Cork County Council

Comhairle Chontae Chorcai

Expansion and Upgrading of Blarney Sewage Treatment Works

Environmental Impact Statement

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CHAPTER ONE

INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT

OF EXTENSION TO BLARNEY WASTEWATER TREATMENT PLANT

1.1 ENVIRONMENTAL IMPACT ASSESSMENT

Throughout the world there is increasing evidence and awareness of the immediate and long term detrimental effects on the natural environment brought about by mans' activities in the name of progress and development. With the growing recognition that all natural resources are finite, despite ever increasing demands upon them, there is now much greater acceptance of the principle of balancing the needs of man and nature and conserving resources - *i.e.* the principle of sustainability.

Therefore, where significant developments are proposed it is essential that a systematic examination be carried out to assess the likely significant effects such developments may have on the environment. This is also desirable to ensure that the development is environmentally sustainable and to maximise the positive aspects while simultaneously minimising the negative effects of the project on the environment.

The systematic examination of the effects of a proposed development is known as the process of Environmental Impact Assessment (EIA) and the Environmental Impact Statement (EIS) is a statement of those effects. The evaluation of the EIS to determine whether a proposed development should be permitted to proceed is undertaken by a competent approval authority with an input by interested members of the public and this evaluation is part of the overall EIA process. The competent authority in this case is the Minister of the Environment.

Ryan (1990) defines the role of environmental impact assessment in the development of projects as follows:

"Environmental impact assessment (EIA) involves a systematic examination of the likely significant effects on the environment of proposed development, and incorporation into the decision making process of the results of that examination. Its purpose is to ensure that adequate consideration is given to the environmental effects of a development. It is important to understand that EIA forms part of, rather than pre-empts, decision-making processes. It is, therefore, a formal mechanism for ensuring that the environmental dimension is properly considered along with, for example, the social and economic aspects of the development….."

1.2 LEGISLATIVE BACKGROUND

The greatest single influence on Irish environmental legislation has been the EC and much of the recent legislation which has been enacted has been done so in order to comply with the requirements of the EC Action Programs on the Environment (Simons,

1994). Therefore, in order to fully understand the basis of Irish environmental legislation, the associated influencing factors must first be considered.

1.2.1 EU Directives and Regulations

The harmonious development of economic activities at a continued and balanced rate of expansion - *i.e.* the principle of sustainability - is among the main objectives of the Community. The Council of Ministers declared in 1973 that this could not be achieved in the absence of an effective campaign to combat pollution and protect the environment (Simons, 1994).

Simons (1994) outlines the basic tenets of sustainable development as:

1. "the polluter pays" principle;
2. the need for integrated pollution control and waste minimisation;
3. the need to assess environmental impacts at the earliest possible stage in all decision making processes.

With regard to the last tenet of sustainability as defined above, Environmental Impact Assessment is undertaken to ensure that the environmental effects that may arise from a proposed development are given due consideration from the outset of the planning process. In order to achieve this, the European Council issued Directive No. 85/337/EEC on the 27th of June 1985 regarding the assessment of the effects of certain public and private projects on the environment. This provides for the mandatory and discretionary assessment of projects on the basis of their inclusion in the Directive's two Annexes - Annex I contains nine classes of project and these are subject to mandatory EIA (however, special exemption procedures can apply) whereas Annex II contains a more extensive list of 83 types of project which is in turn divided into 12 classes (G. Kiely, Environmental Engineering, 1997). The projects listed in Annex II require an EIA only in certain circumstances. Wastewater treatment plants are listed under Annex II.

The Irish and EU environmental directives that can apply to the EIA process as it relates to wastewater treatment plants are listed as follows:

Regulation Name	Number
Quality of Bathing waters	S.I. No. 155 of 1990
Water Pollution Regulations	S.I. No. 271 of 1992
Quality of Salmonid Waters	S.I. No. 293 of 1988
Water Pollution Regulations	S.I. No. 108 of 1978
Quality of Shellfish Waters Regulations	S.I No. 200 of 1994
Urban Waste Water Treatment Regulations	S.I. No. 419 of 1994
Use of Sewage Sludge in Agriculture	S.I. No. 183 of 1991

Table 1.1 Irish and EU Environmental Regulations

The Urban Wastewater Directive S.I. No. 419 of 1994 (91/271/EEC) is the most relevant of those listed in Table 1.1 and the salient aspects of which are as follows (Kiely, 1997):

- "general need for secondary treatment of urban wastewater" for industrial and municipal discharges;
- treated effluent BOD (biochemical oxygen demand) of 25 mg/l;
- treated effluent COD (chemical oxygen demand) of 125 mg/l;
- treated effluent TSS (total suspended solids) of 35 mg/l;
- nutrient removal (2mg/l of Phosphorous and 10 to 15 mg/l of Total Nitrogen) for "sensitive receiving waters".

The terms BOD, COD and TSS are explained in Chapter Two.

In addition to the Urban Wastewater Directive, the Quality of Freshwater Supporting Fish Directive 78/659/EEC is also particularly important when the treatment works are discharging to a freshwater environment - *e.g.* a river. This directive lists minimum and desired values for fourteen (14) physical and chemical parameters which determine whether or not a freshwater environment can be deemed to support salmonid or coarse fish.

1.2.2 Local Government (Planning and Development) Regulations

The effect of Directive No. 85/377/EEC (EIA) on Irish legislation can be seen in the following quotation which is taken from the proceedings of a seminar entitled "Designing under the European Community Directives on the Environment" by Ryan, 1990 presented to the Institution of Engineers of Ireland:

"The European Communities (Environmental Impact Assessment) Regulations, 1989 (S.I. No. 349 of 1989), made by the Minister in December, 1989, provided for incorporation of the Directive into Irish Law for relevant developments other than motorways. These latter Regulations came into operation on 1st February, 1990. To coincide with this, the Minister made the Local Government (Planning

and Development) Regulations, 1990 (S.I. No. 25 of 1990). These Regulations set out detailed requirements as to the operation of EIA in planning applications and appeals, and established the procedure through which EIA will take place for relevant development undertaken by or on behalf of local authorities."

In view of the above, this EIS has been prepared for Cork County Council in accordance with the provisions of the following documents:

1. Statutory Instrument No. 349 of 1989:- European Communities (Environment Impact Assessment) Regulations 1989, and
2. Statutory Instrument No. 25 of 1990: - Local Government Planning and Development Regulations 1990.

The provisions of the above regulations stipulate which projects must be subjected to an Environmental Impact Assessment prior to the granting of the necessary approval for the project to proceed to construction stage.

The particular provisions of the Regulation applicable to this study are those pertaining to development by or on behalf of State Authorities - *i.e.* Part IV of S.I. No. 349, 1989 and Part IV of S.I. No. 25, 1990 - with Cork County Council as the Developer and the Minister of the Environment as the competent approval authority.

The subject of the proposal, the upgrading and expansion of an existing sewage treatment works at Blarney, Co. Cork, falls within the scope of Article 24.11(d) of S.I. No. 349 of 1990 - *i.e.* Wastewater treatment plants with a capacity greater than 10,000 population equivalent (p.e.). It will be seen in Chapter Two that the upgrading and expansion of the existing 6,500 p.e. works at Blarney will increase the p.e. being served by that plant to a figure in excess of 10,000.

1.3 DEVELOPMENT PLAN RECOMMENDATIONS

The town of Blarney is situated approximately 8km to the north-west of Cork City. It is built on the banks of the River Martin which is a tributary of the River Shournagh. The village of Tower is located 3 km to the west along the Link Road No. 69 and the village of Killard is located 1 km to the south-east. All three drain to the wastewater treatment plant at Blarney. The Ordnance Survey Discovery Map for the area is shown overleaf.

The 1996 County Development Plan for South Cork identifies the Blarney/Tower area as a twin settlement. In addition, the Development Plan designates the said area as a satellite serving Cork City. Therefore Blarney has considerable capacity for development given its proximity to a large, expanding urban centre such as Cork. Indeed, the 1976 Proposed Blarney Sewerage Scheme Report (Kavanagh) quotes the then Blarney Development Plan as identifying Blarney as being suitable for "heavy residential growth" given its accessibility to Cork City. Accordingly considerable residential development has occurred in the last two decades.

Blarney has its own tourist industry - Blarney Castle and its Blarney Stone being a well-known attraction for visitors. There are also a number of craft-based industries which have replaced the traditional textile industry which ceased with the closure of the Woollen Mills. The restoration of the mill for hydropower purposes and the development of activity holidays in the Blarney Estate will tend to increase the numbers of visitors to the area. The Development Plan recommends that the existing craft industries are to be maintained and augmented in time by light industry. In order to facilitate these recommendations, lands will require to be serviced for industrial, residential and associated purposes. The drainage of additional wastewater from these lands will place increased pressure on the existing treatment works.

Figure 1.1 Location Map Blarney – Tower, Co. Cork

1.4 BASIS OF EIS

The EIS for the proposed upgrading and expansion of the wastewater treatment plant at Blarney has been prepared on the basis of a preferred process design and layout. However, under procurement procedures for the construction of the facility, tenderers are permitted to propose alternative designs and layouts provided that the alternative can provide an equivalent, or better, level of performance as detailed in the written specification for the project.

If alternative designs are submitted and satisfy the above criteria, then the tendering authority (Cork County Council) must give due consideration to them.

It is therefore important to note that the process design and layout of the proposed upgrading and expansion works on which this EIS is based must be taken as indicative only.

1.5 CONCLUSION

In summary, this study:

1. outlines the necessity for upgrading and expanding the existing sewage treatment works at Blarney;
2. gives the information required in an environmental impact statement as specified in Article 25 of S.I. No. 349 of 1989 and Amendments S.I. No. 84 of 1994 and S.I. No. 101 of 1996);
3. shows that the scheme is in accordance with the relevant Plans and Directives including:
    a) the 1996 County Development Plan for South Cork;
    b) the Environment Action Programme (Department of the Environment, 1990);
    c) the EC Council Directive, 91/271/EEC (EC, 1991), concerning urban wastewater treatment.

CHAPTER TWO

DESCRIPTION OF EXISTING WORKS

2.1 SITE LOCATION

The existing wastewater treatment plant serving both the Tower and Blarney areas is located just off the main road connecting the two populations at Kilnamucky, Blarney, alongside Riverview.

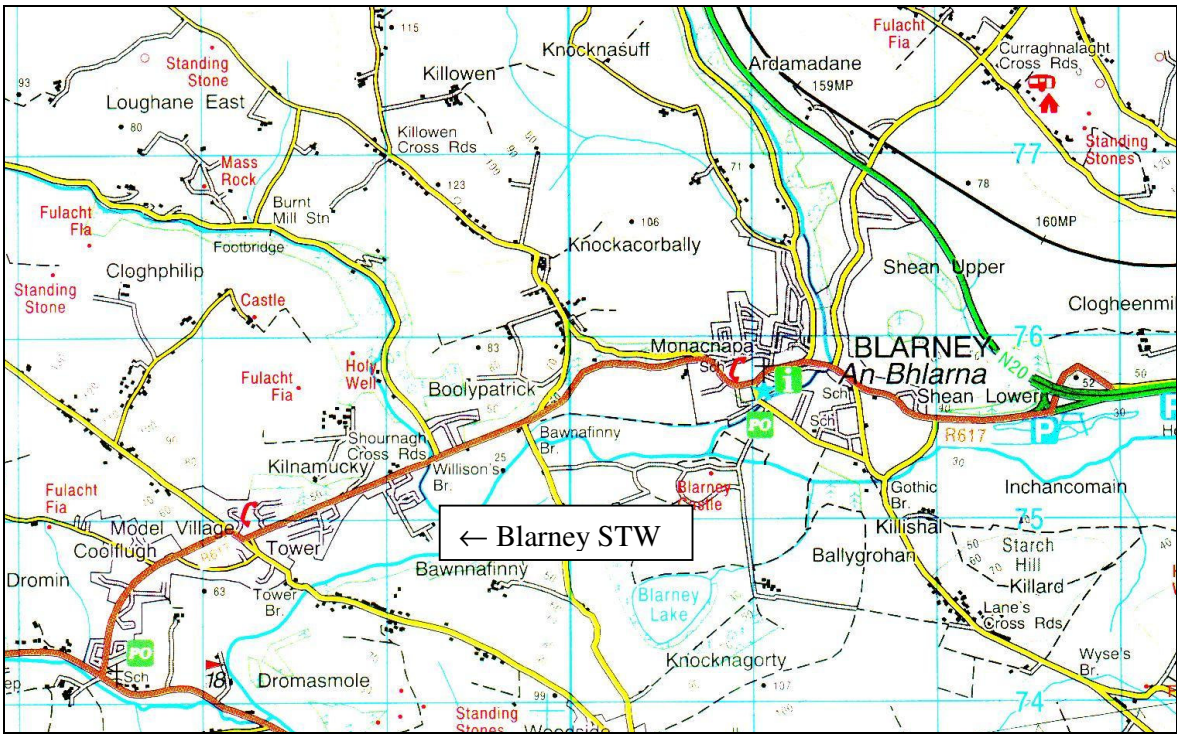

Figure 2.1 Site Location Map

A layout of the existing STW is contained in Appendix 3.

Figure 2.2 Aerial photograph of Blarney STW viewed looking east

Figure 2.3 Aerial photograph of Blarney STW viewed looking north

Figure 2.4 Aerial photograph of Blarney STW viewed looking west

2.2 HYDRAULIC AND BIOLOGICAL LOADINGS

Two key criteria in the design of a wastewater treatment plant are:

1. the hydraulic loading;
2. the biological loading.

