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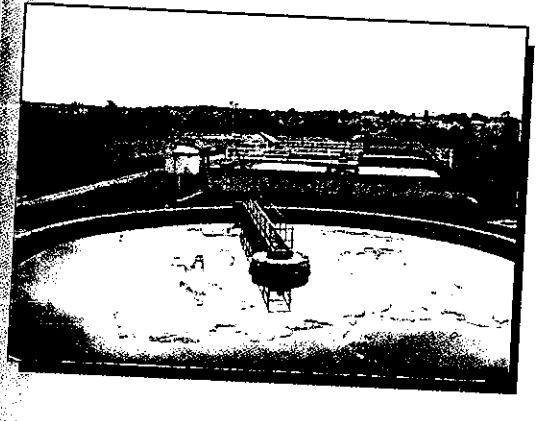
*Comhairle Chontae Laoise*
**LAOIS COUNTY COUNCIL**

# PORTLAOISE MAIN DRAINAGE

## Environmental Impact Statement

## for the

## Upgrade of Portlaoise Wastewater Treatment Works



August 2001

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*Comhairle Chontae Laoise*
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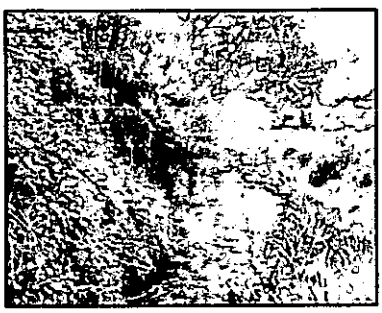

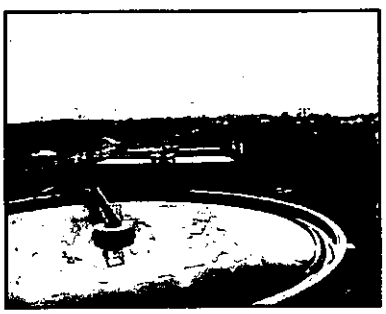

## PORTLAOISE MAIN DRAINAGE

**Environmental Impact Statement**

**for the**

**Upgrade of Portlaoise Wastewater Treatment Works**

# NON-TECHNICAL SUMMARY

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B.E., M.I.E., F.I.E.I.
County Engineer

***November 2001***

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## 1 PORTLAOISE MAIN DRAINAGE SCHEME

The Portlaoise Main Drainage Scheme concerns the proposed strategic development of the sewerage infrastructure in Portlaoise.

The three main elements of the drainage scheme are:

- The phased upgrading of the existing wastewater treatment works,
- The provision of new trunk foul sewers, and
- The upgrading of the storm drainage system.

The scheme also includes for significant rationalisation of the existing network including the elimination of existing pumping stations where possible, reducing overflows from the combined sewer system and separating stormwater from the foul flows wherever practicable.

## 2 BACKGROUND TO THE SCHEME

Portlaoise is currently experiencing significant development pressures associated with the general economic environment and the particular characteristics of Portlaoise as the major commercial and institutional centre for County Laois. The increasing role of Portlaoise as a dormitory centre for the Dublin region, due to its location on the N7 primary road and link to the mainline rail network is further intensifying these development pressures. This pressure to provide services to expanding developments is exacerbating capacity problems in the existing sewerage infrastructure.

The Portlaoise Main Drainage catchment, shown in **Fig. 1**, comprises the town centre area, the newer outlying suburbs and a considerable area of land, which has been zoned for new development in the current County Development Plan.

The existing sewer network generally comprises of combined systems in the older town centre area, with separate systems in the newer outlying suburbs. Because of the relatively flat nature of the catchment, a large proportion of the catchment is served by submersible pumping stations, a number of which operate in series.

The sewerage from the town drains to a treatment works, located to the north of the town, which discharges to the river Triogue.

The river Triogue is a tributary of the river Barrow, which is an important national river system in terms of fisheries, navigation, water abstraction, general environment and amenity. The Triogue is severely

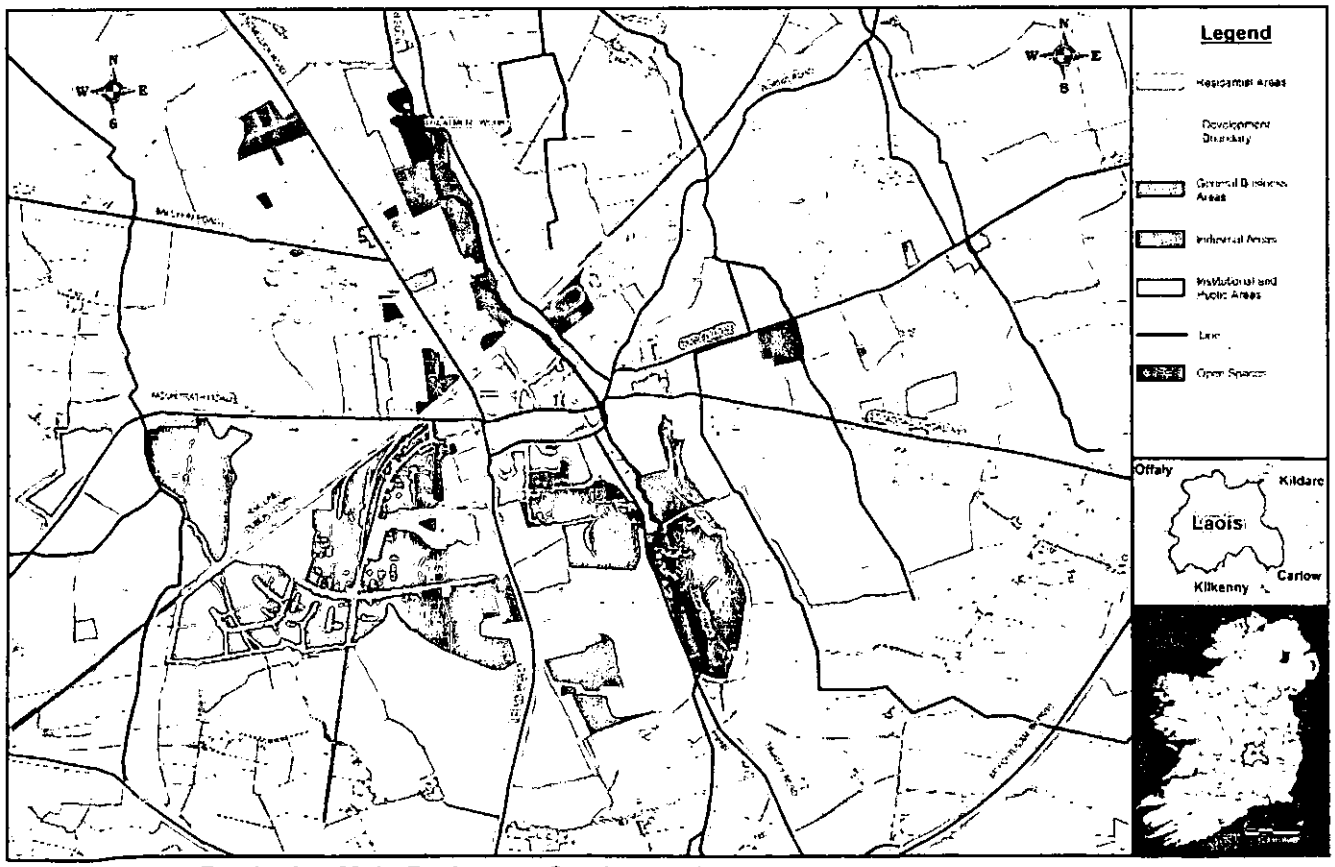


**Figure 1** **Portlaoise Main Drainage - Catchment Area**

polluted downstream of the wastewater treatment discharge point (biotic index of Q-2 in 1997), compared with a moderately polluted condition upstream of the town (Q-3). The Barrow is moderately polluted upstream and downstream of the Triogue branch. The existing receiving environment, therefore, is regarded as somewhat degraded and in need of urgent measures to reverse this position.

The existing treatment works **(Fig. 2)** provides conventional treatment for a designed load of 12,000 population equivalent (p.e.), which current loads now exceed. The treatment works is currently biologically and hydraulically overloaded with the load on the works in 1999 was in the order of 15,000 p.e. There are also significant capacity problems in the existing sewer network, which are being exacerbated by the increasing development pressures. To overcome the problems in the existing sewerage infrastructure Laois County Council propose to implement the Portlaoise Main Drainage Scheme.

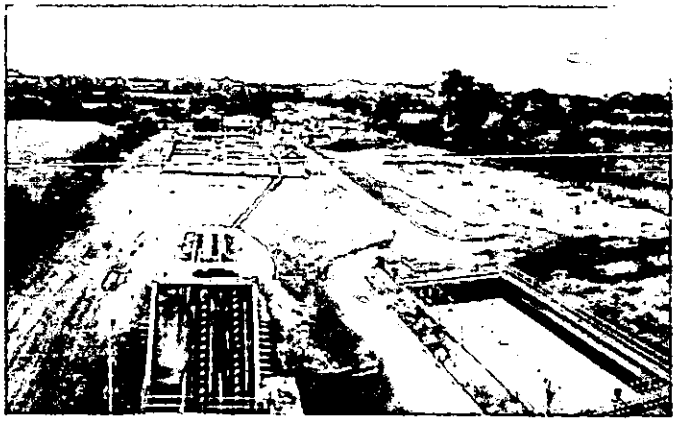

**Figure 2** **Existing Wastewater Treatment Works**

However, there is an immediate and urgent need to commence work on the phased upgrade of the existing wastewater treatment works to cater for the present and future loads while achieving appropriate effluent standards to improve and protect water quality in the river Triogue and in the Barrow system generally.

In conjunction with upgrading of the wastewater treatment plant, new sludge treatment and handling facilities are required in order to achieve sustainable re-use of the biosolids. This sludge can be very beneficial as a nutrient supplement and soil conditioner, provided it is rendered inoffensive and safe from the point of view of pollutants and pathogens and applied in accordance with accepted Codes of Practise. This requires the provision of appropriate treatment facilities in accordance with the Draft Sludge Management Plan for Co. Laois. The proposed sludge treatment facilities must also be capable of handling and treating the sludges generated at other wastewater treatment plants in the county, which will be transported to Portlaoise for treatment.

## 3 ENVIRONMENTAL IMPACT STATEMENT

This Environmental Impact Statement concerns the proposed upgrading of Portlaoise Wastewater Treatment Works (WWTW), which is one of the main elements of the overall drainage strategy. The other elements of the drainage strategy, involving sewers, pumping stations, ponds and other works, will be the subject of separate statutory process, as appropriate, prior to their development.

This Environmental Impact Statement has been prepared in accordance with the following:

- The EU Directive on Environmental Impact Assessment (85/337/EEC) and associated National Regulations referred to as the European Communities (Environmental Impact Assessment) Regulations, 1989 (SI No. 349/1989).
- The Local Government (Planning and Development) Regulations, 1994 (S.I. No. 86 of 1994)
- Advice notes on current practice in the preparation of Environmental Impact Statements published by the Environmental Protection Agency (1995)

Following completion of the E.I.S., a notice will be published in the public press advising that it has been prepared and forwarded to An Board Pleanala for assessment.

Copies of the E.I.S. will be available for inspection during normal office hours by the public, for the period specified in the notice, at the Main Reception, Laois County Council, County Hall, Portlaoise.

Copies of the E.I.S document and of the Non-Technical Summary will be available on application to the Water Services Section, Laois County Council, County Hall, Portlaoise. The Non-Technical Summary is available free of charge. The main E.I.S. Report is available for purchase at a cost of IR£50.

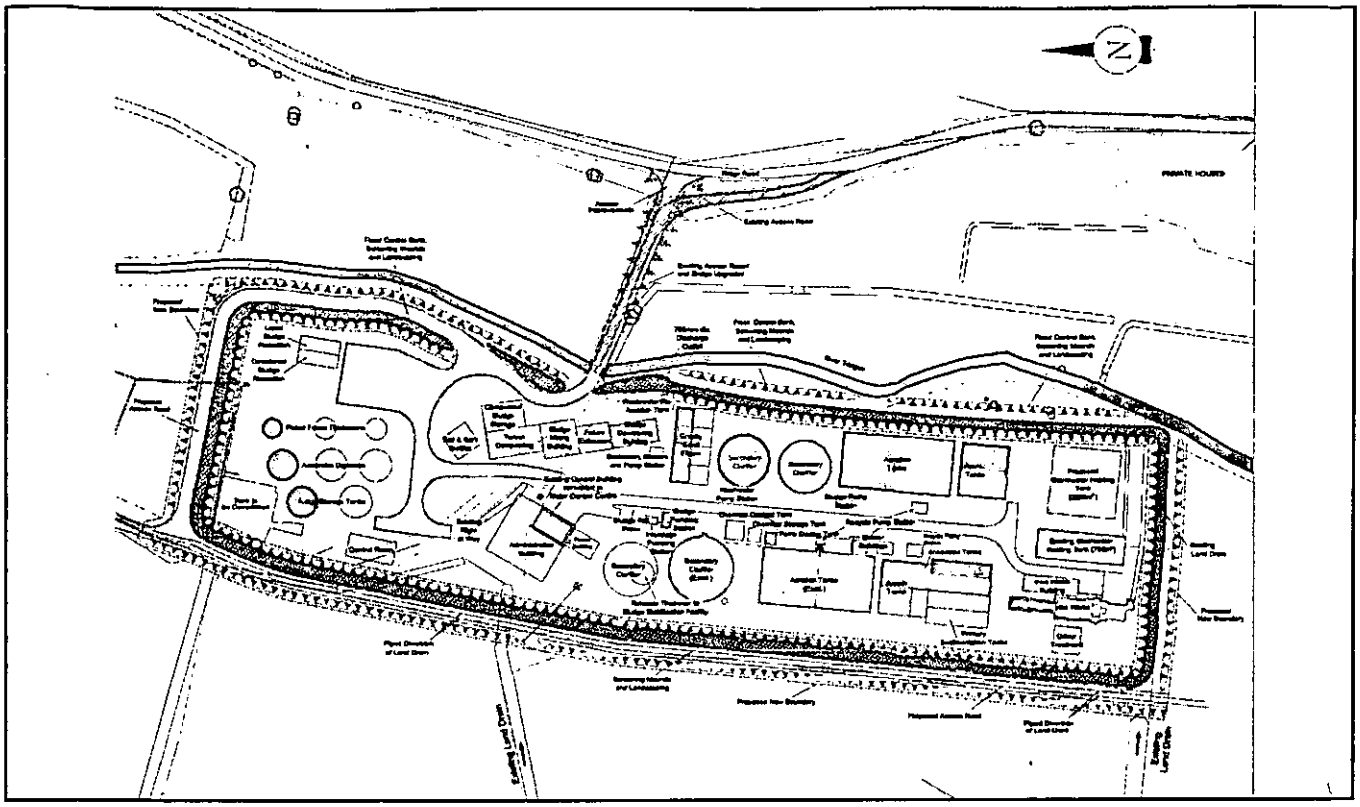

**Figure 3 Indicative Arrangement of Proposed Upgraded Wastewater Treatment Works**

## 4 DESCRIPTION OF PROPOSED WORKS

The proposed works, to which this EIS relates, concerns the provision of upgraded sewage treatment and sludge treatment facilities for the town and environs of Portlaoise, Co. Laois, on the site of the existing wastewater treatment works at Portlaoise. The upgrading of the existing treatment facilities will be undertaken in a number of stages to cater for projected design loads of 26,000 p.e. in the short term (2008) and 39,000 p.e. in the medium term (2020).

The proposed work involves the provision of new tankage, buildings mechanical and electrical plant associated with wastewater and sludge treatment process and siteworks infrastructure at the site of the existing Wastewater Treatment Works.

It should be noted that the project, if approved, would be implemented as a Public Private Partnership (PPP) project whereby it is proposed to invite Contractors to tender for the design, construction and long term operation of this plant. In this approach, variations in the design detail and arrangement of the facilities would be permitted, subject to achieving the performance objectives set out in this EIS both in terms of wastewater and sludge treatment and also in achieving compliance with all of the environmental performance standards defined in the document.

The proposed upgraded wastewater treatment facility will employ appropriate BATNEEC (Best Available Technology Not Entailing Excessive Costs) technologies to cater for the projected development loads in order to achieve the defined effluent standards with a view to providing Laois County Council with the Best Practicable Environmental option.

**Fig. 3** shows an indicative arrangement of the proposed upgrading works showing the extent of the site, access arrangements and a typical arrangement showing new construction and modifications to the existing works to achieve the requirements and objectives of the upgraded works. **Fig. 4** shows a photomontage of this indicative arrangement.

The arrangement of tanks and buildings indicated in **Fig. 3** is typical of a works that would meet the requirements. Some variations in tankage and building requirements will arise depending on the selected process. The size and dimension of the proposed structures of the development will vary up to a maximum height of approximately 8 to 10 meters above ground level. The proposed water retaining structures will be comparable in scale to those existing on site at present. The tankage associated with sludge treatment and some of the proposed buildings will be larger in scale than those existing on site in order to provide extra treatment

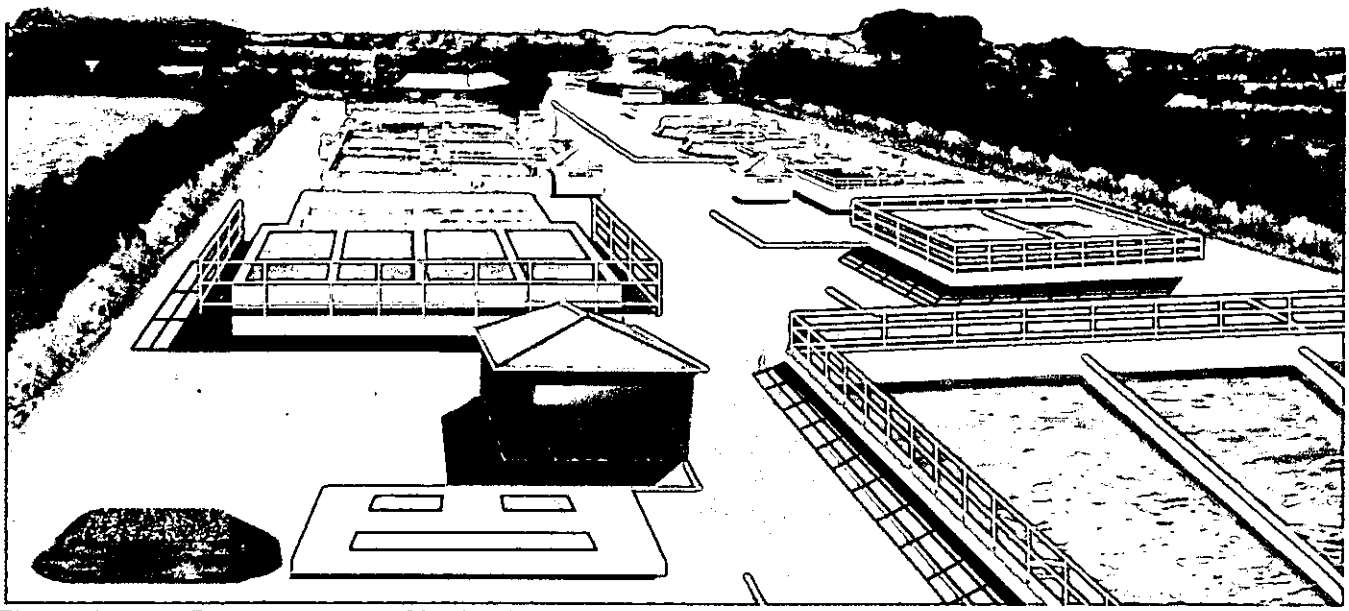

**Figure 4 Photomontage of indicative Arrangement of Proposed Wastewater Treatment Works**

and minimise odour emissions. The arrangement in **Fig. 3** and the indicative details elsewhere in this EIS are representative of the requirements of the plant, whichever process options are ultimately selected following procurement of a Contractor.

The existing site access arrangements are unsatisfactory in terms of safe access / egress from the public road and relatively poor horizontal and vertical alignment of the access road. In the short term, therefore, it is proposed to upgrade and improve the existing access road from the public road to the site. However, there is a future proposal for a new ring road passing to the north of the treatment works site. In the event that this road is provided in the future, provision is made for a separate access road from this ring road to the site. This will provide a more satisfactory long term arrangement for vehicular access, particularly for conveyance of sludges from outlying plants into the site and conveyance of biosolids product from the site.

Three landowners currently have right of way to their lands on the western side of the treatment works via the existing works access road. Right of access to these lands for the landowners will be maintained in the future development. However, depending on final site layout, it may be necessary to divert the 'right of way' around the perimeter of the works site as indicated on **Fig. 3**.

## 5 ALTERNATIVES EXAMINED

It is proposed to site the new treatment facilities on the site of the existing works. The new treatment facility will discharge to the River Triogue and will employ appropriate BATNEEC (Best Available Technology Not Entailing Excessive Costs) technologies to cater for the projected development loads in order to achieve the defined effluent standards.

The principal alternatives examined in the development of the scheme were:

- Relocation of the treatment works further downstream on the Triogue or at the confluence of the rivers Triogue and Barrow where the greater baseflows in the river would be available, which might permit less rigorous effluent standards;
- Pumping of effluent from the treatment works site downstream to the river Barrow for discharge at the Triogue confluence or further downstream;

The options of relocating treatment or discharge to locations further downstream in the river system were rejected on the following grounds:

- They are not considered sustainable in that they could compromise discharges or water abstractions associated with other communities lower down the catchment;
- The costs involved in these options were

significantly higher than for upgrading of the existing works.

In the area of sludge treatment, the County Laois Sludge Management Plan recommended sludge stabilisation and re-use for the wastewater sludges produced in County Laois. The following re-use options are permitted by the Sludge Management Plan:

- Thermal Waste to Energy Treatment
- Restoration of Peat Bogs
- Land Application of stabilised and dewatered sludges

Re-use of dewatered sludge either by landspreading or in reclamation of cut-away bog are the most viable options. Thermal waste to energy treatment is seen as a viable alternative for the longer term.

Sludge stabilisation processes, such as composting, alkaline stabilisation and thermal drying, produce a biosolid product, which is suitable for re-use and compliant with standards set in the relevant Codes of Good Practise.

Based on assessment of the available alternatives, therefore, the proposed scheme has been selected as the optimum scheme following technical, environmental and economic appraisal of all feasible alternatives.

## 6 APPRAISAL OF THE ENVIRONMENTAL EFFECTS OF THE PROJECT

The project was examined from the point of view of its environmental impacts, with significant adverse impacts categorised as profound, significant, moderate, slight, imperceptible or none depending on their scale, intensity or duration, combined with likelihood of occurrence.

The following is a general summary of the environmental impacts of the project:

***Human Beings:*** *The overall socio-economic impact of the proposed works would be positive, given the generally beneficial impact on the environment of the improvement in quality of effluent discharged, with considerable reduction in the organic, bacterial and nutrient load, compared with the existing discharge. Potential health and safety and nuisance risks associated with the project can be satisfactorily managed in the design of the project and are therefore regarded as of minor significance. Visual impact and disturbance to residential properties adjacent to the development varies from slight to moderate depending on viewing point. Provision of appropriate planted mounds and screening will mitigate any adverse visual and aesthetic impacts.*

***Air Impacts (Odour and Noise):*** *Wastewater treatment facilities can create odour nuisances to the surrounding environment. An environmental odour standard of 1 OU/$m^3$ at a 99.5% non-exceedence level as measured at adjacent residential dwellings and by the application of appropriate odour control measures to those processes that generate foul odours is required to mitigate this potential nuisance. The overall effect of providing advanced treatment will be positive from the perspective of decreasing odour dispersion currently associated with the existing treatment works.*

*There is also a potential for noise and vibration from mechanical plant. Setting appropriate limit values for noise from the proposed wastewater treatment works, as measured at the site boundary can offset this effect. Therefore, the construction and operation of the wastewater treatment works can be defined as "no impact" with respect to noise and vibration.*

***Climate:*** *The potential impacts of the proposed development on the global climate were addressed in relation to the generation of greenhouse gases from process facilities and through the consumption of energy. Given the scale of the development and the nature of the local environment, the development will not have any adverse impacts on the local climate.*

***Landscape:*** *The proposed development will involve slight change to the visual character of the area in the long term. The main visual impact will occur due to scale and height of the proposed structures. The potential short term "slight to moderate impacts" will be minimised by providing visual screening in the form of planted mounds and through the promotion of early establishment of planted species, both within the site and at the site perimeter. In the longer term, once the proposed screening has matured, the impact will be "imperceptible".*

***Flora and Fauna:*** *Approximately one third of the existing / proposed wastewater treatment site lies within the Ridge of Portlaoise proposed Natural Heritage Area (Site Code 876) with the main body*

*of the existing works lying outside the pNHA. The vegetation on site comprises common species of grassland and disturbed ground. In comparison with the surrounding agricultural land with species rich hedgerows, the proposed development site provides little habitat for birds and mammals. No significant nesting habitat for birds is present. The vegetation and habitats of the site are extensively modified by the existing wastewater treatment facilities, and do not meet NHA standard. All of the existing vegetation on the site will be impacted by the construction of the new plant. This impact is assessed as slight.*

*The proposed Natural Heritage Area adjacent to the site will not be impacted by the proposed development.*

*The mitigation measures proposed here aim to enhance biodiversity within the wastewater treatment site, by developing a range of habitats consistent with the site topography, and with the remaining habitats of conservation value in the Ridge of Portlaoise pNHA*

***Freshwater Environment:*** *The existing wastewater treatment works discharge to the river Triogue downstream of the town of Portlaoise. The river Triogue has a catchment area of approximately 96km$^2$ and is part of the upper Barrow catchment. The Triogue is severely polluted downstream of the wastewater treatment discharge point (biotic index of Q-2 in 1997), compared with a moderately polluted condition upstream of the town (Q-3). The Barrow is moderately polluted upstream and downstream of the Triogue branch. The existing environment, therefore, is regarded as somewhat degraded and in need of urgent measures to reverse this position*

*The Phosphorus Regulations (S.I. No. 258 of 1998) specified that the rivers with a Q2 should achieve a minimum target of Q3 by the year 2007, which correspond to a median of 0.07mg/l of Molybdate-Reactive Phosphate (MRP).*

*Achievement of this standard is currently beyond the practical limits, which can be achieved by proven available technologies, given present background concentrations in the river. It may be possible to reduce the background concentration by implementing an integrated nutrient management approach for agriculture in the upstream catchment. However, reduction of the background concentration is outside the scope of this EIS. Therefore, a BATNEEC standard for total phosphorous in the effluent discharge, having a median value of 0.5mg/l P, has been adopted.*

*An estimated load of 13.7kg TP is currently discharged daily from the existing WWTW to the river Triogue, the proposed BATNEEC standard will reduce the current phosphorus loading to the river Triogue by a factor of 4.7 at 26,000 p.e. and by a factor of 3.1 at 39,000 p.e.*

*Water quality in the river will thus improve as a higher quality effluent will result from the proposed upgrade to the works, which will lead to an increase in the diversity of species present.*

***Geology, Hydrogeology and Soil:*** *Given the confined nature of the proposed development no significant adverse impacts are anticipated in relation to the geology, hydrogeology and soil of the site.*

*Material Assets: The upgrading of the WWTW will occur without loss of amenity area as the upgrading will occur on the existing site. Existing right of access to lands on the western boundary of the site for the landowners will be maintained, both during the construction period and in the operation of the upgraded works. However, depending on final site layout, it may be necessary to divert the existing 'right of way' around the perimeter of the works site. The impact on material assets is, therefore, considered minor.*

***Cultural Heritage:*** *No known sites of archaeological significance exist within the proposed works site, which is the site of the existing Portlaoise Wastewater Treatment Works. It is considered unlikely that that any significant historical sites will be encountered during the construction of the proposed works and the impact is therefore considered as 'no impact'.*

***Construction:*** *The construction of these major works will result in adverse local impacts notably increased noise, vibration, dust emissions, visual impact, traffic disruption, damage to surfaces requiring re-instatement and to land use during the construction phase. These impacts will vary in intensity and are likely to be greatest in the early stages. The construction specification will incorporate a range of restrictions and standards for working practice and requirements for monitoring and management systems to moderate these impacts within normally accepted limits for the period of the construction, taken as approximately two years.*

In general, adverse environmental impacts can be satisfactorily mitigated / minimised in the design of the proposed works.

## Response to Environmental Studies

In recognition of potential adverse environmental impacts, the following works are proposed to mitigate such impacts:

- *The scale of the building works will be kept as small as practicable, consistent with the requirements for its satisfactory operation and maintenance. Landscape mitigation measures will be executed as part of the infrastructural component of the site development works, to provide visual screening in the form of planted mounds and by the promotion of early establishment of planted species, both within the site and at the site perimeter.*
- *Mitigation measures will be specified for incorporation into the design of the works to ensure that no detectable change will occur in ambient air quality (odour or noise)*
- *The proposed works will not significantly impact on the local traffic conditions in the area, apart from short-term traffic impacts during construction.*
- *Construction impacts will require to be managed in order to prevent undue local disturbance, particularly on Ridge Road. These measures will include programming and other restrictions, implementation of industry standard practices and compliance with legislation, normal codes and standards.*

The proposed upgrade work to the existing wastewater treatment works is an essential element of the Portlaoise Main Drainage Scheme, which will provide the sewerage infrastructure to allow the town of Portlaoise achieve its full potential as the major commercial and institutional centre for County Laois.

# DOCUMENT CONTROL SHEET

| | | | | | | |
|---|---|---|---|---|---|---|
| Client | Laois County Council | | | | | |
| Project Title | Portlaoise Main Drainage Scheme | | | | | |
| Document Title | Environmental Impact Statement for the Upgrade of Portlaoise Wastewater Treatment Works | | | | | |
| Document No. | MCOS/045-015-1-1/Rp015_F2 | | | | | |
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# Part A

## General

# 1 INTRODUCTION

## 1.1 PORTLAOISE MAIN DRAINAGE SCHEME

The Portlaoise Main Drainage Scheme concerns the proposed strategic development of the sewerage infrastructure in Portlaoise. The requirements for such a scheme is evidenced by the significant development pressures, which are currently being experienced in Portlaoise, associated with the general economic environment and the particular characteristics of Portlaoise as the major commercial and institutional centre for County Laois. The increasing role of Portlaoise as a dormitory centre for the Dublin region, due to its location on the N7 primary road and link to the mainline rail network is further intensifying these development pressures. This pressure to provide services to expanding developments is exaserbating capacity problems in the existing sewerage infrastructure. To overcome these problems Laois County Council propose to implement the Portlaoise Main Drainage Scheme.

This scheme includes for the phased upgrading of the existing wastewater treatment works, the provision of new trunk sewers and upgrading of the storm drainage system. The scheme also includes for significant rationalisation of the existing network including the elimination of existing pumping stations where possible, reducing overflows from the combined sewer system and separating stormwater from the foul flows wherever practicable. The scheme also includes for the provision of stormwater retention ponds on the northern boundary of the treatment works site by means of which stormwater run-off from the town would be attenuated, with reduction in suspended solids and pollutant loading on the River Triogue.

## 1.2 ENVIRONMENTAL IMPACT STATEMENT

This Environmental Impact Statement concerns the proposed upgrading of Portlaoise Wastewater Treatment Works (WWTW), which is one element of the overall drainage strategy. The other elements of the drainage strategy, involving sewers, pumping stations, ponds and other works, will be the subject of separate statutory process, as appropriate, prior to their development.

This EIS has been prepared in accordance with the requirements of the European Communities (Environmental Impact Assessment) Regulations 1989 (S.I.No.349, 1989) and the Local Government (Planning and Development) Regulations, 1994 (S.I. No.86 of 1994).

This document is presented in two parts;

Part A 'General' comprises chapters 1 & 2 which describe the scheme, i.e. the proposed upgrading works to the WWTW, the alternatives considered and project characteristics;

Part B 'Appraisal of Environmental Effects' comprises chapters 3 to 13. The contents of both parts are summarised below:

**Part A – General**

Chapter 1 - Introduction
Chapter 2 - Description of Proposed Scheme and Alternatives

**Part B – Appraisal of Environmental Effects**

Chapter 3 - Human Beings
Chapter 4 - Air & Odour
Chapter 5 - Climate
Chapter 6 - Noise & Vibration
Chapter 7 - Landscape
Chapter 8 - Fauna & Flora
Chapter 9 - Freshwater Environment
Chapter 10 - Geology, Hydrogeology & soil
Chapter 11 - Material Assets
Chapter 12 - Cultural Heritage
Chapter 13 - Construction phase

A list of specialist contributors to the EIS is presented in **Table 1.1.**

**Table 1.1 List of specialist contributors**

| Consultant Appointed | Area Covered |
|---|---|
| Tom Casey,<br>Aquavarra Research Ltd | Odour |
| Enterprise Ireland,<br>Environmental Services | Noise |
| Murray & Associates,<br>Landscape Architecture, Horticulture | Landscape |
| Eleanor Mayes,<br>Ecological consultancy | Ecology |
| Ecoserve,<br>Ecological consultancy Services Limited | Freshwater |
| Valerie J. Keeley Ltd<br>Archaeological consultancy | Archaeology |

## 1.3 EIS PUBLICATION

Following completion of the E.I.S., a notice will be published in the public press advising that it has been prepared and forwarded to An Board Pleanala for assessment.

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## 1.4 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT

This Environmental Impact Statement has been prepared in accordance with the following:

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- The Local Government (Planning and Development) Regulations, 1994 (S.I. No. 86 of 1994)
- Advice notes on current practice in the preparation of Environmental Impact Statements published by the Environmental Protection Agency (1995)
- The structure of the statement outlined in section 1.2 follows the headings in S.I. 349 under which the detailed Environmental Appraisal of project impacts is considered.
- In **Part A**, the scheme is described, together with the alternatives considered and the reasons for adoption of the proposed scheme.
- In **Part B**, covering the appraisal of environmental effects, the significant effects and ameliorative measures are considered.

# 2 DESCRIPTION OF PROPOSED SCHEME & ATERNATIVES CONSIDERED

## 2.1 BACKGROUND TO THE SCHEME

Portlaoise is the major population centre in Co. Laois and also supports the majority of service and industrial employment in the county. The town is experiencing rapid growth at present and this rapid growth is putting severe pressure on existing sewerage infrastructure.

The Portlaoise Main Drainage catchment, shown in **Fig. 2.1**, comprises the town centre area, the newer outlying suburbs and a considerable area of land, which has been zoned for new development in the current County Development Plan.

The sewer network generally comprises of combined systems in the older town centre area, with separate systems in the newer outlying suburbs. Because of the relatively flat nature of the catchment, a large proportion of the catchment is served by submersible pumping stations, a number of which operate in series.

The sewerage from the town drains to a treatment works, located to the north of the town, which discharges to the river Triogue..

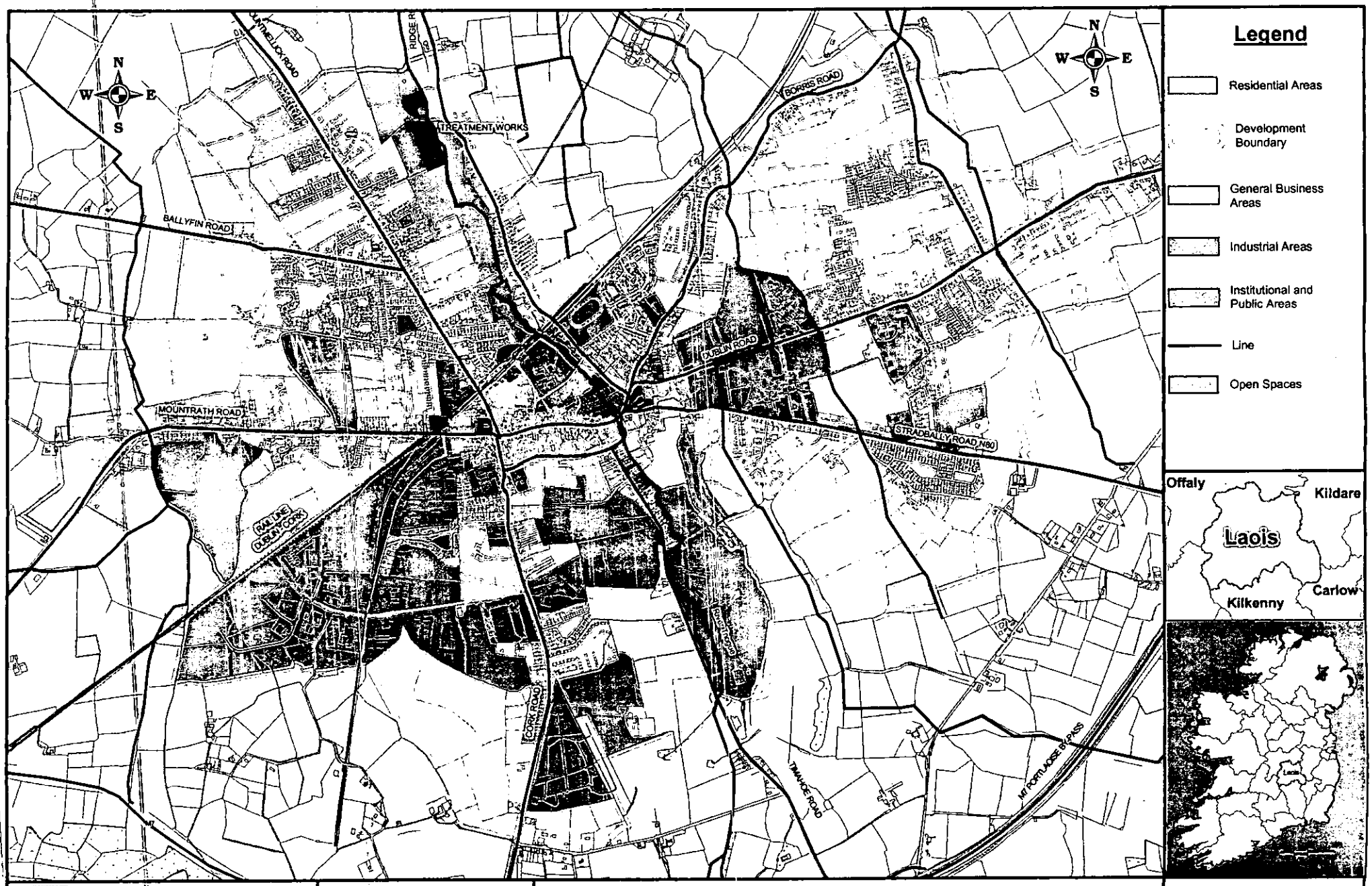
The river Triogue is a tributary of the river Barrow, which is an important national river system in terms of fisheries, navigation, water abstraction, general environment and amenity.

The existing treatment works provides conventional treatment for a designed load of 12,000 population equivalent (PE), which current loads now exceed. There are also significant capacity problems in the existing sewer network, which are being exaserbated by the increasing development pressures. To overcome the problems in the existing sewerage infrastructure Laois County Council propose to implement the Portlaoise Main Drainage Scheme.

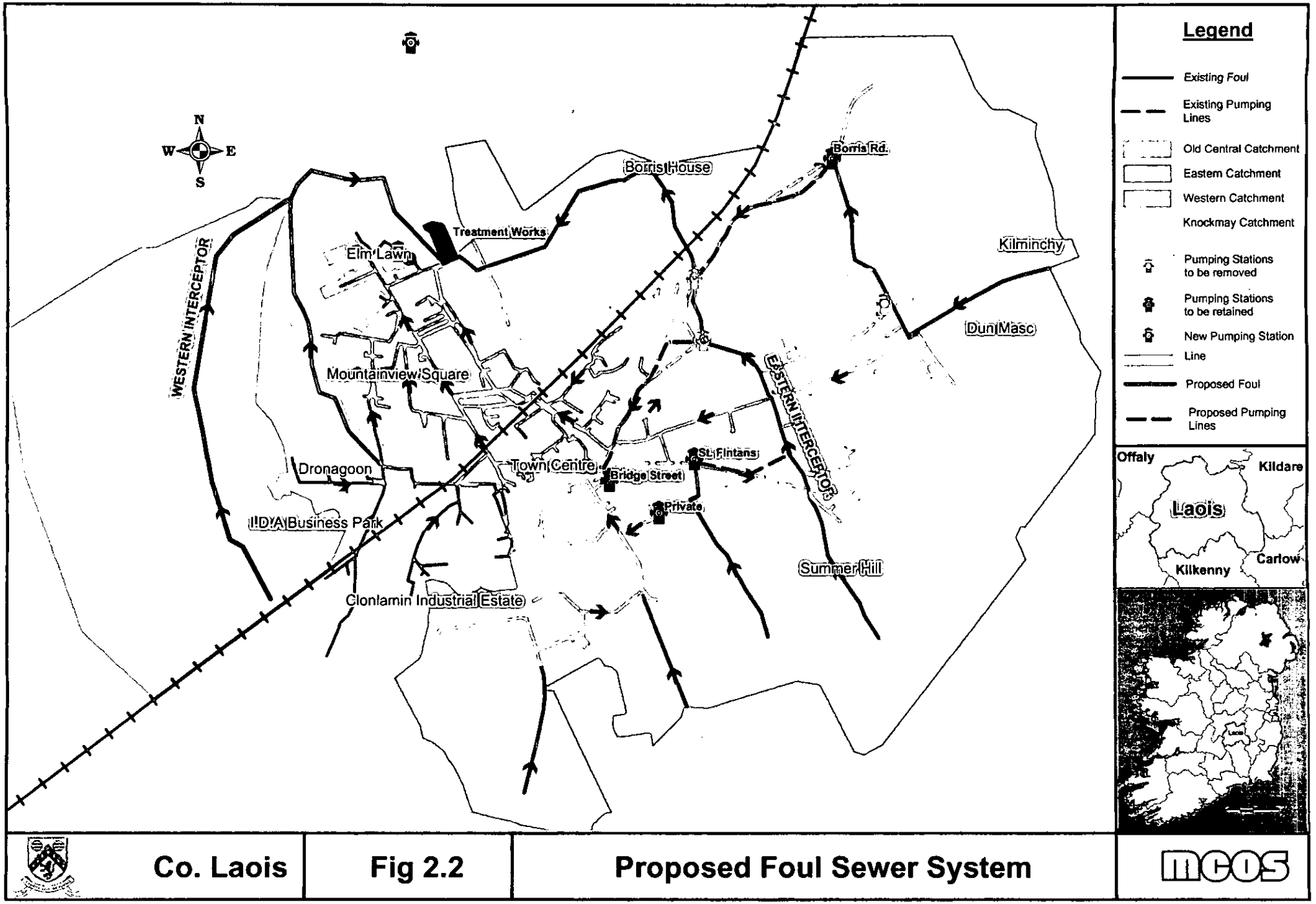
**Fig. 2.2** shows the general arrangement of the proposed strategic development of the sewerage infrastructure for the town of Portlaoise. This Portlaoise Main Drainage Scheme includes for the phased upgrading of the existing wastewater treatment works, the provision of new trunk sewers and upgrading of the storm drainage system. The scheme also includes for significant rationalisation of the existing network including the elimination of existing pumping stations where possible, reducing overflows from the combined sewer system and separating stormwater from the foul flows wherever practicable. The scheme also includes for the provision of stormwater retention ponds on the northern boundary of the treatment works site by means of which stormwater run-off from the town would be attenuated, with reduction in suspended solids and pollutant loading on the River Triogue.

