proposals which support the living countryside policy and which the landscape has capacity to absorb.*

*In Landscape Category 2 Areas, it is the Council's policy to conserve the scenic landscapes of these areas, by more specific control types of development and categories of users. Priority will be given to the indigenous rural population building permanent houses and holiday homes will in general not be permitted.*

*In Landscape Category 3 Areas, it is the Council's policy to preserve the amenities of the highest quality scenic landscapes in the county and only very limited further development will be considered in these areas."*

The County Donegal Development Plan 2000 Landscape Conservation Map indicates that the majority of the proposal is located within a Landscape Category 1 Area. This landscape category surrounds Buncrana Town.

**Natural Heritage**

Land around the coastline within Lough Swilly lies within a proposed Natural Heritage Area (NHA), including land designated as a European Site of Community Importance (SCI) (formerly a candidate Special Area of Conservation (cSAC)) and as a Special Protection Area (SPA). These conservation categories are examined further below.

*Policy 6 Natural Heritage Areas, Special Protection Areas and Special Areas of Conservation*

The Plan identifies two other conservation categories with the NHAs. These are Special Protection Areas (SPA), which are classified pursuant to the Birds Directive, and Special Areas of Conservation (SAC), classified pursuant to the Habitats Directive[3].

Existing policy serves to protect the County's natural heritage and conservation resources:

*"The Council will work with relevant authorities, voluntary and community groups, to optimise the contribution of these and other heritage resources to the sustainable development of the county".*



**The Marine Resource**

It is recognised that the area where the marine outfall will discharge is sensitive, supporting aquaculture, as well as populations of wild native salmon and brown trout.

The Plan's goal for the Marine Resource comprises "*the multidimensional and sustainable development of Donegal's Marine Resources, as a critical element of an overall economic development strategy, at county and local level*" (Para 2.10.2). The Plan's objectives include, *inter alia*, the following points:

- "to create a distinctive marine leisure and tourism base within the county; and
- to initiate a management approach to coastal zone and related issues (Para 2.10.3)."
- Pending the Government's review of national marine policy, the Council intends to initiate the preparation of a "County Framework for Marine Development and Management" (Para 2.10.4) in conjunction with all relevant interest groups, including coastal communities.

[3] The process of designating Special Areas of Conservation involved identification of states as candidate sites (cSAC) by member states and submission to the European Commission. The Commission has recently adopted the sites submitted, which have now become Sites of Community Importance (SCI). Member States are now required to designate these as SAC within a set time period.

**Communication**

The Plan's goals for access and communication aims to ensure the provision of the best access and communication system within Donegal County. Paragraph 2.3.5 states that "*the Council will safeguard the carrying capacity of the National Primary Routes*" by restricting number of access points as well as significant intensification of existing access points which are outside the 40 mile speed limit. This Policy applies to the Bridgend – Buncrana Road (R238) outside control points.

### 2.4.6 Waste Management Plan for County Donegal (October 2000)

County Donegal has prepared a Waste Management Plan in order to comply with Section 22 of the Waste Management Act 1996. Its purpose is to create a framework for waste management in Donegal, through which the implementation of European and national waste management policies can be achieved, and to allow the development of waste management systems which ensure compliance with European and National targets for waste, recycling, recovery and diversion.

**Waste Management Policy**

Irish policy on waste management is guided by the Department of the Environment and Local Government's policy statement of September 1998 "*Changing our Ways*". The Plan identifies waste management as currently the most rapidly developing field in the environmental and public health sectors (para. 3.1.1). The County's review of their approach to Waste Management in 1995 identified a specific policy framework, which included that waste management should be developed in a regional context rather than on a stand alone basis.



The Plan recognises that Donegal County Council faces significant challenges in developing sustainable waste management practices that comply with policy and legislative requirements. The Plan demonstrates the Council's commitment to continue the development of waste management systems and fulfil the policy objectives set out in "*Changing Our Ways*", through planning for the provision of requisite infrastructure, either on a stand alone basis or through its participation in the North West Region Cross Border Group Waste Management Strategy (para. 3.7).

### 2.4.7 Sludge Management Plan for County Donegal

The Waste Management Act obliges Local Authorities to produce a plan to deal with waste arisings in its functional area. The SMP for County Donegal was produced on the basis of the guidelines produced by the Department of the Environment and Local Government and sets out the Council's plan for the sustainable management of all non-hazardous sludges arising within its functional area.

**Sludge Management Policy**

The Plan recognises Local Authority wastewater treatment plants as one of the main producers of sludge and confirms that a major programme of new wastewater treatment

capacity is planned for Donegal in order to ensure compliance with the EC Urban Wastewater Directive (91/271/EEC).

# 3. Assessment of Alternatives

## 3.1 Introduction

The proposed WWTW upgrading and SSDC at Buncrana will provide for the immediate and long-term improvement and expansion of the existing system of collection, treatment and disposal of wastewater and sludge generated within the town and the wider Inishowen area and comply with the requirements of the Urban Waste Water Treatment Directive.

## 3.2 Consideration of Alternative Sites

A series of documents/plans/reviews have been undertaken over the last five or so years which have carefully considered the development of a sustainable sludge management and water treatment facilities. The following sub-sections *précis* these documents and the consideration of alternative strategies and sites considered within them.



### 3.2.1 The Donegal County Council SMP

The Donegal County Council SMP, completed in 1999, addressed the management of non-hazardous sludges in four 'Sludge Regions', namely Letterkenny, Donegal, Gweedore and Inishowen. The SMP recommended the development of twin drying plants at Donegal Town and Letterkenny, which would produce a product with a range of outlets, with use in agriculture being the preferred option.

For the Inishowen region, new sludge thickening and dewatering facilities were recommended for Carndonagh and Moville/Greencastle, which together with Buncrana would form three Satellite Treatment Centres from which dewatered sludge cake would be transferred to the proposed Drying Plant at Letterkenny.

Five years have elapsed since the SMP was produced and consequently the previous recommendations have been reviewed in the light of current data and developments in the sludge management field.

The 2002 census has provided accurate population data, and these have been used together with population prediction data prepared by Jonathan Blackwell and Associates (JBA), to estimate current and future sludge arisings. Also, the 3rd draft proposal of the European Sludge to Land Directive has been circulated which proposes that in the future all rural septic tank sludge will require treatment prior to reuse or disposal. This proposal from the European Directive is very likely to be accepted and therefore it is sensible to allow for this future requirement in the updated sludge arisings.

### 3.2.2 Review of Sludge Management Plan – Inishowen Region

The review of the Sludge Management Plan (SMP Review) for the Inishowen region (Entec & O'Dwyer, April 2003) reviewed the findings of the Donegal County SMP with regard to the Inishowen region.

The SMP Review report concluded that Carndonagh and Buncrana should be used as SSDC for the Inishowen region with de-watered sludge cake being transferred from these two sites to Letterkenny for further treatment. It also recommended that sludge thickening facilities be provided at Moville/Greencastle for the transfer of thickened sludge to Letterkenny.

The SMP Review also reviewed the transport strategy for the Inishowen region. South of Buncrana there are three WWTW's at Fahan, Inch Island and Bridgend/Burnfoot which generate liquid sludge requiring treatment. To the east of Buncrana there is Quigleys Point which also generates liquid sludge. Following the review of the transport strategy it has been found that the most economically advantageous option is to transfer liquid sludge from the four sites to the proposed Buncrana SSDC for treatment.

The SMP Review identified that in order to cater for the imported sludges at Buncrana from the outlying sites and for the sludges generated at Buncrana, it will be necessary to have sludge handling facilities capable of catering for the arisings profile as shown in **Table 3.1.** It should be noted however, that a more recent review (Review Report, Nicholas O'Dwyer, 2005) 2005 identifies that a SSDC is required to cater for increased sludge throughput and should be designed to produce 680 tds/annum in 2027) based on a contributing population of 36,766 p.e.



**Table 3.1 Summary of sludge arisings**

| | Sludge arisings – tonnes dry solids/annum (tds/a) | | | | |
|---|---|---|---|---|---|
| | **2006** | **2010** | **2014** | **2018** | **2022** |
| Buncrana | 144 | 198 | 235 | 239 | 243 |
| Bridgend/Burnfoot | 12 | 16 | 19 | 19 | 19 |
| Inch Island | 1 | 1 | 1 | 1 | 1 |
| Fahan | 9 | 12 | 15 | 15 | 15 |
| Quigley's Point | 4 | 4 | 4 | 4 | 4 |
| Total | 170 | 231 | 274 | 278 | 282 |

The SMP Review report concludes that the most economically advantageous option is to provide a SSDC at Buncrana, which will dewater sludge from the four identified satellite sites in addition to the arisings at Buncrana, prior to transfer of dewatered sludge cake to Letterkenny for final treatment.

### 3.2.3 Alternative Sites

As detailed above, the SMP and SMP Review identified the Buncrana WWTW as a satellite sludge dewatering centre. The required upgrading and expansion of the wastewater treatment works can be carried out within the boundary of the existing WWTW. This means there is no requirement for significant additional disturbance of the local population or ecological receptors due to installation of large new stretches of sewers, outfalls etc. The land available at the proposed site is considered to be of low ecological value. Emissions of odour and a certain amount of noise from the existing WWTW operations already exist. The upgrading of the WWTW will improve lead to an improvement in the effluent standards and a reduction in the level of odour emissions. The landscape already contains similar treatment features at the existing WWTW.

The above considerations identify that utilisation of existing WWTW site will result in a lower environmental effect and a greater contribution to sustainable development than would a remote site requiring new sewerage infrastructure.

## 3.3 Consideration of Alternative Processes and Designs

Consideration of various processes for the SSDC at Buncrana have been rigorously undertaken and a summary of the relevant report given below.



### 3.3.1 Inishowen Sludge Treatment Centre – Preliminary Report (Draft)

The Draft Preliminary Report was completed by Nicholas O'Dwyer in February 2004. This report is based on the findings of the SMP Review and a review of the existing wastewater treatment works.

The Draft Preliminary Report looked at a number of options available for the development of a SSDC at Buncrana, it also looked at a number of options for the expansion/upgrade of the existing WWTW and also the option of progressing both as a single contract.

The options assessed were as follows:

- Option 1 - Development of Satellite Sludge Dewatering Centre only (Picket Fence Thickeners);
- Option 2 - Development of Satellite Sludge Dewatering Centre only (Picket Fence Thickeners and Digesters);
- Option 3 - Development of Satellite Sludge Dewatering Centre (using option 1) and expansion/upgrading of the WWTW using Extended Aeration;
- Option 4 - Development of Satellite Sludge Dewatering Centre (using option 1) and expansion/upgrading of the WWTW using SBR;
- Option 5 - Development of Satellite Sludge Dewatering Centre (using option 2) and expansion and upgrading of the WWTW using Extended Aeration.

- Option 6 - Development of Satellite Sludge Dewatering Centre (using option 2) and expansion and upgrading of the WWTW using SBR

Each of these options would also include expanded sludge dewatering facilities at Buncrana (currently a belt press is used). It is envisaged that dewatering at the new SSDC will be by centrifuge.

At this stage, a particular option has not been selected. The detailed specifications of the SSDF and WWTW extension are not fully known, as it is likely that the work will be procured under a PPP, where the bidders will submit their tenders on individual design options for the proposed works. However, preliminary indicative layout plans have been prepared based on Options 2, 3, 4 and 5 as detailed above. These layouts are shown on **Figures 3.1, 3.2, 3.3** and **3.4** respectively. The Contractor may select any process which provides the required level of treatment and will be considered appropriate provided its negative impacts are of lesser significance than those to be outlined in this EIS.

The treatment process offered by the PPP Contractor will also be subject to operation limits for noise, odour and air quality, i.e. the process should operate without exceeding specified limits for noise and odour levels and ground levels of atmospheric pollutants.

### 3.3.2 The DBO Specification and Environmental Protection

**Section 2.3** identifies that the final site design and processes to be used will be finally determined via the Contract Documents for the PPP contract. This will affect parts of the EIS, for example, assumptions will have to be made on the size of the buildings and structures. In such cases the EIS will aim to consider the 'worst case' scenario, and/or to specify limits on emissions (including odour, noise and effluent standards) necessary to meet environmental standards. These limits will be incorporated into the tender documents for the scheme.



## 3.4 Conclusion

The proposed Satellite Sludge Dewatering Centre and Wastewater Treatment Works upgrading will provide for compliance with the Urban Wastewater Treatment Directive and implementation of the Sludge Management Plan for County Donegal and the SMP Review. In order to implement the recommendations of the SMP Review, facilities for the acceptance of imported sludges must also be provided.

# 4. Description of the Proposed Development

## 4.1 Site Description

The WWTW upgrading and SSDC will be constructed entirely within the boundary of the existing WWTW site at Buncrana .

The existing WWTW is located on the southern edge of Buncrana to the south of the Mill River adjacent to the local golf course and the beach running along the eastern shoreline of Lough Swilly. The site comprises a rectangle of land approximately 0.518 hectares in area, delineated by a metal palisade fence with some trees and shrubs along the outer edge. The location of the existing WWTW means that development outside the site boundary is not desirable. Consequently the proposed SSDC and any subsequent expansion/upgrading of the WWTW must be accommodated within the existing site boundary.

Within the site the area is almost entirely surfaced with stone chippings bisected by metalled roads which provide access to the buildings and waste water treatment facilities on the site. There is currently little landscaping within the site boundary.

**Section 6.2** describes the environs surrounding the site, placing it in a landscape and visual context.



## 4.2 Existing WWTW Facilities

The existing WWTW, which provides a primary level of treatment and has been operational since 1991, comprises an inlet works (incorporating comminutors and grit trap), two primary settling tanks, a pumping station and a discharge to Lough Swilly, which is approximately 500m in length, ending in a diffuser. This discharge will continue to be used for the foreseeable future, incorporating the current and predicted treated effluent flows.

The facilities also include sludge handling facilities, comprising a primary sludge pumping station, picket fence thickener, sludge digester, sludge holding tank, sludge dewatering room (housing a belt press), with discharges handled via the WWTW. The existing site extends to 0.518 hectares, which means that available space for expansion is limited. A detailed discussion of the existing facilities is presented in the 'Draft Preliminary Report' (Nicholas O'Dwyer, 2004).

## 4.3 Proposed New Infrastructure

The options identified for the development of the SSDC and the upgrade/expansion of the WWTW are summarised in **Section 3.3**. The work involved in the provision of Option 3 includes the demolition of the existing picket fence thickener, sludge digester, gas exchange tank and sludge holding tank. The level of treatment provided at the WWTW will therefore increase from primary to secondary, with the overall effect of reducing pollutant loads discharges to Lough Swilly. New infrastructure on site for the provision of Option 3 will include the following:

- picket fence thickeners;
- aeration tanks;
- an air blower building;
- storm tank;
- extension to inlet works building;
- sludge reception and screening building
- provision of hard standing areas; and
- landscaping features.

As it is intended to procure this scheme under a PPP type contract, the exact site layout is not finalised at this stage. However, **Figures 3.1 to 3.4** present indicative site layouts based on the anticipated arrangement. As mentioned previously these indicative arrangements are set out in accordance with the development envelope limits which are established in this EIS document.



### 4.3.1 Construction

The construction programme for the development has yet to be finalised however, it is envisaged that the development will take approximately 12 months to construct and this is likely to commence in mid/late 2006 for completion in mid/late 2007. Construction activities will normally be restricted to between 08.00 - 18.00 hours on weekdays and 08:00 – 13:00 on Saturdays. Evening and night-time working is not expected although it is possible that limited 24 hour working may be required to meet specific demands, however, this would be with prior agreement from the local planning authority. This will be written into the DBO. Other mitigation measures have been assumed in this EIS and deviation from the mitigation measures would have to be justified by the DBO contractor.

### 4.3.2 Design and operation

The treatment process offered by the DBO contractor will also be subject to operational limits for noise and no effects greater that those outlined in this EIS will be allowed during operation.

# 5. Scoping

## 5.1 Introduction

Scoping describes the process of identifying the significant issues that should be addressed in detail in an EIS. The scope of this EIS has been defined on the basis of:

- reference to the Environmental Protection Agency's 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' and 'Draft Guidelines on the Information to be contained in Environmental Impact Statements';
- the project team's experience of EIS for similar developments;
- information obtained from consultees;
- site visits; and
- consultation with Donegal County Council to confirm that an EIS with the scope defined here will enable them to identify the full range of environmental effects of the proposed development.



## 5.2 Scoping Report

To assist them in reaching their opinion, and to facilitate broader consultation to bodies that may be unfamiliar with the proposals, a Scoping Report was produced which included the following information:

- an outline description of the proposed development;
- the site location and description;
- the purpose of the proposal; and
- the proposed basis of the EIA.

The EIA Regulations state that significant effects should be assessed and, in our view, these were identified in the Scoping Report. We also identified effects which we considered to be minor and not significant, in order that as complete a picture as possible of potential effects was presented.

**Appendix A** summarises the predicted environmental effects from the Scoping Report to be addressed in this EIS.

## 5.3 Public Consultation

This EIS will be advertised in accordance with Part X (Section 175) of The Planning and Development Act 2000 so that, before submission of the EIS to Buncrana Town Council, Donegal County Council will, "*publish in one or more newspapers circulating in the area in which it is proposed to carry out the development a notice indicating the nature and location of the proposed development…*"

This advert will, amongst others, specify, "*the times and places at which, and the period (not being less than 6 weeks) during which, a copy of the environmental impact statement may be inspected free of charge or purchased*".

A public consultation event was held by Donegal County Council on Thursday 2nd March at the Lake of Shadows Hotel, Buncrana from 13:00 to 19:00.

The event was publicised in the Derry Journal on 24th February 2006 and the Inish Times on the 1st March 2006.

Members of Donegal County Council and the wider project team were available to discuss the proposals and a poster exhibition was set up to inform the public of the proposals and the findings of the EIA.

The event was attended by approximately 10 members of the general public and no significant comments or objections were received.

# 6. The Existing Environment

## 6.1 Introduction

The two documents 'Review of Sludge Management Plan, Inishowen Region' and 'Preliminary Report' (Draft, Nicholas O'Dwyer, Consulting Engineers, 2004) identified all relevant information available at the time of those studies. The EIS draws upon this information, where it still remains valid, and has supplemented it with the most recent information available. Additional information has been sought from relevant bodies and the assessment repeated using existing and supplementary data.

## 6.2 Landscape and Visual

In this section the landscape of the area is described in relation to a 'baseline'. This is a description of the existing environment and is required to be able to predict any likely significant impacts of the development. The baseline data are supported by a series of photo viewpoints and photo montages, the locations of which are shown in **Figure 6.1**.



### 6.2.1 Existing Situation

The coverage of the study area was chosen with the following objectives in mind:

- to reflect the land within the estimated visual envelope (see **Figure 6.2**); and
- to include an area that is sufficient to gain a full understanding of the factors that influence the form and appearance of the landscape around the proposed development.

A photographic record is included at **Figures 6.3 to 6.5**. Photographs are included that reflect the existing visual context of the site as perceived from publicly accessible vantage points and those representative of residential properties.

**Estimated Visual Envelope**

The estimated visual envelope or Zone of Visual Influence (ZVI) of the WWTW is illustrated in **Figure 6.2**. The envelope is largely dictated by intervening screening elements and topography. There are areas within the indicated ZVI from which there would be no views of the proposed development and conversely there may be areas outside the indicated ZVI from which long distance views would be available.

**Topography and Drainage**

The site is situated at the shoreline of Lough Swilly, at an approximate height of 5m AOD (Above Ordnance Datum). Land surrounding the site rises from the shore towards mountains in the east. Immediately to the east of the site the land rises for 5 km to a

height of 258m AOD at Meenkeeragh Hill. To the south-east the land rises up Barrack Hill at 40m AOD and on for 7 km towards Scalp Mountain which is 484m AOD (see **Figure 6.3, Photo viewpoint 2**).

Land to the south of the site again rises from the shore to Barrack Hill and on to Mouldy Hill (312m AOD) some 2.5 km distant. It then continues to Gollan Hill, which is 209m AOD and 3.5 km from the site.

Lough Swilly lies to the west of the site and is approximately 3.5 km wide at this point. The lough is linked to the open sea and is consequently tidal in nature. Inch Island is situated 6.5 km to the south-west of the site and the topography rises to a height of 222m AOD at Inch Top.

Drainage of the surrounding area is predominantly via the Mill River situated to the immediate north of the site (see **Figure 6.3, Photo viewpoint 2**). Many other smaller streams flow from the mountains to the west and out onto the White Strand beach and ultimately into Lough Swilly. To the north of Buncrana the River Crana flows into Buncrana Bay. This river is fed by many tributaries arising from Meenkeeraugh Hill, Sorne Hill and Slieve Snaght, a mountain of 615m AOD situated 11km from the site.

**Built Environment**

The site is situated on the southern outskirts of Buncrana to the south of the Victoria Bridge just off the Fahan to Drumfree road, the R238. A mixture of industrial and residential buildings lie to the east of the site while the commercial town centre of Buncrana is 1 km to the north.



The R238 becomes St Orans road to the north of the site and bears eastwards parallel to the Mill River. It then becomes Lower and Upper Main Street respectively as it heads north through Buncrana before becoming Cock Hill Road.

The immediate environs of the site are made up of buildings lining the R238. The Buncrana tourist office is the closest building and is situated 10m from the site (see **Figure 6.4, Photo viewpoint 5**). A large, visually prominent hanger-type building lies to the south of the tourist office. Formerly a furniture workshop, the building is made from corrugated iron and painted white with a blue roof and red ends. Beyond this is the Drift Inn Bar and Grill, which is a large two storey building of stone with a slate roof and gabled dormers with plain coping. Further south lie further stone buildings which house a hair salon and an off-licence. The Buncrana Golf Course clubhouse is a detached two storey building at the edge of the golf course. The last building on the eastern edge of the R238 is the Inishowen Gateway Hotel. This is a large two storey building some 200m long with 63 bedrooms which incorporates a health club with swimming pool at the northern end and the Equinox night club at the southern end.

On the opposite side of the road, there are several residential properties and the Shell garage, which incorporates Farren's Mace. The houses are a mixture of bungalows, single storey and two storey buildings. The entrance to two residential estates, Oakfield Court and Strand Court, emerge at the garage and opposite the Inishowen Gateway Hotel respectively. Further to the south a roundabout forms the entrance to Buncrana

and splits the road into the R238 and the Inner Relief road. The town fire station is situated just to the north of the roundabout.

A number of residential and commercial properties lie between the R238/St Orans road and the Inner Relief road. To the east of the Relief Road lies the gigantic Fruit of the Loom industrial building which is over 500m long (see **Figure 6.5, Photo viewpoint 6**). The structure is made of galvanised sheet metal with a repeating gable M-shaped roof and is painted black with a wide red stripe horizontally across the façade. In addition, a tall chimney stack rises above the factory dispensing smoke or vapour.

To the west of the site, beyond the mouth of the Mill River, is the Buncrana Pier at Salpans point (see **Figure 6.3, Photo viewpoint 1**). This is a large concrete pier with asphalt surfacing which forms the quayside for fishing boats and the RNLI lifeboat, a Tyne class all-weather vessel. The pier also forms the departure point for the Buncrana/Rathmullan car ferry. A large disused oil tank provides the main focal point of the pier. The tank is approximately 15m in diameter and 20m tall. Various elements of fishing paraphernalia including landing trailers, cranes and storage containers lie to the north of the pier. Several buildings stand at the point between Buncrana Pier and Swilly Road, namely the Stranagor restaurant, a large 3 storey concrete apartment block and Flanagan's furniture warehouse.



### Vegetation

There is no vegetation within the existing site boundary fence, however, a variety of species exist on the outside. The site is bounded on all sides by screen planting although the west facing edge is sparse in comparison to the other three sides.

The vegetation surrounding the site is described in **Section 6.7.3**.

### Public Rights of Way

There are no public rights of way across the site.

### Landscape Character

On a national basis the site is located in the north-west of County Donegal on the Inishowen peninsula some 15km to the north west of Derry. At a more local scale the site is characterised by the gentle valley slopes which fall from the mountains in the east to Lough Swilly. Infrastructure and buildings follow the undulating shoreline of this peninsula with low density building rising up the slopes following minor roads. There are a mixture of building types in the area but the majority are single storey and bungalow type properties.

Leisure activities form a large part in the character of the area. Entering Buncrana from Fahan, several golf clubs including the North West Golf Club at Lisfannan and the Buncrana Golf Course have a strong impact. The presence of undulating fairways with interspersed sand bunkers and bright green holes give a calming ambience to the area. Other locations such as the GAA sports pitches, the track at the Scoil Mhuire Leisure Centre and the Pitch and Putt golf course on the seafront reinforce this character attribute.

Industry too has a strong influence on the character at Buncrana. The Fruit of the Loom factory along with the other premises on Cahir O'Doherty Avenue, now disused, provide a large presence in the town with its chimney visible from miles around. Other industrial influences include the quarry workings above Buncrana with the associated frequent passage of quarry trucks, the fire station, garage and other commercial properties along the Inner Relief Road.

Buncrana's close proximity to Lough Swilly provides another strong element in its character. There is a 'seaside town' feeling to the shore front houses along Aileach Road, while the pier at Salpans Point gives the area a maritime atmosphere. In addition, the shoreline known as The White Strand, has over 5 km of sandy Blue Flag beach along the western front of the town. All these elements combine to create this strong feeling of the sea which pervades the town.

### 6.2.2 Predicted Trends

The predicted trends for the landscape of the study area are dependent upon the possible future changes to existing baseline conditions in other categories, especially agriculture, planning and transport. Overall it is unlikely that the landscape of the study area would sustain large-scale changes. Instead most changes would be incremental and small-scale, although if there are sufficient small-scale changes their cumulative effect could be significant. Potential changes could involve possible changes to agricultural practices and a continued increase in the development of residential properties in Buncrana.



### 6.2.3 Information Gaps

It was not possible to ascertain all the names of the properties around the site.

## 6.3 Air Quality and Odour

### 6.3.1 Existing Situation

**Air Quality Regulations**

The air quality standards currently in force in the Republic of Ireland are set out in **Table 6.1**. These are based on the European Union's Air Quality Framework and Daughter Directives (First Air Quality Daughter Directive for nitrogen dioxide, sulphur dioxide and $PM_{10}$ and Second Air Quality Daughter Directive for carbon monoxide).

**Table 6.1 Air Quality Standards for Ireland µg $m^{-1}$**

| Pollutant | Limit Value | Measured as | Date to be achieved by |
|---|---|---|---|
| Nitrogen dioxide | 40 µg $m^{-3}$ | Annual mean | 2010 |
| | 200 µg $m^{-3}$ | 1-hour mean | 2010 |
| Particles ($PM_{10}$) | 40 µg $m^{-3}$ | Annual mean | 2005 |
| | 50 µg $m^{-3}$ not to be exceeded more than 35 times a year | 24-hour mean | 2005 |
| Sulphur dioxide | 350 µg $m^{-3}$ not to be exceeded more than 24 times a year | 1-hour mean | 2005 |
| | | 24-hour mean | 2005 |
| | 125 µg $m^{-3}$ not to be exceeded more than 3 times a year | | |
| Carbon monoxide | 10 mg $m^{-3}$ | Max daily 8-hour mean | 2005 |

The local air quality at Buncrana can be assessed by examining the continuous monitoring data from Derry, which is representative of the conditions likely to be observed.



### 6.3.2 Derry Monitoring Data for 2000-2004

The closest air quality analyser was based in Derry. The monitoring station is classified as 'Urban Background', located in the south east corner of an urban park approximately 1 km from the city centre. The park is bounded on three sides by roadways that are periodically subject to congestion during peak traffic flow periods. The busiest road has a traffic flow of approximately 9,000 vehicles per day and is 55 metres distance from the monitoring station. The manifold intake is at approximately 3 metres above ground level with mature trees within 10 metres distance. The site monitors ozone, carbon monoxide, sulphur dioxide, particulate matter (PM10) and oxides of nitrogen.

A summary of the allocation of zones for air quality management has been included in **Table 6.2**.

**Table 6.2 Air Quality Zone Classification**

| Zone Name | Zone A | Zone B | Zone C | Zone D |
|---|---|---|---|---|
| **Coverage** | Dublin City and environs | Cork city and environs | 16 Urban areas with populations greater than 15,000 | Remainder of the country |
| **Areas ($km^2$)** | 485 | 185 | 222 | 69,381 |
| **Population (2002)** | 1,050,834 | 178,271 | 299,716 | 2,388,515 |

**Derry Monitoring Data for 2000-2004**

- Carbon Monoxide (CO) Results

The results from the CO measuring sites are shown in **Table 6.3** below. Annual data capture is at least 75%. The limit for carbon monoxide (10 $mg/m^3$ as an 8 hour mean) is above the recorded values, which have seen a general fall over recent years (1.4 - 2.4 $mg/m^3$).



