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Laois County Council

LAOIS GROUPED TOWNS SEWERAGE SCHEME

SUMMARY REPORT ON UPGRADE PROPOSALS FOR STAGE 3 APPROPRIATE ASSESSMENTS - MOUNTRATH

January 2012

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LAOIS COUNTY COUNCIL

LAOIS GROUPED TOWNS SEWERAGE SCHEME

SUMMARY UPGRADE REPORT - MOUNTRATH

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PROJECT NO. 20345					
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1. INTRODUCTION

1.1 Background

In September 2008, Laois County Council applied for a Wastewater Discharge Licence from the Environmental Protection Agency (EPA) for the town of Mountrath. As part of the Discharge Licence application, Ecofact Environmental Consultants Ltd carried out a Receiving Water Impact Assessments on behalf of Laois County Council.

The receiving water for the existing Wastewater Treatment Works (WWTW) at Mountrath is the Mountrath River, a tributary of the River Nore. The Mountrath River is part of the River Nore and River Barrow Special Area of Conservation (SAC) (Site Code 002162).

Following correspondence from the EPA in June 2009, Laois County Council were required to conduct an Appropriate Assessment (Stage 2) based on Circular Letter L8/08 (Water Services Investment and Rural Water Programmes - Protection of Natural Heritage and National Monuments) issued by the Department of the Environment, Heritage and Local Government in relation to a determination as to the likelihood of discharges from the waste water works having a significant effect on a European site.

Laois County Council instructed Ecofact Environmental Consultants Ltd to prepare the Appropriate Assessment reports. In June 2011, Ecofact finalised the Stage 2 Appropriate Assessment Report. The conclusions of the Stage 2 Appropriate Assessment Report can be summarised as follows:-

- The existing Mountrath Wastewater Treatment Works (WWTW) is operating at capacity, with the requirement for greater capacity and a higher level of treatment recommended by the SERBD River Basin Management Plan.
- The Mountrath Wastewater Treatment Works (WWTW) discharge is likely to be in excess of the Urban Wastewater Treatment Directive for treatment plants discharging to sensitive areas.
- The Mountrath Wastewater Treatment Works discharge has been identified as having a direct, localised impact on the qualifying interests of the SAC i.e. floating river vegetation, otter, lamprey and Atlantic salmon. These localised impacts are not evaluated as being significant with regard to

adversely affecting the conservation objectives or the integrity of the River Barrow and River Nore SAC as a whole.

- There remains the potential for indirect and cumulative impacts on the conservation objectives of this Natura 2000 site which may affect the integrity of the site. The existing WWTW at Stradbally therefore must progress to a Stage 3 Appropriate Assessment (Considerations of Alternatives).

Nicholas O'Dwyer Ltd has been requested to prepare this Summary Upgrade Report to provide details of the current upgrade proposal for the town of Mountrath. The Summary Upgrade Report is required to provide sufficient information to demonstrate that the proposal is practical and achievable by providing detailed design information and a timetable for delivery. In addition, it must be demonstrated that the proposed plant will not cause the effects that the existing plants are presently doing and that it will not alone or in combination with other projects or plans, significantly affect "the integrity of the Natura 2000 site with respect to the conservation objectives of the site and to its structure and function".

1.2 Description of Scheme

Mountrath is situated on the N7 in the southwest of County Laois. The nearby Mountrath River is a tributary of the River Nore. The confluence of the two rivers is approximately 2.5km downstream of the town. The Mountrath River and the River Nore are part of the River Barrow and River Nore Special Area of Conservation (Site Code 002162).

Mountrath is one of 5 towns included in the Laois Grouped Towns Sewerage Scheme. The upgrade of the Wastewater Treatment Works (WWTW) in each town is included in Contract A – Design Build Operate Scheme. The proposed WWTW is located on a new site to the west of the existing WWTP. The new plant will cater for 4,500 population equivalent (PE). The plant will continue to discharge to the Mountrath River. The existing plant will be decommissioned.

The procurement of the scheme is by means of a Design Build Operate (DBO) contract, which is a form of Public Private Partnership (PPP). Tenders are invited from suitably qualified contractors to design and build a wastewater treatment plant to meet the level of service required in the Employer's Requirements. In the

case of DBO, not only does the contractor design and build the plant, he also contracts to operate it for a set period.

Design Build Operate Contracts combine, in a single contract, the requirement to design and construct a wastewater treatment plant and to deliver the associated level of service required to achieve the effluent standards and other specified requirements. This is an important shift of focus towards service provision. While these types of contracts are financed from public funds, the responsibility for the construction of the facility and its operation for a defined period of time rests with the private sector. As with other types of PPP arrangements the treatment plant remains in the ownership of the Local Authority and responsibility for management returns to the Local Authority at the end of the contract period, at which time a further service contract may be procured.

1.3 Current Status of Upgrade Proposals

The Laois Grouped Towns Sewerage Scheme is currently listed on the Department of Environment Community and Local Government (DECLG) Water Services Investment Programme (2010 to 2012). The scheme is designated to start construction in 2010 to 2012.

The scheme was given approval to proceed to tender by the Minister for the Environment in July 2011. The prequalification process for the shortlisting of suitable contractors was commenced in July following the Minister's announcement. Expressions of Interest were requested and 11 No. submissions were received in September 2011. A review of the submission for compliance with the suitability criteria is currently underway, and shortlisting will be carried out by a board convened by Laois County Council, expected to be in February 2012.

Following shortlisting, it is anticipated that the tender process will begin in December. It is anticipated that the tender award and hence design and construction will commence March 2013. A summary of the project milestones for the WWTW element of the scheme is given in Table 1.1 below.

Table 1.1 – Timeline for LTVWIS Contract A – DBO Scheme

Task Item	Commencement / Completion Date	Status
Design Review Report	December 2005	Complete
Preliminary Risk Assessment	November 2006	Complete
Preliminary Work		
▪ Archaeology	June 2006	Complete
▪ Noise/Odour Study	October 2006	Complete
▪ Site Investigation	February 2007	Complete
▪ Environmental Appropriate Assessment	September 2006	Complete
Part 8 Planning	January 2007	Complete
Land Acquisition/Wayleaves	January 2007	Complete
Polluter Pays Report	November 2006	Complete
Draft Tender Documents	April 2006	Complete
Finalise Tender Documents	December 2010	Complete
Approval to proceed to Tender	July 2011	Complete
Prequalification (re-run of process due to passage of time)	October 2010	Complete
Prequalification Interview Process	February 2012	-
Tender period	April 2012	-
Tender evaluation/Report on Tenders	July 2012	-
Approval and Tender Award	October 2012	-
Commencement on Site	March 2013	-
Laois T&V Wastewater Improvement Scheme Construction Completed	March 2015	-

2. WASTE ASSIMILATIVE CAPACITY AND PROPOSED EFFLUENT STANDARDS

On commencing the preparation of the tender documents for the scheme, a Design Review Report was carried out by Nicholas O'Dwyer Ltd in 2005. Following the client approval of the Design Review Report, and the submission of the draft Design Build Operate Tender Documents in 2006, Laois County Council applied for Part VIII planning for the treatment plant sites. As part of the consultation process, National Parks and Wildlife Service (NPWS) recommended that an Appropriate Assessment be carried out in relation to the impacts on the Nore Freshwater Pearl Mussel which is an endangered species. The effluent standards for the towns were reviewed based on guideline values recommended in studies of Freshwater Pearl Mussels and on draft NPWS guidance for protection of the species.

The *River Barrow and River Nore Report to Inform an Appropriate Assessment (Entec and O'Dwyer, 2007)* concluded that only the discharges at Abbeyleix and Durrow would have a direct impact on the population of fresh water pearl mussels in the River Nore channel. The effluent standards for those towns were recommended to be revised accordingly. The effluent standards at Mountrath recommended in the Design Review Report in 2005 were not affected.

In 2009, the Environmental Objectives (Surface Water) Regulations S.I. 272 of 2009 came into effect. These regulations implement the Water Framework Directive and aim to prevent the deterioration in the existing status of waters, including the maintenance of "high status" where it exists, and at ensuring that all waters, with some limited exceptions, achieve at least "good status" by 2015.

In addition, the Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. 296 of 2009 also came into effect. These regulations provide for Draft Management Plans for Freshwater Pearl Mussels to be prepared for each catchment where the species is known to exist.

Furthermore, the Draft South East River Basin Management Plan (SERBMP) was published in December 2008. The objectives of the SERBMP are to achieve protected areas status, prevent deterioration of water quality, restore good status and reduce chemical pollution by 2015. The Environmental Objectives Regulations identified above provide a basis for deciding on the appropriate treatment required in order to meet the River Basin Management Plan objectives, enabling

necessary infrastructure and operational improvements to be prioritised in line with Water Framework Directive objectives.

The proposed effluent standards included in the DBO Tender Documents were reviewed and revised in accordance with the above legislation, and were based on background river water quality data obtained directly from the Environmental Protection Agency Regional Laboratory in Kilkenny in 2009.