However, there is an immediate and urgent need to commence work on the phased upgrade of the existing wastewater treatment works to cater for the present and future loads while achieving appropriate effluent standards to protect water quality in the river Triogue and in the Barrow system generally.

In conjunction with upgrading of the wastewater treatment plant, new sludge treatment and handling facilities are required in order to achieve sustainable re-use of the biosolids. This sludge can be very beneficial as a nutrient supplement and soil conditioner, provided it is rendered inoffensive and safe from the point of view of pollutants and pathogens and applied in accordance with accepted Codes of Practise. This requires the provision of appropriate treatment facilities in accordance with the Draft Sludge Management Plan for Co. Laois. The proposed sludge treatment facilities must also be capable of handling and treating the sludges generated at other wastewater treatment plants in the county, which will be transported to Portlaoise for treatment.




Co. Laois | Fig 2.1 | Portlaoise Main Drainage Catchment | mcos




| Co. Laois | Fig 2.2 | Proposed Foul Sewer System | mcos |
|---|---|---|---|

Therefore, the scheme, to which this EIS relates, concerns the provision of upgraded sewage treatment and sludge treatment facilities for the town and environs of Portlaoise, Co. Laois, on the site of the existing wastewater treatment works at Portlaoise

## 2.2 EXISTING ENVIRONMENT

The river Triogue has a catchment area of approximately 96km$^2$ and is part of the upper Barrow catchment. The Triogue is severely polluted downstream of the wastewater treatment discharge point (biotic index of Q-1 in 1999), compared with a moderately polluted condition upstream of the town (Q-3). The Barrow is moderately polluted upstream and donwstream of the Triogue branch. The principal pressures on the Triogue are:-

- The effluent discharge from the wastewater treatment works.
- A number of overflows from the combined sewer system in the town together with impacts from the urban stormwater drainage system.
- Downstream of Portlaoise, the river is also affected by reduced water quality in the Tip stream adjacent to the Kyletalesha landfill.

In considering the requirements for upgrading of the wastewater treatment works, the objective is to restore and conserve water quality in the Triogue and in the Barrow system generally to support coarse and game fisheries by complying with SI 293\88 "Salmonid Water Quality Regulations", to comply with the legislative requirements of SI 258\98, "Water Quality Requirement for Phosphorus" and generally to comply with the requirements of the "Urban Wastewater Treatment Regulations", SI 419\94. Consideration was also given to downstream water abstractions and to EPA Guideline Water Quality parameters for the south east rivers of Ireland.

At present, the Triogue does not meet these requirements and a number of fish kills have been recorded on the river in recent years. The existing environment, therefore, is regarded as somewhat degraded and in need of urgent measures to reverse this position.

## 2.3 EXISTING WASTEWATER TREATMENT WORKS

The existing wastewater treatment works was designed and commissioned in 1980 as an Extended Aeration plant to cater for a population equivalent (PE) of 10,000. Increased flow and organic load to the treatment works has resulted in a decrease in hydraulic and solids retention time in the aeration basin, which is insufficient for the extended aeration process. Therefore, the treatment process is now operating as a conventional activated sludge process. The original works was upgraded in 1998, with replacement of much of the mechanical plant and equipment, to cater for a population equivalent of 12,000.

The treatment works is currently biologically and hydraulically overloaded, which is evidenced by low dissolved oxygen levels in the aeration basin and a relatively poor efficiency of organic and nutrient load removal. The existing load on the works is in the order of 15,000 PE on average, which is significantly higher than the 1998 upgraded design load capacity.

The average summer and winter dry weather flow rates are estimated at 3,600m$^3$/d and 5,800m$^3$/d respectively. The winter flow rate is significantly higher than the summer flow rate, which is indicative of a high level of infiltration. As much of the sewer network in the town centre is a combined system, receiving both storm and foul flows, and because of misconnection of storm water pipework to the foul network in the newer suburbs, wet weather flows to the treatment works are extremely high.

The flows to treatment are limited by the capacity of duty and standby archimedian screw pumps, which lift the influent wastewater to the preliminary treatment inlet works. Excess flows are overflowed to a stormwater-balancing tank, which in turn overflows directly to the river Triogue. This storm water tank can also be occasionally backpounded by floodwaters from the Triogue.

## 2.4 NEED FOR THE SCHEME

Very significant development pressures are being experienced in Portlaoise associated with the general economic environment and the particular characteristics of Portlaoise as the major commercial and institutional centre for County Laois. The increasing role of Portlaoise as a dormitory centre for the Dublin region, due to its location on the N7 primary road and link to the mainline rail network is further intensifying these development pressures

Consideration of these pressures and of the Laois County Development Plan has resulted in the projected development loads presented in **Table 2.1** and in proposals for a phased upgrading of the existing treatment works to cater for these projected loads.

**Table 2.1 Projected Development Loads**

| Proposed Upgrade Work | Nominal Design Year | Population Equivalent | $BOD_5$ Load (kg/d) | DWF ($m^3$/d) | TWWF ($m^3$/s) |
|---|---|---|---|---|---|
| Stage 1 | 2008 | 26,000 | 1,430 | 5,850 | 0.25 |
| Stage 2 | 2020 | 39,000 | 2,125 | 8,780 | 0.38 |
| Stage 3 | Long Term Future | 52,000 | 2,860 | 11,640 | 0.50 |

Note: (1) The $BOD_5$ Load is developed by assuming a per capita production of 55 g/day

(2) The Dry Weather Flow (DWF) figures are developed by assuming a per capita flow of 225l/day

(3) The Treatment Wet Weather Flow (TWWF) is defined as the flow rate through the biological treatment plant

Sludge production in County Laois in 2020 is estimated at 1,440t.DS/yr, of which some 460t.DS/yr will be produced by the Portlaoise WWTW.

As indicated in **Section 2.3** above, the existing wastewater treatment works is already overloaded and unable to cope with current flow and load. Furthermore, comparison of effluent flows and loads with low flows in the Triogue river would indicate that a significantly higher standard than that of "normal secondary treatment" is required at this location.

Therefore, there is an urgent need for a phased upgrade to the existing wastewater treatment works in order to provide a level of sewage and sludge treatment for the projected design loads, as indicated in **Table 2.1** above, to achieve effluent standards appropriate to the water resources capacity of the River Triogue and the environmental objectives, which have been set for the river.

Consistent with these objectives is the adoption of BATNEEC (Best Available Technology Not Entailing Excessive Costs) with a view to providing Laois County Council with the Best Practicable Environmental option.

## 2.5 EFFLUENT DISCHARGE STANDARDS

A study has been carried out of the background water quality parameters in the river, medium and 95 percentile flows (95% ile). In light of the environmental quality objectives already set out, the effluent standards listed in **Table 2.2** below are considered necessary for the projected design horizon loads. The applicable effluent standards will depend on the scale of the works, i.e. as the loading on the treatment works and the volume of effluent discharge increases, the acceptable effluent concentrations will reduce. These effluent standards set the minimum design requirements to be met by the upgraded wastewater treatment works.

**Table 2.2: Proposed Effluent Discharge Standards**

| Parameter | Basis | Units | 26,000 PE | 39,000 PE |
|---|---|---|---|---|
| $BOD_5$ | Average | mg/l | 7.7 | 6.8 |
| $BOD_5$ | 95% ile | mg/l | 15 | 13 |
| Ammonia (summer) | Average | mg/l N | 2.1 | 1.8 |
| Total Ammonia (winter) | Average | mg/l N | 4.0 | 3.0 |
| Nitrate | Average | mg/l N | 19.6 | 15.4 |
| Total P | Average | mg/l | 0.5 | 0.5 |
| Suspended Solids | 95% ile | mg/l | 35 | 35 |

Provision of a treatment works guaranteed to meet these minimum standards would be expected to give better performance in average operating conditions.

## 2.6 WASTEWATER SLUDGE TREATMENT AND RE-USE

Historically, wastewater sludges at Portlaoise and generally in County Laois have been dewatered and disposed of to landfill, with a small proportion being used in land–spreading. In general, landfill sludge had a solids content in the range 10 – 15%. This disposal outlet is no longer acceptable having regard to landfill management policy and the implications for the landfill of liquid sludge disposal.

A total of 573 TDS was produced from the 14 WWTW in County Laois in 1998, of which 205 TDS was produced at Portlaoise WWTW. Studies into wastewater sludge characteristics generated in Co. Laois indicate that the sludge is generally suitable for re-use in agriculture, forestry or other equivalent use, though elevated copper levels have been identified in some samples. However, it is necessary to improve the treatment of sludges in order to render them safe for re-use in accordance with accepted Codes of Good Practise. In this way, the environmental problems associated with unsuitable disposal methods are avoided, while the positive benefits to be derived from sewage sludge can be realised.

## 2.7 PROPOSED SCHEME – DESCRIPTION

The scheme, to which this EIS relates, concerns the provision of upgraded sewage treatment and sludge treatment facilities for the town and environs of Portlaoise, Co. Laois, on the site

of the existing wastewater treatment works at Portlaoise. The upgrading of the existing treatment facilities will be undertaken in a number of stages to cater for projected design loads of 26,000 PE in the short term (2008) and 39,000 PE in the medium term (2020).

The Proposed Scheme involves the provision of new tankage, buildings mechanical and electrical plant associated with wastewater and sludge treatment process and siteworks infrastructure at the site of the existing Wastewater Treatment Works.

It should be noted that the project, if approved, would be implemented as a Public Private Partnership (PPP) project whereby it is proposed to invite Contractors to tender for the design, construction and long term operation of this plant. In this approach, variations in the design detail and arrangement of the facilities would be permitted, subject to achieving the performance objectives set out in this EIS both in terms of wastewater and sludge treatment and also in achieving compliance with all of the environmental performance standards defined in the document.

**Fig. 2.3** is an indicative arrangement of the proposed upgrading works showing the extent of the site, access arrangements and a typical arrangement showing new construction and modifications to the existing works to achieve the requirements and objectives of the upgraded works.

The proposed upgraded wastewater treatment facility will employ appropriate technologies to cater for the projected development loads in order to achieve the effluent standards defined in **Section 2.5**. These technologies will include:

- Secondary Treatment Systems which may also incorporate preliminary treatment and primary sedimentation and will involve some form of biological treatment;

- Tertiary Treatment involving sand filtration or an equivalent high efficiency treatment system may also be required in order to achieve an effluent quality consistent with the demanding standards defined for the works in **Section 2.5**;

- Extended stormwater storage would be provided at the site in order to achieve efficient operation of preliminary treatment works and to protect the Triogue river from overflow spillages from the foul sewer network except under very extreme conditions.

The proposed Sludge Treatment facility will employ appropriate technologies to cater for the projected quantities of sludge in order to achieve an acceptable biosolid end product, which complies with the relevant Codes of Good Practise and the requirements of the Draft Sludge Management Plan for County Laois. These technologies may include:

- sludge reception facilities for sludges from external plants;
- extended sludge thickening and dewatering facilities;
- sludge digestion facilities (anaerobic or aerobic); and
- sludge stabilisation facilities (either by composting or thermal drying).

The arrangement of tanks and buildings indicated in **Fig. 2.3** is typical of the works, which would be required. Some variations in tankage and building requirements will arise, however, depending on the alternatives selected. The size and dimension of the proposed structures of the development can vary up to a maximum height of approximately 8 to 10 meters above ground level. The proposed water retaining structures will be comparable in scale to those existing on site at present. The tankage associated with sludge treatment and some of the proposed buildings will be larger in scale than those existing on site. The arrangement in **Fig. 2.3** and the indicative details elsewhere in this EIS are representative of the requirements of the plant, whichever process options are ultimately selected following procurement of a Contractor.

The existing site access arrangements are unsatisfactory in terms of safe access/egress from the public road and relatively poor horizontal and vertical alignment of the access road. In the short term, therefore, it is proposed to upgrade and improve the existing access road from the public road to the site. However, there is a future proposal for a new ring road passing to the north of the treatment works site. In the event that this road is provided in the future, provision is made for a separate access road from this ring road to the site, which would provide a more satisfactory long term arrangement for vehicular access, particularly for conveyance of sludges from outlying plants into the site and conveyance of biosolids product from the site.

Three landowners currently have right of way to their lands on the western side of the treatment works via the existing works access road. Right of access to these lands for the landowners will be maintained in the future development. However, depending on final site layout, it may be necessary to divert the 'right of way' around the perimeter of the works site as indicated on **Fig. 2.3**

## 2.8 ALTERNATIVES EXAMINED

The principal alternatives examined in the development of the scheme were:

- Relocation of the treatment works further downstream on the Triogue or at the confluence of the rivers Triogue and Barrow where the greater baseflows in the river would be available, which might permit less rigorous effluent standards;

- Pumping of effluent from the treatment works site downstream to the river Barrow for discharge at the Triogue confluence or further downstream;

The options of relocating treatment or discharge to locations further downstream in the river system were rejected on the following grounds:

- They are not considered sustainable in that they could compromise discharges or water abstractions associated with other communities lower down the catchment;

- The costs involved in these options were significantly higher than for upgrading of the existing works.

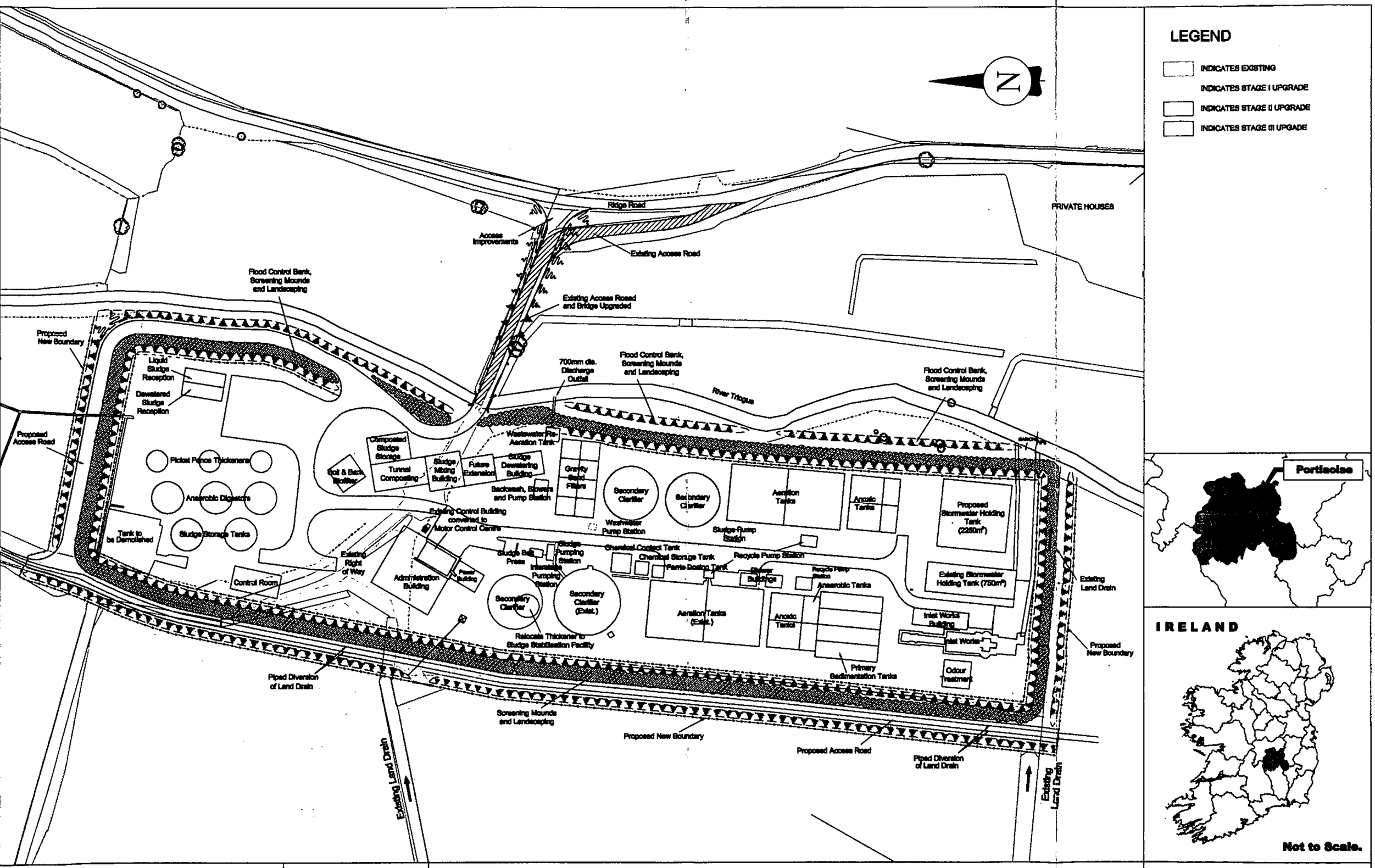
In the area of sludge treatment, the County Laois Sludge Management Plan recommended sludge stabilisation and re-use for the wastewater sludges produced in County Laois. The following re-use options are permitted by the Sludge Management Plan:

- Thermal Waste to Energy Treatment
- Restoration of Peat Bogs
- Land Application of stabilised and dewatered sludges

Re-use of dewatered sludge either by landspreading or in reclamation of cut-away bog are the most viable options. Thermal waste to energy treatment is seen as a viable alternative for the longer term.

Sludge stabilisation processes, such as composting, alkaline stabilisation and thermal drying, produce a biosolid product, which is suitable for re-use and compliant with standards set in the relevant Codes of Good Practise.

Based on assessment of the available alternatives, therefore, the proposed scheme has been selected as the optimum scheme following technical, environmental and economic appraisal of all feasible alternatives.




CO. LAOIS

fig.

Fig. 2.3

Title

# INDICATIVE ARRANGEMENT OF PROPOSED UPGRADED WWTW

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## 2.9 CONSTRUCTION OF THE WASTEWATER & SLUDGE TREATMENT FACILITIES

The existing WWTW will be upgraded over a period of time in a number of stages to cater for projected development loads as previously indicated **(Section 2.4)**.

The construction of the Stage 1 works will involve a number of operations as follows:-

- **Below ground works:** will involve the excavation of sub-structures following appropriate sheet-piling or other techniques to support the necessary excavations. This phase will involve heavy engineering construction in the installation of temporary works, excavation, groundwater control, disposal of spoil and construction of the permanent works,

- **Above ground works:** the construction of the above ground works will involve the completion of tanks and erection of buildings.

- **Mechanical and Electrical Plant:** a significant element of the project will be the installation of mechanical plant, pipework, process and electrical equipment,

- **Site pipework:** this phase of the works will involve construction of all site pipework below ground, installation of service pipework and ducts and connections to existing services,

- **Siteworks and finishes:** this phase of the works will involve the construction of the access road, site roads, completion of boundaries, site finishes and landscaping,

The duration of the construction of these works will be in the order of 2 years. While the construction of the wastewater and sludge treatment works will be continuous during this period, it is likely that the intensive construction activities will be completed in approximately 18 months.

Throughout this construction phase it will be necessary for the successful Contractor to schedule the development of the new works such that treatment of the existing sewage flow from Portlaoise is maintained at all times.

Significant environmental effects of the construction stage of the project as discussed in **Ch. 13** and can be summarised as follows:-

- **Landtake:** constructional activities will affect the site of the wastewater treatment plant for an extended period of approximately 2 years. Appropriate secure temporary fencing will be provided to confine the construction activities within the limits of the site as far as possible.

- **Noise and vibration:** the construction contract will be required to limit noise and vibration to accepted standards in order to avoid nuisance and prevent damage to property. These parameters will be monitored at sensitive locations throughout the construction period and records will be maintained of the levels measured for comparison with the specified standards.

- **Traffic management:** a traffic management plan will be developed for the construction of the works, integrated to the construction programme, and traffic restrictions will be publicised in the area to ensue that alternative routes are availed of where possible. Minimum standards of signage and protection of excavations will be provided for to safeguard the public.

- **Groundwater levels:** it is anticipated that significant pumping of groundwater will be required during the construction of the below ground structures. Appropriate temporary

works will be required to limit draw-down of the water table to prevent adverse impact on existing structures.

- **Effluents from construction:** the construction activities will be carried out have regard to the requirements of the Local Government (Water Pollution) Act 1977 and 1990 to ensure that disposal of effluents does not result in pollution of receiving waters. This will also require measures to contain fuel oil and other liquid materials in the event of spillages. Sedimentation tanks will be used to remove sediment prior to discharge to receiving waters.

- **Air emissions:** all plant employed in the project will be required to be maintained in good working order to limit exhaust fumes emitted to the atmosphere.

- **Utility services:** in carrying out excavations which are likely to conflict with existing services (water, drainage, telecommunications, power), the measures to identify existing services and their protection will include liaison with the utility organisations, reference to the record drawings of the services, the use of proprietary location equipment, advance trial holes and careful excavation procedures in accordance with good working practice. These measures are intended to ensure safety of persons and protection of services to the public.

Where monitoring equipment is specified, provision will be made for independent calibration of the equipment together with independent field measurements by an approved agency in order to validate the routine measurements. Information leaflets will be provided to residents locally in the area of works being carried out to advise them of construction activities and their likely programme and providing contact references for reporting of complaints and emergencies. A liaison committee will also be established, including representatives of the local community to address issues arising during the construction stage.

## 2.10 COMMISSIONING OF THE WORKS

The construction of the project will be followed by a period of testing and commissioning of plant and treatment system. The duration of this period is likely to be in the order of 3 – 6 months. During this period, reasonably intensive activity will continue, involving attendance by construction and operational personnel.

## 2.11 OPERATION OF THE WASTEWATER TREATMENT & SLUDGE TREATMENT FACILITIES

As outlined in **Section 2.7** sewage treatment generally comprises four principal elements

- Preliminary Treatment
- Primary Settlement
- Secondary Treatment
- Tertiary Treatment

This section discusses the general operational characteristics of each of these elements to provide a general understanding of the likely operational activities, which would occur at the upgraded treatment facilities at Portlaoise, should any of these elements be incorporated into the final design.

The objectives of Preliminary Treatment are the removal of:

- Fats, oils and grease (FOG)
- Plastics and rags
- Grit, silt and sand

from the crude sewage in order to protect downstream mechanical equipment and prevent blockages in subsequent treatment plant and remove items which could interfere with the treatment processes. The main processes utilised to achieve this are screening and grit removal.

Screenings are objectionable because of the presence of faecal matter and other items. In order to render screenings less objectionable they are normally washed, thereby returning the faecal and other treatable matter to the treatment stream. Thereafter the screenings are compacted to remove water and reduce volume prior to removal off site for disposal to landfill. Grit collected from the influent flow requires to be washed in order to remove any organic matter and thereafter sieved and collected for disposal to landfill.

The purpose of Primary Settlement is to remove the maximum amount of polluting matter from sewage as quickly and economically as possible. This is achieved by the reduction of the flow velocity of the sewage to a point below which it can not transport the suspended matter and as a consequence the materials settle and can be removed as sludge. This primary sludge will be pumped to the sludge treatment facility for treatment and stabilisation.

Secondary Treatment is a process generally involving biological treatment, as in activated sludge processes, and incorporating secondary settlement (or clarification). The function of secondary clarifiers is separation of activated sludge solids from liquid phase in order to produce a good quality final effluent and secondary sludge. This secondary sludge is then removed to the sludge treatment facility for treatment and stabilisation with the primary sludges.

Tertiary Treatment processes, such as sand filtration, will further reduce suspended solids, biochemical oxygen demand and nutrient load of the effluent.

Influent flows in excess of treatment capacity will occur during wet weather conditions due to the combined nature of the sewage collection system in Portlaoise. During these conditions excess flows will be overflowed via screened overflow weirs to storm water balancing tanks for temporary storage during the storm event and subsequent return to the treatment stream

when the storm has abated. Provision of storm water storage to cater for a 1 year return period, 60 minute duration storm (M1/60) will provide a high level of protection from direct untreated overflow into the river. When a higher duration or higher intensity storm event occurs the storage tank will overflow via a screened overflow weir to the river.

Chemicals, such as ferric sulphate, can be added to the wastewater stream to aid in the removal of suspended solids or phosphorus by precipitation with metal salts.

The operation of the Sludge Treatment Facility involves the handling, treatment and stabilisation of primary and secondary sludges from all municipal wastewater treatment works in County Laois and from domestic septic tanks in the county. Sludges from the outlying works and septage from the domestic septic tanks will be transported by road in covered tankers to the Portlaoise STF where they will be discharged to the sludge reception facility. These sludges will be subject to screening and grit removal prior to blending with the sludges from the Portlaoise WWTW. The screenings and grit will be disposed off site to landfill.

The blended sludge will then undergo treatment processes to produce an acceptable biosolid product complying with the standards set in the relevant Codes of Good Practise.

Chemical coagulants such as polyelectrolytes are normally used to assist the thickening phase of the treatment process, which, if required, would have to be imported to the site in covered tanker.

Biogas is a by-product of anaerobic digestion processes. Should processes of this type be utilised, the biogas may be used in on-site electricity generation, which would be used to satisfy part of the WWTW energy demand.

Composting processes, if utilised, would be conducted in-vessel to control moisture content and odours and to promote process efficiency. Composting processes also require suitable bulking agents, such as shredded green waste, which would have to be imported to the site.

This EIS discusses the environmental impacts that may result from operating this upgraded wastewater and sludge treatment facility. The main impacts can be summarised as follows:

- **Odour;** raw wastewaters and sludges generally have high concentrations of odorous substances, which could be released to the atmosphere at various stages of the treatment process. Wastewater screening, grit removal, primary treatment processes and sludge handling processes are the major foul odour sources at WWTW's. The emission of foul odours from the WWTW will be controlled by covering/housing the primary odour sources and by providing forced ventilation of the enclosed air spaces to appropriate air treatment facilities.

- **Noise and vibration;** the contract for the operation of the works will limit noise and vibration to accepted standards in order to avoid nuisance and prevent damage to property. Due to the continuous nature of the operation of the works, night-time operation is of major importance as this requires a lower noise limit than daytime. Housing enclosures will be required for mechanical plant where the supplied plant cannot meet the noise limits set in the contract.

- **Landscape;** The size and dimension of the proposed structures of the development will vary. The proposed water retaining structures will be comparable in scale to those existing on site at present. The tankage associated with sludge treatment and some of the proposed buildings will be larger in scale than those existing on site. The maximum

height of any of these structures will be approximately 8 to 10 meters. Landscape mitigation measures are proposed to provide extensive screening and also to provide for the creation of wildlife habitats through the use of indigenous plant species. Visual screening will be provided in the form of planted mounds and through the promotion of early establishment of plants, both within and at the site perimeter.

- **Traffic;** during the operation of the works traffic movements to and from the works will be associated with the movement of operational and maintenance personnel, the delivery of chemicals, the importation of dewatered and liquid sludges from the outlying municipal wastewater treatment works and septage from domestic septic tanks, the importation of bulking agents for the composting process if present, and the exportation of the biosolid product. It is estimated that traffic movements associated with these activities will not exceed 25 per week on average in 2020.

The upgraded wastewater and sludge treatment facility will operate on a continuous 24hr. basis and will have a high level of automation and monitoring of all key process components by state of the art SCADA and Telemetry systems. During normal working hours it is anticipated that the works will be manned by 2 or 3 permanent staff, who will have access, on a call out basis, to headquarter expertise. During the night hours and at weekends the telemetry and SCADA system will facilitate remote dial-up and interrogation of process performance. Automatic alarms will trigger immediate call-up of operational personnel in the event of equipment malfunction outside of normal working hours.

Security of the works will be provided by a robust palisade type perimeter fence, which may be augmented by CCTV and intruder alarm systems as required.

# Part B

## Appraisal of Environmental Effects

# 3 HUMAN BEINGS

## 3.1 INTRODUCTION

The impact of the development on the human beings may be considered at a number of levels:

- Health and safety- in terms of both the public and site operatives;
- Nuisance including, noise, odour, traffic and construction impacts;
- Visual impacts;
- Amenity impacts; and
- Socio-economic impacts.

Healthy & Safety, traffic nuisance, amenity and socio-economic impacts are considered in this chapter while noise, odour, visual and construction impacts are considered separately in **Chapter 6, 4, 7** and **13** respectively.

## 3.2 DESCRIPTION OF EXISTING ENVIRONMENT

The proposed development is located at the existing WWTW, to the north of Portlaoise town adjacent to Triogue River, South of Kyle Bridge. The site occupies an area of approximately 28,800 $m^2$ and is accessed, at present, by a laneway off the Ridge Road.

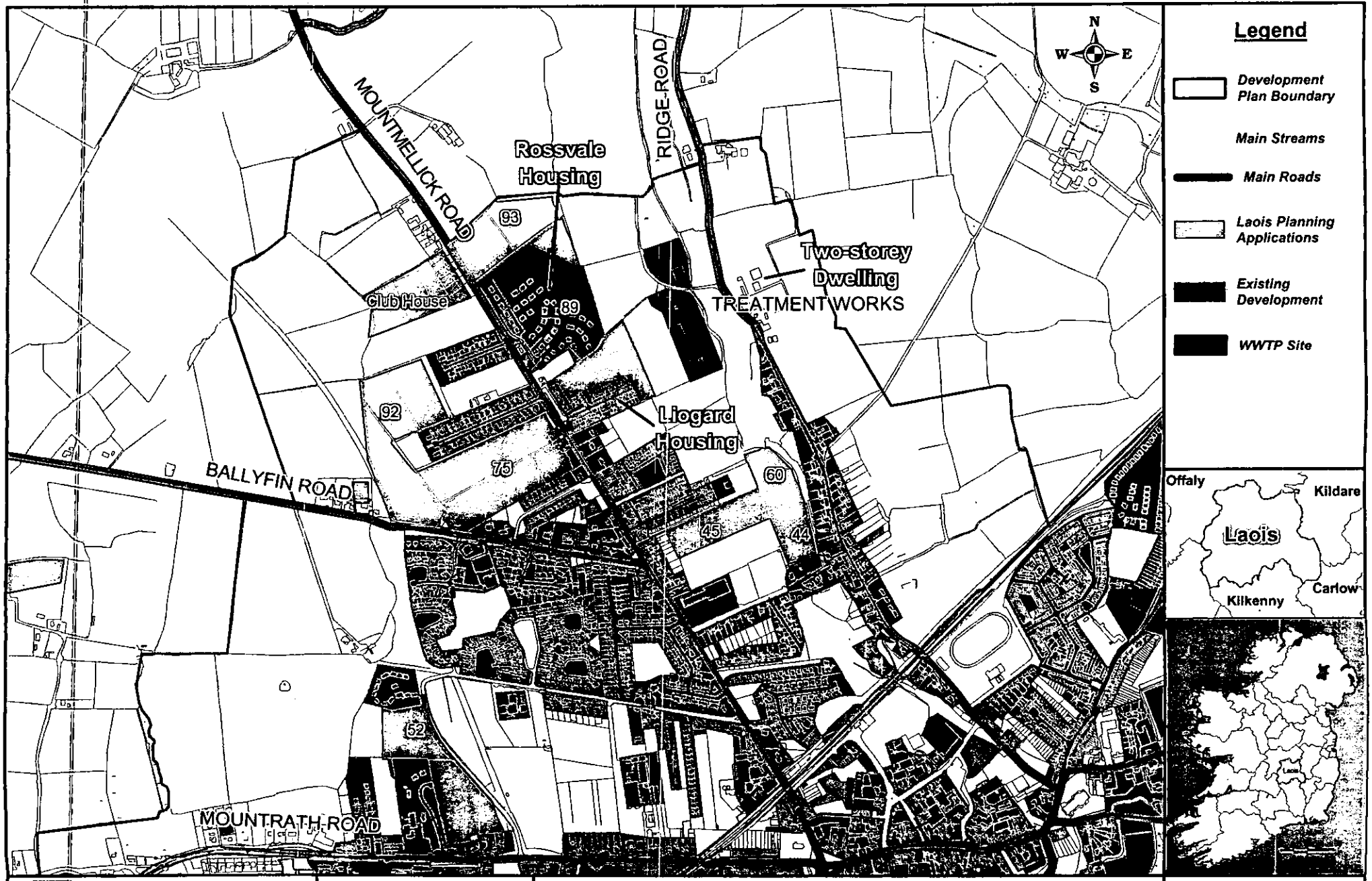
The existing site boundaries are formed by green fields to the north, south and west, and by the Triogue River to the east. The site occupies a lowlying land area defined by the surrounding hillocks and the Triogue River. The fields immediately adjacent to the site are managed as agricultural fields and grazed by cattle. The site is relatively close to the town, with a farmhouse approximately 100 metres to the East and residential developments approximately 150 metres to the West. The existing environment is presented in **Fig. 3.1**.

Noises are produced by the existing WWTW and the background noise measured at the nearest neighbour is in the range of 42-43dB. Some odours are also currently arising from the WWTW and in particular from the screening process, the extended aeration tank and the sludge-thickening tank.

The present traffic associated with the operation of the WWTW, is due to the importation of chemical products and exportation of de-watered sludge to landfills. The number of trucks coming in and out of the site varies between 7 and 10 per week.

At present, the site accommodates inlet works, storm tanks, overflow channels, aeration tanks, secondary settlement tanks, thickening tanks and a control building. The site also contains sludge de-watering and handling facilities and old disused sludge drying beds.

The proposed development will be incorporated within the existing site boundary.




| Co. Laois | Fig 3.1 | Existing Environment | mcos |
|---|---|---|---|

## 3.3 POTENTIAL SIGNIFICANT IMPACTS & MITIGATION MEASURES

### 3.3.1 Health and Safety

**Potential Significant Impacts:**

Potential impacts on health & safety with respect to the general public or site operatives might arise due to the unauthorised entry to the site or through unsafe working practices or conditions. Potential impacts on public health due to the release of effluent to the Triogue River are addressed in **Ch. 9** impacts on water quality. Health and Safety issues associated with this development include:

- site boundary security
- building regulations
- classification of hazardous areas
- ventilation
- hygiene facilities
- staff training

**Mitigation Measures**

- Provision of secure site boundary in the form of a fence, gates, earth-mounding and mature planting around the site to exclude members of the public.

- Compliance with building regulations and appropriate standards in relation to the design of works, for example, through the provision of covers/decks where appropriate, cleaning equipment to maintain platforms and walkways, protective covers to moving parts, etc.

- Classification of hazardous areas in buildings, appropriate zoning and specification of electrical apparatus, fixed and portable gas monitoring equipment (methane, petroleum vapours, oxygen level), with effective ventilation.

- Provision of hygiene facilities for operators including lockers and washing facilities.

- Training of operational personnel and development of a safe system of work for the plant.

### 3.3.2 Nuisance-Traffic

The increases of traffic associated with the operation of the plant are anticipated to be negligible. The normal operation of a wastewater treatment works has very limited traffic, of the same order as that involved in the present operation. The 50 - 80 truck movements per week associated with construction of the works will not be a significant source of noise or safety risk.

### 3.3.3 Amenity

**Potential Significant Impacts:**

- The upgrading of the WWTW will be carried out with minimal loss of amenity. While the development will generally take place within the existing site some work will be undertaken outside the existing site boundaries. This work will include the development of earth mound planted screens, the re-alignment of the access lane-way off Ridge Road and the relocation of the existing right-of-way. Therefore, the proposed development can be described as having "minimal impact".

- The assessment of visual or aesthetic impacts varies from none to significant, dependent on viewing point, as discussed in **Ch. 7**.

- The impact will be positive on the receiving freshwater ecosystem as discussed in **Ch. 9**.

**Mitigation Measures:**

- Provision of appropriate planted mounds will mitigate the adverse visual and aesthetic impacts as discussed in **Ch. 7.**

- The increase in discharge volume at the outfall is negated by the provision of more advanced treatment, which will reduce considerably the organic, bacterial and nutrient loading of the effluent, compared with the existing discharge as detailed in **Ch. 9.**

### 3.3.4 Socio-Economic Aspect

The proposed scheme and the other elements of the Portlaoise Main Drainage Scheme will have a positive impact on the local economy and social conditions by providing a sewerage infrastructure for the town and its environs, which will:

- Cater for existing and new development (residential, commercial and industrial).

- Allow the objectives of the Portlaoise Integrated Land-use and Transportation Study (LUTS), which requires Portlaoise to be developed as an independent and self-sustaining town, to be realised.

- Protect and improve the freshwater aquatic environment

It is also anticipated that construction of the upgraded WWTW will provide local employment opportunities.

## 3.4 RESIDUAL IMPACTS

Some residual impact on human beings is anticipated from the scheme in relation to visual and construction aspects. These impacts however will be mitigated by the employment of various measures designed to lessen the adverse effects associated with these issues. Some of these measures will actually provide a positive residual impact with respect to the existing situation at Portlaoise.

## 3.5 SUMMARY

The impact of the proposed scheme on human beings can be summarised as being generally positive.

# 4 AIR AND ODOUR

## 4.1 INTRODUCTION

Odour is the sensation transmitted to the brain by the olfactory receptors in the nasal cavity when exposed to so called odorous substances in the inhaled air. If these substances are of a malodorous nature and are present in air above a certain threshold concentration, they may cause annoyance and constitute an environmental nuisance. The science of odour response measurement is known as olfactometry. Standard olfactometric methods for odour strength measurement by dilution techniques, using a panel of people operating according to standard procedures, have been developed (Frechen, 1994).

The concentration of odourants in air is expressed in odour units per cubic metre ($OU/m^3$). Its numerical value is quantified as the number of dilutions with clean air required to reach the odour perception threshold. The odour perception threshold is the lowest odour concentration which is detectable by half the members of a test panel (half the members do not detect any smell while the other half still smells something). At a concentration of 2 $OU/m^3$ an odour is faintly perceivable, at 3 $OU/m^3$ it is clearly perceivable while at 5 $OU/m^3$ is strongly perceivable and, if unpleasant, is likely to give rise to environmental nuisance. The duration of an odour is also significant. Dispersion calculations are normally based on meteorological data using mean 1-hour wind speeds, producing hourly means of odour concentration. A concentration of 5 $OU/m^3$ lasting 15 to 30 minutes is commonly used as the nuisance threshold. If the mean hourly odour concentration is less than 1 $OU/m^3$, it is unlikely that shorter duration odour concentrations will exceed 5 $OU/m^3$.

## 4.2 WASTEWATER ODOURS

Wastewater odours arise either through the discharge of odorous substances of industrial origin to the sewer system or from the anaerobic decomposition of biodegradable matter in the wastewater. Anaerobic biodegradation produces volatile fatty acids and a variety of reduced sulphur compounds most of which have very low odour threshold concentrations.

Anaerobic biodegradation is inhibited in the presence of dissolved oxygen and thus does not occur while wastewaters remain aerobic. However, where there is a long residence time in the sewer system or where sewer gradients are small, resulting in low velocities and solids deposition, wastewaters are likely to become septic and malodorous. Biodegradation rates are also strongly influenced by temperature, hence odour problems are likely to be accentuated during warm weather or where industrial discharges raise the wastewater temperature.

### 4.2.1 Odour Emission from Wastewater Treatment Processes

The rate of release of odorous compounds into the atmosphere at wastewater treatment works (WWTWs) is influenced by:

(a) the concentration of odorous substances in the liquid phase exposed to air
(b) total air/wastewater interface area
(c) conditions at air/wastewater interface.

Raw wastewaters and sludges generally have high concentrations of odorous substances. Processes that generate surface turbulence and high rates of interface renewal, such as open channel flow, weir overflows, biofilter flow distribution systems etc., have much higher rates of volatilisation of odorous compounds than quiescent processes such as sedimentation.

The specific odour emission rate from a water or sludge surface can be measured experimentally in a standardised way. The specific odour emission rate ($OU/m^2.h$) is quantified as the product of the emitted odour concentration ($OU/m^3$) and the specific air flow rate ($m^3/m^2.h$). Odour emission rates for the various phases of wastewater treatment processes are available from published data (Frechen,1992).

Wastewater screening, grit removal, primary treatment processes and sludge handling processes are the major foul odour sources at WWTWs. With the exception of aerobically stabilised sludges, sludge residues are the primary sources of very high odour concentration at WWTWs. This is because of their potentially high concentrations of reduced volatile substances including hydrogen sulphide ($H_2S$). It should be noted that anaerobically digested sludge, though biologically stable, can be a significant source of malodour, particularly if it contains $H_2S$ - 1 ppm by volume of $H_2S$ in air is approximately equivalent to an odour concentration of 200 $OU/m^3$. Aerobically stabilised sludges, on the otherhand, have a relatively low odour emission rate. Surplus activated sludges from medium or high rate processes also have low odour emission rates while maintained in an aerobic condition.

### 4.2.2 Odour Standards for Wastewater Treatment Plants

The European Union has not as yet developed environmental directives relating to the control of odour nuisance nor are there any Irish guidelines. Cumulative non-exceedence frequencies for the threshold odour value (1 $OU/m^3$) are commonly specified at particular receptor locations. A 99.5% limit value has been adopted for the Portlaoise WWTW. This limit infers 44 computed exceedences per year, based on hourly input data.

## 4.3 ODOUR DISPERSION MODELING

The malodours emitted from WWTWs are carried downwind and are diluted through atmospheric dispersion by mixing and transport mechanisms. This atmospheric dilution process can be mathematically modelled as a Gaussian plume (Pasquill, 1974), taking wind speed, wind direction and atmospheric stability conditions into account (USEPA, 1987). Thus, using the local meteorological data and the estimated odour emission rates from the individual treatment processes, it is possible to compute the odour concentration fluctuation at sensitive receptor locations in the vicinity of a WWTW.

The output from such a computer modelling exercise can be presented in a variety of formats to suit the needs of the user. Isolines for any odour concentration can be plotted. Alternatively, the model can be used to define the odour threshold boundary for the WWTW, or the boundary limit for a specified odour concentration.

Aquavarra Research Limited were commissioned to carry out odour dispersion modelling for the proposed upgrading of the Portlaoise WWTW. Their full report can be found in **App. 1**.

### 4.3.1 Input Data

#### Meteorological data

The required meteorological data consists of the mean hourly values forwind speed, wind direction and Pasquill stability classification for the WWTW location for at least one year's duration. As the required data are not available for the Portlaoise site, data from the meteorological station at Birr for 1990 were used.

**Process Odour Emission Estimates**

Process odour emission estimates (OU/s) were based on published data for specific odour emission rates (OU/$m^2$.s) (Frechen, 1992) applied to the open surface gross area ($m^2$) for various unit processes. Two levels of odour emission control at the proposed development were examined:

Level (1): odour abatement measures applied to the inlet works and the sludge processes, which are the main potential sources of offensive odour at WWTWs. With this level of odour control in place, the residual odour emission is estimated at 876 OU/s (odour unit per second).