**Table 6.3 Results from Derry Monitoring Site for Carbon Monoxide**

| Calendar year | Annual Mean $mg/m^3$ | Daily Max running 8 hour mean $mg/m^3$ | Max 1 hour Mean $mg/m^3$ | Number is exceedences of EC limit value |
|---|---|---|---|---|
| 2000 | 0.3 | 2.4 | 3.9 | 0 |
| 2001 | 0.3 | 2.4 | 4.2 | 0 |
| 2002 | 0.2 | 1.8 | 3.0 | 0 |
| 2003 | 0.2 | 1.7 | 2.3 | 0 |
| 2004 | 0.3 | 1.4 | 2.4 | 0 |

- Automatic Nitrogen Dioxide ($NO_2$) Results

**Table 6.4** below shows $NO_2$ results from the automatic monitoring site in Derry, from 2000 onwards. The statistics shown are the maximum hourly mean, the annual mean, and the number of hourly means greater than 200 $\mu g/m^3$. Annual data capture is at least 75%.

The recorded values for nitrogen dioxide are relatively static, with both the annual and 1-hour objectives being well below the limit values (annual limit 40 µg/m$^3$ with values recorded of 15-17 µg/m$^3$; 1-hour limit 200 µg/m$^3$ with values recorded of 73-96 µg/m$^3$). There were no exceedences of the 200 µg/m$^3$ hourly limit in any of the 5 years data.

**Table 6.4 $NO_2$ results from Derry**

| Year | Max Hourly Mean µg/m$^3$ | Annual Mean µg/m$^3$ | No. of hourly means > 200 µg/m$^3$ | Annual Mean > 40 µg/m$^3$ |
|---|---|---|---|---|
| 2000 | 73 | 15 | No | No |
| 2001 | 74 | 16 | No | No |
| 2002 | 94 | 15 | No | No |
| 2003 | 96 | 17 | No | No |
| 2004 | 86 | 15 | No | No |



- Automatic Sulphur Dioxide ($SO_2$) Results

**Table 6.5** shows results from the automatic $SO_2$ monitoring site in Derry. Annual data capture is at least 75%.

The sulphur dioxide limits for 1 hour were breached in 2000, In the other years the recorded values were well below the limit.

**Table 6.5 $SO_2$ results from Derry**

| | Max 15 minute mean µg/m$^3$ | No. of 15 minute means> 266 µg/m$^3$ | Max 1 hour mean µg/m$^3$ | No. of 1 hour means > 350 µg/m$^3$ | Max 24 hour mean µg/m$^3$ | No. of 24 hour means > 125 µg/m$^3$ |
|---|---|---|---|---|---|---|
| 2000 | 649 | 19 | 383 | 1 | 73 | 0 |
| 2001 | 197 | 0 | 136 | 0 | 44 | 0 |
| 2002 | 136 | 0 | 101 | 0 | 35 | 0 |
| 2003 | 263 | 0 | 125 | 0 | 45 | 0 |
| 2004 | 144 | 0 | 106 | 0 | 33 | 0 |

- Particulate Matter ($PM_{10}$) Results

**Table 6.6** presents data from automatic $PM_{10}$ monitoring sites. In accordance with the UK Automatic Network Protocols these have been measured using a Tapered Element Oscillating Microbalance (TEOM). The resultant data has therefore data have been converted to gravimetric equivalent by multiplying by the appropriate factor of 1.3 to allow for a direct comparison with EC and Irish air quality criteria.

The annual limit for $PM_{10}$ was not breached in any of the 5 years of monitoring. The 24-hour limit value (50 µg/m$^3$) was breached in 2000. The number of exceedences allowed though (35) was never reached (highest number of exceedences was 3).

**Table 6.6 Results from Automatic $PM_{10}$ Monitoring Site in Derry**

| Calendar Year | Annual Mean µg/m$^3$ | Max Daily Mean µg/m$^3$ | Daily Means > 50 µg/m$^3$ |
|---|---|---|---|
| 2000 | 20 | 73 | 3 |
| 2001 | 23 | 44 | 0 |
| 2002 | 22 | 35 | 0 |
| 2003 | 24 | 45 | 0 |
| 2004 | 20 | 33 | 0 |



## Dust

During the existing operation of the WWTW no evidence has been found relating to the deposition of dust sufficient to warrant a complaint.

## Odour

The issue of malodours from WWTWs has gained increased public recognition over the last 20 years, along with growing expectations of quality of life and a reduced tolerance towards adverse environmental effects of business and utilities upon public amenity.

### *Assessment Criteria*

For many wastewater treatment works, dispersion modelling output has been assessed against a commonly applied criterion for odour annoyance. This is based upon the premise that no critical receptor shall be exposed to a concentration of more than 5 $ou_E m^{-3}$ 98$^{th}$ percentile of hourly averages as a result of emissions from a wastewater treatment works[4,5]. Entec's extensive experience of applying and designing to this

[4] McGovern, JE, Clarkson, CR (1994) The Development of Northumbrian Waters Approach to Odour Abatement for Wastewater Facilities

criterion over the last 10 years for wastewater treatment schemes indicates that, where compliance occurs, complaints with respect to odour are unlikely.

The baseline dispersion modelling has been conducted using the US EPA (United States Environmental Protection Agency) AERMOD Prime dispersion model. AERMOD Prime is a new generation air quality modelling system, used to support regulatory and non-regulatory requirements world-wide, superseding older Gaussian models such as ISC and COMPLEX.

Special features of AERMOD include its ability to treat the vertical inhomogeneity of the planetary boundary layer, special treatment of surface releases, irregularly-shaped area sources, a three plume model for the convective boundary layer, limitation of vertical mixing in the stable boundary layer and fixing the reflective surface at the stack base[6].

In lieu of site specific emission parameters, the dispersion model has been prepared using emission parameters taken from Entec's database of emission factors. This database has been complied from the extensive work undertaken by Entec in recent years, alongside referenced data from other sources such as environmental statements. These emissions parameters have been included in **Table 6.7**.

Meteorological data has been obtained from Derry Airport. This site is considered by Entec to be the most representative meteorological station for Buncrana, but an incomplete data set was available from this site, so this was supplemented with the next closet meteorological station at Aldergrove (Belfast).

Process units at Buncrana WwTW are close to ground level and as such are unlikely to be affected by terrain variation and as such have not been included in this assessment.



**Table 6.7 Emission Parameters for Baseline Area Sources**

| Source | Emission Rate ($ou_E/s$) | Total Area ($m^2$) | Site (x,y) |
|---|---|---|---|
| Distribution Chamber 1 | 250 | 10 | (7,10.4) |
| Distribution Chamber 2 | 101 | 10 | (7,-9.6) |
| Sludge Pumping Station | 101 | 12 | (8,-25) |
| Primary Settlement Tanks (2) | 40 | 333 | (-7,-7), (11,-7) |
| Inlet Works Building | 0.8 | 112 | (36.4,18.8) |
| Sludge Holding Tank | 71 | 117 | (52.8,-26) |

[5] Department of the Environment (1993) Report by the Inspector on a Public Enquiry in to the Appeal by Northumbrian Water Limited for Additional Sewage treatment Facilities on Land Adjacent to Spital Burn, Newbiggin by the Sea, Northumberland. DoE APP/F2930/A/92/206240

[6] US EPA (2002). www.epa.gov/scram001

| Source | Emission Rate ($ou_E/s$) | Total Area ($m^2$) | Site (x,y) |
|---|---|---|---|
| Inlet Works Channel | 80 | 4 | (30.4,22.6) |
| Storm Overflow Channel | 0.15 | 43 | (54,19.5) |
| Picket Fence Thickener | 710 | 15 | (31,21.5) |
| Belt Press Building | 37 | 72 | (48.2,-5) |
| Sludge Trailer | 62 | 8 | (57.6,-3.6) |

Using 3 years of hourly sequential meteorological data obtained from Derry Airport (2000-2002) a contour plot has been produced to show the predicted concentration of odour as the 98$^{th}$ percentile of hourly averages (see **Figure 6.6**). Results have also been presented in tabular form in **Table 6.8** to show the predicted distance at which the odour concentration as the 98$^{th}$ percentile of hourly averages is 5 $ou_E/m^3$.

**Table 6.8 Predicted Distance from site centreto Odour Concentrations of 5 $ou_E/m^3$, baseline**

| Direction from Site | Predicted Distance (m) from site boundary for Odour concentration of 5 $ou_E/m^3$ as the 98$^{th}$ percentile of hourly averages | | | Approximate distance to the nearest buildings (m) |
|---|---|---|---|---|
| | 2000 | 2001 | 2002 | |
| North | 254 | 280 | 157 | **170** |
| North-East | 148 | 187 | 129 | **300** |
| East | 160 | 172 | 143 | **110** |
| South-East | 97 | 159 | 100 | **150** |
| South | 140 | 200 | 133 | **100** |
| South-West | 130 | 146 | 114 | **-** |
| West | 269 | 215 | 158 | **-** |
| North-West | 445 | 214 | 146 | **150** |

Directions in which buildings lie within the 5 $ou_E/m^3$ contour for at least two of the three baseline years are shaded in grey.



It can be seen that when compared to the assessment criteria for odour, there are some critical receptors (residential properties) which fall within the 5 $ou_E/m^3$ contour due to the present operation of Buncrana WWTW.

### 6.3.3 Predicted Trends

The continued development in the area and the population increase could result in increased sources of air quality pollutants (e.g. from traffic emissions) but no significant

change over the lifetime of the development is expected due and the baseline is expected to remain similar.

### 6.3.4 Information Gaps

Although baseline air quality data are not available for Buncrana, the remote coastal location of the site means that baseline air quality at the site is likely to be equal to or better than that recorded at Derry.

No other data gaps have been identified that would reasonably be expected to be available and/or assist the assessment above that presented here.

## 6.4 Noise and Vibration

### 6.4.1 Existing Situation

**Introduction**

The proposed WWTW upgrading and SSDC will introduce new noise sources to the existing site. The site location is semi-rural surrounded by beach/coastline to the west and north, a golf course to the south and by the R238 road to the east. There are also a number of residential properties in close proximity to the existing WWTW site to the north and east. Baseline or ambient noise levels are variable and depend on the noise sources that affect the area of concern. Existing potential local noise sources have been identified as:



- Road traffic noise from local roads, particularly the R238;
- The existing WWTW;
- The industrial units to the south-east of the site; and
- Agricultural activity on the surrounding land.

In order to assess the existing noise baseline, a noise survey has been undertaken and the results presented in **Section 6.4.3**.

**Noise Terminology**

The ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. Because of the wide range encompassed by these limits a logarithmic scale is used in noise level description and measurement. The decibel (dB) scale is used which extends from 0 to 140 dB corresponding to the intensity of the sound pressure level. The ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear, and to counter this the noise measuring instrument applies a correction to correspond more closely to the frequency response of the ear. The correction factor is called a “weighting” and the resulting measurements are written as dB(A). A “weighting” refers to the noise level

that represents the human ear's response to sound. The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Typical dB(A) noise levels for familiar noises are given in **Table 6.9**.

**Table 6.9 Typical Noise Levels**

| Approximate Noise Level dB(A) | Example |
|---|---|
| 0 | Limit of hearing |
| 30 | Rural area at night, no wind or adverse weather conditions |
| 40 | Library |
| 50 | Quiet office without noisy machinery, such as typewriters |
| 60 | Normal conversation |
| 70 | In car noise without radio |
| 80 | Household vacuum cleaner |
| 100 | Pneumatic drill |
| 130 | Threshold of pain |



Noise levels vary over time depending on noise generating activities. The following indices are used to take account of these variations.

- $L_{Aeq}$ is the equivalent continuous sound level and is based on the assumption that a steady sound has the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. $L_{Aeq}$ is considered the best general purpose index for environmental noise.
- $L_{A90}$ index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background noise level.
- $L_{A50}$ and $L_{A10}$ refer to the level exceeded for 50% and 10% of the measurement period respectively. $L_{A10}$ is widely used as a descriptor of traffic noise.
- $L_{Amax}$ is the maximum recorded noise level during the measurement period.

### Baseline Noise Survey

Background noise monitoring was carried out at two residential receptors between Thursday 11th and Monday 15th September 2003. These locations are representative of the nearest noise sensitive properties to the north and east of the site. They are:

- Swilly Terrace (No.2) to the north; and
- Oakfield Court (No.4) to the east.

The site of the existing WWTW is in a fairly enclosed location. The surrounding land and physical barriers/bunding, natural or otherwise, do afford some degree of screening and attenuation for any noise emanating from the plant within the works. The site is quite well hidden from the R238 and the houses to the east of the existing WWTW.

The residential properties located to the north do have a clearer view of the works, but the distance between these two points is such that the works are not audible at these receptors at the present state of operation.

No noise complaints due to the present operation of the WWTW were identified by the occupiers of the properties where noise monitoring equipment was installed. During the site visit the WWTW could not be heard beyond its site boundary. Within the site of the treatment works, the noise emanating from the plant was of a low order. No other extraneous noises were apparent and the nearby industrial estate was not discernible.

Noise levels were measured continuously at both locations throughout the day (07:00 – 23:00) and night (23:00 – 07:00) during weekday and weekend periods between Thursday 11th and Monday 15th September 2003. This was required to gain an understanding of the variability of noise levels in the area at all times of the day and night and at times when construction and operational activities at the site could be taking place. A summary of the average $L_{Aeq}$ and the $L_{A90}$ levels is shown in **Table 6.10** below. The variability of the $L_{Aeq}$ levels at both receptors during weekday, weekend, day and night periods are illustrated in **Figure 6.7**. The full noise survey results can be found in **Appendix B**.

The equipment used for the background noise monitoring exercise comprised 2 x Rion NL-31 Type 1 Sound Level Meters enclosed in environmental cases. The Sound Level Meters were fitted with wind shields to maintain Type 1 measurement accuracy, and were positioned between 1.2m and 1.5m above local ground level and away from reflective facades.

The Sound Level Meters were calibrated before and after each measurement exercise and no significant drifts (>1dB) in calibration were found to have occurred, therefore the data can be assumed valid.



**Table 6.10 Summary of Monitored Noise Levels (Average), Thursday 11th – Monday 15th September 2003.**

| Location | Weekday (Daytime) | | Weekday (Night-time) | | Weekend (Daytime) | | Weekend (Night-time) | |
|---|---|---|---|---|---|---|---|---|
| | LAeq | LA90 | LAeq | LA90 | LAeq | LA90 | LAeq | LA90 |
| No.2 Swilly Terrace | 45.6 | 42.4 | 35.1 | 31.5 | 43.9 | 40.9 | 43 | 40.3 |
| No.4 Oakfield Court | 51.7 | 45.2 | 43.8 | 31.6 | 50.5 | 42.9 | 45.2 | 36.7 |

Source: Entec

## Weather Conditions/Data

Prevailing weather conditions are an important factor when determining ambient noise levels, with windy conditions resulting in potentially significant increases in background noise levels. The weather during the survey period was fairly mixed, ranging from fine, dry and calm to windy with occasional outbreaks of heavy rain. Consequently the baseline conditions varied throughout the survey period.

Buncrana is a coastal town and as such is exposed to quite strong on-shore winds. A summary of the local weather conditions during the monitoring period is shown in **Table 6.10**. The weather station at Malin Head, which is the nearest to the site, has been used to represent the conditions at Buncrana. Malin Head is approximately 20 miles due north of Buncrana at the top of the Inishowen peninsula. The weather at Malin Head can be extreme due to its coastal location, with Storm Force 12 winds recorded at the station during most years. Whilst the extremes of data recorded at Malin Head do not necessarily accurately reflect all weather conditions at Buncrana, the geographical proximity of the two locations means that most data are broadly applicable to Buncrana.

As a comparison, the weather data for the town of Mullingar, which is situated in the middle of rolling countryside in the centre of Ireland has also been provided for the same period.



**Table 6.10 Summary of Weather Data from Tuesday 9th – Monday 15th September 2003**

| Weather Station | Temp (°C) (Difference from normal in brackets) | Rain (mm) (% of normal in brackets) | Average Wind Speed (Knots) (Difference from normal in brackets) |
|---|---|---|---|
| Malin Head | 14.9 (+1.5) | 19.7 (81%) | 14 (-1.2) |
| Mullingar | 14.7 (+2.3) | 8.6 (42%) | 6.7 (-1.2) |

All data are averaged or summed over the seven day period)

Source: www.met.ie

The data show only slight deviations in wind speed and rainfall from the norm at Malin Head and the baseline noise data collected can be deemed to reflect ambient weather conditions adequately and thus natural, ambient noise conditions.

### 6.4.2 Predicted Trends

A slight increase in ambient noise may be expected as Buncrana expands and population increases.

### 6.4.3 Information Gaps

The baseline noise survey collected a level of data suitable for use in this assessment and no data gaps are identified.

## 6.5 Traffic and Transport

### 6.5.1 Existing Situation

**Introduction**

The existing WWTW is located to the south of Buncrana and is accessed from the R238 St Orans Road. Traffic movements within this location are average for a residential area of this nature, and vehicle trips are spread quite equally throughout the day without any major peak time periods. The proposed WWTW upgrading and SSDC will be constructed within the boundaries of the existing works, therefore utilising the same site access.



**Proposed Routing**

An agreement will be made with the works operator regarding the routes that vehicles will take from the seven satellite centres to the proposed Buncrana SSDC/WWTW once the site is in operation. Vehicles accessing the site during the construction phase will also be advised of the most appropriate route. Details of these are listed below.

- Traffic travelling from Redcastle and Greencastle satellite centres will travel south along the R238 to Muff and will then travel west along the R239 where it again picks up the R238 in a northerly direction. Traffic will approach the site access on St Orans Road from the south.
- Traffic from Burnfoot/Bridgend, Fahan and Inch Island satellite centres will all travel north on the R238 and will approach the site access on St Orans Road from the south.
- Traffic from both Ballyliffin and Clonmany satellite centres will travel south on the R238 and then turn right onto St Orans Road. Traffic will approach the site access on St Orans Road from the south.

All of the roads highlighted above are main, arterial routes around the Inishowen area.

After treatment of the liquid sludge at Buncrana, the dewatered sludge will be transported in sealed skips for further treatment to the main Letterkenny Sludge Hub Treatment Centre (SHTC). Vehicles travelling this route will exit the site south-bound onto St Orans Road and continue onto the main R238 to Burnfoot, where they will turn right onto the N13 south-westbound. The route then turns right at Pluck onto the N14

and continues on this road to the Letterkenny SHTC, approaching the site access from the south. It is assumed that vehicles returning to the Buncrana SSDC/WWTW will follow the same route as described above but in a reverse direction.

Traffic generated during the construction period of the proposed SSDC/WWTW extension, and staff vehicles during both the construction and operational periods of the development, could arrive and leave using a variety of routes depending on the source and destination of materials and workforce. However, construction vehicles will be advised of the most suitable route to the site and will use major roads whenever possible. For the purposes of this assessment it has been assumed that the construction traffic and operational staff vehicles will use a combination of routes to the site.

**Highway Network**

The roads anticipated to be used for vehicles travelling to and from the satellite centres to Buncrana are a combination of national roads (N13, N14), and regional roads (R238, R239). All of these routes are fairly wide two lane single carriageways throughout, with the exception of a 7-8km two-lane dual section of the N14. It is therefore assumed that these routes are adequate to accommodate Heavy Goods Vehicles (HGV).

**Existing Traffic Data**

Entec commissioned traffic surveys at two locations close to the roundabout junction of the R238 St Orans Road and the Inner Relief Road, to establish a baseline. The results of these counts are summarised in **Table 6.11**.



**Table 6.11 Existing 24hr Traffic Counts (Two-way Movements)**

| Location | Year and Type of Count | Total Traffic | Total HGVs (HGVs %) |
|---|---|---|---|
| R238 St Orans Road. (NORTH of the roundabout with the Inner Relief Road)[1] | 2003 AADT | 9115 | 288 (3.2%) |
| R238. (SOUTH of the roundabout with the Inner Relief Road)[1] | 2003 AADT | 9232 | 367 (4.0%) |

Source: [1] Count On Us Ltd Traffic Consultants

AADT is the Annual Average Daily Traffic.

### 6.5.2 Predicted Trends

Traffic numbers are predicted to increase by 4% annually (as identified by the 'National Roads Needs Study' produced by the National Roads Authority (NRA)). This growth rate has been used further on in this EIS to determine future baseline traffic flows.

### 6.5.3 Data Gaps

The baseline traffic survey collected a level of data suitable for use in this assessment and no data gaps are identified.

## 6.6 Socio-economics

### 6.6.1 Existing Situation and Predicted Trends

**Population Growth**

Population projections for Buncrana have been reviewed and findings are presented in a *Population Review Report* (O'Dwyer, 2005). Buncrana is located within a growth area within County Donegal within close reach of Letterkenny and Derry. Discussions with Donegal County Council planners have indicated that Buncrana is likely to continue to grow over the foreseeable future. The average annual increase predicted by the Central Statistics Office in the Regional Population Projections 2006-2021 is 1.2% per annum for the border region. A higher short term growth rate of 2% has been assumed for the next five years based on current planning applications lodged with Donegal County Council. Following this, it is anticipated that growth will be 1.2% for the remainder of the design period to 2026. It has been assumed that the non-domestic sector will grow at a similar rate to the domestic.

The predicted population growth is summarised in **Table 6.12**. It should be noted that the ultimate design p.e. for the WWTW is 50% larger that the anticipated 2026 p.e.



**Table 6.12 Population growth (given in population equivalents)**

| Year | 2005 | 2026 |
|---|---|---|
| Domestic PE | 5,156 | 7,000 |
| Non Domestic PE | 1,393 | 1,800 |
| Total | 6,549 | 8,800 |

The County Donegal Development Plan (2000) recognises the importance of Buncrana as a key industrial location within Inishowen. The industrial areas within Buncrana have been identified within the plan as potential centres of excellence requiring further development in the future.

**Economic Activity**

Buncrana is the largest town on the Inishowen peninsula and the second largest in County Donegal, and is set to expand in future years. Until recently Buncrana was the largest centre of textile and clothing manufacture in Donegal, but is now developing as

a centre for a broader range of business. Expansion is predicted in both the commercial and industrial sectors with growth forecast in these sectors plus the tourist trade.

Lough Swilly is extensively used for aquaculture, with a large number of aquaculture licences covering mussel, oyster and salmon production facilities. Salmon rearing is concentrated around the mouth of the estuary with oyster production being concentrated in the upper reaches of the estuary to the south of Buncrana. There are few shellfish rearing facilities in the immediate vicinity of Buncrana, the closest being mussel rearing sites to the west.

### 6.6.2 Data Gaps

No data gaps have been identified.

## 6.7 Flora and Fauna

### 6.7.1 Existing Situation

**Marine and Freshwater**

***Candidate Site of Community Importance***

The site is adjacent to Lough Swilly Site of Community Importance (formerly candidate Special Area of Conservation (cSAC)), with an existing outfall pipeline which will be used to discharge the treated effluent from the new facility into the Lough. The SCI (cSAC) includes much of the Lough (see **Figure 6.8**), extending from Port Bridge below Letterkenny, to beyond Buncrana. It is designated due to the presence of:

- the Annex 1 Habitats[7] 'Coastal Lagoons', 'Estuaries', 'Atlantic Salt Meadow', and 'Old Oak Woodland'; and
- the Annex 2 species[3] otter (*Lutra lutra*).



***Special Protection Area***

Parts of Lough Swilly and the surrounding area are also designated as a Special Protection Area (SPA) due to their high ornithological importance. These areas include the Leannan and Swilly estuaries and areas of intensively farmed grassland at Big Isle and adjacent to Blanket Nook (see **Figure 6.8**). The designated areas support internationally important numbers of:

- the Annex I species Greenland white-fronted goose (*Anser albifrons flavirostris*) [8]; and

[7] Annex 1 and Annex 2 of Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna

[8] Annex I and Annex II of Council Directive 79/409/EEC on the conservation of wild birds

- the Annex II species greylag goose (*Anser anser*).

Another two Annex I species also winter at Lough Swilly, whooper swan (*Cygnus cygnus*) and golden plover (*Pluvialis apricaria*). Several species of waterfowl are also present in nationally important numbers, including shelduck (*Tadorna tadorna*), wigeon (*Anas penelope*), teal (*Anas crecca*), mallard *(Anas platyrhynchas*), shoveler (*Anas clypeata*), tufted duck (*Aythya fuligula*), scaup (*Aythya marila*), goldeneye (*Bucephala clangula*), red-breasted merganser (*Mergus serrator*), coot (*Fulica atra*), oystercatcher (*Haematopus ostralegus*), knot (*Calidris canutus*), dunlin (*Calidris alpina*), curlew (*Numenius arquata*), bar-tailed godwit (*Limosa lapponica*), redshank (*Tringa totanus*) and greenshank (*Tringa nebularia*).

***Aquaculture***

As identified in **Section 6.6.2**, aquaculture is an important industry within Lough Swilly. There are no data available on the ecological significance of these operations, both in terms of direct local impacts on the marine flora and fauna arising and in terms of accidental releases of farmed fish and shellfish.



## Terrestrial Habitats

The site of the proposed WWTW upgrading and SSDC was surveyed in September 2003 to identify the extent and type of vegetation growing within and around the boundary of the existing WWTW site. The standard Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey methodology was not used in this case, as the proposed works will take place entirely within the boundary of the existing site. Consequently it is not envisaged that there will be an impact on any habitat outside the existing site boundary.

The principal habitats present within and adjacent to the site have been recorded and categorised according to guidance published by The Heritage Council[9].

The majority of the existing site at Buncrana is occupied by buildings serviced by metalled roads, and areas surfaced with stone chippings. The site boundary comprises a metal pallisade fence which has been partially screened with well developed trees and shrubs, probably planted during the construction of the facility.

There is no vegetation within the existing site boundary fence, however, a variety of species exist on the outside. The site is bounded on all sides by screen planting although the west facing edge is sparse in comparison to the other three sides. The surrounding vegetation is a mixture of trees and shrubs including the following; Poplar (*Populus spp.*), Alder (*Alnus spp.*), Willow (*Salix spp.*), Beech (*Fagus sylvatica*), Willow (*Salix spp.*), Field Maple (*Acer campestre*), Rowan (*Sorbus spp.*), Scots Pine

[9] Fossitt, J. A. (2000) A Guide to Habitats in Ireland. The Heritage Council

(*Pinus sylvestrus*), and Viburnum (*Viburnum spp*.). The land beyond the site to the east and north is scrub land and contains many ruderals including Dock (*Rumex spp*.), Fat Hen (*Chenopodium album*), Dandelion *(Taraxacum officinale*), Ragwort (*Senicio jacobaea*), Oilseed Rape (*Brassica rapus*) and Japanese Knotweed (*Polygonum cuspidatum*).

The vegetation in the immediate vicinity of the existing site comprises amenity grassland, rough grassland and scrub and is of low ecological value (Andrew Speer, Dúchas, pers. comm). Between the site and the dunes is an area of poor quality fixed dunes, which also have a low ecological value.

### 6.7.2 Predicted Trends

No trends have been identified which would affect the ecology of the site significantly.

### 6.7.3 Data Gaps

The baseline terrestrial ecology survey collected a level of data suitable for use in this assessment and the SCI and SPA designations identify the important marine ecological receptors. No data gaps were identified.



## 6.8 Cultural Heritage

### 6.8.1 Existing Situation

**Overview**

Cultural heritage interest may include features that have archaeological value, as well as other features that are not necessarily archaeological in nature (for example buildings and hedgerows). This report has considered a wide range of features, both visible and buried, that result from past human use of the landscape. These may include all aspects of the built environment, including buildings, earthwork monuments, landscape features such as field boundaries, and industrial and military remains, in addition to sub-surface archaeological remains and material culture, whether as individual finds or artefact scatters.

**Legislation and Guidance**

The importance of archaeological remains is recognised in national, European and international legislation. The treatment of all archaeological sites and monuments, inclusive of marine archaeology, is protected under the National Monuments Act 1930 and subsequent amendments (1954, 1987, 1994):

- Under Section 2 of the 1994 Amendment, all archaeological finds become the property of the state. They are disposed of as required by the Director of the National Museum.
- Section 3 of the 1987 Act provides that a person 'shall not dive on, damage, or generally interfere with any wreck which is more than 100 years old' except in

accordance with a licence issued by the Minister for Arts, Heritage, Gaeltacht and the Islands. This section also protects individual objects.