2.1 Waste Assimilative Capacity Calculations

Waste Assimilative Capacity - BOD

In accordance with accepted water quality management plan requirements, the waste assimilative capacity of BOD for a watercourse is a function of its 95-percentile flow and its background biological quality. The Waste Assimilative Capacity (WAC) in mg/l for BOD is therefore calculated as follows:

$$WAC = (C_{max} - C_{back}) \times F_{95} \times 86.4 \text{ kg BOD/day} \quad (1)$$

Where:

C_{max} = maximum permissible BOD concentration in river (mg/l)

C_{back} = background (upstream) pollutant concentration (mg/l)

F_{95} = 95%ile flow in river (m^3/s)

86.4 = conversion factor

The waste load (WL) from the plant is given by:

$$WL = C_{eff} \times F_{eff} \times 86.4 \text{ kg BOD/day} \quad (2)$$

Where:

C_{eff} = Effluent Concentration (mg/l)

F_{eff} = Average Daily effluent flow (m^3/s)

86.4 = conversion factor

Equation 1 and 2 are combined as follows:

$$\frac{(C_{back} \times F_{95} \times 86.4) + (C_{eff} \times F_{eff} \times 86.4)}{[(F_{95} + F_{eff}) \times 86.4]} = C_{max}$$

The equation is then transposed to determine the effluent concentration as follows:

$$C_{eff} = \frac{[(C_{max} \times (F_{95} + F_{eff})) - (C_{back} \times F_{95})]}{F_{eff}} \text{ mg/l Effluent Conc.}$$

Where:

C_{eff} = required effluent BOD concentration in river (mg/l)

C_{max} = maximum permissible BOD concentration in river = 2.2 mg/l

C_{back} = background (upstream) pollutant concentration = 0.94 mg/l

F_{river} = F_{95} (for BOD calculations) = 0.11 m^3/s

F_{eff} = effluent flow = 4,500 x 0.225 / (60 x 60 x 24) = 0.012 m^3/s

The Surface Water Regulations are more stringent than the Urban Wastewater Treatment Regulations and the Salmonid Regulations for this water quality parameter. The maximum concentration of Carbonaceous BOD stated in the Surface Water Regulations is 2.6 mg/l.

The background BOD concentration (C_{back}) has been taken as the medium concentration recorded at EPA station 0100 between 2008 and 2009. Station 0100 is located at the bridge at Rushin House, upstream of Mountrath WWTW.

$$C_{eff} = \frac{[(2.6^* (0.11 + 0.012) - (0.94 * 0.11)]}{0.012} = 14 \text{ mg/l}$$

The maximum allowable BOD concentration, as stated in the Surface Water Regulations, is set out at 2.2 mg/l for waters of high ecological status. The total flow is the sum of the 95th percentile river flow and the dry weather effluent flow.

The background BOD concentration is the mean concentration recorded in the river upstream of the discharge point. The associated flow is the 95th percentile river flow.

The maximum allowable effluent concentration has been determined by dividing the net allowable daily increase in BOD by the daily flow of effluent.

It is recommended that, for discharge to the current outfall location, a minimum level of BOD removal of 95%, which will result in an effluent BOD standard of 14 mg/l. A 95% level of reduction in suspended solids (SS) is required to achieve a standard of 20mg/L.

Waste Assimilative Capacity - Phosphorus

The waste assimilative capacity of phosphorous has been determined using the 95th percentile flow.

The median background Ortho-Phosphate concentration recorded at the Station 0100 on the Mountrath River from the 2008-2009 data, is 0.015 mg/l.

Using the Waste Assimilation Capacity calculation as derived in the previous section, the maximum allowable phosphorus concentration to the river is calculated as follows:

$$C_{eff} = \frac{[(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})]}{F_{eff}} \quad \text{mg/l Effluent Conc.}$$

C_{max} = maximum permissible Phosphate concentration in river = 0.075 mg/l

C_{back} = background (upstream) pollutant concentration = 0.015 mg/l

F_{river} = F_{95} (for P calculations) = 0.11 m^3/s

F_{eff} = effluent flow = 4,500 x 0.225 / (60 x 60 x 24) = 0.012 m^3/s

$$C_{eff} = \frac{[(0.045^* (0.11 + 0.012) - (0.015^* 0.11)]}{0.012} = 0.32 \text{ mg/l}$$

The maximum allowable phosphorous concentration, as stated in the Surface Water Regulations, is set out at 0.075 mg/l at 95%ile flows for waters of good ecological status. The background median phosphorous concentration is 0.065 mg/l upstream at the Bridge south east of Beachmount. The associated flow is the 95th percentile river flow.

The maximum allowable effluent concentration has been determined by dividing the net allowable daily increase in phosphorous by the daily flow of effluent. The allowable concentration of Ortho Phosphate is taken as 0.8 times the allowable concentration of Total Phosphorous. The required effluent standard is equal to 0.32 / 0.8 = 0.40 mg/l of Total Phosphorous.

Waste Assimilative Capacity - Ammonia

Using the Waste Assimilation Capacity calculation as set out in the previous section, the maximum allowable ammonia concentration to the river is calculated as follows:

$$C_{eff} = \frac{[(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})]}{F_{eff}}$$ mg/l Effluent Conc.

C_{max} = maximum permissible Ammonia concentration in river = 0.09 mg/l

C_{back} = background (upstream) pollutant concentration = 0.018 mg/l

F_{river} = F_{95} (for ammonia calculations) = 0.11 m^3/s

F_{eff} = effluent flow = 4,500 x 0.225 / (60 x 60 x 24) = 0.012 m^3/s

$$C_{eff} = \frac{[(0.14* (0.11 + 0.012) - (0.018 * 0.11)]}{0.012} = 0.75 \text{ mg/l}$$

The maximum allowable ammonia concentration, as stated in the Surface Water Regulations, is set out at 0.09 mg/l for waters of high ecological status.

The background ammonia concentration is the mean concentration recorded in the river upstream of the discharge. The associated flow is the 95th percentile river flow.

The background NH concentration (C_{back}) has been taken as the medium concentration recorded at station 0100 between 2008 and 2009. Station 0100 is located at the bridge at Rushin House. The 95%ile flow in the river is 0.012 m^3/s.

The resulting maximum allowable concentration of Ammonia is 0.75 mg/l.

Waste Assimilative Capacity - Total Oxidised Nitrogen

There is no requirement for a Total Oxidised Nitrogen standard at Mountrath.

2.2 Proposed Effluent Standards to be achieved by Upgrade Proposal

The effluent standards for the proposed upgrade at Mountrath identified in Table 2.1 below are the effluent standards included in the tender documents for the Laois Grouped Towns Sewerage Scheme – Contract A Design Build Operate Contract.

Table 2.1 – Proposed Effluent Standards at Mountrath WWTW in DBO Contract Documents

Parameter	Concentration
BOD_5 (mg/L)	14
Total Suspended Solids (mg/L)	20
COD (mg/L)	125
Total Phosphorus (mg/L P)	0.40
Total Oxidised Nitrogen (mg/L N)	NR[1]
Total Ammonia (mg/L N)	0.75

1. NR = Not Required

2.3 Required Effluent Standards during Design Build Period

Under the DBO Contract, the Contractor shall take over responsibility for the operation and maintenance of the existing wastewater treatment plant from Laois County Council.

The proposed effluent standards for the existing plants to be maintained during the Design Build Phase (prior to upgraded plants coming into operation) are shown in Table 2.2 below.

Table 2.2 – Proposed Effluent Standards during Design Build Phase

Parameter	Concentration
BOD_5 (mg/l)	25
Total Suspended Solids (mg/l)	35
COD (mg/l)	125

2.4 EPA Discharge Licence Standards

At the time of this report, the Wastewater Discharge Licence for Mountrath has not been issued by the Environment Protection Authority (EPA) under the Wastewater Discharge (Authorisation) Regulations (S.I. 684 of 2007). It is anticipated that the effluent standards required by the Discharge Licences will be similar to the proposed effluent standards in the Employer's Requirements, however more or less stringent standards may be prescribed by the EPA.

If the Wastewater Discharge Licence is issued post tender, any modification to the Employer's Requirements required in order to comply with the Licence conditions will have to be instructed by Laois County Council as a variation to the Contract.

In other locations, where plant upgrades were in progress and anticipated to be complete after the issue of the discharge licence, less stringent interim effluent standards have been applied by the EPA for an agreed timeframe, until the upgrade is complete and operational.

2.5 Key Specification Requirements

2.5.1 General Design Requirements

Under the DBO Contract, the Contractor shall be fully responsible for the design of the Works. The design of the Works shall be such as to facilitate operation, inspection and maintenance of all processes and equipment and shall be in accordance with all applicable approvals, standards and Regulations. All mechanical and electrical equipment supplied shall have a proven reliability record in similar works.

The Works shall be suitable for operating continuously, satisfactorily and fully automatically under the most severe historical climatic conditions recorded on the site or in the local area for the projected design life as required under Section 3.1.5 herein. The Contractor shall be deemed to have obtained all information as necessary for the purpose of preparing his designs.

All equipment shall be new and unused and shall comply at a minimum with the standards specified in the Employer's Requirements. All workmanship and standards shall comply with specification. All equipment shall be capable of operating through the full range of flows and loads. Adequate turn-down capability shall be provided. Provision for manual control of the plant shall also be provided.

The proposed treatment process shall:

a) Be designed to achieve the stated effluent quality standards and stated noise and odour emissions standards, and

b) Incorporate measures to minimise the impact of the development on the environment, and

c) Be of modular design, robust, fit for purpose and can easily accommodate future expansion as described.

No treatment process will be acceptable to the Employer which is not based on proven technology. A process based on proven technology is defined as a process which:

- has been demonstrated by at least three (3) years satisfactory operation under stable process conditions;
- has been employed successfully on at least three (3) municipal wastewater treatment plants of similar sized modules to those proposed, treating a similar flow and load to that at the new wastewater treatment plants and has achieved the standards required; and
- has operated successfully under climatic conditions similar to those at the proposed sites.

The hydraulic design of the facilities shall be flexible. The Contractor shall ensure that the final effluent requirements are met during any maintenance of equipment or process units. By-passing of a process unit shall be permissible only if the final effluent requirements are met during any such by-passing.

The Contractor shall allow in his design for fluctuations in the average daily BOD, suspended solids, phosphorus and nitrogen loads of up to 125% of the specified influent daily loads on a continuous basis. The Contractor shall also allow in his design for peak flows to treatment of 3 times the Dry Weather Flow (3 DWF). Flows in excess of 3 DWF will be diverted to a storm tank which will have a storage capacity of 3 DWF for 2 hours.

The treatment plant and process design shall allow for peak flows for an extended period of time with no derogation of effluent quality. The wastewater treatment plants shall be capable of achieving the Final Effluent Discharge Limit Standards during any combination of load conditions up to the design loads and peaks loads specified.