Level (2): odour abatement measures applied to all potential sources of unpleasant odour viz. the inlet works, stormwater tank, primary sedimentation tanks and sludge processes. With this level of odour control in place, the residual odour emission is estimated at 476 OU/s, some 84% of which is derived from aerobic secondary treatment of the activated sludge type. While there is a perceptible odour associated with activated sludge, it is normally described as an "earthy" odour and does not cause odour nuisance.

### 4.3.2 Results of Dispersion Analysis

A series of computer analyses of odour dispersion from the Portlaoise WWTW, using the 1990 Birr hourly wind data, and estimated odour emission rates with Level 1 and Level 2 odour abatement, was carried out. The output data was analysed to define the 98%, 99% and 99.5% odour threshold isolines for the treatment plant environs.

The threshold isolines for the odour emission rates with Level 1 odour abatement are plotted on **Fig. 4.1** and the threshold isolines for the odour emission rates with Level 2 odour abatement are plotted on **Fig 4.2**. These isolines represent the boundary lines within which the threshold odour concentration of 1 OU/$m^3$ would be exceeded during 2%, 1% and 0.5% of the time, respectively (2% corresponds to 176 exceedences, 1% corresponds to 88 exceedences and 0.5% corresponds to 44 exceedences during the one year test period).

As may be seen from the plotted odour threshold isolines on **Figs 4.1** and **4.2**, the principal direction of odour spread is approximately along an NNW-SSE axis.

### 4.3.3 Conclusions

The results of the computer analyses of odour dispersion from the upgraded Portlaoise wastewater treatment works, show:

(a) that Level 1 odour abatement **(Fig. 4.1)** is not sufficient to protect the housing on the east and west side of the site from odour encroachment at the 99.5% level.

(b) that Level 2 odour abatement **(Fig. 4.2)** i.e. the installation of odour treatment facilities to deal with all potential offensive odour sources, namely, the inlet works, the stormwater tank, the primary sedimentation tanks and the sludge processing units, is required to prevent the 99.5% threshold odour isoline from encroaching on the nearby dwellings on the east and west sides of the site. As well as reducing the radial spread of odour, this level of odour abatement effectively minimises the emission of offensive odours. Hence, with this level of odour abatement in place, the operation of the works should not give rise to any environmental odour nuisance and so has no significant odour impact.

## 4.4 MITIGATION MEASURES

An environmental odour standard of 1 OU/$m^3$ at a 99.5% non-exceedence level at all adjacent residential dwellings is considered appropriate to this development. It has been shown by

odour dispersion analysis that this standard is achievable by the application of appropriate odour control measures to those processes that generate foul odours.

Treatment technologies for odorous air streams, such as generated at wastewater treatment plants, include:

- Biofiltration and bioscrubbing
- Activated carbon
- Wet chemical scrubbing
- Thermal oxidation

In biological treatment processes such as biofiltration and bioscrubbing the odour contaminants are adsorbed on to a moist contact medium, where they are decomposed by selected bacteria that are capable of using the contaminants as a growth substrate. Peat or heather is used as the contact medium in biofilters while a variety of packing materials is used in biotower scrubbers. Biofiltration will probably be the most suitable general method of treatment for the Portlaoise WWTW.

## 4.5 RESIDUAL IMPACTS

The overall effect of providing advanced treatment will be positive from the perspective of decreasing odour dispersion currently associated with the existing treatment works.

## 4.6 SUMMARY

The operation of the WWTW should have no significant odour impact on the environment if appropriate treatment facilities are installed to deal with all potential offensive odour sources such that an environmental odour standard of 1 $OU/m^3$ at a 99.5% non-exceedence level is attained at all adjacent residential dwellings

The overall effect of providing advanced treatment will be a positive impact on the environment compared to the current situation.

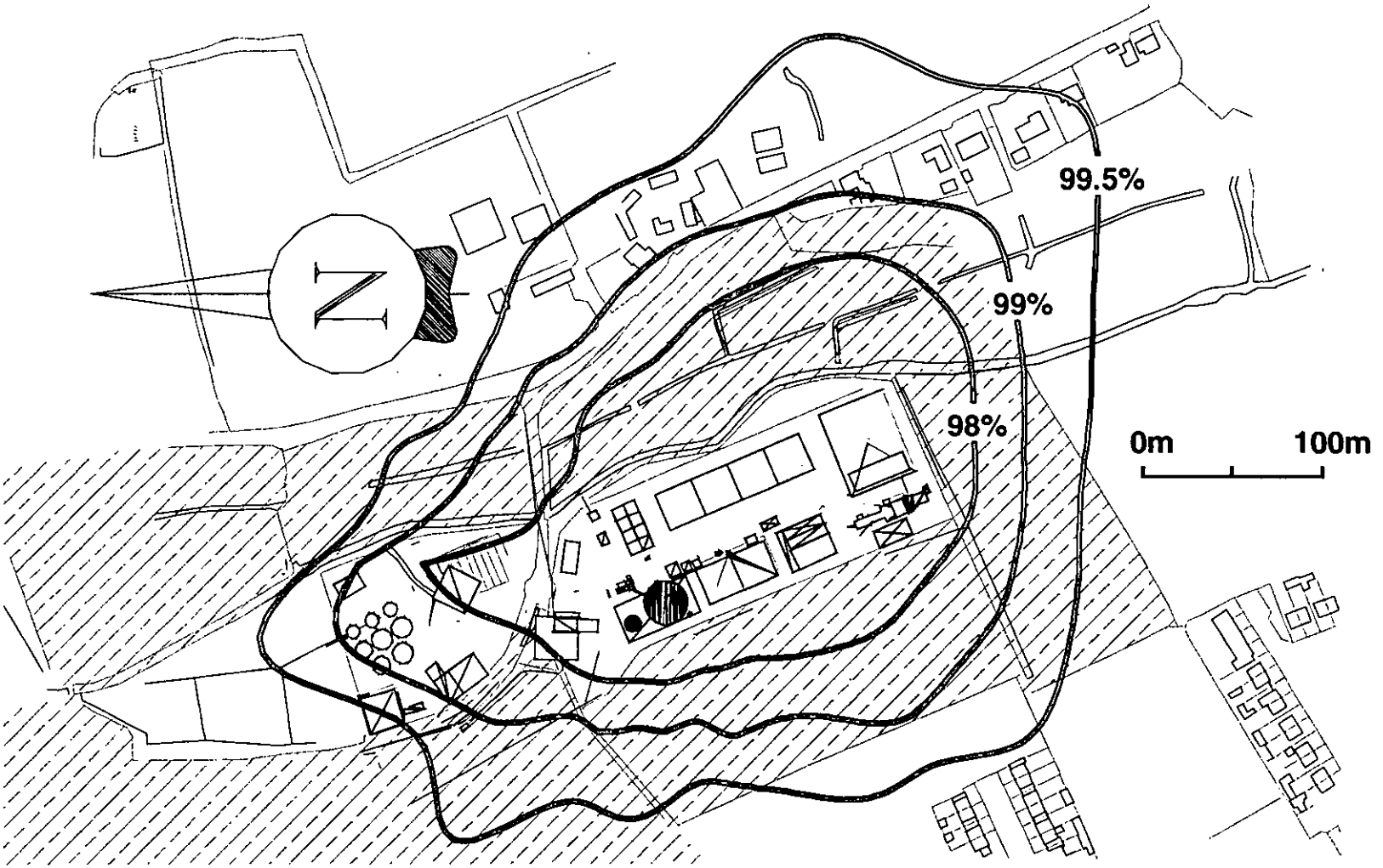



**Fig 4.1 : Odour isolines with level 1 odour abatement.**

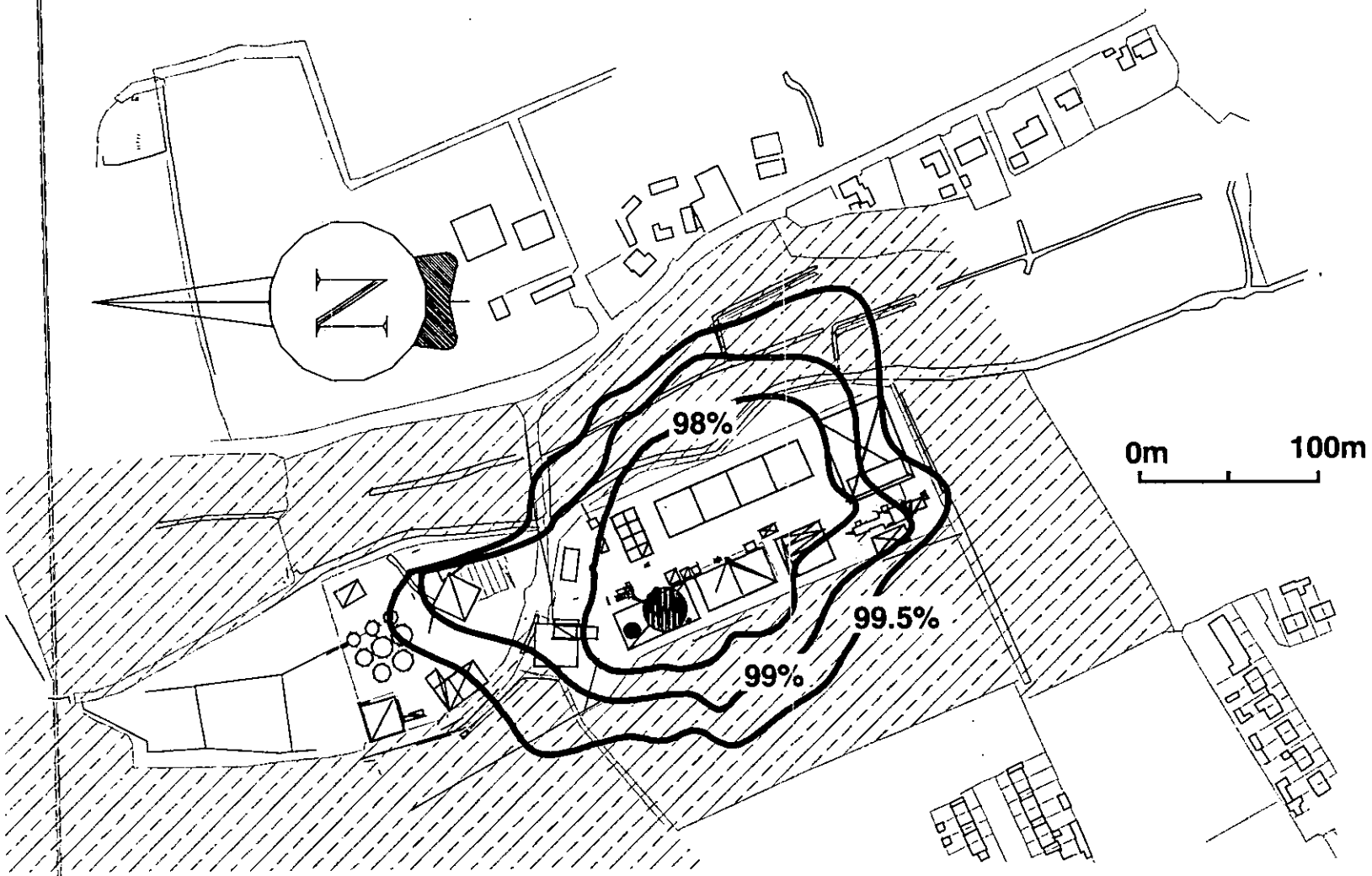



**Fig 4.2 : Odour isolines with level 2 odour abatement measures.**

# 5 CLIMATE

## 5.1 INTRODUCTION

The potential impacts of the proposed development on the global climate are addressed in relation to the generation of greenhouse gases from process facilities and through the consumption of energy. Given the scale of the development and the nature of the local environment, the development is unlikely to have adverse impacts on the local climate.

## 5.2 GREENHOUSE GAS EMISSIONS

The natural carbon cycle involves plants absorbing gases from the atmosphere most notably CO2 and converting these compounds into biomass. Some of this biomass is then either consumed directly or indirectly by humans. This portion of carbon is then excreted as waste in the form of various carbon compounds. Allowing for no treatment of the waste, it degrades naturally either aerobically or anaerobically. With aerobic degradation principally CO2 is emitted with some minor gas compounds, while anaerobic digestion will produce principally CO2 and methane. The methane may then go on to oxidise to CO2 or rise into the atmosphere. While both CO2 and methane are considered greenhouse gases, methane is the more significant due to its higher reactivity. Therefore, with aerobic degradation the CO2 extracted from the atmosphere by photosynthesis is returned to the atmosphere and the overall process in terms of greenhouse gas generation can be considered neutral. However, anaerobic degradation of waste can be considered to generate some greenhouse gases due to the production of methane.

The natural degradation of the waste can be accelerated and controlled by the use of wastewater treatment processes such as the facilities proposed at Portlaoise. The net effect of proposed aerobic treatment option in the production of CO2 over natural aerobic degradation is zero. However, greenhouse gases (methane) would be generated from the anaerobic treatment option and *if released to the atmosphere,* could be considered to add to the global production of greenhouse gases (though at a very minor scale).

However, under the anaerobic option, gases produced by the process will be collected, stored and combusted to generate energy which will be used to operate the treatment plant. This combustion produces CO2 and thus the anaerobic option can also be considered neutral in terms of net greenhouse generation.

Should an anaerobic facility be installed then the imported energy required to operate the plant would be significantly reduced. In Ireland this energy is principally derived from fossil fuels; the consumption of which generates greenhouse gases (approximately 94 %). So the overall net effect of an anaerobic digestion and energy recovery facility would be a net reduction in greenhouse gases emissions over its aerobic option.

# 6 NOISE AND VIBRATION

## 6.1 INTRODUCTION

Enterprise Ireland, Environmental Services section were commissioned to undertake a study of the potential impacts from noise and vibration due to the construction and operation of the upgraded wastewater treatment works at Portlaoise. Their full report is presented in **Appendix 2**

The operation of the treatment works will generate environmental noise in two principal ways, which are:

- Noise emission from outdoor plant and processes
- Noise emission from indoor plant including compressors.

The construction phase of the development will also give rise to noise, some of which will be perceptible off-site. There will be no vibration effects off-site.

While the specific treatment processes, which will be operated at the works can not be specified in detail at this stage in the PPP procurement process, potential noise emissions can be estimated based on emissions from similar modern wastewater treatment works. Baseline measurements of the existing environmental noise can also be made at any residential properties near the proposed site.

Sound levels are measured with a meter in units called decibels (dB), and noise has often been defined as unwanted sound. Environmental noise levels are usually assessed in terms of A-weighted decibels, the dB(A). The A-weighting approximates to the response of the human ear. Industrial, occupational and environmental noise is usually expressed in equivalent continuous levels, $L_{Aeq,T}$. This is based on the average energy level over the relevant time interval. Environmental noise may be corrected for tonal or impulsive characteristics and the unit is the rating level, $L_{Ar,T}$. Statistical parameters are also used as noise descriptors.

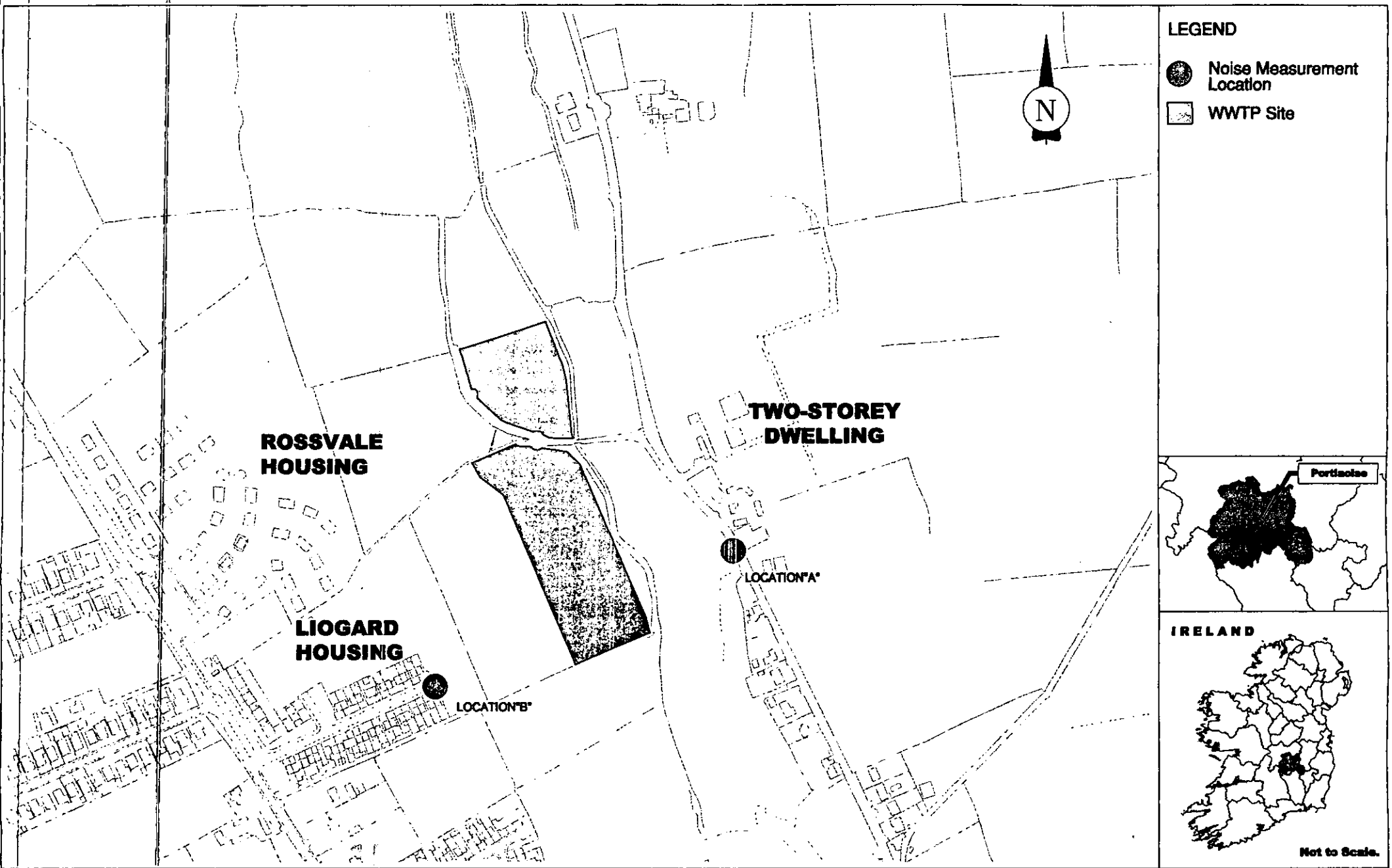
## 6.2 DESCRIPTION OF EXISTING ENVIRONMENT

The proposed site is the site of the existing wastewater treatment works at Ridge Road, Portlaoise. It is relatively close to the town and the nearest residential properties are a farmhouse approximately 100 metres to the East and a housing development approximately 150 metres to the West. Baseline measurements were made at these two locations, shown as Location A and Location B respectively (**Fig. 6.1**).

## 6.3 METHODOLOGY

Baseline measurements of the existing environmental noise were made at two locations adjacent to residential properties near the site (**Fig. 6.1**) and at a similar modern wastewater treatment works at Greystones, Co. Wicklow.

Noise measurements were made at the nearest residence (location A) over a number of days and nights with principally good weather conditions with light winds before the weather deteriorated. Only night-time measurements were made at location B on a calm night. The microphone height was at first floor level at location A and 1.5 metres above ground level at location B. The following parameters were measured:




LEGEND

- Noise Measurement Location
- WWTP Site







Not to Scale.

CO. LAOIS

fig. **Fig 6.1**

Title **Noise Measurement Locations**

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- $L_{Aeq,\ T}$ the equivalent continuous noise level for the measurement period. This parameter is very sensitive to local high-level short time sources, e.g. local traffic, etc.

- $L_{A01,\ T}$ the sound level equalled or exceeded for 1% of the measurement period, the maximum levels.

- $L_{A10,\ T}$ the sound level equalled or exceeded for 10% of the measurement period, the parameter usually used for traffic noise assessment.

- $L_{A90,\ T}$ the sound level equalled or exceeded for 90% of the measurement period. This level is sometimes taken to represent the "background" noise level.

The principal noise sources audible at location A was traffic, and in the absence of traffic the existing treatment plant. The principal sources of noise at location B were traffic on the Mountmellick Road and distant traffic. The time history graph at location B is shown in **Fig. 6.2.** The minimum night-time levels at location A were $L_{A90,1\ hour}$ values of 42 – 43 dB(A) and the corresponding $L_{Aeq,1\text{-}hour}$ values were 48 dB(A). The night time 'background' level of 42 – 43 dB(A) was due to the existing plant. At location B the night-time 'background' level of 36 dB(A) was due to distant traffic and the more distant treatment plant

## 6.4 TYPICAL NOISE EMISSIONS

Noise measurements were made at a similar modern treatment works at Greystones, Co. Wicklow and the results were:

**Decanter Centrifuge**

| | |
|---|---|
| 10 metres | 50 dB(A) |
| 20 metres | 45 dB(A) |
| 30 metres | 42 dB(A) |
| 40 metres | 40 dB(A) |

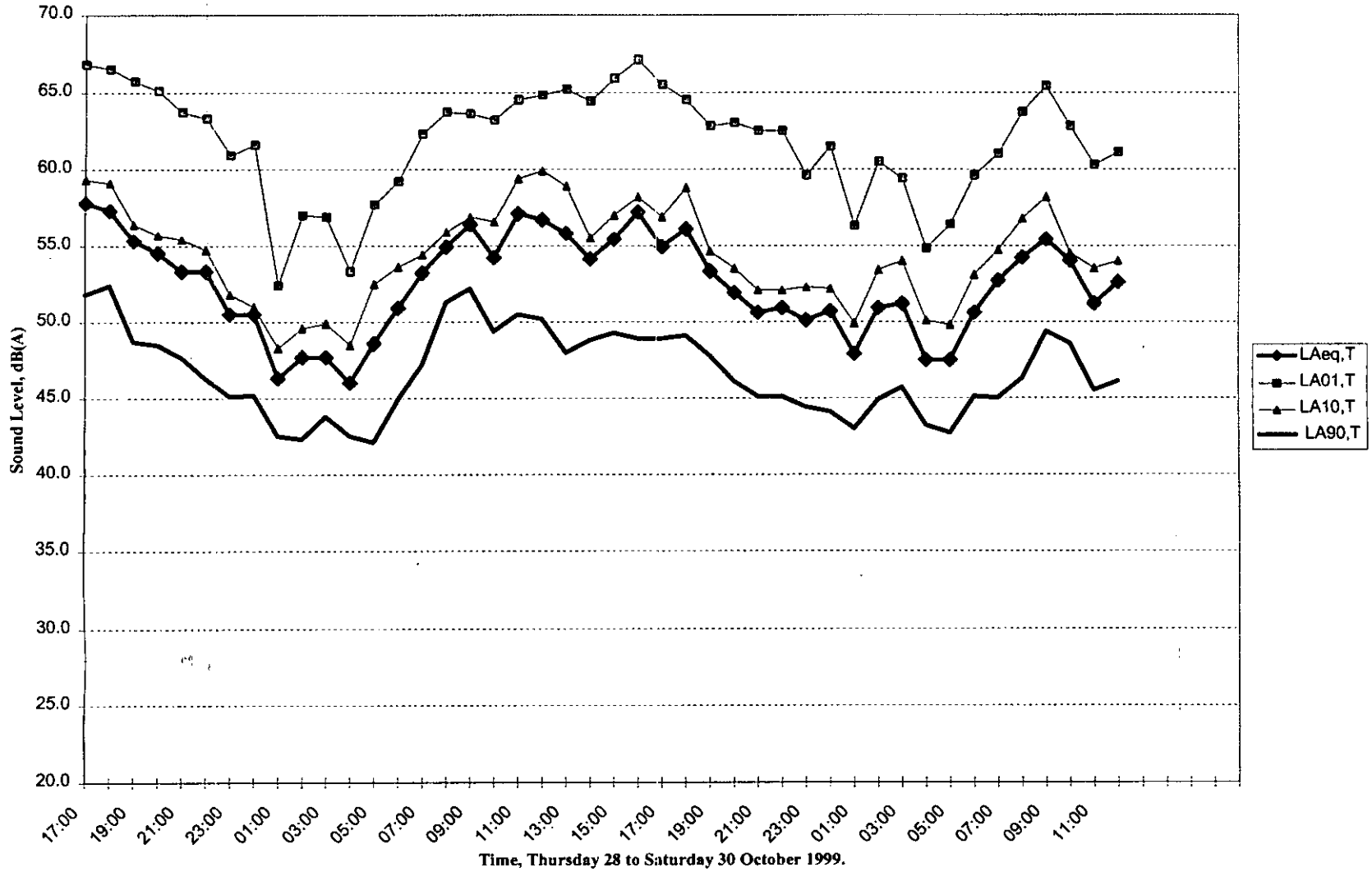
**Aerator Tanks**

| | |
|---|---|
| above tanks, 1.5m | 50 dB(A) |
| 20 metres | 40 dB(A) |

**Compressor Building**

| | |
|---|---|
| 0 metres | 38 dB(A) |

**Fig. 6.2 Ambient Sound Level, Greenview, Portlaoise**



## 6.5 POTENTIAL SIGNIFICANT IMPACTS & MITIGATION MEASURES

The major items of plant in a treatment works operate 24 hours a day. However, sludge pressing and removal operations are normally undertaken during daytime working hours. Due to the continuous nature of the plant operation, night-time operation is of major importance, as this requires a lower noise limit than daytime. There are no statutory limits for environmental noise emissions for wastewater treatment works, or industry in general, in this country.

In general, noise is likely to provoke complaints when its level exceeds the level of the background noise level by a certain margin or when certain absolute levels are attained. The criteria for industrial noise generally lie in the range 35-45 dB(A) at night and 45-55 dB(A) by day. The lower values are normally applicable to rural areas and zones of hospitals, and the higher values are sometimes applicable to city centre areas or special cases such as mining or quarrying. Currently the most widely applied criteria for industry are that of 45 dB(A) (night-time) and 55 dB(A) (daytime) with no impulsive or tonal characteristics.

Selection of the preferred noise criteria values within the range of values above depends on the pre-existing noise levels, the character of the area and the nature of the development.

Taking the above into account and the existing "background" noise measured, the following criteria are proposed as being appropriate to this type of development for minimal impact on the noise environment:

**Existing Residences**

Night :45 dB $L_{Aeq}$ (hourly)

Day :55 dB $L_{Aeq}$ (hourly)

These are limit values for the noise from the proposed treatment works measured outside any dwelling. There should be no significant pure tones or impulsive elements in the noise spectrum of the emissions from the plant. The noise characteristic associated with plants of this nature is generally perceived as being of a broad band unobtrusive character.

All main sources of noise in the proposed treatment works will be required to incorporate noise control measures, as appropriate, to meet the above criteria.

## 6.6 RESIDUAL IMPACTS

Due to the distance of the treatment works from sensitive locations and the noise criteria under which the treatment works will be designed to operate there are no anticipated noise impacts due to the proposed development.

## 6.7 SUMMARY

The construction and operation of the wastewater treatment works can be undertaken without undue impact on the noise environment. There will be no vibration perceptible off-site.

The construction and operation of the wastewater treatment works can be defined as "no impact" with respect to noise and vibration.

# 7 LANDSCAPE

## 7.1 INTRODUCTION

The landscape and visual impact assessment of the proposed development examines the existing landscape in terms of its visibility and scenic quality. The impact of the development on that character is assessed, including views into and out from the site. In determining the impact, consideration is given to reducing any significant impact associated with the development proposal and accordingly mitigation measures are considered.

## 7.2 METHODOLOGY

The assessment relates to the views of the proposed development from surrounding areas and the nature and extent of these views. It was conducted as follows:

1. Site survey to determine the character of the site and its surrounding area.
2. Site analysis to determine views into and out of the site area.
3. Assessing the proposed development through layout plans and sections to determine the impacting features.
4. Evaluating these impacts on the landscape in accordance with EPA guidelines.

A list of the definitions used to describe the visual impact is presented in **Table 7.1**.

## 7.3 DESCRIPTION OF EXISTING ENVIRONMENT

### 7.3.1 Introduction

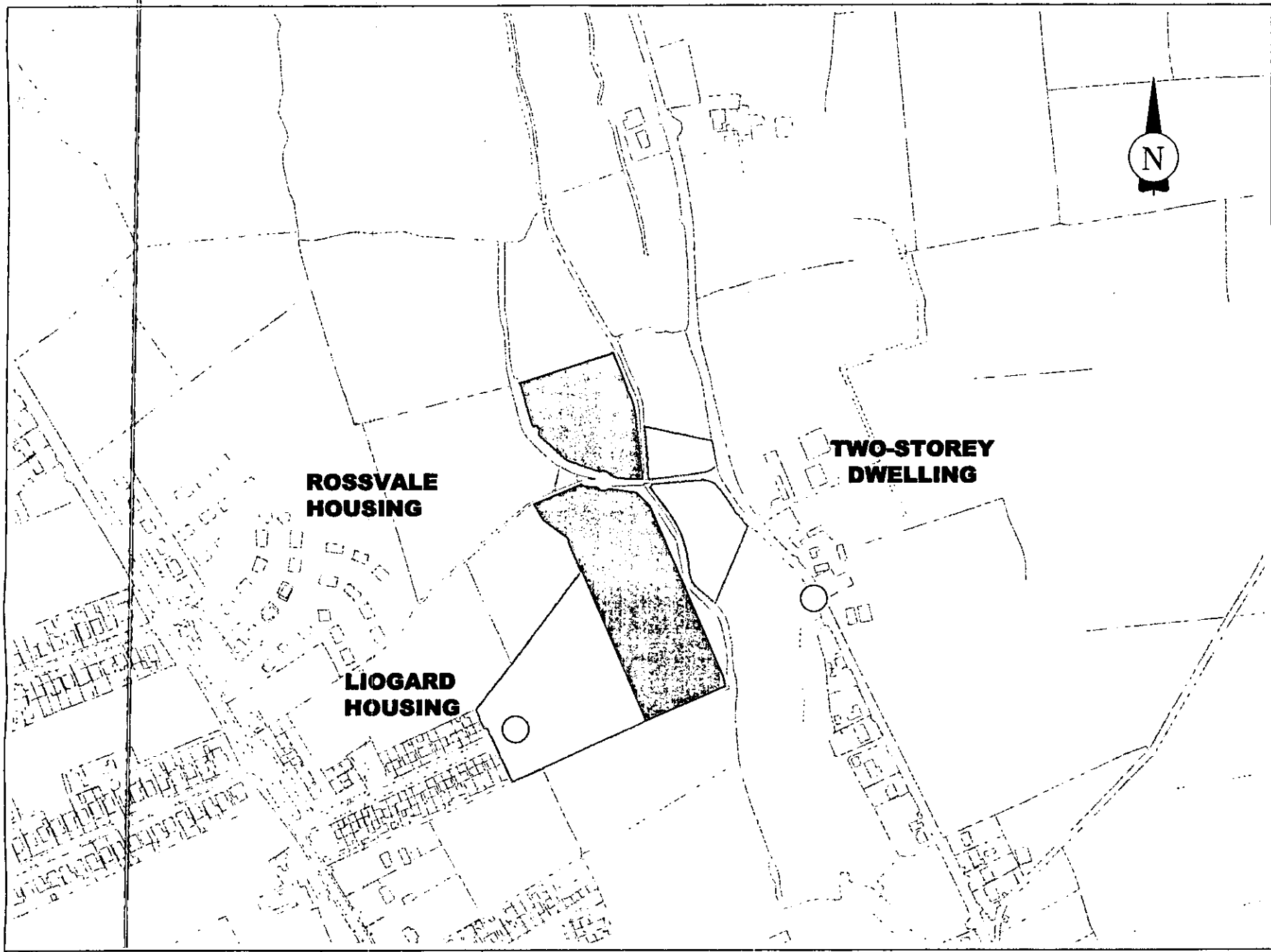
The existing site boundaries are formed by green fields to the north, south and west, and by the Triogue River to the east (**Fig. 7.1**). The site occupies a low-lying land area defined by the surrounding hillocks and the Triogue River. The fields immediately adjacent to the site are managed as agricultural fields and grazed by cattle. The main landscape features visible from the site are the Triogue River, the surrounding hills, and the roofs of Rossvale and Liogard housing estates in the distance, approximately 150m from the site boundary.

Some buildings are already present on the site and their heights vary between 1 and 7meters. The character of the site is one of an urban fringe, situated on the outskirts of Portlaoise town with housing developments moving gradually farther outwards into the rural landscape. The present management of the site gives the overall impression of a somewhat degraded site on the urban fringes of Portlaoise, surrounded by agricultural land.

### 7.3.2 Hedgerows

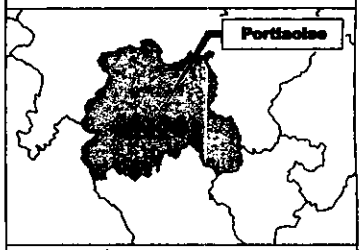
The hedgerow survey was undertaken to assess the condition of the existing hedgerows in the environs of the site area. There are 6 principal hedgerows on the site and 2 on the Ridge Road, which are also of importance as they screen the site (**Fig. 7.2**). Hedgerows No. 1,3 & 8 are classified as being species rich. However, much of this planting lies outside of the fence line of the proposed site and these hedgerows have not been managed in the recent past (A summary of the hedgerow survey can be found in **App. 3**).

In terms of possible visual impact of the proposed wastewater treatment works, the hedgerows, which are on the site boundary provide important screening to the surrounding areas.




LEGEND

- WWTP Site
- Viewshed
- Sensitive Receptor



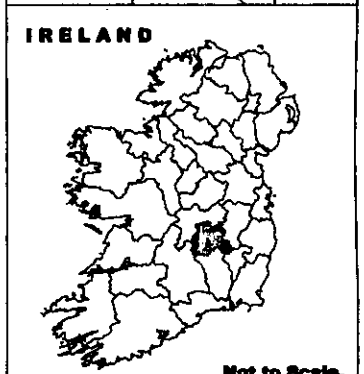




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fig.

**Fig 7.1**

Title

**Location of Sensitive Receptors and Viewshed**

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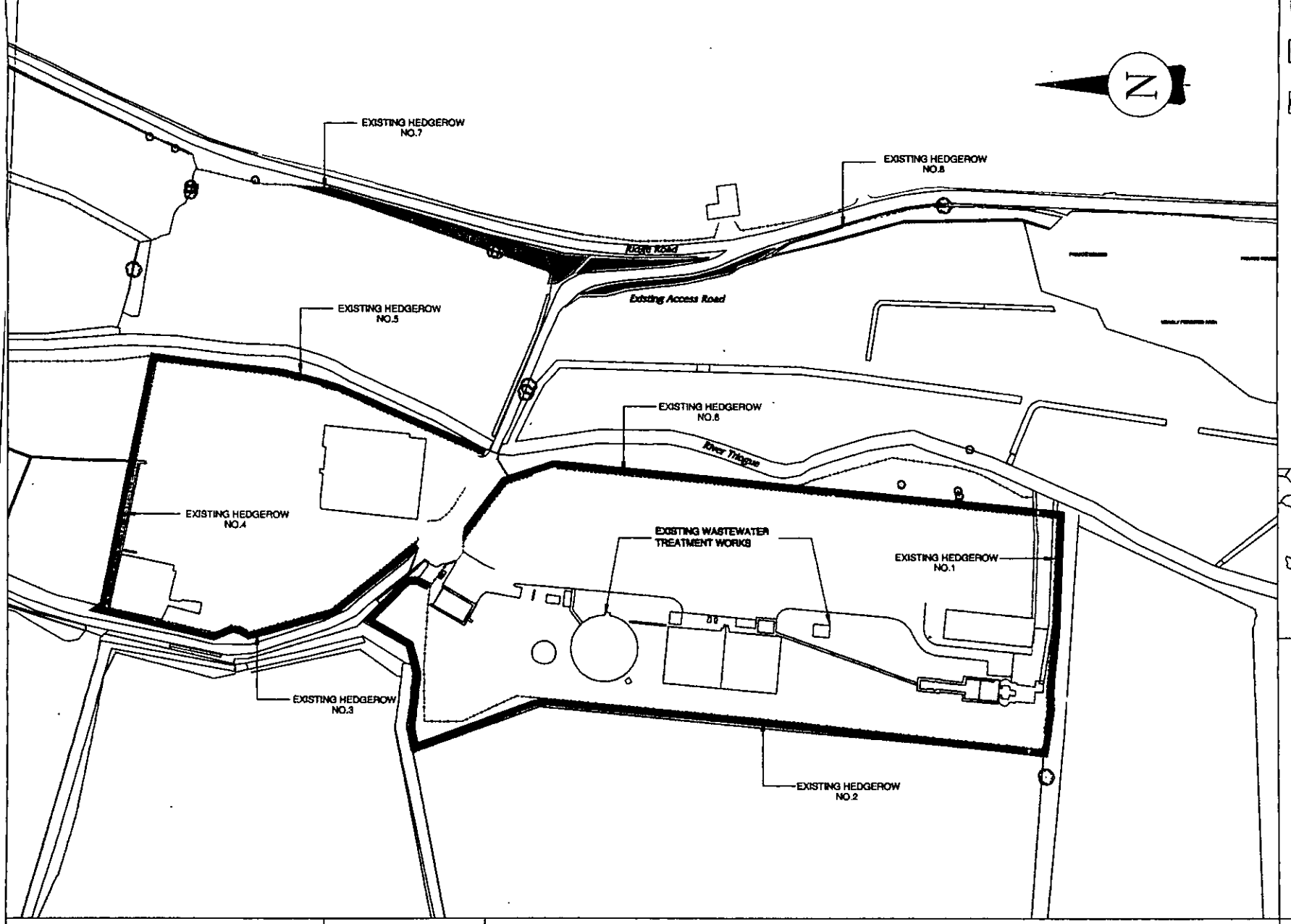
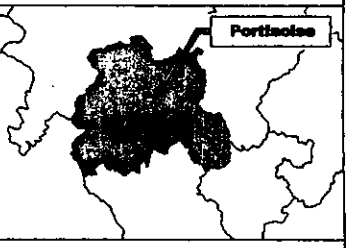



**LEGEND**

INDICATES EXISTING WASTEWATER TREATMENT WORKS

INDICATES EXISTING HEDGEROWS



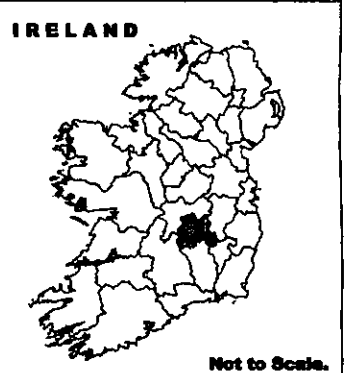




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fig.

**Fig 7.2**

Title

# Location of Existing Hedgerows

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**Table 7.1: Definitions Used in the Description of the Visual Impact**

| | |
|---|---|
| **Extent of Visual Impact** | |
| No Impact | There is no change to views in the visual landscape |
| Imperceptible Impact | In this situation the proposal is adequately screened due to the existing land form, vegetation or constructed features |
| Slight Impact | In this situation the affected view forms only a small element in the overall visual composition , or changes the view in a marginal manner |
| Moderate Impact | In this situation the proposal affects an appreciable segment of the overall visual composition, or where there is an intrusion into the foreground of a view |
| Significant Impact | In this situation the proposal affects a significant segment of the overall visual composition, or where views are so affected that they form a new element in the physical landscape |
| Profound Impact | is one where the view is entirely altered, obscured or affected |
| **Quality of Visual Impact** | |
| Neutral | will neither detract nor enhance the landscape character or viewpoint |
| Positive | will improve or enhance the landscape character or viewing |
| Negative | will dis-improve or detract the quality of the landscape |
| **Duration of Visual Impact** | |
| Temporary | Impacts lasting one year or less |
| Short-term | Impacts lasting one to seven years |
| Medium-term | Impacts lasting seven to twenty years |
| Long-term | Impacts lasting twenty to fifty years |
| Permanent | Impacts lasting over fifty years |

### 7.3.3 Residential Areas

**Eastern Boundary**

A number of single-storey dwellings are located, along the Ridge Road, to the south east of the existing site access road (**Fig. 7.1**). They occupy an area of higher topography in relation to the proposed site. The views from these dwellings into the proposed site are totally screened by the presence of planted earthbanks at the rear gardens of these dwellings. As a result there are no significant views into the site from these dwellings.

There is however a two-storey dwelling located opposite the site access road, which is not screened effectively by existing hedgerows (**Fig. 7.3**). This house occupies an elevated position above the proposed site. This two-storey dwelling on the Ridge Road is the only sensitive receptor to the proposed development along the eastern boundary of the site.

**Western Boundary**

To the west of the proposed site are the Rossvale and Liogard housing estates. Two medium sized fields with mature hedgerows separate the houses from the proposed site at this point, a distance of approximately 150m to the proposed site boundary.

The views from the Rossvale housing estate are made up of localised views into the adjacent fields and mature hedgerows (**Fig. 7.4**). These mature hedgerows provide almost complete screening of the proposed site from the houses in this development.

The views from the houses in the Liogard development, which are closest to the proposed site are also screened by mature hedgerows (**Fig. 7.5**). The houses are orientated at right angles to the site and there are no significant views directed from the houses into the proposed site. Direct views into the site are farther obscured, at eye level, by the eastern boundary wall of Liogard housing estate.

However, at the eastern extreme of Liogard housing, and closer to the proposed site, the building foundations for new houses have been prepared. These houses will become a single large sensitive receptor to the proposed wastewater treatment works (**Fig. 7.1**). These new houses will be approximately 100 meters distance from the proposed site and will be orientated parallel to the proposed development, with unobscured views from the rear windows.

**North and South**

There are no houses to the south and north of the proposed site, and therefore no sensitive receptors on these boundaries.

### 7.3.4 Surrounding Roadways

**North and south**

The existing roads to the north and south of the proposed site are in excess of 600m distance from the site (**Fig. 3.1**). These roads are extensively screened by mature hedgerows and trees. There are no views into the proposed site from these roadways.

**West**

The roads to the west of the proposed site are composed of the access roads off the Mountmellick Road (**Fig. 7.1**) into the Rossvale and Liogard housing estates. Accordingly there will be virtually no visual change from these roadways as a result of the proposed wastewater treatment works.

**East**

At a distance of approximately 30 meters at its closest point the Ridge Road runs parallel to the eastern boundary of the proposed site **(Fig. 7.1)**. The visibility into the site is predominantly along the northern section of the site as far as, and including the existing access road.

Along the northern section of the Ridge Road there is a high degree of intervisibility between the proposed site and the road. Along this site boundary the road overlooks the proposed site, which is at a lower elevation and this provides fragmented views into the proposed site. The existing hedgerow (No.7, **Fig. 7.2**) planting along this section of the Ridge Road does not provide extensive visual screening of the site as it is principally low to medium in height, and composed of hazel (Corylus), brambles (Rubus) and gorse (Ulex) species. The site boundary hedgerow (No. 5, **Fig. 7.2**) at this point is composed of small to medium hawthorn (Crataegus) and bramble (Rubus) species.