- Section 12 of the 1994 Amendment required the Minister for Arts, Heritage, Gaeltacht and the Islands to compile a record of monuments, and this record has, in effect, been an updated version of existing sites and monuments records. Existing protection under the National Monuments Amendment Act 1954 was extended to all monuments on this record. This requires that a minimum of two months notice must be given to the Minister for Arts, Heritage, Gaeltacht and the Islands prior to any work at or in relation to a recorded monument. Maintenance of the record of monuments and related functions of the Minister is carried out through the National Monuments and Historic Properties section of Dúchas, within the Department for Arts, Heritage, Gaeltacht and the Islands. Dúchas also advises local authorities and other state agencies through the provisions of the Planning Regulations where archaeological issues might arise.

- Section 23 of the 1930 Act (as amended 1994) requires that a person who finds an archaeological object shall not remove it or otherwise interfere with it unless there is reason to believe that this is required so as to preserve it or keep it safe. All such finds must be reported to the Director of the National Museum within a reasonable period of time.

National Monuments legislation also makes provision for the excavation and recording of any archaeological features that are to be disturbed by development. This would be carried out by a Licensed Archaeologist.



Further protection for archaeological remains is afforded by the Heritage Act 1995 and the European Convention on the Protection of the Archaeological Heritage (revised) 1992 (commonly known as the Valletta Convention), European Treaty Series No 143, applicable in Ireland from 1997.

Marine archaeology is additionally covered by The Dumping at Sea Act 1996, The Merchant Shipping Act (Salvage and Wreck) Act 1993 and the United Nations Law of the Sea Convention 1994.

The County Donegal Development Plan (2000) states that it is an objective of the Council 'to protect the essential qualities of this multifaceted landscape heritage'. This includes areas of scientific interest and items of archaeological and historical importance.

### Scope

In completing a desk-based assessment of the effects on archaeological remains from development it is important to define the known and potential nature of features that may be involved. This requires consideration of a number of factors:

- Development can affect archaeological features not only through direct effects (e.g. land take) but also indirect effects, such as the setting of monuments;

- Desk-based assessment involves a review of current information only and there may be further features within the site that are not yet known. The potential for this may be assessed from the conditions of the site, features within the wider area and a history of land use within the site. It can realistically be assumed that the majority of the archaeological resource is buried; and
- Not all cultural heritage features are considered of equal "importance" and it is important to identify the significance of the features. This can be a subjective process, with features being assessed in terms of their rarity, state of preservation, date, group value and historical associations. This is done through reference to legislation, policy guidance and professional judgement.

Information is required on any features that are known to be or could potentially be within the area directly affected by any development. This includes the footprint of both the area to be developed and those to be landscaped and managed as part of the overall scheme. To this end published and unpublished sources were consulted from the Department of Environment, Heritage and Local Government (formerly Dúchas).

Indirect effects on features of archaeological and wider cultural heritage interest can also occur as a result of significant changes to the setting of a feature, whether permanent or temporary. However, this is considered to be highly unlikely in this case as the proposed development will take place within the footprint of the existing site.



**Recorded Sites**

There are known features of archaeological and cultural heritage interest in the vicinity of the existing WWTW. Buncrana is an historic town, having developed as a port from the 15th century onwards. In addition, there has been occupation of the area from the Prehistoric period and associated monuments are present within the wider area.

However, development of the existing WWTW involved the construction of buildings, treatment facilities and metalled roads within the site, as well as surfacing the remaining areas with stone chippings. Any archaeological remains present on the site are likely to have been removed, lost, damaged or disturbed during the construction of the WWTW.

### 6.8.2 Predicted Trends

As previously discussed the proposed development will take place within the boundary of the existing WWTW[10] and so there will be no impact on features of cultural interest arising from the construction of the WWTW upgrading and SSDC. No further extension of the works is predicted during its design life to 2022.

### 6.8.3 Information Gaps

There is no further information that could reasonably have been collected as part of this assessment.

[10] The proposed development includes the continued use of the existing discharge pipeline.

# 6.9 Water Quality

## 6.9.1 Existing Situation

### Water Quality – lower Mill River

***Biological Quality***

The site of the proposed development is located immediately to the south of the Mill River close to the point where it discharges into Lough Swilly. Biological water quality data collected by the Environmental Protection Agency (EPA) for the Mill River at a point downstream of the old railway bridge south of Buncrana, show that the watercourse achieved a 'fair' water quality classification using the biological quality rating (Q-value[11]) in 1998. Prior to this the river has shown a gradual improvement from a 'poor' classification recorded in 1980.

The Mill River has been given a target class of RE2 (Swilly Water Quality Management Plan) as the river does not attain its potential to support fish as there are several obstacles to migration.

***Chemical Quality***

No chemical water quality data were available for any sites on the Mill River in the vicinity of the proposed WWTW upgrading and SSDC.



### Water Quality – Lough Swilly

***Biological Quality***

Very few biological water quality data are available for Lough Swilly. The results of bioassays on shellfish collected from the Lough are reported in the Swilly Water Quality Management Plan (2003a). Shellfish act as bioaccumulators of pollutants and so the analysis of their flesh provides a useful means of assessing water quality, which may also be influenced by sediment quality.

The results of the bioassays indicated that some heavy metal levels were quite high, although the actual values and location of the sampling sites were not reported. It was reported that the levels measured may have reflected the underlying geology rather than some contamination source. No evidence was detected of true organic contamination.

The Marine Institute undertakes the analysis of shellfish and seawater samples from Lough Swilly, and has occasionally detected elevated levels of algae in samples taken from the Lough. In August 1997 a bloom of *Gyrodinium aureolum*, which can cause invertebrate and fish mortalities, was detected off North Donegal. Although elevated algal levels were also recorded in Lough Swilly at this time, the concentrations were not

[11] The Biotic Index routinely adopted by the Environmental Protection Agency in Ireland. A Q-value of 5 represents 'good' water quality, 4 'fair 'quality, 3 'doubtful' water quality, 2 'poor' water quality and 1 'bad' water quality.

sufficient to constitute a bloom. The maximum recorded chlorophyll level, which is proportional to the algal biomass, was 8.2mg/l, which is within normal limits.

***Chemical Quality***

- ***Overview***

Data collected by Donegal County Council in 1994 indicated that water quality throughout the lough was excellent, although the bacterial impact of Letterkenny was apparent but sufficiently diluted within the Lough that bathing beaches and shellfisheries were not impacted.

More recently, the Swilly Water Quality Management Plan (2003a) highlighted poor water quality in the Swilly River as an issue, in particular elevated BOD, ammonia and bacteria in the Upper Swilly Estuary in the vicinity of Letterkenny. The Upper Swilly Estuary is also considered to be sensitive to eutrophication (see below). However, the impact on the lough appears to be reduced, probably as a result of dilution.

Buncrana falls within the coastal waters where water quality is high. This section of the estuary is wide and open, and consequently is likely to experience a relatively high level of mixing due to wind, wave and tidal effects. Nevertheless, the Swilly Water Quality Management Plan (2003a) highlights effluent disposal from Buncrana and Letterkenny as being an issue.



- ***Dissolved Oxygen***

Data published by the EPA in the document '*Water quality in Ireland 1998-2000*' show that water quality in the lower (northern) part of the estuary is consistently exceptionally high. Dissolved oxygen levels generally fell within normal limits, values ranging from 70% to 117% saturation. In the outer part of the Lough saturation levels ranged from 91% to 104%. Both BOD and nutrient levels were very low with many samples being close to the detection limits of the analytical methods being used. Chlorophyll concentrations, which may be used to assess algal productivity, ranged from 3.0 to 6.0 µg/l, which are considered to be low.

- ***Biochemical Oxygen Demand (BOD[12])***

The Lough Swilly Management Plan (2003a) indicates that BOD concentrations in the Lough vary between 0.71 and 2.43mg/l (except in the vicinity of the Letterkenny Outfall where values rise as high as 7.1mg/l). BOD measurements in the rivers that feed the lower parts of the Lough indicate median BOD values of between 1 and 2mg/l.

- ***Nutrients and Eutrophication***

It is generally accepted that nitrogen is the bio-limiting nutrient controlling production in coastal waters. Excessive concentrations can lead to eutrophication which is a natural process that may result in undesirable changes to marine ecosystems. Its definition in a

[12] A measure of the organic content.

scientific context has been based on some or all of increases in nutrient loading, chlorophyll concentration and primary production, and decreases in transparency. However, policy driven definitions include references to increased nutrient loads, increases in algal growth and shifts in the balance of organisms. These biological effects can be regarded as symptoms of eutrophication.

The lower Swilly Estuary has been classified as a non-eutrophic waterbody, which is supported by the most recent survey data. The upper Swilly Estuary, which is influenced by discharges from Letterkenny, may be suffering some nutrient enrichment, however, it is not classified as a eutrophic waterbody.

- ***Ammonia***

Ammonia can be toxic to fish, especially the non-ionised fraction, and therefore is often measured in coastal and freshwater environments.

Background concentrations of ammonia in Lough Swilly are (Lough Swilly Water Quality Management Plan 2003a) generally less than 0.11mg/l rising to 0.65mg/l at the Letterkenny Outfall. Ammonia measurements in the rivers that feed the lower parts of the Lough indicate median ammonia values of between up to 0.03mg/l. The maximum concentration in the River Crana did however rise to 0.14mg/l.

- ***Sewage Indicator Bacteria***

The Bathing Waters Regulations 1992 use total and faecal coliforms as bacterial indicators of sewage contamination. These bacteria are present in waters from other natural sources such as agricultural run-off from livestock areas.

Background total coliforms concentrations have been measured to be between 0 and 900/100ml (Lough Swilly Management Plan, 2003a). Bathing water at Lisfannon, Rathmullen, Portsalon and Lady's Bay all complied fully with European Guideline standards and National Limit Values (see below) in 2004, while Lisfannon and Portsalon qualified for 'Blue Flag' status.



## Regulatory Guidelines

The effluent from the existing WWTW and any future development will have to meet an effluent quality standard designed to ensure that all current statutory regulations applying to Lough Swilly Estuary, are complied with. The relevant regulatory guidelines for this site are identified below.

- The Urban Waste Water Treatment Regulations 2001 (SI No.254 of 2001)

Lough Swilly has not been classified as 'sensitive' under the Urban Waste Water Treatment Regulations, and consequently nutrient removal will not be a requirement.

- Quality of Bathing Waters Regulations 1992 (SI No. 155 of 1992), as amended[13]

The beaches at Lisfannon, Rathmullen, Portsalon and Lady's Bay (see **Figure 6.8**) are currently designated as bathing waters under the Bathing Water Regulations, which requires strict adherence to bacteriological water quality standards.

- European Communities (Quality of Salmonid Waters) Regulations 1988 (SI No. 293 of 1988)

The River Swilly is a designated salmonid water and therefore compliance with standards defined in S.I. 1988 No. 293 is required. Although these standards apply to the freshwater areas and so are not directly relevant to waters potentially affected by the proposed development, water quality in Lough Swilly is clearly important in maintaining conditions suitable for migration of salmonids.

**Commercial Shellfisheries**

As previously discussed, Lough Swilly supports a number of commercial shellfish farms and a significant increase in aquaculture activity is currently under debate. There are no designated shellfish waters in Lough Swilly requiring compliance with the EEC Shellfish Waters Directive[14] but the EC Shellfish Hygiene Directive[15] requires that certain bacteriological standards must be met for shellfish that are to be used for human consumption.



### 6.9.2 Predicted Trends

The Bathing Waters Directive is currently under review and there is likely to be a tightening of bacteriological standards.

Implementation of the Water Framework Directive (2000/60/EC) may lead to a requirement for improvements in water quality, particularly in relation to diffuse pollution from agriculture. Improvements to discharges elsewhere in Lough Swilly (e.g. Rathmullan and Letterkenny) will assist in improving water quality over the coming years.

### 6.9.3 Data Gaps

No modelling data regarding the influence of the current discharge from Buncrana on local bathing waters is available otherwise there is no further information that could reasonably have been collected as part of this assessment.

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[13] Amended by S.I. 1994 No. 145; S.I. 1996 No. 230; S.I. 1998 No. 177 and S.I. 2001 No. 22, which all add bathing waters to the list in the First Schedule.

[14] Directive 79/923/EEC (as amended) by 91/692/EEC

[15] Directive 91/492/EEC

# 6.10 Land Contamination

## 6.10.1 Existing Situation

The contaminants on a site will largely depend on the history of the site and on the range of materials handled on the site.

The assessment has used a theoretical approach to assess the impact of the proposed development on the liberation of contaminants. This approach has been based on experience gained on similar sites.

The proposed WWTW expansion and SSDC will be located within the boundary of the existing WWTW site. The existing site comprises buildings, wastewater treatment facilities, extensive areas surfaced with stone chippings, and access roads. The facility was commissioned in 1991 and, although it is possible that some pollution may have occurred during the life of the facility from leaks and small scale spills, this is likely to be organic and of minor significance.

The existing site is visited by vehicles on an infrequent basis and there are no fuel storage facilities on site. Consequently contamination by fuel oils and lubricants is likely to be minimal.



## 6.10.2 Predicted Trends

No significant future contamination of the development site is considered likely.

## 6.10.3 Information Gaps

No information gaps have been identified.

# 7. Impacts and Effects

## 7.1 Introduction

This section analyses the likely impacts and effects resulting from the construction and operation of the proposed WWTW upgrading and SSDC. The proposed works will take place within the boundary of the existing facility and so the majority of construction effects will be concentrated within this area. However, certain operational effects have the potential to be wider ranging, such as noise, air quality and landscape, and these have been fully assessed.

## 7.2 Landscape and Visual

### 7.2.1 Background

This section analyses the likely landscape and visual impacts and effects resulting from the construction and operation of the WWTW upgrading and SSDC at Buncrana. The existing site is already partially screened by landscape planting that is thought to have taken place following the construction of the original facility. It is intended to retain this landscaping in its current form.



### 7.2.2 Methodology

The landscape and visual assessment was prepared according to a methodology developed by Entec based upon the Guidelines for Landscape and Visual Impact Assessment jointly published by the Landscape Institute (LI) and the Institute of Environmental Assessment (IEA). The assessment distinguishes between landscape and visual effects, which are discussed separately.

- Landscape Impacts consist of the changes in the fabric, character and quality of the landscape. They include changes to the landscape as a resource such as the loss of elements or features or the alteration of the balance of features in a landscape causing a shift in the perceived landscape character.
- Visual Impacts relate to views of the landscape available from publicly accessible areas and residential dwellings and the predicted effects of these visual changes on the public and residents, i.e. receptors. Visual effects include the loss of important elements in a view, the obstruction of views or the introduction of new features or elements. Visual changes can be caused by a change of scale, bulk, colour or texture of an existing view. As with landscape effects, change can be beneficial as well as adverse.

The assessment of the likely landscape effects is based upon information gathered through field survey and desktop studies concerning the following factors which, in combination, make up the landscape:

- physical factors - geology, landform, soils, drainage, ecology and climate;
- human factors - archaeology/history, land-use and settlement patterns;
- aesthetic factors - visual and sensual considerations; and
- associations - cultural and historic.

These factors are considered in the designation of landscapes at national, regional and local levels.

The visual assessment is based upon the identification of potential visual receptors for the development. This is achieved by the prediction of the estimated visual envelope or "Zone of Visual Influence" (ZVI) of the development, i.e. the area or areas from within which it is predicted that people would have a view of the development (see **Figure 6.2**). The effects sustained by visual receptors within the estimated visual envelope are assessed as a product of their sensitivity to visual change and the predicted magnitude of that change.



### 7.2.3 Predicted Landscape Effects

The predicted landscape effects, as illustrated in **Table 7.1,** are concerned with the changes in the fabric, quality and character of the landscape caused by the construction and operation phases of the development. These changes may be temporary, such as soil storage mounds or, in most cases, permanent such as land-take or loss of landscape elements.

**Table 7.1 Predicted Landscape Effects**

| Activity/Operation | Landscape Impacts | Predicted Landscape Effects |
|---|---|---|
| Construction activities | Landscape character change | Temporary effects during construction activities |
| Operation of the site | Loss of land within existing compound | Increase in built elements within the site. |
| | Introduction of new vertical elements to the site | Change in character of the area around the site |

The landscape impacts and effects of the proposed development will include land-take within the existing compound and the introduction of new elements into the landscape.

The introduction of new elements including the aeration tanks, storm tank, sludge screening building, picket fence thickeners, and the extension of the inlet works

building will have the effect on the landscape character of the surrounding area of increasing the amount of built elements within the compound area.

### 7.2.4 Predicted Visual Effects

This section of the assessment considers what are predicted to be the main visual effects on the identified visual receptors that would result from the construction and operation of the proposed WWTW extension and SSDC. To minimise repetition, many individual receptors have been grouped together where it is considered that the predicted effects will be substantially the same (e.g. the majority of properties to the east of the site beyond the R238). The principal receptor groups are identified on **Figure 6.1** along with photo viewpoint locations. **Table 7.2** identifies the predicted visual effects of the proposals.

**Table 7.2 Predicted Visual Impacts and Their Effects: WWTW (Construction)**

| Predicted Visual Impacts | Predicted Visual Effects |
|---|---|
| Construction | |
| On-site construction activities | Temporary introduction of vertical elements that will break the skyline including excavation machines, cranes and piling equipment. |
| Construction traffic | Introduction of movement and activity on the and around site. |
| Operation | |
| Operation of the site | Change to the composition of the current view through the introduction of elements not previously there. This will apply principally to visual receptors with close to medium distance views of the facility. Removal of the Sludge Digestion Tank will have a positive visual effect as it is currently the tallest structure on the site. |
| Completion of mitigation screen planting | Although designed to partially screen the site the additional planting will itself constitute a new visual element in the landscape. |



During the construction phase there would be an increase in the amount of activity in and around the existing facility. In addition, the tops of plant and machinery including cranes and piling rigs would be visible from areas around the site. The erection of new buildings and plant would be visible to the west while the removal of the existing sludge digestion tank will have a positive effect.

Once operational the scene will have changed through the addition of the buildings and plant.

## 7.2.5 Evaluation of Landscape Effects

### Criteria

The significance of landscape effects reflects the sensitivity of the landscape to change (see Table **7.3**) and the magnitude of that change (see Table **7.4**). The evaluation of criteria and thresholds is primarily based upon professional judgement and is tailored to suit individual locations. It is important to use sensitivity criteria of an appropriate scale for the development.

The intention of identifying criteria is to aid in the separation of fact from interpretation and to assist in demonstrating the nature and extent of the identified landscape effects. The criteria in this case for evaluating sensitivity of landscapes and the positive and negative magnitudes of effect are outlined below.

**Table 7.3 Sensitivity of Landscape Resources**

| Landscape Resource Categories | Sensitivity |
|---|---|
| Nationally designated landscapes e.g. AONBs | High |
| Landscapes with common characteristic landscape features and elements | ↓ |
| Developed or previously developed land | Medium |
| Degraded landscapes | ↓ |
| | Low |



**Table 7.4 Magnitude of Landscape Effects**

| Predicted Landscape Effects | Level |
|---|---|
| Notable changes in landscape character over an extensive area or intensive change over a more limited area / complete loss of notable features or elements | High |
| | ↓ |
| Moderate changes over a localised area / partial loss / alteration of notable features or elements | Medium |
| | ↓ |
| Little change in any landscape feature | Low |

## 7.2.6 Significance of Effects

There has been a general consensus in recent landscape assessments on the recognition of three thresholds of significance that are derived from different combinations of landscape resource sensitivity and impact magnitudes. Once again the appraisal reflects the categories and principles laid down with the LI/IEA Guidelines. These are:

- '**major**' meaning high sensitivity or major magnitude;
- '**minor**' meaning medium sensitivity or some magnitude; and

- '**not significant**' meaning low sensitivity or minor magnitude.

The assessment of significance is on a qualitative basis, as a scoring system does not avoid subjectivity and suggests a certainty that may not be present. The results of this assessment are presented in **Table 7.5**

**Table 7.5 Landscape Effects and Evaluation of Significance**

| Landscape Effect | Type of Effect | Probability of Effect Occurring | Sensitivity | Magnitude of Effect | Significance Level | Significance Rationale |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Construction activities | Negative | Certain | Low | Low | Not significant | Temporary construction within existing compound boundary |
| **Operation** | | | | | | |
| Operation of the site | Negative | Certain | Low | Medium | Minor | Land take within the compound by new elements.<br>Minor change to the landscape character of the surrounding area through the increase in the number of buildings on the site |
| **Key:** | **Type** | **Probability** | **Sensitivity** | **Magnitude** | **Significance** | |
| | Negative | Certain | High | High | Major | |
| | Positive | Probable | Medium | Medium | Minor | |
| | | Unlikely | Low | Low | Not Significant | |



The evaluation of the landscape effects of the proposals indicate that there will be a number of individual localised negative landscape effects caused by the construction and operation of the site. When combined, these effects will give rise to a minor negative change to the landscape character in the locality.

### 7.2.7 Evaluation of Visual Effects

The likely visual effects of the proposed development are described below.

#### Criteria

Drawing on the assessment of visual effects in **Section 7.2.4**, this part of the report evaluates their significance. This significance is dependent on two factors:

- The sensitivity of the receptor to the identified impact; and
- The magnitude of the predicted changes as measured along an agreed continuum.

### Sensitivity of the receptor

Based on the *Guidelines for Landscape and Visual Assessment* (LI/IEA 1995), the different receptor categories are ranked in order of their sensitivity to visual impacts as set out in **Table 7.6**. It should be stressed that this table is indicative only as it would be impossible to rigidly tabulate sensitivity to change.

**Table 7.6 Sensitivity of Visual Receptors**

| Visual Receptor Categories | Sensitivity |
|---|---|
| Residential Areas | **High** |
| Isolated Residential Properties | ↓ |
| Motorists | **Medium** |
| Public Rights of Way | ↓ |
| Public and Private Recreational Open Space | **Low** |
| Business and Industry | |



### Magnitude of Effects

Magnitude of visual effect is a function of three factors:

- the number of visual receptors affected;
- the distance from receptors to the source(s) of visual impact; and
- the degree of change to existing views taking into consideration the agreed mitigation works as well as the extent of the proposed extension.

These factors are graded in accordance with **Table 7.7**.

**Table 7.7 Criteria for Evaluation of Magnitude of Visual Effects**

| Visual Effects | Numbers Affected | Distance From Sources of Impact |
|---|---|---|
| Substantial changes in views | Few: less than 5 properties/receptors | Close: less than 500 metres |
| Moderate changes in views | Moderate: 5-15 properties/receptors | Middle: 500 metres - 1 kilometre |
| Small changes in view | Many: over 15 properties/receptors | Long: over 1 kilometre |

Magnitude is expressed as high, medium or low.

## Significance of Effects

There has been a general consensus in recent landscape assessments on the recognition of three thresholds of significance, that are derived from different combinations of sensitivity and magnitude, reflecting the categories and principles laid down by the LI/IEA. These are:

- '**major'** meaning high sensitivity or high magnitude;
- '**minor'** meaning medium sensitivity or medium magnitude; and
- '**not significant**' meaning low sensitivity or low magnitude.
- It is clear that a number of intermediate situations occur with, for example, a receptor of medium sensitivity combined with an effect of high magnitude. Guidelines[16] suggest that in such situations, professional judgement should supplement the rigid application of matrix tables. The assessment of significance is on a qualitative basis, as a scoring system does not avoid subjectivity and suggests a certainty that may not be present.

The results of this analysis for receptors potentially affected by the construction and operation of the proposed development are shown in **Table 7.8**[17].



**Table 7.8 Evaluation of Visual Effects: Construction and Operation)**

| Visual Receptor | Type of Effect | Probability of Effect Occurring | Sensitivity | Magnitude of Effect | Significance Level | Significance Rationale |
|---|---|---|---|---|---|---|
| Residential receptors at location 4 Swilly Road | Negative | Certain | High | Medium | Minor | Although very close the site, the existing trees and vegetation to the north of Mill River and existing screening round the site provide a strong screen to the works from upper storey windows of properties |
| Residential receptors Aileach Road | Negative | Certain | High | Medium | Minor | Views of site screened by existing vegetation |
| Residential receptors at location 2, apartment block | Negative | Probable | High | Low | Not significant | Views towards the site are screened by existing vegetation |

[16] Landscape Institute Practice Note (01/99)

[17] Locations of receptors are cross referenced to those identified on Figure 6.1 (Site Location and Visual Receptors)

| Visual Receptor | Type of Effect | Probability of Effect Occurring | Sensitivity | Magnitude of Effect | Significance Level | Significance Rationale |
|---|---|---|---|---|---|---|
| Residential receptors at location 6, north of garage | Negative | Certain | High | Medium | Minor | Views towards the site are screened existing vegetation, stone walling and tourist office. |
| Residential receptors at location 8, south of garage | Negative | Certain | High | Medium | Minor | The Drift Inn and warehouse and existing vegetation will screen all of the properties except the bungalow (see photo viewpoint 5) |
| Residential receptors at location 14, Loch View | Negative | Certain | High | Medium | Minor | Existing vegetation around site will screen the majority of the works (see photo viewpoint 6) |
| Residential receptors at location 15, north of town | Negative | Certain | Low | Low | Not significant | Intervening properties and topography screen the works from this part of town (see photo viewpoint 8) |
| Motorists on R238 | Negative | Certain | Medium | Low | Not significant | Glimpsed views down entrance road possible as at present |
| Recreational receptors at location 5, GAA sports ground | Negative | Certain | Low | Low | Minor | Topography, Victoria Bridge and existing vegetation screen works |
| Recreational receptors at location 12, Buncrana Golf Course | Negative | Certain | Medium | Medium | Minor | Topography and existing vegetation screen the majority of the golf course from the works however, the 6th tee is directly adjacent to the site |
| Vehicular receptors at location 7, the Shell Garage | Negative | Certain | Low | Medium | Minor | Views as at present down entrance road to works |
| Business receptors at location 12, Stranagor Restaurant | Negative | Certain | Low | Low | Not significant | Existing vegetation and topography totally screen works from restaurant |
| Business receptors location 9, the Drift Inn | Negative | Certain | Low | Low | Not significant | No windows overlook site from Drift Inn |
| Business receptors at location 10, Inishowen Gateway | Negative | Certain | Low | Low | Minor | Glimpsed views of the site may be possible from upper storey windows on the west facing façade of the hotel |

| Visual Receptor | Type of Effect | Probability of Effect Occurring | Sensitivity | Magnitude of Effect | Significance Level | Significance Rationale |
|---|---|---|---|---|---|---|
| Hotel | | | | | | |
| Industrial receptors at location 11, the fire station | Negative | Certain | Low | Low | Not significant | No views of site |
| Industrial receptors at location 13, the Fruit of the Loom factory | Negative | Certain | Low | Low | Not significant | No views of site |
| Industrial receptors at location 1, Buncrana Pier | Negative | Certain | Low | High | Major | As seen in Photomontage B, views are available into west facing end of works site. |
| **Key:** | **Type** | **Probability** | **Sensitivity** | **Magnitude** | **Significance** | |
| | Negative | Certain | High | High | Major | |
| | Positive | Probable | Medium | Medium | Minor | |
| | | Unlikely | Low | Low | Not Significant | |



It is predicted that only a industrial receptors at Buncrana Pier would sustain negative visual effects of major significance due to their close proximity to the site.

Other visual receptors, whilst being in sensitive categories, would only sustain effects of minor, or non-significant, visual significance due to intervening screening elements. The proposals take place on the existing site of the WWTW and as such, the visual character of area will only be altered slightly by the proposals. The removal of the existing sludge digester however will have a positive effect on the surrounding receptors as this is currently the most visually obvious element in the works.

## 7.3 Air Quality and Odour

### 7.3.1 Construction Phase

**Ambient Air Quality**

During the construction phase of the proposed WWTW upgrading and SSDC, two main effects will occur, arising from increases in traffic on local roads and from dust arising from construction activity.

Emissions of gaseous pollutants and fine particulate matter will only be from vehicle exhausts. Due to the nature of the construction activity vehicle movements will be low, any associated increases in emissions are also likely to low and the distance of receptors

from the site means that there will be no significant change in ambient concentrations of pollutants.

**Dust**

The extent to which dust nuisance might occur is difficult to predict and assess. The potential for nuisance depends upon the respective locations of the sensitive receptors and work being undertaken. In addition to the nature of the activity being carried out, wind direction, wind speed and precipitation will all influence whether the potential for nuisance exists. Most of these factors are dependent on site operating and weather conditions at any given time.

As a general rule, dust nuisance would not be expected at a distance beyond 250m from the work activity and then only when these receptors are downwind of the construction work.

**Odour**

No odour issues are anticipated as a result of construction activities as no additional odour sources will be present during this phase.