Other factors include the diurnal and seasonal variations of the above.

The hydraulic loading can be defined as the quantity of wastewater arriving at the treatment works requiring purification. It is derived from the population equivalent (p.e.) contributing to the wastewater plant and this in turn estimated by considering the domestic, industrial/commercial and infiltration contributions to the plant and assigning appropriate p.e. figures to each. The overall hydraulic loading is then determined by multiplying the total p.e. value by per *capita* consumption estimation. Typical values range from 150 to 300 l/head/day.

The biological loading is defined as the total p.e. value multiplied by the BOD *per capita*. BOD is an abbreviation for biochemical oxygen demand which gives an indication of the biological instability or pollution capacity of a wastewater. A typical organic load for domestic wastewater is 60 g/head/day.

Fluctuations in both the hydraulic and biological loading will occur over any given day with typical domestic peak hydraulic flows occurring in the morning and early evening for example. However, for a town like Blarney which has a significant tourism industry, attention must also be paid to seasonal variations in loadings.

2.2.1 Original Design Loadings

The 1976 Preliminary Report prepared by Cork County Council for the construction of a drainage and treatment scheme suggested the ultimate population equivalent for lands available for development to be 19,000 excluding any industrial contributions. However, this figure was a conservative estimate insofar as development intensities for the development land were not known at the time. These figures were subsequently revised to a p.e. of 13,000. In lieu of this revision, it was proposed that the wastewater plant would be constructed in two stages, both of which would accommodate the wastewater arising from a population equivalent of 6,500. The plant as it currently exists corresponds to stage one of the original proposals.

The design per *capita* hydraulic and biological contributions were taken as being 300l/day and 60g/day respectively. These equate to a total hydraulic and biological loadings of 1,950m^3/day and 390kg/day BOD respectively for the stage 1 p.e. of 6500. The existing plant was installed to treat these loadings.

2.2.2 Current Loadings

Malachy Walch & Partners (MW&P) in their 1999 Scoping Report have reported current hydraulic and biological loadings as follows:

- Minimum Dry Weather Flow = 1,400m^3/day;
- Influent BOD = 310mg/l.

Assuming 85 to 90% of water users are connected to the sewerage scheme, MW&P have estimated a daily contributing p.e. of between 6,800 and 7,200.

Figure 2.5 Aeration and Clarifier Tanks

2.3 TREATMENT PROCESSES

Various methods of sewage treatment can be considered when designing a wastewater treatment plant. In choosing a treatment method (i.e. a secondary treatment method) items to be considered include:

a) characteristics of the raw sewage

b) sewage flow, present and future,

c) final effluent standard required,

d) acceptability of certain process related hazards such as smell, fly nuisance, etc.

e) ambient temperature,

f) disposal routes for the treated effluent and sludge

g) capital and running costs,

h) land requirements, and

i) civil works requirements

Conventional 'full' treatment to provide a Royal Commission quality effluent normally comprises:

a) Preliminary treatment: consisting of screening and grit removal,

b) Primary treatment (if included): in which solid matter is settled out as sludge in sedimentation tanks with the settled sewage (liquid) going forward for further treatment,

c) Secondary treatment of the settled sewage, and

d) Sludge treatment of the solid matter removed.

In addition to the above, provision can be made for nutrient removal based on the criteria set down in EC directive 91/271/EEC discussed previously. The primary sedimentation stage (b above) can be omitted from the overall treatment process as in the case with the existing plant at Blarney. In these types of plants, screening and grit removal is provided, and only secondary treatment and sludge treatment process options are considered. The individual stages of treatment are described briefly below by reference to the existing plant at Blarney which is a conventional activated sludge installation of its time:

2.3.1 Preliminary Treatment

The preliminary treatment (pre-treatment) may be defined as the process or processes that prepare a wastewater to a condition whereby it can be further treated in conventional secondary treatment processes (Kiely, 1997).

The pre-treatment process units which are installed in the Blarney plant are as follows:

- 2 no. comminutors;
- overflow weir and bar screen;
- 4 no. forward feed pumps providing an approximate combined capacity of 68 l/s.

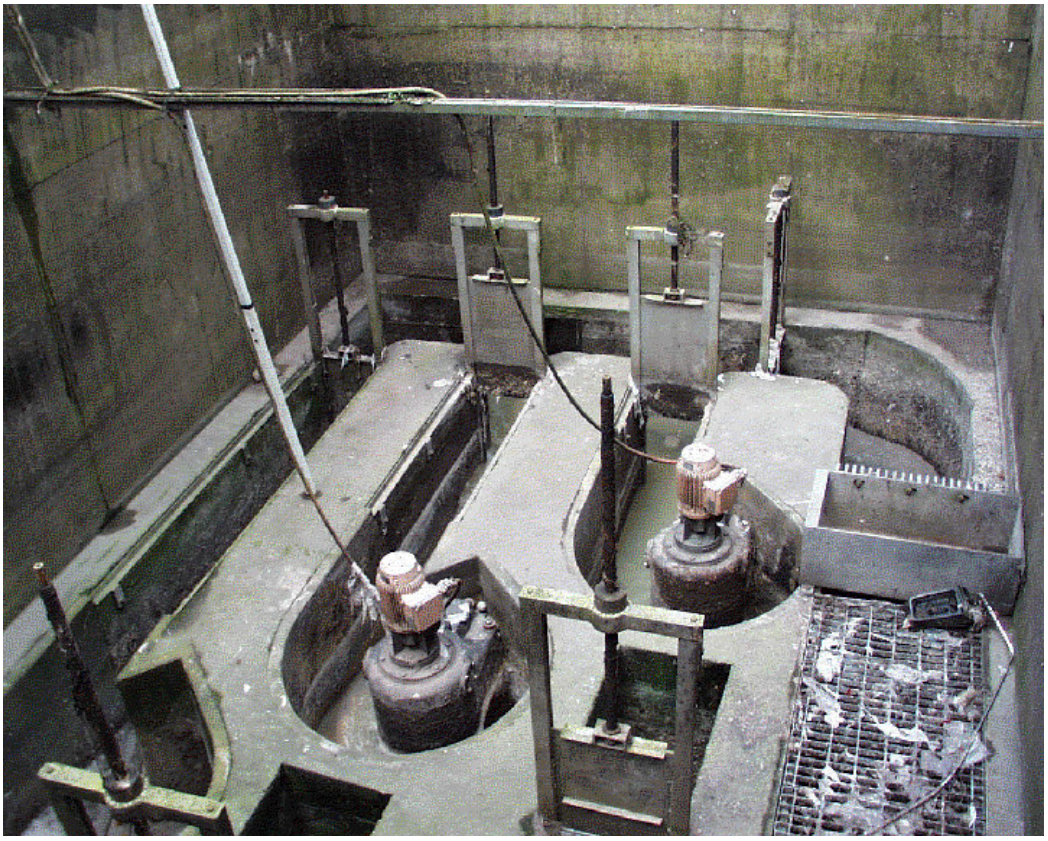

Figure 2.6 Comminutors

2.3.2 Primary Treatment

Primary treatment (also known as sedimentation, clarification or settling) allows the pre-treated wastewater to settle for a period (usually in the region of 2 hrs) thereby producing two effluent streams - 1) a moderately clarified wastewater stream (BOD concentration reduced by 25%) and 2) a liquid-solid sludge stream. The main objective of primary treatment is to remove part of the loading (gross solids) and to produce an effluent of suitable quality for secondary treatment.

Primary treatment was not provided at the existing Blarney works.

2.3.3 Secondary Treatment

Secondary treatment may be defined as the unit process which biodegrades the organic material in the primary effluent and converts it into non-polluting end products - *e.g.* H_2O, CO_2 and biomass (sludge). The resulting effluent has a reduced BOD concentration.

The treatment works at Blarney uses the activated sludge method of secondary (biological) treatment. This is achieved by first treating the effluent from the pre-

treatment processes in an aeration tank which promotes the biodegradation of unstable organic matter in an oxygen-rich environment. The effluent from the aeration tank is then subjected to clarification in secondary settling tanks from which there are two outgoing streams - 1) the treated wastewater and 2) a microbe-rich sludge. Approximately 20% of this sludge is returned to the aeration tank in order to maintain a sufficiently large microbial population in the aeration tank and the remaining 80% is sent to the sludge treatment processes. The sludge returned to the aeration process is referred as the returned activated sludge (RAS) and that which is sent directly to the sludge treatment processes is referred to as the waste activated sludge (WAS).

The secondary treatment units at Blarney are as follows:

- 1 no. extended aeration tank; (diameter = 29 m, volume = 1880 m^3)
- 1 no. secondary clarification tank. (diameter = 20 m, volume = 895 m^3)

Figure 2.7 Surface Aerators

Figure 2.8 Secondary Clarifier

2.3.4 Tertiary Treatment

With regard to municipal wastewaters, disinfection or polishing of the treated effluent is normally referred to as tertiary treatment.

Disinfection of effluent discharges is uncommon. However, where the receiving water body is considered particularly "sensitive" - e.g. bathing waters, waters used for shellfish farming and waters used for potable water abstraction - it may be considered as an option. The EC have issued directives governing the quality of bathing waters (76/160/EEC), shellfish waters (79/923/EEC) and waters from which potable water is abstracted (75/440/EEC). The following Irish regulations apply to Bathing Waters: S.I. No. 154 of 1992 Quality of Bathing waters, Recovation, Regulations, SI No. 145 of 1994 Quality of Bathing waters (amendment) regulations 1994. These may, in turn, determine whether or not tertiary treatment is required and, if so, to what standard.

A form of tertiary treatment system was installed at the Blarney works. This comprised of a spray system which spreads the treated effluent over a grassed area on the west side of the treatment works site. This allowed the effluent to percolate down through the soil undergoing further microbial action and filtering in the natural environment. However the system fell into disrepair after a few years of operation and has not been used for the past number of years.

2.3.5 Nutrient Removal

Nutrient removal refers to the reduction of phosphorous and/or total nitrogen levels. This is required where the receiving water body is deemed sufficiently "sensitive" - *e.g.* waters susceptible to eutrophication.

2.3.6 Sludge Treatment and Disposal

As stated above, approximately 80% of the sludge arising from the secondary clarification process is not returned to the aeration process and so requires disposal. However, given the biological instability of the sludge, it is standard practice to treat this sludge prior to disposal. In the context of sludge arising from the treatment of municipal wastewater various forms of treatment (aerobic and anaerobic) are used to stabilise the sludge.

Figure 2.9 Picket fence thickener

For example anaerobic sludge digestion involves the biological degradation of the sludge by microbial action in the absence of oxygen, the by-products of which include CH_4, CO_2 and a more stable biomass.

It is common practice to condition the WAS by thickening and dewatering. Thickening and dewatering have essentially the same effect - *i.e.* increasing the dry solids (DS) content of the effluent sludge by reducing the water content. The water abstracted during these processes is returned to the aeration tanks where it again undergoes secondary treatment.

Sludge thickening dewatering facilities are provided in the Blarney plant. The de-watered sludge is then removed off-site by private contractor and disposed of at Rossmore landfill, near Midleton, Co. Cork.

2.4 EFFLUENT STANDARD

The required effluent standard is a function of the sensitivity of the receiving environment as well as legislative requirements as outlined in Chapter One of this report. The two main parameters governing the quality of a treated effluent are:

1. BOD - biochemical oxygen demand;
2. SS - suspended solids.

SS represents the organic constituent of the wastewater that could not be settled out of solution because of practical restrictions on residence times and/or unsettleable particle sizes.

Other parameters might include COD (chemical oxygen demand), nitrogen and phosphorous. However, these are generally applicable to more specialised forms of treatment - *e.g.* wastewater arising from industrial processes - or in situations where the plant is discharging to an environmentally sensitive area - *e.g.* a water body susceptible to eutrophication.

As seen in the 1976 Preliminary Report prepared by Cork County Council, the UK Royal Commission standard of 20/30 was applied in the case of the Blarney Wastewater Treatment Plant. This implies that the treated effluent has a BOD of 20 mg/l and a SS content of 30 mg/l. Attaining a 20/30 standard approximately equates to a 90 %/ 95 % reduction of raw wastewater BOD/SS values.

2.5 IDENTIFICATION OF DEFICIENCIES

The original design caters for a population equivalent of 6,500 whereas the contributing p.e. in 1999 was estimated as being between 6,800 and 7,200. Currently it is estimated to be close to 8,000 p.e. In order to cope with the existing overloading and facilitate future developments in the Blarney area, the existing treatment plant will require upgrading and expansion.

MW&P, in their 1999 Scoping Report, identified the following as the main deficiencies associated with the Blarney works:

2.5.1 Preliminary Treatment

- Flows entering the works contain large quantities of storm water;
- The existing comminutors allow shredded material to enter the secondary treatment plant and this material can inhibit the biological processes. Also submergence of the comminutors can occur during storm events leading to the majority of the incoming flow bypassing the communitors and resulting in a significant quantity of rag and unscreened material being pumped forward to the aeration basin;

2.5.2 Secondary treatment

- The forward feed pumps are all capable of operating simultaneously allowing a flow greater than the design flow to be pumped to the aeration basin and secondary clarifiers thereby leading to hydraulic overloading the works for short periods (less than 16 hours) and inhibition of settlement in the final clarification tank;

2.5.3 Tertiary treatment

- Vandalism of the works is a regular occurrence, especially in relation to the spray irrigation system the administration buildings and treatment units.