2.5.2 Summary of Employer's Requirements at Mountrath WWTW

The indicative layout used for the Part 8 Planning Documents is shown in Drawing No. 20345-SR-RY-101. The Contractor shall comply fully with the requirements of the Part 8 Planning Documents. In particular any treatment process / treatment process layout offered by the Contractor shall be considered appropriate provided that:

a) The impacts are equal to the impacts outlined in the Part 8 Planning Documents; and/or

b) The positive impacts are of greater significance than those outlined in the Part 8 Planning Documents; and

c) The negative impacts are of lesser significance than those outlined in the Part 8 Planning Documents

However, no treatment process will be acceptable which is not based on proven technology.

The plant shall, as a minimum, include the following:

- Inlet Lift Pump Station (if required)
- Preliminary treatment – to include screening and grit removal – grease removal shall be provided if the Contractor considers it necessary;
- Biological treatment and phosphorus removal;
- Liquid sludge thickening and storage;
- Storm treatment;
- Influent Sewer from the interface with the Network Contract to the plant.

The Inlet Works including preliminary treatment shall be designed and built to cater for the Stage 2 peak flows to treatment. Mechanical and electrical equipment shall be provided in the inlet works to cater for the Stage 1 flows.

3. DETAILS OF UPGRADE PROPOSALS

3.1 Population Projections and Staging of the Scheme

The population projections for Mountrath were identified in the Design Review Report (Nicholas O'Dwyer Ltd, 2005). The Design Review Report indicated that full development of all available land within the 2006 to 2011 development boundary would result in a design P.E. of 6,500. High, medium and low population growth rates were examined. The adoption of a high growth rate to the project horizon would result in a design P.E. of 5,088. The adoption of a medium growth rate was recommended which resulted in a design P.E. of 4,500, which was adopted as the Stage 1 design capacity.

The following table details the projected total population equivalent for Mountrath including the proposed single staging of the scheme to the project horizon of 2025.

Table 3.1 - Current and Future WWTW Population Equivalents at Mountrath

Mountrath WWTW	Population Equivalent (p.e.)		
	2005	2015	2025
Domestic	1,548	2,874	3,419
Commercial	164	304	362
Educational	288	535	636
Total	2,000	3,713	4,417
Existing/Proposed WWTW Capacity	**1,500**	**4,500**	**4,500**

The Staging of the Scheme (and the resulting Proposed Upgrade Capacity) is as follows:

Stage 1 (20 years) = 4,500 p.e.

Ultimate = 6,500 p.e.

A recent review on the population projections carried out in the *Report on Compliance – WWTW (Nicholas O'Dwyer Ltd, August 2011)* indicates that the population projections in the Design Review Report are broadly in line with actual population growth experienced in the intervening period.

3.2 Proposed Layout of Upgrade Proposal

Refer to Drg. 20345-SR-MH-101 in Appendix A for details of the proposed WWTW Upgrade and indicative layout developed for the purposes of obtaining Part 8 Planning Permission for the site. Due to the Design Build Operate nature of the procurement process, the final layout may look different from the indicative layout in accordance with the successful Contractor's preference and proposals.

3.3 Proposed Timetable for Upgrade Proposal

The timetable for completion of the individual towns within the scheme is estimated from the expected duration of the construction works at each location, and the priority of towns included within the Employer's Requirements for the Scheme and is shown in Table 3.2 below.

It is anticipated that the WWTW upgrade at Mountrath will be brought into operation in September 2014, 23 months after the anticipated contract commencement.

Table 3.2 – Anticipated Commencement Completion Dates for DBO Scheme

Task Item	Commencement Date	Completion Date
Tender period	April 2012	June 2012
Tender evaluation/Report on Tenders	July 2012	September 2012
Approval and Tender Award	October 2012	March 2013
Contract Start-up and Commencement	March 2013	
Design Phase	March 2013	May 2013
Commencement on Site	March 2013	March 2015
Abbeyleix	March 2013	September 2014
Stradbally	March 2013	September 2014
Durrow	July 2013	January 2015
Mountrath	July 2013	January 2015
Rathdowney	July 2013	March 2015
Design Build Phase Completion	-	March 2015
Defect Liability Period	March 2015	March 2016
Operations and Maintenance Period	March 2015	March 2035

4. SIGNIFICANT EFFECTS IDENTIFIED

4.1 Environmental Reports prepared for Upgrade Proposal

An Appropriate Assessment was carried out by Ecofact Environmental Consultants Ltd. on behalf of Laois County Council in June 2011 to assess the impacts of the effluent discharged from the existing Mountrath WwTW with regard to the potential for adverse effects on the River Barrow and the River Nore Special Area of Conservation. The Mountrath WwTW discharges to the Mountrath River within the River Barrow and River Nore SAC. The WwTW therefore has the potential to directly impact on the SAC. It is proposed to upgrade the WwTW at Mountrath which will also discharge to the River Barrow and River Nore SAC. The potential for the discharge from the upgraded WwTW to impact on the River Barrow and Nore SAC is discussed in the following sections.

4.2 Significant Effects on SAC Identified in Environmental Reports

The Appropriate Assessment firstly concluded that there could be direct impacts from discharges from the existing Mountrath WwTW on the SAC as the WwTW discharges directly to the SAC. As the proposed WwTW will also discharge directly to the River Barrow and Nore SAC, the WwTW also has the potential to directly impact on the SAC.

It was also concluded that the Mountrath WwTW may indirectly impact on the SAC qualifying features such as Freshwater Pearl Mussel further downstream and may also work in combination with background water quality to cumulatively impact on the SAC. It is therefore feasible that discharges from the proposed WwTW may also cause indirect and cumulative impacts on conservation interests of the SAC.

Impacts on Qualifying features

The Appropriate Assessment concluded that discharges from the operation of the current Mountrath WwTW are not thought to be impacting on the following SAC qualifying features.

- **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (91E0)**
- **Petrifying springs with tufa formation (Cratoneurion) (7220)**
- **Hydrophilous tall herb fringe communities of plains / montane to alpine levels (6430)**

- **Atlantic salmon (1106)**
- **Otter (1355)**
- **White-clawed crayfish (1092)**
- **Desmoulin's whorl snail (1016)**

The proposed Mountrath WwTW will result in a highly significant improvement in the quality of the effluent and consequently improved water quality in the Mountrath stream downstream of the discharge location. It is therefore reasonable to assume that the proposed Mountrath WwTW will not impact on these SAC conservation interests.

The Appropriate Assessment concluded that discharges from the operation of the current Mountrath WwTW may impact on the following conservation interests

- **Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho Batrachion* vegetation (3260)**
  According to NPWS (2008), discharges, fertilisation and water pollution are identified as the main pressures affecting this water dependant habitat; with a direct application to the current WwTW at Mountrath where water quality impacts have been recorded in the Mountrath River, designated within the SAC. The WwTW at Mountrath has the potential to contribute to nutrient-loadings and water pollution affecting the structure and function of this habitat.
- **Irish Freshwater Pearl mussel (1990) and Nore Freshwater Pearl Mussel (1029)**
  There is no monitoring evidence to show that the Mountrath River is having a negative impact on the water quality of the River Nore main channel. However, the ongoing impacts to water quality arising from the plant, affecting the Mountrath River within the SAC will contribute to cumulative background water quality impacts potentially affecting the integrity of this conservation interest.

It is therefore feasible that discharges from the upgraded WwTW at Mountrath could impact on the conservation interests of Nore SAC.

4.3 Details of Measures to avoid Significant Environmental Effects

A summary of measures to mitigate the potential effects of the discharge from the proposed Mountrath WwTW are presented in Table 4.1 below. For completeness mitigation measures to avoid impacts during the construction phase are also included. The mitigation of impacts arising from discharges of wastewater through the implementation of strict effluent standards is discussed in more detail in Section 4.3.1.

Table 4.1 Summary of Required Mitigation

Potentially Significant Effect on SAC	Mitigation/Enhancement	Residual Adverse Affect on Integrity of SAC?	Rationale
Construction			
Release of sediments resulting in negative effects on SAC species.	Contractor to produce a Method Statement which should be approved by the EPA, NPWS and SRFB. Method Statement should include/refer to the following measures: A coffer dam to be used during in-channel works. Dewatered water to pass through settlement tanks prior to return to the river. In-channel work to be carried out during the period July to September Work to avoid wet weather conditions. Adoption of additional pollution prevention measures outlined in relevant guidance. Site briefing to be held with site personnel prior to commencement of works.	**No**	**Risk has been minimised as far as possible. Despite a high level of mitigation there remains an extremely small possibility of an unforeseen event (e.g. sudden extreme weather conditions). However the risk of this is considered to be so low as to be negligible.**

Potentially Significant Effect on SAC	Mitigation/Enhancement	Residual Adverse Affect on Integrity of SAC?	Rationale
Discharge of chemicals to SAC (e.g. fuels, oils) resulting in negative effects on SAC species.	Chemicals stored in bunded areas away from the river and secured/removed overnight. Adoption of pollution prevention measures outlined in relevant guidance. Any refuelling must be carried out in bunded areas of 110% volume at least 50m away from banks. Contractors to have an appropriate emergency response plan in place in the event of spillages. Adoption of additional pollution prevention measures outlined in relevant guidance. Site briefing to be held with site personnel prior to commencement of works.	**No**	**Risk has been minimised as far as possible. Despite a high level of mitigation there remains an extremely small possibility of an unforeseen event (e.g. failure of machinery/ equipment). However the risk of this is considered to be so low as to be negligible.**
Damage/disturbance to bank side habitat resulting in negative effects on SAC species.	Minimal vegetation clearance on banks.	**No**	**Low potential to affect small area therefore no significant effect on populations of Annex II species predicted.**
Operation			
Discharges of inadequately treated sewage to the SAC resulting in a reduction in water quality and negative effects on SAC features.	The WwTW would be designed and operated to ensure that the effluent standards specified in **Table 4.2** would be complied with. Water quality around the discharge point would be slightly reduced from background levels however the effluent standards specified in **Table 4.2** would enable the passage of migratory fish. Sufficient storm water storage would be provided to ensure a minimum retention time of 2 hours for peak flows. Discharge to the centre of the channel where flow is highest and use of diffuser to maximise dilution.	**No**	**Risk has been minimised as far as possible. Despite a high level of mitigation there remains an extremely small possibility of an unforeseen event (e.g. failure of treatment plant). However the risk of this is considered to be so low as to be negligible.**
Alteration of river flow pattern around outfall affecting quality of river habitat for SAC species.	Discharge rate would be controlled to ensure effluent flow does not disrupt the natural river flow pattern.	**No**	**Low potential to affect small area therefore no significant effect on populations of Annex II species predicted.**
Disturbance of SAC species' habitat during outfall maintenance operations.	Schedule any significant maintenance operations (except for emergency works) to be carried out during the period July to September.	**No**	**Low potential to affect small area avoiding most sensitive time therefore no significant effect on populations of Annex II species predicted.**

4.3.1 Effluent standards

Waste Assimilative Capacity calculations have been carried out for the Mountrath River as per section 2.1 of this document. Effluent standards have been set to ensure compliance with Surface Water Regulations 2009 requirements for 'good status' waterbodies and the Urban Wastewater Treatment Regulations for BOD, Ammonia and Phosphorus. The proposed effluent standards for Mountrath WwTW are presented in Table 4.2 below.