The visibility into the site increases at the site access road. From an elevated position at the top of the access road the proposed site is clearly visible. Moving down into the proposed site the screening along this road is moderate at eye level.

Travelling in a southerly direction along Ridge Road the degree of intervisibility between the Ridge Road and the proposed site decreases after the access road into the site. From this point there is dense screening by existing hedgerow vegetation, approximately 6.0m in height and composed of hazel (Corylus), blackthorn (Prunus spinosa) and brambles (Rubus) species. These mature hedgerows, though unmanaged, do serve to break up views into the site area. There are no views into the site, which could be considered as having very high quality. However the existing vegetation breaks up the scale of the existing structures considerably.

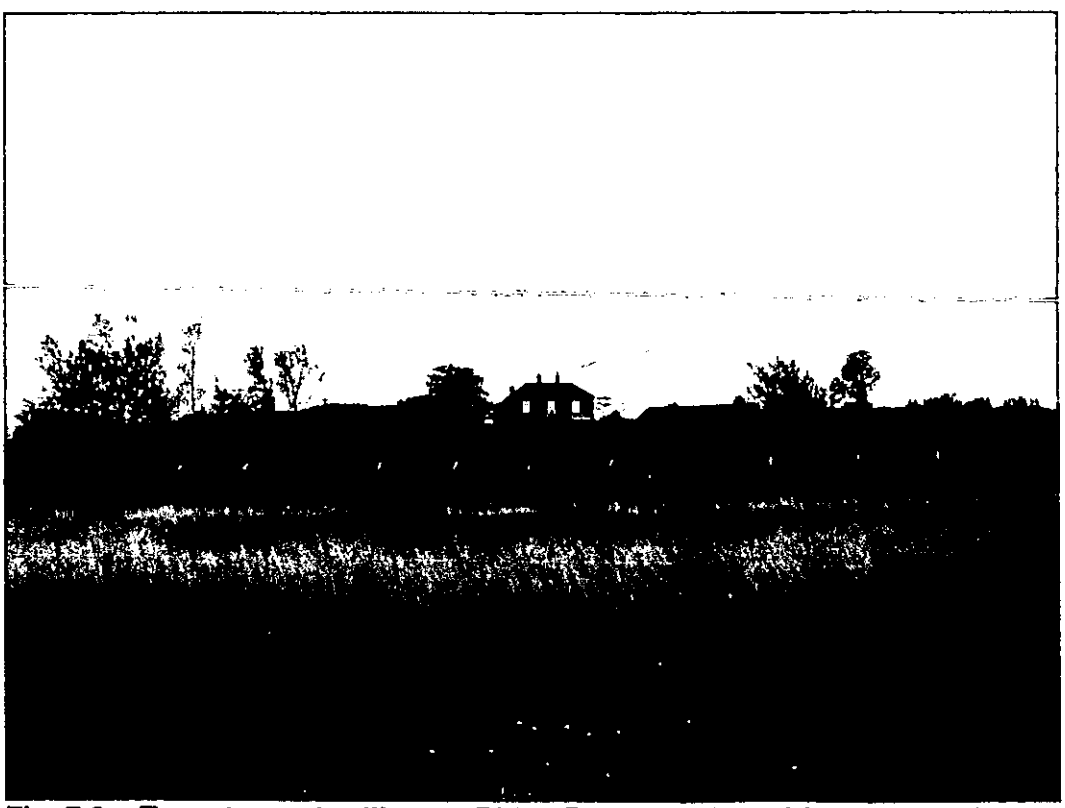


**Fig. 7.3 Two-storey dwelling on Ridge Road (as viewed from WWTW)**

**Fig. 7.4 Rossvale housing estate (as viewed from WWTW)**

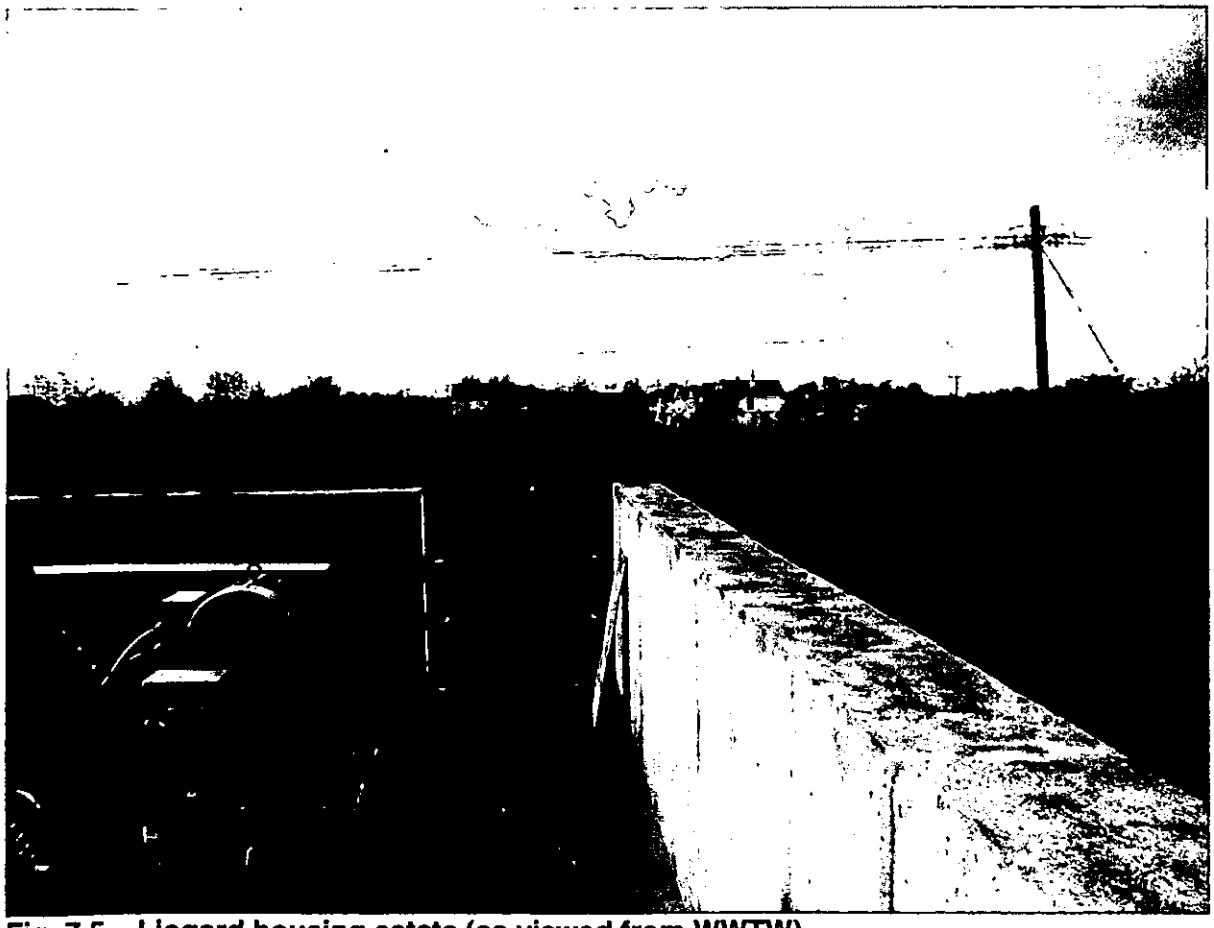


**Fig. 7.5 Liogard housing estate (as viewed from WWTW)**

## 7.4 POTENTIAL SIGNIFICANT IMPACTS

### 7.4.1 General

The proposed development shown as indicative possible option **Fig. 7.6**, will involve slight change to the visual character of the area in the long term. The main visual impact will occur due to scale and height of the proposed structure in the short term during the construction works and in the early stages of the proposed woodland copse screening. The proposed development would occur over a phased period of time. The potential "slight impact" will be minimised by the establishment of screen planting during the early phases of the proposed development **(Fig 7.7 to 7.9c)**.

### 7.4.2 Views from Surrounding Residential Areas and Community Facilities

The visual impact of the proposed development on the surrounding residential areas will be slight to moderate.

There will be no visual impact on the single-storey dwellings along the Ridge Road, south of the existing site entrance, as there is total visual screening of the proposed site here.

The proposed development may be clearly visible from the two-storey dwelling on the Ridge Road opposite the existing site entrance. Situated in an elevated position above the proposed site, with slight visual screening in existence there may be unobstructed views from this dwelling into the proposed site (**Fig. 7.1**). The visual impact on this dwelling will be moderate in extent. The proposed screen planting along the eastern boundary of the site will mitigate the impact to this dwelling..

Mature hedgerows provide extensive visual screening of the proposed development for the Rossvale and Liogard housing estates. There are also no direct views from these residential areas due to the orientation of the existing houses. Therefore, the visual impact on the existing housing in these estates will be slight in extent.

There will be direct views into the proposed development from the housing currently under construction adjacent to Liogard housing estate. These houses will be approximately 100 meters from the proposed development and the visual impact on them will be significant in extent. The proposed screen planting along the western boundary of the site will mitigate this impact

### 7.4.3 Views from Surrounding Roadways

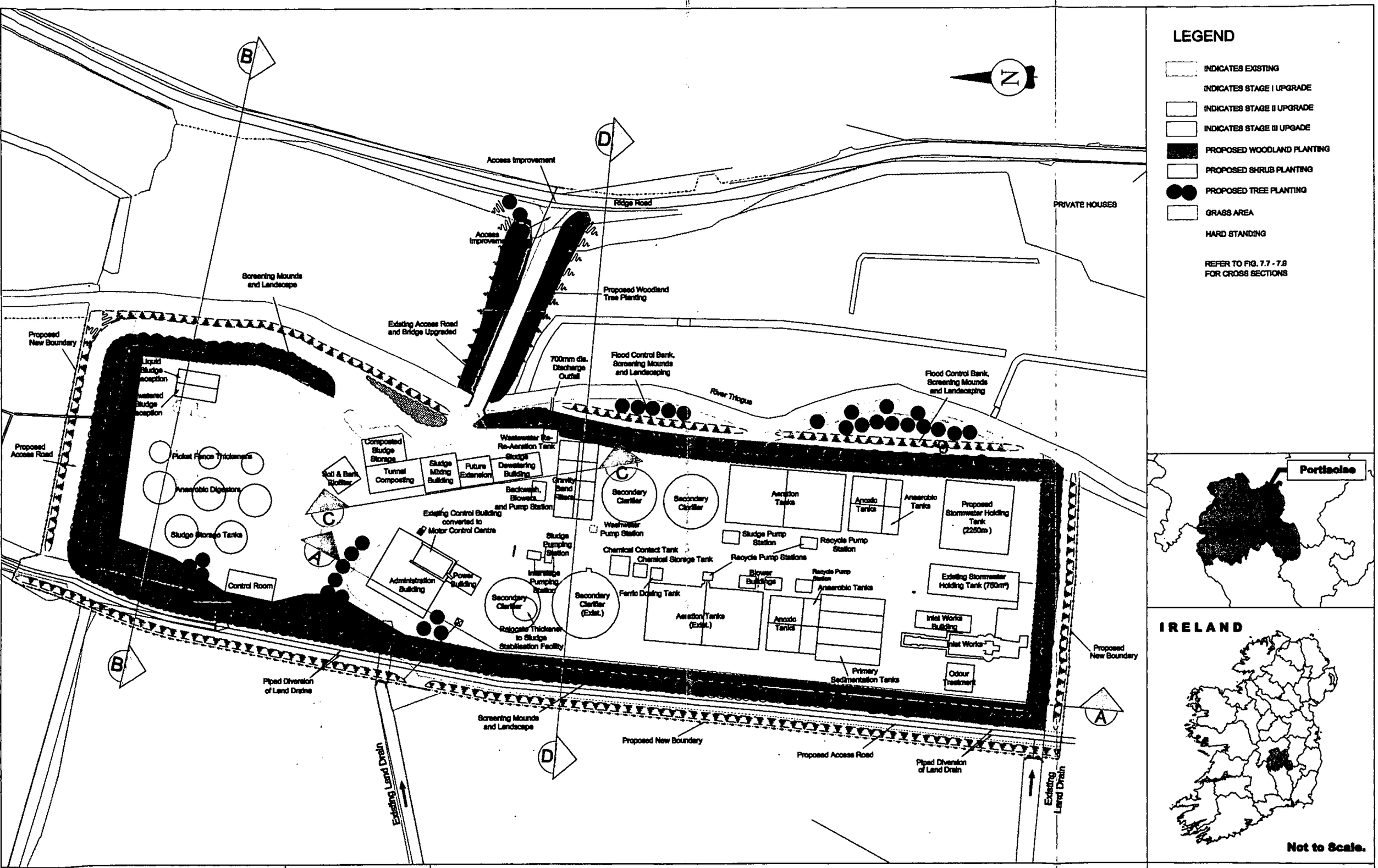
There will be no visual impact on the roads to the north and south of the proposed development as they are in excess of 600m distance from the site.

There are limited views from the roadways to the west of the proposed site, composed of views from the access roads, off the Mountmellick Road, into the Rossvale and Liogard residential areas. There is slight potential visual impact from the proposed development along these roadways.

The views along the the Ridge Road, north of the site access road, will be visually disrupted in the short term during the construction of the proposed development. It is proposed to establish a minimum 6.0m wide woodland copse along the inside of the proposed site boundary. In the longer term, this will create visual screening along this particular section of road and give the impression of reducing the scale and height of the proposed structures. Therefore there are limited views from the northern section of the Ridge Road and potential slight impact from the proposed development.

## 7.5 MITIGATION MEASURES

Landscape mitigation works are proposed to provide extensive screening and also provide for the creation of wildlife habitats through the use of indigenous plant species. This section deals with the layout of this planting whereas the ecological aspect is described in **Ch. 8**.




## LEGEND

- INDICATES EXISTING
- INDICATES STAGE I UPGRADE
- INDICATES STAGE II UPGRADE
- INDICATES STAGE III UPGADE
- PROPOSED WOODLAND PLANTING
- PROPOSED SHRUB PLANTING
- PROPOSED TREE PLANTING
- GRASS AREA
- HARD STANDING

REFER TO FIG. 7.7 - 7.8 FOR CROSS SECTIONS







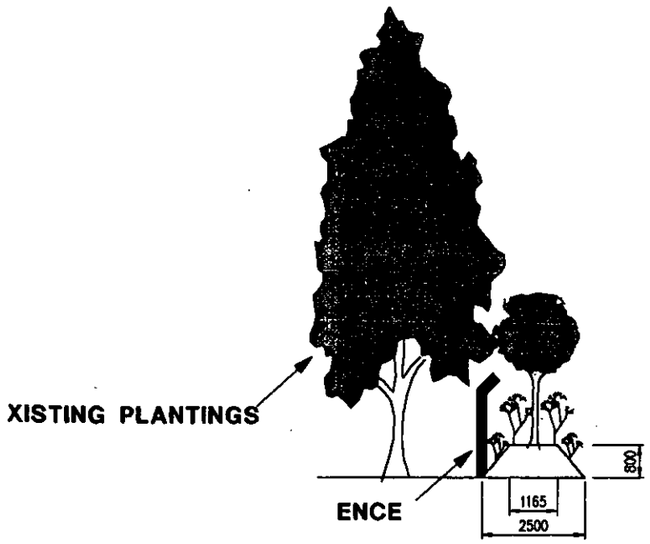
Not to Scale.

CO. LAOIS

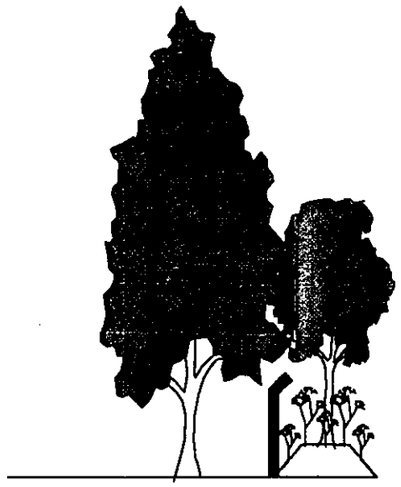
fig. Fig. 7.6

Title **PROPOSED LANDSCAPE FEATURES**

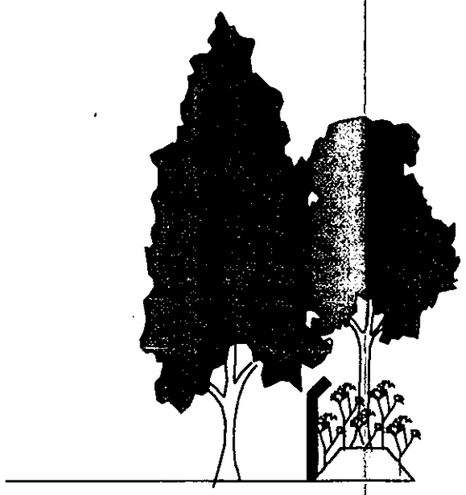
mcos




PLANTING YEAR 1

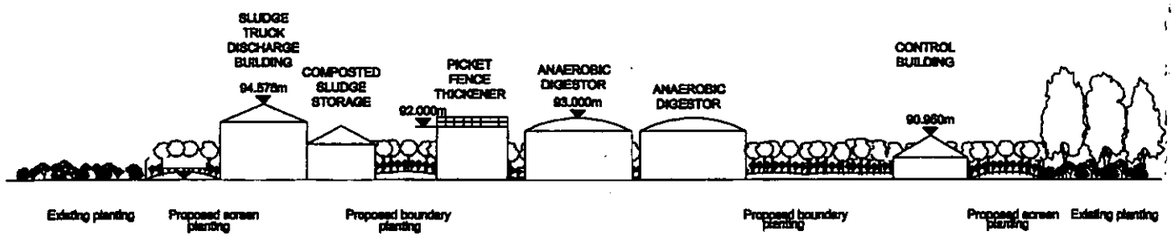


PLANTING YEAR 5

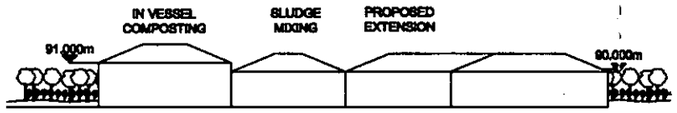


PLANTING YEAR 10

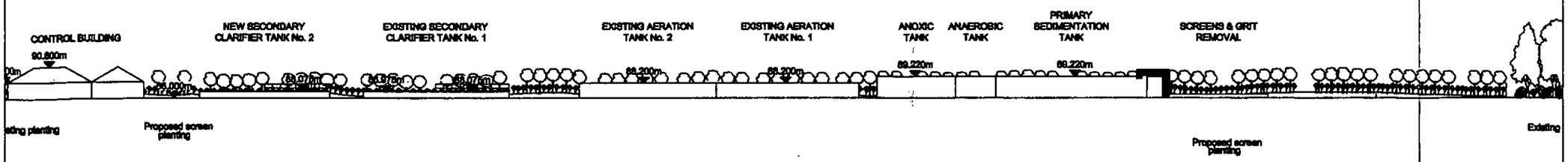
## EARTH MOUND SECTION




ELEVATION B - B ( Scale 1:1000 )




ELEVATION C - C ( Scale 1:1000 )



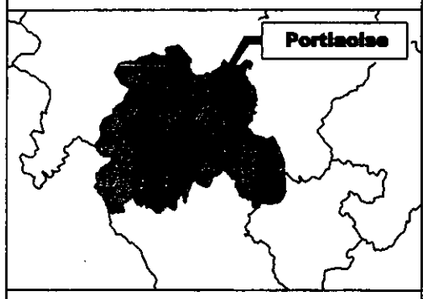

ELEVATION A - A ( Scale 1:1000 )

## PLANTING YEAR 1

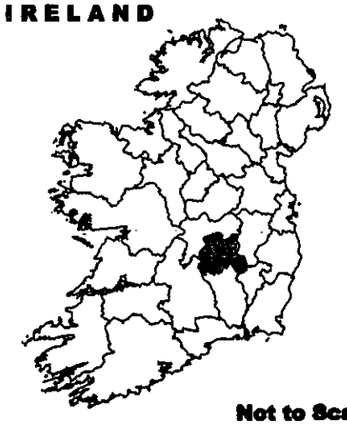
### LEGEND

INDICATES EXISTING

INDICATES STAGE I UPGRADE




IRELAND



Not to Scale.

CO. LAOIS

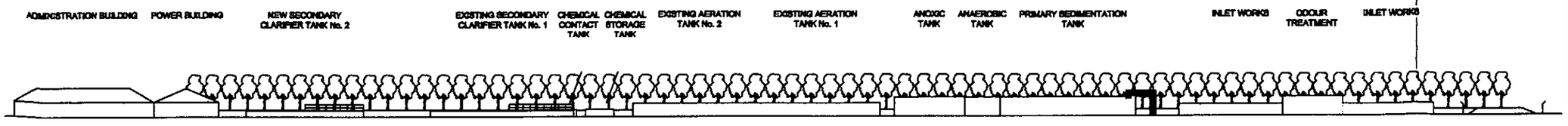
fig.

**Fig 7.7**

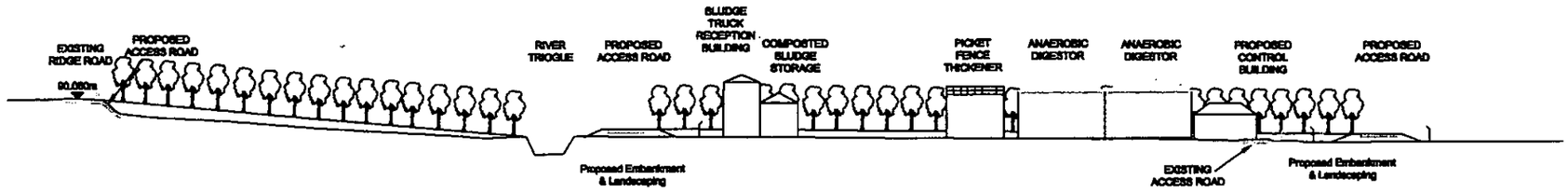
Title

# Earth Mound Section and Planted Vegetation at Year 1

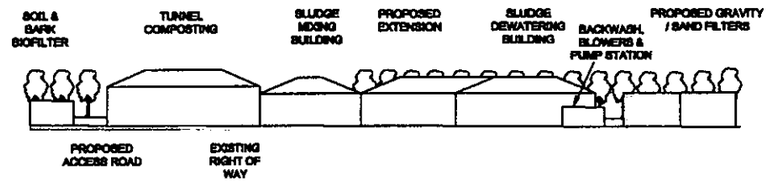
mcos



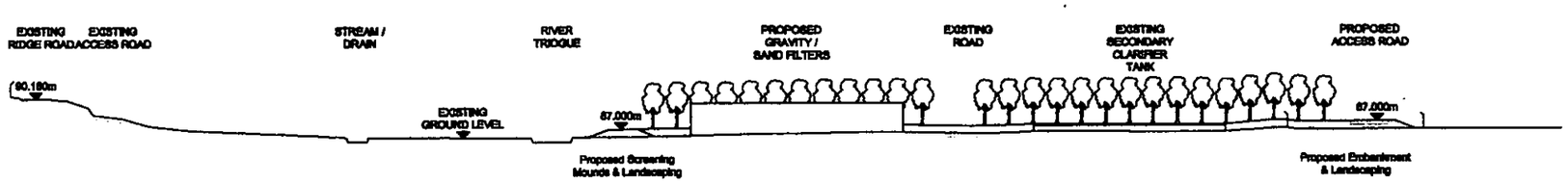

**ELEVATION A - A**




**ELEVATION B - B**



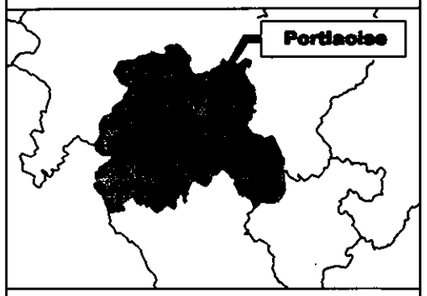

**ELEVATION C - C**



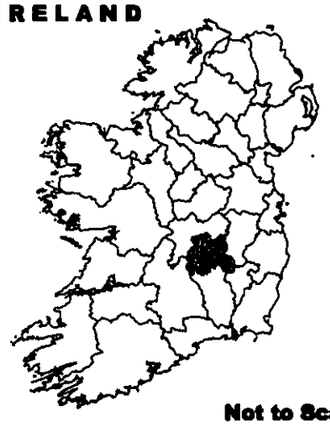

**ELEVATION D - D**

## LEGEND

- INDICATES EXISTING
- INDICATES STAGE I UPGRADE
- INDICATES STAGE II UPGRADE
- INDICATES STAGE III UPGADE




IRELAND



Not to Scale.

CO. LAOIS

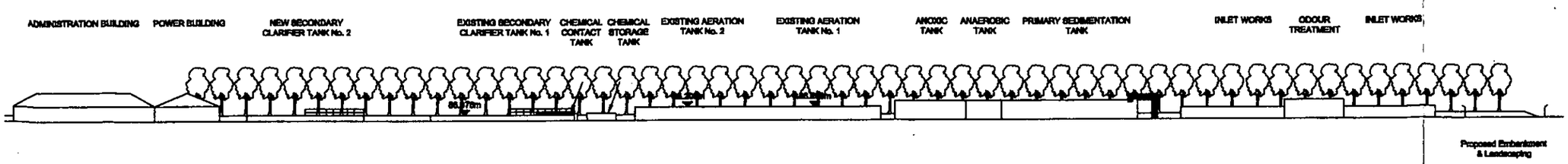
fig.

Fig. 7.8

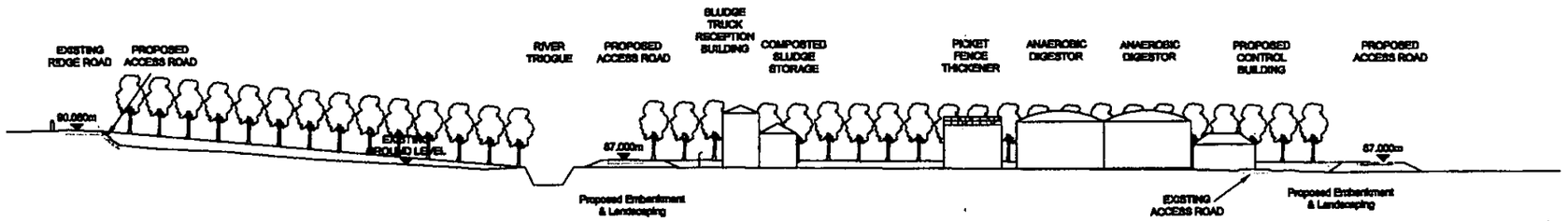
Title

# Earth Mound Section and Planted Vegetation at Year 5

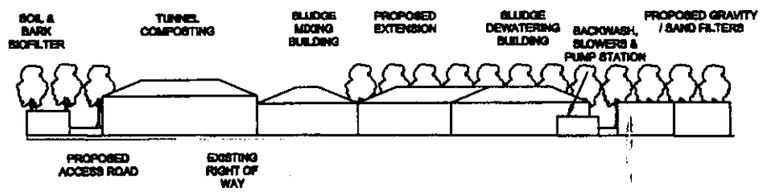
mcos



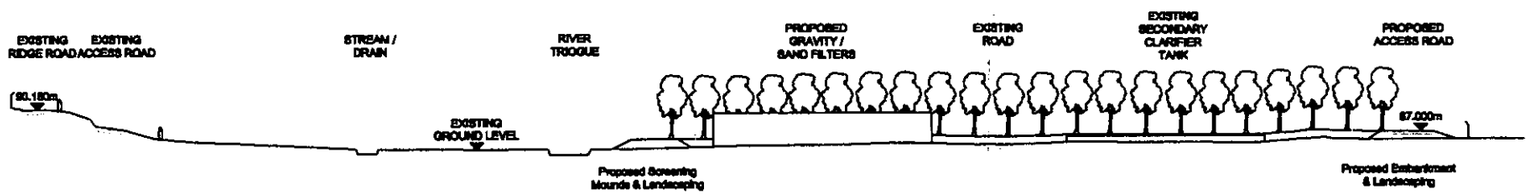

ELEVATION A - A




ELEVATION B - B



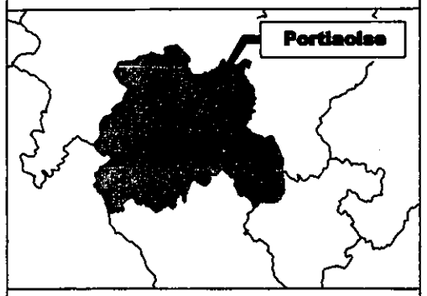

ELEVATION C - C



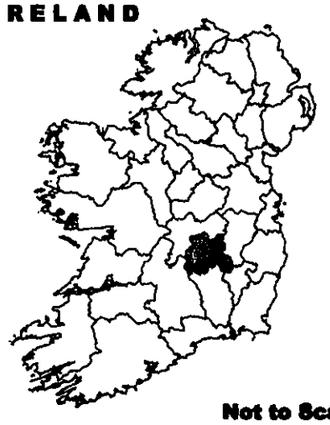

ELEVATION D - D

## LEGEND

- INDICATES EXISTING
- INDICATES STAGE I UPGRADE
- INDICATES STAGE II UPGRADE
- INDICATES STAGE III UPGADE




IRELAND



Not to Scale.

CO. LAOIS

fig.

Fig. 7.9

Title

# Earth Mound Section and Planted Vegetation at Year 10

mcos

Visual screening will be provided in the form of planted mounds and through the promotion of early establishment of planted species, both within the site and at the site perimeter. This is proposed in order to establish an effective screen as an infrastructural element in the development of the site at an early stage. The screen planting will achieve progressively greater height and provide increased screening to the successive stages of the phased upgrading of the Wastewater Treatment Works.

- All existing hedgerows within the site boundary will be retained and augmented, which will reduce any effects of the proposed development.

- In the short term, the planting of standard trees of 2.5 - 3.0m in height on earth mounds of between 0.6 - 1.0m in height in conjunction with an under-storey of woodland shrubs will provide partial screening up to 3.1 - 4.0m height (**Fig. 7.7 and 7.9a**).

- In the medium term, the height of the screen planting will be at an expected height of 5.0 - 6.0m which forms a significant screen for all but the highest of the wastewater treatment work structures. The woodland under-storey also forms a continuous visual screen up to 3.0m in height (**Fig. 7.7, 7.8 & 7.9b**).

- In the long-term, the standard trees planted at year one are shown at their potential height of 10 - 15m. This will provide significant screening for the wastewater treatment works. The woodland under-storey will be mature and will provide visual screening from ground level to the tree canopy (**Fig. 7.7, 7.8 & 7.9c**).

The planting of the side of the existing main access roadway as indicated on **Fig. 7.6** would allow a better screening to be achieved from some part of the development.

Detailed landscape development guidelines, presented in **App. 3,** will provide guidance to the future development of the woodland and screen planting management.

## 7.6 MONITORING AND MANAGEMENT STRUCTURES

The landscape development of the site, subject to planning approval would be as follows:

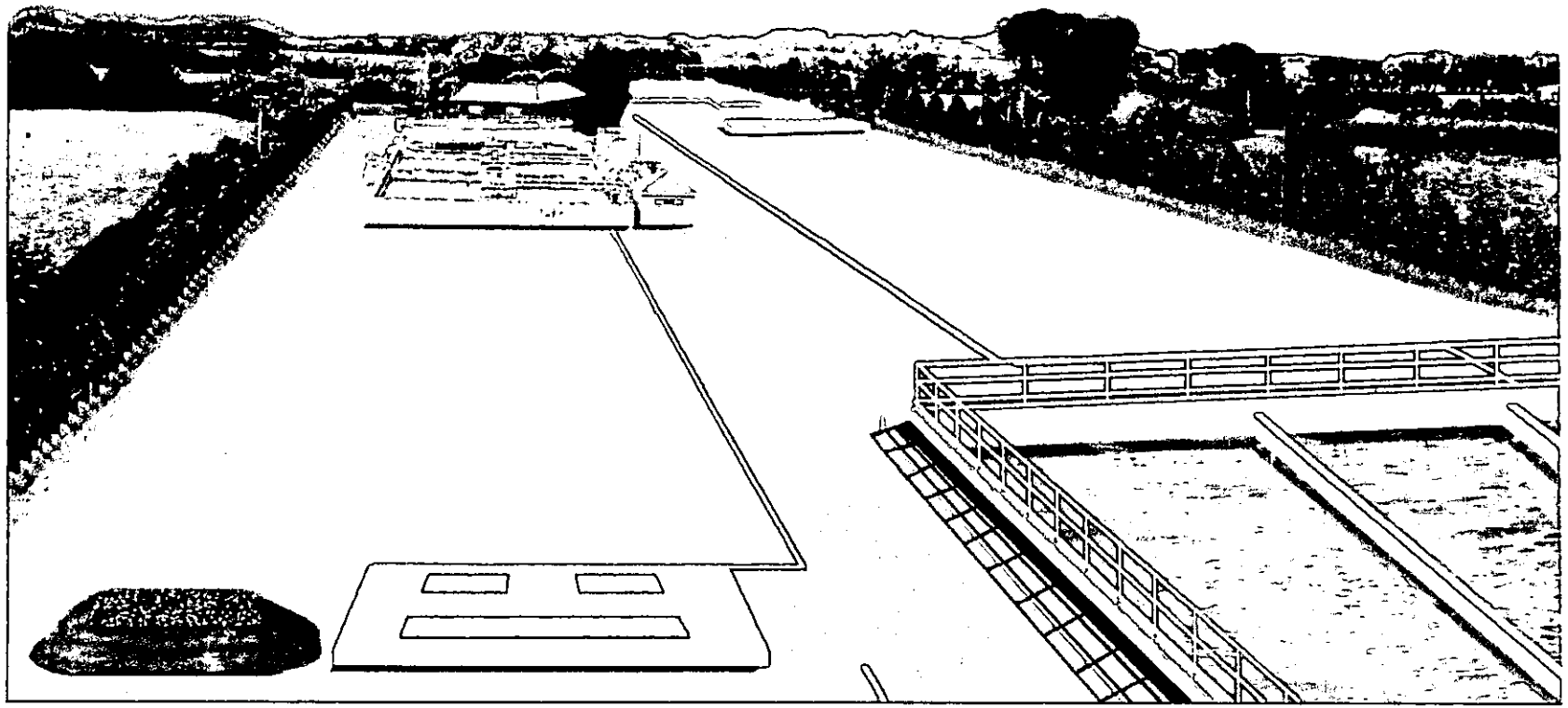
Structural landscape elements such as roadway screening, site boundary screening and the establishment of the perimeter woodland copse would be executed as part of the infrastructural component of the site development works. The planting of woodland copse screen planting will take place an advanced or initial stage of the proposed upgrading works. The landscape proposals will be an integral part of the proposed upgrading of the wastewater treatment works and will form part of the PPP contract. These would be undertaken in compliance with the details as proposed in the previous sections of the EIS. This would include a three-year monitoring period on all structural landscape elements as detailed in previous sections. During this period, all defects would be identified and corrected on an ongoing basis.

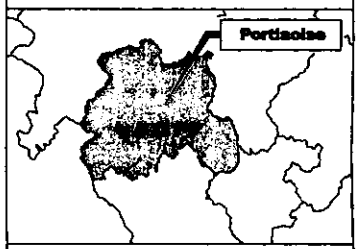
## 7.7 SUMMARY

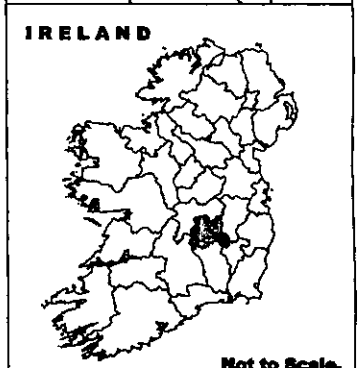
The proposed development will have:

- No visual impact on the views from the single-storey dwellings on Ridge Road, and the roads to the north and south of the site.
- Slight impact on views from the Rossvale & Liogard housing estates, Ridge Road, and Mountmellick Road.
- Potential moderate and significant impacts on views from, respectively, the two-storey dwelling on Ridge Road and future housing adjacent to the Liogard housing estate.

Landscape mitigation measures are proposed to provide extensive screening and the creation of wildlife habitats, in the form of planted mounds and trough the use of early establishment.






Not to Scale.

CO. LAOIS

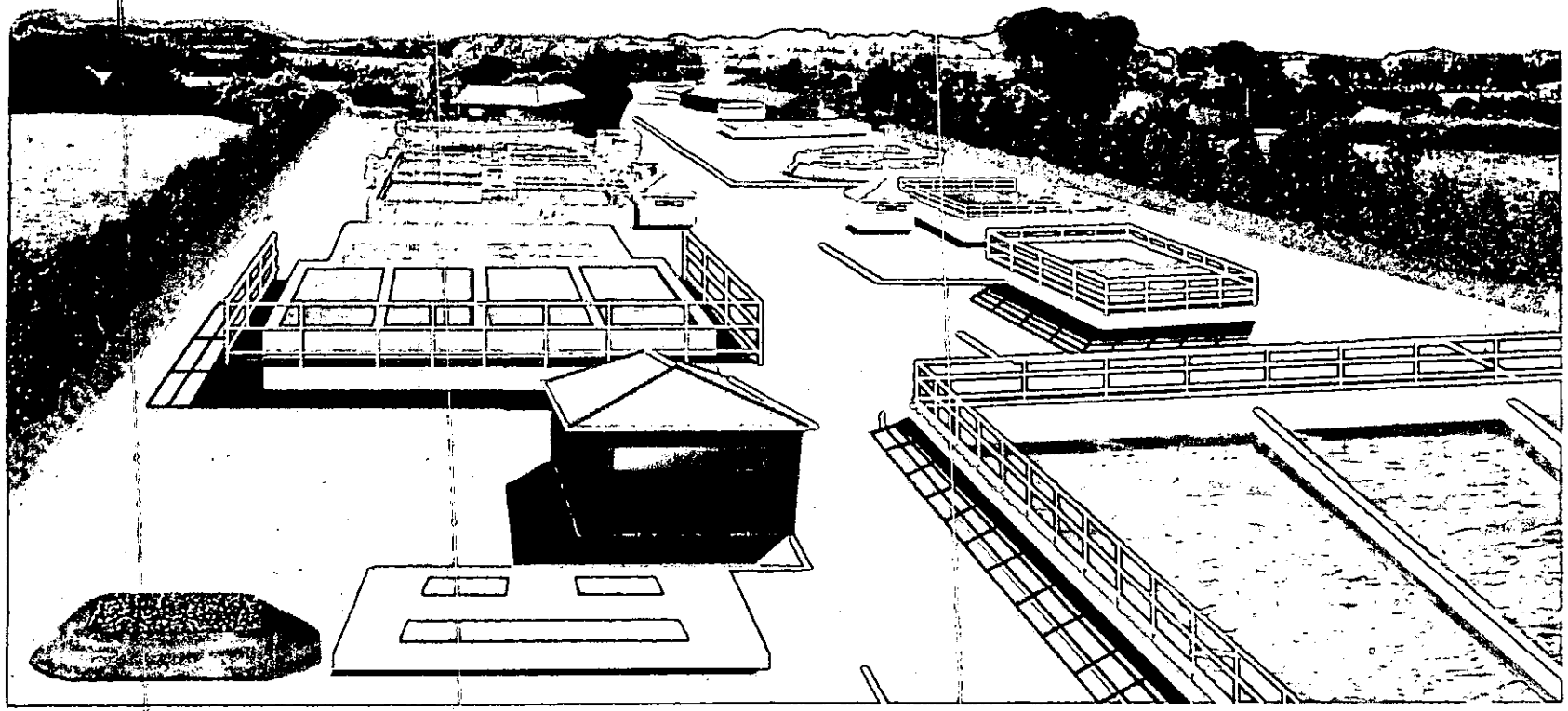
fig.

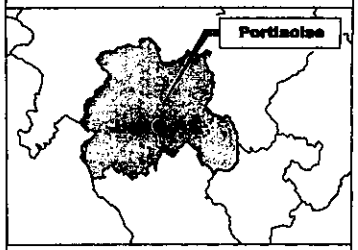
**Fig 7.10a**

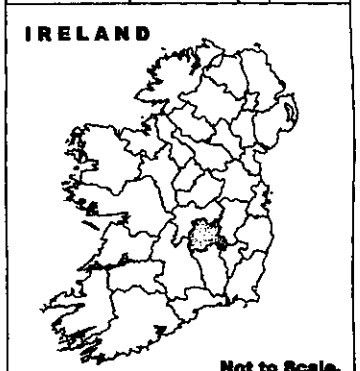
Title

**Photomontage of Plantations at year 1, viewed facing north.**

mcos






Not to Scale.

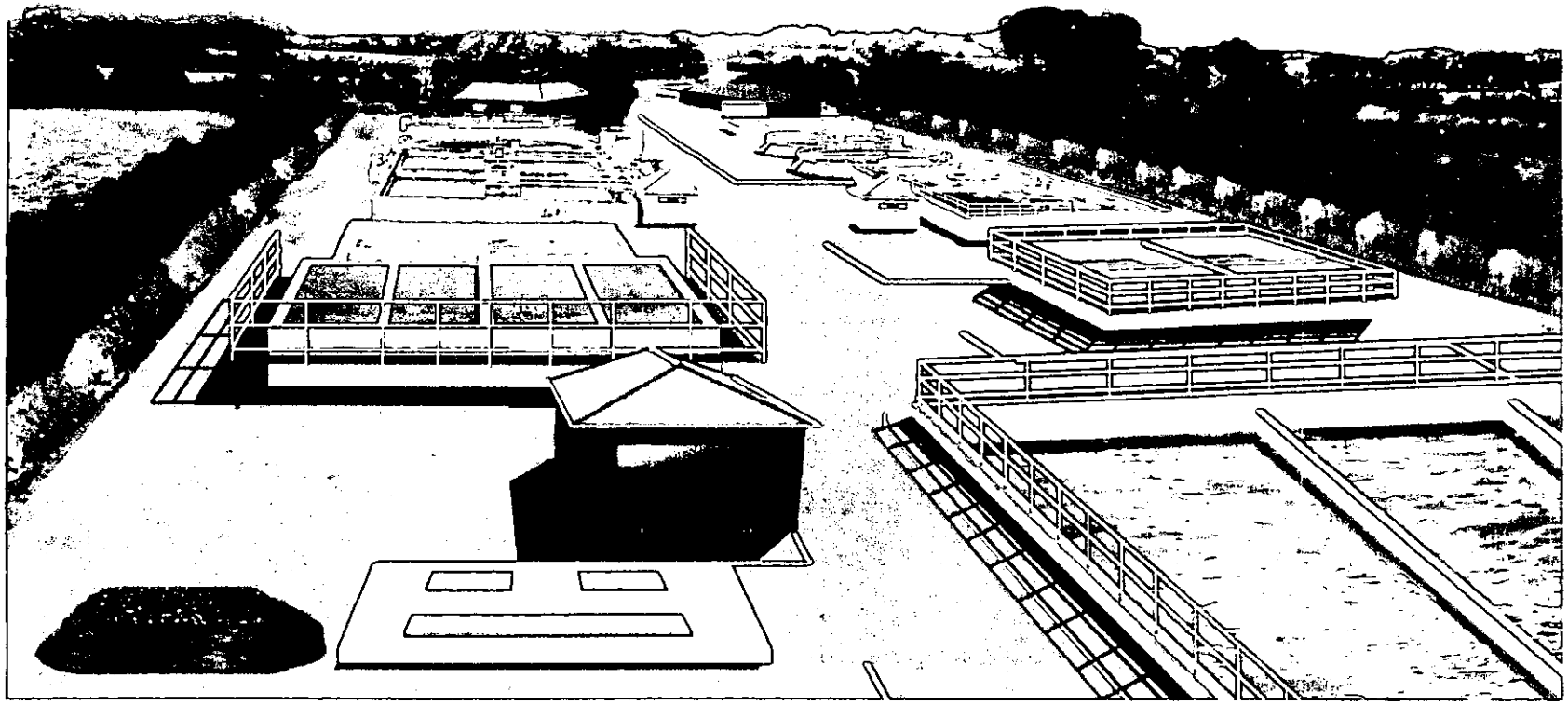
CO. LAOIS

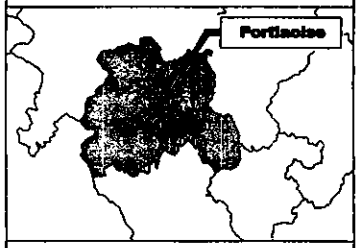
fig.