2.5.4 Sludge Treatment

In addition to the problems identified in the scoping report by MW&P, the sludge handling and dewatering operations at the plant result in considerable odour nuisance to the plant operators and to the adjoining administration building / local area office and outside the site boundary.

2.6 CONCLUSION

In summary, the existing wastewater treatment plant at Blarney is currently overloaded- it was designed for a p.e. of 6,500 but the influent flow suggests a contributing population equivalent of approaching 8,000. MW&P have highlighted existing deficiencies with regard to the inlet works in particular, especially in relation to the control of flow through the works. The revised design population equivalent and the necessary upgrading and expansion of the works to cater for the increased flows are discussed in the following chapter.

CHAPTER THREE

PROPOSED UPGRADING AND EXPANSION OF WORKS

3.0 INTRODUCTION

It is intended that the expansion and upgrading works required at the Blarney Sewage Treatment Plant will be procured under Design/Build form of contract. This method of procurement is favoured for works of this nature so as to allow the maximum flexibility to tenderers / contractors in the type of equipment and treatment plant units to be designed and installed to meet the specific needs of the individual facility. It is also in keeping with the objective of the Department of the Environment and Local Government (DOELG) as set out in the circular letter L3/99.

The indicative upgrading and expansion process described below is based on the Employer's Requirements for the works and on the earlier scoping report prepared by Messrs Malachy Walsh & Partners.

Accordingly, the proposed upgrading and expansion works described below should be taken as an indicative layout only of the type of plant that will be installed at Blarney. Any process and layout arising from the design/build method of contract procurement will be considered appropriate provided:

a) Its impacts are equal to the impacts described in the EIS

or

b) Its positive impacts are of greater significance than those outlined in the EIS

or

c) Its negative impacts are of lesser significance than those outlined in this EIS.

3.1 PREDICTED LOADINGS

MW&P in their 1999 Scoping Report suggest a proposed population equivalent of 17,000 based on existing and predicted usage - residential, industrial and commercial/tourism (Ref. Appendix 3 for extract on Design Loadings). It is noted that this population equivalent is in excess of the 10,000 threshold for mandatory EIA (see Chapter One).

Based on the above report and the proposals in the County Development Plan for the Blarney area it is proposed that the upgrading and expansion works at the wastewater plant be designed to cater for the following population equivalents:

Phase 1 13,000 (i.e. 100% increase on the existing capacity)

Phase 2 19,500 pe. (i.e. 200% increase on the existing capacity)

Assuming a *per capita* contribution of 225 l/day, this p.e. figure implies a design dry weather flow of 2925 m^3/day for phase 1 and 4388 m^3/day for phase 2.

The biological loading associated with this flow, assuming a *per capita* contribution of 60 g/day, is 780 kg/day for phase 1 and 1170 kg/day for phase 2.

3.2 REQUIRED EFFLUENT STANDARD

The Shournagh River is not designated as a "sensitive area" under the third schedule of the Environmental Protection Agency Act, 1992 and (Urban Wastewater) Regulations, 1994. Therefore, under article 4(1) of the Regulations, secondary treatment of the wastewater is normally required yielding an effluent with at least the following requirements:

- BOD ≤ 25 mg/l;
- SS ≤ 35 mg/l;
- COD ≤ 125 mg/l.

Another standard commonly applied is the Royal Commission on Sewage Disposal standard (1912). This standard requires an effluent BOD of 20 mg/l and a SS of 30 mg/l. With this standard it can be shown that an 8 times dilution with clean river water is required to prevent the BOD exceeding 4 mg/l below the discharge. The main reason for limiting SS in effluents is that they may settle o the stream bed and inhibit certain forms of aquatic life. Flood flows may re-suspend these bottom deposits and exert sudden oxygen demands. This standard will be reached in the proposed effluent quality below.

Due to the limited dilution capacities of the Shournagh River, as examined in section 4.1, it is proposed to improve on the current standard of the effluent discharged as the quantity of effluent increases. Figure 3.1 and Table 3.1 indicate the variation of the allowable effluent BOD as the hydraulic load increases.

Stage	Population	Design Flow rate	Allowable Effluent BOD	
		[m3/day]	BOD [mg/l]	SS [mg/l]
Existing	6500	1950	25	35
Phase 1	13000	2925	20	30
Phase 2	19500	4388	15	25

Table 3.1 Effluent Flow Rate v. Allowable Effluent standard

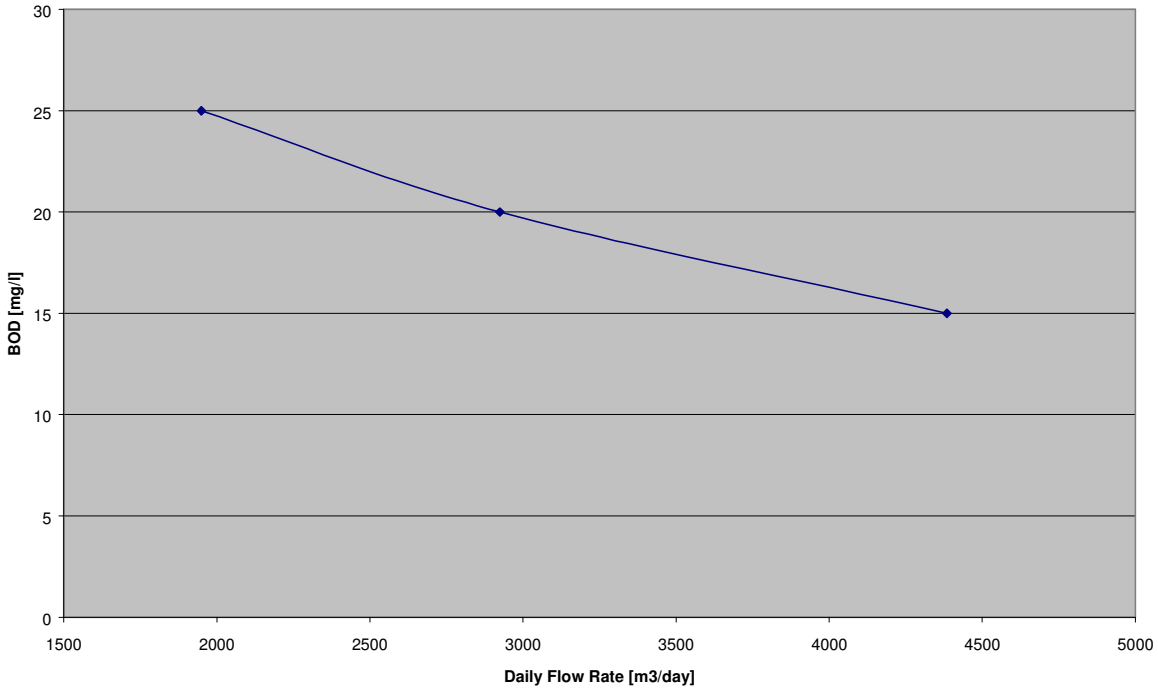

Figure 3.1 Plot of Effluent Flow Rate v. Allowable Effluent BOD

3.3 PROPOSED IMPROVEMENTS TO TREATMENT PROCESSES

3.3.1 Preliminary Treatment

It is proposed to remove the comminutors as they are deemed ineffective and to use the inlet tank as a pump sump for the forward feed pumps to the plant.

It is proposed that a new inlet works be provided comprising screening, washing and compacting of the material removed by the screens, grit removal and grit classification to cater for in the preliminary treatment of the influent to the plant. Flow measurement of incoming and forward feed flows would also be provided.

In response to the stated deficiencies, it is recommended that suitably sized storm water tanks be provided as a means of flow equalisation. Other advantages inherent in the provision of balancing tanks are:

- better flow management through the plant allowing for a more uniform hydraulic loading and the elimination of surging;
- the facilitation of chemical pre-treatment - *e.g.* neutralisation of pH variations.

All these ensure greater efficiency of the unit processes thereby producing a higher quality effluent.

However, equalisation may not be economical for municipal plants if the peaking factors (peak flow/average flow) are less than 2 (AWWA, 1992).

3.3.2 Primary Treatment

Primary treatment could be provided through the construction of sedimentation tanks. They would normally be designed to remove approx. 30 % of the BOD load and 60 % of TSS load, and would have a retention time of about 2 hours. The settled primary sludge would be pumped on to the Sludge Holding Tank and then eventually on to the de-watering house, after which it may require further stabilisation. However the installation of primary treatment units may not be favoured or proposed by tenderers as the sludge produced at this stage of the treatment process is less stable and requires further treatment.

3.3.3 Secondary Treatment

It is proposed that a second aeration basin of equal capacity to the existing basin be constructed to cater for the phase 1 increases in plant size and that a further aeration basin be constructed at a later stage for the phase 2 flows. Surface mounted aerators, similar to the existing could be utilised or alternatively a diffused air system could be installed. In order to keep the MLSS in suspension during low load periods, it is proposed that submersible mixers or flow boosters be installed in each aeration basin.

To allow the aerated effluent to settle, another secondary clarifier is proposed. It is to be of similar capacity to the existing clarifier and is again to return a portion of the activated sludge to the aeration tank. The waste activated sludge is to be pumped forward to the existing sludge holding tank.

3.3.4 Tertiary Treatment

It is not intended to restore the spray irrigation system as it exists at the plant at present. This type of treatment is very rare in Ireland and is considered unnecessary. The pumps supplying the irrigation system are still functioning as recently demonstrated by the caretaker.

During the odour dispersion modelling assessment by Bord na Mona, the odours emitted by the spray system were considered. The assessment was that the odours would be negligible as the BOD of the treated effluent are already expected to be low. The capacity of the spray area to drain the spayed effluent is small because of the low lying ground (almost at river level). Also as the water table is relatively high, the treatment of the effluent is minimal.

In phase 2, an alternative form of tertiary treatment is proposed to reduce the effluent BOD levels from 20 to 15 mg/l. This treatment may be undertaken via reed bed filtration. As the treatment to be provided by the reed bed is essentially a polishing process, the retention times and overall area required should be well below the typical values stated for full treatment by this method.

3.3.5 Sludge Treatment and Disposal

It is proposed that the sludge de-watering system be completely upgraded with the provision of a new double belt press, capable of dealing with the total design load (19,000 p.e.) installed in new building on the south western area of the site and remote from the administration building. De-watered sludge would be conveyed to the exterior of the building using a screw conveyor. The existing belt presses would be transferred to the new sludge building and used as a back-up for the new system.

The de-watered sludge would continue to be removed off-site by a private contractor to the council landfill at Rossmore. If primary treatment were to be provided as part of the upgrading works , the sludge could be less stable than the existing sludge produced and appropriate odour control measures would have to be incorporated to ensure compliance with the criteria specified later in section 5 of the EIS.

3.3.6 Plant Layout

As stated earlier the final plant layout for the upgraded and expanded works will be governed by the particular design adopted for the works. Indicative layouts of some of the options which might to be considered are shown on drawings no 3 to 5.

3.3.7 Telemetry and Security

It is proposed to install telemetry to each process within the plant to allow complete monitoring of all operations. All operational data would be recorded for future review and analysis. It is also proposed to install a CCTV system and security system which would sound an alarm should the plant be broken into. It is proposed to retain and to repair any defective sections in the existing fence and to extend the security palisade fencing around the entire site boundary.

3.3.8 Buildings and Accommodation Works

The proposed buildings are to house only the control works and the sludge dewatering equipment for the proposed plant. The existing area office at the site is to be relocated in due course to the centre of Blarney to allow for greater accessibility to the public and visitors to the town. In the interim the existing office will be retained at the site until such time as the new offices are provided in the town. The plant store offices will be retained at the works and the existing sludge dewatering building will be converted to a store.

3.4 Conclusion

It is concluded that if the stated proposed works are constructed the final effluent produced will meet the required standards and that the expanded and upgraded plant will meet the emissions and other criteria specified later herein (e.g. odour, noise, etc.). The predicted developments in the serviced areas may then go ahead to the extent of a population equivalent of 13,000 in phase 1 and 19,500 in phase 2.

CHAPTER FOUR

WATER QUALITY

4 Water Quality

4.1 Baseline Conditions

These refer to the average existing water quality in the water body affected, in this case the Shournagh River.

4.1.1 Receiving Water Body

The EPA has defined a biotic index to describe the degree of pollution and the faunal diversity of a water body. This index is summarised in the table below:

Biotic Index	Quality Status	Water Quality	Condition
Q5	Unpolluted	Good	Satisfactory
Q4	Unpolluted	Fair	Satisfactory
Q3	Moderately Polluted	Doubtful	Unsatisfactory
Q2	Seriously Polluted	Poor	Unsatisfactory
Q1	Seriously Polluted	Bad	Unsatisfactory

The intermediate indices Q1-2, 2-3, 3-4 and 4-5 are also used to denote transitional conditions. The biotic index may be used to evaluate the community diversity, with a water body designated as Q5 having a high degree of diversity. A consequence of increasing pollution is a decrease in faunal diversity and an increase in the density of tolerant forms; in extreme cases all life may be obliterated. It is therefore possible to relate certain faunal groupings or community types to particular levels of pollution.