Table 4.2 – Proposed Effluent Standards at Mountrath WWTW in DBO Contract Documents

Parameter	Concentration
BOD_5 (mg/L)	14
Total Suspended Solids (mg/L)	20
COD (mg/L)	125
Total Phosphorus (mg/L P)	0.40
Total Oxidised Nitrogen (mg/L N)	NR[1]
Total Ammonia (mg/L N)	0.75

1. NR = Not Required

5. CONCLUSION

It has been concluded that effective mitigation measures would remove the potential for the majority of activities associated with the WwTW capacity upgrade to have a significant effect alone (or in-combination) on the River Barrow and River Nore SAC. The only exceptions where it is not considered possible to entirely remove the risk of a significant effect on the SAC are instances of construction and operational pollution, as there would always remain an extremely small possibility of extreme/unforeseen events, as currently exists with respect to the Mountrath WwTW already being operational. However, by employing the specified mitigation measures and enforcing the effluent standards in Table 4.2, it is considered that the risk of such events occurring has been reduced to the lowest possible level (negligible risk) and thus the integrity of the SAC would not be adversely affected. Overall, the upgrade of the Mountrath WwTW will result in a reduction in contaminant loadings and a reduction in the discharge of poorly treated sewage to the SAC. The scheme will not result in significant adverse effects on the integrity of the SAC or prevent the achievement of favourable conservation status for the qualifying interests of the SAC including the Nore Freshwater Pearl Mussel.

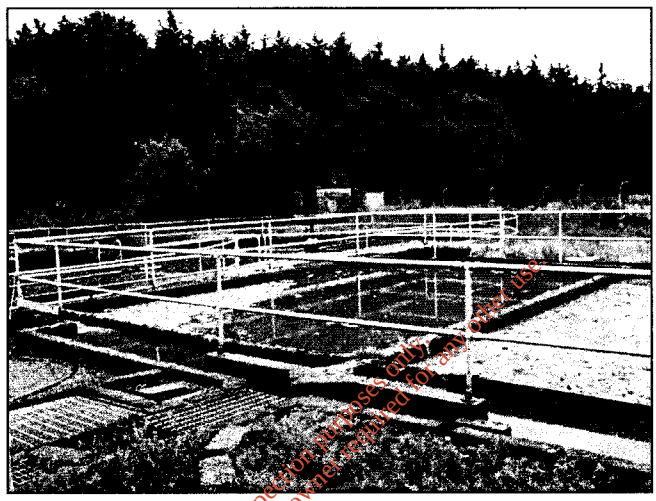
It is anticipated that improvements in background water quality in combination with the new WwTW at Mountrath would contribute to indirect positive impacts on water dependant qualifying interests of the SAC downstream i.e. floating river vegetation and Freshwater Pearl mussel.

APPENDIX 1 –LAYOUT PLAN OF WWTW UPGRADE

Laois County Council

Mountrath Wastewater Treatment Plant

Appropriate Assessment Report for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)



Version: June 2011

Prepared on behalf of: Laois County Council

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FOREWORD

The current Appropriate Assessment has been prepared following the EPA (2009) '*Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)*'. This provides guidance for Appropriate Assessment for the purposes of a waste water licence application under the Waste Water Discharge (Authorisation) Regulations (2007).

The EPA guidance note makes reference to the relevant EC legislation regarding designated sites (i.e. the EC Council Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna 92/43/EEC and on the Conservation of Wild Birds 2009/147/EC) and also to the EC guidance available at the time of publishing (EC 2001 and EC 2007). However, the Department of the Environment, Heritage and Local Government guidance '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*' (DoEHLG, 2009) had not been published at this time.

Following the DoEHLG (2009) guidance, the Appropriate Assessment process assesses the potential adverse or negative effects of a plan or project, in combination with other plans or projects, on a European Site (i.e. Special Area of Conservation, Special Protection Area or Ramsar site). However, following the EPA (2009) guidance note in the context of a Waste Water Discharge Licence Application for Local Authority waste water discharges, the EPA guidance considers the assessment to be limited to the discharge which '*will only have an impact on the aquatic environment [and] it can be inferred that the 'in combination' effect need only apply to other plans and projects that have an impact on the aquatic environment*'.

Therefore the current assessment for the Waste Water Discharge Licence is limited to assessing the potential adverse effects on the aquatic elements of the Natura 2000 network of the plant discharge, in combination with other plans / projects affecting the aquatic environment. The potential adverse effects of the plant discharge of the proposed plant is also considered in the context where this plant is proposed as a mitigation measure, however other potential impacts associated with the construction or operation the proposed plant are outside of the scope of the current document. It is recognised therefore that this does not correspond to the requirements of the Habitats Directive and the DoEHLG (2009) Guidance; where the Stage 2 assessment in the current report does not correspond to the rigours of a Natura Impact Statement (NIS).

The EPA (2009) guidance note states that it is the responsibility of each Local Authority to ensure that the AA process is carried out in accordance with the Habitats Directive and relevant national legislation. It is noted that an Article 6 Appropriate Assessment for a number of WwTP sites in Co. Laois, including the proposed Mountrath WwTP, was completed in 2006 (Entec & O'Dwyer, 2006). However this AA was completed prior to the publication of the European Communities Environmental Objectives (Surface Water) Regulations (SI No 272 of 2009) and DoEHLG (2009) guidelines on Appropriate Assessment.

The current therefore document provides an Appropriate Assessment following the EPA (2009) guidance, to form part of the overall Article 6 Appropriate Assessment process. The purpose of the current report is limited to the purposes of applying for a waste water licence application under the Waste Water Discharge (Authorisation) Regulations (2007).

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1. INTRODUCTION

The current document provides an Appropriate Assessment of the discharge of the Mountrath Waste Water Treatment Plant (WwTP) with regard to the potential for adverse effects on the River Barrow and River Nore Special Area of Conservation (SAC). Effects upon both habitats and species within the SAC are considered, where the key qualifying interests of the site are primarily aquatic. The Mountrath WwTP discharges directly into the River Barrow and River Nore SAC and therefore has the potential for direct effects on this Natura 2000 Site. The site synopsis for the affected SAC is included as Appendix I to this report. Designated Natura 2000 sites within 15km of the Mountrath WwTP are presented in Figure 1.

An Article 6 Appropriate Assessment is required under the Habitats Directive (92/43/EEC), in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are those identified as sites of European Community importance designated under the Habitats Directive (Special Areas of Conservation, hereafter referred to as SACs or the Birds Directive (Special Protection Areas, hereafter referred to as SPAs).

This report follows the guidance for Appropriate Assessment published by the EPA (2009) '*Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)*'; taking account of the National Parks and Wildlife Service (NPWS 2009) '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*' and The Department of the Environment Circular L8/08 '*Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*' (DoEHLG, 2008) as relevant. The EPA (2009) guidance is for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007) and the current report only meets the requirements of the EPA (2009) document, and is therefore not a full Natura Impact Statement (see foreword for explanation).

In the current situation, with regard to the WwTP at Mountrath, the magnitude of impact of the discharge is not easily quantifiable at Stage 1 Screening; indicating the potential for adverse effects on the SAC. Therefore a Stage 2 Appropriate Assessment has been undertaken. This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the *integrity* of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. It is noted that the current assessment only considers part of the project or plan, i.e. the discharge itself (as per EPA, 2009 guidelines). This document also only concerns the existing plant, although an assessment of the proposed WwTP at the Mountrath site is also made where it is introduced as a mitigation measure.

This document draws upon the information supplied in the Receiving Water Impact Assessment (RWIA) for the existing Mountrath Waste Water Treatment Plant (WwTP) produced on behalf of the Water Services section of Laois County Council (Ecofact, 2009). It is acknowledged that a screening report has already been prepared to assess the implications of the ongoing operation of the Mountrath Waste Water Treatment Plant (WwTP) upon the River Barrow and River Nore SAC. However, the current document provides an updated screening assessment following NPWS (2009) and EPA (2009) guidelines.

The current report was prepared by Ecofact Environmental Consultants Ltd. on behalf of Laois County Council during November/December 2010.

2. METHODOLOGY

2.1 Desktop Review

A review of areas designated (or being considered for designation) for nature conservation was carried out by consulting the National Parks and Wildlife Service (NPWS). These included Special Areas of Conservation and Special Protection Areas for birds within 15 km of the WwTP discharge point. The Mountrath Receiving Water Impact Assessment (Ecofact, 2009) produced on behalf of the Water Services section of Laois County Council was also consulted. This RWIA is included in Appendix 2 of the current document. An Appropriate Assessment was prepared by Entec & O'Dwyer (2006) '*Laois towns and villages wastewater improvement scheme: River Barrow and River Nore SAC Appropriate Assessment – Draft Report*', which was reviewed as part of the current assessment.