### 7.3.2 Operational Phase

**Ambient Air Quality**

There is not likely to be any significant effect on air quality during the operation of the Inishowen WWTW and SSDC site. Currently, for both carbon monoxide and nitrogen dioxide, the baseline values (based on data from Derry) are well within the limit values set out in Irish law (as set out in the European Directives).

There is not expected to be an adverse effect on air quality due to the proposed works due to the lack of sources of pollutants, but the mitigation methods outlined below will help minimise any change.



**Dust**

Site based activity, such as earth moving and off-site traffic associated with the proposed works, has the potential to generate emissions of dust. However, given the adoption of the mitigation measures outlined below, the change in air quality, in relation to dust, is not expected to be significant.

During operation, traffic levels are not anticipated to generate any significant change in local air quality or dust emissions.

**Odour**

Odour dispersion modelling for the Inishowen WWTW upgrading and SSDC has been undertaken based on the preferred development option of a SSDC (using Picket Fence Thickeners) and expansion/upgrading of the WWTW using Extended Aeration.

The dispersion modelling has been conducted using the AERMOD Prime dispersion model, as described in **Section 6.3.1**.

Emission data for the various sources from the WWTW have been derived from referenced sources[18],[19] and these are shown in **Table 7.9** and **7.10**.

**Table 7.9 Emission Parameters for Area Sources**

| Source | Emission Rate ($ou_E/s$) | Total Area ($m^2$) |
|---|---|---|
| Distribution Chamber 1 | 40 | 10 |
| Aeration Lanes | 45 | 378 |
| Storm Tank | 0.15 | 98 |
| Inter. Pumping Station | 10 | 3 |
| Sludge Pumping Station | 250 | 1 |

**Table 7.10 Emission Parameters for Point Sources**

| Source | Emission Rate ($ou_E/s$) | Height (m) | Temperature | Efflux Velocity (m/s) | Diameter (m) |
|---|---|---|---|---|---|
| Odour Control Unit | 29.5 | 5 | Ambient | 15 | 0.22 |



Using 3 years of hourly sequential meteorological data obtained from Derry Airport (2000 to 2002 inclusive) contour plots have been produced to show the predicted concentration of odour as the 98$^{th}$ percentile of hourly averages (see **Figure 7.1**), with the results shown in tabular form, in **Table 7.11**. It can be seen that the only direction in which the 5 $ou_E/m^3$ (as the 98$^{th}$ percentile of hourly averages) will continue to be exceeded at nearby buildings is to the north west. In the baseline situation this exceedance currently occurs to the north, east, south and north west.

It is therefore necessary to implement odour control mitigation within the design of the site. These measures are detailed in **Section 8.3**.

[18] Entec Emissions Database

[19] UKWIR (2001) Odour Control in Wastewater Treatment – A Technical reference Document 01/WW/13/3

**Table 7.11 Predicted Distance from site centre to Odour Concentrations of 5 $ou_E/m^3$**

| Direction from Site | Predicted Distance (m) from site boundary for Odour concentration of 5 $ou_E/m^3$ as the 98th percentile of hourly averages | | | Approximate distance to the nearest buildings (m) |
|---|---|---|---|---|
| | 2000 | 2001 | 2002 | |
| North | 160 | 196 | 114 | **170** |
| North-East | 89 | 114 | 79 | **300** |
| East | 69 | 88 | 60 | **110** |
| South-East | 34 | 65 | 30 | **150** |
| South | 66 | 119 | 67 | **100** |
| South-West | 70 | 82 | 51 | **-** |
| West | 188 | 165 | 120 | **-** |
| North-West | 323 | 180 | 115 | **150** |

Directions in which buildings lie within the 5 $ou_E/m^3$ contour for at least two of the three baseline years are shaded in grey.

**Table 7.12** indicates the change in the predicted distance of the 5 $ou_E/m^3$ (as the 98th percentile of hourly averages) between the baseline situation and the predicted future situation.



**Table 7.12 Change in predicted distance from site boundary to Odour Concentrations of 5 $ou_E/m^3$, baseline to future.**

| Direction from Site | Change in predicted distance (m) from site boundary for Odour concentration of 5 $ou_E/m^3$ as the 98th percentile of hourly averages | | |
|---|---|---|---|
| | 2000 | 2001 | 2002 |
| North | -94 | -84 | -43 |
| North-East | -59 | -73 | -50 |
| East | -91 | -84 | -83 |
| South-East | -63 | -40 | -70 |
| South | -74 | -81 | -66 |
| South-West | -60 | -64 | -63 |
| West | -81 | -50 | -38 |
| North-West | -122 | -34 | -31 |

It can be seen that there is a predicted decrease in the odour signature of the site, as identified by a decrease in the distance the 5 $ou_E/m^3$ (as the 98th percentile of hourly averages) will be located from the site boundary.

**Table 7.13 Effects and Evaluation of Significance - Air Quality**

| Environmental effect | Type of effect | Probability of effect occurring | Policy Importance (or sensitivity) | Magnitude of effect | Significance level | Rationale |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Increase in ambient concentration of air pollutants | Negative | Unlikely | Local | Minor | Not significant | The nature of the construction activities and the low level of vehicle movements |
| Dust arising from construction causing nuisance at sensitive receptors | Negative | Unlikely | Local | None | Not significant | Mitigation measures that would be employed, and the distance from the works to the sensitive receptor |
| Odour Emissions causing nuisance at sensitive receptors | Negative | Unlikely | Local | None | Not significant | Odour emissions would be same as baseline |
| **Operation** | | | | | | |
| Increase in ambient concentration of air pollutants | Negative | Unlikely | Local | None | Not significant | No increase in emissions |
| Odour Emissions causing nuisance at sensitive receptors | Negative | Unlikely | Local | Minor | Not significant | Predicted concentrations at sensitive receptor less than selected nuisance criteria in all directions once odour control mitigation is implemented (see Section 8.3) |

| Key: | Type | Probability | Policy Importance | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | International | Major | Major |
| | Positive | Likely | National (Eire) | Some | Minor |
| | Unknown | Unlikely | County | Minor | Not Significant |
| | | | District | None | |
| | | | Local/Parish | | |



## 7.4 Noise & Vibration

Noise effects have been assessed in accordance with the methodology and criteria outlined in Irish legislation and guidance where possible. Where such information is not available, equivalent British Standards have been used. Construction noise effects have been assessed using the methodology and information outlined in *BS5228 Noise and Vibration Control on Construction and Open Sites, 1997.* The information outlined in the *BS4142 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas 1997* has been used to assess noise effects from the operational phase of the development.

### 7.4.1 Construction Noise Impacts

Construction works are often characterised by temporary increases in ambient noise levels which may result in short-term disturbance to nearby sensitive receptors. Early establishment and maintenance of good site relations is a key to ensuring that unnecessary disturbance does not result from construction operations.

Details of the construction programme and the anticipated equipment requirements are not yet established and it is therefore not possible to accurately predict the noise levels which could be caused by the construction activity.

During the construction and commissioning of the plant there would be a number of different phases, some of which would overlap. Those with greatest potential for noise generation are:

1. Site Preparation – mainly involving creation of construction laydown and working areas, clearance of overlying peat and preparation of base for foundations;
2. Civils Stage – creation of foundations, buildings, services, i.e. drains, roads, etc;
3. Steel Erection and installation of mechanical plant - construction of structural steel framework and placement of equipment on foundations using a range of cranes and on-site assembly of plant; and
4. Duct and Pipework - Fabrication and installation of pipes and ducts.



Construction activities will normally be restricted to 07:00 – 18:00 on weekdays and 08:00 – 13:00 on Saturdays. Evening and night-time working is not expected although it is possible that limited 24 hour working may be required to meet specific demands, however, this would be with prior agreement from the local planning authority. Similarly, working on Saturday afternoons, Sundays and Bank Holidays is not expected unless a specific requirement arises, but again, this would require prior agreement.

The final phases including painting of external surfaces and installation of electrical and instrumentation equipment would not generate significant noise and have not been considered further.

An anticipated equipment list for the works has been identified. This information is presented in **Appendix C**, as well as estimated sound power levels for the key noise sources.

As the actual types of equipment are not known at this stage, typical source noise data for the construction plant has been obtained from the available literature. These data provide an indication of noise levels from construction plant taken from measurements at various sites.

Consideration of miscellaneous equipment including compressors, hand tools, generators etc. have a significantly lower noise output than the heavy construction plant identified and any potential noise impacts can be effectively controlled by means of siting and screening.

### 7.4.2 Construction Noise Predictions

Day to day activities will vary and not all construction equipment will be operational at all times. However, in order to assess potential construction noise impacts, a number of possible scenarios can be considered for the proposed development areas. These are based on periods when activities overlap within the construction programme and assume that all the plant required for those construction stages are operational the whole time they are on site. In reality it is highly unlikely that such a situation would exist and therefore these predictions can be taken as the worst case scenario. The scenarios considered are:

1. During the earthworks/site preparation, foundations, construction and civils works occurring elsewhere on site;
2. Steel fabrication close to the site boundary, with installation of mechanical plant and duct/pipe fabrication taking place at different locations within the site.

It should be noted that the plant noise levels set out in *BS5228 Noise and Vibration Control on Construction and Open Sites, 1997* which has been used as a data source for the assessment, are worst case. There is, therefore, scope for mitigation and reduction by use of modern, quieter plant.

Predictions have been made for both noise sensitive locations and the results are summarised in **Table 7.14**, full calculations are included as **Appendix C**.



**Table 7.14 Construction Noise Predictions, $L_{Aeq,\ 1hour}$ dB**

| Location | Scenario 1: Earthworks and Foundations | Scenario 2: Civils, steel fabrication and pipe work |
|---|---|---|
| No.4 Oakfield Court | 57.8 | 56.5 |
| No.2 Swilly Terrace | 54.9 | 53.6 |

### 7.4.3 Traffic Noise Impacts During Construction

Traffic noise consists of two main parts:

- vehicle engine/exhaust noise; and
- tyre noise.

Noise from traffic travelling along a road consists of a contribution from a number of different sources. The overall traffic noise level is influenced by traffic flow, speed and composition (% HGV's), road gradient and road surface. The noise experienced by a nearby receptor is dependent upon the separation distance from the road and any intervening ground cover and/or screening.

The potential impact of construction traffic affecting the closest properties to the proposed site will be considered together with those properties along the route in and out of the site. Heavy construction traffic will pass a number of residential dwellings along and close to the R238 which will be the route for all traffic travelling to the site.

As a general rule a doubling of the traffic flow gives a 3 dB increase in the associated noise level for road traffic. As the construction works are relatively small scale, the construction traffic will not result in a doubling of traffic volume (see **Section 7.12**). It is therefore considered that any change in traffic noise will be imperceptible and not significant.

### 7.4.4 Operational Noise Impacts

The aim of this part of the assessment is to determine acceptable operational noise levels, the Environmental Noise Criterion (ENC) for the WWTW, which is based on the existing background noise levels at the nearest properties. As the final plant items have not been determined, it has not been possible to prepare any detailed calculations for operational noise in this EIS.

In order to determine the ENC, the most appropriate standard is *BS4142 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Users 1997*. This UK Standard has been used as it has no Irish equivalent. It provides a method for determining whether a new noise source is likely to cause noise complaints by comparing the operational noise level with the measured background. An increase of 10 dB or more means complaints are likely, whereas 5dB is of marginal significance. For differences of less than 5dB the likelihood of complaints reduces further.



**Table 7.15** shows the existing weekday, daytime background noise levels for each location together with the ENC based on $L_{A90\ (weekday\ night\text{-}time)}$ + 5dB levels taken from **Table 6.8**.

**Table 7.15 Environmental Noise Criteria Operational Noise**

| Location | Background Noise Level $L_{A90}$ dB | Operational ENC Levels as $L_{Aeq,1\ hour}$ (Free Field) |
|---|---|---|
| No.2 Swilly Terrace | 31.5 | 36.5 |
| No.4 Oakfield Court | 31.6 | 36.6 |

### 7.4.5 Construction Noise Impact Criteria

The main effects that could result from noise impacts during the construction period can be identified as nuisance/disturbance to nearby residents or to other sensitive locations. An increase in ambient noise levels can result in sleep disturbance, annoyance and

stress. However, this is dependent upon the overall noise level, the times over which it occurs, the frequency of the noise and its character, i.e. an intermittent noise can be subjectively more annoying than a steady noise.

The area around the site is semi-rural and at the present time would only appear to be affected by a small number of noise sources, primarily the surrounding roads. The relevant criteria for the assessment of impact on construction noise for the surrounding areas has therefore been taken per **Table 7.16**.

**Table 7.16 Assessment criteria for Construction Noise Impact**

| | |
|---|---|
| Daytime (07:00 – 19:00) facade[1] LAeq (12 hour) | 70dB (A) – For Rural, suburban and urban areas |
| Evening (19:00 – 22:00) facade LAeq (3 hour) | 60dB (A) – No construction anticipated |
| Night-time (22:00 – 07:00) | No Construction |

Source: Advisory Leaflet 72 Noise Control on Building Sites

These levels are not proposed as construction noise limits for the WWTW but they are useful for comparative purposes.

It is anticipated that construction noise levels during the worst-case earthworks stage will fall within the above criteria for daytime construction noise levels. Noise generating activities are not anticipated to occur during the evening or night-time periods. Although construction noise is likely to be audible at the closest properties, particularly during working in the closest areas of the site, it is likely to be well below generally accepted criteria for construction noise.



### 7.4.6 Operational Environmental Noise Criterion

The ENC for the proposed facility will form the basis of the operational design criteria for the chosen contractor. The tender documentation will state the need to reduce the impacts of noise and will specify the ENC for each of the representative locations. Confirmation of compliance with the ENC will be required. This should ensure that noise complaints due to operation of the new development are unlikely to occur.

### 7.4.7 Evaluation Criteria

Four criteria have been used in the evaluation of the predicted effects of the proposed development:

i) The type of effect, (i.e. whether it is positive, negative or unknown).

ii) The probability of the effect occurring based on the scale of certain, likely or unlikely. If there is uncertainty this will be noted.

iii) The policy importance (or sensitivity) for the evaluation, (i.e. international, national, county, district or local/parish importance). An effect can have a policy importance (or sensitivity) at more than one level.

iv) The magnitude is quantified using a simple scale of major, some, minor or no effect. In some cases it is not possible to quantify the magnitude of impact and therefore not quantified is used in these instances.

The findings in relation to all of these criteria are brought together to give an assessment of significance for each effect, based on professional judgement. Effects are considered to be of major, minor or no significance. Those effects rated 'major' equate to the term 'significant effects' in the EIA Regulations 1999. The assessment is presented in **Table 7.17**.

**Table 7.17 Effects and Evaluation of Significance**

| Environmental effect | Type of effect | Probability of effect occurring | Policy Importance (or sensitivity) | Magnitude of effect | level | Significance Rationale |
|---|---|---|---|---|---|---|
| Construction Noise | | | | | | |
| Noise at surrounding existing properties due to construction activity including construction traffic. | Negative | Likely | Local | Mostly Minor, however, could be short periods of some effect during specific works. | Minor | High noise levels are likely to be short-term and would generally vary over the construction phase.<br><br>Construction activity will be limited to daytime periods only. |
| Operational Noise | | | | | | |
| Noise at surrounding properties. | Negative | Unlikely | Local | None | Not Significant | Operation noise levels from the WWTW are expected not be sufficiently high to cause a nuisance to the residential properties. Therefore can be expected not to influence ambient noise conditions at surrounding receptors. |
| Traffic Noise | | | | | | |
| Noise at properties on surrounding road networks resulting from the increase in traffic associated with the development. | Negative | Unlikely | Local | Minor | Minor | The predicted percentage increases in total traffic are well below levels required to increase traffic noise levels by a perceptible amount. |

| Key: | Type | Probability | Policy Importance | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | International | Major | Major |
| | Positive | Likely | National | Some | Minor |
| | Unknown | Unlikely | County | Minor | Not Significant |
| | | | District | None | |
| | | | Local | | |

## 7.5 Traffic and Transport

### 7.5.1 Methodology

The methodology used in this assessment accords to that set out in the UK's Institute of Environmental Assessment's[20] (IEA's) *'Guidelines for the Environmental Assessment of Road Traffic'*, published in 1993. There is no equivalent Irish guidance and this internationally accepted methodology is deemed to incorporate best available practice in lieu of appropriate Irish guidance. The assessment therefore focuses on:

- potential impacts on local roads and the users of those roads; and
- potential impacts on land uses and environmental resources fronting those roads, including the relevant occupiers and users.

The construction phase of the proposed SSDC at Buncrana is expected to last approximately 12 months, during this period there will be temporary effects arising from construction traffic moving to and from the site. Throughout the operational phase sludge tankers will travel from the surrounding satellite centres to the proposed SSDC at Buncrana and then from here to the main hub at Letterkenny.

The methodology used in this assessment will be based on a comparison between predicted traffic flows on potentially affected or sensitive routes with and without operational and construction traffic. Criteria are then applied to establish whether significant environmental effects are likely.

The following rules, taken from the IEA's guidelines, have been used as a screening process to define the scale and extent of the transportation assessment:

- **Rule 1** Include highway links where two-way traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- **Rule 2** Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

[20] Now the Institute of Environmental Management and Assessment (IEMA)

It should be noted that increases below 10% are generally considered to be insignificant given that daily variations in background traffic flow may fluctuate by this amount. Changes in traffic flow below this level are therefore assumed to result in no discernible environmental effect.

It is not anticipated that there are any particularly sensitive areas within the routes that operational traffic will take to and from the site. The routes under consideration are already regularly used by HGVs, coach tour buses and agricultural machinery. Therefore the threshold used in the assessment will be 30%.

### 7.5.2 Baseline Traffic Flows

It is proposed that construction of the SSDC works will take place in year 2006 and that it will be fully operational by year 2007. It is assumed that background traffic flows within the road network will increase annually even without the development going ahead. As a result of this, traffic figures will be factored up to represent the predicted background traffic for the construction and opening years.

Using statistics taken from the 'National Roads Needs Study' produced by the National Roads Authority (NRA), it is considered that flows are anticipated to increase annually by 4%. By using this 4% growth and applying it to existing counts available, an estimation of the background traffic flows that exist on these links can be made.

It is proposed that construction working hours will normally be restricted to Mon-Fri between 08:00 and 19:00, and Saturday's between 08:00 and 13:00. **Table 7.18** and **Table 7.19** show predicted background traffic flows during construction hours for the periods of Monday-Friday and Saturday respectively.



**Table 7.18 Predicted average weekday two-way background traffic for the Construction Year (2006) and Opening Year (2007) (Mon-Fri 0800-1900)**

| Location | Existing Traffic (inc HGVs) (2003) | Existing HGVs | Predicted Traffic (inc HGVs) (2006) | Predicted HGVs (2006) | Predicted Total Traffic (2007) | Predicted HGVs (2007) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of the roundabout with the Inner Relief Road)[1] | 7585 | 299 | 8532 | 336 | 8873 | 350 |
| R238. (SOUTH of the roundabout with the Inner Relief Road)[1] | 7829 | 395 | 8806 | 444 | 9159 | 462 |

Source : [1] Count On Us Ltd Traffic Consultants

**Table 7.19 Predicted background two-way traffic for the Construction Year (2006) and Opening Year (2007) (Sat 0800-1300)**

| Location | Existing Traffic (inc HGVs) (2003) | Existing HGVs | Predicted Traffic (inc HGVs) (2006) | Predicted HGVs (2006) | Predicted Total Traffic (2007) | Predicted HGVs (2007) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of the roundabout with the Inner Relief Road)[1] | 2255 | 89 | 2537 | 100 | 2638 | 104 |
| R238. (SOUTH of the roundabout with the Inner Relief Road)[1] | 2279 | 97 | 2564 | 109 | 2666 | 113 |

Source : [1] Count On Us Ltd Traffic Consultants

### 7.5.3 Construction Effects

It is anticipated that the construction and commissioning phase of the proposed SSDC will be carried out within a 12 month period. Based on the size of the development extension and the length of the construction period, it is assumed that a maximum of two HGV's per day will enter the site. This equates to a total of four HGV movements per average working day in and out of the site.

It has also been assumed that a total of approximately 25 construction workers will be at the site during the most intense phase of the construction period. Based on a worse case scenario that each of these workers will drive alone to the site, then this will equate to a total of 50 vehicle movements per average working day in and out of the site. For the purpose of this assessment, it is assumed that 100% of the generated traffic uses all the routes to present a worst-case scenario. In reality this situation would not occur as staff and operational vehicles will use several different routes.

**Table 7.20** and **Table 7.21** shows the impact, in percentage terms, of the development related construction traffic relative to the same time-period of existing background traffic in the year of construction (2006).

**Table 7.20 Predicted changes in traffic flows during construction period. (Based on two-way daily flows, Mon-Fri only, between site opening hours of 0800-1900)**

| Location | Predicted Total Traffic (inc HGVs) (2006) | Predicted Total HGVs (2006) | Development Generated Traffic (inc HGVs) (2006) | Development Generated HGVs (2006) | % increase Total Traffic (inc HGVs) (2006) | % increase HGVs (2006) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of roundabout with Inner Relief Road) | 8532 | 336 | 54 | 4 | 0.6% | 1.2% |
| R238. (SOUTH of roundabout with the Inner Relief Road) | 8806 | 444 | 54 | 4 | 0.6% | 0.9% |

**Table 7.21 Predicted changes in traffic flows during construction period. (Based on two-way daily flows, Sat only, between site opening hours of 0800-1300)**

| Location | Predicted Total Traffic (inc HGVs) (2006) | Predicted Total HGVs (2006) | Development Generated Traffic (inc HGVs) (2006) | Development Generated HGVs (2006) | % increase Total Traffic (inc HGVs) (2006) | % increase HGVs (2006) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of roundabout with Inner Relief Road) | 2537 | 100 | 23 | 2 | 0.9% | 2.0% |
| R238. (SOUTH of roundabout with the Inner Relief Road) | 2564 | 109 | 23 | 2 | 0.9% | 1.8% |

[1] = Generated traffic figures for Saturday are based on 42% on that used for weekdays due to reduced site opening hours.



Based on the impacts detailed in **Table 7.20** and **Table 7.21**, and the IEMA's threshold test, no further assessment is required during the peak stage of construction, for any of the sections of road considered.

### 7.5.4 Operation Effects

It is intended that the SSDC will be automatically controlled and will therefore only require a small amount of additional staff. It is predicted that there is likely to be just one full time operator with an additional assistant/technician. There will also be occasional visitors to the site during some working days, for the purposes of this assessment it is assumed that 8 two-way trips per day are related to staff and visitors.

It is proposed that the seven satellite centres will export 84.4 tonnes of dry solids (tds) to Buncrana annually. This will be in addition to the sludge arising at Buncrana itself, which at the anticipated opening year is expected to be approximately 131tds, rising to 243tds by year 2022. All of which will then be transported to the main hub at Letterkenny. The trips associated with these figures is very minimal, and so a maximum worst case of 4 two-way trips per day would be sufficient to account for tankers entering and exiting the SSDC.

Based on the above assumptions, a worst case scenario is likely to produce just 12 two-way trips to and from the site per day by 2022. The impacts of these are shown on **Table 7.22** (Mon-Fri) and **Table 7.23** (Sat).

**Table 7.22 Predicted average weekday background and site operational traffic flows for 2022 (Mon-Fri only, between site opening hours of 0700-1900)**

| Location | Predicted Existing Traffic (inc HGVs) (2022) | Predicted Existing HGVs (2022) | Development Generated Traffic (inc HGVs) (2022) | Development Generated HGVs (2022) | % increase Total Traffic (inc HGVs) (2022) | % increase HGVs (2022) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of roundabout with Inner Relief Road) | 15980 | 630 | 12 | 4 | 0.08% | 0.6% |
| R238. (SOUTH of roundabout with the Inner Relief Road) | 16495 | 832 | 12 | 4 | 0.07% | 0.5% |



**Table 7.23 Predicted average weekday background and site operational traffic flows for 2022 (Sat only, between site opening hours of 0800-1300)**

| Location | Predicted Existing Traffic (inc HGVs) (2022) | Predicted Existing HGVs (2022) | Development Generated Traffic[1] (inc HGVs) (2022) | Development Generated HGVs[1] (2022) | % increase Total Traffic (inc HGVs) (2022) | % increase HGVs (2022) |
|---|---|---|---|---|---|---|
| R238 St Orans Road. (NORTH of roundabout with Inner Relief Road) | 4750 | 188 | 5 | 2 | 0.1% | 1.07% |
| R238. (SOUTH of roundabout with the Inner Relief Road) | 4801 | 204 | 5 | 2 | 0.1% | 0.99% |

[1] = Generated traffic figures for Saturday are based on 42% on that used for weekdays due to reduced site opening hours.

Based on the information displayed in **Table 7.22** and **Table 7.23** no further assessment is required during the operational period of the development for any of the roads considered.

### 7.5.5 Information Gaps

Detailed information relating to the construction of the SSDC will not be available until the contract is awarded to the contractor. Nevertheless, for the purposes of this traffic assessment, some assumptions have been made regarding traffic generated during both the construction and operational phases' of the development, and these have been based on absolute worst case scenarios.

### 7.5.6 Evaluation of Effects

Professional judgement is used to assess the findings in relation to each of these criteria to give an assessment of significance for each effect. Effects are considered to be of major or minor significance, or not significant. This is detailed below in **Table 7.24.**

**Table 7.24 Effects and Evaluation of Significance – Traffic and transport**

| Effect | Type of Effect | Probability of Effect Occurring | Level of Exposure | Magnitude of Effect | Significance Level | Rationale |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Increase in traffic on R238 (NORTH of roundabout with Inner Relief Road) | Negative | Certain | Low | Minor | Not Significant | Increases are predicted to be well below the threshold of significance. |
| Increase in traffic on R238 (SOUTH of roundabout with the Inner Relief Road) | Negative | Certain | Low | Minor | Not Significant | Increases are predicted to be well below the threshold of significance. |
| **Operation** | | | | | | |
| Increase in traffic on R238 (NORTH of roundabout with Inner Relief Road) | Negative | Certain | Low | Minor | Not Significant | Increases are predicted to be well below the threshold of significance. |
| Increase in traffic on R238 (SOUTH of roundabout with the Inner Relief Road) | Negative | Certain | Low | Minor | Not Significant | Increases are predicted to be well below the threshold of significance. |
| Key: | Type | Probability | Exposure | Magnitude | Significance | |



| Key: | Type | Probability | Exposure | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | High | Major | Major |
| | Positive | Likely | Medium | Medium | Minor |
| | Unknown | Unlikely | Low | Minor | Not Significant |
| | | | | None | |

# 7.6 Socio-Economics

## 7.6.1 Construction Effects

The location of the proposed development on the outskirts of Buncrana mean that construction will take place close to the main residential and industrial population. The assessments presented in **Sections 7.3** (air quality and odour), **7.4** (noise) and **7.5** (traffic) indicate that no significant effects are likely that will disturb the local populus causing social nuisance.

A benefit of the temporal construction period will be a slight increase in the workforce in the town which may result in some small benefit to local businesses.

## 7.6.2 Operation Effects

The operation of a SSDC and the extension of the existing WWTW at Buncrana will provide for the immediate and long-term expansion of the residential, commercial and industrial populations in the town and the wider Inishowen area.

A major socio-economic effect of the development is the benefit to be gained by the provision of adequate sewage sludge treatment infrastructure to the local area. The new SSDC will therefore contribute to a sustainable management programme for dealing with the sludge stream and promote orderly economic growth whilst safeguarding the environment.

Furthermore the upgrading of the existing facilities will ensure that the impact of the effluent on Lough Swilly is minimised. This is particularly significant given the importance of the Lough as a wildlife site, as a site of shellfish aquaculture, and as a recreational resource.



## 7.6.3 Evaluation of Effects

Predicted socio-economic effects are evaluated in **Table 7.25**.

**Table 7.25 Effects and Evaluation of Significance – Socio-economic**

| Environmental effect | Type of effect | Probability of effect occurring | Policy Importance (or sensitivity) | Magnitude of effect | Significance level | Rationale |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Imported workforce spending money in the local community | Positive | Uncertain | Local | Minor | Not Significant | Some very minor spend may occur on accommodation and subsistence. |

| Environmental effect | Type of effect | Probability of effect occurring | Policy Importance (or sensitivity) | Magnitude of effect | Significance level | Rationale |
|---|---|---|---|---|---|---|
| **Operation** | | | | | | |
| Increased wastewater treatment capacity for an expanding population | Positive | Certain | Local | Major | Major | Increased capacity at the WWTW will ensure that future growth is accommodated without comprising environmental quality. |
| Sustainable management of sewage sludge | Positive | Certain | Local | Major | Major | The SSDC will contribute to sustainable management of this waste stream in County Donegal. |

| Key: | Type | Probability | Policy Importance | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | International | Major | Major |
| | Positive | Likely | National | Some | Minor |
| | Unknown | Unlikely | County | Minor | Not Significant |
| | | | District | None | |



# 7.7 Flora and Fauna

## 7.7.1 Construction Effects

### Terrestrial Habitats

As previously discussed the proposed WWTW upgrading and SSDC will be constructed within the boundary of the existing WWTW facility and ample space is available for all construction activities and material storage. The site is currently devoid of vegetation and consequently there will be no impact on any habitats or species of ecological interest. The boundary of the site has been subject to previous screen planting using a variety of native and non-native species. This screen planting is quite well developed and it is proposed to retain this in its current form.