The Shournagh River and its tributaries the Blarney and the Martin are not designated as salmonid waters under the Freshwater Fish Regulations (S.I. No. 293, 1998). Thus, as stated in section 2.30 of Water Quality in Ireland, 1995-1997, EPA, these regulations do not strictly apply to the water quality of these rivers. However as tributaries of the River Lee (a designated salmonid water), it is intended to comply with these regulations where possible.
The criteria of these regulations relating to oxygen levels are:

1. Dissolved oxygen : none less than 6 mg/l; 50 % of samples to be greater than 9 mg/l;
2. Biochemical Oxygen Demand (BOD) :95 % of samples to be less than 5 mg/l O_2;

In the Water Quality in Ireland, part 2: river quality data, EPA, 1986, the Shournagh River has a water quality rating of 4 - 5. In the Interim Report on The Biological Survey of River Quality, EPA, 1997, The Shournagh was given a Q value of 4 - 5. Also the Water Quality in Ireland 1995-1997 report, EPA also states a Q value of 4 - 5. The assessment of these ratings are: "continuing satisfactory with mostly fair to good ecological quality". The physico-chemical analysis data available for this river are contained in Table 4.1 and generally show a

high percentage saturation of dissolved oxygen. The river drains into the River Lee near Ballincollig (downstream of Iniscarra Dam).

Figure 4.1 Shournagh River

1 Willisons Bridge (upstream of sewage treatment works)

Date	Appearance	Temperature Deg C	pH	Dissolved Oxygen [mg/l O_2]	DO Sat. [%]	BOD [mg/l]
15/05/97	Clear	12.0	8.1	11.3	103	1.0
18/03/98	Clear	---	7.9	---	---	1.0
25/06/98	Coloured	13.0	7.8	11.2	105	1.5
24/09/98		---	7.9	10.7	75	0.5
10/02/99	Clear	5.0	7.6	12.7	100	1.5
30/06/99	Clear	13.0	7.8	10.9	102	0.9

2 Bawnnafinny Bridge (upstream of sewage treatment works on the River Martin)

Date	Appearance	Temperature Deg C	pH	Dissolved Oxygen [mg/l O_2]	DO Sat. [%]	BOD [mg/l]
15/05/97	Clear	12.0	8.1	12.0	110	1.0
18/03/98	Clear	0	7.8	---	0	1.0
25/06/98	Clear	13.0	7.8	10.7	100	2.2
23/09/98	Clear	12.0	7.8	10.1	92	0.7
10/02/99	Clear	6.0	7.3	12.5	100	0.8
23/06/99	Clear	14.0	8.0	11.8	113	1.4

3 Tower Bridge (just downstream of sewage treatment works (STW))

Date	Appearance	Temperature Deg C	pH	Dissolved Oxygen [mg/l O_2]	DO Sat. [%]	BOD [mg/l]
24/09/98	Clear	11.0	7.8	10.9	98	0.5
10/02/99	Clear	5.0	7.6	12.3	96	1.2
30/06/99	Clear	13.0	7.7	10.9	102	0.8

4 Bannow Bridge (well downstream of the STW, upstream of confluence with River Lee)

Date	Appearance	Temperature Deg C	pH	Dissolved Oxygen [mg/l O_2]	DO Sat. [%]	BOD [mg/l]
15/05/97	Clear	11.5	7.9	10.6	96	1.5
18/03/98	Clear	---	---	---	---	1.0
25/06/98	Coloured	13..0	7.7	10.2	96	1.8
24/09/98	Clear	12.0	7.8	10.9	100	0.5
10/02/99	Clear	4.5	7.1	12.2	95	1.3
30/06/99	Clear	13.0	7.9	10.9	102	0.9

Table 4.1 Shournagh River Water Quality Records

Table 4.2 shows that the quality of effluent discharged just meets the standard set down in the Environmental Protection Agency Act, 1992 and (Urban Wastewater) Regulations, 1994. BOD ≤ 25 mg/l, SS ≤ 35 mg/l, COD ≤ 125 mg/l.

Date	BOD [mg/l]	COD [mg/l]	TSS [mg/l]
18/06/99	25	65	32
11/02/99	5	15	4
21/01/99	14	29	6
04/12/98	7	22	15
12/11/98	7	12	12
22/10/98	8	24	4
25/09/98	24	40	9
28/08/98	19	59	4
05/08/98	3.4	----	5
25/06/98	5.9	39	8
30/01/98	12	39	18
14/01/98	----	27	12

Table 4.2 Records of the quality of the effluent discharged to the Shournagh River.

4.1.2 River Shournagh Flows

The following is an extract of a personal communication from M. MacCarthaigh, EPA:

"Station 19018 Tower on the Shournagh River is operated and maintained by Cork County Council. The catchment area to the station is estimated at 160 km^2. Records of water level commenced in May 1977. In September 1985, the laying of pipes at Tower Bridge altered the river channel at the station and thus affected the rating of the station. The river channel has been slow to settle down and we have tried to follow the changes in ratings. Since 1985, ratings have been obtained for limited periods: a rating was obtained from 1986-1988, no rating from October 1988 - December 1994, a rating from 1995 to date. Because of these difficulties, it is proposed that the station be relocated to a new location downstream.

95 Percentile Flow at Station 19018 Tower

The 95 percentile flow rate is defined as the daily mean flow with a probability of exceedance of 0.95 in the long term.

The records for the period 1978 – 1985 were processed into tables of daily mean flows and in the period 1978 – 1985, the 95 percentile flow was 0.53 m^3/s. This would not be regarded as a good estimate of the long term 95 percentile flow rate as it does not contain data for the droughts of 1975, 1976, 1977 and 1983 but does not include data for 1985 which was a particularly wet summer.

In the long term the 95 percentile flow at Station 19018 Tower on the River Shournagh would be expected to stabilise at around 0.27 m3/s.

Dry Weather Flow at Station 19018 Tower
The Dry Weather Flow rate (DWF) has been defined in water quality management plans as the annual minimum daily mean flow with a probability of exceedance of 0.98 (i.e. with a return period of 50 years). The dry weather flow at Station 19018 Tower on the River Shournagh is estimated at 0.12 m3/s."

The above figures for Station 19018 Tower were calculated using data from Station 19015 Healy Bridge. The daily mean flows from 1983 to 1985 are given in Appendix 1.

4.1.3 Other Water Bodies

The other water body of interest is the groundwater flowing beneath the irrigation area at the plant. As spray irrigation has not been in use for some years, it is unlikely that the groundwater is contaminated with nutrients or coliform bacteria. This loading of the soil should have no impact as no water wells are sited in the immediate vicinity of the spray area.

4.2 Development Features

One of the main development features regarding water quality is the provision of a storm holding tank and proper inlet works. The storm holding tank will tend to reduce the number and volumes of overflows to the river in an average year. Thus shock loadings during periods of heavy rainfall and large river flows will be reduced. The new screens in the inlet works will remove any plastic material from the incoming sewage and remove the risk of these being discharged to the river.

4.3 Predicted Impacts

The degree of treatment provided will reduce the concentration of BOD in the final effluent to below 20 mg/l. The phase 2 design hydraulic load is taken at 4388 m^3/day.

4.3.1 Dissolved Oxygen (DO):Minimum levels

To assess compliance with the regulations regarding the predicted minimum dissolved oxygen the following calculations have been made:

Parameter	Dissolved Oxygen	BOD	Temperature	Flow Rate Q
	DOo[mg/l]	[mg/l]	Deg. Celsius	[m3/s]
DWF River	10	1	14	0.12
Phase 1 effluent flow	2	20	14	0.034
Phase 2 effluent flow	2	15	14	0.05

Table 4.3 Dissolved Oxygen calculation data

Phase 1

Oxygen Sag curve calculations taken from Streeter &Phelps, US Public Health Service, Washington DC, Bulletin No. 146

$$DO.mix = \frac{(10 * 0.12) + (2 * 0.034)}{0.12 + 0.034} = 8.23 \text{ mg/l}$$

Initial oxygen deficit Di = 10 – 8.23 = 1.76 mg/l

$$\text{Critical Oxygen deficit } Dc = \frac{K1}{K2} * Lo * e^{(-K1 * tc)}$$

Where K1 is the BOD reaction rate at 14 deg. Celsius
K120 is the BOD reaction rate at 20 deg. Celsius = 0.23 /day
K2 is the stream re-aeration rate at 14 deg. Celsius
K220 is the stream re-aeration rate at 20 deg. Celsius = 0.4 /day
Lo is the ultimate BOD of the combined flow
L is the BOD5 of the combined flow
tc critical time for minimum oxygen levels

$$L = \frac{(0.12 * 1.0) + (20 * 0.034)}{0.155} = 6.27 \text{ mg/l}$$

$K1 = K120*(1.047^{(14-20)}) = 0.175$ /day
$K2 = K220*(1.016^{(14-20)}) = 0.36$ /day

$$Lo = \frac{L}{1 - e^{(-5 * K1)}} = \frac{6.27}{1 - e^{(-0.23 * 5)}} = 9.17 \text{ mg/l}$$

$$tc = \frac{1}{K2 - K1} * \ln\left[\frac{K2}{K1}\left(1 - Di\left(\frac{K2 - K1}{K1 * Lo}\right)\right)\right] = 2.51 \text{ days}$$

Dc = 2.95 mg/l

Minimum Dissolved Oxygen level = DOo - Dc = 10 – 2.95 = 7.05 mg/l

Phase 2

$$DO.mix = \frac{(10 * 0.12) + (2 * 0.05)}{0.12 + 0.05} = 7.65 \text{ mg/l}$$

Initial oxygen deficit Di = 10 – 7.65 = 2.35 mg/l

$$L = \frac{(0.12 * 1.0) + (15 * 0.05)}{0.17} = 5.1 \text{ mg/l}$$

$$Lo = \frac{L}{1 - e^{(-5 * K1)}} = \frac{5.1}{1 - e^{(-0.23 * 5)}} = 7.46 \text{ mg/l}$$

Dc = 2.7 mg/l

Minimum Dissolved Oxygen level = DOo - Dc = 10 – 2.7 = 7.3 mg/l

These calculated minimum dissolved oxygen levels are above the stated level of 6 mg/l for designated salmonid rivers. Also, these levels are expected to occur only during a significant dry spell (drought). A proposed mitigation of impacts to water quality is proposed in section 4.4.
If the upgrading of the plant is not undertaken, a gradual increase in the load to the works is still likely to occur. The effect of this will be shorter retention times in the aeration and settlement tanks yielding a lower quality effluent discharged with a higher BOD. Oxygen levels would be continually reduced as a result, particularly during low flows. The associated impact to the aquatic habitat is predicted in Chapter 7. The importance of the proposed works and the reduced BOD levels discharged is evident in light of the above predicted oxygen levels.

4.3.2 Dissolved Oxygen : Average Levels

Parameter	Dissolved Oxygen	BOD	Temperature	Flow Rate Q
	DOo[mg/l]	[mg/l]	Deg. Celsius	[m3/s]
River	10	1	14	1.3
Phase 1 effluent	2	20	14	0.034
Phase 2 effluent	2	15	14	0.05

Table 4.3 Dissolved Oxygen calculation data

A value of 1.3 m3/s is proposed as the 50 % flow rate. River Shournagh Flow Records: Daily Mean Flows 1983 – 1985 are contained in Appendix 1.

Phase 1

$$\text{DO mix} = \frac{(1.3 * 10) + (0.034 * 2)}{1.3 + 0.034} = 9.8 \text{ mg/l}$$

Initial Oxygen Deficit Di = 10 – 9.8 = 0.2 mg/l

$$\text{BODmix} = \frac{(1.3 * 1.0) + (0.034 * 20)}{(1.3 + 0.034)} = 1.48 \text{ mg/l}$$

K1 = 0.175/day, K2 = 0.36/day;

$$\text{Lo} = \frac{1.48}{1 - e^{(-.23*5)}} = 2.16 \text{ mg/l}$$

tc = 3.34 days Dc = 0.59 mg/l
Average Dissolved Oxygen Dav. = 10 – 0.59 = 9.41 mg/l

Phase 2

$$\text{DO mix} = \frac{(1.3 * 10) + (0.05 * 2)}{1.3 + 0.05} = 9.7 \text{ mg/l}$$

Initial Oxygen Deficit Di = 10 – 9.7 = 0.3 mg/l

$$\text{BODmix} = \frac{(1.3 * 1.0) + (0.05 * 15)}{(1.3 + 0.05)} = 1.51 \text{ mg/l}$$

K1 = 0.175/day, K2 = 0.36/day;

$$Lo = \frac{1.51}{1 - e^{(-.23*5)}} = 2.22 \text{ mg/l}$$

tc = 3.07 days Dc = 0.63 mg/l
Average Dissolved Oxygen Dav. = 10 – 0.63 = 9.37 mg/l

This level is above the salmonid requirements stated in section 4.1.1: 50 % of samples to be greater than 9 mg/l DO. Overall we conclude that the water quality with respect to oxygen levels will be in keeping with the standards required for the encouragement of the growth of the salmonid populations.

4.3.3 BOD Levels

To assess compliance with the regulations mentioned in section 4.1.1, the calculation below is made applying the mass balance formula and using the 95 % river flow:

$$\text{BOD level of receiving water d/s of discharge} = \frac{Q*C + q*c}{Q + q}$$

Symbol	Parameter	Phase 1	Phase 2	Unit
Q	95 % river flow u/s of discharge	0.27	0.27	m^3/s
q	effluent discharge flow rate	0.034	0.05	m^3/s
C	BOD level of river water u/s of discharge	1.0	1.0	mg/l
c	Proposed BOD level of effluent	20.0	15.0	mg/l

Table 4.3 BOD calculation data

$$\text{Resultant River BOD Phase 1} = \frac{(0.27*1.0) + (0.034*20)}{(0.27 + 0.034)} = 3.12 \text{ mg/l}$$

$$\text{Resultant River BOD Phase 2} = \frac{(0.27*1.0) + (0.05*15)}{(0.27 + 0.05)} = 3.18 \text{ mg/l}$$

These calculated BOD levels are well below that required by the regulations (maximum of 5 mg/l). The predicted BOD levels are only approx. 1 mg/l above the existing recorded BOD levels stated in Table 4.1 (the maximum BOD level recorded downstream of the works on the Shournagh River is 1.8 mg/l). The dilution factor for phase 1 at 95% flows is 8 and that for phase 2 is 5.4. These predicted BOD levels are below those recommended by The Royal Commission on Sewage Disposal . They considered that a clean stream would normally have a BOD of 2 mg/l and if the BOD exceeded 4 mg/l, the stream was on the verge of becoming a nuisance. Also recent work has indicated that most rivers can in fact easily assimilate a BOD of 4 mg/l without affecting fishing and water supply requirements. Thus it predicted that the water quality will not suffer, but will be protected by the proposed works.