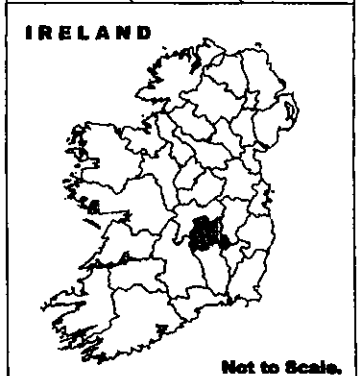
**Fig 7.10b**

Title

**Photomontage of Plantations**






CO. LAOIS

fig.

**Fig 7.10c**

Title

**Photomontage of Plantations at year 10, viewed facing north.**

mcos

# 8 FAUNA AND FLORA

## 8.1 INTRODUCTION

This section examines the present ecology of the site with respect to fauna and flora. The impact of the development on this ecosystem is assessed and mitigation measures are proposed to reduce impacts arising from the development.

## 8.2 METHODOLOGY

Phase 1 habitat survey methodology (JNCC, 1993) was used to describe and map the vegetation in the wastewater treatment plant site. Field survey was carried out between late August and early October 1999. A list of the ecological guides consulted is presented in **App. 4.** Consultations were carried out with Dúchas – National Parks and Wildlife Service personnel, and files relating to the Ridge of Portlaoise proposed Natural Heritage Area were consulted.

Fauna survey work focussed on mammals and birds. As survey work was carried out between late August and early October, the bird breeding season was not covered, but all bird species observed were recorded. The presence of mammals was assessed with regard to field signs such as droppings, burrows, tracks and feeding signs. The aquatic invertebrate fauna of rivers and streams is reported elsewhere in **Ch. 9.**

Impacts are assessed in accordance with the EPA Draft Guidelines on the information to be contained in Environmental Impact Statements.

## 8.3 EXISTING ENVIRONMENT

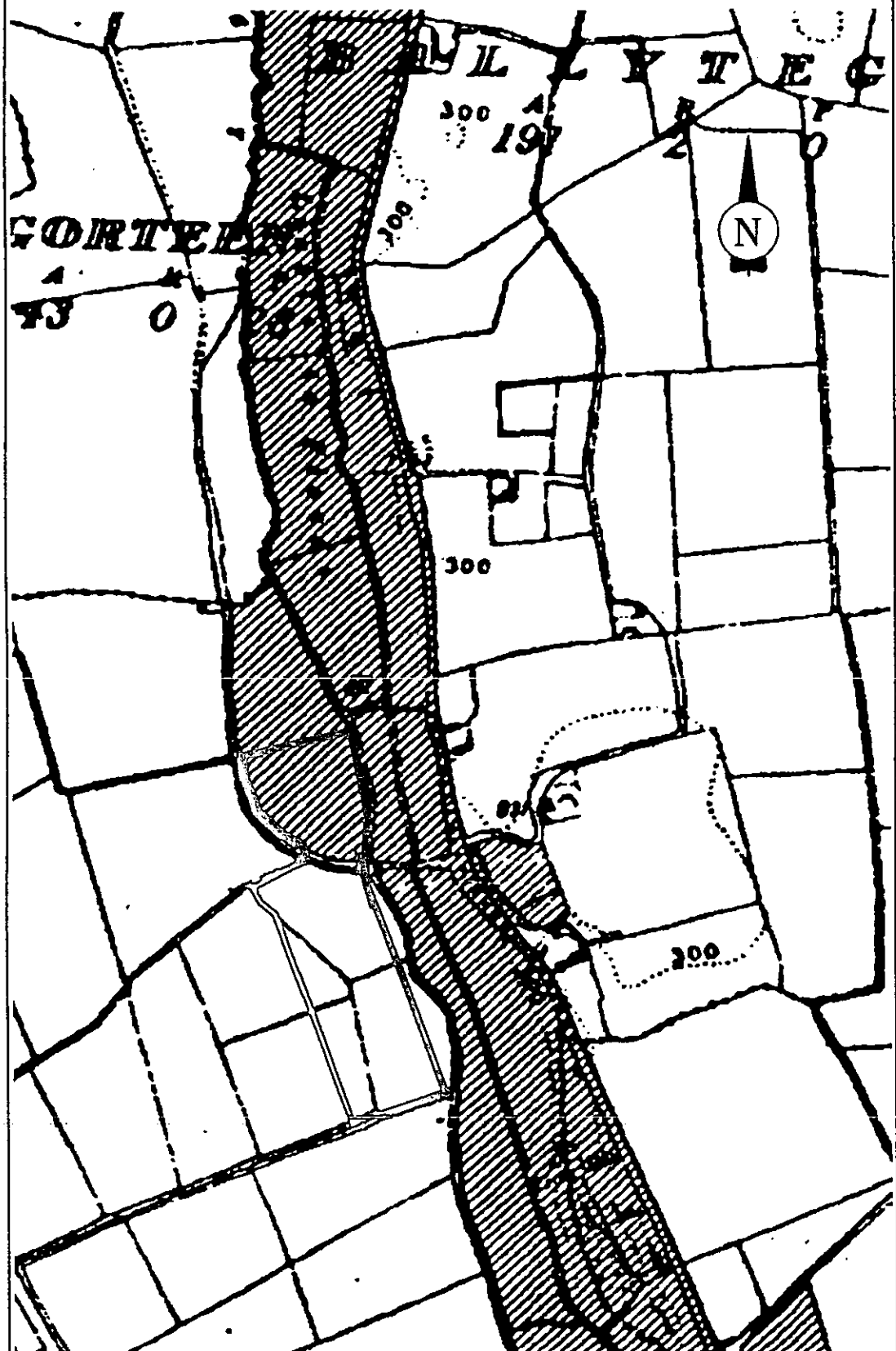
### 8.3.1 Conservation Designations

Approximately one third of the proposed waste water treatment site lies within the Ridge of Portlaoise proposed Natural Heritage Area (Site Code 876) as presented in **Fig. 8.1.** The pNHA includes an esker ridge, and is described as being of interest for esker woodland and calcareous grassland habitats. Two rare plant species occur: blue fleabane *Erigeron acer*, which has been recorded in three separate locations in active and disused sand and gravel pits; and nettle-leaved bellflower *Campanula trachelium*, which has been recorded in a single location in dry woodland adjoining a disused sand and gravel pit (Curtis and McGough, 1988; Dúchas unpublished data, 1991).

All records are from the northern part of the pNHA, to the north of the Dublin-Cork railway line. The esker lies on the eastern side of the river Triogue. The existing and proposed waste water treatment site adjoins the Triogue on the former floodplain of the river, on generally peaty soils, which are included in the pNHA. No other areas of the pNHA are affected by the proposed scheme.

The area proposed for NHA designation has not been modified since the original listing of the site as an Area of Scientific Interest by An Foras Forbartha. Most of the pNHA within the proposed main drainage scheme area has been considerably modified by agricultural improvement, housing development, and by sand and gravel extraction from the esker ridge. The site of the existing/ proposed treatment works has also been considerably modified.

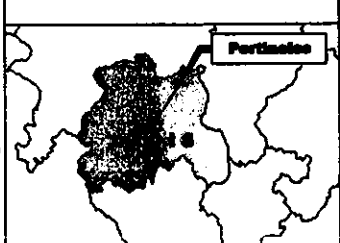
Other sites within a 10km radius of Portlaoise, which are proposed for designation as Natural Heritage Areas, are listed in **Table 8.1** below.

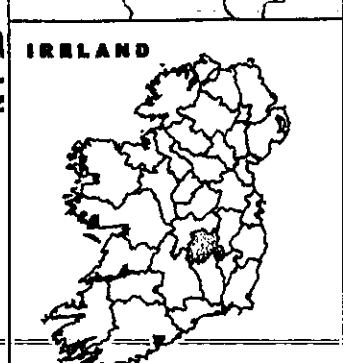



LEGEND

WWTP Site

Proposed Natural Heritage Area




Not to Scale.

CO. LAOIS

fig.

**Fig 8.1**

Title

**WWTP Site in Relation to Proposed Natural Heritage Area**

**Table 8.1.: Sites other than the Ridge of Portlaoise proposed for designation as Natural Heritage Areas, within a 10km radius of Portlaoise**

| Site Name | NHA Site Code | Interest |
|---|---|---|
| Dunamase Woods | 1494 | Woodland on glacial drift |
| Timahoe Esker | 421 | Esker woodland. Designated Nature Reserve |
| Rock of Dunamase | 878 | Calcareous grassland, heath, hazel scrub, on limestone outcrop |
| Kilteale Hill | 867 | Hazel woodland on limestone outcrop |
| Clonsoghey Bog | 879 | Raised bog |
| The Great Heath of Portlaoise | 881 | Acidic grassland, heath, wetland |

### 8.3.2 Flora

The vegetation cover is shown in **Fig. 8.2** and is described in detail below.

**Northern Portion of Site**

The northern part of the existing site (i.e. to the north of the existing access road) has vegetation cover over approximately 50% of the surface area. This vegetation is grass dominated; the dominant species being ryegrass, Yorkshire fog, creeping bent, and red fescue. Other grass species at low cover values are also present. Both hard and soft rush, were found, with hard rush being more abundant. A few dicotyledon species were identified and are listed in **App. 4**. This vegetation has developed on disturbed ground, and is classified as ephemeral and short perennial vegetation of disturbed ground.

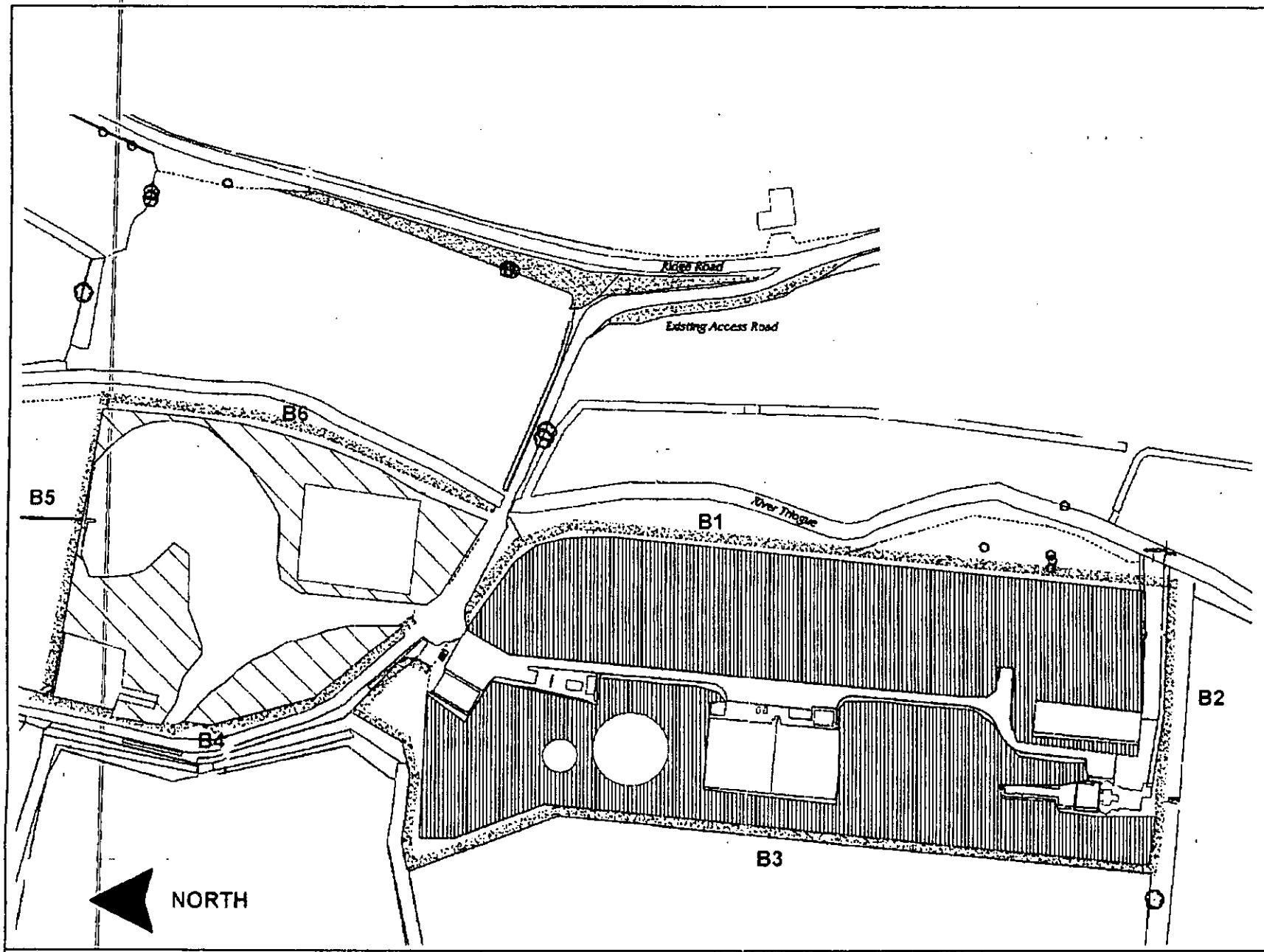
The area is surrounded by a chain link fence, which is partly covered by bramble, creeping thistle, nettle, and great willowherb. There are a few white poplar saplings and rusty willow bushes near the concrete tanks in the northwestern corner of the site, and a wild plum rooted outside the fence line overhangs the fence on the southern side of the site.

The remaining 50% of this area includes a concrete covered tank, and concrete sludge drying beds. The remainder is a trackway and truck turning area of hardcore, gravel and soil, and is largely unvegetated. There is a very sparse vegetation of annual meadow grass and creeping bent grass.

All plants recorded are common species of grassland and disturbed ground. Most species occur across a broad soil pH range, although red bartsia tends to occur on neutral to alkaline soils. The site was searched for blue fleabane, which occurs in sand and gravel pits in the Ridge of Portlaoise pNHA, but this rare species was not found. This area is assessed as not meriting inclusion in a proposed Natural Heritage Area.

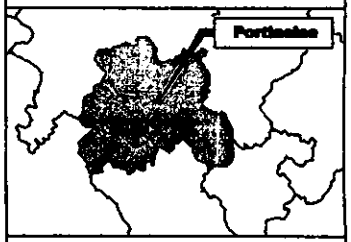
**Southern Portion of Site**

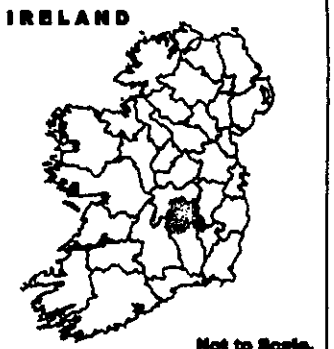
The main area of the existing wastewater treatment works lies outside the proposed Natural Heritage Area. Vegetated areas are mainly improved grassland. The area is surrounded by a chain link fence with some rusty willow, hawthorn and bramble growing along it.




Ephemeral and short perennial vegetation of disturbed ground

Improved grassland




CO. LAOIS

fig.

**Fig 8.2**

Title

**Existing Habitat Cover on the Proposed Development Site**

MCOS

**Site Boundary Vegetation**

Boundary vegetation is generally rooted outside the fencing surrounding the site. Boundaries are numbered on **Fig. 8.2**. These boundaries, apart from B. 2, are not formal hedgerows.

Boundary vegetation is species poor in comparison with field boundary hedgerows elsewhere in the Portlaoise area. Hedgerows in the Portlaoise area are generally species rich. Dominant tree species are ash, beech and oak, with occasional sycamore, lime, alder, birch, Scots pine, wych elm, elm saplings, silver birch, brown birch, crack willow, hybrid willow Salix x sericans, and white poplar. Dominant shrub and small trees are hazel, rusty willow, blackthorn, hawthorn and privet. Common hedgerow shrubs and small trees are holly, elder, guelder rose, goat willow, and dog rose. Occasional species are crab apple, spindle, gorse, autumn gorse and honeysuckle. A single specimen of bird cherry was recorded.

| Boundaries No. | Hedgerows Species |
|---|---|
| B1 | Elder, hawthorn, hazel, rusty willow and bramble along Triogue river bank. Occasional birch and ash |
| B2 | Semi-mature beech, lime, hawthorn |
| B3 | Rusty willow, hawthorn, bramble. |
| B4 | Occasional rusty willow and crack willow, wild plum, bramble |
| B5 | Sparse bramble, hawthorn |
| B6 | Rusty willow, hawthorn, bramble. |

**Aquatic and Channel Margin Vegetation of the Triogue River**

In the vicinity of the site, the Triogue has a patchy channel vegetation of stream water-crowfoot and branched bur-reed, with occasional spiked water milfoil. Channel margins and banks are vegetated with species typical of lowland enriched water courses: reed canary-grass, nettle, and great willowherb, with occasional bittersweet and meadowsweet.

### 8.3.3 Fauna

In comparison with the surrounding agricultural land with species rich hedgerows, the proposed development site provides little habitat for birds and mammals. No significant nesting habitat for birds is present. No birds were recorded on the site during the survey. However, it is likely to be used by passerines which occur in the general area; the ephemeral and short perennial vegetation in the northern part of the site includes seed producing plant species likely to attract finches in late summer and autumn. Moorhen were recorded on the Triogue River. No mammals were recorded; rodents are the most likely group to occur.

### 8.3.4 Potential Significant Impacts

Approximately one third of the site proposed for the development of the Wastewater Treatment Works is included in the proposed Natural Heritage Area designation of the Ridge of Portlaoise. The vegetation and habitats of the site are extensively modified by the existing sewage treatment facilities as described above, and do not meet NHA standard. All of the existing vegetation on the site will be impacted by the construction of the new plant. This impact is assessed as slight.

The proposed Natural Heritage Area adjacent to the site and shown in **Table 8.1** will not be impacted by the proposed development.

## 8.4 MITIGATION MEASURES

The mitigation measures proposed here aim to enhance biodiversity within the wastewater treatment site, by developing a range of habitats consistent with the site topography, and with the remaining habitats of conservation value in the Ridge of Portlaoise pNHA. This section deals with the ecological aspect of the measures whereas the layout is described in **Ch. 7**.

It is proposed to construct screening mounds around the site perimeter to reduce the visual impacts of the new works. These mounds will be planted with native species of trees and shrubs to provide additional visual screening of the site. Some woodland will also be created to provide some additional screening and habitats. Ash, oak and evergreen oak, will be the trees used to provide height whereas woodland will be planted with lower growing trees and shrubs suitable for inclusion to provide bulk and structure. The woodland can be planted with oak, ash, alder, beech, birch, field maple, whitethorn, wild cherry, hazel, scot's pine and holly. The shrub will include guelder and dog roses, snowberry, bridal wreath, snowy mespilus, escallonia, and a creeping form of holly.

Level areas of the site, between buildings and roadways, are suitable for the creation of esker grassland, providing that topsoil is removed prior to seeding. These level areas will be sown with a native wildflower esker grassland seed mix of grasses and dicotyledon species including lady's bedstraw, cowslip, self-heal, meadow vetchling, tufted vetch, creeping cinquefoil, bulbous buttercup, field scabious, wild carrot, bird's-foot trefoil, yarrow, marjoram, and ox-eye daisy.

Different mowing regimes will be used in different areas of esker grassland to enhance plant and habitat diversity. Some areas will be mown in late July/early August, and the cut material removed. These areas will be mown again in late October/early November, and the cut material left. Other areas will be mown either in late July/early August, or in late October/early November, and the cut material removed. Strips of grassland along internal roadways can be mown more frequently.

## 8.5 RESIDUAL IMPACTS

Biodiversity on the site of the Wastewater Treatment Plant will increase in the short, medium and long term.

The proposed development will have a significant positive impact on water quality in the Triogue river, and aquatic habitats, flora and fauna will benefit in the short, medium and long term.

## 8.6 SUMMARY

The impact of the proposed development on the existing vegetation and habitats will be slight, with an overall positive impact in short, medium, and long term as the biodiversity increases.

Mitigation measures proposed are to increase the biodiverstity within the site by planting native species of trees, shrub and grass.

# 9 FRESHWATER ENVIRONMENT

## 9.1 INTRODUCTION

The proposed development may impact on freshwater habitats, their fauna, flora and water quality. Ecoserve Ltd undertook a study to assess the impacts of upgrading the existing WWTW on the freshwater habitats and species in the Triogue River system and to recommend appropriate mitigation measures to minimise any impact on the freshwater environment. Under this study, the freshwater habitats and macroinvertebrate species present in the River Triogue, the river Barrow in the vicinity of its confluence with the river Triogue and other minor waterways within the proposed development area were surveyed. In addition, existing information for the river Triogue and river Barrow was reviewed with respect to fisheries and water quality. These data sets were obtained from the Environmental Protection Agency (EPA) and the Southern Regional Fisheries Board.

## 9.2 METHODOLOGY

Freshwater macroinvertebrate surveys were undertaken on the 7th and 8th September 1999 at existing EPA sampling stations on the river Triogue and on the river Barrow near the confluence with the river Triogue. Additional samples were collected in smaller watercourses, which may be impacted by the development. Fifteen sites were examined, the location of which are presented in **Fig. 9.1 & 9.3**. One macroinvertebrate sample was collected at each of 13 sites. No data was collected at Sites 9 and 15 as there were only ephemeral pools of water here and the ditch at Site 9 was overgrown and inaccessible.

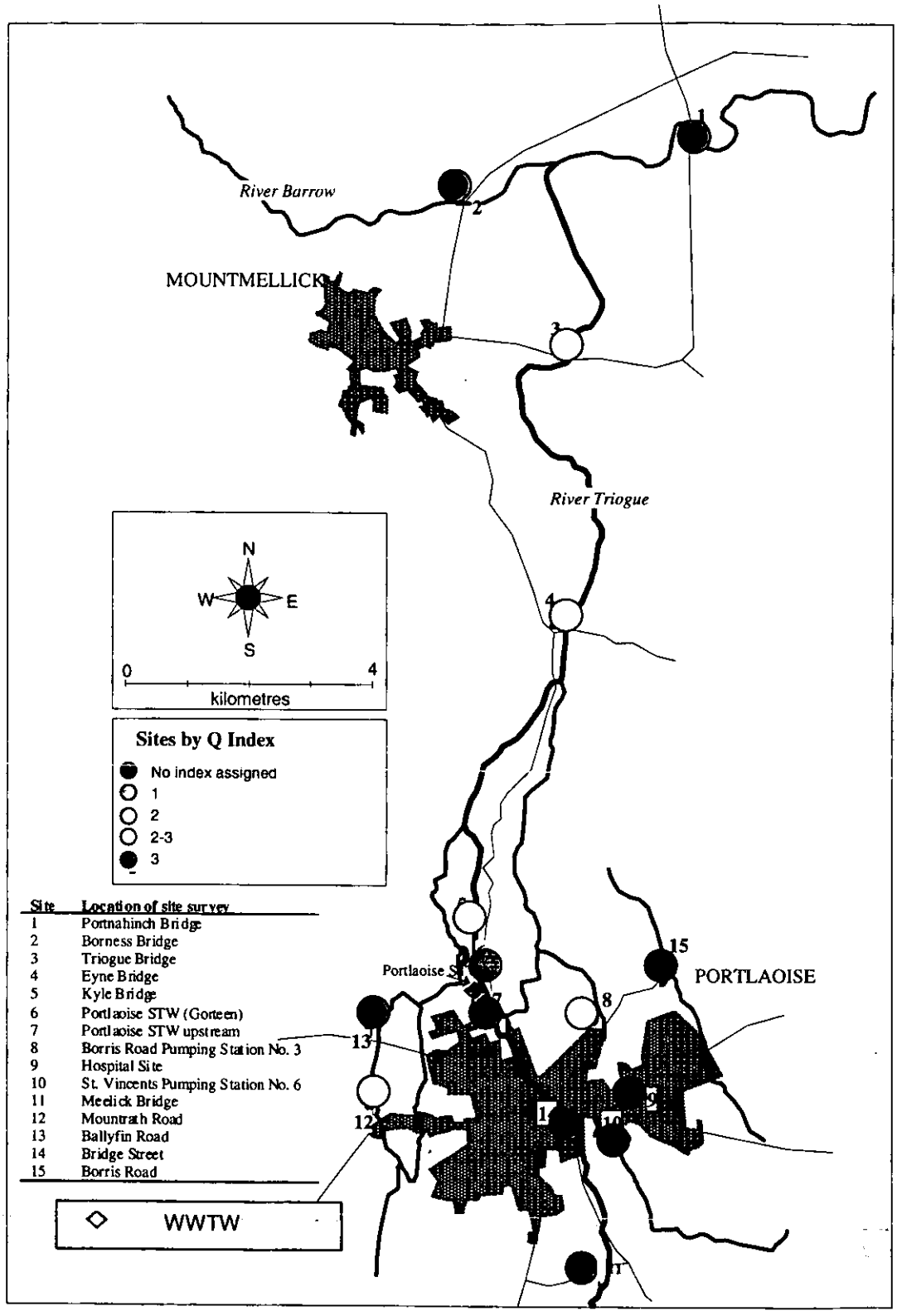
Macroinvertebrate samples were collected by 'kick' sampling for approximately 2.5 minutes in the faster flowing areas (riffles) of the river using a standard hand net (250 mm width, mesh size 1 mm). At some of the sites where there were no riffles, samples were collected in glide areas. The relative proportions of the species were recorded based on the EPA categories, i.e. (1) dominant, (2) common, and (3) present in small numbers, (4) sparse or (5) not recorded. A biotic index was derived using the Environmental Protection Agency (EPA) method (**Table 9.1**).

**Table 9.1.: Biotic Indices and Water Quality Classes (McGarrigle et al., 1996)**

| Biotic Index | Quality Status | Quality Class |
|---|---|---|
| Q5, 4-5, 4 | Unpolluted | Class A |
| Q3-4 | Slightly Polluted | Class B |
| Q3, 2-3 | Moderately Polluted | Class C |
| Q2, 1-2, 1 | Seriously Polluted | Class D |

Species that were not readily identifiable in the field were preserved in 70% Industrial Methylated Spirits (IMS) and returned to the laboratory for identification. Specimens were identified to the lowest possible taxonomic level and a voucher collection of representative material made. A comprehensive list of the literature used to identify the specimens is presented in **App. 5**.

Data was also collected at the sampling sites on substrata, conductivity, water temperature, dissolved oxygen, channel width, channel depth, bankside vegetation and aquatic macrophytes.




| Site | Location of site survey |
|---|---|
| 1 | Portnahinch Bridge |
| 2 | Borness Bridge |
| 3 | Triogue Bridge |
| 4 | Eyne Bridge |
| 5 | Kyle Bridge |
| 6 | Portlaoise STW (Gorteen) |
| 7 | Portlaoise STW upstream |
| 8 | Borris Road Pumping Station No. 3 |
| 9 | Hospital Site |
| 10 | St. Vincents Pumping Station No. 6 |
| 11 | Meelick Bridge |
| 12 | Mountrath Road |
| 13 | Ballyfin Road |
| 14 | Bridge Street |
| 15 | Borris Road |

**Fig. 9.1 Sampling station Locations**

## 9.3 DESCRIPTION OF EXISTING ENVIRONMENT

### 9.3.1 Background

#### Freshwater Macroinvertebrates

Between 1986 and 1997 there has been a decline in water quality in the river Barrow and its tributaries (Lucey, 1998). According to Lucey, 35% of the river Barrow and its tributaries was classed as unpolluted, 40 % as slightly polluted, 22% as moderately polluted and 3% as seriously polluted. These data are based on biological surveys carried out between 1995-1997. Studies by Lucey (1998), Flanagan & Larkin (1992) and the results of this study indicate that water quality and biodiversity is poor in the river Triogue downstream of Portlaoise town (Q-values 1-3). Water quality is particularly bad immediately downstream of the WWTP (Site 6). This demonstrates that the current level of sewerage treatment is inadequate in terms of protecting water quality.

The only legally protected aquatic invertebrate occurring in the rivers Barrow and Triogue is the crayfish *Austropotamobius pallipes* (Lucey, 1998). This species is common in the river Barrow and is protected under the Wildlife Act, 1976 and Habitats Directive (92/43/EEC) This study did not record *Austropotamobius pallipes* or other species of nature conservation interest at any of the sites. However, downstream of Portlaoise town current conditions are unsuitable for crayfish.

Tubificidae and Chironomidae are characteristic of heavily polluted waters, while mayflies and stoneflies are characteristic of clean waters (Gaufin, 1973). The species found in the river Triogue are characteristic of polluted water. Species indicative of cleaner water occur upstream of Portlaoise town and further downstream in the river Barrow. The water was 'cloudy' with a strong odour at the sites on the river Triogue downstream of Portlaoise WWTP. This was also the case for a small stream to the west of the town. A decrease in number of species and oxygen (**Fig. 9.2**) occurs downstream of the WWTP, illustrating its negative impact on freshwater life.

#### Fish Population & Existing Water Quality

Brook lamprey, river lamprey and sea lamprey are rare while twaite shad and Atlantic salmon are common, in the river Barrow (Kurz & Costello, 1999). These species are all listed in the EU Habitats Directive (92/43/EEC). Neither the rivers Triogue or Barrow are designated under the EU Freshwater Fish Directive (78/659/EEC) (**App. 5**). However, there are a number of angling clubs in the area and resident populations of trout occur in the river Barrow (Lucey, 1998). The river Triogue supports stocks of trout, which usually come upstream to spawn above the town and the upper Barrow is important particularly as a salmonid spawning and nursery area (Lennon, pers. comm.).

According to the Council Directive (78/659/EEC) on the quality of freshwater needing protection or improvement in order to support fish life, dissolved oxygen levels should be above 7 mg/l at all times and it is imperative that values remain above 9 mg/l at least 50% of the time. pH levels need to be maintained between 6-9 and a BOD below 3 mg/l is recommended.

Dissolved oxygen levels recorded by EcoServe were below 7 mg/l at five sites (sites 1, 3, 4, 5 and 13) and were lowest downstream of the WWTP. Indeed dissolved oxygen was as low as 3.3 mg/l at Eyne Bridge, just downstream of Kyletalesha landfill site and the WWTP. The EPA previously recorded dissolved oxygen values as low as 3.2 mg/l at site 4 . Dead adult trout were found downstream of this (**Fig. 9.3, Table 9.2**) and a fish kill was reported by the local angling association that day and for which a definitive cause has not been established. Local angling associations and the Southern Regional Fisheries Board have reported a number of fish kills in this area (**Table 9.2**) for 10 years. The river Triogue has thus been polluted with consequent low oxygen conditions, which have significantly impacted fish and macroinvertebrate populations.

Conditions upstream of Portlaoise town on the river Triogue fulfilled the criteria cited in the Council Directive (78/659/EEC) on the quality of fresh waters needing protection or improvement in order to support fish life (based on data obtained from the EPA for 1998-1999). However, downstream of the WWTP, BOD was consistently elevated (up to 12.1 mg/l) and dissolved oxygen levels varied between 3-12 mg/l. Between the WWTP and the town there are no other sources of pollution other than runoff from adjacent land. At Kyle Bridge and Eyne Bridge on the lower reaches of the river Triogue dissolved oxygen levels were low reaching a minimum of 2.8 mg/l while BOD levels were as high as 8.9 mg/l. Levels of these parameters in the river Barrow were within the recommended levels.

### 9.3.2 Recent Survey Results

A total of 36 taxa were identified in the 13 sites (**App. 3**). The Crustacea Asellus aquaticus (water louse) and Gammarus sp. (shrimp) were ubiquitous throughout the sites sampled while Tubificida (sludge worms), Chironomidae (midge larvae) and Glossiphoniidae (leeches) were abundant in the river Triogue downstream of Portlaoise main drainage scheme. Trichoptera, both cased and uncased (caddis larvae), and Ephemeroptera (mayflies) were abundant in the cleaner stretches of river. Filamentous green algae were abundant at many of the sites and 10 other aquatic plants were present (**App. 3**). Data on substrata and other physical parameters (other than water quality) are presented in **App.3**

According to the Q-values, the sites sampled on the river Barrow both upstream and downstream of its confluence with the river Triogue were classified as moderately polluted. Q-values tended to be lower than previous values determined by the EPA. Directly downstream of the WWTP the river Triogue was classified as seriously polluted with a Q-value of 1. The river Triogue upstream of Portlaoise town was classified as moderately polluted. Various tributaries on the east side of the town (sites 8, 10 and 14) were classified as moderately polluted, while a tributary to the west of the town (sites 12 and 13), was classified as seriously to moderately polluted (**Fig. 9.1**).

Dissolved oxygen levels were very low on the river Triogue downstream of Portlaoise town and at Site 13 located on a stream. They were similar to the minimum values recorded by the EPA at various sites on the river Triogue during 1998-1999. The impact of the WWTP is evident when changes in these parameters along the river are graphed (**Fig. 9.2**). There was a fish kill at Site 3 (**Fig. 9.3, Table 9.2**).

**Table 9.2.: Recorded fish kills since 1989 (Lennon, Shannon Regional Fisheries Board, pers. comm.)**

| Date | Location | Species & Number of Fish Killed (Approximately) | Cause of Fish Kill |
|---|---|---|---|
| 23/24th May 1989 | Triogue | 100 trout | De-oxygenation |
| 4th June 1995 | Triogue (Site 14) | 200 brown trout,<br>20 sticklebacks | Eutrophication/diurnal variation in dissolved oxygen |
| 21st June 1995 | Triogue Bridge (Site 3) | > 50 brown trout | Eutrophication/diurnal variation in dissolved oxygen and temperature stress |
| 18th July 1995 | Triogue (Site 14) | > 3 brown trout | Unknown |
| 12th July 1997 | Triogue (Site 4) | > 40 trout | Unknown |
| 24th July 1998 | Triogue (between sites 3 & 4) | > 500 trout | Diurnal dissolved oxygen variation due to eutrophication |
| 7th Sept. 1999 | Triogue (between sites 3 & 4) | > 500 trout | Unknown |

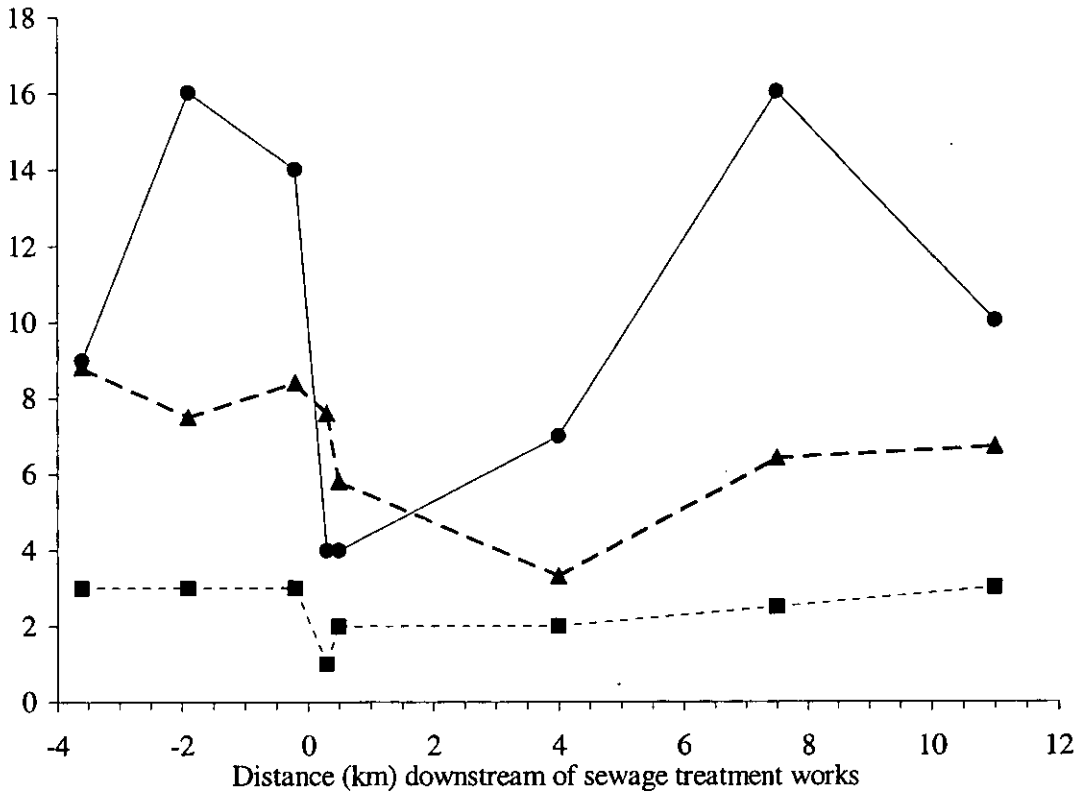



**Figure 9.2.: The number of species (•), Q-index (■) and dissolved oxygen (mg/l) (▲) values from sites upstream and downstream of the sewage treatment works in the River Triogue. The sites are 11, 14, 7, 6, 5, 4, 3 and 1.**

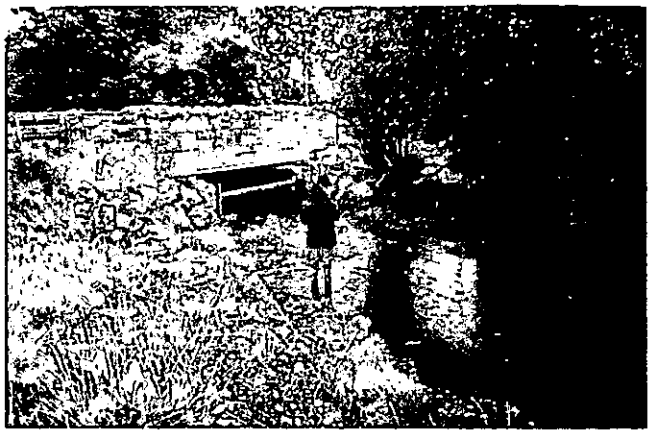


Fig. 9.3a. Site 11: Meelick Bridge, located 3km upstream of Portlaoise town on the river Triogue.

Fig. 9.3b. Site 6: River Triogue, immediately downstream of the Sewage Treatment Works.

Fig. 9.3c. Site 3: Triogue Bridge, located on the river Triogue, approximately 7.5 km downstream of the sewage treatment works. Site of a major fish kill.

Fig. 9.3d. Site 1: Portnahinch Bridge, located on the river Barrow downstream of its confluence with the river Triogue.

Fig. 9.3e. Site 12: A small stream located west of Portlaoise town on the Mountrath Road.

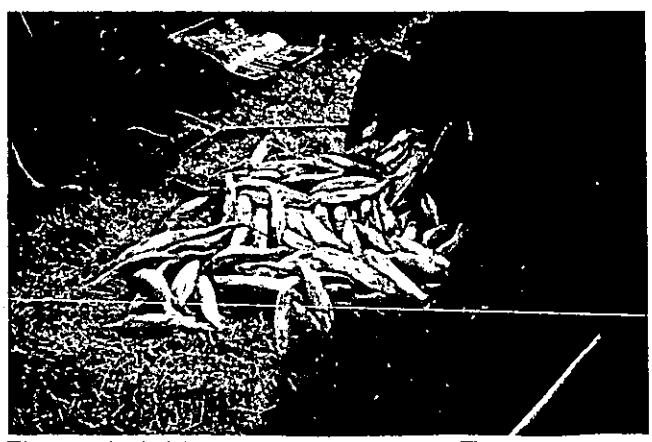


Fig. 9.3f. Evidence of a fish kill at Triogue Bridge on the river Triogue, taken 8th September 1999.

## 9.4 POTENTIAL SIGNIFICANT IMPACTS

The monitoring of the station downstream of Portlaoise WWTW in 1999, indicated that the water was seriously polluted with a biological quality Q rating of Q2 (EPA, 1997). The Phosphorus Regulations (S.I. No. 258 of 1998) specified that the rivers with a Q2 should achieve a minimum target of Q3 by the year 2007, which correspond to a median of 0.07mg/l of Molybdate-Reactive Phosphate (MRP).

Achievement of this standard is currently below the practical limits, which can be achieved by proven available technologies, given present background concentrations. It may be possible to reduce the background concentration by implementing an integrated nutrient management approach for agriculture in the upstream catchment. However, reduction of the background concentration is outside the scope of this EIS. Therefore, a BATNEEC standard for total phosphorous in the effluent discharge, having a median value of 0.5mg/l P, has been adopted.

The phased upgrading of the Portlaoise WWTW to cater for the projected development loads of 26,000 p.e. (2008) and 39,000 p.e (2020), with this median standard for total phosphorous, will result in estimated concentrations for MRP in the receiving waters downstream of the WWTW of 0.094mg/l and 0.116mg/l respectively as seen from **Table 9.3**.

**Table 9.3 Estimate of MRP concentration (mg/l) in River Triogue downstream of WWTW**

| Projected Development Load | 50%ile River Flow | Effluent | | | | Background River Concentration | Resultant D/S River Concentration |
|---|---|---|---|---|---|---|---|
| | | Discharge[1] | Load | Concentration in River[2] | Concentration in River | | |
| P.E. | $m^3$/day | $m^3$/day | kg/d TP | mg/l TP | mg/l MRP[3] | mg/l MRP | mg/l MRP |
| 26,000 | 43,200 | 5,850 | 2.93 | 0.06 | 0.05 | 0.044 | 0.094 |
| 39,000 | 43,200 | 8,775 | 4.39 | 0.084 | 0.072 | 0.044 | 0.116 |

Notes:
(1) Assumed at 225 l/hd/day
(2) Additional flow provided by the effluent is included
(3) MRP assumed at 85% of TP

However, as an estimated load of 13.7 kg TP is currently discharged daily from the existing WWTW to the river Triogue, the proposals will reduce the current phosphorus loading to the river Triogue by a factor of 4.7 at 26,000 p.e. and by a factor of 3.1 at 39,000 p.e.