2.2 Appropriate Assessment Methodology

This Appropriate Assessment follows the EPA (2009) '*Notes on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)*' with further cognisance of the guidance published by the National Parks and Wildlife Service (NPWS 2009) '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*'. Based on these guidelines, the Appropriate Assessment process is a four staged approach described below:

- *Stage One: Screening / Test of Significance* - the process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

- *Stage Two: Appropriate Assessment* - the consideration of the impact of the project or plan on the integrity of the Natura 2000 site, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;

- *Stage Three: Assessment of Alternative Solutions* - the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site; and

- *Stage Four: Assessment Where Adverse Impacts Remain* - an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

The safeguards set out in Article 6(3) and (4) of the Habitats Directive are triggered not by certainty but by the possibility of significant effects. Thus, in line with the precautionary principle, it is unacceptable to fail to undertake an appropriate assessment on the basis that it is not certain that there are significant effects. In this case only affects potentially caused directly, indirectly or cumulatively by the actual discharge are considered.

The current report includes both a Stage One (Screening) and a Stage 2 Appropriate Assessment. This report is not a Natura Impact Statement (NIS) but a Appropriate Assessment Report for the purposes of the Waste Water discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007). Please refer to the foreword for a discussion of the limitations of this report.

The first test within a Stage 1 Screening is to identify whether the proposed plan or project can be excluded from Appropriate Assessment requirements because it is directly connected with or necessary to the management of the site; which is not the case for the current WwTP at Mountrath. The Appropriate Assessment process must be engaged in this instance.

3. STAGE 1: SCREENING / TEST OF SIGNIFICANCE

3.1 Description of the Mountrath WwTP

Mountrath is located south west of Portlaoise, on the main Dublin-Limerick National Primary route (N7). The town of Mountrath is classified as a Secondary Settlement under the County Development Plan 2006-2012, with a population of 1,258 in 2002 (Source: Mountrath Town Plan, Laois County Council website). The design capacity of the Mountrath plant in 2002 was 1,300 p.e. with an estimated load of 2,069 p.e.; therefore, the plant is operating at an overloaded capacity (Ecofact, 2009). Monaghan *et al.* (2009) subsequently reported that the agglomeration p.e. of the Mountrath plant was 2,184 with a plant p.e. of 2,300, which takes account of the addition of a temporary Package Treatment Plant which has been added to the system to increase capacity.

A new treatment plant has been proposed for Mountrath under the Laois Towns and Villages Waste Water Improvement Scheme, a Capital Project on the national Water Services Investment Scheme, funded by the Department of Heritage and Local Government (DEHLG). The project comprises of a DBO (Design Build Operate) contract for the provision of wastewater treatment plant to serve Mountrath up to the year 2025.

3.2 Identification of relevant Natura 2000 Sites

The current Screening Assessment has identified the designated Natura 2000 sites within a 15km radius of the proposed WwTP, as presented in Table 1. The only site within 15km that is likely to be directly, indirectly or cumulatively affected by the Mountrath WwTP discharge is the River Barrow and River Nore SAC. Additional Natura 2000 sites within 15km of Mountrath are not connected with the WwTP, either geographically or hydrologically, with regard to their conservation interests. The qualifying interests of the River Barrow and River Nore SAC site are detailed below. A map of the Mountrath region showing the location of the Mountrath WwTP and designated areas within 15km is provided in the Figures section. The Natura 2000 sites within 15km of the Mountrath WwTP are shown in Figure 1.

Table 1 Summary details of the designated areas located within 15km of the Mountrath WwTP.

Name	Distance from WwTP (km)	Notes	Included in the current Screening Assessment
River Barrow and River Nore SAC 2162	0	Site of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively.	Yes, discharge from the Mountrath WwTP is directly to this SAC.
Knockacoller Bog SAC 2333	5km south west	This site contains active raised bog, degraded raised bog and Rhynchosporion, habitats that are listed on Annex I of the E.U. Habitats Directive. Raised bog is a rare habitat in the E.U.	Not included as there is no connection between this site and the discharge.
Coolrain Bog SAC 2332	9km south west	This site contains active raised bog, degraded raised bog and Rhynchosporion, habitats that are listed on Annex I of the E.U. Habitats Directive. Active raised bog is a priority habitat on Annex I of the E.U. Habitats Directive.	Not included as there is no connection between this site and the discharge.
Slieve Bloom Mountains SAC (0412) and SPA (4160)	5km north	This SAC is designated due to the presence of mountain blanket bog habitat, an increasingly rare habitat in Europe and in Ireland which is continually under threat. The Slieve Bloom Mountains is also a designated SPA of special conservation interest for the Hen Harrier. It is also a breeding site for a pair of Peregrine Falcons and it is also of national importance for breeding Merlin.	Not included as there is no connection between this site and the discharge.

3.3 Assessment of likely impacts affecting the Natura 2000 site

3.3.1 Assessment of likely direct impacts

The discharge from the existing Mountrath WwTP is into the Mountrath River, within the River Barrow and River Nore SAC. The discharge point is approximately 700 metres downstream of Ballydire Bridge. The results of both the chemical and biological water quality assessments as outlined in the RWIA (Ecofact, 2009) suggest that the Mountrath WwTP discharge could potentially be causing an adverse affect on the water quality of the receiving water. However, there are other pollution sources affecting the river from upstream, with additional background water quality impacts affecting the River Nore downstream; therefore the overall significance of the Mountrath plant in terms of water quality impacts is unknown.

3.3.2 Assessment of likely indirect impacts

Indirect (or secondary) impacts are defined as effects that are "*caused by and result from the activity although they are later in time or further removed in distance, but still reasonably foreseeable*" (Bowers-Marriott, 1997). The existing WwTP is known to be overloaded with chemical and biological water quality indicating that the ongoing operation of the plant is having a localised effect on the Mountrath River. Although there is no conclusive evidence that the operation of the plant is having any indirect effects on the main channel of the River Nore SAC downstream i.e. with regard to the conservation interests of the SAC and with particular regard to the presence of Annex II Freshwater pearl mussels within the Nore, downstream of the Mountrath River confluence, this would require further detailed study. In this regard it must be concluded that the operation of the existing plant has at least the potential to be causing significant effects on the SAC.

3.3.3 Assessment of cumulative impacts

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects (Bowers-Marriott, 1997).

Due to the compromised background water quality, the Mountrath River has a limited waste assimilation capacity in relation to phosphorus and ammonia (Ecofact, 2009). The existing discharge from the Mountrath WwTP was found to result in increased concentrations of both ammonia and orthophosphate downstream, exceeding the relevant water quality standards with mean ammonia increasing by 84% and mean orthophosphate increasing by 100% (Ecofact, 2009). Other key parameters such as nitrates, nitrites and BOD were also elevated downstream of the WwTP discharge. It must be noted that the Mountrath River upstream of the WwTP was also found to be affected with both ammonia and orthophosphate again above statutory or guideline limits. It is concluded that the existing Mountrath plant is having an adverse effect on the Mountrath River in terms of assimilation capacity which can have associated impacts on water quality.

3.4 Screening statement with conclusions

According to NPWS (2009), the Appropriate Assessment Stage 1: Screening exercise can result in one of three conditions:

- An Appropriate Assessment is not required i.e. where the plan/proposal is associated with the management of the site;
- There is no potential for significant effects i.e. Appropriate Assessment is not required;
- Significant effects are certain, likely or uncertain i.e. the project must either proceed to Stage 2: Appropriate Assessment or be rejected.

Following the requirements of a Screening Stage Appropriate Assessment as outlined in the EPA's '*Note on Appropriate Assessments for the purposes of the Wastewater Discharges (Authorisation) Regulations (2007)*' the requirements of the DoEHLG Circular Letter '*L8/08 – Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments'* have been followed in establishing the conclusion of the Screening Statement.

1. **Is the development in a nature conservation site?** Yes, the Mountrath WwTP is discharging directly to the River Barrow and River Nore SAC, where the Mountrath River is designated within the SAC.
2. **Is the development in the surface water catchment of a nature conservation site (or part of such a site)?** – Yes, as above.
3. **Are the qualifying habitats and species of the site water dependant?** Yes, the majority of the Annex II species and some of the Annex I habitats.
4. **Is there a WFD sub-basin management plan for the site or its protected habitats/species?** Yes, particularly in relation to Freshwater pearl mussels.
5. **Does this plan cover all potential receptors (habitats/species)?** No, therefore the Screening process must conclude that further impact assessment is required.

From the current screening assessment, taking account of supporting documentation, there are ongoing, unquantified impacts affecting the Mountrath River within the River Barrow and River Nore SAC arising from the current operation of the Mountrath WwTP; particularly in relation to water quality. There is therefore the potential for further downstream effects on the SAC which would require further assessment. It is stated in EPA (2009) that '*if significant effects are likely then an appropriate assessment must be carried out. In addition, if the likelihood of significant effects is in doubt then the precautionary principle applies and an appropriate assessment must be carried out*'. The magnitude of impact on the SAC resulting from the Mountrath WwTP discharge is not known. Therefore it is necessary for the 'Appropriate Assessment' process to proceed to Stage 2 with regard to the potential for adverse effects on the River Barrow and River Nore SAC.

4. STAGE 2: APPROPRIATE ASSESSMENT

At this stage the impact of a project or plan ('the discharge') alone and in combination with other projects or plans on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function (NPWS, 2009). The Stage 2 Appropriate Assessment provides a description of the existing WwTP discharge to the Mountrath River. The conservation objectives of the River Barrow and River Nore SAC are identified, where those potentially affected by the proposed discharge are listed and potential impacts outlined.