4.4 Proposed Mitigation of Impacts

The expansion proposals for the plant should ensure efficient biological treatment in the aeration tanks, resulting in a more consistent quality of effluent discharged. The twin-stream of flow from the inlet works to the outfall pipe will facilitate easier maintenance of the individual wastewater treatment plant units, without having to take the entire plant off-line.

In the case of an extended drought, the River Shournagh flow rates will tend to decrease to the estimated dry weather flow. To maintain oxygen levels downstream of the discharge in such extreme events, it is proposed to provide tertiary treatment of the treated effluent in phase 2. This treatment may involve the use of reed bed filtration (constructed wetland) and this treatment would be used to further reduce the BOD from 20 mg/l to 15 mg/l. This polishing of the effluent would make a substantial difference to the river oxygen levels during drought periods and would ensure that the salmonid regulations are complied with at all times. The reed bed filtration pond, if constructed would be where the existing spray irrigation network is located. These kinds of wetlands have gained scientific acceptance over the last 5 years and are proving to be very cost-effective in comparison to traditional high level treatment techniques.

4.5 Residual Impact

The increase in population and industry in the Blarney / Tower area will place additional demands on the wastewater treatment facilities in the area and if not provided for could be expected to result in a deterioration of the water quality in the Shournagh River. However, the proposed upgrading and expansion works at the Wastewater Treatment plant are designed to protect the water body downstream of the outfall sufficiently to keep its quality rating around Q4. The added impermeable area of the development may add noticeably to the storm run-off to the river, adding further dilution of the treated effluent in the receiving water during wet periods.

Without the proposed works, the town developments would cause a much greater BOD loading to the river, so that the effect of the treatment works expansion is positive.

CHAPTER FIVE

AIR QUALITY

5.0 Introduction

The aspects of the environment, relating to the air, which may be affected by the operation of the sewage treatment works are air quality, noise, and climate. The wastewater treatment plant, while very well screened, is located reasonably close to residential housing. Therefore, due regard must be paid to ensure that acceptable emission standards are set and complied with in the ongoing operation of the plant so as to ensure that no significant impacts result which would have the potential to adversely affect the air quality at the residential housing area.

Air quality may be affected by the emission of odours and aerosols, noise and dust.

These aspects are considered separately below. The background noise levels are important to the extent that if the noise of the proposed works is less than the background noise in the area then no increase in noise levels are actually perceived.

5.1 Baseline Conditions

These refer to the existing air quality at the plant prior to any expansion.

5.1.1 Odour

The main source of odours in the existing plant are the inlet works comminutors, the aeration tank (with surface aerators), the secondary clarifier and the sludge handling and dewatering operations.

Bord na Mona have undertaken an odour survey of the existing plant. The results of this survey are contained in a separate report, see Appendix 2. They also modelled the odours arising from the existing plant for a range of worst case weather conditions and have modelled the predicted odour emitted when the plant has been upgraded and expanded.

5.1.2Aerosols

The existing surface aerators have the potential to generate aerosol spray or droplets, containing micro-organisms. These tiny microdroplets have the potential of being carried and dispersed by the wind. Also the spray irrigation system had the potential result in aerosol generation but this system has not been in use for a number of years.

5.1.3 Noise

Noise can be a source of nuisance and excessive levels of noise can cause deafness to employees, stress and varying community responses. A sewage treatment works operates on a 24 hr basis and, hence, it is a source of some noise at all times. At night, in particular, when background noise levels are low, noise can travel a long way, although the level diminishes with distance. Pumps, motors, compressors and aerators will all generate noise. The tolerance of noise levels can vary depending on noise source, duration, time of day and

frequency. Table 5.1 gives a graphical representation of typical sound levels for a range of everyday activities.

Table 5.1 Typical Sound Levels

Sound Level (dBA)	**Subjective Evaluations**	**Environment**	
		Outdoor	**Indoor**
140	Deafening	Near jet engine, artillery fire	---
130	Threshold of pain	Jet aircraft (within 500 ft)	---
120	Threshold of feeling	Elevated train	Hard-rock band
110		Jet flyover at 1000 ft	Inside propeller plane
100	Very loud	Motor cycle at 25 ft.	Crowd noise in arena
90		Noisy urban street	Full band, noisy factory
80	Moderately loud	Diesel truck at 40 mph at 50 ft.	Dishwasher
70	Loud	Heavy urban traffic	Face to face conversation
60	Moderate	Air condtioner at 15 ft	General Office
50	Quiet	Large transformer at 100 ft	Large public lobby
40		Bird calls	Private office
30	Very Quiet	Quiet residential neighbourhood	Residence without stereo
20		Rustling leaves	Whisper
10	Just audible	Still night in rural area	Recording studio
0	Threshold of hearing	---	---

The current noise levels in the Blarney plant are not a cause for concern, because of the small size of the plant, the fact that the site is well screened and also because of the distance to the nearest sound receiver (i.e. nearby residences).

5.1.4 Dust

This refers to the carrying of fine particles by the wind from various sources. The particular nuisance with dust is that it can harshly effect the respiratory system and the eyes. Standing heaps of fine sand or powder are potential sources of dust. Dust at wastewater treatment works can be generated from screenings and grit removal systems and from dewatered sludge with a low moisture content. The extent of dust emission depends on meteorological conditions; strong winds at dry spells could increase dust emissions whereas humid conditions could reduce it. These are unlikely to occur in the treatment works, and so dust is not considered a problem at present.

5.1.5 Climate

Due to the small scale of the existing plant, it is very unlikely that the local climate has changed as a result of its construction. Thus the climate is taken as typical for the area's topography.

5.2 Development Features Proposed Plant Design

The primary areas of concern relating to air quality at the wastewater treatment works are the inlet works, the primary settlement tanks (if provided) and the sludge handling and de-watering systems. While the proposed works provide for increased areas and an increased number of treatment units at the site, increased standards and mitigation measures are proposed for the upgrading works designed to ensure that improvements will result in the air quality in and around the wastewater treatment plant site.

The design of the treatment works will be carried out by the prequalified contractors under a design/build method of procurement. However, the individual plant units likely to be installed may be summarised as follows in relation to the potential of certain components to affect air quality.

- Inlet works,
- Primary settlement (if provided),
- Biological Oxidation,
- Final settlement,
- Sludge handling, storage, and de-watering.

5.3 Predicted Impacts

The impacts should be low because of the mitigation measures to be incorporated in the upgraded works, the reasonable distance from the site boundary to the nearest housing i.e. (approx. 40 m to the north-west), coupled with the high level of natural screening around the site boundary which gives the opportunity for any noise to attenuate and for odours to be dispersed and diluted, before they may be detected. This screening consists of a flooding embankment to the south and east of the site and dense tree planting to the north and west faces of the site. The likely significant impacts arising from the works are discussed below:

5.3.1 Odour

Fresh wastewater arriving at a treatment works via a properly constructed sewer system has a slight smell, normally described as musty in character. As long as a certain level of dissolved oxygen is maintained in the sewage, anaerobic conditions will not take place. However, if the oxygen content of the sewage is used up then gases such as hydrogen sulphide, nitrogen and sulphur based organic compounds (mercaptans, ketones, amines, indoles and skatoles) are produced and a general septic condition develops with typical pungent odours being emitted.

A sufficient detention time is required for the formation of anaerobic conditions and warm weather conditions above about 20ºC will also assist the rapid growth of anaerobic bacteria.

The operation of a wastewater treatment works involves many locations within the process where anaerobic conditions can occur; from poor maintenance of the inlet works, overloaded secondary treatment through to the dumping of the dewatered sludge in open skips prior to disposal off-site. In many cases the odour problem can be solved by regular cleaning of channels and general maintenance whereas sometimes overloading or sludge treatment may necessitate more extensive mitigation measures such as covering and removing waste gases via an odour control system.

The majority of odour nuisance problems associated with wastewater treatment works are due to the age of the works or where the sewage loading arriving at the works results in regular overloading of the facility. This tends to adversely affect the public perception of sewage treatment works. However, with modern technology, treatment works can exist close to residential areas without causing any problems of odours in the surrounding area. Modern day standards for monitoring of the effluent flow through the works to ensure an adequate flow and to prevent clogging, control of oxygen content and pH levels as well as the containment of the sludge in enclosed units have greatly helped to reduce community nuisance.

The rate of emissions of potentially odorous inorganic and organic compounds from wastewater treatment tanks depend on the tank surface area, organic concentrations and BOD of the tank liquor, volatility of the compounds and the evaporation rate from the tank. The rate of evaporation is lower from a quiescent liquid surface than from a turbulent surface with higher air temperatures and/or wind speeds increasing the evaporation rate. The rate of anaerobic activity within the effluent is also affected by weather conditions such as air temperature and humidity so that odours tend to be greatest during dry, warm weather conditions. These conditions may also be associated with periods of low effluent flow through the plant which can significantly affect the efficiency of the plant. Materials left on the walls or deposited on the floor of the connecting channels can quickly become septic resulting in odorous emissions. Unless there is a strong upward movement within the tank the volume of the tank is not important with respect to the emission rate since compounds near the floor of the tank will not quickly diffuse to the surface.

It is virtually impossible to ensure that odours are never detected beyond the boundary fence of a treatment works. This is because of the nature of the material that is being handled. The aim however, is to prevent an odour nuisance. This requires good plant management to ensure that the influent material is now allowed to stagnate and hence go stale and so a suitable flow through the works is required at all times.

The perception of odour at some point downwind of an emission source depends on the type of odour compound and the air concentration of the odorous gas. The measure used to quantify odour nuisance potential is the odour concentration (odour unit per cubic metre, o.u./m^3). This concentration is equal to the number of times a sample must be diluted with odour free air before 50% of an odour panel cannot detect the odour.

Plant components with the potential to generate odours

Inlet works

The inlet works of a sewage treatment works has the potential to be a major source of odours if not properly designed and maintained due to the collection and deposition of solid matter in the wastewater. Screening devices can clog with material such as rags and plastics, if not cleaned regularly, which can cause anaerobic conditions to occur as well as causing flow rate reductions upstream along the incoming sewer pipe leading to deposition in the pipe. Grit chambers are also another possible source of odours from the organic coating on the finer material collected or deposited in the channel due to low flow rates, especially during low flow conditions. The material collected if stored in an open skip for a number of days can also create offensive odours. In the design of this part of the works the potential for these odour-forming aspects to arise needs to be addressed.

Primary Settling Tanks

Primary settlement tanks may be installed for primary treatment of the wastewater at the treatment plant. The potential for odours from these tanks depends on the BOD load of the influent, the rate of evaporation of odorous components from the surface of the liquid and the turbulence at the peripheral overflow weirs. The surface area of liquor in the tanks rather than the depth of the tank is important in relation to odour potential. In addition the peripheral overflow weir results in the generation of turbulence as the liquor flows out over a drop of 0.3m to a collecting trough and this may be a source of odours, especially during warm weather conditions.

Activated Sludge Treatment

Activated sludge treatment tanks are proposed to be installed. The system will utilise either surface aeration equipment similar to the existing plant or fine bubble diffused aeration from subsurface pipes.

Odour emissions from activated sludge treatment tanks are normally low since the high aeration (either surface or sub-surface) will provide high levels of oxygen in the tank liquor so that most of the odorous compounds are oxidised and anaerobic reactions do not take place.

Final Clarifiers

Final clarifier tanks for secondary settlement, are proposed. Due to the low BOD and relatively stable sludge from the activated sludge tanks the potential for further decay of the sludge and resulting odorous emissions is very low. In addition the liquor in the tanks covers the sludge and so this prevents odorous compounds reaching the surface.

Evidence from existing wastewater treatment works around Ireland indicates that odours from final clarifiers are very low and are normally not detected beyond a few metres from the tank sides.

Sludge Thickeners

The sludge would likely be thickened in a picket fence thickening tank and stored in a holding tank. A sludge blanket forms in the bottom of the tank and as this depth increases the thicker

the solids will be. Excessive retention times can lead to anaerobic conditions resulting in production of gases and buoying of solids to the surface. Another potential source of odours is from the draw-off valve manifold.

Sludge De-watering Building

The sludge from the thickening and holding tanks will be dewatered by double belt filter presses or similar type sludge dewatering equipment which produces a sludge cake with a dry solids content of 15-25%. In the case of belt presses, the sludge would be flocculated with a polymer and then fed onto a wedge shaped belt where the excess water is removed by passing the belt through a series of rollers. The final dewatered sludge cake is removed from the belt by scraper blades and transferred to containers for disposal off-site.

Bord na Mona have identified the sludge dewatering building as the source with the greatest potential to generate odours. They have shown in their assessment of odours that the predicted impact of the upgrading and expansion of the works will lead to a considerable improvement in the air quality experienced in and around the site. This is due mainly to the mitigation measures outlined in Section 5.4.