Water quality in the river will thus improve as a higher quality effluent, with higher BOD and suspended solids removal along with nutrient (N, P) reduction, will result from the proposed upgrade to the works, which will lead to an increase in the diversity of species present.

Any upgrading of the existing WWTP is likely to have a beneficial impact on freshwater flora and fauna. Despite the fact that the river Triogue is currently seriously polluted due to inadequate treatment of wastewater, there is potential for both salmonids and a more diverse invertebrate fauna like that present upstream of Portlaoise town. A reduction in input of fine organic and inorganic particles and nutrients should lead to an increase in dissolved oxygen levels, a reduction in BOD and reduced turbidity thus leading to conditions suitable for salmonids and a more diverse invertebrate community. This may allow recruitment of protected species such as freshwater crayfish, trout and salmon to the river Triogue below the WWTP where conditions are currently unsuitable.

In a wider context upgrading of the WWTW will be carried out in conjunction with the improvement of the collection system thereby limiting the frequency of overflows from the sewer network to the order of 1 spill per year, with consequential additional benefit to the river.

The main impacts are summarised in **Table 9.4**.

**Table 9.4.: Impacts of the proposed development on the freshwater habitats surveyed in this study**

| Impact Type | Duration | Effect |
|---|---|---|
| Fish populations | Long term effect | Positive |
| Organic matter & nutrients Removal | Long term effect | Positive |
| Bacteriological quality Removal | Long term effect | Positive |

## 9.5 SITE MANAGEMENT

During the construction phase, working and access areas should be restricted. Habitats disturbed during the construction process should be restored as close as possible to their previous status after construction. Habitat damage can be limited by working from one bank only and retaining vegetated areas alongside the river.

## 9.6 OPERATIONAL STANDARDS

The highest possible standards should be maintained during the operation of the new WWTP and associated infrastructure. It is important to ensure that the capacity of the WWTP is sufficient to deal with the volume and nature of incoming sewage.

## 9.7 LONG TERM MONITORING

Long term monitoring of the river Triogue will reveal any impacts, beneficial or detrimental of the proposed development and indicate further changes that may need to be implemented in the future in the wastewater treatment plant. Monitoring of the rivers Triogue and Barrow for macroinvertebrates, fish and protected species should be conducted in spring and late summer each year. This will be able to quantify the improvements to river quality due to the improved sewage treatment facility.

## 9.8 SUMMARY

The upgrading of the WWTW will result in a higher quality effluent and will therefore have a positive impact on the receiving freshwater fauna and flora.

# 10 GEOLOGY, HYDROGEOLOGY AND SOIL

## 10.1 INTRODUCTION

This section of the report deals with potential impacts on the geology, soil and hydrogeology associated with the upgrading of Portlaoise Wastewater Treatment Works.

## 10.2 DESCRIPTION OF EXISTING ENVIRONMENT

The geology underlying the area is Carboniferous limestone, varying from lower to upper Carboniferous. The surface topography is gently undulating, and includes a north north-west – south south-east trending esker ridge, on which Ridge Road and the Timahoe Road are built. Extensive quarrying of sand and gravel deposits has affected portions of the esker ridge.

Soils are grey brown podzolics and gleys, derived from limestone gravelly glacial till, and limestone glacial till. There are some pockets of peaty soils along river valleys and in areas of impeded drainage where fen peats have developed. More extensive peat deposits occur to the west and north of Portlaoise.

Information from trial pits indicate that groundwater is present between 1.5 and 2.5m depth below ground level.

## 10.3 POTENTIAL SIGNIFICANT IMPACTS

Given the confined nature of the proposed development no significant adverse impacts are anticipated in relation to the geology and soil of the site.

The only long-term impact of the wastewater treatment is on soils away from the site with the disposal of sewage sludge. This sewage sludge will be treated to produce a biosolid, which can then be used for its fertilizer and soil conditioning value on agricultural soil. This biosolid will be disposed of in accordance with the sludge management plans and the current legislation. This long-term impact will be positive, as the biosolid will be beneficial to the soil on which it is applied.

Potential impact on the groundwater will arise if any sludge / water retaining structures or pipelines leak or in the event of chemical spillages. All water retaining structures and pipelines will be tested to ensure water tightness prior to commissioning. All chemical storage facilities will be bunded.

# 11 MATERIAL ASSETS

## 11.1 INTRODUCTION

The potential impacts under the heading of Material Assets would include limitations in existing land-use and restrictions on leisure and amenity activities. This chapter also covers potential impacts on transport infrastructure.

## 11.2 DESCRIPTION OF EXISTING ENVIRONMENT

The proposed upgrading of Portlaoise WWTW will occur on the site of the existing works. The site is bounded by agricultural fields on the North, West and South and by the River Triogue on the East. The site is accessed by a laneway off the Ridge Road located to the East of the site.

Three landowners currently have right of way to their lands on the western side of the treatment works via the existing works access road

## 11.3 POTENTIAL SIGNIFICANT IMPACTS

The potential impacts include:-

- **Visual Intrusion/Obstruction**

These impacts are discussed in **Ch. 7.**

- **Amenity/Land Use**

The upgrading of the WWTP will occur without loss of amenity area as the upgrading will occur on the site itself. The amenity in terms of aesthetic aspect should be enhanced by the proposed mitigation measures. The amenity of the river should also be enhanced due to the improved quality of the effluent discharged from the upgraded WWTW **(Ch. 9)**

Right of access to lands on the western boundary of the site for the landowners will be maintained in the proposed development. However, depending on final site layout, it may be necessary to divert the existing 'right of way' around the perimeter of the works site as indicated on **Fig. 2.3**

- **Transportation**

Traffic volumes associated with the operation of the upgraded wastewater and sludge treatment facilities will be slightly increased with the importation by covered tanker of sludge and chemical products to the site and the exportation of 'biosolid' product. The impact of this increased traffic volume is assessed as "no impact" with respect to noise and vibration. The overall impact will be beneficial, as the existing works access road will be upgraded, which will provide safer egress to Ridge Road.

## 11.4 MITIGATION MEASURES

- The proposed planting detailed in **Ch. 7** and **8** will mitigate any adverse aesthetic impact associated with the upgrading of the WWTP.

- The existing works access road will be upgraded to ensure safer access to and from the Ridge Road.

## 11.5 RESIDUAL IMPACTS

No significant adverse residual impacts are anticipated with respect to Material Assets in light of the proposed mitigation measures.

# 12 CULTURAL HERITAGE

## 12.1 INTRODUCTION

This section of the report summarises the results of an archaeological assessment to evaluate the impacts of the proposed upgrading of the Portlaoise Wastewater Treatment Works on the receiving archaeological environment.

## 12.2 METHODOLOGY

The assessment was conducted into two separate phases: a desktop study identifying all recorded sites in close proximity to the WWTW site, followed by a field inspection.

## 12.3 DESCRIPTION OF EXISTING ENVIRONMENT

No known sites of archaeological significance exist within the proposed site of Portlaoise Wastewater Treatment Works.

## 12.4 POTENTIAL SIGNIFICANT IMPACTS

The upgrading of the Wastewater treatment plant will have no impact on the surrounding archaeological sites.

Potential impacts would only arise out of earth moving activities associated with the upgrading of the treatment plant, which may disturb previously unknown sources of archaeological material.

## 12.5 MITIGATION MEASURES AND RESIDUAL IMPACTS

In the event of the discovery of archaeological finds or remains, Dúchas and the National Museum of Ireland will be notified immediately and provision will be made to allow for and fund whatever archaeological work which may be needed on the site.

As a result of the above mitigation measures no significant adverse residual impacts are anticipated in relation to Cultural Heritage.

# 13 CONSTRUCTION PHASE

## 13.1 INTRODUCTION

The upgrading of the existing wastewater treatment works in Portlaoise will require detailed planning, procurement and construction of the appropriate facilities, which will then be commissioned and put into operation. The likely significant impacts, direct and indirect, on the environment during the construction phase are considered in reference to the following:-

- Human beings
- Flora and fauna
- Soil, water, air, climate and the landscape
- Material Assets and
- Cultural Heritage

## 13.2 CONSTRUCTION PERIOD

The existing WWTW will be upgraded over a period of time in a number of stages to cater for projected development loads as previously indicated (**Section 2.4**)

The construction period for Stage 1 of the proposed upgrade works is estimated at between 18 to 24 months.

## 13.3 TRAFFIC MANAGEMENT

There will be a significant amount of construction traffic during the estimated two-year Stage 1 construction period. This traffic will arise from construction staff personal vehicles, sub-contractor vans, bulk supply trucks and bulk earthmoving trucks. This traffic will impact on the Ridge Road, which is the only means of accessing the site. The earthmoving truck traffic will have the most significant adverse impact on the local residents due to noise, frequency, dust and personal safety risk.

The actual frequency of truck trips will depend on the type of process selected, the truck payload and the construction sequence. The traffic volume will not be uniform throughout the construction period and much of the traffic will occur early during the construction period. Most of the construction traffic will be associated with removal of excavated material from site and deliveries of concrete to site. From these operations between 20 - 32 truck movements per day are anticipated.

The Contractor will be required to implement detailed traffic management systems in consultation with the Gardai and Laois County Council Roads Department before construction activities commences. Advance notification, extensive signage and widespread public relations in the area will be used to advise the public and particularly the residents of the area of impending disruption due to particular construction activities.

## 13.4 PROGRAMME OF WORKS

Prior to commencing construction work, the contractor will propose an overall programme detailing the timing and proposed duration of the various work elements and the methods to be employed to carry them out. This programme and the methods of construction set out therein must be to the satisfaction of and approved by Laois County Council. The County Council in reviewing the program and methods will take into account the possible adverse impacts on the environment and ensure mitigation measures are put in hand to reduce or eliminate these impacts.

## 13.5 EFFECTS ON HUMAN BEINGS

### 13.5.1 Residential Property

Occupiers of properties on the Ridge Road and in Liogard Housing Estate may be subject to some nuisance resulting from construction activity. This nuisance may consist of noise, vibration, mud or dust and it is difficult to quantify the extent of such nuisances. Determining factors will include meteorological conditions, type of construction plant employed and the phasing of the works. Construction nuisance is generally a localised issue of short duration

#### 13.5.1.1 Noise

The construction phase of the development will give rise to noise, some of which will be perceptible off-site.

The Contract documents will clearly specify that the contractor undertaking the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228 (1984), "Noise Control on Construction and Demolition Sites", which provides guidance on the methods available to control noise from construction work, and to comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988.

Sound levels will be monitored in accordance with Appendix B of BS 5228. Measurements will be made systematically during the construction period in the vicinity of residential properties using a sound level meter conforming to BS 5969. Records of noise levels shall be maintained on site for the construction period.

This will ensure noise impacts are kept to a minimum during the construction phase.

#### 13.5.1.2 Vibration

Vibration impacts in construction are generally associated with the use of piling plant or excavating techniques for the removal of rock or other hard material. In the case of these works it is not envisaged that blasting will be required.

Piling plant may be necessary to construct temporary works in advance of bulk excavation for tanks. Piling equipment may also be required to provide support to trench sides close to buildings or existing services. Mechanical rock breaking equipment may be necessary, if rock is encountered in excavations, or for breaking out of existing foundations. Low vibration plant consistent with urban use will be used, where possible

When this form of plant is working continuous monitoring of vibrations will be a requirement. This will be achieved using equipment capable of yielding a permanent visual record of vibrations in all three perpendicular directions simultaneously using velocity sensitive transducers. The monitoring equipment will also record the frequency of any vibrations. The contractor will be expected to limit vibrations at the nearest properties, measured as peak particle velocity to less than 3mm/s for vibration from mechanical plant activity. These limits will ensure that structural damage will not be caused to any properties in the vicinity of the works.

### 13.5.2 Working Hours

Normal working hours will be 0700-1900 hours Monday to Friday and 0800-1630 hours on Saturday. The Safety, Health and Welfare at Work Act, 1989 will apply. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of Laois County Council. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

The same provision applies to night and Sunday working. Night is defined as 1900-0700 hours. When overtime and shift working is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits mentioned above will apply. No work may be carried out on Sundays or public holidays outside of 0900 & 1600 hours, except in the case of emergencies.

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

## 13.6 EFFECTS ON FLORA AND FAUNA

The extension of the proposed development would temporarily disturb habitats on site. The presence of a work force along with plant and machinery will also disturb habitats in the adjacent areas. A comprehensive planting programme will mitigate all adverse effects and restore habitats to original condition and most likely in the process enhancing the existing flora and fauna.

## 13.7 EFFECTS ON SOILS

Construction activities are unlikely to have any adverse effects on soils.

## 13.8 EFFECTS ON WATER COURSES

Construction work on the proposed upgrading of the existing WWTP will not lead to any direct loss of freshwater habitat as there are none present within the allocated building site.

The river Triogue runs along the Eastern boundary of the WWTP, outside the perimeter fence. During the construction phase, potential short-term impacts may involve the release of sediments and pollutants to the water course.

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

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

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

## 13.9 EFFECTS ON AIR

Construction activities have the potential to cause the formulation/accumulation and airborne pollution of dust, particularly during the earth-moving phase.

Properly designed and recognised methods of controlling and damping down dust will be in operation during the course of the contract and strict enforcement of these regulations will be carried out.

## 13.10 EFFECTS ON LANDSCAPE

During the construction period there will be some visual impact as construction work proceeds. The extent of the visual intrusion will fluctuate according to the location and type of activity being undertaken.

Temporary construction compounds will be located within the existing site boundary.

All disturbed grass areas will be re-seeded on completion of the construction works. Where practicable existing hedgerows on the site boundaries will be protected during construction work.

## 13.11 EFFECTS ON CULTURAL HERITAGE

The report on Archaeology deals with all matters pertaining to the impact on archaeology including those arising during the construction phase. This provides that during the construction phase, provision will be made for full excavation of any archaeologically significant material uncovered.

## 13.12 DAMAGE TO EXISTING ROADS

The movement of heavy goods vehicles transporting plant and materials along the existing local roads may cause damage to the road structure. The contractor will be required to take all necessary precautions to avoid damage to existing roads.

Vehicles will be required to comply with the gross vehicle weights prescribed in the Road Traffic (Construction, Equipment and Use of Vehicles)(Amendment) Regulations, 1990.

Tracked plant will not be permitted on road surfaces outside the site boundaries unless adequate protective measures have been taken to safeguard the integrity of the road surface and the prior approval of Laois County Council has been obtained.

## 13.13 MUD ON ROADS

This is regarded as one of the main environmental nuisance problems arising from construction sites with large quantities of spoil to be removed. The contractor will take strict measures to minimize this problem.

These will include, but not necessarily be limited to:

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

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

- The adequate sheeting of each lorry load of spoil removed to prevent spoil falling off during its journey to the tip concerned.

## 13.14 PRIVATELY AND PUBLICLY OWNED SERVICES

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

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

## 13.15 SUMMARY

It is inevitable that the construction of a major WWTW project will have moderate short-term impact on the environment in the vicinity of the proposed site. However, it is temporary in nature and steps will be taken to minimize these effects through:

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

# Part C

## Appendices

# Appendix 1

# Odour Emission and Dispersion Report

at

## Portlaoise Wastewater Treatment Works

for

M C O'Sullivan & Company Ltd.,
Consulting Engineers,
Ashurst, Mount Merrion Avenue,
Blackrock, Co. Dublin.

December, 1999

# PORTLAOISE WASTEWATER TREATMENT WORKS

# EMISSION, DISPERSION AND CONTROL OF ODOUR

## 1. INTRODUCTION

Odour is the sensation transmitted to the brain by the olfactory receptors in the nasal cavity when exposed to so called odorous substances in the inhaled air. If these substances are of a malodorous nature and are present in air above a certain threshold concentration they may cause annoyance and constitute an environmental nuisance. The science of odour response measurement is known as olfactometry. Standard olfactometric methods for odour strength measurement by dilution techniques, using a panel of people operating according to standard procedures, have been developed (Frechen, 1994).

The concentration of odorants in air is expressed in odour units per cubic metre ($OU/m^3$). Its numerical value is quantified as the number of dilutions with clean air required to reach the odour perception threshold. The odour perception threshold is the lowest odour concentration which is detectable by half the members of a test panel (half the members do not detect any smell while the other half still smells something). At a concentration of 2 $OU/m^3$ an odour is faintly perceivable, at 3 $OU/m^3$ it is clearly perceivable while at 5 $OU/m^3$ is strongly perceivable and, if unpleasant, is likely to give rise to environmental nuisance. The duration of an odour is also significant. Dispersion calculations are normally based on meteorological data using mean 1-hour wind speeds, producing hourly means of odour concentration. A concentration of 5 $OU/m^3$ lasting 15 to 30 minutes is commonly used as the nuisance threshold. If the mean hourly odour concentration is less than 1 $OU/m^3$, it is unlikely that shorter duration odour concentrations will exceed 5 $OU/m^3$.

## 2. WASTEWATER ODOURS

Wastewater odours arise either through the discharge of odorous substances of industrial origin to the sewer system or from the anaerobic decomposition of biodegradable matter in the wastewater. Anaerobic biodegradation produces volatile fatty acids and a variety of reduced sulphur compounds most of which have a very low odour threshold concentration as indicated in Table 1.

Anaerobic biodegradation is inhibited in the presence of dissolved oxygen and thus does not occur while wastewaters remain aerobic. However, where there is a long residence time in the sewer system or where sewer gradients are small, resulting in low velocities and solids deposition, wastewaters are likely to become septic and malodorous. Biodegradation rates are also strongly influenced by temperature, hence odour problems are likely to be accentuated during warm weather or where industrial discharges raise the wastewater temperature.

### 2.1 Odour emission from treatment processes

The rate of release of odorous compounds into the atmosphere at wastewater treatment works (WWTWs) is influenced by:

(a) the concentration of odorous substances in the liquid phase exposed to air
(b) total air/wastewater interface area
(c) conditions at air/wastewater interface.

Table 1

Odour threshold concentrations (Vincent & Hobson, 1998)

| Substance | Threshold conc. ($\mu g/m^3$ air) |
|---|---|
| Ammonia | 100-11000 |
| Methylamine | 1.2-65 |
| Dimethylamine | 47-160 |
| Indole | 7.1 |
| Scatole | 0.012-0.35 |
| Ethylmercapton | 0.043 |
| Diethyl sulphide | 1.4 |
| Hydrogen sulphide | 0.76 |
| Methylmercapton | 0.003-38 |
| Methyl sulphide | 0.34-1.1 |
| Acetic acid | 43 |
| Butyric acid | 0.35-86 |
| Acetaldehyde | 0.01-4 |
| Butyraldehyde | 15 |
| Isobutyraldehyde | 15-22 |
| Valeraldehyde | 2.5-34 |

Raw wastewaters and sludges generally have high concentrations of odorous substances. Processes that generate surface turbulence and high rates of interface renewal, such as open channel flow, weir overflows, biofilter flow distribution systems etc., have much higher rates of volatilisation of odorous compounds than quiescent processes such as sedimentation.

The specific odour emission rate from a water or sludge surface can be measured experimentally in a standardised way using a floating collector hood into which is discharged a measured flow of odour-free air. The odour concentration is then measured in the emergent air stream. The specific odour emission rate ($OU/m^2.h$) is quantified as the product of the emitted odour concentration ($OU/m^3$) and the specific air flow rate ($m^3/m^2.h$). A sample set of wastewater process odour emission rates, measured in this way, is presented in Table 2.

Table 2
Odour emission measurement results
(Frechen, 1992)

| Odour source | Odour Concentration ($OU/m^3$) | Specific air flow rate ($m^3/m^2.h$) | Specific emission rate ($OU/m^2.h$) |
|---|---|---|---|
| Aerated grit chamber | 1021 | 8.8 | 8985 |
| Grit container | 10520 | 8.8 | 92 576 |
| Storm tank, dirty | 71 | 7.6 | 540 |
| Primary sedimentation surface | 100 | 10.2 | 1020 |
| Primary sedimentation overflow | 193 | 10.2 | 1969 |
| Aeration tank | 97 | 10.2 | 990 |
| Secondary sedimentation tank | 25 | 10.2 | 255 |
| Secondary sedimentation overflow | 42 | 10.2 | 429 |

Wastewater screening, grit separation, primary treatment processes, biofiltration processes and sludge handling processes are the major foul odour sources at WWTWs. With the exception of aerobically stabilised sludges, sludge residues are the primary sources of very high odour concentration at WWTWs. This is because of their potentially high concentrations of reduced volatile substances including hydrogen sulphide ($H_2S$). It should be noted that anaerobically digested sludge, though

biologically stable, can be a significant source of malodour, particularly if it contains $H_2S$ - 1 ppm by volume of $H_2S$ in air is approximately equivalent to an odour concentration of 200 OU/$m^3$. Aerobically stabilised sludges, on the otherhand, have a relatively low odour emission rate. Surplus activated sludges from medium or high rate processes also have low odour emission rates while maintained in an aerobic condition.

## 3. ODOUR DISPERSION MODELLING

The malodours emitted from WWTWs are carried downwind and are diluted through atmospheric dispersion by mixing and transport mechanisms. This atmospheric dilution process can be mathematically modelled as a Gaussian plume (Pasquill, 1974), taking wind speed, wind direction and atmospheric stability conditions into account (USEPA, 1987). Thus, using the local meteorological data and the estimated odour emission rates from the individual treatment processes, it is possible to compute the odour concentration fluctuation at sensitive receptor locations in the vicinity of a WWTW.

The required meteorological data consists of the mean hourly values for wind speed, wind direction and Pasquill stability classification for the WWTW location for at least one year's duration. The prevailing Pasquill stability category has a strong influence on the rate odour dilution with distance from source. Unfavourable dispersion conditions arise when there is a combination of low wind velocity and reduced solar radiation such as occurs at night-time or in overcast conditions during the daytime.

The output from such a computer modelling exercise can be presented in a variety of formats to suit the needs of the user. Environmental regulations commonly specify a cumulative non-exceedence frequency for the threshold odour value (1 OU/$m^3$) at particular receptor locations - for example, if this limit value is set at 99.5%, it infers 44 computed exceedences per year, based on hourly input data. Similarly, isolines for any other odour concentration can also be plotted. Alternatively, the model can be used to define the odour threshold boundary for the WWTW, or the boundary limit for a specified odour concentration.

### 3.1 Odour dispersion modelling for Portlaoise WWTW

#### 3.1.1 Input data

(a) **Meteorological data**

Detailed statistical information on wind climate is required for odour dispersion modelling. As the required data are not available for the Portlaoise site, data from the meteorological station at Birr for 1990 were used in the model dispersion run. In order to check whether the 1990 data deviate from the long term average conditions, the frequency distributions of wind direction for the critical wind speeds in the range 0.5 - 3.0 m/s for the 30-year period 1969-1998 and for 1990 were computed and are plotted in Fig 1. Examination of these distributions shows that the 1990 frequencies generally exceed the 30-year average frequencies, except for winds which come from a northerly direction which are of relatively low frequency.

(b) **Process odour emission estimates**

Two levels of odour emission control were examined:

Level (1): odour abatement measures applied to the inlet works and the sludge processes, which are the main potential sources of offensive odour at WWTWs; the estimated odour emission rates for this situation are presented in Table 3.

Level (2): odour abatement measures applied to all potential sources of unpleasant odour viz. the inlet works, stormwater tank, primary sedimentation tanks and sludge processes; the estimated odour emission rates, with these additional odour control measures in place, are presented in Table 4. With this level of odour control in place, the residual odour emission is estimated at 476 OU/s, some 84% of which is derived from aerobic secondary treatment of the

activated sludge type. While there is a perceptible odour associated with activated sludge, it is normally described as an "earthy" odour and does not cause odour nuisance.

The odour emission estimates are based on the specific odour emission rates presented in Table 2.

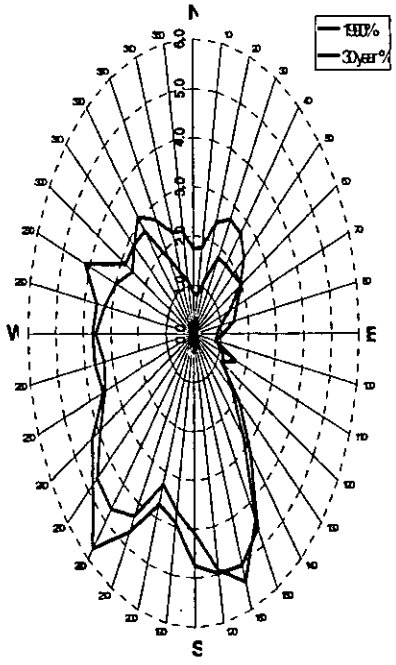



**Fig 1 Wind direction frequency for wind speeds in range 0.5 - 3 m/s for Birr Meteorological Station (direction is from which the wind is blowing)**

Table 3
Estimated odour emission rates from Portlaoise WWTP
with odour abatement measures applied to the inlet works and sludge processes
(Level 1 odour control)

| Source | Open surface gross area ($m^2$) | Specific odour emission ($OU/m^2.s$) | Process emission (OU/s) |
|---|---|---|---|
| Inlet works odour TU[1] | n/a | n/a | 23 |
| Storm tanks [2] | 1927 | 0.15 | 289 |
| Primary sed. tanks | 667 | 0.35 | 234 |
| Secondary treatment | 3000 | 0.10 | 300 |
| Sludge processes odour TU[3] | n/a | n/a | 30 |
| | | Total | 876 |

Footnotes to Table 3:

[1] the inlet works includes pumping, screening, grit separation, screenings/grit handling; facilities to be housed in a building equipped with forced ventilation to an odour treatment unit (TU) producing a residual odour emission of not more than 23 OU/s after treatment.

[2] the storm tank is assumed to be in an inadequately cleaned condition

[3] the sludge processes include thickening, anaerobic digestion, sludge import facility, dewatering, sludge cake transport skips. All tanks containing liquid sludge to be covered and vented to odour treatment. Dewatering equipment and skip loading facilities to be housed in a building equipped with forced ventilation to an odour treatment unit. The odour treatment/control unit for sludge processes to be designed to limit odour emission to not more than 30 OU/s.

Table 4
Estimated odour emission rates from Portlaoise WWTP
with odour abatement measures applied to inlet works,
stormwater tank, primary sedimentation tanks, sludge processes
(Level 2 odour control)

| Source | Open surface gross area ($m^2$) | Specific odour emission ($OU/m^2.s$) | Process emission (OU/s) |
|---|---|---|---|
| Inlet works odour TU [1] | n/a | n/a | 23 |
| Storm tank odour TU[2] | n/a | n/a | 15 |
| Primary sed. tanks odour TU[3] | n/a | n/a | 12 |
| Secondary treatment | 3000 | 0.10 | 300 |
| Sludge processes odour TU[4] | n/a | n/a | 30 |
| | | Total | 380 |

Footnotes to Table 4:

[1] the inlet works includes pumping, screening, grit separation, screenings/grit handling; facilities to be housed in a building equipped with forced ventilation to an odour treatment unit (TU) producing a residual odour emission of not more than 23 OU/s after treatment.

[2] the storm tank to be covered and vented to an odour TU, designed to limit the odour emission rate to not more than 15 OU/s.

[3] the primary sed. tanks to be covered and vented to an odour TU, designed to limit the odour emission rate to not more than 12 OU/s

[4] the sludge processes include thickening, anaerobic digestion, sludge import facility, dewatering, sludge cake transport skips. All tanks containing liquid sludge to be covered and vented to odour treatment. Dewatering equipment and skip loading facilities to be housed in a building equipped with forced ventilation to an odour treatment unit. The odour treatment/control unit for sludge processes to be designed to limit odour emission to not more than 30 OU/s.

### 3.2 **Results of dispersion analysis**

A series of computer analyses of odour dispersion from the Portlaoise WWTW, using the 1990 Birr hourly wind data, and the odour emission rates set out in Tables 3 and 4, was carried out. The output data was analysed to define the 98%, 99% and 99.5% odour threshold isolines for the treatment plant environs.

The threshold isolines for the odour emission rates set out in Table 3 (Level 1 odour abatement), are plotted on Fig 2 and the threshold isolines for the odour emission rates set out in Table 4 (Level 2 odour abatement), are plotted on Fig 3. These isolines represent the boundary lines within which the threshold odour concentration of 1 $OU/m^3$ would be exceeded during 2%, 1% and 0.5% of the time, respectively (2% corresponds 176 exceedences, 1% corresponds to 88 exceedences and 0.5% corresponds to 44 exceedences during the one year test period).

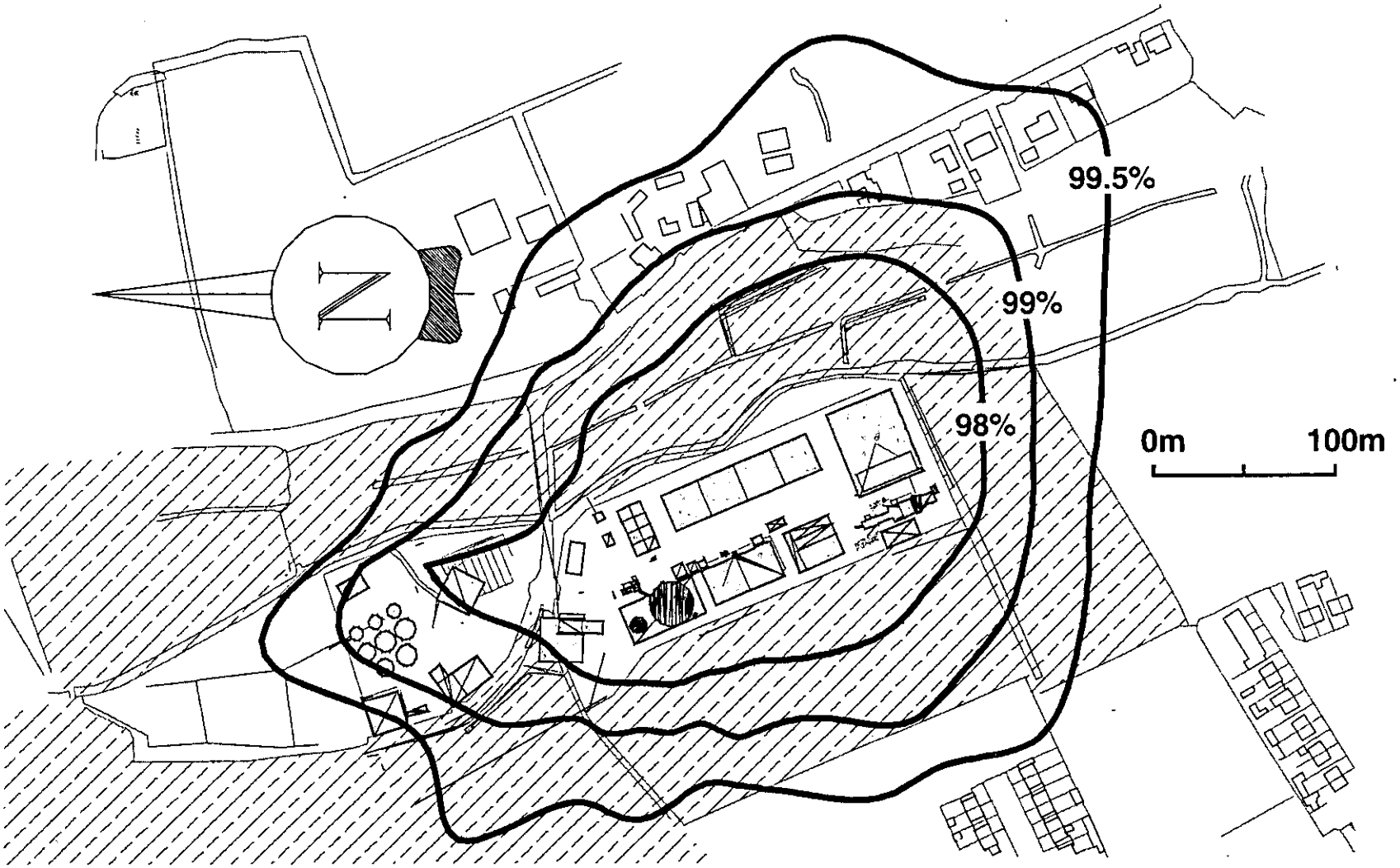



**Fig 2 : Odour isolines with level 1 odour abatement.**

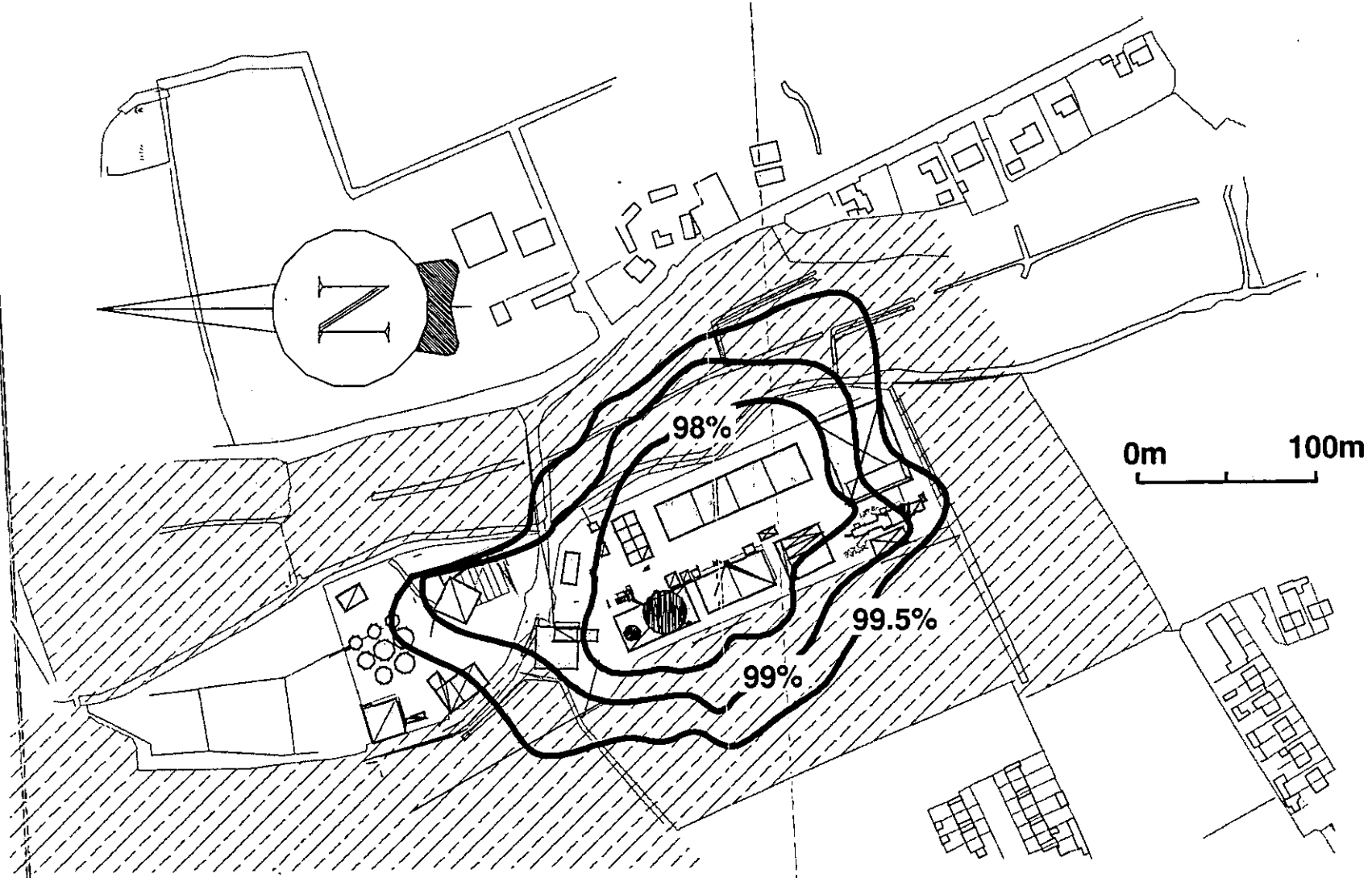



**Fig 3 : Odour isolines with level 2 odour abatement measures.**

As may be seen from the plotted odour threshold isolines on Figs 2 and 3, the principal direction of odour spread is approximately along an NNW-SSE axis. The computed maximum radial spreads, as scaled from Figs 2 and 3, are as presented in Table 5:

Table 5
Predicted odour dispersion limits

| Non-exceedence threshold (%) | Maximum radial spread (m) | |
|---|---|---|
| | With Level 1 odour abatement (Fig 2) | With Level 2 odour abatement (Fig 3) |
| 99.5 | 313 | 193 |
| 99.0 | 230 | 172 |
| 98.0 | 184 | 93 |

## 4. CONCLUSIONS

The results of the computer analyses of odour dispersion from the upgraded Portlaoise wastewater treatment works, as plotted on Figs 2 and 3 and summarised in Table 5, show:

(a) that Level 1 odour abatement (Table 3, Fig 2) is not sufficient to protect the housing on the east and west side of the site from odour encroachment at the 99.5% level.

(b) that Level 2 odour abatement (Table 4, Fig 3) i.e. the installation of odour treatment facilities to deal with all potential offensive odour sources, namely, the inlet works, the stormwater tank, the primary sedimentation tanks and the sludge processing units, is required to prevent the 99.5% threshold odour isoline from encroaching on the nearby dwellings on the east and west sides of the site. As well as reducing the radial spread of odour, as indicated in Table 5, this level of odour abatement effectively minimises the emission of offensive odours. Hence, with this level of odour abatement in place, the operation of the works should not give rise to any environmental odour nuisance.

## 5. RECOMMENDATIONS

In order to limit the spread of offensive odour in the plant environs and ensure that the 99.5% odour threshold isoline does not extend to nearby housing, it is recommended that the following odour abatement measures are implemented:

1. the inlet works, comprising pumping, screening, grit separation and grit/screenings processing, to be housed and vented to odour treatment facilities, designed to limit odour release to not more than 23 OU/s.
2. the following tanks to be covered and vented to odour treatment, thereby limiting odour emission to amounts not exceeding the values in brackets:
    - stormwater tank (15 OU/s)
    - primary sedimentation tanks (12 OU/s)
3. the following sludge process to be covered/housed and vented to odour treatment, thereby limiting the combined odour emission from sludge processes to not more than 30 OU/s:
    - Imported sludge reception facility
    - sludge thickening/storage tanks
    - secondary digestion tanks
    - sludge dewatering building
    - sludge disposal skips

Professor T J Casey

Date: 13 December 1999

**References**

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# Appendix 2

ENVIRONMENTAL SERVICES

# CONFIDENTIAL REPORT

**Client**

**M.C. O'Sullivan**
**Consulting Engineers**
**Ashurst**
**Mount Merrion Avenue**
**Blackrock**
**Co. Dublin**

**Title**

**Portlaoise Main Drainage**
**Stage 2 EIS**
**NOISE ASPECTS**

| | | | |
|---|---|---|---|
| Report Ref. | 111435 | Report by: | Larry Kenny |
| File No. | R6/01696K | Approved by: | Martin Reilly |
| Order | 045-015-2-1-C012 | Date: | 9 August 2000 |

ENVIRONMENTAL SERVICES Fax: 01-808 2259

DRAFT REPORT

## CONTENTS

# 1 INTRODUCTION

1.1 This report was undertaken at the request of M.C. O'Sullivan, Consulting Engineers to the Portlaoise Stage 2 Main Drainage Scheme. The object of this report is to present the noise and vibration aspects of the Environmental Impact Study for the Scheme.

1.2 The major noise-emitting element of the proposed scheme is the extension of the treatment works to be constructed on the existing site at Ridge Road, Portlaoise. A site location plan is shown in figure 1 and the treatment works are shown in figure 2. Noise measurements were made at the existing site and at a similar modern plant at Greystones, Co. Wicklow. Baseline measurements were made at residences near the site.

1.3 Sound levels are measured with a meter in units called decibels (dB), and noise has often been defined as unwanted sound. Environmental noise levels are usually assessed in terms of A-weighted decibels, the dB(A). The A-weighting approximates to the response of the human ear. Industrial, occupational and environmental noise is usually expressed in equivalent continuous levels, $L_{Aeq,T}$. This is based on the energy average level over the relevant time interval. Environmental noise may be corrected for tonal or impulsive characteristics and the unit is the rating level, $L_{Ar,T}$. Statistical parameters are also used as noise descriptors.

1.4 The operation of the plant and the other facilities will generate environmental noise in two principal ways which are:

1. Noise emission from outdoor aeration and settling tanks
2. Noise emission from indoor plant.

1.5 The construction phase of the development will give rise to noise, some of which will be perceptible off-site. There will be no vibration effects off-site.

## 2. *SUMMARY*

*2.1 The construction and operation of the Portlaoise Stage 2 Main Drainage Scheme can be undertaken without undue impact on the noise environment. There will be no vibration perceptible off-site.*

*2.2 The noise impact of the construction and operation of the treatment plant can be defined as "no impact".*

## 3. EXISTING ENVIRONMENT

3.1 The site at Ridge Road, Portlaoise is relatively close to the town with a farmhouse c.100 metres to the East and a residential development c. 150 metres to the West. Baseline measurements were made at these two locations, shown as Location A and Location B respectively in figure 1.

3.2 Noise measurements were made at the nearest residence over a number of days with principally good weather conditions with light winds before the weather deteriorated. Night-time measurements were made at location B on a calm night. The microphone height was at first floor level at location A and 1.5 metres above ground level at location B. The instrumentation consisted of Larson Davis Environmental Noise Analysers 812 and a Bruel & Kjaer type 2231 Precision Sound Level Meter, with calibration checks being made with a B&K type 4230 sound level calibrator. The following parameters were measured:

**$L_{Aeq,T}$** the equivalent continuous noise level for the measurement period. This parameter is very sensitive to local high-level short time sources, e.g. local traffic, etc.

**$L_{A01,T}$** the sound level equalled or exceeded for 1% of the measurement period, the maximum levels.

**$L_{A10,T}$** the sound level equalled or exceeded for 10% of the measurement period, the parameter usually used for traffic noise assessment.

**$L_{A90,T}$** the sound level equalled or exceeded for 90% of the measurement period. This level is sometimes taken to represent the "background" noise level.

3.3 The principal noise sources audible at location A was traffic, and in the absence of traffic the existing treatment plant. The principal sources of noise at locations B was traffic on the Mountmellick Road and distant traffic. The results are shown in table 1and the time history graph at location B is shown in Figure 3. The minimum night-time levels at location A were $L_{A90,1\ hour}$ values of 42 – 43 dB(A) and the corresponding $L_{Aeq,1\text{-}hour}$ values were 48 dB(A). The night time 'background' level of 42 – 43 dB(A) was due to the existing plant. At location B the night-time 'background' level of 36 dB(A) was due to distant traffic and the more distant treatment plant

## 4. NOISE EMISSIONS

4.1 The major items of plant in the treatment works will operate 24 hours a day but the sludge pressing and removal operations are normally undertaken during day time working hours.