### Aquatic Habitats

During the construction phase there is the potential for pollutants to migrate from the site to the local water environment via the existing surface water drainage system. Lubricants, fuel oils and other chemicals may potentially have an acute or chronic toxicological effect on the aquatic fauna present, particularly sensitive macroinvertebrate species and fish eggs and fry. However, the most significant impact that may arise from construction work is the liberation of suspended solids, which can smother habitat and damage the delicate gill structures of some macroinvertebrates and fish.

**Section 7.9.1** outlines predicted construction effects on water quality.

### 7.7.2 Operational Effects

**Terrestrial Habitats**

There will be no disturbance of terrestrial habitats in the vicinity of the site due to operational requirements.

**Aquatic Habitats**

**Section 7.9.2** outlines predicted operational effects on water quality and this has a very close association with potential effects on aquatic dependant species and habitats. The predicted overall improvement in water quality due to implementation of secondary treatment at Buncrana will result in an improvement in conditions for aquatic ecology and the assessment shows that both BOD and ammonia will not be at levels which could result in effects on the local marine ecology.

### 7.7.3 Evaluation of Effects

Predicted ecological effects are evaluated in **Table 7.26**.



**Table 7.26 Effects and Evaluation of Significance – Flora and Fauna**

| Environmental effect on receptors | Type of effect | Probability of effect occurring | Policy Importance (or sensitivity) | Magnitude of effect | Significance | |
|---|---|---|---|---|---|---|
| | | | | | Level | Rationale |
| **Construction** | | | | | | |
| Disturbance of vegetation and associated fauna | Negative | Unlikely | Local | Minor | Not significant | No activity outside is envisaged. |
| Potential for reduced diversity and abundance of aquatic dependant ecology | Negative | Unlikely | Local | Low | Not significant | Any result of contaminated run-off is likely to be small after following mitigation specified in Section 8. |
| **Operation** | | | | | | |
| Permanent loss of vegetation | Negative | Certain | Local | Low | Not significant | The habitat within the site is of low conservation value. |
| Potential for increased diversity and abundance of aquatic dependant ecology | Positive | Likely | Local | Low | Not significant | Although water quality will increase it is not clear if this will result in a significant improvement in marine ecology although conditions will clearly improve to a degree. |

| Key: | Type | Probability | Policy Importance | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | International | Major | Major |
| | Positive | Likely | National | Some | Minor |
| | Unknown | Unlikely | County | Minor | Not Significant |
| | | | District | None | |
| | | | Local | | |

## 7.8 Cultural Heritage

### 7.8.1 Construction Effects

There are no known features of cultural heritage which will be affected during construction, as this will be contained to within the existing WWTW site. Any archaeological remains present on the site are likely to have been removed, lost, damaged or disturbed during the construction of the WWTW. Consequently any future development within the site is unlikely to impact upon any cultural heritage features, either directly or indirectly.

### 7.8.2 Operation Effects

No effects on cultural heritage are anticipated as a result of operation of the scheme.

### 7.8.3 Evaluation of Effects

Predicted ecological effects are evaluated in **Table 7.27**.



**Table 7.27 Effects and Evaluation of Significance**

| Cultural Heritage | Type of Effect | Probability of Effect Occurring | Policy Importance or sensitivity | Magnitude of Effect | Significance Level | Rationale |
|---|---|---|---|---|---|---|
| Construction | | | | | | |
| Loss of features of cultural heritage | Negative | Unlikely | Unknown | None | Not Significant | No known features of cultural heritage interest will be affected due to the restricted construction to be located entirely within the existing WWTW boundary. |

| Key: | Type | Probability | Policy Importance | Magnitude | Significance |
|---|---|---|---|---|---|
| | Negative | Certain | International | Major | Major |
| | Positive | Likely | National (UK) | Medium | Minor |
| | Unknown | Unlikely | Regional | Minor | Not Significant |
| | | | District | None | |
| | | | Local | | |

# 7.9 Water Quality

## 7.9.1 Construction Effects

**Water quality impacts from turbid run-off**

The construction phase of the project poses the greatest threat to water quality in the adjacent lower Mill River and Lough Swilly. By far the most common instance of water pollution arising from construction sites is the increase in suspended sediments in nearby waterbodies, from turbid run-off arising on site.

Deposit of suspended solids on the bed of the Mill River as it enters Lough Swilly could potentially result in smothering of the bed with potential negative ecological effects. In addition, suspended solids can have abrasive characteristics on fish gills.

**Oils, cement and chemicals**

Other sources of contaminants that could cause water pollution include oils and hydrocarbons, concrete and cement products, and any other chemicals or compounds stored on site pertaining to the construction work. Hydrocarbons and oils entering the lower Mill River have the potential to have a negative impact on water quality with subsequent deleterious effect on aquatic life and harmful effects on fish. Fresh concrete and cement are very alkaline and can cause serious pollution in watercourses, with subsequent negative effects on aquatic life.

**Contaminated Soils**

The ground conditions of the proposed development site are considered not to be significantly contaminated and hence liberation of contaminants is highly unlikely to take place.



## 7.9.2 Operational Effects

An operational effluent discharge will be associated with the WWTW. This will utilise the existing pipeline and will consist of an outfall with 15 diffusers of 0.15m diameter. The proposed outfall will be covered at all states of the tide and it is estimated that even at Low Water on a spring tide there will be at least 5.5m depth of water above the diffusers.

Initial dilution, hydrodynamic and dispersion modelling has been undertaken to determine the fate of the effluent and determine its effect on the local water quality in Lough Swilly. A full modelling report[21] is available which is summarised below and contained in full, in **Appendix D**.

Important water quality constituents in the discharge are the organic fraction (as measured by the Biochemical Oxygen Demand (BOD)), nutrients, ammonia and

[21] JBA Associates, Buncrana Sewerage Scheme (Draft Report): Mathematical Modelling of Lough Swilly, April 2006.

bacterial concentrations. An assessment on each of these water quality considerations is given below along with consideration of the dilutions available from the outfall.

**Concentrations after Initial Dilutions**

Initial dilution[22] calculations have been undertaken based on an assumption that about half of the diffusers are blocked (i.e. 7 diffusers) under both the maximum discharge rate from the WWTW and a Dry Weather Flow (DWF) rate. **Table 7.28** shows the concentrations of important parameters after initial dilution has taken place (i.e. in the surface boil of the outfall), using the minimum initial dilution obtained for the completed scheme (referred to in the modelling report as Stage 2).

**BOD and Dissolved Oxygen**

The Lough Swilly Management Plan indicates that BOD concentrations in the Lough vary between 0.71 and 2.43mg/l (except in the vicinity of the Letterkenny Outfall where values rise as high as 7.1mg/l). If the background concentration of BOD is taken to be the maximum value of 2.43mg/l found remote from the existing outfall, then overall BOD concentrations would not rise above 2.51mg/l.

There are no BOD standards strictly applicable for Lough Swilly but the concentrations predicted within the Lough can be compared to the BOD standard presented in the EU Freshwater Fish Directive (78/659/EEC) and the European Communities (Quality of Salmonid Waters) Regulations 1988, where a limit of 5mg/l is set for salmonid waters. The maximum predicted concentration of BOD at the outfall site is 0.075mg/l above background. Assuming a maximum BOD at the outfall location of 2.51mg/l, the 5mg/l standard will be adhered to and this gives a good indication that the discharge will not cause unacceptable water quality deterioration in terms of BOD or dissolved oxygen concentrations.



The secondary treatment process to be provided will reduce BOD below that which is currently being discharged from the primary treated Buncrana discharge providing a benefit over the current discharge scenario with resultant benefits for water quality and dependant ecology.

[22] Initial dilutions occur as the buoyant plume rises through the water column and mixes with the receiving marine waters which dilute the effluent mainly via turbulent mixing.

**Table 7.28 Initial Dilutions and Parameter Values after initial dilution**

| Parameter | Maximum Flow (=8DWF) | Dry Weather Flow |
|---|---|---|
| Flow | 275 l/s | 34.4 l/s |
| Minimum Initial Dilution | 330 | 1300 |
| Total coliforms after initial dilution | 6060/100ml | 769/100ml |
| Faecal coliforms after initial dilution | 3030/100ml | 385/100ml |
| BOD | 0.075 mg/l O | 0.019mg/l O |
| Ammonia | 0.075mg/l N | 0.019mg/l N |

The input parameters for **Dry Weather Flows** for these calculations were:

- Total coliforms $10^6$/100ml (Note: This is a typical value for secondary treated effluent, as proposed at Buncrana[23]).
- Faecal coliforms 5 x $10^5$/100ml (again a typical value for a secondary treated effluent)
- BOD 25 mg/l O
- Ammonia 25 mg/l N

For maximum flows, following first flush, the raw sewage bacterial loads will remain similar to those during DWF or will increase slightly, with foul sewage diluted by surface drainage, which will also contribute some bacterial load. Experience shows that treated sewage discharges during high flow conditions typically contain around double the concentrations of bacteria compared with DWF conditions and this has been assumed here – i.e. for maximum flows, total coliform concentration has been taken as $2x10^6$ and faecal coliform concentration as $1x10^6$.



### Ammonia

Background concentrations of ammonia in Lough Swilly are (Lough Swilly Water Quality Management Plan, 2003) generally less than 0.11mg/l (as N) rising to 0.65mg/l at the existing Letterkenny Outfall. Assuming a background concentration of 0.11mg/l, this will result in a maximum ammonia concentration immediately over the outfall site of 0.185mg/l (as N).

As for BOD, there are no relevant ammonia standards strictly applicable to Lough Swilly but, as a comparison, an ammonia standard of 0.82 is set by the Freshwater Fish Directive. It can be seen that the initial dilutions available ensure that this standard will be met even directly above the outfall discharge. This gives confidence that no significant water quality deterioration will occur due to excessive ammonia concentrations arising from the proposed discharge.

[23] See:
Markland H., Crabtree R.W., Crockett C.P. (1990) Coastal sewerage research. Report no. 1. A preliminary assessment of bacteria levels in sewers. WRC, UC690;
Markland H., Dempsey P. (1991) Coastal sewerage research. Report no. 10. The effects of storage on bacteria in sewage – Morecambe field trial 1990. WRC, UC1006; and
Muego E., Pomfret J.R. (1999) Duddon Estuary Bathing Waters Bacterial Budget study. Report for Environment Agency by Entec.

The secondary treatment process to be provided will reduce ammonia below that which is currently being discharged from the primary treated Buncrana discharge, providing an improvement over the current discharge scenario, with resultant benefits for water quality and dependant ecology.

**Coliforms**

The modelling study showed that dilution of the effluent plume throughout the water column (secondary dilution) would require a further dilution of three times and this secondary dilution zone could extend up to a maximum distance of 1,100m from the diffusers. All of the designated bathing waters are outside this mixing zone. Based on the concentrations in **Table 7.28**, compliance with the National Limit Values for bacteria in bathing waters[24] of 5000/100ml for total coliforms and 1000/100ml for faecal coliforms would be achieved on average after secondary dilution, with potential exceedance at the edge of this mixing zone only at very high sewage flows, assuming there is no significant background bacterial load from other sources. Note that these standards should be met by at least 80% of the samples taken.

An advection dispersion model[25] was run to simulate the dispersion of the plume from the outfall throughout the Lough. The model was run for a spring and neap set of tides in order to determine the impact of the varying tidal conditions. The results were then analysed to determine the peak contributions of the sewage discharge to the concentration of coliforms at critical points in the Lough (e.g. the bathing beaches at Lisfannan, Rathmullen, Portsalon and Lady's Bay).



The model results have been extrapolated, using concentrations following initial dilution given in **Table 7.28**, to give contributions at the designated bathing waters. In relation to Dry Weather Flows predicted maximum coliform concentrations at all the identified local bathing waters are all well below EC guideline values. This is as expected, since the bathing waters all currently comply with the stringent EC Guideline standards, and bacterial loads from the WWTW will be reduced compared with the existing situation as a result of installation of secondary treatment, which will more than offset the increased flows to the works resulting from population growth.

The concentrations presented in **Table 7.29** are the maximum concentrations that might be achieved at the bathing beaches. These values may only be reached over a brief period and so do not indicate the length of time that maximum concentrations will be experienced at a particular location. **Table 7.30** shows the 80-percentile faecal coliform concentrations at the bathing beaches. These predicted concentrations can be compared to the EC bathing Waters Directive guideline targets of 500/100ml for total coliforms

[24] See S.I. 155 of 1992

[25] The software package Surface Water Modelling System (SMS) was used to model the effluent dispersion for Lough Swilly. SMS provides a user friendly front end for the pre- and post- processing of two dimensional numerical models: RMA2; and RMA4. Two-dimensional numerical modelling of the tidal flows in Lough Swilly was undertaken using RMA2 and the effluent dispersion from the proposed sea outfall was simulated using RMA4.

and 100/100ml for faecal coliforms. Only one scenario (faecal coliform concentrations at Lady's Bay under maximum flow conditions (i.e. 8x DWF)) show non-compliance with Blue Flag/National Limit values. This scenario will be experienced only rarely as the amount of time where flows will be maximised will be low. Overall, the results indicate that the contribution of the effluent discharge will increase concentrations of coliforms to a level well below those set out in the relevant national and European standards.

Background bacterial data are not available (clearly past data are not relevant as they include inputs from the existing WWTW, which has only primary treatment). However, the low contributions predicted from the improved WWTW indicate that any failures are likely to arise from sources other than the WWTW e.g. from riverine inputs.

**Table 7.29 Maximum contribution of the treated sewage discharge to bacterial concentrations at local bathing waters for maximum flows from the WWTW**

| | Maximum flows | | Dry weather flows | |
|---|---|---|---|---|
| **Bathing water** | **Total coliforms** | **Faecal coliforms** | **Total coliforms** | **Faecal coliforms** |
| Lisfannon | 184/100ml | 92/100ml | 23/100ml | 12/100ml |
| Portsalon | <1/100ml | <1/100ml | <1/100ml | <1/100ml |
| Rathmullan | 6/100ml | 3/100ml | <1/100ml | <1/100ml |
| Lady's Bay | 830/100ml | 415/100ml | 105/100ml | 53/100ml |
| National limit values are: | Total coliforms | 10000/100ml in 95% of samples<br>5000/100ml in 80% of samples | | |
| | Faecal coliforms | 2000/100ml in 95% of samples<br>1000/100ml in 80% of samples | | |



**Table 7.30 80-Percentile contribution of the treated sewage discharge to bacterial concentrations at local bathing waters for maximum flows from the WWTW**

| | Maximum flows | | Dry weather flows | |
|---|---|---|---|---|
| **Bathing water** | **Total coliforms** | **Faecal coliforms** | **Total coliforms** | **Faecal coliforms** |
| Lisfannon | 108/100ml | 54/100ml | 14/100ml | 7/100ml |
| Portsalon | <1/100ml | <1/100ml | <1/100ml | <1/100ml |
| Rathmullan | <1/100ml | <1/100ml | <1/100ml | <1/100ml |
| Lady's Bay | 258/100ml | 129/100ml | 33/100ml | 16/100ml |
| EC Directive guideline values are: | Total coliforms | 500/100ml in 80% of samples | | |
| | Faecal coliforms | 100/100ml in 80% of samples | | |

### 7.9.3 Evaluation of Effects

Predicted water quality effects are evaluated in **Table 7.30**.

**Table 7.30 Effects on water quality and evaluation of significance**

| Environmental consequence | Type of effect | Policy importance (or sensitivity) | Magnitude/ duration/ frequency of effect | Probability of effect occurring | Significance Level | Rationale |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Release of suspended solids and other pollutants leading to contamination of surface waters | Negative | Local | Low | Unlikely | Minor | Any release of pollutants is likely to be small as a result of on-site mitigation measures. If site drainage is to be passed to nearby watercourses, adequate settlement for removal of suspended solids will be required by the contractor. |
| Release of contaminants and vertical migration down into groundwater | Negative | Local | Low | Unlikely | Minor | No site contamination has been previously identified for the proposed construction areas. There should be minimal risk of contaminant release. |
| **Operation** | | | | | | |
| Change in water quality as a result of implementation of secondary treatment at Buncrana | Positive | Certain | Local | High | Major | The implementation of secondary treatment will result in chemical and bacteriological water quality improvements and assist in securing Bathing Water Directive compliance locally. |
| Key: | Type | Probability | Policy Importance | Magnitude | Significance | |
| | Positive<br>Negative<br>Unknown | Certain<br>Likely<br>Unlikely | International<br>National (UK)<br>Regional<br>District<br>Local | Major<br>Medium<br>Minor<br>None | Major<br>Minor<br>Not Significant | |



## 7.10 Land Contamination

Any contaminants present on site may be liberated by the construction process and may subsequently migrate from the site, depending upon local ground conditions (i.e. mobile groundwater, granular soils etc). However, no contamination at the proposed WWTW

site has been identified and this land has previously been disturbed during the construction of the existing WWTW. Consequently the risk from contaminated soils/land causing environmental harm is considered to be negligible.

# 8. Mitigation Measures and Residual Impacts and Effects

## 8.1 Introduction

Where effects have been identified mitigation measures have been proposed. Some of these measures relate to requirements to be incorporated into the DBO tender documents, which will require utilisation of best available technology within the design of the plant. Where possible the measures that have been recommended are designed mitigate the effect of the effects of the proposed development as far as is possible within any constraints.

## 8.2 Landscape and Visual

### 8.2.1 Mitigation

Mitigation provides the opportunity to reduce or remove the negative visual and landscape impacts identified, as well as providing the potential to introduce elements that will enhance the landscape character of the site.

The mitigation measures fall into two broad categories for the construction phase of the development:

- mitigation through modifications to the design itself e.g. careful consideration of the colour, texture and form of the proposed plant; and
- mitigation (and restoration) through on and off site screen planting, mounding or fencing.
- The mitigation measures for the WWTW and SSDC will draw from both categories. Buildings will be designed in such a way that they have a similar character to residential properties in the vicinity of the site. This will be complimented with landscaping within the site boundary.



### 8.2.2 Residual Impacts and Effects

The introduction of more vegetation to augment the existing vegetation around the site will provide the opportunity to help mitigate the majority of any adverse landscape and visual effects. As mitigation planting matures overtime the proposed structures in the development will become gradually screened. However, not all long distance views will be entirely mitigated but no major residual significant effects are predicted.

# 8.3 Air Quality and Odour

## 8.3.1 Mitigation

**Construction**

It is considered that due to the light nature of the construction activity that will be undertaken combined with the distance of the nearest residential properties from the site, dust emissions are unlikely to be an issue.

To further ensure that no nuisance from dust emissions occur, mitigation from construction activities can take the form of:

- Watering of stockpiles of earth or aggregate during dry periods, as deemed necessary by the site manager.
- Washing of truck wheels when leaving the site to minimise dust being transported onto the local road network.
- Covering of loose material (gravels, soils, etc) carried to and from site by construction vehicles.

Emissions of exhaust gases from the small increase in the number of vehicles using access roads and operating on site will not result in standards for ambient air quality being breached.



**Operation**

To achieve the adopted odour criteria of 5 $ou_E\ m^{-3}$ as the 98$^{th}$ percentile of hourly averages at the receptor the mitigation is required. Modelling of the preferred option (i.e. extended aeration at the WWTW with picket fence thickening at the SSDC) has identified that the odour criteria can be complied with at receptors. Modelling has shown the use of the following techniques to be acceptable and effective:

- Flow proportional dosing of an odour inhibitor prior to the inlet works. Odour inhibitors, such as ferric chloride, would be dosed to reduce the odour emission from the WwTW by 35%.
- Odour abatement for the sludge area, an odour control unit would extract a minimum of 1,700 $m^3\ h^{-1}$ from this area and release from a 7.5 m stack at 15 m s-1 with a concentration of no more than 500 $ou_E\ m^{-3}$.

Odour dispersion modelling for the site has been conducted incorporating the above mitigation techniques. For each year of meteorological data a contour plot has been produced to show the predicted concentration of odour as the 98$^{th}$ percentile of hourly averages and the results are shown in **Figure 8.1** and tabulated in **Table 8.1**.

**Table 8.1 Predicted Distance from site boundary to Odour Concentrations of 5 $ou_E/m^3$ once odour mitigation is implemented**

| Direction from Site | Predicted Distance (m) from site boundary for Odour concentration of 5 $ou_E/m^3$ as the 98th percentile of hourly averages | | | Approximate distance to the nearest buildings (m) |
|---|---|---|---|---|
| | 2000 | 2001 | 2002 | |
| North | 47 | 20 | 11 | **170** |
| North-East | 0 | 0 | 0 | **300** |
| East | 0 | 0 | 0 | **110** |
| South-East | 0 | 0 | 0 | **150** |
| South | 5 | 17 | 0 | **100** |
| South-West | 45 | 38 | 0 | **-** |
| West | 43 | 36 | 7 | **-** |
| North-West | 22 | 21 | 0 | **150** |

**Table 8.2** indicates the change in the predicted distance of the 5 $ou_E/m^3$ (as the 98th percentile of hourly averages) between the baseline situation and the predicted future situation once the above mitigation is implemented. It can be seen that implementing odour mitigation is an extremely effective measure.



**Table 8.2 Change in predicted distance from site boundary to Odour Concentrations of 5 $ou_E/m^3$, baseline to future.**

| Direction from Site | Change in predicted distance (m) from site boundary for Odour concentration of 5 $ou_E/m^3$ as the 98th percentile of hourly averages | | |
|---|---|---|---|
| | 2000 | 2001 | 2002 |
| North | -207 | -260 | -146 |
| North-East | -148 | -187 | -129 |
| East | -160 | -172 | -143 |
| South-East | -97 | -159 | -100 |
| South | -135 | -183 | -133 |
| South-West | -223 | -118 | -114 |
| West | -226 | -179 | -151 |
| North-West | -423 | -193 | -146 |

It can be seen that there is a predicted decrease in the odour signature of the site, as identified by a decrease in the distance the 5 $ou_E/m^3$ (as the 98th percentile of hourly averages) will be located from the site boundary.

The assessment criteria for odour of 5 $ou_E$ $m^{-3}$ as the 98$^{th}$ percentile of hourly averages at the receptor is not predicted to be exceeded at any receptors once mitigation measures are implemented. As identified in **Section 2.3** the detailed specifications of the SSDF and WWTW extension are not fully known, due to the letting of the contract on a DBO basis. The mitigation modelled in this EIA, and presented here, shows that methods are available for successful mitigation of odour and the DBO contractor will have to show that any process offered will be considered appropriate provided its negative impacts are of equal to, or of lesser significance, than those outlined here. Whilst this leaves some flexibility of design the environmental outcome (i.e. the avoidance of nuisance odours at receptors as defined by the odour criteria of 5 $ou_E$ $m^{-3}$ as the 98$^{th}$ percentile of hourly averages) will need to be in line with this EIS. No negative transgressions whatsoever from this criterion will be permitted in the finally accepted proposal.

### 8.3.2 Residual Impacts and Effects

**Construction**
Dust nuisance problems will not occur if adequate control and mitigation measures are in place.

**Operation**
Odour is identified as the only likely air quality issue in the operational phase of the WWTW. Atmospheric dispersion modelling has therefore been undertaken to assess predicted odour concentrations against nuisance thresholds.

Odour concentrations are predicted to be below the 5 $ou_E/m^3$ (as the 98$^{th}$ percentile of hourly averages) standard at all receptors once odour control mitigation is implemented for the WWTW and the SSDC.



## 8.4 Noise & Vibration

### 8.4.1 Mitigation

**Construction**
The main concern for noise is from the construction of the development, however, these will be short term temporary effects and mitigation will effectively reduce potential effects. The proposed mitigation during the construction stages is set out in **Table 8.3**. This takes the form of generic mitigation measures.

**Table 8.3 Noise Mitigation for the Construction Phase**

| Effect | Mitigation incorporated into the proposed development | Effect wholly mitigated? |
|---|---|---|
| **Construction Noise** | | |
| Increased noise levels due to construction traffic | • Movement of heavy plant on local roads will be kept to a minimum. All deliveries will be controlled by restrictions on routes and operating hours | No |
| Increased ambient noise levels | • Use of equipment fitted with effective silencers/insulation | No |
| | • Appointment of site contact to whom complaints/queries about construction activity can be directed. Any complaints to be investigated and action taken where appropriate. | Yes |
| | • Restrictions on the proposed hours of operation to avoid sensitive periods and in particular no night time working without prior agreement. | Yes |

### Operation

The mitigation that is known to be incorporated into the operational phase of the proposed development is shown below in **Table 8.4**.



**Table 8.4 Noise Mitigation for the Operational Phase**

| Effect | Mitigation incorporated into the proposed development | Effect wholly mitigated? |
|---|---|---|
| **Operational Phase of Development** | | |
| Noise generated by wastewater treatment works | • Mitigation will be incorporated in the design including complete enclosure of noise-generating equipment if required to meet the operational noise criteria. | Yes |
| Traffic noise effects on local roads | • Day time delivery vehicles only | Yes |
| | • Traffic constrained to main roads wherever possible | Yes |

## 8.4.2 Residual Impacts and Effects

### Construction

All noise related impacts and effects that are a consequence of the construction phase of the project will cease once construction has been completed.

### Operation

The existing background noise levels for the closest sensitive receptors have been used to identify a design noise criterion. This will be a requirement of the contract

specification for the final supplier. This will ensure that noise effects will be controlled to prevent nuisance being caused to local residents.

### 8.4.3 Irish Context

Under Section 51 of the Local Government Act 1963 it is an offence to make any noise or variation which is so loud, continuous or repeated or at such times as to give reasonable cause for annoyance to neighbours. It also provides for procedures for securing the abatement of the noise.

The various Directives on noise are implemented under The European Communities (Construction Plant and Equipment) (Permissable Noise Levels) Regulations 1988 (S.I. No.320 of 1988).

To date there are no national standards for noise emissions in Ireland. However, the Environmental Protection Agency published in 1995 a Guidance Note on noise for the scheduled activities listed in the EPA Act, 1992. Section 107 of the EPA Act allows the EPA or local authorities to serve a Notice requiring measures to be taken to prevent or limit noise.

Conditions may be attached to planning permissions for developments to reduce emissions from and/or intrusions into structures by noise. Most new and expanded projects are required by law to be assessed in regard to their expected impact on the local noise pattern.



## 8.5 Traffic and Transport

### 8.5.1 Mitigation

**Construction**

As the anticipated effects on the local road network during the construction period are likely to be insignificant no mitigation measures are proposed. The road network is already used by HGVs and therefore no problems are foreseen. However, it should be noted that assumptions have been made at this stage with regard to the construction phase of the project as limited information is available until the DBO contract is awarded. Not all of the relevant road links could be assessed due to a lack of existing traffic count information on these sections.

**Mitigation**

The Environmental Impact Statement has considered the anticipated effects of traffic on the road links that will be used as the main routes for vehicles to and from the proposed WWTW site during the operational phase. It is anticipated that there will be insignificant effects on the road links assessed as the change in total traffic and HGVs on all of the sections of road assessed is considerably less than the 30% threshold in the IEMA guidelines, which is used to indicate whether there will be an environmental effect from the increase in traffic flows.

### 8.5.2 Residual Impacts and Effects

**Construction**
Effects caused by traffic during the construction phase of the project will cease once construction has been completed.

**Operation**
The operation of the proposed WWTW and SSDC will result in a small increase in traffic on certain local roads, but the predicted increase falls well below the IEMA threshold given above.

## 8.6 Socio-economics

### 8.6.1 Mitigation

**Construction**
No significant negative effects are predicted that would affect the socio-economic status of the area during construction and therefore no mitigation is proposed.

**Operation**
Effects on the overall socio-economic well-being of the area will be positive, allowing sustainable growth via the expansion of the residential, commercial and industrial populations of Buncrana and the wider Inishowen area, thus discussion of mitigation measures is not relevant.



### 8.6.2 Residual Impacts and Effects

The residual effects from the operation of proposed development will be positive, as previously outlined in **Section 7.6**.