5.3.2 Aerosols

Aerosols are introduced into the air at aeration tanks in the activated sludge process due to the turbulent nature of the process, i.e. the injection of air into the liquid. Aerosols take the form of a fine mist of tiny droplets (smaller than 5 μm). The concentration of bacteria and viruses in the aerosols can be high. However, because of the very small size of the fine mist droplets, they evaporate very quickly. Hence the micro-organisms will be dehydrated rapidly and will not survive and the risk of inhalation, with the possible risk of infection, does not arise generally outside the site boundary.

Aerosols introduced into the air at the aeration tanks should only present a hazard to anyone within 20 m of these tanks. Even then the risk is very small as there is little, if any, evidence that aerosols affect the plant operatives at treatment works. At distances greater than 20 m the risk of contamination falls away rapidly so there is little reported risk to people or animals outside the treatment works boundary.

There will be a low level of microbe bearing aerosols generated at the works. International experience shows that these pose little or no risk to exposed populations. It is considered that operation of the plant will not generate sufficient aerosol bearing viable microbes to properties outside the site boundary. These properties are already screened from the treatment works site by trees along the site boundary.

The use of the existing spray irrigation system could effect aerosol levels depending on wind direction, speed and relative humidity but the system is been in a state of disrepair and is not in use.

5.3.3 Noise

The main lift pumps and the storm over-flow pumps will be housed in the sump for the existing comminutors. Once this sump is covered (concrete or steel), the noise emitted should be well attenuated to below 50 dB adjacent to the sump. Also the noise from the storm

pumps will be occasional in nature coinciding with periods of heavy rainfall, only to occur when flows exceed 3 DWF.
The only source of noise expected from the inlet works building is from the outlet of the ventilation system. Correct sizing of the outlet diffuser, use of a silencer and maintenance of the diffuser will limit this noise to an acceptably low level. The primary tanks do not tend to emit any noise other than water trickling over the over-flow weir. The addition of a second aeration tank will cause a slight increase in noise at the works due to the action of the surface aerators. Fortunately when one noise source is replaced by two identical sources the increase in noise detected is only 3 dB. As the nearest housing is situated a reasonable distance away, only a fraction of this additional 3 dB will be recognised. Even at the plant boundary the increase in noise from the aerators should be less than 2 dB.
The nature of the de-watering system is not noisy, and the upgraded de-watering system will be housed as before. The installation of odour control equipment outside the building in a walled off area may result in fan noise propagating around the building.
It is not intended that the spray irrigation system will be repaired and re-used in the upgraded works.

The tolerance of noise levels can vary depending on noise source, duration, time of day and frequency.

In the short term, some noise nuisance will be associated with construction traffic to and from the works and with the operation of machinery and plant during the construction of the Treatment Works.

During the operation of the treatment works itself, noise will be generated by plant and mechanical equipment and from traffic associated with the removal of sludge from the site. Items of plant which will generate some noise include pumps, aeration equipment and other motors.

The principal noise sources would include :

- vertical aerators;
- exhaust fans;
- sludge draw-off units at primary and secondary settlement tanks;
- sludge presses.
- grit removal equipment

The distance of 30 m from the works boundary to the nearest housing estate boundary will result in some significant noise attenuation.
The process installed will be required to meet a criteria of an allowable noise level of not more than 45 dBA at the site boundary.
Although the site is located close to the residential housing, it is considered that the noise emissions associated with the operation of the plant are not likely to have a significant impact once standard designs are adopted and the above criteria of permitted noise level is adhered to.

5.3.4 Dust

Dust at the wastewater treatment works can be generated from screenings and grit removal systems and from dewatered sludge with a low moisture content. The extent of dust formation depends on meteorological conditions; strong winds increase dust emissions whereas humid conditions reduce it. The screening systems proposed for the Blarney wastewater treatment works will allow all particles which are less than 5 mm in diameter to pass through to the treatment process and therefore no dust particles will be produced at that stage. Grit classifiers remove only particles heavier than grit and which will again not create dust emissions.
Dust can be generated from settled solids in empty open tanks but the possibility of dust emissions from these sources can be prevented by washing of tanks after emptying.

The construction works will tend to increase the dust levels around the plant and the access roads. The sources of dust in this case are cutting of existing concrete sections and road sweeping. There are no powder additives proposed in the expansion of the works, so that dust will only arise during the construction period (approx. 6 months).

5.3.5 Climate

Due to the scale of the proposed works, there is no change in climatic conditions expected.

5.4 Proposed mitigation of impacts

5.4.1 Odour

While the final design for the plant will rest with the particular contractor under the design/build contract, the following or similar type measures to reduce odorous emissions would be proposed as part of any plant design.

(1) The pumps sump and inlet channels including screening equipment would be enclosed or covered with the air extracted through a high efficiency odour control unit and so odorous emissions from this part of the plant would not occur. The grit traps and channel would not be covered. The screened material and grit would be washed and deposited in covered skips which would be regularly removed for disposal off-site.

(2) The use of diffused aeration rather than a surface aeration system in the aeration tank would be the preferred method to reduce turbulence and hence the potential for generating malodours or aerosols from the surface of these tanks. However surface aeration equipment similar to the existing plant would be permitted provided the overall plant met the Odour Compliance Criteria specified for the site boundary.

(3) The sludge draw-off chambers, sludge buffer tank, sludge thickening tank and sludge holding tanks would be covered and the air extracted via a biofilter or similar odour control unit.

(4) The newly relocated dewatering building would be completely enclosed with high rate of extraction of fumes with hoods located about the belt presses. An odour control system would also be installed in the de-watering building with 3 air changes per hour to prevent toxic fumes building up within the building and posing a threat to employees. A

concentration of 14 mg/m^3 for hydrogen sulphide would represent the maximum level employees should be exposed to within the building in terms of occupational exposure thresholds over a normal 8 hour working day. The proposed odour extraction system will ensure levels are much lower than this concentration.

The odour control system to be installed as a part of the sludge dewatering building air handling unit would have a very high removal efficiency rate with in excess of 95% of the inlet odours being removed. This should ensure that odours are not detected beyond a few metres from the building.

The de-watered sludge, which is relatively stable and hence has a low odour potential, would be stored in covered skip for subsequent disposal off-site.

The intensity of an odour from various parts of the wastewater treatment works will depend on the strength of the initial odour concentration from the surface of the tank or other emission source and the distance downwind at which the prediction, or indeed measurement, is being made. Where the odour emission plumes from a number of sources combine downwind then the predicted odour concentrations may be significantly higher than that resulting from an individual emission source. An odour concentration of 1 o.u./m^3 is the level at which there is a 50% probability that, under laboratory conditions using a panel of qualified observers, an odour may be detected. At levels below 1 o.u./m^3 the concentration of the gaseous compound causing the odour in the air will be less than the detection level and so although the gas is still present in the air no odour nuisance will occur.

Sensitivity to an odour also depends on the location; for example an odour from agricultural related activities will be tolerated by the community longer in a rural setting than in an urban area.

The individual mitigation measures to be adopted in the various elements of the plant must be such that the following criteria is complied with at the site boundary:

Odour concentrations should not exceed 1 o.u./m^3 at the site boundary at a 98 percentile probability of occurrence or it should not exceed this limit for more than 2 % of the year whichever is the lesser.

and

Odour concentration should not exceed 2 o.u./m^3 at the site boundary at a 99 percentile probability of occurrence or that it should not exceed this level for more than 2 % of the year, whichever is the lesser.

The Contractor will be required to submit detailed calculations to show that the above criteria is satisfied by the mitigation measures he is to adopt for dealing with the treatment of odours emanating from the individual elements of the plant to be installed and/or upgraded as part of the necessary expansion works.

5.4.2 Aerosols

The generation of aerosols arises mainly from the aeration tanks. Aerosols, therefore, are really only of concern within the treatment works. Operatives may need to take precautions, such as wearing of face masks during certain operations, to prevent the inhalation of the aerosols. While there is no reported problems of aerosol transmission outside the site, installation of sub-surface aeration diffusers would reduce aerosol generation by reducing surface turbulence compared to the existing surface aeration systems. Maintaining the boundary of the site with dense tree plantation will also reduce the risk of aerosol transmission outside the site.

5.4.3 Noise

Noise is generated by the mechanical and ventilation equipment at the site and mitigation measures may need to be incorporated in the works to keep resulting noise levels within acceptable criteria at the site and thereby minimise the possibility of community response to the operation of the works. It is proposed that a rigorous criterion for noise of 45 dB(A) : maximum allowable 15 minute Leq, be adopted at the site boundary due to operations within the site. This is the proposed standard in the EPA Noise Level Recommendations. 15 minute Leq refers to an average noise level over a 15 minute period. In order to achieve this level, certain mitigation measures may be adopted by the contractors depending on their own plant designs and choice of treatment process. However the following measures are likely to be considered in order to achieve the 45 dB(A) criterion:

- A diffused-air aeration system could be adopted on account of its low noise level, over the surface aeration system;
- Perimeter banking be constructed around particular units and between the proposed site and the nearest adjacent residences;
- Air blowers could be enclosed in a block-walled building, with a concrete roof to minimise their noise impact at any residence. Double glazed windows of thickness 6 mm and 9 mm, in separate frames, separated if possible, by 100 mm air-gap, could be provided for such buildings;
- The generator housing, if provided should be provided with sound attenuators, acoustic doors, and a thick concrete roof to achieve the recommended noise level;
- The exhaust pipes and air openings of the generator (if provided) be subject to noise attenuation in order to achieve a noise limit of 70dB(A) at 3 metres ;
- Elements of the Inlet Works be housed for sound attenuation if necessary;
- If any of the mechanical elements are not set to run at efficient motor speeds, they will tend to cause greater noise levels than those specified by the manufacturer. Any such elements will be replaced by elements sized to handle the loads more efficiently.
- The access to the storm pump sump may be sealed to further reduce the noise caused by the occasional use of the storm pumps. Ventilation pipes from the storm tanks may be

lined with acoustical duct liner and a silencer may also be fitted to prevent piping of the noise to the outdoors.

- The odour control equipment for the de-watering building may need to be housed, i.e. not just walled off, a concrete roof may provide the necessary transmission losses.
- Ventilation fans should be located so as to give the maximum noise screening in respect of any building. The noise level from any fan should not exceed 25 dB(A) at any building. Fan silencing may therefore be required.

The net results should be no noise disturbance outside the site boundary thereby resulting in a minimal possibility of adverse community response.

Appropriate steps should be taken to timetable the construction traffic so as to minimise disruption in this regard. Likewise every effort should be made to muffle noisy plant during the construction period. Working hours will be restricted as far as possible to the normal working day. The British Standard B.S.5228 recommends practical methods for noise control on construction sites. In addition, S.I. 320 of 1988 sets down limits for noise from construction plant and these standards will be set out in the Specification requirements for the construction of the Works.

5.4.4 Dust

As it is proposed that the sludge thickeners and holding tanks will be covered, this will eliminate dust emissions. Digested and thickened sludge at 15 - 25 % dry solids is a wet cake and will not create dust emissions. Higher dry solid content sludge would have a higher dust emission rate and to prevent any such dust emissions, dewatered sludges will be transported in covered containers to the final disposal or treatment location.

Based on the proposed treatment process for the incoming waste load and generated sludge, the possibility of dust emissions will be very low. In addition, humid conditions predominate because of high average annual rainfall and dust emissions rarely if ever occur at the site in the current situation. The dense mature screening around the site boundary also curtails the risk of dust nuisance from the site.

Dust is likely to be generated during the construction period by construction traffic on the public roads, and also from within the site itself during the various stages of the construction process. Regular hosing with bowsers along construction haulage routes will mitigate any such problems in dry spells and road sweeping can be done during the construction period at times agreed with the residents in the area to suit their needs. Provision will be made in the construction works for these types of mitigation measures.

5.5 Residual Impacts

The overall effect of the expansion and upgrading of the works will cause a definite improvement in air quality, mainly because of the housing of the inlet works and the provision of the odour control equipment at the inlet works and the de-watering building. Noise at the plant boundary will be contained within the acceptable limits specified herein .

Monitoring of odours will be carried out by the full-time personnel based at the sewage treatment works. The Bord na Mona studies show that the potential of the existing works to

generate adverse odour conditions sufficient to cause nuisance at and beyond the site boundary will be removed in the upgraded works through the provision of various mitigation measures to meet the specified acceptable criteria at the site boundary. In the event of excessive odour emissions arising due to process malfunction, for example, the site personnel will be required to take prompt remedial action to ensure that any such short-term odour nuisance is contained and its cause rectified to ensure continued compliance with the specified odour criteria at the site boundary.

CHAPTER SIX

SOILS

6.1 Baseline Conditions

This refers to the existing soil conditions at the plant. A site investigation using trial holes is to be carried out at the site. The proposed works are to be built within the boundaries of the existing sewage works site, so one anticipates similar conditions to those encountered during the first construction.

All soils not covered by the existing works are at present topsoiled with grass, providing cover from the elements. Old Red Sandstone is the type of rock shown on the GSI map of Ireland's geology for this area. The depth to bedrock is at present unknown. There does not appear to be any rock exposed at the surface.

6.2 Development Features

The proposed development will result in the loss of soil area on the site of no more than 5 to 10 % (phase 1 and phase 2). The topsoil removed for the construction of the various treatment tanks and treatment units will be kept on site for landscaping of the works when construction is complete. Excavated topsoil on the site will be re-used to form earth screening embankments and the existing embankments around the site boundary will be maintained.