4.2 The major external plant will employ essentially quiet technology with fine bubble diffusion in the aeration tank. Noise measurements made at a similar plant at Greystones and the results were:

| | |
|---|---|
| Decanter centrifuge | |
| 10 metres | 50 dB(A) |
| 20 metres | 45 dB(A) |
| 30 metres | 42 dB(A) |
| 40 metres | 40 dB(A) |
| Aerator Tanks | |
| above tanks, 1.5m | 50 dB(A) |
| 20 metres | 40 dB(A) |
| Compressor Building | |
| 10 metres | 38 dB(A) |

4.3 The air blowers and the sludge treatment plant will be housed in buildings of concrete construction. All air openings required for the housed plant will have attenuators sized and specified in terms of meeting the external night time noise criterion.

4.4 Noise measurements made c.25 metres from a pumping station similar to that proposed gave results of 42 dB(A) with the pump in operation.

4.5 There will be approximately ten truck movements per week, removing composted material from the plant and delivering untreated sludge. This source of noise is not significant.

## 5 CRITERIA

5.1 Duc to the continuous nature of the plant operation the night-time operation is of major importance as this requires a lower limit than daytime. There are no statutory limits for environmental noise emissions for this type of plant, or industry in general, in this country.

5.2 In general, noise is likely to provoke complaints when its level exceeds the level of the background noise level by a certain margin or when certain absolute levels are attained. The criteria for industrial noise generally lie in the range 35-45 dB(A) at night and 45-55 dB(A) by day. The lower values are normally applicable to rural areas and zones of hospitals, and the higher values are sometimes applicable to city centre areas or special cases such as mining or quarrying. Currently the most widely applied criteria for Industry are that of 45 dB(A) (night-time) and 55 dB(A) (daytime) with no impulsive or tonal characteristics.

5.3 Selection of the preferred noise criteria values within the range of values above depends on the pre-existing noise levels, the character of the area and the nature of the development. Taking the above into account and the existing "background" noise at the proposed location we propose the following criteria as being appropriate for minimal impact on the noise environment:

Existing residences

Night : 45 dB $L_{Aeq}$ (hourly)

Day : 55 dB $L_{Aeq}$ (hourly)

5.4 These are limit values for the noise from the proposed plant measured outside any dwelling. There should be no significant pure tones or impulsive elements in the noise spectrum of the emissions from the plant. The noise characteristic associated with plants of this nature is generally perceived as being of a broad band unobtrusive character.

## 6. CONSTRUCTION

6.1 As construction work is of a temporary nature, the resulting higher noise levels are usually acceptable. British Standard BS 5228: 1997 on Noise Control on construction and demolition sites provides guidance on the methods available to control noise from construction work and is used on road and other large scale construction projects.

## 7. ASSESSMENT

7.1 The construction and operation of the Treatment Plant and other facilities can be undertaken without undue disturbance to local residents. The sound from the facility is broadband in character. The ten truck movements per week associated with the development is not a significant source of noise.

7.2 Noise control measures are built into the design of the plant with the enclosure of the main sources of noise and the detailed design of the plant will incorporate noise control measures, as appropriate, to meet the criteria. These will include enclosure of the compressors and screening of plant.

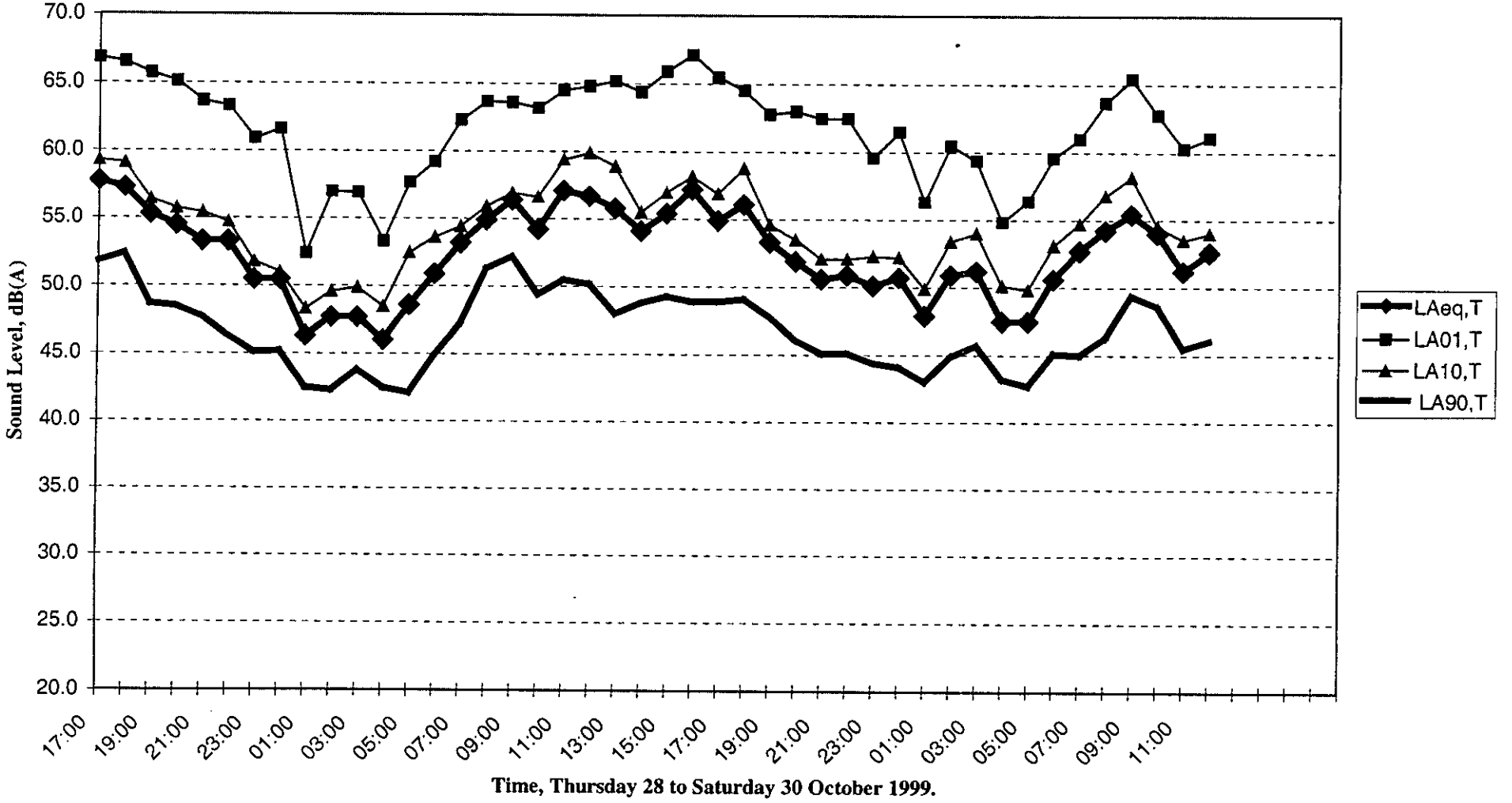
7.3 Due to the distances involved the noise impact of the construction and operation of the treatment plant can be defined as "no impact".

**Table 1**

**Location A** **SOUND PRESSURE LEVEL dB**

| Day | Date | Time | $L_{Aeq,1h}$ | $L_{A01,1h}$ | $L_{A10,1h}$ | $L_{A90,1h}$ | |
|---|---|---|---|---|---|---|---|
| Thursday | 28-Oct | 17:00 | 57.8 | 66.8 | 59.3 | 51.8 | |
| | 28-Oct | 18:00 | 57.3 | 66.5 | 59.1 | 52.4 | |
| | 28-Oct | 19:00 | 55.3 | 65.7 | 56.4 | 48.7 | |
| | 28-Oct | 20:00 | 54.5 | 65.1 | 55.7 | 48.5 | |
| | 28-Oct | 21:00 | 53.3 | 63.7 | 55.4 | 47.7 | |
| | 28-Oct | 22:00 | 53.3 | 63.3 | 54.7 | 46.3 | |
| | 28-Oct | 23:00 | 50.5 | 60.9 | 51.8 | 45.1 | |
| Friday | 29-Oct | 00:00 | 50.5 | 61.6 | 51.0 | 45.2 | |
| | 29-Oct | 01:00 | 46.3 | 52.4 | 48.3 | 42.5 | |
| | 29-Oct | 02:00 | 47.7 | 57.0 | 49.6 | 42.3 | |
| | 29-Oct | 03:00 | 47.7 | 56.9 | 49.9 | 43.8 | |
| | 29-Oct | 04:00 | 46.0 | 53.3 | 48.5 | 42.5 | |
| | 29-Oct | 05:00 | 48.6 | 57.7 | 52.5 | 42.1 | |
| | 29-Oct | 06:00 | 50.9 | 59.2 | 53.6 | 44.9 | |
| | 29-Oct | 07:00 | 53.2 | 62.3 | 54.4 | 47.2 | |
| | 29-Oct | 08:00 | 54.9 | 63.7 | 55.9 | 51.3 | |
| | 29-Oct | 09:00 | 56.4 | 63.6 | 56.9 | 52.2 | |
| | 29-Oct | 10:00 | 54.2 | 63.2 | 56.6 | 49.4 | |
| | 29-Oct | 11:00 | 57.1 | 64.5 | 59.4 | 50.5 | |
| | 29-Oct | 12:00 | 56.7 | 64.8 | 59.9 | 50.2 | |
| | 29-Oct | 13:00 | 55.8 | 65.2 | 58.9 | 48.0 | |
| | 29-Oct | 14:00 | 54.1 | 64.4 | 55.5 | 48.8 | |
| | 29-Oct | 15:00 | 55.4 | 65.9 | 57.0 | 49.3 | |
| | 29-Oct | 16:00 | 57.2 | 67.1 | 58.2 | 48.9 | |
| | 29-Oct | 17:00 | 54.9 | 65.5 | 56.9 | 48.9 | |
| | 29-Oct | 18:00 | 56.1 | 64.5 | 58.8 | 49.1 | |
| | 29-Oct | 19:00 | 53.3 | 62.8 | 54.6 | 47.8 | |
| | 29-Oct | 20:00 | 51.9 | 63.0 | 53.5 | 46.1 | |
| | 29-Oct | 21:00 | 50.6 | 62.5 | 52.1 | 45.1 | |
| | 29-Oct | 22:00 | 50.9 | 62.5 | 52.1 | 45.1 | |
| | 29-Oct | 23:00 | 50.1 | 59.6 | 52.3 | 44.4 | |
| Saturday | 30-Oct | 00:00 | 50.7 | 61.5 | 52.2 | 44.1 | |
| | 30-Oct | 01:00 | 47.9 | 56.3 | 49.9 | 43.0 | |
| | 30-Oct | 02:00 | 50.9 | 60.5 | 53.4 | 44.9 | |
| | 30-Oct | 03:00 | 51.2 | 59.4 | 54.0 | 45.7 | |
| | 30-Oct | 04:00 | 47.5 | 54.8 | 50.1 | 43.2 | |
| | 30-Oct | 05:00 | 47.5 | 56.4 | 49.8 | 42.7 | |
| | 30-Oct | 06:00 | 50.6 | 59.6 | 53.1 | 45.1 | |
| | 30-Oct | 07:00 | 52.7 | 61.0 | 54.7 | 45.0 | |
| | 30-Oct | 08:00 | 54.2 | 63.7 | 56.8 | 46.3 | |
| | 30-Oct | 09:00 | 55.4 | 65.4 | 58.2 | 49.4 | |
| | 30-Oct | 10:00 | 54.0 | 62.8 | 54.5 | 48.6 | |
| | 30-Oct | 11:00 | 51.2 | 60.3 | 53.5 | 45.5 | |
| | 30-Oct | 12:00 | 52.6 | 61.1 | 54.0 | 46.1 | |
| **Location B** | | | | | | | |
| Tuesday | 5-Oct | 00:00 | 38.7 | 44.1 | 40.5 | 36.0 | T=30 min |

**Ambient Sound Level, Greenview, Portlaoise**
**Figure 3**



# Appendix 3

### 5.7.1.3.1 Hedgerow survey

The hedgerow survey was undertaken to assess the condition of the existing hedgerows in the environs of the site area. There are 6 principal hedgerows on the site (see drawing no.616-HR-05 titled Hedgerow Location Plan). The hedgerows which screen the site from the Ridge Road are also of importance and have been detailed below as numbers 7 and 8. A summary of the hedgerow survey is listed in table 5.7.01.

(The flora and fauna section of the EIS refers to the ecological value of the existing hedgerows on the site area).

**Table 5.7.01 :- Existing hedgerows**

| Hedge No. | Length (m) | Classification | Comments | Development Impact |
|---|---|---|---|---|
| 1 | 90 | Hedge & trees species rich | 7.0m(H), semi-mature Beech, lime, hawthorn | Retain |
| 2 | 221 | (Outside of fence line) Fragmented, hedge species poor | Hawthorn, bramble | Retain |
| 3 | 70 | (Outside of fence line) Hedge & trees species rich | Mature planting of ash, birch, and salix | Retain |
| 4 | 90 | (Outside of fence line) Fragmented, hedge species poor | Hawthorn, bramble | Retain |
| 5 | 121 | Defunct hedge species poor | Hawthorn, bramble | Retain |
| 6 | 174 | (Outside of fence line) Hedge & trees species rich | Birch, salix and ash | Retain |
| 7 | 188 | (Along Ridge Road) Hedge & trees species poor | Hazel, brambles, gorse | Retain |
| 8 | 100 | (Along Ridge Road) Hedge & trees species rich | Dense planting of hazel, and bramble 7.0m(H) | Retain |

**Note:**
Hedgerow numbers 1, 3, and 8 are classified as being species rich. However much of this planting lies outside of the fence line of the proposed site and these hedgerows have not been managed in the recent past.

In terms of possible visual impact of the proposed wastewater treatment works, the hedgerows which are on the site boundary provide important screening to the surrounding areas. The upgrading of these existing hedgerows and the provision of screen planting within the site boundary fence line is described in section 5.7.4 of this report.

## Landscape Development Guidelines

**1.1 Inspections:**
The Landscape Architect will inspect the site with the Landscape Contractor during the execution of the works and following maintenance visits.

**1.2 Replacement**
The Landscape Architect shall inspect the planting in July following planting. Any tree found to have died from any cause except as provided below or the contractor at his own expense shall replace the work of other contractors. Replacement planting shall conform in all aspects with this Specification, including all specified excavation, provision and incorporation of all fertilisers and ameliorants, and weed killer treatments.

Failures will not be charged to the contractor in the following cases:

- Damage by hares or rabbits, where not protected by fencing
- Losses due to theft, vandalism or disturbance by other contractors

**1.3 Firming**
Firm any plant loosened by frost, wind or cultivation at each maintenance visit.

**1.4 Spraying:**
The contractor shall be responsible for keeping the all ground around all planted material weed-free by means of herbicidal application during the course of the contract. Such routine spraying shall be carried out during maintenance visits over the three-year period. No spraying shall take place during adverse weather conditions or at times not recommended by the manufacturer.

**1.5 Spraying at Planting Edge**
Spray planting edges to maintain a crisp and distinct edge between planting edges and grassed areas. No spraying shall take place during adverse weather conditions or at times not recommended by the manufacturer.

**Herbicides.**
**Glysophate "Round-up"** by Mosanto Chemical ltd. Do not apply when rain is forecast within six hours. Do not apply when wind is likely to cause drift of spray (over 32 kph/20mph). Allow leaf symptoms to develop before cultural operations.

**Paraquat "Gramoxone" and 'Basta'** by ICI Plant Protection Ltd. Do not spray when wind is likely to cause drift over 32kph/20mph. Protect all foliage of plants from spray drift.

**1.6 Cutting back:**
Plants for cutting back/tip pruning shall be cut back after inspection by the Landscape Architect. This work to be carried out initially following planting for plants suffering from wind damage.

**1.7 Ground finish:**
Upon completion of planting, all ground finish shall include for the removal of stones greater than 10mm excavated during the course of the digging for planting purposes. All stones to be tipped off site.

**1.8 Aftercare:**

**1.8.1 Period:**

The Contractor shall be responsible for aftercare of the completed works for 3 Years from the date of completion of planting. The works include grass cutting, field cutting of grass, boundary herbicidal control, pond maintenance etc.

**1.8.2 Organisation:**

The aftercare programme will be organised as follows: -

(1) Scheduled operations, in whose timing the contractor will be permitted some flexibility and which will be the basis of payment to the Contractor.
(2) Performance standards, which the Contractor is required to meet at all times, and on which his performance will be assessed.
(3) Critical dates, by which time scheduled operations shall have been completed, and at which performance will be assessed.

**1.8.3 Performance standards:**

Structural planting to be maintained in accordance with specifications e.g. firming, tree ties fertilising replacement, pruning.
**Weeds shall not cover more than 1% of the ground surface at any time and neither shall they exceed 10mm in height or spread.**
Noxious weeds (Dock, Thistle, Ragwort) shall not be allowed to flower and all weeds shall be killed or removed at each maintenance visit.
All planting areas shall have soil surface free of all weeds and grass over 10mm high; clumps and tussocks of grassy weeds and, on the critical dates, shall be free of all weeds.

**1.9 PROGRAMME**
**Year One (After Planting)**

**1.9.1 By end of February (Year One):**

'Round-Up'@5.0 litres/ha to all planted and boundary planted areas. Protect all plants. Pull all weeds too close to nursery stock for safe treatment.

**1.9.2 April/May (Year One):**

'Round-Up' @ 5.0 litres/ha to al planted and boundary areas areas where weed growth is apparent. Protect all plants. Pull all weds too close to nursery stock for safe treatment. Tip prune, firm plants.

**1.9.3 June (Year One):**

'Round-Up' @5.0 litres/ha to all planted and boundary areas where weed growth is apparent. Protect all plants. Spot treat any Ragwort or Thistle. All necessary cultural/husbandry methods to be completed in order to leave the sites in a clean, orderly and tidy manner. Watering of heavy standards as necessary (2 no. times)
**Critical Date: 30 June (Year One)**

**1.9.4 July - Sept (Year One):**

1 no. application 'Round-Up' to all planted and boundary areas, followed 3 weeks later by 1 no. visit for spot Gramoxone application. Firm plants. . Watering of heavy standards as necessary ( 3 no. times).

**1.9.5 Oct. (Year one):**

Remove dead plants after Landscape Architect's inspection.
Replacement planting in November.

**Critical Date: 30 October (Year one)**

**Year Two (After Planting)**
**1.9.6 Maintenance as per year one**

**Year Three (After Planting)**
**1.9.7 Maintenance as per year one**

**1.10 Grass cutting**

As recommended in **Ch. 8.**

**1.11 Herbicides & fertiliser**
The contractor shall apply *Supertox,* a selective weed killer, in mid April, at the recommended application rate, to control weeds in the grassed areas during the growing season. In addition 1 no. application of *Clovertox* herbicide to kill off clover in the grass areas shall be applied in April.

The contractor shall apply a fertiliser dressing of sulphate of ammonia to all grass areas 2 no. times during the growing season at a rate of 1/8 oz. per sq.m (15grms/Sq.m)

**1.12 Tree Ties**
Tree ties and stakes are to be checked, adjusted, removed or replaced where necessary. Tree stakes should be removed where the diameter of the tree trunk is greater than the stake.

**1.13 Sweeping and Cleaning**
**1.13.1** Sweeping shall mean sweeping of car parks, roadside kerbs and other paved areas and removal of all grit rubbish moss and leaves, keeping the paved areas of the respective centres in a neat and tidy condition.

**1.13.2** Cleaning shall mean the removal of paper, plastic bags and all other rubbish from grassed areas, roads, car parks and other paved areas, shrubberies etc. in the respective areas. This operation shall be carried out on each site visit.

**1.13.3** All dirt and rubbish is to be removed off site to a tip to be provided by the contractor.

**1.13.4** All areas- roads, footpaths, public paved areas shall be cleaned and swept once a month during the contract period, except in the case of Autumn leaves which shall be swept on a weekly basis from the end of October to mid-November (three weeks). Any additional cleaning and sweeping deemed necessary during the year, and requested by the company for any of the various locations will be paid for at a pro rata basis to the rates for the programmed maintenance schedule.

**1.14 Inspections**
The Landscape Architect will inspect the site with the Contractor on each critical date, or as soon as possible thereafter.

# Appendix 4

# PROPOSED PORTLAOISE WASTEWATER TREATMENT PLANT UPGRADING

# ENVIRONMENTAL IMPACT STATEMENT

## FLORA AND FAUNA.
**REVISED 6 DECEMBER 2000**

PREPARED FOR M.C. O'SULLIVAN & COMPANY Ltd.

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# 1. INTRODUCTION.

## 1.1. GENERAL LOCATION.

The proposed Portlaoise Wastewater Treatment Plant Upgrading works all take place on the existing treatment plant site. This is located on the west (left) bank of the River Triogue, at Ridge Road, Portlaoise.

The Portlaoise area drains to the river Barrow catchment via the Triogue river. A number of streams drain the Portlaoise area, these rise to the south of Portlaoise and run northwards to join the Triogue. The geology underlying the area is Carboniferous limestone, varying from lower to upper Carboniferous. The surface topography is gently undulating, and includes a north north-west – south south-east trending esker ridge, on which Ridge Road and the Timahoe Road are built. Extensive quarrying of sand and gravel deposits has affected portions of the esker ridge. Soils are grey brown podzolics and gleys, derived from limestone gravelly glacial till, and limestone glacial till. There are some pockets of peaty soils along river valleys and in areas of impeded drainage where fen peats have developed. More extensive peat deposits occur to the west and north of Portlaoise.

## 1.2. CONSERVATION DESIGNATIONS.

Part of the existing waste water treatment site lies within the Ridge of Portlaoise proposed Natural Heritage Area (Site Code 876). This pNHA adjoins and partly includes the existing waste water treatment plant. It includes an esker ridge, and is described as being of interest for esker woodland and calcareous grassland habitats. Two rare plant species occur: blue fleabane *Erigeron acer*, which has been recorded in three separate locations in active and disused sand and gravel pits; and nettle-leaved bellflower *Campanula trachelium*, which has been recorded in a single location in dry woodland adjoining a disused sand and gravel pit (Curtis and McGough, 1988; Dúchas unpublished data, 1991). All records are from the northern part of the pNHA, to the north of the Dublin-Cork railway line. The esker lies on the eastern side of the river Triogue. The existing and proposed waste water treatment site adjoins the Triogue on the former floodplain of the river, on generally peaty soils, which are included in the pNHA. No other areas of the pNHA are affected by the proposed scheme.

The area proposed for NHA designation has not been modified since the original listing of the site as an Area of Scientific Interest by An Foras Forbartha. Most of the pNHA within the proposed main drainage scheme area has been considerably modified by agricultural improvement, housing development, and by sand and gravel extraction from the esker ridge.

Other sites within a 10km radius of Portlaoise which are proposed for designation as Natural Heritage Areas are listed in Table 1 below. None of these sites is impacted by the proposed development.

**Table 1. Sites other than the Ridge of Portlaoise proposed for designation as Natural Heritage Areas, within a 10km radius of Portlaoise.**

| Site name | NHA Site code | Interest |
|---|---|---|
| Dunamase Woods | 1494 | Woodland on glacial drift |
| Timahoe Esker | 421 | Esker woodland. Designated Nature Reserve |
| Rock of Dunamase | 878 | Calcareous grassland, heath, hazel scrub, on limestone outcrop |
| Kilteale Hill | 867 | Hazel woodland on limestone outcrop |
| Clonsoghey Bog | 879 | Raised bog |
| The Great Heath of Portlaoise | 881 | Acidic grassland, heath, wetland |

## 2. FLORA.

Phase 1 habitat survey methodology (JNCC, 1993) was used to describe and map the vegetation in the wastewater treatment plant site. Field survey was carried out between late August and early October 1999. Plant identification follows Webb *et al* (1996), Jermy *et al* (1982) and Hubbard (1980). Plant species nomenclature follows Scannell and Synnott (1987). Reference was made to Curtis and McGough (1988) and the Flora Protection Order (S.I. No. 94 of 1999) in relation to rare and protected plant species. Consultations were carried out with Dúchas – National Parks and Wildlife Service personnel, and files relating to the Ridge of Portlaoise proposed Natural Heritage Area were consulted.

Impacts are assessed in accordance with the EPA Draft Guidelines on the information to be contained in Environmental Impact Statements.

## 2.1. RECEIVING ENVIRONMENT.

The wastewater treatment works lies partly within the area proposed for designation as a Natural Heritage Area. The general area is shown in Figure 1. The vegetation cover shown in Figure 2 and is described in detail below.

**Northern portion of site.**
The northern part of the existing site (i.e. to the north of the existing access road) has vegetation cover over approximately 50% of the surface area (Figure 2). This vegetation is grass dominated; the dominant grass species being ryegrass, Yorkshire fog, creeping bent, and red fescue. Other grass species present at low cover values are cock'sfoot, annual meadow grass, and timothy, with occasional reed canary grass and a variant of couch grass in which the glumes and lemmas are awned (awns 5 –6 mm long). Hard and soft rush are both present, with hard rush being more abundant. Dicotyledon species present include red bartsia, creeping cinquefoil, silverweed, mayweed, pineappleweed, great plantain, ribwort plantain, nettle, creeping thistle and spear thistle, coltsfoot, clustered dock, creeping buttercup, nipplewort, red clover, white clover, yellow clover, meadow vetchling, tufted vetch, smooth sow-thistle, smooth hawk's-beard, redshank, knotweed, cut-leaved geranium, and occasional common poppy, great willowherb and scarlet pimpernel. This vegetation has developed on disturbed ground, and is classified as ephemeral and short perennial vegetation of disturbed ground.

The area is surrounded by a chain link fence, which is partly covered by bramble, creeping thistle, nettle, and great willowherb. There are a few white poplar saplings and rusty willow bushes near the concrete tanks in the northwestern corner of the site, and a wild plum rooted outside the fence line overhangs the fence on the southern side of the site.

The remaining 50% of this area includes a concrete covered tank, and concrete sludge drying beds. The remainder is a trackway and truck turning area of hardcore, gravel and soil, and is largely unvegetated. There is a very sparse vegetation of annual meadow grass and creeping bent grass.

All plants recorded are common species of grassland and disturbed ground. Most species occur across a broad soil pH range, although red bartsia tends to occur on neutral to alkaline soils. The site was searched for blue fleabane, which occurs in sand and gravel pits in the Ridge of Portlaoise pNHA, but this rare species was not found. This area is assessed as not meriting inclusion in a proposed Natural Heritage Area.

**Southern portion of site.**
The main area of the existing wastewater treatment works lies outside the proposed Natural Heritage Area. Vegetated areas are under occasionally mown ryegrass and white clover, with Yorkshire fog, timothy, creeping buttercup, curled dock and red clover, with occasional reed canary-grass, tufted vetch, and red bartsia. This vegetation is classified as improved grassland. The area is surrounded by a chain link fence with some rusty willow, hawthorn and bramble growing along it.

**Site boundary vegetation.**
Boundary vegetation is generally rooted outside the fencing surrounding the site. Boundaries are numbered on Figure 2. These boundaries, apart from no. 2, are not formal hedgerows.

B1. Elder, hawthorn, hazel, rusty willow and bramble along Triogue river bank. Occasional birch and ash.

B2. Semi-mature beech, lime, hawthorn.

B3. Rusty willow, hawthorn, bramble.

B4. Occasional rusty willow and crack willow, wild plum, bramble.

B5. Sparse bramble, hawthorn.

B6. Rusty willow, hawthorn, bramble.

Boundary vegetation is species poor in comparison with field boundary hedgerows elsewhere in the Portlaoise area. Hedgerows in the Portlaoise area are generally species rich. Dominant tree species are ash, beech and oak, with occasional sycamore, lime, alder, birch, Scots pine, wych elm, elm saplings, silver birch, brown birch, crack willow, hybrid willow *Salix x sericans*, and white poplar. Dominant shrub and small trees are hazel, rusty willow, blackthorn, hawthorn and privet. Common hedgerow shrubs and small trees are holly, elder, guelder rose, goat willow, and dog rose. Occasional species are crab apple, spindle, gorse, autumn gorse and honeysuckle. A single specimen of bird cherry was recorded.

**Aquatic and channel margin vegetation of the Triogue River.**
In the vicinity of the site, the Triogue has a patchy channel vegetation of stream water-crowfoot and branched bur-reed, with occasional spiked water milfoil. Channel margins and banks are vegetated with species typical of lowland enriched water courses: reed canary-grass, nettle, and great willowherb, with occasional bittersweet and meadowsweet.

## 3. FAUNA.

Fauna survey work focussed on mammals and birds. As survey work was carried out between late August and early October, the bird breeding season was not covered, but all bird species observed were recorded. The presence of mammals was assessed with regard to field signs such as droppings, burrows, tracks and feeding signs. The aquatic invertebrate fauna of rivers and streams is reported elsewhere in this EIS.

Impacts are assessed in accordance with the EPA Draft Guidelines on the information to be contained in Environmental Impact Statements.

In comparison with the surrounding agricultural land with species rich hedgerows, the proposed development site provides little habitat for birds and mammals. No significant nesting habitat for birds is present. No birds were recorded on the site during the survey. However, it is likely to be used by passerines which occur in the general area; the ephemeral and short perennial vegetation in the northern part of the site includes seed producing plant species likely to attract finches in late summer and autumn. Moorhen were recorded on the Triogue River. No mammals were recorded; rodents are the most likely group to occur.

## 4. IMPACTS AND MITIGATION.

The site proposed for the development of the Wastewater Treatment Works is included in the proposed Natural Heritage Area designation of the Ridge of Portlaoise. The vegetation and habitats of the site are extensively modified by the existing sewage treatment facilities as described above, and do not meet NHA standard. All of the existing vegetation on the site will be impacted by the construction of the new plant. This impact is assessed as slight.

The mitigation measures proposed here aim to enhance biodiversity within the wastewater treatment site, by developing a range of habitats consistent with the site topography, and with the remaining habitats of conservation value in the Ridge of Portlaoise pNHA.

It is proposed to construct screening mounds around the site perimeter to reduce the visual impacts of the new works. These mounds will be planted with native species of trees and shrubs to provide additional visual screening of the site. Ash and alder will be used to provide height; lower growing trees and shrubs suitable for inclusion to provide bulk and structure include hazel, holly, hawthorn, blackthorn, guelder rose and spindle.

Level areas of the site, between buildings and roadways, are suitable for the creation of esker grassland, providing that topsoil is removed prior to seeding.
These level areas will be sown with a native wildflower esker grassland seed mix of grasses and dicotyledon species including lady's bedstraw, cowslip, self-heal, meadow vetchling, tufted vetch, creeping cinquefoil, bulbous buttercup, field scabious, wild carrot, bird's-foot trefoil, yarrow, marjoram, and ox-eye daisy.

Different mowing regimes will be used in different areas of esker grassland to enhance plant and habitat diversity. Some areas will be mown in late July/early August, and the cut material removed. These areas will be mown again in late October/early November, and the cut material left. Other areas will be mown either in mown in late July/early August, or in late October/early November, and the cut material removed. Strips of grassland along internal roadways can be mown more frequently.

## 5. RESIDUAL IMPACTS.

Biodiversity in the Wastewater Treatment Plant site will increase in the short, medium and long term.

The proposed development will have a significant positive impact on water quality in the Triogue river, and aquatic habitats, flora and fauna will benefit in the short, medium and long term.

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# APPENDIX 1. PLANT SPECIES LIST (includes all species referred to in the text).

| Common name | Scientific name |
|---|---|
| | |
| **Rushes** | **Juncaceae** |
| Hard rush | Juncus inflexus |
| Soft rush | Juncus effusus |
| | |
| **Grasses** | **Gramineae** |
| Annual meadow-grass | Poa annua |
| Cock's-foot | Dactylis glomerata |
| Couch grass | Elymus repens |
| Creeping bent-grass | Agrostis stolonifera |
| Red fescue | Festuca rubra |
| Reed canary grass | Phalaris arundinacea |
| Ryegrass | Lolium perenne |
| Timothy | Phleum pratense |
| Yorkshire fog | Holcus lanatus |
| | |
| **Bur-reeds** | **Sparganiaceae** |
| Branched bur-reed | Sparganium erectum |
| | |
| | |
| **Dicotyledons** | |
| **Trees and shrubs** | |
| Alder | Alnus glutinosa |
| Ash | Fraxinus excelsior |
| Aspen | Populus tremula |
| Autumn gorse | Ulex minor |
| Beech | Fagus sylvatica |
| Bird cherry | Prunus padus |
| Blackthorn | Prunus spinosa |
| Bramble | Rubus fruticosus agg. |
| Brown birch | Betula pubescens |
| Crab apple | Malus sylvestris |
| Dog rose | Rosa canina |
| Elder | Sambucus nigna |
| Elm | Ulmus spp. |
| Goat willow | Salix caprea |
| Gorse | Ulex europaeus |
| Guelder rose | Viburnum opulus |
| Hawthorn | Crataegus monogyna |
| Hazel | Corylus avellana |
| Holly | Ilex aquifolium |
| Honeysuckle | Lonicera periclymenum |
| Lime | Tilia cordata x platyphyllos |
| Pedunculate oak | Quercus robur |
| Privet | Ligustrum vulgare |
| Rusty willow | Salix cinerea oleifolia |
| Scots pine | Pinus sylvestris |
| Silver birch | Betula pendula |
| Spindle | Euonymus europaeus |

| | |
|---|---|
| Sycamore | Acer pseudoplatanus |
| White poplar | Populus alba |
| Wild plum | Prunus domestica |
| Wych elm | Ulmus glabra |
| | |
| **Herbs** | |
| Bittersweet | Solanum dulcamara |
| Bird's-foot trefoil | Lotus corniculatus |
| Blue fleabane | Erigeron acer |
| Bulbous buttercup | Ranunculus bulbosus |
| Clustered dock | Rumex conglomeratus |
| Coltsfoot | Tussilago farfara |
| Common poppy | Papaver rhoeas |
| Cowslip | Primula veris |
| Creeping buttercup | Ranunculus repens |
| Creeping cinquefoil | Potentilla reptans |
| Creeping thistle | Cirsium arvense |
| Curled dock | Rumex crispus |
| Cut-leaved geranium | Geranium dissectum |
| Field scaboius | Knautua arvensis |
| Great plantain | Plantago major |
| Great willowherb | Epilobium hirsutum |
| Knotweed | Polygonum aviculare |
| Lady's bedstraw | Galium verum |
| Marjoram | Origanum vulgare |
| Mayweed | Matricaria maritima agg. |
| Meadow vetchling | Lathyrus pratensis |
| Meadowsweet | Filipendula ulmaria |
| Nettle | Urtica dioica |
| Nettle-leaved bellflower | Campanula trachelium |
| Nipplewort | Lapsana communis |
| Ox-eye daisy | Leucanthemum vulgare |
| Pineappleweed | Chamomilla suaveolens |
| Red bartsia | Odontites verna |
| Red clover | Trifolium pratense |
| Redshank | Polygonum persicaria |
| Ribwort plantain | Plantago lanceolata |
| Scarlet pimpernel | Anagallis arvensis |
| Self-heal | Prunella vulgaris |
| Silverweed | Potentilla anserina |
| Smooth hawk's-beard | Crepis capillaris |
| Smooth sow-thistle | Sonchus oleraceus |
| Spear thistle | Cirsium vulgare |
| Spiked water-milfoil | Myriophyllum spicatum |
| Stream water-crowfoot | Ranunculus penicillatus |
| Tufted vetch | Vicia cracca |
| White clover | Trifolium repens |
| Wild carrot | Daucus carota |
| Yarrow | Achillea millefolium |
| Yellow clover | Trifolium dubium |

# Appendix 5

# Portlaoise Main Drainage Stage 2

# Environmental Impact Assessment: Aquatic Ecology

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16 November, 2001

EcoServe

# CONTENTS

# EXECUTIVE SUMMARY

At present, the sewerage infrastructure in Portlaoise town is inadequate. Laois County Council propose to improve the current foul collection and storm-water system, and upgrade the existing Waste Water Treatment Plant (WWTP). The current study assessed existing water quality, freshwater fauna, flora, and fisheries in the river Triogue and smaller streams and tributaries likely to be impacted by the development. Recommendations and mitigation measures were made in relation to the potential short term and long term environmental impacts of the scheme on the aquatic environment.

A total of 36 taxonomic groups were recorded at 13 sites. The crustaceans *Asellus aquaticus* and *Gammarus* sp. were ubiquitous throughout the sites while sludge worms, midge larvae and leeches were abundant downstream of the sewage treatment works. Both cased and uncased caddisflies and mayflies were abundant in the cleaner stretches of river. Filamentous green algae were abundant at many of the sites and 10 other aquatic plants were recorded. Upstream of the sewage treatment works and far downstream on the river Barrow sites were classified as moderately polluted. Immediately downstream of the sewage treatment works the river was classified as seriously polluted with a gradual improvement downstream. Tributaries of the river Triogue passing through Portlaoise town were seriously to moderately polluted. The EPA found river quality in previous years to be better than recorded in the current study.

No species of nature conservation interest were recorded in the study area but they have been found elsewhere on the rivers Triogue and Barrow. The river Triogue supports stocks of trout while the upper Barrow is important particularly as a salmonid spawning and nursery area. Oxygen levels were lowest at three sites downstream of the WWTP and at one site on a tributary of the river Triogue. The Southern Regional Fisheries Board have reported a number of fish kills in this area over the past 10 years which have been caused predominantly by low oxygen levels. While the exact cause of these fish kills has not been determined, the sewage discharges may be an important factor.

Short-term impacts of the proposed scheme include sedimentation and the possible release of pollutants during the construction phase. These impacts can be minimised by the maintenance of a buffer zone along the edge of channels. The most important long-term impact of the scheme will be the improvement in water quality as a high quality effluent with lower BOD, suspended solids and nutrient levels (N, P) will replace the current discharge. Upgrading of pumping stations, removal of storm overflows and an improved collection system will improve water quality in the streams around Portlaoise town. This improvement in water quality will lead to an increase in the diversity of freshwater life, and conditions will be more suitable for salmonid fish. Careful site management during the construction phases, and high standards of maintenance during the operation of the new WWTP are important as mitigation. Long-term monitoring is recommended to document the impacts of the scheme.

# INTRODUCTION

The town of Portlaoise in County Laois is a large commercial and residential centre with a number of large housing developments underway. At present the current sewerage infrastructure is insufficient to deal with the quantity of waste produced. Thus increased sewage treatment is required. Laois County Council wish to (1) upgrade and extend the current foul collection system, (2) remove storm-water from the foul sewerage system, (3) upgrade and provide additional capacity at the existing Wastewater Treatment Plant (WWTP) site to ensure a consistent high quality effluent, and (4) provide sludge treatment facilities for the County with sustained disposal routes.

The development may impact on freshwater habitats, their fauna, flora and water quality. As part of a wider environmental impact statement the present study aimed to assess the impacts of

(1) construction of sewer extensions, new interceptor sewers, storm sewers, pumping stations, and

(2) upgrading of the existing WWTP on the freshwater habitats and species.

It would also recommend mitigation measures to minimise the impact on the freshwater environment. To achieve this, the freshwater habitats and macroinvertebrate species present in the River Triogue, the river Barrow in the vicinity of its confluence with the river Triogue and other minor waterways within the proposed development area were surveyed. In addition, existing information for the river Triogue and river Barrow was reviewed with respect to fisheries and water quality.

## Study area

Ecological Consultancy Services Ltd (EcoServe) undertook a freshwater macroinvertebrate survey of the proposed WWTP site and of watercourses likely to be impacted by the development. An assessment of the likely impacts of the development on the freshwater environment was made using data collected from the current study and existing information. Existing data on water quality, macroinvertebrates and fisheries was obtained from the Environmental Protection Agency (EPA) and the Southern Regional Fisheries Board.

# METHODS

Freshwater macroinvertebrate surveys were undertaken on the 7th and 8th September 1999 at existing EPA sampling stations on the river Triogue and on the river Barrow near the confluence with the river Triogue. Additional samples were collected in smaller watercourses, which may be impacted by the development.

Fifteen sites were examined (Table 1, Figure 1). One macroinvertebrate sample was collected at each of 13 sites; 2 on the river Barrow near the confluence with the river Triogue, 5 on the river Triogue downstream of the proposed WWTP development, 1 in Portlaoise town centre, 1 upstream of Portlaoise town, and 5 on smaller watercourses in the vicinity of the proposed development. No data was collected at Sites 9 and 15 as there were only ephemeral pools of water here and the ditch at Site 9 was overgrown and inaccessible. Macroinvertebrate samples were collected by 'kick' sampling for approximately 2.5 minutes in the faster flowing areas (riffles) of the river using a standard hand net (250 mm width, mesh size 1 mm). At some of the sites where there were no riffles, samples were collected in glide areas. The relative proportions of the species were recorded based on the EPA categories, i.e. (1) dominant, (2) common, and (3) present in small numbers, (4) sparse or (5) not recorded. A biotic index was derived using the Environmental Protection Agency (EPA) method (Table 2). Data was also collected at the sampling sites on substrata, conductivity, water temperature, dissolved oxygen, channel width, channel depth, bankside vegetation and aquatic macrophytes.