4.1 Description of Natura 2000 Site affected

The River Barrow and River Nore Special Area of Conservation (site code 002162) is the only site affected. This site is selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive, 1992. The site is also selected as a SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. As well as habitats, the SAC has been selected due to the presence of invertebrate, fish and mammal species which are listed under Annex II of the EU Habitats Directive, including freshwater pearl mussel (*Margaritifera margaritifera* and its hardwater form *M. durrovensis*), freshwater crayfish (*Austropotamobius pallipes*), Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax fallax*), the three Irish Lamprey species - sea (*Petromyzon marinus*), brook (*Lampetra planeri*) and river (*Lampetra fluviatilis*), the Desmoulin's whorl snail *Vertigo moulinsiana* and Eurasian otter (*Lutra lutra*). A detailed map of the Mountrath WwTP study area, indicating the River Barrow and River Nore SAC site boundary, is given in Figure 2. The qualifying interests of the River Barrow and Nore SAC are presented in Table 2 and are discussed individually below.

Table 2 Qualifying Interests of the River Barrow and River Nore SAC and their potential to occur within the study area.

	Natura Code	Item Description	Present in the Mountrath River	Present in the Nore River within 15km
Species	1095	Sea lamprey (*Petromyzon marinus*)		
	1096	Brook lamprey (*Lampetra planeri*)	✓	✓
	1099	River Lamprey *Lampetra fluviatilis*		
	1102	Allis shad (*Alosa fallax*)		
	1106	Atlantic salmon (*Salmo salar*)	✓	✓
	1103	Twaite shad (*Alosa alosa*)		
	1355	Otter (*Lutra lutra*)	✓	✓
	1092	White-clawed crayfish (*Austropotamobius pallipes*)		✓
	1029	Freshwater pearl mussel (*Margaritifera margaritifera*)		
	1990	Nore Freshwater pearl mussel (*Margaritifera durrovensis*)		
	1016	Desmoulin's whorl snail (*Vertigo moulinsiana*)		
	1421	Killarney Fern (*Trichomanes speciosum*)		
Habitats	91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles		
	91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)		✓
	3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	✓	✓
	1310	*Salicornia* and other annuals colonizing mud and sand		
	1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)		
	1410	Mediterranean salt meadows (*Juncetalia maritimi*)		
	4030	European dry heaths		
	7220	Petrifying springs with tufa formation (*Cratoneurion*)		
	6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		✓
	1320	*Spartina* swards (*Spartinion maritimae*)		
	1140	Mudflats and sandflats not covered by seawater at low tide		
	1130	Estuaries		

4.2 Description of the conservation interests of the SAC

4.2.1 Annex I Habitats: Primary Reason for the Selection of the Site

The site is an SAC selected for alluvial wet woodlands and petrifying springs which are priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as an SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herb communities, all habitats listed on Annex I of the E.U. Habitats Directive. For the purpose of this study Estuaries; *Salicornia* species colonising mud and sands; Atlantic and Mediterranean salt meadows; Spartina swards; and tidal mudflats / sandflats are not considered further. This decision has been made on the basis that the conservation status of these habitats are not associated with or potentially affected by the Mountrath WwTP, due to the considerable distance from the discharge point in the Mountrath River. Terrestrial habitats and habitats not classified as 'water dependant' e.g. Dry heaths and Old sessile oak woods are considered to be outside the scope of this study and not included further, as there is no pathway through which changes in the current and future WwTP can impact on these habitats. The site synopsis for the River Barrow and River Nore cSAC is included in Appendix 1. The individual Annex 1 habitats that could be affected by the plant discharge are discussed below.

4.2.1.1 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)

This habitat occurs along the riparian corridor of the River Nore downstream of the Mountrath River confluence. Alluvial woodland habitats along the River Nore were surveyed as part of the National Survey of Native Woodlands (Perrin 2008); however, individual site data applicable to the River Barrow and River Nore SAC was not available for the current assessment. The conservation status of this Priority Annex I habitat takes account of the overall national conservation status i.e. 'Bad'; where the range is identified as favourable; with the reference area (Bad); structure and functions (Bad); and future prospects (Bad). The national conservation status context is taken into account for this habitat within the River Barrow and River Nore SAC – i.e. 'Unfavourable - Bad' conservation status.

4.2.1.2 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)

This Annex I habitat type occurs frequently within the River Barrow and River Nore SAC, where suitable gradient and flow occurs, conditions which were prevalent in the Mountrath River, both upstream and downstream of the WwTP discharge. At a national level its range is evaluated as being 'favourable'. However, overall nationally it is evaluated as being of 'Bad' conservation status (NPWS, 2008); due to failures in relation to specific structures and functions and also in relation to future prospects, principally in relation to impacts affecting the aquatic environment.

4.2.1.3 Petrifying springs with tufa formation (Cratoneurion) (7220)

This priority Annex I habitat is listed as a qualifying interest of the River Barrow and River Nore SAC. Calcareous springs are known to occur within the riparian corridor and floodplain of the River Nore main channel; however, there is no data regarding the presence of this habitat within the SAC boundary on the Mountrath River. In the absence of a conservation status evaluation for this habitat within the River Barrow and River Nore SAC it is considered that the national conservation status 'Unfavourable Bad' (NPWS 2008) is utilised.

4.2.1.4 Hydrophilous tall herb fringe communities of plains/montane to alpine levels (6430)

This Annex I habitat occurs within the River Barrow and River Nore, on the River Nore main channel, this habitat was not recorded on the Mountrath River downstream of the WwTP discharge. This habitat is evaluated as being of 'Inadequate' conservation status (NPWS 2008); where the range and area for this habitat are identified as being 'Favourable'.

4.2.2 Annex II Species: Primary Reason for the Selection of this Site

Species present at this site and listed on Annex II of the E.U. Habitats Directive include: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, brook lamprey *Lampetra planeri*, freshwater pearl mussel *Margaritifera margaritifera*, Nore freshwater pearl mussel *Margaritifera durrovensis*, white-clawed crayfish *Austropotamobius pallipes*, twaite and allis shad *Alosa fallax* and *Alosa alosa* respectively, Atlantic salmon *Salmo salar*, otter *Lutra lutra*, Desmoulin's whorl snail, *Vertigo moulinsiana* and the Killarney fern *Trichomanes speciosum*. The Killarney fern (1421) will not be considered in this assessment due to its current distribution, which is limited to areas close to Carlow in the River Barrow catchment; taking cognisance of its connection to terrestrial habitats.

Sea lampreys (1095) are anadromous and appear to be confined in general to the lower reaches of the River Nore. There is no evidence that they ascend any further upstream than Kilkenny, and are probably confined to the area of the river below Bennettsbridge Weir (c 60km downstream from the Mountrath WwTP discharge). Lampreys are poor swimmers and cannot jump or climb (Reinhardt *et al*, 2009), so will have significant difficulty getting past the main stem weirs on the River Nore. River lampreys (1099) are also an anadromous species. They are also poor swimmers and cannot jump and climb so they are almost certainly confined to the lower reaches of the River Nore below Bennettsbridge. This species will therefore not be discussed any further in this assessment as it is not considered likely that they could be affected by the ongoing operation of the plant. The anadromous lamprey species will therefore not be discussed any further in this assessment. Twaite Shad (1103) and Allis Shad (1102) are one of the rarest fish species which breed in Irish freshwaters. Shad have an anadromous life cycle and have been recorded in the lower reaches of the River Nore. However, it is clear that both shad species are confined to the lower reaches of the river below the weirs in the lower river and would therefore not occur in the study area. These species are also not discussed further in this report. The other species are discussed individually below.

4.2.2.1 Brook lamprey (1096)

The brook lamprey is the smallest of the three lampreys native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). Brook lamprey were recorded in the study area occurring within the Mountrath River both upstream and downstream of the WwTP discharge and within the River Nore main channel (Ecofact, 2009). The affected stretch of the Mountrath River contains both nursery and potential spawning habitats for this species. This species is evaluated as being of 'Favourable' conservation status nationally (NPWS 2008).

4.2.2.2 Atlantic salmon (1106)

Salmon are present throughout the Nore catchment, including the Mountrath River (McGinnity *et al*, 2003). The stretch of the Mountrath River in the vicinity of the WwTP outfall contains physical habitat suitable for use as both a spawning and nursery. The conservation status of salmon in the Mountrath River is dependent on good water quality status; as this species requires clean water (Q4) for spawning and early life stages. This species is evaluated as being of overall 'Bad" conservation status nationally (NPWS 2008).

4.2.2.3 Otter (1355)

Evidence of otter activity has been recorded from the Mountrath River corridor both upstream and downstream of the WwTP discharge (Ecofact, 2009) and this species is widespread in the designated catchments of the River Barrow and River Nore SAC. The conservation status of this species is dependent on fish stocks, which are ultimately dependent on water quality.

4.2.2.4 White-clawed crayfish (1092)

White-clawed crayfish occur in the River Nore catchment but were not recorded in the Mountrath River during the field work carried by Ecofact (2009). Crayfish are recognized as

being tolerant of moderate pollution levels and are classed as Group C organisms in the EPA Q-Value biotic index. This species is evaluated as being of overall 'Inadequate' conservation status nationally (NPWS 2008).

4.2.2.5 Irish Freshwater pearl mussel (1990) and Freshwater pearl mussel (1029)

The Freshwater pearl mussel (*Margaritifera margaritifera*) does not occur in the Mountrath River catchment; however, distinct populations occur in the River Nore main channel, downstream of the Mountrath River confluence. The populations of *M. margaritifera* within the River Nore have been described as a separate hard water species (*Margaritifera durrovensis)*, or as a subspecies; however discussion remains as to whether these hard water populations are actually an ecophenotypic hard water form of *M. margaritifera* (Lucey, 2006).

The most recent monitoring surveys for *M. durrovensis* indicate that, while there may be outliers downstream, its main population is now restricted to approximately 10km length of river and 500 individuals, and that there is no evidence of reproduction (2007). The majority of the population is located between Watercastle and Tallyho Bridges (DOELG, 2009), approximately 18 river kilometres downstream of the Mountrath WwTP discharge.