6.3 Predicted Impacts

The spray irrigation system will not be used in the upgraded works. As there will be no spreading of sludge on the irrigation area, the levels of heavy metals will be below the maximum limits recommended for spreading on agricultural land. Construction works will generally cause damage to green areas within the site, due to the driving of heavy vehicles and the storage of materials.

6.4 Proposed Mitigation of Impacts

The landscaping of the finished works is always one of the last items of work to be done. Reinstatement of topsoil and grass-seeding will be done in the affected areas. Additional landscaping of shrubs and trees will be provided and the existing dense natural tree boundary will be maintained and enhanced wherever this is required around the entire site boundary.

6.5 Residual Impacts

With the excavated topsoil to be retained on-site and the small size of the works, no residual impacts on the soil are expected.

CHAPTER SEVEN

ECOLOGICAL IMPACTS

7.1 Baseline Conditions

These describe the ecological habitats as they exist at the moment.

7.1.1 Land Based Habitats

Fortunately, due to extensive landscaping the habitat for land based animals is quite stable and healthy. The regular mowing of the grass may not suit some of the ground based animals, but it may also benefit the bird population providing easier access to the rich topsoil feeding areas. The resident bird life appears to be well catered for with plenty of trees and dense shrubs for refuge. The nearby river is a renewable source of food with flies and fish available.
There is also a lot of feeding from the agricultural lands surrounding the site.

7.1.2. Aquatic Habitats

The fly populations on the river surface and larvae in the water column will tend to explode during the summer months and are not evident for the remainder of the year. The fish populations are generally good, but vary with the spawning salmon returning in spring from their seaward travels.

7.2 Predicted Impacts

7.2.1. Land Based Habitats

The land based habitat may be disturbed in the area of the works, but once it is restored properly should be resilient enough to recover rapidly. Selective removal of surrounding shrubs will ensure that sufficient cover is retained to shield the existing wildlife populations from the rapidly changed environment.The main disturbance will occur during construction when noise and exhaust emissions will be temporarily high.

7.2.2. Aquatic Habitats

In the short-term, if construction practises do not allow for the proximity of the river to the new works, rainfall may act as a form of transportation of pollutants including dust and washings to the watercourse. However this can be prevented with proper construction techniques.
The most significant long-term impact will be the improvement in aquatic habitat to the extent that during the heavy rains, storm water overflow occurrences and volumes will be minimised and the storm overflows that do occur will be screened. The final effluent discharged to the river will meet the discharge criteria laid down in the relevant standards and directives. The quantity of suspended solids will be reduced and the oxygen levels during flood should remain high.
As the bulk of the waste is to remain composed primarily of municipal wastewater and therefore does not contain significant quantities of materials that would be toxic to the flora

and fauna of the stream. If the upgrading of the works is not undertaken, the suitability of the aquatic environment for salmonid populations will noticeably decrease. Oxygen levels may tend to below 40 % of saturation, bacteria and algae will tend to flourish as the conditions tend towards septic. However, with the proposed works, the river has every chance to retain its current status of Q4-5 and its diversity of species.

7.3 Proposed Mitigation

Construction based run-off should not be allowed to enter the river, but should be collected and settled in a temporary sump prior to discharge to any water course or site drainage pipe. This procedure is to include washings from construction plant and pumped water from excavations and run-off from excavated material.

7.4 Conclusion

As with any change to the habitat, the resident populations will receive knock-on effects, this effect will be measurable only during and for a short duration after the construction period.
The completed works will provide as much of a stable living environment as the rest of the river bank in the area.
The aquatic habitats will not be adversely affected but rather will be improved downstream of the works as a result of the upgrading works at the plant and the continued compliance with the required discharge standards to the river. This will lead to less weed and algal growth and higher dissolved oxygen levels than existed prior to the works being undertaken.

CHAPTER EIGHT

SOCIO-ECONOMIC IMPACTS

8.1 Baseline Conditions

These describe the conditions that exist at present.

8.1.1 Land Use

Adjacent to the existing treatment works, the current land use is a combination of agriculture and residential housing.

8.1.2 Fisheries

The River Lee, a designated Salmonid river depends on its tributaries to supply waters at standards suitable for the encouragement of fish growth. The receiving water body, the Shournagh, most likely also contains trout and salmon, in good health, due of the recorded good quality of water. The fishing of these waters is for game only (non-commercial) and is controlled by the local angling clubs.

8.1.3 Agriculture

The scale of agriculture in the area is small, with much of the land being developed for housing sites. The fertilisation of the agricultural lands is carried out in accordance with present farming standards.

8.1.4 Industry

Most of the industry as mentioned in Chapter 1 relates to tourism, which is dependent on the cleanliness of the environment visited.

8.1.5 Residential

In accordance with the development plan for South Cork, the number of houses in the area is set to increase noticeably in the short term. It has expanded slowly over the years.
New housing has been constructed in reasonably close proximity to the sewage treatment plant site, this is evident in Drawing 5 in Appendix 3.

8.1.6 Recreational and Leisure

Given that the Shournagh River is not a designated bathing water, the only recreation and leisure related to the proposed works is the amenity value of the river for fishing and walking along the river bank. The entire site boundary will be protected by security fencing and will be planted with dense hedging and trees.

8.1.7 Electricity and Water

The town is well served with electricity supply at present. The water scheme proposed in 1996 is now under construction and will ensure that water supply will not be the limiting factor for envisaged development.

8.1.8 Transport

As the main Mallow-Cork road bypasses Blarney and Tower, the traffic tends to be mainly local and only a portion is through traffic. The road networks in the area are generally sufficient, but some congestion does occur in Blarney centre and parking is at a premium. The number of trucks removing sludge off-site in skips is estimated at between 2 and 3 per week for the existing plant.

8.1.9 Landfill

The landfill used for the South Cork region is located near Midleton, Co. Cork. Its remaining capacity is at this time unclear, but the cost of landfilling is expected to rise as demand for the space increases, and the cost of land increases.

8.2 Predicted Impact

8.2.1 Land Use

The present use of the land is expected to be retained for both housing and agriculture. The impact of the works will be negligible to the suitability for either use. As the proposed works will be contained within the bounds of the existing site, the expansion will not cause any change of land use in the area.

8.2.2 Fisheries

The benefit of the works to the fisheries will be gradual and lasting. The decrease in competition for dissolved oxygen will tend to encourage fish growth and reproduction. This will concur with the Southern Regional Fisheries Board's charge of protection, conservation and promotion of fisheries.

Angling tourism will tend to increase as a result of better fishing and once licensed by the angling clubs will benefit the area and facilitate conservation.

8.2.3 Agriculture

The expansion of the treatment works will have no real effect on agriculture in the area. The improvement and consistency of quality of effluent from the works may tend to turn the attention of those monitoring the river water quality towards agriculture. The prevention of run-off from land as a non-point source of phosphorus is likely to become an issue of greater concern.

A side benefit of the increased volumes of sludge produced, is the availability of more sludge for land injection and spreading of sludge as a cheap source of fertiliser. As the expansion of the treatment works will allow for further development, some agricultural lands will become more valuable if granted planning permission (in accordance with county development plan).

8.2.4 Industry

Given that some of the industries discharges effluent to the river without passing through the Councils treatment works, they will tend to pollute as before. The river water quality does not benefit in this regard. Monitoring of the loading of the discharges to assess compliance with trade licences will remain important. Additional industry draining to the works can be accommodated within the serviced areas as set out in the town development plan. In turn the additional industry is likely to stimulate the need for additional housing.

8.2.5 Residential

Expansion of the works will facilitate the proposed local authority housing to proceed in the Blarney area. Also the zoned private residential areas identified in the development plan can be accommodated while maintaining standards of effluent discharged.

8.2.6 Recreational and Leisure

The river is not designated as a bathing water, so expansion of the works will not directly impact the recreational and leisure facilities. The use of the river as a visual amenity will be maintained and noticeably improved because of the cleaner effluent discharged with less suspended solids and less storm overflow of solids. The use of the river bank around the site for walking will be enhanced by the upgraded site boundary fences and plantation.

8.2.7 Electricity and Water

The area is well served with electricity, so that the proposed plant expansion should not put a noticeable increase on the load.

The expansion of the treatment works should not be a reason for tolerating excessive leakage losses to the town's sewer network or excessive consumption, which would eventually cause a need for further expansion of the water supply system.

8.2.8 Transport

As the treatment works is not proposed to be a major collection centre for the treatment of sludge, there should not be a noticeable increase in the volume of traffic disposing of sludge. But because of the proposed increased load to the proposed works, there will be an increased volume of sludge produced. This will result in a minor increase in the volume of traffic disposing of the treated sludge from the site to landfill. The number of trucks removing sludge in skips off-site is expected to rise to 5 per week for phase 1 and eventually to 8 per week for phase 2.

There is no necessity to upgrade the access road or public roads in the vicinity of the works as a result of the upgrading works at the site. However it is proposed to install speed control measures in the form of ramps or similar type devices at a number of locations along the access road and to provide for a dedicated pedestrian crossing point.

8.2.9 Landfill

The disposal of de-watered sludge at landfill is expected to continue. The volumes of sludge transported will increase slowly as the loading of the sludge increases, but the increased volumes represent a very minor proportion of the capacity of the landfill.
The disposal by land-spreading as an alternative to landfill has not been considered because of the nature of the undigested sludge.
The disposal to landfill may be acceptable in the short-term but should be reviewed in light of the Councils sludge management plan which is currently being prepared for the treatment of sludge accumulated from around Cork County.
This sludge may then be land spread and save the resource of space in the landfill for less-treatable forms of waste.

8.3 Proposed Mitigation

The treatment works site should continue to be heavily screened and landscaped around its boundaries. This measure in conjunction with the air quality criteria, specified earlier, to be satisfied at the site boundaries in the ongoing operation of the plant will ensure that the value of adjacent properties is not diminished. The enclosure of the site with trees further limits the extent to which the wind might disperse odours and cause nuisance to the neighbours.
The disposal of sludge should be reviewed in future in light of the overall sludge management plan for the county.

8.4 Residual Impact

The town will benefit generally so that the proposed extension of facilities is an essential element of the infrastructure development and will therefore have positive impacts on the socio-economic environment.

CHAPTER NINE

MATERIAL ASSETS

9.1 Land Ownership and Access

The proposed expansion and upgrading works will be procured through a design and build form of contract. The treatment works and the land on which it is sited will at all times remain within the ownership of Cork County Council (their heirs or assigns). Access to the site will be the right of the local authority and will be granted to the Contractor at all times during the construction period and process proving period.

9.2 Development Potential and Expansion.

The proposed expansion will require some part of the remaining limited unused space.
The ultimate capacity of the site will depend on the process type used by the Contractor and the space used per cubic metre of capacity. The treatment works will be designed to cater for the envisaged populations well into the 21st Century. Depending on changes in technology in the future, the ultimate capacity of the site should be sufficient until the middle of the 21st Century.

9.3 Sludge

In line with current practices of waste minimisation and energy efficiency, the sludge produced from wastewater treatment plants is now seen as a potentially useful by-product. The value of the sludge increases with further stabilisation. This further stabilisation does not form part of this project but rather will be addressed on a county wide basis in the short to medium term.
In the proposed works, the processing of the sludge on site will end with de-watering and disposal off-site will be to landfill until such time as further treatment facilities are provided as part of the overall sludge management plan for the county. These additional treatment facilities are likely to be provided in a designated 'hub' sludge treatment outside the Blarney area.

9.4 Conclusion

The local authority is making the anticipated and reasonable use of the land which was the retained for this purpose. The material asset originally purchased years ago is now proving to be a very valuable asset to cater for the increasing wastewater treatment needs and continued development of the Blarney area.

CHAPTER TEN

VISUAL IMPACTS

10.1 Baseline Conditions

These describe the conditions that exist at present.

10.1.1 Topography

The land lies beside the Shournagh River and is on a continual slope down toward the river.

10.1.2 Buildings and Landscaping of Works

The buildings comprise mainly of low steel tanks, together with a brick-clad sludge de-watering building and a single storey administration office. The remaining site is well grassed, and these grassed areas are well maintained. There is a light scatter of trees around the site, with a complete ring of dense evergreen trees around the north and west site perimeter just inside the security fence.

10.1.3 Light

As the tanks are partly recessed into the ground, the density of planting is low, and with the small area of building, daytime lighting is not a problem. The shadows cast within the site are minimal. The perimeter fence and evergreens cast a very minor shadow around the outside of the site. Night-time lighting is by a means of lamp-standards on the side of the roadways. These lamps are not normally on (except during urgent works and monitoring), so that night-sky light pollution does not tend to occur.

10.2 Predicted Impact

10.2.1 Topography

The shape of the land will not change significantly with the construction of the proposed works. The lie of the land will be as before, sloping continually towards the river.

10.2.2 Buildings and Landscaping of Works.

The existing sludge building will be converted to a store as part of the upgrading works and will be finished in standard type building materials. The existing administration building will be refurbished internally and externally. The new buildings for the sludge dewatering plant will most likely consist of similar type and size to the existing and will be positioned into the existing ground contours to minimise the quantities of cut and fill required. The additional treatment works will comprise either concrete or steel tank type structures of maximum height above ground level comparable with the existing units. The grassed area will decrease as a result, but the impression of the site will remain as being a generally green area.

10.2.3 Light

No noticeable decrease in daylight shall occur. Sufficient lighting from the lamp standards during the hours of darkness will be provided around the upgraded works.