## 8.7 Flora and Fauna

### 8.7.1 Mitigation

**Construction**

- Aquatic

There is a possibility of pollutants migrating from the construction site to the water environment. The mitigation set out in **Section 8.9** will result in associated benefits to aquatic flora and fauna and no additional mitigation is proposed beyond this.

- Terrestrial

No mitigation is proposed as the development will be contained entirely within the existing WWTW site which is devoid of any vegetation. The well developed boundary planting will be retained in the future development.

**Operation**

- Aquatic

The implementation of a higher level of treatment for sewage is a major benefit of the scheme and the use of the existing outfall and diffusers will ensure that mixing is effective. No additional mitigation is proposed.

- Terrestrial

The operation of the site will have minimal effects on ecological receptors and no mitigation is proposed.

### 8.7.2 Residual Impacts and Effects

**Construction**

- Aquatic

Following the implementation of measures to minimise the risk of pollutant (including sediment) run-off from the construction site there are no significant residual impacts predicted.

- Terrestrial

The construction phase will have no residual impacts on terrestrial ecology.



**Operation**

- Aquatic

The operation of the site will improve the standard of effluent discharged to Lough Swilly and this will result in an improvement in the conditions for aquatic ecology in the local area.

- Terrestrial

No residual effects following construction should be realised due to the lack of habitat which will be affected.

## 8.8 Cultural Heritage

### 8.8.1 Mitigation

**Construction**

The construction of the scheme will minimise effects upon features of cultural heritage interest as:

- no known cultural heritage features will be directly affected; and
- the proposed site of the construction will be contained entirely within the curtilage of the existing WWTW site.

No mitigation is proposed due to the lack of potential to affect features of cultural heritage.

**Operation**
Additional effects associated with land-take and operation are not anticipated and no further mitigation is proposed.

### 8.8.2 Residual Impacts and Effects

**Construction**
The construction phase will have extremely limited scope to result in residual impacts due to the spatially confined nature of the works and the fact that ground disturbance will only take place on previously developed land within the existing WWTW site boundary.

**Operation**
No residual effects are expected during the operation of the WWTW and SSDC.



## 8.9 Water Quality

### 8.9.1 Mitigation

**Construction**
The main area of concern relates to the liberation of suspended solids during ground preparation works and the occasional accidental spillage of pollutants such as fuel oils and lubricants. Construction effects will be mitigated by adopting those measures set out in **Table 8.5**.

**Table 8.5 Implementing incorporated mitigation/compensation/enhancement measures**

| Effect | Mitigation | Effect wholly mitigated? |
|---|---|---|
| Discharges to surface waters during construction | It will be the contractors responsibility to ensure that aqueous discharges to surface water are controlled.<br><br>Appropriate measures should be adopted to prevent the accidental spillage of any chemicals stored on site, including fuel oils and lubricants.<br><br>The contractor should have measures in | Yes - if covered by planning condition or obligation with EPA consultation. |

| Effect | Mitigation | Effect wholly mitigated? |
|---|---|---|
| | place to deal with spillages if they should occur. All staff should be made aware of this procedure and all relevant materials should be clearly marked. | |

**Operation**

Water quality changes under new outfall operation will occur with the effluent being discharged having been subjected to secondary treatment. Dispersion will be via the existing 15 port diffuser head. Modelling has shown that dispersion and dilution of the effluent will be rapid and a reduction in the contribution of the effluent discharge to bacterial levels at local bathing waters is very likely to occur due to the improved treatment process proposed. This will further secure compliance with national and European bathing water legislation. No additional mitigation will be required.

### 8.9.2 Residual Impacts and effects

**Construction**

The potential for residual effects to water quality will be minimal following the mitigation proposed to reduce the risk of pollutants entering the aquatic environment as far as is practicable.

**Operation**

Bacterial loadings will lead to very low increases in coliforms above background levels at bathing beach receptors assisting compliance with standards. The discharge of BOD and ammonia, after secondary treatment will not lead to effects on local fisheries (or other ecological receptors).

The discharge of treated sewage to Lough Swilly will lead to an overall improvement in water quality compared to the current situation.



## 8.10 Land Contamination

### 8.10.1 Mitigation

**Construction**

Ground contamination issues are not likely to be significant at the site and no specific mitigation measures are proposed.

**Operation**

As per the construction phase no specific mitigation is proposed due to the lack of potential effects arising from the proposals.

### 8.10.2 Residual Impacts and Effects

**Construction**
No residual impacts or effects are anticipated during the construction phase of the project.

**Operation**
No residual impacts or effects are anticipated during the operation of the WWTW and SSDC.

## 8.11 Summary of Predicted Residual Effects

The proposed Inishowen WWTW and SSDC will provide significant benefits to the area through the following mechanisms:

- controlled discharge of secondary treated effluent via existing outfall and diffuser, thereby improving local water quality;
- provision of additional treatment capacity for any future expansion of the local residential, commercial and industrial population; and
- the SSDC will provide for the immediate and long-term collection and disposal of sewage sludge generated within the town and the wider Inishowen area contributing significantly to a more sustainable way of dealing with this sludge stream.



The construction of a new WWTW and SSDC at Buncrana will inevitably lead to some impact on the local environment in a variety of ways. However, through the EIA process many of these impacts have been fully mitigated. Despite this the project will experience some residual effects which are summarised below.

**Landscape and Visual**
Although the exact details of the plant design and layout are not yet known, it is likely that the buildings will represent a new visual component on the landscape. However the effect of this change is likely to be minimal due to the suggested mitigation measures, such as bunding and using vegetation to screen the development.

Further mitigation will be achieved by constructing the various buildings on the site with materials that will blend in with nearby housing, for example white-washed walls. Buildings will also be restricted to single storey, reducing the visual impact. The potential for long distant views of the works will not be entirely mitigated by the proposals, but the visual impacts will diminish with time as the landscape planting matures.

**Air Quality and Odour**
The main air quality issue arising from the operational development is odour which, once mitigation techniques are employed, is expected to be a non-significant effect. Any odour control systems and any design submitted in the DBO tender process will

have to meet strict emissions limits giving the equivalent level of protection as identified within this ES.

Modelling work has indicated that the preferred option, which will incorporate appropriate abatement technologies, will reduce odour emissions from that currently produced by the existing WWTW in Buncrana. This will reduce the odour footprint of the site considerably.

### Noise

Noise resulting from the WWTW and SSDC is expected to be a minor effect as modern technologies include noise abatement systems and any design submitted in the DBO tender process will have to meet strict emissions limits.

During construction there may be periods where construction activities may result in elevated noise levels, but such occasions are likely to be infrequent and short-lived. During operation noise impacts are likely to be minimal as all mechanical units will be housed inside buildings where noise abatement technology has been included in the design.

### Traffic and Transport

The operation of the proposed WWTW and SSDC will result in a small increase in traffic on certain local roads, but the predicted increase falls well below the IEMA threshold level. The majority of traffic will approach the site from the south, entering the industrial estate via the short connecting road running from the R258, or via the main access off the R257 in Bunbeg itself.

When the WWTW and SSDC is first commissioned operational traffic levels will be at their lowest, as many of the satellite WWTW (which will be transporting sludge to Buncrana for treatment) will not have been commissioned at this time. As time progresses the quantity of operational traffic will increase until the capacity is met at the end of the twenty year operating period. However, at no point will operational traffic increase to levels that exceed the IEMA threshold level.



### Socio-Economic

The operation of the WWTW and SSDC is likely to bring positive benefits to the area with improved water quality and improved sewerage infra-structure which takes into account projected growth in the area. Furthermore, the WWTW will help to bring economic stability, and potentially expansion, to the area, which is considered to be vital if the heritage value of the area is to be preserved.

### Flora and Fauna

There will be no direct impact on flora and fauna as the new facilities will be constructed within the existing site boundary in an area devoid of vegetation. Off site impacts during construction will be avoided by adoption of recognised good practice measures and operation will cause no adverse impacts.

No residual adverse impact is expected to result from the discharge of the treated effluent into Buncrana Bay as there will an improvement in the quality of the discharge which will enter the environment at the same location as now.

### Cultural Heritage

No significant impacts are anticipated for features of cultural heritage interest.

### Water Quality

The discharge of effluent into Buncrana Bay is likely to bring positive benefits to the area with improved water quality at local bathing waters.

### Land Contamination

No residual land contamination impacts are expected as a result of the proposed development.

# Appendix A
# Scoping Report Summary

**Summary of predicted environmental effects to be addressed in the EIS**

| **Potential significant effects on valued receptors** (*identified in italics*) **during construction** | **Potential significant effects on valued receptors** (*identified in italics*) **during operation** | **Scope of assessment** |
|---|---|---|
| **Landscape and visual** | | |
| Visual effects on *local properties* arising from construction activities, including use of cranes and other heavy plant. | Visual effects on *local properties* arising from the construction of new facilities/infrastructure within the site. | Identification of visual envelope based on worst-case assessment of maximum dimensions for buildings and other infrastructure within the site. |
| Effects on the *landscape character* arising from construction activities. | Effects on the *landscape character* arising from the construction of new facilities/infrastructure within the site. | Evaluation of landscape effects based on existing and predicted landscape character and estimate of visual envelope based on worst-case scenario. |
| **Air quality (including odour)** | | |
| Effects of odour on *local properties* arising from short-term/ temporary changes in the operation of the site during the construction process. | Effects of odour on *local properties* arising from the operation of the new facilities. | Odour modelling using worst-case weather conditions and assuming no odour suppression and assuming suppression to meet agreed emission limits |
| Effects of emissions from vehicles and heavy plant on *local properties* during the construction process. | Emissions are not likely to have a significant effect during the operation of the site as traffic movements to and from the site will be minimal. | Emissions will be considered based on likely traffic volumes and worst-case weather conditions. |
| Effects of dust from construction activities on *local properties.* | Dust is not likely to have a significant effect during the operation of the site as no activities will take place that will lead to dust generation. | Dust will be considered based on likely traffic volumes and construction activities and worst-case weather conditions. |
| **Noise and vibration** | | |
| Effects of noise and vibration from construction activities on *local properties* and *SPA interest features (birds).* | Operational noise and vibration effects will be considered but are not likely to be significant due to the requirement to incorporate noise suppression into the design of the facilities. | Noise and vibration will be considered with particular emphasis on the use of technology to suppress noise to below accepted limits. |
| **Traffic and transport** | | |
| Effects of construction traffic on *local road infrastructure* and *residents*. | Operational traffic effects on the *local road infrastructure* and *residents* are not likely to be significant as the number of vehicles visiting the site will be low. | Traffic movements will be assessed against existing traffic levels, where data are available. Access route options will be appraised taking into account population centres, road conditions etc |

| **Potential significant effects on valued receptors** (*identified in italics*) **during construction** | **Potential significant effects on valued receptors** (*identified in italics*) **during operation** | **Scope of assessment** |
|---|---|---|
| | | and likely source of materials being delivered to the site. |
| **Flora and fauna** | | |
| Effects of construction, particularly dust, effluent and disturbance, on *sensitive species and habitats*. | The only significant effects on *flora and fauna* during the operational phase will be from changes in water quality due to the increased volume of the effluent. | The various species and habitats present in the vicinity of the site and discharge will be assessed to evaluate their sensitivity to various effects arising from the development. |
| **Cultural heritage** | | |
| No significant effects are likely as the works will take place within the existing site boundary. | No significant effects are likely as the works will take place within the existing site boundary. | No significant effects are likely. |
| **Water quality and fisheries** | | |
| Construction may lead to occasional accidental releases of pollutants to Lough Swilly, including untreated effluent and suspended solids. This may have a significant effect on the *ecology* of Lough Swilly and the *aquaculture* that takes place within the Lough. | Although the proposed works will result in effluent water quality being maintained or improved, there will be an increase in effluent volume which may have a significant effect on the *ecology* of Lough Swilly and the *aquaculture* that takes place within the Lough. | The impact of pollutant loads on the Lough will be examined with specific reference to the sensitivity of the receptor. Pollution prevention guidelines will be identified that will have to be adopted during construction. |
| **Land contamination** | | |
| No land contamination issues are likely given the scale and nature of the existing development on the site. Some contamination may take place as a result of the accidental spillage of fuel oils etc stored on site. | No land contamination is likely during the operational phase. | The assessment will identify best practice pollution prevention guidelines that will have to be adopted during the construction phase to minimise the risk of contamination occurring. |

# Appendix B
# Noise Survey Results

Results of noise surveys undertaken between 11th and 15th September 2003 at:

- No.2 Swilly Terrace; and
- No.4 Oakfield Court.

All noise levels are expressed in dB(A)

**Swilly Terrace Weekday (Daytime)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 06:57 | 49.5 | 71.1 | 44.2 | 36.7 | 35 |
| 12/09/03 07:12 | 39.2 | 58.1 | 39.8 | 37 | 35.5 |
| 12/09/03 07:27 | 38.1 | 56.6 | 40.2 | 37 | 35.2 |
| 12/09/03 07:42 | 42.1 | 63.2 | 44 | 40.7 | 39.2 |
| 12/09/03 07:57 | 41.6 | 62.9 | 42.9 | 40.8 | 39.5 |
| 12/09/03 08:12 | 40.2 | 54.6 | 41.6 | 39.9 | 38.5 |
| 12/09/03 08:27 | 40.5 | 60.4 | 42 | 39.6 | 37.9 |
| 12/09/03 08:42 | 39.2 | 58.2 | 40.5 | 38.7 | 37.3 |
| 12/09/03 08:57 | 45 | 72.2 | 44.3 | 40 | 38.1 |
| 12/09/03 09:12 | 48.5 | 75.7 | 43.3 | 39 | 37.2 |
| 12/09/03 09:27 | 40.5 | 67 | 41.1 | 39.1 | 37.5 |
| 12/09/03 09:42 | 43.7 | 62.8 | 43.9 | 41.1 | 39.6 |
| 12/09/03 09:57 | 43.6 | 62.5 | 46.6 | 41.3 | 39 |
| 12/09/03 10:12 | 43.5 | 57.8 | 47.1 | 40.1 | 38 |
| 12/09/03 10:27 | 39 | 59.7 | 40.7 | 37.8 | 36.3 |
| 12/09/03 10:42 | 43.7 | 65.5 | 42.9 | 39.3 | 37.6 |
| 12/09/03 10:57 | 43.4 | 68.3 | 43.4 | 39.9 | 37.7 |
| 12/09/03 11:12 | 43.1 | 68 | 43.1 | 39.4 | 37.6 |
| 12/09/03 11:27 | 41.7 | 66.6 | 43.2 | 40.5 | 38.6 |
| 12/09/03 11:42 | 41.6 | 50 | 43.1 | 41.2 | 39.7 |
| 12/09/03 11:57 | 42.5 | 62.7 | 43.8 | 41.4 | 39.9 |
| 12/09/03 12:12 | 42.6 | 52.3 | 44.2 | 42.3 | 39.9 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 12:27 | 42.7 | 58.9 | 44.1 | 42.4 | 41 |
| 12/09/03 12:42 | 42.5 | 65.4 | 43.9 | 41.8 | 40.3 |
| 12/09/03 12:57 | 43.7 | 53.7 | 45.1 | 43.4 | 41.9 |
| 12/09/03 13:12 | 44.1 | 59 | 45.8 | 43.5 | 42.1 |
| 12/09/03 13:27 | 45.4 | 60.3 | 46.8 | 45.2 | 43.7 |
| 12/09/03 13:42 | 45.2 | 55.6 | 46.6 | 44.9 | 43.6 |
| 12/09/03 13:57 | 46.3 | 63 | 47.9 | 46 | 44.6 |
| 12/09/03 14:12 | 44.9 | 53.7 | 46.7 | 44.5 | 42.6 |
| 12/09/03 14:27 | 46.2 | 61.9 | 47.8 | 45.5 | 43.6 |
| 12/09/03 14:42 | 48.6 | 62.3 | 52 | 47.2 | 44.9 |
| 12/09/03 14:57 | 49.2 | 58.6 | 53 | 46 | 42.8 |
| 12/09/03 15:12 | 45.7 | 73.5 | 46.3 | 44.1 | 42.4 |
| 12/09/03 15:27 | 45.1 | 63.4 | 46.5 | 44.3 | 42.8 |
| 12/09/03 15:42 | 43.1 | 65.5 | 44.2 | 42.1 | 40.8 |
| 12/09/03 15:57 | 45.4 | 62.1 | 47.4 | 44.8 | 43 |
| 12/09/03 16:12 | 45.6 | 61.3 | 47 | 45.2 | 43.3 |
| 12/09/03 16:27 | 44.6 | 55.4 | 46.3 | 44.3 | 42.4 |
| 12/09/03 16:42 | 44.3 | 53.1 | 46 | 43.9 | 42.4 |
| 12/09/03 16:57 | 44.5 | 53.8 | 46.1 | 44.2 | 42.3 |
| 12/09/03 17:12 | 45.5 | 61.2 | 47.4 | 44.8 | 43.2 |
| 12/09/03 17:27 | 48.5 | 72.5 | 49.5 | 46.6 | 44.8 |
| 12/09/03 17:42 | 46 | 51.4 | 47.6 | 45.7 | 44.4 |
| 12/09/03 17:57 | 46.1 | 52.6 | 47.7 | 45.7 | 44.6 |
| 12/09/03 18:12 | 48.1 | 75 | 46.9 | 44.7 | 43.1 |
| 12/09/03 18:27 | 51.7 | 76.5 | 53.4 | 43.6 | 40.9 |
| 12/09/03 18:42 | 42.9 | 54.4 | 44.7 | 42.3 | 40.2 |
| 12/09/03 18:57 | 45.4 | 53.4 | 47 | 45.1 | 43.2 |
| 12/09/03 19:12 | 44.5 | 53.7 | 45.9 | 44.2 | 42.8 |
| 12/09/03 19:27 | 45.4 | 50.6 | 47.3 | 45 | 43.6 |
| 12/09/03 19:42 | 47.7 | 54.1 | 49.2 | 47.3 | 45.9 |
| 12/09/03 19:57 | 49.2 | 57.9 | 50.7 | 48.9 | 47.4 |
| 12/09/03 20:12 | 50.9 | 72.5 | 52.4 | 50.1 | 48.7 |
| 12/09/03 20:27 | 51.3 | 56.9 | 52.8 | 51 | 49.5 |
| 12/09/03 20:42 | 52.4 | 58.4 | 53.8 | 52.2 | 50.9 |
| 12/09/03 20:57 | 52.2 | 58.6 | 53.9 | 51.9 | 50.3 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 21:12 | 51.2 | 58.9 | 53.5 | 51 | 47.5 |
| 12/09/03 21:27 | 49.6 | 56.1 | 51.3 | 49.1 | 47.7 |
| 12/09/03 21:42 | 50.7 | 59.4 | 52.4 | 50.4 | 48.3 |
| 12/09/03 21:57 | 52.6 | 63.4 | 55.2 | 51.6 | 49.8 |
| 12/09/03 22:12 | 52.5 | 60.3 | 55 | 51.7 | 49.4 |
| 12/09/03 22:27 | 52.2 | 61.3 | 54.4 | 51.6 | 49.3 |
| 12/09/03 22:42 | 49.9 | 61.2 | 52.4 | 49 | 47.2 |
| 12/09/03 22:57 | 47.8 | 55.4 | 50 | 47 | 45.3 |

**Swilly Terrace (Weekday Night-Time)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 11/09/03 22:57 | 37.3 | 57.1 | 40.6 | 34.7 | 32.9 |
| 11/09/03 23:12 | 35 | 64.9 | 35.4 | 33.3 | 31.8 |
| 11/09/03 23:27 | 33.4 | 42.9 | 34.9 | 33 | 31.4 |
| 11/09/03 23:42 | 33.5 | 51.3 | 35.2 | 32.9 | 31.1 |
| 11/09/03 23:57 | 37.3 | 56.2 | 38 | 35.5 | 33.7 |
| 12/09/03 00:12 | 34.5 | 43.4 | 36.1 | 34 | 32.5 |
| 12/09/03 00:27 | 33.3 | 49.9 | 34.6 | 33.2 | 31.8 |
| 12/09/03 00:42 | 34.2 | 43.2 | 35.6 | 33.7 | 32.5 |
| 12/09/03 00:57 | 34.9 | 44.6 | 36.6 | 34.4 | 32.7 |
| 12/09/03 01:12 | 36.7 | 42.7 | 38.1 | 36.6 | 35.2 |
| 12/09/03 01:27 | 37.4 | 44.6 | 39.3 | 37 | 35.2 |
| 12/09/03 01:42 | 37.6 | 55.8 | 38.9 | 37.2 | 35.5 |
| 12/09/03 01:57 | 38 | 43.9 | 40.4 | 37.2 | 35.3 |
| 12/09/03 02:12 | 36.6 | 43.4 | 39 | 36 | 33.2 |
| 12/09/03 02:27 | 34.4 | 38.9 | 35.7 | 34.3 | 33.1 |
| 12/09/03 02:42 | 34.7 | 43.4 | 36.5 | 34.6 | 31.1 |
| 12/09/03 02:57 | 34.3 | 46.1 | 36.5 | 33.5 | 31.2 |
| 12/09/03 03:12 | 33.6 | 45.8 | 36.3 | 32.2 | 30.3 |
| 12/09/03 03:27 | 35.2 | 54.9 | 38.2 | 32.7 | 30 |
| 12/09/03 03:42 | 35.1 | 48.4 | 38.1 | 33 | 30.4 |
| 12/09/03 03:57 | 31.1 | 47.1 | 34.2 | 29.1 | 27 |
| 12/09/03 04:12 | 30 | 44 | 31.2 | 29.2 | 27.3 |
| 12/09/03 04:27 | 27.3 | 37.8 | 28.7 | 26.7 | 25.5 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 04:42 | 28.4 | 38.5 | 30.6 | 27.4 | 26.2 |
| 12/09/03 04:57 | 30 | 37.6 | 31.7 | 29.5 | 28 |
| 12/09/03 05:12 | 31.7 | 39.9 | 33.7 | 31.1 | 29.5 |
| 12/09/03 05:27 | 31 | 40.3 | 33.1 | 30.2 | 28.8 |
| 12/09/03 05:42 | 33.1 | 43.4 | 36 | 31.9 | 28.1 |
| 12/09/03 05:57 | 35.1 | 47.1 | 37.5 | 33.8 | 32.1 |
| 12/09/03 06:12 | 34.9 | 50.8 | 36.1 | 34.2 | 32.9 |
| 12/09/03 06:27 | 50.5 | 81.3 | 39.7 | 35.9 | 34.4 |
| 12/09/03 06:42 | 39 | 67.6 | 38.5 | 35.9 | 34.5 |
| 12/09/03 06:57 | 49.5 | 71.1 | 44.2 | 36.7 | 35 |