Pearl mussels have a complicated life cycle, involving native salmon or trout. The key cause of decline in pearl mussel populations in Ireland is unsuitable habitat for juvenile mussels after they fall off the gills of host salmonids (Moorkens, 2007). This stage requires the safety of remaining within the river bed gravels, before growing to a size that allows the emergence of the filtering siphons into the open water body. While the juvenile mussels remain within the river bed gravels, they filter the interstitial water within the gravels. Where the gaps between the gravel and stones get clogged with fine silt, either physical (from suspended solids entering the river) or organic (from algal growth and decay prompted by nutrients in the water), the flow of water in the interstices becomes very restricted. Without adequate water movement and replacement, oxygen levels are exhausted and young mussels die. The decline in interstitial water quality in silted gravels has been detailed by a number of authors in the scientific literature. Fine sediments in gravels have been shown to increase mortality in juvenile mussels to 100%. As river quality becomes depressed, breeding stops and populations become "*functionally extinct*", i.e. older adults persist, but are not replaced by a new generation (Moorkens, 2007). The mussel population eventually dies out when the older individuals die of old age. Once breeding stops, it becomes very difficult to save a population. No mussel river in this situation has yet been recovered to a fully independent, recovered and breeding colony. In this knowledge, the pearl mussel has been identified as being internationally endangered.

The Irish pearl mussel *Margaritifera durrovensis* is listed as critically endangered in the Republic of Ireland in the most recent review of local IUCN threat status of Irish molluscs. It is evaluated as being of overall 'Unfavourable to Bad" conservation status nationally (NPWS 2008).

4.2.2.6 Desmoulin's whorl snail (1016)

In the River Barrow and River Nore cSAC the status of this snail population is considered 'Unfavourable' (Conservation Status Assessment Report, 2007). This species has been recorded within the riparian corridor of the River Nore and may occur within the Nore main channel downstream of the Mountrath River confluence. No suitable habitat for this species was recorded in the Mountrath River directly downstream of the WwTP discharge. According to NPWS (2008) Vertigo moulinsiana is sensitive to eutrophication and consequent vegetation changes to its riparian and fen habitats. This species is evaluated as being of overall 'Bad - Unfavourable' conservation status nationally (NPWS 2008).

4.3 Impact Prediction / Assessment

The discharge from the existing Mountrath WwTP is directly into the River Barrow and River Nore SAC (site code 002162) and both the chemical and biological water quality of the receiving water (Mountrath River) is affected. On this basis it is concluded that the ongoing operation of the plant will have a direct, localized effect on the SAC.

At Stage 2 the impact of the project / plan affecting the *integrity* of a Natura 2000 site is considered with respect to the conservation objectives of the site. Integrity is defined as: '*the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified*'. Therefore the integrity of a site is principally related to the structure and function of the site with regard to its Annex I habitats and Annex II species listed as the qualifying interests. The conservation status of these qualifying interests comprises the primary conservation objectives for all designated Natura 2000 sites. Favourable conservation status is defined for Annex I habitats and Annex II species in the Habitat Directive (1992):

Article 1 (e)

> *Conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2.*
> *The conservative status of a natural habitat will be taken as 'favourable' when: its natural range and areas it covers within that range are stable or increasing, and the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.*

Article 1 (i)

> *Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2;*
> *The conservation status will be taken as 'favourable' when: population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

The conservation status of the qualifying interests within the River Barrow and River Nore SAC are subject to the Conservation Management Plans in preparation by the NPWS. The conservation status of Annex I Habitats and Annex II species as qualifying interests of the SAC are assessed as follows:

- Range
- Area
- Specific structures and functions
- Future prospects

The conservation status of the qualifying interests within the River Barrow and River Nore SAC are available at a national level; however, there is currently no Conservation Management Plan for this SAC where the conservation status of the qualifying interests within the site may be identified. The current assessment therefore utilises the available literature and the national '*Conservation Status Assessment Report*' (NPWS, 2008).

From Ecofact (2009) it was found that biological water quality deteriorates downstream of the WwTP discharge in the Mountrath River, from Q3-4 to Q3. The EPA undertakes biological water quality monitoring on both the Mountrath River and the River Nore. From the 2010 monitoring data it was found that biological water quality in the Mountrath River was at 'Unsatisfactory status' Q3-4 both upstream and downstream of the WwTP discharge; it is acknowledged that the EPA downstream monitoring station is greater than 1 kilometre downstream from the WwTP discharge and therefore would not be likely to identify direct,

localised impacts as recorded during the Ecofact 2009 survey. The River Nore upstream and downstream of the Mountrath River confluence was rated as 'Good status' Q4.

Based on calculations in the RWIA (Ecofact, 2009), it was evident that the effluent from the WwTP at Mountrath is having a significant adverse effect on the Mountrath River due to poor dilution and assimilation capacity in the receiving water. The impacts of poor water quality in the Mountrath River have been shown to historically affect the River Nore main channel downstream of the confluence, with the Mountrath WwTP identified as being a significant pressure within the Nore sub-basin with regard to the conservation of the Freshwater pearl mussels (DoEHLG, 2010).

The Mountrath WwTP has been identified as a point pressure and at risk in the Southeastern River Basin Management Plan; Nore Upper Water Management Unit (SERBD, 2010). Measures for the implementation of increased capacity and provision of tertiary treatment are recommended for the Mountrath WwTP (SERBD, 2010).

According to the WWDA Licence Application submitted by Laois County Council to the EPA (Reg. No. D0153-01) chemical water quality assessments indicate that background water quality in the Mountrath River upstream of the WwTP discharge was found to be affected with Ammonia and Orthophosphate above statutory or guideline limits. Downstream of the WwTP however the concentrations of these nutrients were amplified with mean Orthophosphate increasing by 100% and mean Ammonia increasing by 84%. In addition to raised Orthophosphate and Ammonia, Nitrates, Nitrites and BOD were also elevated downstream of the WwTP discharge. One of the samples taken upstream of the discharge had an Ammonia concentration of 1.82mg/l or 18.2 times the statutory limit. This result was probably due to a pollution episode and highlights that there are also factors upstream of the WwTP discharge contributing to degraded water quality in the Mountrath River.

In the RWIA (Section 3.2.3), the observed effluent quality from the plant during the period February 2007 to March 2008 is summarised. The results confirm that the plant is overloaded and performing poorly. The general conclusion of the sampling undertaken in 2008 as part of the RWIA was that the Mountrath River was considered to be impacted with imbalances in terms of the macroinvertebrate communities present at the sites investigated both upstream and downstream of the plant. Downstream of the Mountrath WwTP outfall, the macro-invertebrate communities indicated deterioration in water quality, with greater relative abundances of the pollution tolerant taxa and increased sewage fungus, pointing to a decline in ecological status at the downstream site. The role of storm water outfalls in affecting biological water quality at both of these sites is unknown. The RWIA utilised the extent of data available and there was no evidence that water quality in the River Nore is significantly affected by the Mountrath WwTP.

Cumulative impacts affecting the water quality of the Mountrath River include possible run-off from the surrounding catchment. The Mountrath catchment in the upper reaches is mainly under commercial forestry. As the Mountrath River flows through the town of Mountrath, it is mainly influenced by light industry and residential housing, with contributions from storm water outfalls in the collection network identified. The mid to lower reaches of the Mountrath River is mostly surrounded by pasture and tillage. The resultant cumulative impacts on the water quality of the Mountrath River are evident both upstream and downstream of the discharge point.

4.3.1 Impacts on Annex I Habitats listed as qualifying interests of the SAC

4.3.1.1 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)

This habitat is not a water dependant habitat and is not directly connected to the aquatic fluvial environment. However, as it occurs along the riparian corridor and within the flood plain of the River Nore within the SAC, there is the potential for alteration of the ground flora and botanical communities of this woodland habitat in a localised context, arising from increased nutrification of the soils within the woodland. This may arise during flood events, where

nutrient enriched silt or flood waters with a high nutrient load may be deposited within the woodland.

This habitat was not recorded from the riparian corridor of the Mountrath River, however, the existing WwTP is liable to inundation and flooding and therefore there is the potential for water quality impacts affecting the River Nore main channel downstream. The extent and significance of these impacts is currently unknown. Although there is no recent data regarding the conservation status of this habitat within the SAC it is concluded that the ongoing discharge would not have a significant effect on the integrity of this habitat within the River Barrow and River Nore SAC.

4.3.1.2 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)

It is considered that the ongoing operation of the Mountrath plant would have localised impacts affecting this habitat. According to NPWS (2008), discharges, fertilisation and water pollution are identified as the main pressures affecting this water dependant habitat; with a direct application to the current WwTP at Mountrath where water quality impacts have been recorded in the Mountrath River, designated within the SAC. In the absence of detailed conservation status data for this habitat within the River Barrow and River Nore SAC, the national context of 'Unfavourable - Bad' conservation status is utilised for the current assessment, where the WwTP at Mountrath has the potential to contribute to nutrient-loadings and water pollution affecting the structure and function of this habitat within the SAC.

4.3.1.3 Petrifying springs with tufa formation (Cratoneurion) (7220)

This habitat is associated with calcareous springs within the SAC along the corridor and floodplain of the River Nore main channel. However, these springs are separate aquatic entities to the main watercourses designated within the SAC, and are connected to the catchment via tributaries of these main watercourses. The extent and location of these habitats within the SAC has not been identified or evaluated. Tufa-forming springs are considered likely to be independent of water quality within the Mountrath River; however, the ground-water/surface-water interactions within the Mountrath River catchment have not been investigated, where the WwTP discharge, affecting the river may impact on these habitats via groundwater connections. Based on the information currently available it is therefore not possible to assess whether the ongoing discharge would significantly affect this cSAC feature. However, it is clear that due to the size of the Mountrath plant that any impacts would be localised, and would not be expected to have integrity level impacts on this conservation interest.

4.3.1.4 Hydrophilous tall herb fringe communities of plains / montane to alpine levels (6430)

According to the NPWS (2008) water quality and discharges are not identified as being main pressures or threats affecting this habitat. However, it is considered that there is the potential for significant water quality deterioration to affect / alter the botanical communities of these habitats along the riparian corridor of the River Nore main channel within the SAC. However, this habitat was not recorded from the Mountrath River corridor downstream of the WwTP and it is considered unlikely that the conservation status of this habitat affecting the integrity of the SAC would be realised from the Mountrath WwTP discharge.