10.3 Proposed Mitigation

Additional lamp standards are to be installed to provide sufficient luminance of the buildings for safe operation at night when required.
Additional planting shall be undertaken to blend the new works into the landscape and help retain the overall green appearance of the area.
The new buildings and treatment units will be constructed with standard building materials. New buildings may be brick or blockwork with traditional tiled pitched roofs or alternatively may be enclosed with coated steel cladding and roofing. New tanks will be either concrete or coated steel units similar to the existing circular tanks.

10.4 Conclusion

The visual impact of the treatment works will not change in nature. The most striking features on the site will be the buildings, tanks and roads. These will all remain reasonably in harmony with the surrounding terrain and will be well screened from view from locations outside the site by the site boundary plantation.

CHAPTER ELEVEN

CULTURAL HERITAGE

As there are no listed sites of archaeological interest or sites of monumental records contained in the site , it is not expected that the proposed works will have any effect on the cultural heritage. Neither were any items of archaeological interest discovered during the construction of the existing works. If, in the unlikely event, some remains of archaeological interest are exposed, an archaeologist shall inspect the same and the contractor will be required to co-operate with the archaeologist's team in the process of detailed excavation and recording.

CHAPTER 12

CONCLUSION

12.1 Summary of Impacts: interaction of the foregoing

The impacts on the general environment are predicted to be positive overall with improvement in water quality where this is currently at risk from the discharges from the existing treatment works which is becoming increasingly overloaded.

The preservation of the quality of the water environment will benefit the general amenity of the area. With the increase in plant capacity and the provision of storm tanks, the occurrence and quantities of overflows will tend to decrease.

The adherence to the air quality criteria proposed for the upgraded and expanded works will be a significant improvement on the air quality standards pertaining at the existing plant, thereby protecting the environment outside the treatment plant boundaries. The high standard of the works proposed, including comprehensive landscaping and architecturally sensitive building works will ensure that there is no diminution of the amenities enjoyed in the area. The economic effects of the scheme will be to facilitate residential and commercial development in Blarney and the adjoining area, some of which have been postponed due to the fact that the existing treatment works is already overloaded. Increased tourism related activities, including fishing, could result from the protection and improvement in water quality of the Shournagh River.

The volume of traffic will increase marginally with increasing volumes of sludge produced.
The increase will be of the order of approx. two trucks in and out per week.

The principal impact on the physical assets arises from the fact that part of the existing site will be used for the proposed works, limiting the amount of further expansion that can take place.
The construction stage will involve short-term impacts caused by increased traffic and traffic disruption.

12.2 Recommendations

The perception of wastewater treatment works might be regarded by some as undesirable with respect to adjacent properties.
To improve this perception, the upgrading of the works will enhance the visual amenity while noise and odour emissions will be contained and controlled within acceptably recognised standards in keeping with the location of the works and the nearby residential housing.
The future of the Rivers Shournagh and Lee as significant water bodies downstream of the town will be better safeguarded, such that the proposed works should go ahead as a matter of importance.

Appendix 1

River Shournagh Flow Records: Daily Mean Flows 1983 – 1985

Appendix 2

Bord na Mona assessment of odours from the Existing and Proposed Blarney Sewage Treatment Works

Appendix 3

Drawings

L1 Blarney Sewage Treatment Works – Location Map

E1 Blarney Sewage Treatment Works – Existing Site Layout

P1 Blarney Sewage Treatment Works – Proposed Site Layout

CORK COUNTY COUNCIL

Expansion & Upgrading of Blarney Sewage Treatment Works

Publication of Environmental Impact Statement

Notice in accordance with Part IX of the Local Government (Planning & Development) Regulations, 1994

Notice is hereby given that Cork County Council, in pursuance of the above Regulations, has prepared an Environmental Impact Statement in respect of the Expansion & Upgrading of Blarney Sewage Treatment Works:

(a) The proposed development provides for the upgrading and expansion of the existing sewage treatment works located at Riverview, Blarney, Co. Cork.

(b) (1) Cork County Council proposes to make an application to the Minister for the Environment & Local Government for certification of the proposed development.

(2) An Environmental Impact Statement has been prepared in respect of the proposed development.

(3) The Environmental Impact Statement will be available for inspection and for purchase, at **Cork County Council Offices, Room 707, County Hall, Cork** and at the **Area Engineers Office, Riverview, Blarney** between the hours of **09.00-13.00** and **14.00-17.00** during the period **29th May 2000 to 27th June 2000.**

(4) Submissions or observations in relation to the effects on the environment of the proposed development may be made in writing to the Minister for the Environment & Local Government, O'Connell Bridge House, Dublin 2, before **16.00 hours** on **Wednesday 12th July 2000.**

Room 707,
County Hall, Cork.

John O'Neill,
County Secretary.

29th May, 2000.

Blarney – Tower Sewage Treatment Works

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Existing Septic Tank

Existing Palisade Fencing

Popular & Evergreen Trees

225mm Conc

150mm PVC

450mm Concrete Inlet Pipe

Existing Comminutors

Electrical Connection

Inlet Works Pumping Station

Site Of Previous Meterological Station

300 Conc AC

150mm AC Conc

150mm AC Conc

300mm AC

450mm Conc Bypass

Electrical Duct

Telecom Ducting

Power House

Existing Control House

Existing Sludge Building

Existing Aeration Tank

Picket Fence Thickener

ø29.5m

Thickened Sludge Pumping Station

ø8.5m

150mm Return Sludge

200mm AC

ø18.5m

Existing Clarifier

50mm AC Conc

Indicative Layout of Recent Housing

Road Crossing

Electricity Supply

Hedging

Hedging

Grass Area

25.0m

Machinery Shed

Hedging

Valve Chamber

Tertiary Treatment Chamber

Existing Spray Irrigation Network (Not in Use)

2nd Machinery Shed

Council Area Office /Storage Office

Proposed Palisade Fencing

450mm AC

To Outfall

Proposed Palisade Fencing

Flooding Embankment

Outfall to River Shournagh

River Shournagh

Blarney River

River Shournagh

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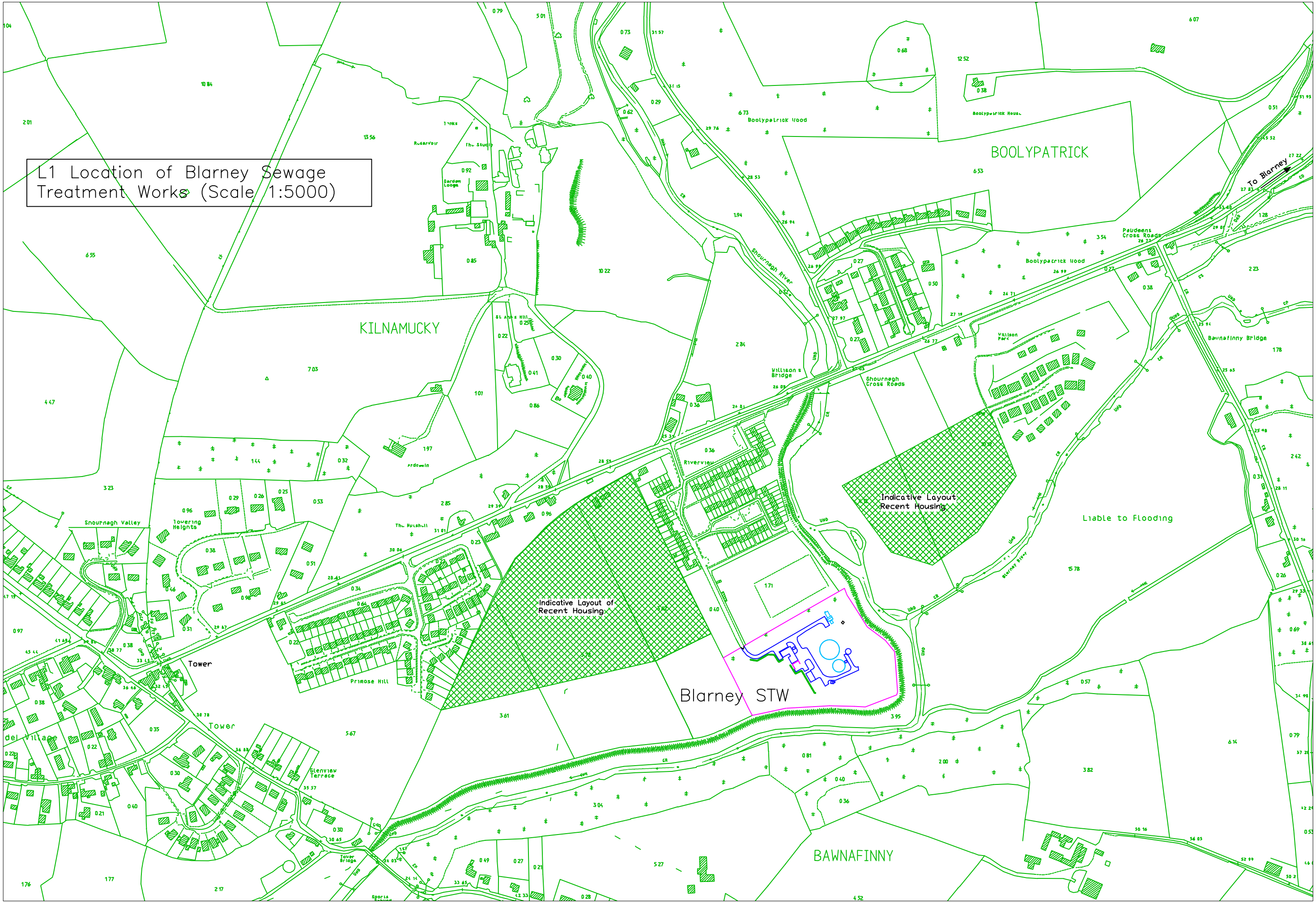
Legend

- Existing Surface Water Sewer
- Existing Chainlink Fencing
- Spray Irrigation System
- Through Flow Pipe
- Existing Sludge Pipe

E1 Blarney Sewage Treatment Plant – Existing Site Layout (Scale 1:1000)

Note
Layout of Surface Water Drainage is Indicative

L1 Location of Blarney Sewage Treatment Works (Scale 1:5000)



Blarney – Tower
Sewage Treatment Works

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Existing Septic Tank

Existing Palisade Fencing

Popular & Evergreen Trees

Overflow Via Storm Screen

Remove Existing Comminutors

New Forward Feed Pumps (1)

Existing Comminutors

Storm Holding Tank

Storm Pumps

Electrical Connection

Inlet Works Pumping Station

Site Of Previous Meteorological Station

225mm Conc

150mm PVC

450mm Concrete Inlet Pipe

150mm AC Conc

150mm AC Conc

300mm AC

Inlet Works Building

Proposed Aeration Tank

Electrical Duct

Telecom Ducting

Power House

Existing Control House

Existing Aeration Tank

Picket Fence Thickener

Thickened Sludge Pumping Station

ø29.5m

ø8.5m

450mm Conc Bypass

Proposed Clarifier

Road Crossing

Electricity Supply

Hedging

Existing Sludge Building

200mm AC

Sludge House Relocated

ø18.5m

Existing Clarifier

150mm AC Conc

Indicative Layout of Recent Housing

25.0m

Grass Area

Machinery Shed

Hedging

Valve Chamber

Tertiary Treatment Chamber

Existing Spray Irrigation Network (Not in Use)

2nd Machinery Shed

Council Area Office /Storage Office

Proposed Palisade Fencing

Area to be Reserved for Future Tertiary Treatment If Required

450mm AC

To Outfall

Proposed Palisade Fencing

Flooding Embankment

Outfall to River Shournagh

River Shournagh

River Shournagh

Blarney River

UNO

CR

UNO

Legend

- Existing Surface Water Sewer
- Proposed Palisade Fencing
- Spray Irrigation System
- Through Flow Pipe
- Existing Sludge Pipe
- Proposed Works

P1 Blarney Sewage Treatment Plant – Proposed Site Layout (Scale 1:1000)

Note
Layout of Surface Water Drainage is Indicative

Blarney – Tower Sewage Treatment Works

171

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Existing Septic Tank

Existing Palisade Fencing

Popular & Evergreen Trees

225mm Conc

150mm PVC

450mm Concrete Inlet Pipe

Inlet Works Pumping Station

Existing Commhutors

Electrical Connection

Site Of Previous Meterological Station

300 Conc AC

150mm AC Conc

150mm AC Conc

300mm AC

450mm Conc Bypass

Electrical Duct

Power House

Existing Control House

Existing Sludge Building

Existing Aeration Tank

Picket Fence Thickener

ø29.5m

Thickened Sludge Pumping Station

ø8.5m

150mm Return Sludge

150mm AC Sludge

200mm AC

ø18.5m

Existing Clarifier

150mm AC Conc

Machinery Shed

Tertiary Treatment Chamber

Valve Chamber

Hedging

Grass Area

Existing Spray Irrigation Network (Not in Use)

2nd Machinery Shed

Council Storage/ Maintenance Area

450mm AC

To Outfall

Proposed Palisade Fencing

Flooding Embankment

Outfall to River Shournagh

River Shournagh

Blarney River

UNO

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395

Road Crossing

Electricity Supply

Indicative Layout of Recent Housing

Proposed Palisade Fencing

25.0m

22.0m

Legend

- Existing Surface Water Sewer
- Existing Chainlink Fencing
- Spray Irrigation System
- Through Flow Pipe
- Existing Sludge Pipe
- Zone of Future Works
- Council Storage/ Maintenance Area

Z1 Blarney Sewage Treatment Plant – Existing Site Layout Showing Zone of Future Works (Scale 1:1000)

Note
Layout of Surface Water Drainage is Indicative