Table 1. Location of sites surveyed.

| Site | Location | River | Grid Reference |
|---|---|---|---|
| 1 | Portnahinch Bridge | Barrow | N 101 491 |
| 2 | Borness Bridge | Barrow | N 093 463 |
| 3 | Triogue Bridge | Triogue | N 075 476 |
| 4 | Eyne Bridge | Triogue | N 042 475 |
| 5 | Kyle Bridge | Triogue | N 005 464 |
| 6 | Portlaoise STW (Gorteen) | Triogue | N 001 464 |
| 7 | Portlaoise STW upstream | Triogue | S 997 464 |
| 8 | Borris Road Pumping Station No. 3 | small stream | S 994 478 |
| 9 | Hospital Site | small stream | S 987 485 |
| 10 | St. Vincents Pumping Station No. 6 | small stream | S 984 479 |
| 11 | Meelick Bridge | Triogue | S 966 479 |
| 12 | Mountrath Road | small stream | S 983 453 |
| 13 | Ballyfin Road | small stream | S 992 452 |
| 14 | Bridge Street | Triogue | S 985 474 |
| 15 | Borris Road | Small stream | S 992 491 |

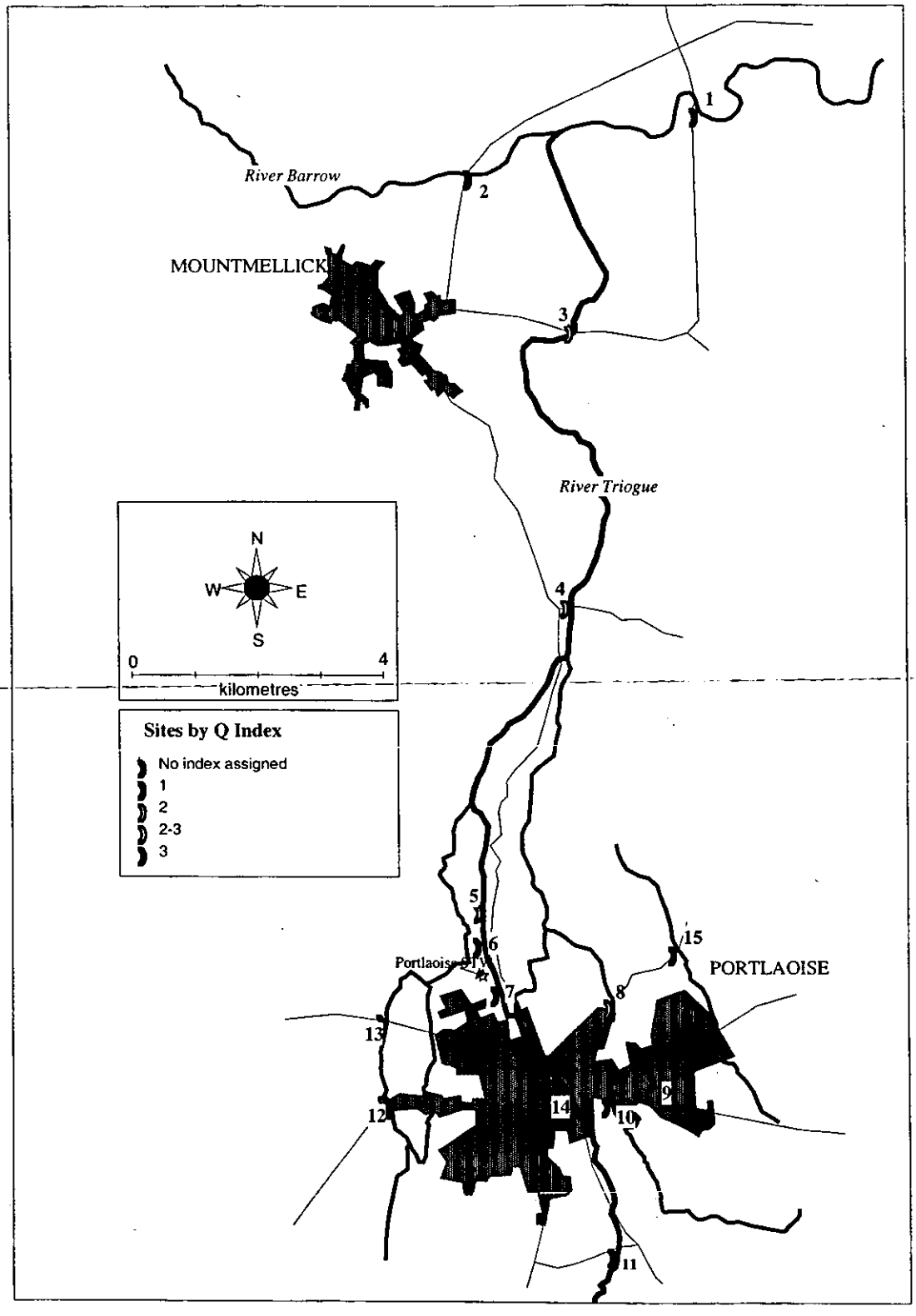


Figure 1. Map showing the sites surveyed.

Table 2. Biotic Indices and water quality classes (McGarrigle *et al.*, 1996).

| Biotic Index | Quality Status | Quality Class |
|---|---|---|
| Q5, 4-5, 4 | Unpolluted | Class A |
| Q3-4 | Slightly Polluted | Class B |
| Q3, 2-3 | Moderately Polluted | Class C |
| Q2, 1-2, 1 | Seriously Polluted | Class D |

Species that were not readily identifiable in the field were preserved in 70% Industrial Methylated Spirits (IMS) and returned to the laboratory for identification. Specimens were identified to the lowest possible taxonomic level and a voucher collection of representative material made. Specimens were identified using the following literature: for Ephemeroptera, Elliott *et al.* (1988); for Plecoptera, Hynes (1977); for caseless caddis larvae, Edington & Hildrew (1981); for case-bearing caddis larvae, Wallace *et al.* (1990); for Hemiptera-Heteroptera, Macan (1976); for bivalves, Ellis (1946); for gastropods, Macan (1977); for leeches, Elliot & Mann (1979); for triclads, Reynoldson (1978) and for other fauna, Fitter & Manuel (1986) and Croft (1986).

# RESULTS

A total of 36 taxa were collected in 13 sites (Table 3). The Crustacea *Asellus aquaticus* (water louse) and *Gammarus* sp. (shrimp) were ubiquitous throughout the sites sampled while Tubificida (sludge worms), Chironomidae (midge larvae) and Glossiphoniidae (leeches) were abundant in the river Triogue downstream of Portlaoise main drainage scheme. Trichoptera, both cased and uncased (caddis larvae), and Ephemeroptera (mayflies) were abundant in the cleaner stretches of river. Filamentous green algae were abundant at many of the sites and 10 other aquatic plants were present (Table 4). Data on substrata and other physical parameters (other than water quality) are presented in Appendix 1.

According to the Q-values, the sites sampled on the river Barrow both upstream and downstream of its confluence with the river Triogue were classified as moderately polluted. Q-values tended to be lower than previous values determined by the EPA (Table 3). Directly downstream of the WWTP the river Triogue was classified as seriously polluted with a Q-value of 1. The river Triogue upstream of Portlaoise town was classified as moderately polluted. Various tributaries on the east side of the town (sites 8, 10 and 14) were classified as moderately polluted, while a tributary to the west of the town (sites 12 and 13), which is also likely to be impacted by the development, was classified as seriously to moderately polluted.

Table 3. Aquatic fauna found in the macroinvertebrate survey of the rivers Triogue and Barrow and streams in Portlaoise town. No samples were collected at sites 9 and 15. ++++ = Well represented or dominant, +++ = Common, ++ = Present in small numbers, + = Sparse or absent, - = not recorded.

| Site | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLATYHELMINTHES | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Turbellaria** | - | - | - | - | ++++ | +++ | - | - | - | - | - | - | - |
| ANNELIDA | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Hirudinea** | - | - | +++ | ++++ | ++++ | +++ | +++ | - | - | - | +++ | - | - |
| Glossiphoniidae | - | ++ | - | ++++ | ++++ | - | + | - | - | - | I | - | - |
| *Helobdella stagnalis* | - | - | +++ | - | - | - | - | ++ | - | - | - | - | - |
| *Hemiclepsis marginata* | - | - | +++ | - | - | - | - | - | - | - | - | - | - |
| Pisicolidae | - | - | +++ | - | - | - | - | - | - | - | - | - | - |
| **Oligochaeta** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Tubificidae | - | - | +++ | +++ | ++++ | ++++ | +++ | - | ++ | - | - | ++ | ++ |
| Lumbricidae | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Eiseniella tetraeda* | - | - | - | - | - | - | +++ | - | - | - | - | ++ | - |
| MOLLUSCA | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Gastropoda** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Lymnaea peregra* | - | - | - | - | - | - | ++ | ++++ | +++ | - | - | - | +++ |
| *Potamogyrgus jenkinsi* | +++ | +++ | - | - | + | - | - | - | - | - | +++ | ++ | +++ |
| *Planorbis fluviatilis* | - | - | - | - | - | - | - | - | - | - | - | - | +++ |
| *Ancylus fluviatilis* | - | - | - | - | - | - | - | - | - | ++ | - | - | +++ |
| *Physa fontinalis* | - | - | +++ | - | - | - | - | - | - | - | - | - | - |
| *Bithynia leachi* | - | - | +++ | - | - | - | - | - | - | - | - | - | - |
| **Bivalvia** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Sphaerium corneum* | - | - | ++++ | - | - | - | - | +++ | ++ | - | - | - | - |
| *Pisidium* sp. | - | - | - | - | - | - | - | +++ | ++ | - | - | ++ | - |
| CHELICERATA | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Arachnida** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Lebertia* sp. | - | - | ++++ | - | - | - | - | - | - | - | - | - | - |
| CRUSTACEA | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Malacostraca** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Asellus aquaticus* | ++ | +++ | ++++ | ++++ | ++++ | +++ | - | +++ | ++ | - | ++++ | - | +++ |
| *Gammarus* sp. | +++ | +++ | ++++ | + | - | - | ++++ | ++++ | - | ++++ | ++ | ++++ | ++ |
| INSECTA | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Ephemeroptera** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Baetis rhondani* | ++++ | ++++ | - | - | - | - | ++++ | - | - | ++++ | - | - | ++++ |
| *Caenis pusilla* | - | ++++ | - | - | - | - | ++++ | - | - | ++++ | - | - | ++++ |
| **Plecoptera** | - | - | - | + | - | - | - | ++ | - | - | - | - | - |
| *Leuctra fusca* | - | ++++ | - | - | - | - | - | - | - | - | - | - | - |
| **Hemiptera** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Corixinae | - | - | - | - | - | - | - | - | +++ | - | - | - | - |
| **Diptera** | - | - | - | - | - | - | - | ++ | ++ | ++ | ++ | - | ++++ |
| Chironomidae | ++ | +++ | +++ | - | - | - | ++++ | +++ | ++++ | +++ | ++++ | - | +++ |
| *Chironomus* sp. | - | - | +++ | +++ | - | - | - | - | ++++ | +++ | - | - | +++ |
| Simuliidae | - | - | - | - | - | - | ++++ | - | - | - | - | - | ++++ |
| Cyclorrhapha | - | - | - | - | - | - | ++++ | ++ | - | +++ | ++ | - | +++ |
| Tipuliidae | - | - | - | - | - | - | ++++ | - | - | - | - | +++ | ++++ |
| **Trichoptera** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Hydropsyche* sp. | ++++ | ++++ | +++ | - | - | - | - | - | - | +++ | - | - | - |
| Limnephilidae | +++ | - | - | - | - | - | +++ | - | - | - | - | - | ++++ |
| Sericostomatidae | - | - | ++++ | - | - | - | - | - | - | - | - | ++ | - |
| **Coleoptera** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Haliplus* sp. | ++ | +++ | +++ | - | - | - | +++ | ++ | - | ++++ | - | - | ++ |
| *Elmis aenea* larvae | ++ | +++ | +++ | - | - | - | - | - | ++ | - | - | - | - |
| *Elmis aenea* adult | ++ | +++ | - | - | - | - | +++ | - | ++ | - | ++ | - | - |
| Beetle larvae indet. | - | - | - | + | - | - | - | + | - | - | - | - | - |
| **Lepidoptera** | - | - | - | - | - | - | - | - | - | - | + | - | - |
| PISCES | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Gasterosteus aculeatus* | - | - | - | - | - | - | - | ++++ | - | - | - | - | - |
| *Phoxinus phoxinus* | ++ | - | - | - | - | - | - | - | - | - | - | - | - |
| **Total No. Species** | **10** | **11** | **16** | **7** | **4** | **4** | **14** | **13** | **9** | **9** | **9** | **7** | **16** |
| **Q-index** | **3** | **3** | **2/3** | **2** | **2** | **1** | **3** | **2/3** | **3** | **3** | **2** | **3** | **3** |
| **EPA Q-index (sampled in 1997)** | **3/4** | **4** | **3** | **2** | **2** | **-** | **-** | **-** | **-** | **4** | **-** | **-** | **3/4** |

Table 4. Aquatic macrophytes recorded at the sites. A = abundant, C= common, P = present.

| Sites | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Filamentous green algae | A | A | A | - | - | P | A | A | - | A | P | - | - | - |
| *Lemna minor* | C | - | - | C | P | - | A | C | - | - | P | - | - | - |
| *Lemna trisulca* | - | - | - | - | - | - | - | C | - | - | P | - | - | - |
| Musci (mosses) | - | A | - | - | - | - | - | - | - | - | - | - | - | - |
| *Myriophyllum* sp. | - | - | A | A | - | - | - | - | - | - | - | - | - | - |
| *Phragmites* sp. | - | - | - | A | - | - | - | - | - | A | - | A | - | - |
| Slime | - | - | - | P | - | - | - | - | - | - | - | - | - | - |
| *Nasturtium officinale* | - | - | - | - | - | - | - | P | - | P | P | P | - | P |
| *Veronica beccabunga* | - | - | - | - | - | - | - | - | - | P | - | - | - | - |
| *Potamogeton obtusifolius* | - | - | - | - | - | P | A | - | - | A | - | - | - | - |
| *Mentha aquatica* | - | - | - | - | - | - | - | - | - | P | - | P | - | - |
| Other (unidentified) | - | - | P | - | - | P | - | - | - | - | - | - | - | - |

Dissolved oxygen levels were very low on the river Triogue downstream of Portlaoise town and at Site 13 located on a stream (Table 5). They were similar to the minimum values recorded by the EPA at various sites on the river Triogue during 1998-1999 (Table 5). The impact of the WWTP is evident when changes in these parameters along the river are graphed (Figure 2). There was a fish kill at Site 3 (Figure 3, Table 6). Figure 3 presents photographs taken at some of the sites.

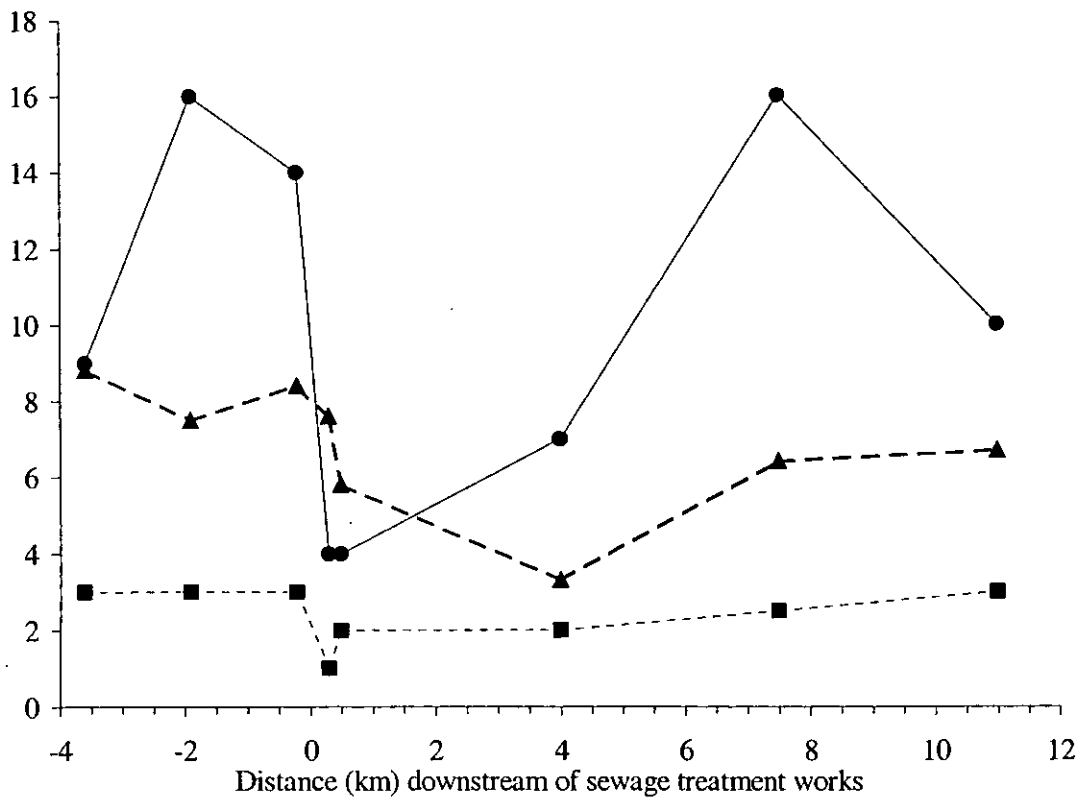


Figure 2. The number of species (#), Q-index (!) and dissolved oxygen (mg/l) (4) values from sites upstream and downstream of the sewage treatment works in the River Triogue.
The sites are 11, 14, 7, 6, 5, 4, 3 and 1.

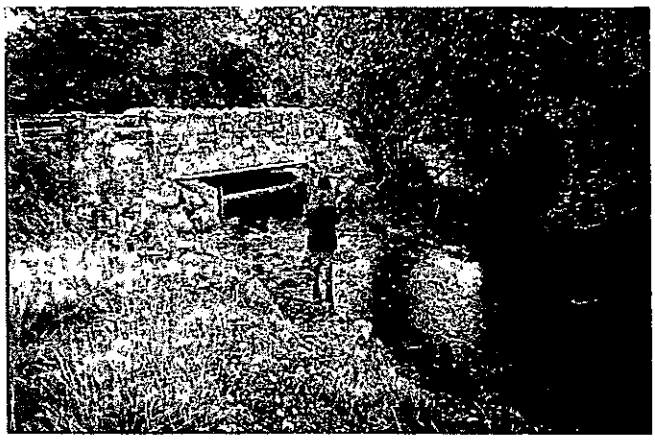

Figure 3a. Site 11: Meelick Bridge, located 3km upstream of Portlaoise town on the river Triogue.

Figure 3b. Site 6: River Triogue, immediately downstream of the Sewage Treatment Works.

Figure 3c. Site 3: Triogue Bridge, located on the river Triogue, approximately 7.5 km downstream of the sewage treatment works. Site of a major fish kill.

Figure 3d. Site 1: Portnahinch Bridge, located on the river Barrow downstream of its confluence with the river Triogue.

Figure 3e. Site 12: A small stream located west of Portlaoise town on the Mountrath Road.

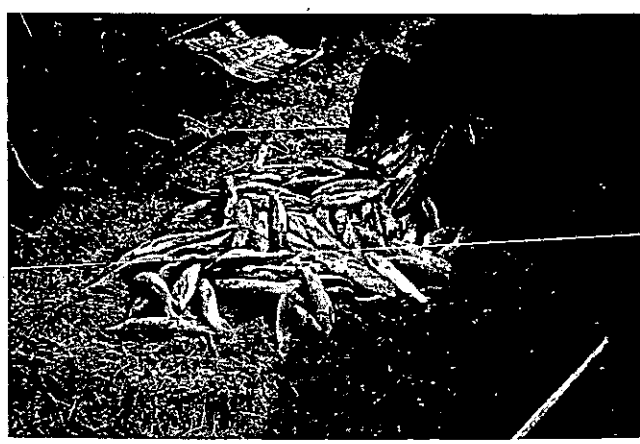

Figure 3f. Evidence of a fish kill at Triogue Bridge at on the river Triogue, taken 8th September 1999.

Table 5. Water temperature and dissolved oxygen conditions when the sites were sampled. No data was collected at sites 9 and 15. *EPA data, minimum values recorded 1998-1999 (n=8).

| Site | Water temperature | Dissolved Oxygen | | *Dissolved Oxygen |
|---|---|---|---|---|
| | (°C) | (mg/l) | (% sat) | (mg/l) |
| 1 | 16.3 | 6.7 | 71 | - |
| 2 | 16.5 | 9.8 | 98 | - |
| 3 | 17.1 | 6.4 | 68 | 7.0 |
| 4 | 17.1 | 3.3 | 36 | 3.2 |
| 5 | 17.4 | 5.8 | 60 | 2.8 |
| 6 | 16.6 | 7.6 | 78 | 7.4 |
| 7 | 16.3 | 8.4 | 85 | 8.5 |
| 8 | 16.6 | 10.0 | 101 | - |
| 10 | 16.1 | 9.3 | 93 | - |
| 11 | 15.5 | 8.8 | 88 | 8.7 |
| 12 | 16.1 | 8.1 | 82 | - |
| 13 | 14.7 | 6.0 | 58 | - |
| 14 | 14.9 | 7.5 | 73 | 9.3 |

Table 6. Recorded fish kills since 1989 (Lennon, Shannon Regional Fisheries Board, pers.comm.).

| Date | Location | Species & number of fish killed (approximately) | Cause of fish kill |
|---|---|---|---|
| 23/24th May 1989 | Triogue | 100 trout | De-oxygenation |
| 4th June 1995 | Triogue (Site 14) | 200 brown trout, 20 sticklebacks | Eutrophication/diurnal variation in dissolved oxygen |
| 21st June 1995 | Triogue Bridge (Site 3) | > 50 brown trout | Eutrophication/ diurnal variation in dissolved oxygen and temperature stress |
| 18th July 1995 | Triogue (Site 14) | > 3 brown trout | Unknown |
| 12th July 1997 | Triogue (Site 4) | > 40 trout | Unknown |
| 24th July 1998 | Triogue (between sites 3 & 4) | > 500 trout | Diurnal dissolved oxygen variation due to eutrophication |
| 7th September 1999 | Triogue (between sites 3 & 4) | > 500 trout | Unknown |

# DISCUSSION

## Freshwater macroinvertebrates

Between 1986 and 1997 there has been a decline in water quality in the river Barrow and its tributaries (Lucey, 1998). According to Lucey (1998), 34.7% of the river Barrow and its tributaries was classed as A (unpolluted), 40.1% as B (slightly polluted), 22.3% as C (moderately polluted) and 2.9% as D (seriously polluted). These data are based on biological surveys carried out between 1995-1997. Studies by Lucey (1998), Flanagan & Larkin (1992) and the results of this study indicate that water quality and biodiversity is poor in the river Triogue downstream of Portlaoise town (Q-values 1-3). Water quality is particularly bad immediately downstream of the WWTP (Site 6). This demonstrates that the current level of sewerage treatment is inadequate.

Tubificidae and Chironomidae are characteristic of heavily polluted waters, while mayflies and stoneflies are characteristic of clean waters (Gaufin, 1973). The species found in the river Triogue are characteristic of polluted water. Species indicative of cleaner water occur upstream of Portlaoise town and further downstream in the river Barrow. The water was 'cloudy' with a strong odour at the sites on the river Triogue downstream of Portlaoise WWTP. This was also the case for a small stream to the west of the town. A decrease in number of species and oxygen (Figure 2) occurs downstream of the WWTP, illustrating its negative impact on freshwater life.

The only legally protected aquatic invertebrate occurring in the rivers Barrow and Triogue is the crayfish *Austropotamobius pallipes* (Lucey, 1998). This species is common in the river Barrow and is protected under the Wildlife Act, 1976 and Habitats Directive (92/43/EEC) (Appendix 2). This study did not record *Austropotamobius pallipes* or other species of nature conservation interest at any of the sites. However, downstream of Portlaoise town conditions are unsuitable for crayfish.

## Fish populations

Brook lamprey, river lamprey and sea lamprey are rare while twaite shad and Atlantic salmon are common, in the river Barrow (Kurz & Costello, 1999). These species are all listed in the EU Habitats Directive (92/43/EEC) (Appendix 2). Neither the rivers Triogue or Barrow are designated under the EU Freshwater Fish Directive (78/659/EEC) (Appendix 2). However, there are a number of angling clubs in the area and resident populations of trout occur in the river Barrow (Lucey, 1998). The river Triogue supports stocks of trout, which usually come upstream to spawn above the town and the upper Barrow is important particularly as a salmonid spawning and nursery area (Lennon, pers. comm.). According to the Council Directive (78/659/EEC) on the quality of freshwater needing protection or improvement in order to support fish life, dissolved oxygen levels should be above 7

mg/l at all times and it is imperative that values remain above 9 mg/l at least 50% of the time. pH levels need to be maintained between 6-9 and a BOD below 3 mg/l is recommended. Dissolved oxygen levels recorded by EcoServe were below 7 mg/l at five sites (sites 1, 3, 4, 5 and 13) and were lowest downstream of the WWTP. Indeed dissolved oxygen was as low as 3.3 mg/l at Eyne Bridge, just downstream of Kyletalesha landfill site and the WWTP. The EPA previously recorded dissolved oxygen values as low as 3.2 mg/l at site 4 (Table 5). Dead adult trout were found downstream of this (Figure 3, Table 6) and a fish kill was reported by the local angling association that day and for which a definitive cause has not been established. Local angling associations and the Southern Regional Fisheries Board have reported a number of fish kills in this area (Table 6) for 10 years. The river Triogue has thus been polluted with consequent low oxygen conditions, which have significantly impacted fish and macroinvertebrate populations.

Conditions upstream of Portlaoise town on the river Triogue fulfilled the criteria cited in the Council Directive (78/659/EEC) on the quality of fresh waters needing protection or improvement in order to support fish life (based on data obtained from the EPA for 1998-1999). However, downstream of the WWTP, BOD was consistently elevated (up to 12.1 mg/l) and dissolved oxygen levels varied between 3-12 mg/l. Between the WWTP and the town there are no other sources of pollution other than runoff from adjacent land. At Kyle Bridge and Eyne Bridge on the lower reaches of the river Triogue dissolved oxygen levels were low reaching a minimum of 2.8 mg/l while BOD levels were as high as 8.9 mg/l. Levels of these parameters in the river Barrow were within the recommended levels.

# PREDICTED IMPACTS

## Short term impacts

1. The proposed upgrading of the existing WWTP will not lead to any direct loss of freshwater habitat as there are none present within the allocated building site. The river Triogue runs outside the perimeter of the WWTP. This river is already severely polluted from sewerage input from the sewage treatment works. During the construction phase, short-term impacts will involve sedimentation and release of pollutants. However, the biological impact is likely to be minimal due to the paucity of invertebrates and fish present here.
2. The proposed extension of the current foul collection system will involve the building of a large number of pipelines within Portlaoise town. The proposed pipelines impinge on smaller streams and channels in the town (Sites 8, 9, 10, 12 and 13). Construction of these pipelines will have a predominantly physical impact on the watercourses with potential for localised impacts on river bed habitats. During the construction phase increased sedimentation and turbidity in the water is likely to be detrimental to freshwater fauna. However, the freshwater communities are already limited to pollution tolerant invertebrates. Thus, the impacts would be minimal.

## Long term impacts

1. Water quality will improve as a high quality effluent with high BOD and suspended solids removal along with nutrient (N, P) reduction will result from the proposed upgrade to the works, which is very likely to lead to an increase in the diversity of species present.
2. Any upgrading of the existing WWTP is likely to have a beneficial impact on freshwater flora and fauna. The river Triogue is currently seriously polluted due to inadequate treatment of waste. However, there is potential for both salmonids and a more diverse invertebrate fauna like that present upstream of Portlaoise town. A reduction in input of fine organic and inorganic particles and nutrients should lead to an increase in dissolved oxygen levels, a reduction in BOD and reduced turbidity thus leading to conditions suitable for salmonids and a more diverse invertebrate community. This may allow recruitment of protected species such as freshwater crayfish, trout and salmon to the river Triogue below the WWTP where conditions are currently suitable.
3. The main proposals for an improved collection system are: (a) removal of storm overflows from streams by eliminating pumping stations. (b) upgrading of pumping stations which are required to be kept (increased carry forward capacity and/or storage) thereby limiting the frequency of overflows to the order of 1 spill per year. (c) new interceptor pipework will be sized to carry all flows from the full extent of the proposed development of Portlaoise.

4. The proposed extension of the current foul and storm collection system will alter the flow regime of the existing streams and channels, as wastewater from sources currently not included in the current collection system are intercepted and transported directly to the upgraded wastewater treatment plant. However, this is unlikely to be detrimental to the current fauna which are limited to a few pollution tolerant species.

The main impacts are summarised in Table 7.

Table 7. Impacts of the proposed development on the freshwater habitats surveyed in this study.

| **Impact type** | **Duration** | **Effect** |
|---|---|---|
| Fish populations | Long term effect | positive |
| Sedimentation | Short term effect | negative |
| Organic matter & nutrients | Long term effect | Positive |
| Bacteriological quality | Long term effect | Positive |
| Alteration to hydrology | Long term effect | unknown |
| Habitat removal during construction of pipes | Short term effect | negative |

# RECOMMENDATIONS AND MITIGATION MEASURES

## Site management

Utmost care and vigilance should be taken to prevent accidental contamination of the site and surrounding environment during the construction of interceptor sewers. During the construction phase, working and access areas should be restricted. Habitats disturbed during the construction process should be restored as close as possible to their previous status after construction. Habitat damage can be limited by working from one bank only and retaining vegetated areas alongside the river.

## Operational standards

The highest possible standards should be maintained during the operation of the new WWTP and associated infrastructure. It is important to ensure that the capacity of the WWTP is sufficient to deal with the volume and nature of incoming sewage.

## Long term monitoring

Long term monitoring of the river Triogue will reveal any impacts, beneficial or detrimental of the proposed development and indicate further changes that may need to be implemented in the future in the wastewater treatment plant. Monitoring of the rivers Triogue and Barrow for macroinvertebrates, fish and protected species should be conducted in spring and late summer each year. This will be able to quantify the improvements to river quality due to the improved sewage treatment facility.

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# GLOSSARY

Taken from National Rivers Authority (1992).

| Term | Definition |
|---|---|
| **Semi-improved grassland** | Vegetation dominated by grasses, herb-rich grassland lacking ancient meadow indicators |
| **Silt/Mud** | Unlike fine sands, these are of a soft texture and not abrasive to the hands if rubbed (<0.64 mm |
| **Sand** | Includes coarse and fine sands, the former merging into fine gravel and the latter merging into mud and silt (0.64 - 2mm). |
| **Gravel/shingle** | 2 - 64 mm diameter |
| **Cobbles** | 64 - 256 mm diameter |
| **Boulders** | Any rocks larger than 256 mm in diameter |
| **Bedrock** | Exposure of underlying solid rock in river bed. |
| **Artificial** | Any artificial materials covering the river bed e.g. concrete, brick, timber, etc. |
| **Pool** | A distinct, deeper area of slow-flowing water, often with an eddying flow, between fast-flowing stretch |
| **Slack** | Area of deep or shallow water where the velocity is slow due to a very shallow slope in the river, natural or artificial ponding. There is no widespread eddying and as river levels rise the water velocity increases much quicker than areas recorded as "pool" |
| **Riffle** | Fast flowing; shallow water with a distinctly broken or disturbed surface |
| **Run** | Fast or moderate flowing, deeper water with a surface generally undisturbed except for occasional swirls and eddies |
| **Rapids** | Rapid water velocity with a severely broken surface, deeper than a riffle |
| **BOD** | Biochemical Oxygen Demand |

# APPENDIX 1

Physical data for sampling sites. Substrata: B= boulders, C= cobbles, G= gravel, S= sand, M= mud.

| Site | Substratum | Width (m) | Depth (m) | Flow | Siltation | Discharge | Water clarity | Bankside vegetation | Habitat sampled |
|---|---|---|---|---|---|---|---|---|---|
| 1 | B=80%; G/S=20% | 8 | 0.6 | Fast | Slight | Normal | Slightly turbid | Open | Riffles |
| 2 | B=70%; C=20%; G/S=10% | 8 | 0.5 | Torrential | Slight | High | Slightly turbid | Partly shaded | Riffles |
| 3 | B=10%; C=10%; S=70%; P=10% | 5 | 0.3 | Slow | Moderate | Low | Slightly turbid | Open | Glides |
| 4 | G=50%; S=30%; M=10%; B/C=10% | 4 | 0.6 | Slow | Heavy | Normal | Turbid | Open | Glides |
| 5 | G=50%; C/S =50% | 5 | 0.1 | Fast | Moderate | Normal | Turbid | Open | Riffles |
| 6 | B=20%; C=20%; G=40%; S/M=20% | 3 | 0.3 | Moderate | Slight | Normal | Slightly turbid | Partly shaded | Riffles |
| 7 | B=30%; C=20%; G=30%; S=20% | 2 | 0.5 | Moderate | Slight | Normal | Slightly turbid | Partly shaded | Riffles |
| 8 | M=80%; C=10%; G=10% | 2 | 0.1 | Moderate | Heavy | Normal | Clear | Open | Glides |
| 10 | M=90%; C/S =10% | 4 | 0.4 | Slow | Heavy | Normal | Slightly turbid | Partly shaded | Glides |
| 11 | M=5%; G=15%, S/C=80% | 3 | 0.1 | Fast | Slight | Normal | Clear | Partly shaded | Riffles |
| 12 | B=10%; C=10%; M=80% | 3 | 0.1 | Moderate | Heavy | Normal | Very turbid | Partly shaded | Glides |
| 13 | B=30%; C=50%; other=20% | 2 | 0.2 | Moderate | Slight | Normal | Very turbid | Partly shaded | Riffles |
| 14 | B=70%; other=20% | 4 | 0.25 | Moderate | Moderate | High | Very turbid | Open | Riffles |

Site descriptions.

| Site | Name | Description |
|---|---|---|
| 1 | Portnahinch Bridge | Located on the River Barrow downstream of its confluence with the River Triogue. This is an EPA sampling site. There were abundant filamentous green algae in the channel and some common duckweed (*Lemna minor*) at the edges of the channel. There were sycamore trees (*Acer pseudoplatanus*) on the left bank and dense ruderal vegetation on both sides (e.g. grasses, horsetails & *Epilobium hirsutum*). The sample was taken 20 m downstream from the bridge. |
| 2 | Borness Bridge | Located on the River Barrow upstream of its confluence with the River Triogue. This is an EPA sampling site. Within the channel there were abundant mosses and filamentous green algae. There was semi-improved grassland on either side of the channel and limited shading. There were a few goat willows (*Salix caprea*) on the left bank and grasses, sedges and ruderals on both banks. The dominant ruderal species were thistles, docks, nettles, vetches and the Great Willowherb, *Epilobium hirsutum.* |
| 3 | Triogue Bridge | Located on the River Triogue downstream of Portlaoise and near to Mountmellick. This is an EPA sampling site. Within the channel there was a dense cover of water milfoils (*Myriophyllum* sp.), filamentous green algae and pondweed. Unimproved grassland occurred on each side of the channel, which was unshaded. There were some ruderals, with nettles and grasses dominating. There was a drinking hole for cattle beside the bank causing erosion here. A dead adult brown trout (*Salmo trutta*) approximately 15 cm long was found here (Note: a day subsequently there was a major fish kill reported here with up to 100 dead trout collected by the local angling association). |
| 4 | Eyne Bridge | Located on the River Triogue downstream of Portlaoise and upstream of Triogue Bridge. This is an EPA sampling site. There is evidence of canalisation here. There were abundant aquatic macrophytes (*Myriophyllum* sp., *Lemna minor* and *Phragmites*) in the channel. Abundant ruderals such as nettles, grasses and *Epilobium hirsutum* dominated the bankside vegetation. The channel was surrounded by unimproved grassland. The water here was cloudy. There was slime present within the channel on boulders and vegetation. |
| 5 | Kyle Bridge | Located on the River Triogue downstream of Portlaoise WWTP. This is an EPA sampling site. The river is very shallow here with some macrophytes (*Lemna minor*) within the channel. There was sewage fungus present and the water was odorous and cloudy. The left bank was badly eroded (by cattle drinking) and unimproved grassland was found here. On the right bank, there were patches of shrubs consisting mainly of bramble (*Rubus fruticosus*) and hawthorn (*Crataegus monogyna*). |
| 6 | Portlaoise STW (Gorteen) | Located on the River Triogue just downstream of Portlaoise WWTP. Dense hawthorn (*Crataegus monogyna*) and shrubs dominated the left bank. There were dense nettles and thistles on the right bank and unimproved grassland. There was a cattle drinking area on the right bank and the channel and banks were muddy here. Within the channel blunt-leaved pondweed (*Potamogeton obtusifolius*), filamentous green algae and other pondweeds were present. |
| 7 | Portlaoise STW upstream | Located on the River Triogue just upstream of the Portlaoise WWTP. The sample was taken approximately 6 metres upstream of the outfall. On the left bank there were dense shrubs, mainly brambles and hawthorn (*Crataegus monogyna*). Unimproved grassland was found on the right bank with nettles, thistles dominating the edge of the channel. There were muddy, eroded patches where cattle drinking areas were located. Within the channel filamentous green algae was abundant as was duckweed (*Lemna minor*) and blunt-leaved pondweed (*Potamogeton obtusifolius*). |
| 8 | Borris Road Pumping Station No. 3 | Located on a small stream bisecting Borris Road north-east of Portlaoise town centre along the path of the proposed eastern interceptor sewer. On the right bank unimproved grassland occurred with Borris Pumping Station on the left bank. Both banks were grassy and muddy with some ruderals. Within the channel, filamentous green algae were abundant. Duckweeds, *Lemna minor, Lemna trisulca* and common watercress (*Nasturtium officinale*) were present. |
| 9 | Hospital Site | Located in a small drainage ditch south of the Dublin Road between the Psychiatric Hospital and General Hospital in Portlaoise town along the path of an existing rising main. The channel here consisted of a very overgrown ditch running along a wall at the edge of an overgrown field. There were abundant ruderals and brambles present. The channel was more or less inaccessible with patches of standing water. No macroinvertebrate sample was taken. |
| 10 | St. Vincents Pumping Station No. 6 | Located on a small stream bisecting the Stradbally Road near the town centre located along the path of one of the proposed interceptor sewers north of a possible Pumping Station and at the site of a proposed rising main. This is a slow moving channel running through a housing estate. There are dense trees and shrubs along the left bank. The main species here are *ash (Fraxinus excelsior)*, beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), hawthorn |

| | | |
|---|---|---|
| | | (*Crataegus monogyna*) and brambles (*Rubus fruticosus*). On the right bank, managed grassland occurs. There are a few garden shrubs and tree saplings along here. Great willowherb (*Epilobium hirsutum*), water mint (*Mentha aquatica*), Brooklime (*Veronica beccabunga*) and watercress (*Nasturtium officinale*) occur at the water edges while blunt-leaved pondweed, *Potamogeton obtusifolius* is abundant within the channel. There is abundant filamentous green algae and organic matter in the channel. The river widens out to become a large pond just upstream of this with dense reedbeds, *Salix alba* and *Alnus glutinosa* and a variety of birds such as herons, mallard, coot and moorhen. |
| 11 | Meelick Bridge | This is a control site located on the River Triogue upstream of Portlaoise town. This is an EPA sampling site. On the left bank umimproved grassland dominates. There are some weeds along the left bank. The right bank is moderately shaded. Various willow trees (*Salix* sp.) occur along the right bank. Within the channel, there are some filamentous green algae on rocks. Duckweeds, *Lemna minor* and *Lemna trisulca* and watercress (*Nasturtium officinale*) were also present. |
| 12 | Mountrath Road | This is located on a small stream bisecting the Mountrath Road at Clonroosk Little west of Portlaoise town along the path of the proposed Western Interceptor Sewer. The water here is cloudy with a strong odour. The banks are steep with extensive ruderals and grasses on the right bank. On the left bank dense shrubs and trees occur. Brambles are abundant on both banks. Downstream, the river is completely shaded and overgrown with trees such as *Alnus glutinosa*. Within the channel there are dense sedges, reeds (*Phragmites*) and grasses. Marginal vegetation included *Nasturtium officinale, Epilobium hirsutum* and *Mentha aquatica.* |
| 13 | Ballyfin Road | This is located at a small stream bisecting the Ballyfin Road northwest of Portlaoise town along the path of the proposed Western Interceptor Sewer. Unimproved grassland occurs on the left bank. There is a line of trees running along the left bank shading the river with only a couple of trees on the right bank. *Fagus sylvatica* (beech) and *Crataegus monogyna* (hawthorn) are the main species present. There are abundant ruderals along the bank of the river. No macrophytes were present in the channel. |
| 14 | Bridge Street | This is located on the River Triogue in Portlaoise town centre and is an EPA sampling site. Cement walls surround the channel on both banks with some grasses and ruderals. Hedge bindweed and *Epilobium hirsutum* are abundant on the available banks. Downstream, high walls and dense trees cause heavy shading. *Nasturtium officinale* was present in the channel. |
| 15 | Borris Road | A drainage ditch at Borris Road proposed Pumping Station No. 4 was also visited but there was no water in the channel here so no samples were collected. Access was difficult to the stream running between the Industrial Estate and railway line southeast of Portlaoise town where a proposed sewer bisects the stream. Thus this area was not sampled. However, the same stream was sampled further downstream at sites 12 and 13 and the fauna here is likely to be similar to that these sites. |

# APPENDIX 2

## Extracts from 'Council Directive of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life (78/659/EEC)'.

"This Directive concerns the quality of fresh waters and applies to those waters designated by the Member States as needing protection or improvement in order to support fish life.... The aim of this Directive is to protect or improve the quality of those running or standing fresh waters which support or which, if pollution were reduced or eliminated, would become capable of supporting fish belonging to:

- indigenous species offering a natural diversity, or
- species the presence of which is judged desirable for water management purposes by the competent authorities of the Member States".

For the purposes of this Directive:

- salmonid waters shall mean waters which support or become capable of supporting fish belonging to species such as salmon (*Salmo salar*), trout (*Salmo trutta*), grayling (*Thymallus thymallus*) and whitefish (*Coregonus*).

The physical and chemical parameters applicable to the waters designated by the Member States are listed in Annex 1.

| Parameter | Salmonid waters | |
|---|---|---|
| | Guideline | Mandatory |
| Dissolved oxygen (mg l $O_2$) | 50% ≥ 9 | 50% ≥ 9 |
| | 100% ≥ 7 | |
| pH | - | 6 to 9 |
| Suspended solids (mg/l) | ≥ 25 | - |
| $BOD_5$ (mg/l O2) | ≥ 3 | - |
| Nitrites (mg/l $NO_2$) | ≥ 0.01 | - |
| Non-ionized ammonia (mg/l $NH_3$) | ≥0.005 | ≥0.025 |
| Total ammonium (mg/l $NH_4$) | ≥0.04 | ≥1 |

## Extracts from 'Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora'.

Annex II. Animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation.

Annex V. Animal and plant species of community interest whose taking in the wild and exploitation may be subject to management measures

Table of Irish freshwater species listed in the Habitats Directive.

| Species | Annex II | Annex V |
|---|---|---|
| *Lampetra fluviatilis* | ✓ | - |
| *Salmo salar* (only in freshwater ) | ✓ | ✓ |
| *Austropotamobius pallipes* | ✓ | ✓ |
| *Margaritifera margaritifera* | ✓ | ✓ |
| *Margaritifera durrovensis* | ✓ | ✓ |

## Wildlife Act, 1976 (No. 39 of 1976).

Under the Fifth Schedule (a) hunting listed species without a licence, (b) injuring a protected wild animal otherwise than while hunting it, (c) wilfully interfering with or destroying the breeding place of any protected wild animal is illegal.

However, it is not an offence 'while engaged in agriculture, fishing or forestry, or in zoology or in any other scientific pursuit, unintentionally to injure or kill a protected wild animal, or while so engaged to interfere with or destroy the breeding place of such an animal, or while constructing a road or while carrying on any archaeological operation, building operation or work of engineering construction, or while constructing or carrying on such other operation or work as may be prescribed, to kill or injure such an animal or destroy or injure the breeding place of such an animal, or to capture an injured or disable protected wild animal for the purpose of killing it humanely or with the intention of tending it and of later releasing it...'

The only freshwater species listed above included in Schedule 5 are *Austropotamobius pallipes* (freshwater crayfish) and *Margaritifera margaritifera* (freshwater pearl mussel).