**Swilly Terrace (Weekend Daytime)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 06:57 | 47.8 | 66.4 | 50 | 45.6 | 43.4 |
| 13/09/03 07:12 | 49.3 | 65.9 | 51.2 | 48.5 | 46.5 |
| 13/09/03 07:27 | 49.9 | 60.7 | 51.7 | 49.4 | 47.8 |
| 13/09/03 07:42 | 47.8 | 55.9 | 49.6 | 47.3 | 45.6 |
| 13/09/03 07:57 | 48.6 | 77.2 | 48.3 | 46.3 | 44.8 |
| 13/09/03 08:12 | 48.4 | 62.4 | 50.8 | 46.4 | 44.4 |
| 13/09/03 08:27 | 47.1 | 60.1 | 48.8 | 46.7 | 44.8 |
| 13/09/03 08:42 | 49.6 | 62.4 | 51.5 | 49.1 | 47.1 |
| 13/09/03 08:57 | 49.8 | 62.6 | 51.5 | 49.4 | 47.6 |
| 13/09/03 09:12 | 48.5 | 61.1 | 50.2 | 47.8 | 46.2 |
| 13/09/03 09:27 | 50.5 | 59.4 | 52.5 | 49.9 | 47.9 |
| 13/09/03 09:42 | 49.8 | 57.9 | 51.7 | 49.3 | 47.6 |
| 13/09/03 09:57 | 50.6 | 67.8 | 51.7 | 49.2 | 47.9 |
| 13/09/03 10:12 | 49.6 | 64 | 51.3 | 49.1 | 47.7 |
| 13/09/03 10:27 | 49.9 | 65.2 | 51.1 | 49.2 | 47.9 |
| 13/09/03 10:42 | 49.1 | 64.6 | 50.7 | 48.6 | 47.1 |
| 13/09/03 10:57 | 48.5 | 65.4 | 50.5 | 47.8 | 46 |
| 13/09/03 11:12 | 48.1 | 68.2 | 50.7 | 46.6 | 44.3 |
| 13/09/03 11:27 | 50.5 | 64.2 | 52.3 | 50 | 47.7 |
| 13/09/03 11:42 | 50.5 | 57.6 | 52.7 | 50.3 | 46.7 |
| 13/09/03 11:57 | 47.5 | 55.1 | 49.4 | 47.1 | 45.2 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 12:12 | 46.1 | 57.2 | 47.8 | 45.5 | 44.1 |
| 13/09/03 12:27 | 48.8 | 65.3 | 50.4 | 48.1 | 46.4 |
| 13/09/03 12:42 | 49.6 | 60.2 | 51.7 | 49.3 | 46.2 |
| 13/09/03 12:57 | 49.5 | 59.9 | 51.9 | 48.6 | 46.3 |
| 13/09/03 13:12 | 48.8 | 61.1 | 51 | 48.1 | 45.8 |
| 13/09/03 13:27 | 47.7 | 62.1 | 49.7 | 47 | 45.1 |
| 13/09/03 13:42 | 51.6 | 58.7 | 53.8 | 51.1 | 48.7 |
| 13/09/03 13:57 | 54.7 | 63.8 | 56.6 | 54.1 | 51.6 |
| 13/09/03 14:12 | 54.3 | 73.5 | 56.3 | 53.2 | 51.6 |
| 13/09/03 14:27 | 52.4 | 63.6 | 54.6 | 51.6 | 49.8 |
| 13/09/03 14:42 | 53.3 | 61.7 | 55.2 | 52.8 | 50.7 |
| 13/09/03 14:57 | 54.7 | 68.3 | 56.3 | 54.2 | 52.5 |
| 13/09/03 15:12 | 54.4 | 64.1 | 56.3 | 53.6 | 51.2 |
| 13/09/03 15:27 | 53.3 | 63.7 | 55.3 | 52.8 | 50.7 |
| 13/09/03 15:42 | 52.3 | 66.1 | 54 | 51.7 | 50.2 |
| 13/09/03 15:57 | 51.8 | 59 | 53.7 | 51.5 | 49.7 |
| 13/09/03 16:12 | 53.1 | 61.8 | 55.1 | 52.7 | 50.5 |
| 13/09/03 16:27 | 52.5 | 62.7 | 54.6 | 52.1 | 49.7 |
| 13/09/03 16:42 | 51.9 | 69.7 | 53.4 | 51.3 | 49 |
| 13/09/03 16:57 | 50.5 | 61.9 | 52.3 | 49.9 | 48.1 |
| 13/09/03 17:12 | 49.1 | 64.3 | 50.8 | 48.6 | 46.8 |
| 13/09/03 17:27 | 48.6 | 58 | 50.4 | 48.1 | 46.5 |
| 13/09/03 17:42 | 50 | 57.1 | 52 | 49.5 | 47.6 |
| 13/09/03 17:57 | 48.6 | 59.2 | 50.1 | 48.3 | 46.6 |
| 13/09/03 18:12 | 47.9 | 59 | 50.1 | 47.3 | 45.6 |
| 13/09/03 18:27 | 47.6 | 59.5 | 49.6 | 47.1 | 45 |
| 13/09/03 18:42 | 45.6 | 61.9 | 46.4 | 44.9 | 43.8 |
| 13/09/03 18:57 | 43.6 | 50.6 | 44.5 | 43.5 | 42.7 |
| 13/09/03 19:12 | 43.8 | 59.1 | 45.2 | 43.4 | 42.4 |
| 13/09/03 19:27 | 45.4 | 63.1 | 46.5 | 45.1 | 44.2 |
| 13/09/03 19:42 | 43.5 | 50.1 | 44.8 | 43.3 | 42 |
| 13/09/03 19:57 | 44.9 | 53.1 | 46.4 | 44.6 | 42.9 |
| 13/09/03 20:12 | 46.6 | 54.7 | 48.2 | 46.4 | 44.8 |
| 13/09/03 20:27 | 47.2 | 62.5 | 48.3 | 46.5 | 45 |
| 13/09/03 20:42 | 45.5 | 52.8 | 46.8 | 45.3 | 43.9 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 20:57 | 45.7 | 53.2 | 47 | 45.4 | 44.3 |
| 13/09/03 21:12 | 44.7 | 53.3 | 45.8 | 44.6 | 43.7 |
| 13/09/03 21:27 | 46.2 | 53.3 | 47.4 | 46.1 | 44.7 |
| 13/09/03 21:42 | 46.3 | 59.2 | 47.6 | 45.9 | 44.8 |
| 13/09/03 21:57 | 45.7 | 55.8 | 47.3 | 45.4 | 43.8 |
| 13/09/03 22:12 | 45.4 | 52.3 | 46.3 | 45.3 | 44.4 |
| 13/09/03 22:27 | 46.3 | 54 | 47.3 | 46.2 | 45.2 |
| 13/09/03 22:42 | 46.3 | 55.3 | 47.9 | 46.1 | 44.3 |
| 13/09/03 22:57 | 45.9 | 54.4 | 47 | 45.7 | 44.6 |
| 14/09/03 06:57 | 39.4 | 65.4 | 39.7 | 37.6 | 35.8 |
| 14/09/03 07:12 | 42 | 63.2 | 41.7 | 39.3 | 38.1 |
| 14/09/03 07:27 | 45.7 | 74 | 42.5 | 39.1 | 37.8 |
| 14/09/03 07:42 | 44.2 | 61.4 | 47.6 | 40.7 | 38.2 |
| 14/09/03 07:57 | 39.8 | 61.9 | 40.3 | 38.6 | 37.3 |
| 14/09/03 08:12 | 38.9 | 61.7 | 39.9 | 38.4 | 37.2 |
| 14/09/03 08:27 | 40.4 | 63 | 40.8 | 39.5 | 38.5 |
| 14/09/03 08:42 | 40.4 | 62 | 40.8 | 39.2 | 38.1 |
| 14/09/03 08:57 | 40.5 | 60.2 | 40.9 | 39 | 37.9 |
| 14/09/03 09:12 | 40.2 | 60.5 | 40.5 | 38.7 | 37.6 |
| 14/09/03 09:27 | 39.1 | 57.3 | 40.3 | 38.7 | 37.3 |
| 14/09/03 09:42 | 39.8 | 54.7 | 40.7 | 39.3 | 38.2 |
| 14/09/03 09:57 | 39.7 | 63.2 | 40.6 | 39 | 37.8 |
| 14/09/03 10:12 | 40 | 63.3 | 41.5 | 38.8 | 37.1 |
| 14/09/03 10:27 | 41.2 | 67.5 | 41.4 | 38.4 | 37.1 |
| 14/09/03 10:42 | 40.4 | 62.1 | 41.9 | 39.3 | 37.9 |
| 14/09/03 10:57 | 40.6 | 59.5 | 41.5 | 38.6 | 37.2 |
| 14/09/03 11:12 | 37.2 | 56.8 | 38.5 | 36.7 | 35.3 |
| 14/09/03 11:27 | 40.4 | 64.7 | 39.7 | 36.7 | 34.9 |
| 14/09/03 11:42 | 40.3 | 64.1 | 39.9 | 38 | 36.6 |
| 14/09/03 11:57 | 38.4 | 58.8 | 39.7 | 37.8 | 36.6 |
| 14/09/03 12:12 | 41.6 | 61.5 | 43.1 | 38.6 | 37 |
| 14/09/03 12:27 | 38.2 | 58.2 | 39.6 | 37.6 | 36.4 |
| 14/09/03 12:42 | 39.2 | 61.4 | 40.3 | 38.3 | 36.7 |
| 14/09/03 12:57 | 44.7 | 68.3 | 48 | 40.3 | 37.6 |
| 14/09/03 13:12 | 44.3 | 68.7 | 48.2 | 39.6 | 37.5 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 13:27 | 43 | 64.9 | 46.5 | 39 | 37.1 |
| 14/09/03 13:42 | 40.4 | 57.9 | 42 | 38.6 | 36.5 |
| 14/09/03 13:57 | 38.7 | 55.7 | 40.4 | 37.6 | 35.8 |
| 14/09/03 14:12 | 38.7 | 58.1 | 39.7 | 37.6 | 36.2 |
| 14/09/03 14:27 | 41.6 | 63.2 | 41.9 | 40.3 | 38.5 |
| 14/09/03 14:42 | 41.3 | 58.2 | 42.5 | 40.4 | 39.2 |
| 14/09/03 14:57 | 41.5 | 63.9 | 41.7 | 39.9 | 38.8 |
| 14/09/03 15:12 | 42.1 | 66.5 | 42.3 | 39.4 | 38.3 |
| 14/09/03 15:27 | 39.4 | 62.8 | 40.5 | 37.6 | 36.4 |
| 14/09/03 15:42 | 41.7 | 69.8 | 42.1 | 38.3 | 35.6 |
| 14/09/03 15:57 | 40.1 | 55.9 | 42.8 | 38.8 | 36.3 |
| 14/09/03 16:12 | 40.2 | 57.9 | 42.5 | 38.8 | 35.9 |
| 14/09/03 16:27 | 41.5 | 55.3 | 44.3 | 40.1 | 37.6 |
| 14/09/03 16:42 | 39.4 | 50.2 | 41.9 | 38.1 | 36.3 |
| 14/09/03 16:57 | 39.3 | 50.6 | 42 | 37.7 | 35.6 |
| 14/09/03 17:12 | 40.3 | 61.4 | 43.4 | 38 | 35.6 |
| 14/09/03 17:27 | 39.9 | 57.5 | 42.5 | 37.2 | 34.9 |
| 14/09/03 17:42 | 40.9 | 65.3 | 43 | 38.7 | 36.3 |
| 14/09/03 17:57 | 38.8 | 55.2 | 41.1 | 37.7 | 35.4 |
| 14/09/03 18:12 | 36.7 | 58.3 | 37.8 | 34.7 | 32.2 |
| 14/09/03 18:27 | 36.1 | 52.1 | 37.9 | 34.8 | 32.9 |
| 14/09/03 18:42 | 36.3 | 60 | 37.7 | 34.8 | 32.8 |
| 14/09/03 18:57 | 35.3 | 49 | 37.4 | 34.7 | 32.5 |
| 14/09/03 19:12 | 36.5 | 53.9 | 38.4 | 35.8 | 33.4 |
| 14/09/03 19:27 | 36.8 | 55.9 | 38.5 | 35.8 | 33.4 |
| 14/09/03 19:42 | 37.7 | 60.8 | 39.9 | 35.5 | 32.8 |
| 14/09/03 19:57 | 35.5 | 53.1 | 37.2 | 34.6 | 32.1 |
| 14/09/03 20:12 | 37.3 | 63.2 | 38.6 | 35.5 | 33.4 |
| 14/09/03 20:27 | 36.5 | 49.8 | 38.8 | 35.6 | 32.9 |
| 14/09/03 20:42 | 35.7 | 68.4 | 36.4 | 33.8 | 31.2 |
| 14/09/03 20:57 | 32.3 | 44.6 | 34.5 | 31.5 | 28.6 |
| 14/09/03 21:12 | 32.7 | 51.2 | 35 | 31.7 | 29.4 |
| 14/09/03 21:27 | 33.7 | 45.9 | 36 | 32.6 | 30 |
| 14/09/03 21:42 | 34.9 | 45.4 | 37.1 | 34.2 | 31.5 |
| 14/09/03 21:57 | 34.5 | 46.4 | 36.8 | 33.4 | 29.9 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 22:12 | 33.9 | 58.8 | 36 | 32.7 | 29.9 |
| 14/09/03 22:27 | 34.4 | 41.7 | 36.7 | 34 | 31.2 |
| 14/09/03 22:42 | 34.7 | 48 | 36.9 | 34 | 31.4 |
| 14/09/03 22:57 | 35.9 | 52.2 | 38.5 | 34.5 | 31.2 |

**Swilly Terrace (Weekend Night-Time)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 22:57 | 47.8 | 55.4 | 50 | 47 | 45.3 |
| 12/09/03 23:12 | 46.6 | 58.2 | 48.9 | 45.9 | 43.8 |
| 12/09/03 23:27 | 45.1 | 55.6 | 47.6 | 44 | 42 |
| 12/09/03 23:42 | 46.4 | 57.5 | 48.7 | 44.8 | 42.3 |
| 12/09/03 23:57 | 47 | 58.2 | 49.7 | 44.9 | 41.4 |
| 13/09/03 00:12 | 43.7 | 54 | 45.4 | 43.5 | 41.2 |
| 13/09/03 00:27 | 47.3 | 62.6 | 50.1 | 46 | 43.3 |
| 13/09/03 00:42 | 48.9 | 57.1 | 51.2 | 47.9 | 45.2 |
| 13/09/03 00:57 | 47.8 | 56.6 | 50.4 | 46.7 | 44.7 |
| 13/09/03 01:12 | 48.9 | 59.6 | 50.7 | 48.4 | 46.1 |
| 13/09/03 01:27 | 45.7 | 51.8 | 48.1 | 45.1 | 42.7 |
| 13/09/03 01:42 | 44.6 | 53 | 46.9 | 43.9 | 41.5 |
| 13/09/03 01:57 | 43.5 | 53 | 45.6 | 42.7 | 41 |
| 13/09/03 02:12 | 45.3 | 53.2 | 47.8 | 44.7 | 42 |
| 13/09/03 02:27 | 46.7 | 54.1 | 49.2 | 45.9 | 42.9 |
| 13/09/03 02:42 | 47.6 | 55.4 | 49.9 | 46.9 | 44.5 |
| 13/09/03 02:57 | 46.9 | 57.4 | 49.2 | 46.1 | 43.9 |
| 13/09/03 03:12 | 48.8 | 60.9 | 51.7 | 47.7 | 45 |
| 13/09/03 03:27 | 47.7 | 57.7 | 50.9 | 46.3 | 43.9 |
| 13/09/03 03:42 | 48.5 | 60.2 | 50.9 | 47.3 | 44.9 |
| 13/09/03 03:57 | 50.2 | 56.6 | 52.6 | 49.6 | 46.8 |
| 13/09/03 04:12 | 48.8 | 56.5 | 50.9 | 48.3 | 45.8 |
| 13/09/03 04:27 | 48.6 | 56.1 | 51 | 48 | 45.3 |
| 13/09/03 04:42 | 47.2 | 55.7 | 49.5 | 46.5 | 44.4 |
| 13/09/03 04:57 | 47.4 | 56.9 | 49.8 | 46.4 | 44 |
| 13/09/03 05:12 | 48.5 | 57.2 | 51.2 | 47.5 | 44.7 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 05:27 | 47.9 | 55.5 | 50.5 | 47 | 44.7 |
| 13/09/03 05:42 | 45.9 | 53.3 | 47.7 | 45.6 | 43.7 |
| 13/09/03 05:57 | 47.1 | 56.1 | 49.3 | 46.3 | 44.4 |
| 13/09/03 06:12 | 47.4 | 69.1 | 49.7 | 46.7 | 44.5 |
| 13/09/03 06:27 | 46 | 53.5 | 47.7 | 45.7 | 44 |
| 13/09/03 06:42 | 46.9 | 63.5 | 48.4 | 45.6 | 43.6 |
| 13/09/03 06:57 | 47.8 | 66.4 | 50 | 45.6 | 43.4 |
| 13/09/03 22:57 | 45.9 | 54.4 | 47 | 45.7 | 44.6 |
| 13/09/03 23:12 | 44.6 | 51.9 | 45.8 | 44.5 | 43.4 |
| 13/09/03 23:27 | 43.5 | 55.8 | 44.8 | 43.4 | 41.7 |
| 13/09/03 23:42 | 41.6 | 50.6 | 43.2 | 41.2 | 39.8 |
| 13/09/03 23:57 | 45.7 | 58.8 | 47.9 | 44.8 | 43.2 |
| 14/09/03 00:12 | 43.4 | 52.3 | 44.7 | 43.3 | 41.8 |
| 14/09/03 00:27 | 41.9 | 48.5 | 43.4 | 41.7 | 40.3 |
| 14/09/03 00:42 | 40.7 | 52 | 42.1 | 40.2 | 39 |
| 14/09/03 00:57 | 41.9 | 54.1 | 43.5 | 41.6 | 39.8 |
| 14/09/03 01:12 | 39.4 | 51.2 | 40.9 | 39 | 37.6 |
| 14/09/03 01:27 | 38.7 | 56.6 | 39.5 | 38.3 | 37.1 |
| 14/09/03 01:42 | 36.4 | 45.5 | 38 | 35.9 | 34.6 |
| 14/09/03 01:57 | 36 | 43.2 | 37.6 | 35.6 | 34.1 |
| 14/09/03 02:12 | 36.8 | 48.1 | 38.6 | 36.1 | 34.2 |
| 14/09/03 02:27 | 36.8 | 52.9 | 38.3 | 36.6 | 35.1 |
| 14/09/03 02:42 | 37.1 | 56.7 | 38.3 | 36.3 | 34.2 |
| 14/09/03 02:57 | 35.5 | 44.6 | 37.3 | 35.2 | 33.3 |
| 14/09/03 03:12 | 36.8 | 51.2 | 38.4 | 36.1 | 34.5 |
| 14/09/03 03:27 | 38.3 | 62.5 | 39.9 | 37.6 | 35.9 |
| 14/09/03 03:42 | 37.6 | 54.6 | 38.9 | 37.1 | 35.5 |
| 14/09/03 03:57 | 36.3 | 42.7 | 38.1 | 36 | 34 |
| 14/09/03 04:12 | 36.6 | 54.8 | 38.1 | 35.8 | 34.1 |
| 14/09/03 04:27 | 36.2 | 46 | 38.1 | 35.5 | 34 |
| 14/09/03 04:42 | 37 | 55.3 | 38.4 | 36.3 | 35.1 |
| 14/09/03 04:57 | 36.8 | 47.8 | 38.2 | 36.5 | 34.6 |
| 14/09/03 05:12 | 36.5 | 44.7 | 38.2 | 36.1 | 34.5 |
| 14/09/03 05:27 | 36.3 | 46.6 | 38 | 35.8 | 34.4 |
| 14/09/03 05:42 | 36.7 | 49.2 | 37.8 | 36.5 | 35.5 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 05:57 | 36.8 | 43.7 | 38.1 | 36.4 | 35.4 |
| 14/09/03 06:12 | 36.8 | 50.7 | 38.4 | 36.4 | 34.8 |
| 14/09/03 06:27 | 35.8 | 48.8 | 36.8 | 35.7 | 34.6 |
| 14/09/03 06:42 | 42.8 | 64.6 | 40.3 | 36 | 34.8 |
| 14/09/03 06:57 | 39.4 | 65.4 | 39.7 | 37.6 | 35.8 |

**Oakfield Court (Weekday Daytime)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 07:03 | 48.9 | 64.3 | 53.5 | 41.9 | 34.7 |
| 12/09/03 07:18 | 48.2 | 63.8 | 52.8 | 42.8 | 34.7 |
| 12/09/03 07:33 | 50.4 | 65.2 | 54 | 47.4 | 42.6 |
| 12/09/03 07:48 | 52.9 | 63.3 | 56.1 | 51.5 | 45.5 |
| 12/09/03 08:03 | 50.7 | 63.2 | 53.8 | 49.1 | 44 |
| 12/09/03 08:18 | 52.4 | 66.2 | 55.1 | 51.2 | 47.1 |
| 12/09/03 08:33 | 53 | 72.8 | 55.1 | 50.2 | 45.1 |
| 12/09/03 08:48 | 52.5 | 67.1 | 55.4 | 51.3 | 46 |
| 12/09/03 09:03 | 50.4 | 67.2 | 53.3 | 49.1 | 43.7 |
| 12/09/03 09:18 | 50.9 | 61 | 54 | 49.8 | 44.4 |
| 12/09/03 09:33 | 53.2 | 67.8 | 56.8 | 50.6 | 44.3 |
| 12/09/03 09:48 | 54.9 | 67.4 | 57.8 | 52.2 | 47.8 |
| 12/09/03 10:03 | 51.1 | 62.3 | 54 | 49.9 | 45.7 |
| 12/09/03 10:18 | 50.1 | 69.3 | 53.1 | 48.6 | 43 |
| 12/09/03 10:33 | 51.8 | 71.4 | 54.4 | 50.1 | 45.8 |
| 12/09/03 10:48 | 51.6 | 65.6 | 54.5 | 49.3 | 44.6 |
| 12/09/03 11:03 | 49 | 59 | 51.7 | 47.9 | 44.2 |
| 12/09/03 11:18 | 49.8 | 69.8 | 52.2 | 48.5 | 44.3 |
| 12/09/03 11:33 | 62.3 | 74.6 | 65.8 | 57.2 | 48.5 |
| 12/09/03 11:48 | 62.6 | 78.1 | 56 | 50.5 | 46.2 |
| 12/09/03 12:03 | 51 | 76.7 | 53.6 | 49.4 | 45 |
| 12/09/03 12:18 | 49.2 | 64.8 | 52.1 | 47.5 | 43.6 |
| 12/09/03 12:33 | 49.1 | 66.5 | 51.3 | 47.7 | 44.4 |
| 12/09/03 12:48 | 51.5 | 67.1 | 54.4 | 49.4 | 46.2 |
| 12/09/03 13:03 | 50.7 | 68.6 | 53.2 | 48.8 | 45.3 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 13:18 | 56.9 | 71.8 | 59 | 50.3 | 46 |
| 12/09/03 13:33 | 56.6 | 78.3 | 55.5 | 51.5 | 48.6 |
| 12/09/03 13:48 | 54.3 | 74.4 | 57.2 | 52.6 | 49.4 |
| 12/09/03 14:03 | 58.2 | 74.3 | 62.5 | 52.5 | 47.9 |
| 12/09/03 14:18 | 52.4 | 70.3 | 54.2 | 49.3 | 45.1 |
| 12/09/03 14:33 | 54.7 | 72 | 55.6 | 49.8 | 45.7 |
| 12/09/03 14:48 | 57.6 | 70.5 | 61.8 | 54 | 49.7 |
| 12/09/03 15:03 | 52.8 | 62.6 | 56 | 51.8 | 47.7 |
| 12/09/03 15:18 | 51.5 | 76.4 | 53.6 | 49.2 | 44.6 |
| 12/09/03 15:33 | 50.2 | 79.2 | 52.5 | 48.7 | 44.6 |
| 12/09/03 15:48 | 50 | 67 | 52.3 | 48.9 | 45.8 |
| 12/09/03 16:03 | 48.7 | 65.8 | 51 | 47.8 | 45.2 |
| 12/09/03 16:18 | 49.3 | 61.4 | 52.2 | 48.2 | 44.7 |
| 12/09/03 16:33 | 50.1 | 72.7 | 52.4 | 48.1 | 44 |
| 12/09/03 16:48 | 52.6 | 82 | 52 | 48.6 | 45 |
| 12/09/03 17:03 | 49.8 | 71.7 | 52.3 | 48.7 | 45 |
| 12/09/03 17:18 | 50.1 | 73.7 | 52.5 | 48.9 | 45.5 |
| 12/09/03 17:33 | 50.8 | 67.2 | 53.2 | 49.5 | 46.1 |
| 12/09/03 17:48 | 55.8 | 84.1 | 55.3 | 50.5 | 46.9 |
| 12/09/03 18:03 | 53.9 | 78 | 53.6 | 49.6 | 46.2 |
| 12/09/03 18:18 | 50.3 | 72.5 | 52.5 | 48.4 | 44.5 |
| 12/09/03 18:33 | 49.6 | 74.1 | 51.9 | 47.9 | 43.3 |
| 12/09/03 18:48 | 49.3 | 70.2 | 51.6 | 47.7 | 43.4 |
| 12/09/03 19:03 | 49.9 | 78.1 | 51.2 | 47.2 | 42.7 |
| 12/09/03 19:18 | 49 | 78 | 51.3 | 46.6 | 42.9 |
| 12/09/03 19:33 | 48.4 | 63.1 | 50.9 | 47.6 | 44 |
| 12/09/03 19:48 | 49.3 | 72.2 | 51.3 | 47.8 | 44.5 |
| 12/09/03 20:03 | 50.1 | 75.4 | 51.8 | 48.3 | 45.8 |
| 12/09/03 20:18 | 50 | 73.8 | 52 | 48.9 | 46.4 |
| 12/09/03 20:33 | 53.6 | 76.5 | 53.6 | 50.6 | 48.5 |
| 12/09/03 20:48 | 50.8 | 66.7 | 52.8 | 50.2 | 48.2 |
| 12/09/03 21:03 | 51.8 | 69.5 | 54 | 51 | 48 |
| 12/09/03 21:18 | 50.1 | 67.9 | 52.4 | 49.3 | 46.6 |
| 12/09/03 21:33 | 50.2 | 73.1 | 52 | 49.2 | 46.3 |
| 12/09/03 21:48 | 51.1 | 72.6 | 52.8 | 49.4 | 46.4 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 22:03 | 52 | 77.8 | 53.1 | 50 | 47.2 |
| 12/09/03 22:18 | 51.7 | 77.3 | 53.5 | 49.8 | 46.2 |
| 12/09/03 22:33 | 50.3 | 72.9 | 52.8 | 48.7 | 45.5 |
| 12/09/03 22:48 | 49.2 | 63.5 | 52.1 | 47.6 | 44.5 |
| 12/09/03 23:03 | 47.8 | 73.3 | 50.1 | 45.4 | 42.3 |

**Oakfield Court (Weekday Night-Time)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 11/09/03 23:03 | 49.3 | 63 | 53.9 | 44.9 | 35.6 |
| 11/09/03 23:18 | 49.3 | 61.3 | 53.9 | 45.1 | 33.5 |
| 11/09/03 23:33 | 48.2 | 64 | 52.7 | 42.5 | 33.8 |
| 11/09/03 23:48 | 49.4 | 64.8 | 53.4 | 44.9 | 37.1 |
| 12/09/03 00:03 | 51.3 | 66 | 55.6 | 47.2 | 35.4 |
| 12/09/03 00:18 | 46.9 | 63.4 | 51.2 | 39.5 | 32.8 |
| 12/09/03 00:33 | 45.9 | 62 | 50.1 | 36.8 | 31.7 |
| 12/09/03 00:48 | 45.2 | 60.5 | 49.4 | 38.9 | 31.6 |
| 12/09/03 01:03 | 45.6 | 62.8 | 49.6 | 38 | 32 |
| 12/09/03 01:18 | 43.9 | 60 | 48 | 35.5 | 31.8 |
| 12/09/03 01:33 | 45.3 | 65.9 | 49.2 | 35.8 | 32.2 |
| 12/09/03 01:48 | 43.3 | 59.7 | 46.9 | 34.9 | 32.2 |
| 12/09/03 02:03 | 43.2 | 58.8 | 47.4 | 36.2 | 33.3 |
| 12/09/03 02:18 | 44.6 | 61.7 | 48.6 | 34.7 | 31.2 |
| 12/09/03 02:33 | 41.9 | 60.1 | 44.8 | 32.5 | 31 |
| 12/09/03 02:48 | 40.3 | 61 | 42.1 | 31.6 | 29.4 |
| 12/09/03 03:03 | 44.3 | 65.3 | 38.1 | 31.8 | 30.3 |
| 12/09/03 03:18 | 41 | 62.8 | 40.7 | 34.5 | 32.3 |
| 12/09/03 03:33 | 40.3 | 61 | 38.4 | 34.4 | 32.1 |
| 12/09/03 03:48 | 39.6 | 59 | 39.3 | 33.1 | 31.2 |
| 12/09/03 04:03 | 37.1 | 57.6 | 31.2 | 29.1 | 28.3 |
| 12/09/03 04:18 | 39.3 | 60 | 36.4 | 28.9 | 27.8 |
| 12/09/03 04:33 | 39.5 | 59.9 | 38.5 | 28.6 | 27.9 |
| 12/09/03 04:48 | 40.1 | 59.6 | 39.8 | 29.3 | 28.6 |
| 12/09/03 05:03 | 40.7 | 58.3 | 41.6 | 29.6 | 28.4 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 05:18 | 36.7 | 61 | 32.6 | 29.3 | 28.2 |
| 12/09/03 05:33 | 41.5 | 63.6 | 42.4 | 29.7 | 28.6 |
| 12/09/03 05:48 | 41.3 | 57.2 | 44.8 | 33.2 | 31.6 |
| 12/09/03 06:03 | 43.2 | 58.8 | 46.7 | 35.6 | 31.9 |
| 12/09/03 06:18 | 43.7 | 62.2 | 45.4 | 32.1 | 30.4 |
| 12/09/03 06:33 | 46.2 | 61.1 | 50.5 | 36.9 | 31 |
| 12/09/03 06:48 | 47.8 | 61.2 | 52.2 | 41.7 | 34.2 |
| 12/09/03 07:03 | 48.9 | 64.3 | 53.5 | 41.9 | 34.7 |

**Oakfield Court (Weekend Daytime)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 07:03 | 46.1 | 60 | 49.4 | 42.8 | 39.1 |
| 13/09/03 07:18 | 45.9 | 64 | 48.6 | 43.7 | 41.7 |
| 13/09/03 07:33 | 48.5 | 66.3 | 51.1 | 45.3 | 41.2 |
| 13/09/03 07:48 | 48.2 | 68 | 50.3 | 44.1 | 40.5 |
| 13/09/03 08:03 | 47.3 | 68.3 | 50.4 | 43.8 | 40.1 |
| 13/09/03 08:18 | 47.3 | 73 | 50.1 | 43.9 | 39.9 |
| 13/09/03 08:33 | 49.6 | 69.6 | 53.4 | 46.2 | 41.1 |
| 13/09/03 08:48 | 49.4 | 70.7 | 52 | 46.3 | 42.5 |
| 13/09/03 09:03 | 48 | 63.2 | 50.8 | 46.3 | 42.8 |
| 13/09/03 09:18 | 48.6 | 65.1 | 51.7 | 46.7 | 42.8 |
| 13/09/03 09:33 | 51.3 | 77.6 | 53.5 | 49 | 45.4 |
| 13/09/03 09:48 | 62.6 | 90.9 | 58.5 | 49.9 | 45.7 |
| 13/09/03 10:03 | 55.5 | 83.1 | 55.8 | 50 | 46.2 |
| 13/09/03 10:18 | 53.4 | 80.9 | 53.2 | 48 | 44.3 |
| 13/09/03 10:33 | 48.4 | 58.6 | 51 | 47.3 | 44.3 |
| 13/09/03 10:48 | 49.2 | 61 | 51.8 | 47.6 | 44.1 |
| 13/09/03 11:03 | 48.9 | 63.6 | 51.3 | 47.2 | 43.2 |
| 13/09/03 11:18 | 52.1 | 75.3 | 55.1 | 50.7 | 46.2 |
| 13/09/03 11:33 | 52.9 | 77.6 | 55.1 | 51.8 | 48.1 |
| 13/09/03 11:48 | 51.8 | 68.7 | 54.9 | 50.6 | 46.3 |
| 13/09/03 12:03 | 50.6 | 67 | 53.4 | 49.4 | 45 |
| 13/09/03 12:18 | 53.3 | 76.2 | 56.2 | 50.8 | 46.5 |
| 13/09/03 12:33 | 53.8 | 79.9 | 56.2 | 50.4 | 46.4 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 12:48 | 59.1 | 74.7 | 64 | 51.1 | 46.2 |
| 13/09/03 13:03 | 58 | 77.6 | 63.9 | 50.4 | 46.2 |
| 13/09/03 13:18 | 54.6 | 79 | 57.7 | 50.1 | 46.1 |
| 13/09/03 13:33 | 57.2 | 85.3 | 55.1 | 50 | 46.7 |
| 13/09/03 13:48 | 53.9 | 75.4 | 55.9 | 52.4 | 49.5 |
| 13/09/03 14:03 | 53.2 | 77.6 | 54.8 | 51.6 | 48.8 |
| 13/09/03 14:18 | 52.3 | 80.3 | 53.7 | 50.6 | 47.7 |
| 13/09/03 14:33 | 53.8 | 81.9 | 54.7 | 51.2 | 48.6 |
| 13/09/03 14:48 | 55.4 | 81.5 | 56.6 | 53.1 | 49.8 |
| 13/09/03 15:03 | 64.1 | 86.9 | 61.1 | 53.6 | 50.7 |
| 13/09/03 15:18 | 54.9 | 80.5 | 56 | 52.9 | 50.5 |
| 13/09/03 15:33 | 54 | 79.4 | 55.9 | 52.5 | 49.6 |
| 13/09/03 15:48 | 54.4 | 76.4 | 55.9 | 52.4 | 48.9 |
| 13/09/03 16:03 | 54.2 | 80.7 | 55.1 | 51.3 | 48.4 |
| 13/09/03 16:18 | 54.3 | 76.8 | 56.5 | 53.1 | 50.3 |
| 13/09/03 16:33 | 54.1 | 81 | 55.1 | 51.7 | 49.1 |
| 13/09/03 16:48 | 53.6 | 76.7 | 55.9 | 52.1 | 49.1 |
| 13/09/03 17:03 | 51.6 | 77.8 | 53.9 | 50 | 46.6 |
| 13/09/03 17:18 | 52 | 72.5 | 54.1 | 50.6 | 47.7 |
| 13/09/03 17:33 | 52.3 | 75.8 | 53.8 | 50.4 | 47 |
| 13/09/03 17:48 | 53.8 | 72.3 | 56.5 | 51.5 | 47.9 |
| 13/09/03 18:03 | 53.2 | 75.1 | 55.4 | 51.3 | 47.6 |
| 13/09/03 18:18 | 55.1 | 78.6 | 56.4 | 51.9 | 47.3 |
| 13/09/03 18:33 | 53.6 | 67.4 | 57 | 51.6 | 46.1 |
| 13/09/03 18:48 | 51.9 | 65.4 | 55.2 | 50.4 | 45.5 |
| 13/09/03 19:03 | 55.1 | 73.8 | 56.3 | 51.4 | 45.9 |
| 13/09/03 19:18 | 52.3 | 70.7 | 55.8 | 50.1 | 44.1 |
| 13/09/03 19:33 | 52.1 | 69.1 | 55.1 | 49.9 | 44.5 |
| 13/09/03 19:48 | 50 | 65.6 | 52.9 | 48.2 | 42.6 |
| 13/09/03 20:03 | 50.3 | 66.3 | 52.7 | 48.1 | 44.2 |
| 13/09/03 20:18 | 50 | 72.2 | 52.7 | 48.3 | 43.6 |
| 13/09/03 20:33 | 52.5 | 75.1 | 53.6 | 49 | 44.6 |
| 13/09/03 20:48 | 50.1 | 76.7 | 53 | 48.4 | 43.1 |
| 13/09/03 21:03 | 49.9 | 61.3 | 53.3 | 48.1 | 42.7 |
| 13/09/03 21:18 | 48.6 | 60.9 | 52.1 | 46.9 | 41.1 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 21:33 | 49.8 | 60.1 | 53.2 | 48 | 43 |
| 13/09/03 21:48 | 51.6 | 79 | 52.8 | 47.7 | 43.1 |
| 13/09/03 22:03 | 49.2 | 71.1 | 52.4 | 47.5 | 42.4 |
| 13/09/03 22:18 | 49.4 | 72.3 | 52.7 | 47.6 | 42.7 |
| 13/09/03 22:33 | 49 | 61.3 | 52.6 | 47 | 41.7 |
| 13/09/03 22:48 | 49.7 | 73.9 | 52.7 | 47 | 42.3 |
| 13/09/03 23:03 | 49.7 | 75 | 52.8 | 46.9 | 41.9 |
| 14/09/03 07:03 | 44.2 | 66.2 | 47.1 | 36.5 | 32.9 |
| 14/09/03 07:18 | 42 | 59 | 46 | 34.8 | 31.9 |
| 14/09/03 07:33 | 42.4 | 62.7 | 46.1 | 36.2 | 32.2 |
| 14/09/03 07:48 | 43.4 | 58.3 | 47.3 | 39.3 | 33.2 |
| 14/09/03 08:03 | 44.6 | 64 | 48.2 | 35.8 | 30.8 |
| 14/09/03 08:18 | 46.5 | 65.1 | 49.6 | 38.4 | 32.5 |
| 14/09/03 08:33 | 42 | 64.2 | 46 | 36.5 | 32.8 |
| 14/09/03 08:48 | 44.5 | 61.9 | 48.1 | 40.8 | 34.2 |
| 14/09/03 09:03 | 42.8 | 60.1 | 46.7 | 37.8 | 33 |
| 14/09/03 09:18 | 43.6 | 58.3 | 47.4 | 39.4 | 33.4 |
| 14/09/03 09:33 | 44.1 | 59.2 | 47.9 | 41.6 | 35.2 |
| 14/09/03 09:48 | 46.4 | 61.5 | 50.1 | 44.5 | 37.9 |
| 14/09/03 10:03 | 48.5 | 74.7 | 51.6 | 44 | 35.8 |
| 14/09/03 10:18 | 46.4 | 60 | 49.8 | 43.9 | 38.1 |
| 14/09/03 10:33 | 47.6 | 67 | 50.9 | 45.6 | 40.2 |
| 14/09/03 10:48 | 55.4 | 85.2 | 53.4 | 46 | 40 |
| 14/09/03 11:03 | 48.9 | 59.6 | 52.2 | 47.2 | 40.1 |
| 14/09/03 11:18 | 48.3 | 58.4 | 52.2 | 46 | 38.8 |
| 14/09/03 11:33 | 48.6 | 63.8 | 52 | 47.2 | 40.8 |
| 14/09/03 11:48 | 49.5 | 67.3 | 52.7 | 47.9 | 42.2 |
| 14/09/03 12:03 | 48.3 | 61.5 | 51.9 | 46.1 | 39.9 |
| 14/09/03 12:18 | 49.8 | 57.5 | 52.9 | 49.1 | 42.8 |
| 14/09/03 12:33 | 54.3 | 69.5 | 58.2 | 49.8 | 43.7 |
| 14/09/03 12:48 | 53.3 | 71.9 | 55.2 | 50 | 44.4 |
| 14/09/03 13:03 | 52.2 | 74 | 54.4 | 48.8 | 43.9 |
| 14/09/03 13:18 | 50.6 | 65.6 | 53.3 | 49.7 | 44.6 |
| 14/09/03 13:33 | 52.5 | 65.8 | 55.5 | 50.8 | 44.8 |
| 14/09/03 13:48 | 54.5 | 66.4 | 58.2 | 52.5 | 47.3 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 14:03 | 52.3 | 64.4 | 56 | 50.3 | 44.3 |
| 14/09/03 14:18 | 53.1 | 73.3 | 56.1 | 51.7 | 47.2 |
| 14/09/03 14:33 | 51.6 | 68.7 | 54.5 | 50.6 | 45.1 |
| 14/09/03 14:48 | 50.8 | 59.2 | 54 | 50 | 43.8 |
| 14/09/03 15:03 | 51.2 | 63.5 | 54.2 | 50.4 | 44.3 |
| 14/09/03 15:18 | 50.9 | 64.9 | 54 | 49.6 | 43.1 |
| 14/09/03 15:33 | 51 | 59.3 | 53.8 | 50.4 | 45.5 |
| 14/09/03 15:48 | 50.9 | 62.7 | 53.5 | 49.8 | 45.3 |
| 14/09/03 16:03 | 50.4 | 57.6 | 53 | 49.9 | 45.3 |
| 14/09/03 16:18 | 50.9 | 68.4 | 53.5 | 50.3 | 44.8 |
| 14/09/03 16:33 | 51.4 | 63.9 | 54.1 | 50.3 | 45.9 |
| 14/09/03 16:48 | 50.7 | 63.3 | 53.5 | 49.9 | 44.1 |
| 14/09/03 17:03 | 50.2 | 59.2 | 53.1 | 49.6 | 44.2 |
| 14/09/03 17:18 | 52 | 71.1 | 53.6 | 49.8 | 44.9 |
| 14/09/03 17:33 | 50.4 | 60 | 53.3 | 49.6 | 44.8 |
| 14/09/03 17:48 | 50.3 | 69 | 52.6 | 49.6 | 45.5 |
| 14/09/03 18:03 | 52.1 | 62 | 55 | 51.3 | 46.8 |
| 14/09/03 18:18 | 51.1 | 77.2 | 53.5 | 49.6 | 44.6 |
| 14/09/03 18:33 | 50.2 | 62.7 | 53.2 | 49.4 | 43.6 |
| 14/09/03 18:48 | 50.2 | 59.7 | 53.2 | 49.3 | 43.2 |
| 14/09/03 19:03 | 49.5 | 60.1 | 52.7 | 48.7 | 42.6 |
| 14/09/03 19:18 | 48.2 | 57.3 | 51.4 | 47.4 | 40 |
| 14/09/03 19:33 | 49.3 | 63 | 52.1 | 48.6 | 42.2 |
| 14/09/03 19:48 | 49 | 58.7 | 52.1 | 48.3 | 41.7 |
| 14/09/03 20:03 | 49.6 | 68.4 | 52.4 | 48.8 | 43.9 |
| 14/09/03 20:18 | 48 | 58.8 | 51.3 | 46.5 | 40.7 |
| 14/09/03 20:33 | 49.3 | 57.6 | 52.4 | 48.6 | 40.3 |
| 14/09/03 20:48 | 49.4 | 58.6 | 52.6 | 48.4 | 42 |
| 14/09/03 21:03 | 48.9 | 61.4 | 52 | 47.8 | 40.8 |
| 14/09/03 21:18 | 48.4 | 59.4 | 51.8 | 46.7 | 39.7 |
| 14/09/03 21:33 | 47.5 | 57.9 | 50.9 | 45.9 | 39 |
| 14/09/03 21:48 | 48.6 | 58.6 | 52 | 47.6 | 37.4 |
| 14/09/03 22:03 | 48 | 57.5 | 51.6 | 46.3 | 38.2 |
| 14/09/03 22:18 | 48.6 | 57.9 | 52 | 47.4 | 40 |
| 14/09/03 22:33 | 47.1 | 59.5 | 50.8 | 45.1 | 38.4 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 22:48 | 46.5 | 57.3 | 50.5 | 44.5 | 35.1 |
| 14/09/03 23:03 | 46.8 | 57.4 | 50.3 | 45 | 37.7 |

**Oakfield Court (Weekend Night-Time)**

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 12/09/03 23:03 | 47.8 | 73.3 | 50.1 | 45.4 | 42.3 |
| 12/09/03 23:18 | 47.9 | 61.9 | 51.2 | 46.4 | 41.7 |
| 12/09/03 23:33 | 46.2 | 63.1 | 49.3 | 44.7 | 40.3 |
| 12/09/03 23:48 | 47 | 68.8 | 50.4 | 44.7 | 40.5 |
| 13/09/03 00:03 | 47.8 | 73.5 | 51.2 | 45.4 | 39.5 |
| 13/09/03 00:18 | 48 | 62.4 | 51.5 | 46 | 40.6 |
| 13/09/03 00:33 | 48 | 73.2 | 50.8 | 45.5 | 40.9 |
| 13/09/03 00:48 | 47.9 | 74.6 | 50.5 | 45.5 | 41.3 |
| 13/09/03 01:03 | 46.3 | 61.9 | 49.5 | 44.3 | 40.1 |
| 13/09/03 01:18 | 47 | 65.8 | 49.6 | 45.4 | 42 |
| 13/09/03 01:33 | 46.2 | 65.5 | 49.3 | 44.3 | 40 |
| 13/09/03 01:48 | 45 | 62.1 | 48.3 | 42.7 | 38 |
| 13/09/03 02:03 | 45.3 | 67.6 | 48.6 | 42.6 | 37.9 |
| 13/09/03 02:18 | 44.9 | 60.3 | 49 | 40.8 | 36.2 |
| 13/09/03 02:33 | 46.3 | 60.3 | 48.9 | 44.6 | 40.4 |
| 13/09/03 02:48 | 43.6 | 63 | 46 | 41.4 | 38.9 |
| 13/09/03 03:03 | 43.3 | 63.3 | 46.1 | 41.4 | 39.1 |
| 13/09/03 03:18 | 45.3 | 64.8 | 48.1 | 43.1 | 39.5 |
| 13/09/03 03:33 | 45.4 | 67.3 | 47.5 | 42.2 | 39.2 |
| 13/09/03 03:48 | 46.8 | 67.2 | 49.3 | 45.1 | 42.5 |
| 13/09/03 04:03 | 46.6 | 65.9 | 49.8 | 44.3 | 41 |
| 13/09/03 04:18 | 45 | 66.3 | 47.3 | 42.3 | 39.9 |
| 13/09/03 04:33 | 42.9 | 57.9 | 44.7 | 42 | 39.9 |
| 13/09/03 04:48 | 44.6 | 66.7 | 47.3 | 41.8 | 38.5 |
| 13/09/03 05:03 | 44.3 | 68 | 47.4 | 41.9 | 39.6 |
| 13/09/03 05:18 | 45 | 66.8 | 46.5 | 42.8 | 40.7 |
| 13/09/03 05:33 | 44.5 | 66.9 | 45.8 | 42 | 39.4 |
| 13/09/03 05:48 | 43 | 64.7 | 45 | 41.2 | 39.3 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 13/09/03 06:03 | 42.1 | 66.1 | 43.4 | 40 | 38.5 |
| 13/09/03 06:18 | 41.4 | 58.9 | 42.9 | 39.4 | 37 |
| 13/09/03 06:33 | 44.2 | 59.3 | 47.6 | 40.4 | 37.7 |
| 13/09/03 06:48 | 44.9 | 62.9 | 47.8 | 40.4 | 37.5 |
| 13/09/03 07:03 | 46.1 | 60 | 49.4 | 42.8 | 39.1 |
| 13/09/03 23:03 | 49.7 | 75 | 52.8 | 46.9 | 41.9 |
| 13/09/03 23:18 | 47.8 | 62.2 | 51.4 | 44.5 | 39.3 |
| 13/09/03 23:33 | 48.3 | 61.7 | 52.4 | 45.4 | 38.7 |
| 13/09/03 23:48 | 48 | 61.1 | 51.7 | 45.4 | 39.3 |
| 14/09/03 00:03 | 49.4 | 64.8 | 53.3 | 46.2 | 39.9 |
| 14/09/03 00:18 | 47.7 | 67 | 51.9 | 43.7 | 37.6 |
| 14/09/03 00:33 | 47.1 | 63.1 | 51 | 42.4 | 37.4 |
| 14/09/03 00:48 | 47.9 | 60.7 | 52.1 | 44.1 | 36.2 |
| 14/09/03 01:03 | 47.3 | 61.8 | 51 | 42.7 | 36.5 |
| 14/09/03 01:18 | 46 | 59.9 | 50.3 | 41.2 | 34.3 |
| 14/09/03 01:33 | 46.1 | 61.5 | 50.7 | 41.1 | 32.7 |
| 14/09/03 01:48 | 43 | 56.4 | 47.6 | 37.8 | 31 |
| 14/09/03 02:03 | 44.1 | 58.7 | 47.9 | 40.8 | 32.6 |
| 14/09/03 02:18 | 43.9 | 56.8 | 48.1 | 39.5 | 32.3 |
| 14/09/03 02:33 | 44.7 | 63.6 | 49 | 39.5 | 33.2 |
| 14/09/03 02:48 | 44.7 | 60 | 48.8 | 36.3 | 30 |
| 14/09/03 03:03 | 45.2 | 59.1 | 49.5 | 39.6 | 32.6 |
| 14/09/03 03:18 | 45.7 | 59.6 | 49.6 | 41.8 | 34.2 |
| 14/09/03 03:33 | 44.9 | 59.9 | 49.5 | 39.4 | 33.4 |
| 14/09/03 03:48 | 44.4 | 58.1 | 48.9 | 38.2 | 31.9 |
| 14/09/03 04:03 | 45.3 | 59.6 | 49.4 | 40.9 | 34.1 |
| 14/09/03 04:18 | 44.9 | 58.7 | 49.9 | 39.1 | 32.8 |
| 14/09/03 04:33 | 45.5 | 59.1 | 49.6 | 38.2 | 31.5 |
| 14/09/03 04:48 | 41.2 | 57.8 | 44.9 | 34.5 | 32.1 |
| 14/09/03 05:03 | 41.3 | 59.7 | 44 | 33.4 | 31.1 |
| 14/09/03 05:18 | 41.3 | 60.3 | 44.3 | 33.1 | 30.7 |
| 14/09/03 05:33 | 40.2 | 60.4 | 41.9 | 32.9 | 30.7 |
| 14/09/03 05:48 | 39.5 | 59.4 | 41.6 | 33.4 | 30.9 |
| 14/09/03 06:03 | 39.6 | 59.6 | 39 | 31.8 | 30.4 |
| 14/09/03 06:18 | 40.8 | 64.3 | 39.9 | 30.9 | 29.4 |

| Date & Time | LAeq | LAmax | LA10 | LA50 | LA90 |
|---|---|---|---|---|---|
| 14/09/03 06:33 | 40.8 | 63.4 | 41.8 | 31.9 | 29.9 |
| 14/09/03 06:48 | 51.8 | 71.4 | 56.6 | 33.8 | 30.3 |
| 14/09/03 07:03 | 44.2 | 66.2 | 47.1 | 36.5 | 32.9 |

# Appendix C
# Noise Effect Calculations

## Expected Plant Inventory during Construction

**Calculation of Equivalent Continuous Sound Power Level dB(A) for each type of plant**

| Operation and Plant | Number | Assumed Sound Power Level dB(A) | Estimated on-time of activity (%) | Equivalent Continuous Sound Power Level dB(A) |
|---|---|---|---|---|
| **Site Preparation/Earthworks** | | | | |
| Bulldozer | 1 | 108 | 100 | 108 |
| Pneumatic Breaker | 1 | 119 | 100 | 119 |
| Grader | 1 | 108 | 100 | 108 |
| Excavator | 2 | 106 | 100 | 109 |
| Dump Trucks | 2 | 110 | 100 | 113 |
| Continuous Flight Auger Piling Rigs | 2 | 115 | 100 | 118 |
| | | | Total | **122** |
| **Civils and Building Phase** | | | | |
| Excavators | 2 | 106 | 100 | 109 |
| Dump Trucks | 2 | 110 | 100 | 113 |
| Hydraulic Crane | 1 | 105 | 100 | 108 |
| Batching Plant (small mobile plant) | 1 | 106 | 100 | 106 |
| Re-bar saws | 2 | 107 | 100 | 110 |
| Grinders | 4 | 110 | 100 | 116 |
| | | | Total | **119** |
| **Structural Steel and Mechanical Plant** | | | | |
| 40t crane | 4 | 105 | 100 | 111 |
| 150t crawler crane | 2 | 110 | 100 | 113 |
| Pneumatic guns | 4 | 110 | 100 | 116 |
| Diesel Weld sets | 10 | 105 | 100 | 115 |
| Air Compressors | 10 | 105 | 100 | 115 |
| | | | Total | **121** |
| **Pipe and duct fabrication and installation** (Similar plant to structural steel fabrication but including grinders) | | | | |
| | | | Total | **122** |

Source Entec & O'Dwyer/BS 5228



## Scenario 1 - Earthworks and foundations

**Noise level predictions at sensitive receivers for typical plant, based on the preceding table**

| *Receptor location* | *Plant type* | *$L_{wa}$ dB(A)* | *On-time correction* | *Distance (m)* | *Distance correction* | *$L_{pa}$ sound level* | *Ground correction* | *Barrier correction* | *Activity $L_{Aeq}$* |
|---|---|---|---|---|---|---|---|---|---|
| Oakfield Court | Bulldozer | 108 | 0 | 250 | 56.0 | 52.0 | 0 | -10 | 42.0 |
| | Pneumatic breaker | 119 | 0 | 250 | 56.0 | 63.0 | 0 | -10 | 53.0 |
| | Grader | 108 | 0 | 250 | 56.0 | 52.0 | 0 | -10 | 42.0 |
| | Excavators | 109 | 0 | 250 | 56.0 | 53.0 | 0 | -10 | 43.0 |
| | Dumpers | 113 | 0 | 250 | 56.0 | 57.0 | 0 | -10 | 47.0 |
| | Piling Rig | 118 | 0 | 250 | 56.0 | 62.0 | 0 | -10 | 52.0 |
| | Hydraulic crane | 105 | 0 | 250 | 56.0 | 49.0 | 0 | -10 | 39.0 |
| | Batching Plant | 106 | 0 | 250 | 56.0 | 50.0 | 0 | -10 | 40.0 |
| | Re-bar saws | 110 | 0 | 250 | 56.0 | 54.0 | 0 | -10 | 44.0 |
| | Grinders | 116 | 0 | 250 | 56.0 | 60.0 | 0 | -10 | 50.0 |
| Swilley Terrace | Bulldozer | 108 | 0 | 350 | 58.9 | 49.1 | 0 | -10 | 39.1 |
| | Pneumatic breaker | 119 | 0 | 350 | 58.9 | 60.1 | 0 | -10 | 50.1 |
| | Grader | 108 | 0 | 350 | 58.9 | 49.1 | 0 | -10 | 39.1 |
| | Excavators | 109 | 0 | 350 | 58.9 | 50.1 | 0 | -10 | 40.1 |
| | Dumpers | 113 | 0 | 350 | 58.9 | 54.1 | 0 | -10 | 44.1 |
| | Piling Rig | 118 | 0 | 350 | 58.9 | 59.1 | 0 | -10 | 49.1 |
| | Hydraulic crane | 105 | 0 | 350 | 58.9 | 46.1 | 0 | -10 | 36.1 |
| | Batching Plant | 106 | 0 | 350 | 58.9 | 47.1 | 0 | -10 | 37.1 |
| | Re-bar saws | 110 | 0 | 350 | 58.9 | 51.1 | 0 | -10 | 41.1 |
| | Grinders | 116 | 0 | 350 | 58.9 | 57.1 | 0 | -10 | 47.1 |

**Calculation of resultant $L_{Aeq}$ dB(A) (Scenario 1)**

| *Receptor location* | *Activity $L_{Aeq}$* | *$L_{Aeq}/10$* | *$10^{L_{Aeq}/10}$* | *Sum* | *Resultant $L_{Aeq}$* |
|---|---|---|---|---|---|
| Oakfield Court | 42 | 4.2 | 16000.0 | 608593.1 | **57.8** |
| | 53 | 5.3 | 201428.1 | | |
| | 42 | 4.2 | 16000.0 | | |
| | 43 | 4.3 | 20142.8 | | |
| | 47 | 4.7 | 50596.4 | | |
| | 52 | 5.2 | 160000.0 | | |
| | 39 | 3.9 | 8019.0 | | |
| | 40 | 4.0 | 10095.3 | | |
| | 44 | 4.4 | 25358.3 | | |
| | 50 | 5.0 | 100953.2 | | |
| Swilley Terrace | 39 | 3.9 | 8163.3 | 310506.7 | **54.9** |
| | 50 | 5.0 | 102769.4 | | |
| | 39 | 3.9 | 8163.3 | | |
| | 40 | 4.0 | 10276.9 | | |
| | 44 | 4.4 | 25814.5 | | |
| | 49 | 4.9 | 81632.7 | | |
| | 36 | 3.6 | 4091.3 | | |
| | 37 | 3.7 | 5150.7 | | |
| | 41 | 4.1 | 12937.9 | | |
| | 47 | 4.7 | 51506.7 | | |

# Scenario 2 - Civils, steel fabrication and pipe work

**Noise level predictions at sensitive receivers for typical plant.**

| *Receptor location* | *Plant type* | *$L_{wa}$ dB(A)* | *On-time correction* | *Distance (m)* | *Distance correction* | *$L_{pa}$ sound level* | *Ground correction* | *Barrier correction* | *Activity $L_{Aeq}$* |
|---|---|---|---|---|---|---|---|---|---|
| Oakfield Court | 40t crane | 111 | 0 | 250 | 56.0 | 55.0 | 0 | -10 | 45.0 |
| | 150t crane | 113 | 0 | 250 | 56.0 | 57.0 | 0 | -10 | 47.0 |
| | Pneumatic guns | 116 | 0 | 250 | 56.0 | 60.0 | 0 | -10 | 50.0 |
| | Diesel weld sets | 115 | 0 | 250 | 56.0 | 59.0 | 0 | -10 | 49.0 |
| | Air compressors | 115 | 0 | 250 | 56.0 | 59.0 | 0 | -10 | 49.0 |
| | Grinders | 116 | 0 | 250 | 56.0 | 60.0 | 0 | -10 | 50.0 |
| Swilley Terrace | 40t crane | 111 | 0 | 350 | 58.9 | 52.1 | 0 | -10 | 42.1 |
| | 150t crane | 113 | 0 | 350 | 58.9 | 54.1 | 0 | -10 | 44.1 |
| | Pneumatic guns | 116 | 0 | 350 | 58.9 | 57.1 | 0 | -10 | 47.1 |
| | Diesel weld sets | 115 | 0 | 350 | 58.9 | 56.1 | 0 | -10 | 46.1 |
| | Air compressors | 115 | 0 | 350 | 58.9 | 56.1 | 0 | -10 | 46.1 |
| | Grinders | 116 | 0 | 350 | 58.9 | 57.1 | 0 | -10 | 47.1 |



**Calculation of resultant $L_{Aeq}$ dB(A) (Scenario 2)**

| *Receptor location* | *Activity $L_{Aeq}$* | *$L_{Aeq}/10$* | *$10^{L_{Aeq}/10}$* | *Sum* | *Resultant $L_{Aeq}$* |
|---|---|---|---|---|---|
| Oakfield Court | 45 | 4.5 | 31924.2 | 444806.9 | **56.5** |
| | 47 | 4.7 | 50596.4 | | |
| | 50 | 5.0 | 100953.2 | | |
| | 49 | 4.9 | 80190.0 | | |
| | 49 | 4.9 | 80190.0 | | |
| | 50 | 5.0 | 100953.2 | | |
| Swilley Terrace | 42 | 4.2 | 16287.9 | 226942.3 | **53.6** |
| | 44 | 4.4 | 25814.5 | | |
| | 47 | 4.7 | 51506.7 | | |
| | 46 | 4.6 | 40913.2 | | |
| | 46 | 4.6 | 40913.2 | | |
| | 47 | 4.7 | 51506.7 | | |

# Appendix D
# Mathematical Modelling of Lough Swilly

# An Bord Pleanála

# EIS Approval



| | Drawing No | Attachment No | Description | Date | Check By |
|---|---|---|---|---|---|
| | Buc/LA/B6(ii) | Attachment B.6 | EIS Approval | 01/07/2008 | Donal Casey |

# An Bord Pleanála

## PLANNING AND DEVELOPMENT ACTS 2000 TO 2007

**Donegal County Council**

**APPLICATION** by Donegal County Council for approval under section 226 of the Planning and Development Acts, 2000 to 2007 in accordance with plans and particulars, including an environmental impact statement, lodged with the Board on the 7th day of December, 2007.

**PROPOSED DEVELOPMENT:** Construction of an upgrade of the wastewater treatment works and satellite sludge dewatering centre to provide treatment facilities for a population equivalent of 13,200 at Buncrana, County Donegal.

### DECISION

**GRANT approval for the above proposed development in accordance with the said plans and particulars based on the reasons and considerations under and subject to the conditions set out below.**



### MATTERS CONSIDERED

In making its decision, the Board had regard to those matters to which, by virtue of the Planning and Development Acts and Regulations made thereunder, it was required to have regard. Such matters included any submissions and observations received by it in accordance with statutory provisions.

### REASONS AND CONSIDERATIONS

Having regard to the Environmental Impact Statement and the mitigation measures set out therein, the submissions made to the Board, the provisions of the current development plan for the area and to the wastewater treatment facilities currently serving the town of Buncrana, it is considered that, subject to compliance with the conditions set out below, the proposed development would not result in significant adverse effects on the environment and would be in accordance with the proper planning and sustainable development of the area.

## CONDITIONS

1. Treated wastewater shall be discharged via the existing long sea outfall to Lough Swilly.

   **Reason:** To protect the quality of receiving waters.

2. A comprehensive Site Management Plan, which shall include bunding and filtration measures, shall be put in place for the duration of construction so as to ensure that no undue risk of water pollution is posed by stored oils/fuels/lubricants or from silt laden site run-off.

   **Reason:** To protect water quality during construction.

3. A receiving water survey to determine the resultant water quality impacts of the wastewater treatment works shall be undertaken after completion of Stage 1 of the development. Any corrective action required in respect of the resultant water quality impacts shall be incorporated into/undertaken in advance of Stage 2 of the development.

   **Reasons:** To protect the quality of receiving waters.

4. The results of the monitoring of the effluent discharges shall be made available to the general public and shall be published at least annually on the planning authority's website.

   **Reason:** To ensure that information in relation to the environment is available to the public.

5. Odours emanating from the development shall not exceed a level of 3ou/m³ on a 98 percentile basis when measured at the site boundary.

   **Reason:** To control odour emissions from the development.

6. New and extended buildings shall be visually co-ordinated. Finishes and roof profiles on new and extended or modified buildings shall be compatible.

**Reason:** In the interest of visual amenity.

**Member of An Bord Pleanála**
**duly authorised to authenticate**
**the seal of the Board.**

**Dated this** 22nd **day of** August **2008.**