4.3.2 Impacts on Annex II species listed as qualifying interests of the SAC

4.3.2.1 Brook lamprey (1096)

Water quality impacts downstream of the Mountrath WwTP outfall would not be expected to have significant negative impacts on existing brook lamprey populations, as they would tolerate such pollution. Such pollution would, however, be expected to affect recruitment of this species, as they are understood to require a high standard of water quality for successful spawning and ova survival. Therefore the current poor water quality status of the Mountrath River, affected by the WwTP discharge, has the potential to affect this species. However,

brook lampreys can be expected to be found throughout the SAC and have a favourable conservations status nationally. In this respect it is unlikely that the ongoing operation of the Mountrath plant would have the potential to affect the integrity of this SAC conservation interest.

4.3.2.2 Atlantic salmon (1106)

Poor water quality will affect the conservation status of salmon in the Mountrath River, as this species requires clean water (Q4) for spawning and early life stages. The Mountrath WwTP was considered to be further contributing background water quality problems with a deterioration in the trophic status of the macroinvertebrate community compared to upstream (Ecofact, 2009). Therefore, the potential of the Mountrath River as a salmon producing watercourse is being affected by the plant, with localised impacts on this species within the SAC. Overall, however, the conservation status of salmon in the River Barrow and River Nore SAC is not thought to be affected by the Mountrath plant discharge as this species has a wide range in the catchment and impacts form the Mountrath plant appear to be localised only.

4.3.2.3 Otter (1355)

Reduced water quality and ecological status downstream of the discharge of the Mountrath WwTP could be potentially having indirect effects on otters; as a result of reduced food supply i.e. reduced macroinvertebrate and fisheries production. The otter is dependent on fish stocks, which are ultimately dependent on water quality. However, there is no indication that the ongoing operation of this plant is having an adverse effect on otters within the River Barrow and River Nore SAC as a whole.

4.3.2.4 White-clawed crayfish (1092)

White-clawed crayfish occur in the River Nore catchment, although apparently not in the general area of the Mountrath WwTP (Ecofact, 2009). Crayfish are recognised as being tolerant of moderate pollution levels and are classed as Group C organisms in the EPA Q-Value biotic index. A recent report found that "*crayfish were most often found in unpolluted waters but were also found in slightly polluted and moderately polluted waters. Some populations were even found at sites with very low water quality*" (Demers *et al*, 2005). However, the relationship between water quality and crayfish populations is not fully understood and there have some cases of crayfish populations being lost from rivers which deteriorated from slightly (Q3-4) to moderately polluted (Q3) conditions (Reynolds, 2007). It is therefore considered sensible to consider them as a species that is vulnerable to water quality changes (Reynolds, 2007). Reduced water quality and ecological status downstream of the discharge of the Mountrath WwTP could potentially have indirect effects on crayfish.
Overall however, the integrity of the white-clawed crayfish population in the River Barrow and River Nore SAC is not thought to be affected by the Mountrath plant discharge at a level that would affect the integrity of this conservation interest. This is because this species has a wide range in the catchment and any impacts from the Mountrath plant appear to be localised only.

4.2.2.5 Irish Freshwater pearl mussel (1990) and Freshwater pearl mussel (1029)

The Freshwater Pearl mussel population is at unfavourable conservation status in the Nore catchment (DoEHLG, 2010). The population of *Margaritifera durrovensis* in the Nore River is known to be critically endangered for some time with evidence that there has been no recruitment for some time (DoEHLG, 2010). The population is failing in its habitat quality (through evidence of heavy siltation, macrophyte and filamentous green algal growth), and its population demographic profile, where it is evident that there are not the numbers of juveniles present in the population to provide sustainable replacement of the current adult numbers.. The population is now thought to be restricted to a short section of approximately 10km of the main Nore channel in very low numbers (DoEHLG, 2010). Freshwater pearl mussels occur in the River Nore approximately 18km downstream of the Mountrath River confluence.

Point discharges in the sub-basin are identified as being a significant threat in the Freshwater Pearl Mussel Nore Sub-Basin Management Plan (DoEHLG, 2010), where the Mountrath

WwTP itself is one of the listed WwTPs in the sub-basin that have high risks associated with them and that have been identified to be in need of improvements. There is however, no monitoring evidence to show that the Mountrath plant is having a negative impact on the water quality of the River Nore main channel. However, the ongoing impacts to water quality arising from the plant, affecting the Mountrath River within the SAC will contribute to cumulative background water quality impacts potentially affecting the integrity of this conservation interest. According to DoEHLG (2010) the Nore sub-basin catchment currently fails all of the five Environmental Quality Objectives (EQOs) as specified in Schedule 4 of the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. 296 of 2009 (DoEHLG, 2010).

4.2.2.6 Desmoulin's whorl snail (1016)

In River Barrow and River Nore cSAC the status of this snail population is considered unfavourable (Conservation Status Assessment Report, 2007). No records of this species were found in the survey undertaken during 2008; however, no specific methodology was used to survey this species. No suitable habitat for this species exists in the vicinity of the Mountrath plant and, as this is a semi-aquatic species and effects of the Mountrath discharge are probably only localised, the ongoing discharge is unlikely to have the potential to affect the conservation status of this qualifying interest or the integrity of the cSAC.

4.4 Conservation Objectives for River Barrow and River Nore SAC

At a national level the conservation status of these water dependant qualifying interests has been provided in the NPWS Conservation Status Report (2008) '*The status of EU Protected Habitats and Species in Ireland*'. For habitats/species identified as being affected by the Mountrath WwTP the following Conservation status conclusions were made (NPWS, 2008):

- Floating river vegetation – Unfavourable / Bad conservation status
- Brook lamprey – Favourable conservation status
- Atlantic salmon – Bad conservation status
- Otter – Inadequate conservation status
- Freshwater pearl mussel – Unfavourable / Bad conservation status for both *M. margaritifera* and *M. durrovensis*.
- Desmoulin's whorl snail – Unfavourable / Bad conservation status

The Conservation Management Plan detailing the conservation interests of the River Barrow and River Nore SAC is currently under preparation by the National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government. However, the draft conservation objectives of all Conservation Management Plans were available at the time of preparing the current report. The conservation objectives of the draft Conservation Management Plan for the River Barrow and River Nore SAC are given in Table 3.

Table 3 The conservation objectives of the draft Conservation Management Plan for the River Barrow and River Nore SAC.

Number	Objective
Objective 1	To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status.
Objective 2	To maintain the Annex II species for which the cSAC has been selected at favourable conservation status.
Objective 3	To maintain the extent, species richness and biodiversity of the entire site
Objective 4	To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation. The Government and its agencies (i.e. the NPWS, local authorities and other statutory bodies) are responsible for the implementation and enforcement of regulations that

will ensure the ecological integrity of these sites. According to the EU Habitats Directive (1992), favourable conservation status of a habitat is achieved when:

"*...its natural range, and area it covers within that range, is stable or increasing, and the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable*". The favourable conservation status of a species is achieved when "*population data on the species concerned indicate that it is maintaining itself, and the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis*".

The operation of the existing plant at Mountrath has been recognised as having an adverse effect on the water quality of the Mountrath River within the SAC; where water quality has been identified as a key indicator of conservation value for the River Barrow and River Nore SAC. Deleterious impacts on water quality will directly interfere with the structure and function of the SAC, where the conservation objectives of the site are focussed on maintaining the aquatic Annex I habitats and Annex II species at favourable conservation status. Within the Mountrath River, this would result in localised impacts affecting aquatic Annex II species including Atlantic salmon, brook lamprey and otter. It is considered that the conservation status of these species is directly affected by water quality impacts in the Mountrath River, but with cognisance of the background water quality issues, as a cumulative impact; where the existing plant alone is not considered to be affecting the population size and range of these species within the Mountrath River.

The provisions of Article 6 of the 'Habitats' Directive 92/43EC (2000) defines 'integrity' as the '*coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or population of species for which the site is or will be classified*'.

With regard to the integrity of the site as a whole, both the Mountrath River and the River Nore main channel are affected by background water quality pressures which affects the waste assimilation capacity for WwTP discharges at point source, although there is greater capacity for dilution within the Nore. The Mountrath WwTP, discharging to the Mountrath River within the SAC is therefore impacting directly on the conservation objectives and therefore the integrity of the SAC within the Mountrath River; however, there is no evidence of impacts affecting the River Nore main channel in relation to water quality (Ecofact, 2009), neither is there any monitoring data to determine the extent of cumulative impacts affecting the River Nore main channel arising from the existing WwTP at Mountrath. This leads to uncertainty, where unquantified cumulative impacts have the potential to contribute to impacts affecting the conservation objectives of the SAC.

4.5 Mitigation measures

4.5.1 Existing Plant

Laois Co. Co. recognises that the existing plant is not operating to the required standards and a new plant has been proposed for the site. The proposed plant will include tertiary treatment where effluent quality will be significantly better than is currently the case.

Mitigation measures recommended until the new plant is operational include:

- Improving the operating standards of the existing plant to reduce the impact of the ongoing operation of the existing plant at the discharge source;
- Immediate introduction of plant maintenance with ongoing monitoring of the operation of the plant machinery with regard to compliance with the operating standards of the plant
- Continuation of monitoring of the discharge, both upstream and downstream of the plant to allow for accurate determination of the impact of the existing plant on the SAC and the background water quality loadings affecting the Mountrath River, upstream of the plant. Monitoring of the current situation with regard to the

contribution of the existing storm water outfalls to the SAC is also recommended to allow for a greater degree of certainty in assessing impacts to the Mountrath River within the SAC.

- It is also recommended that annual biological monitoring be undertaken upstream and downstream of the WwTP outfall. Any biological monitoring should be carried out during the summer / autumn period. Further monitoring for dangerous substances from the WwTP discharge is recommended.

4.5.2 Reduction in cumulative background water quality pressures

Laois County Council is already making significant efforts to reduce cumulative impacts on water quality in the Mountrath and upper Nore catchments and is concurrently working with the EPA to identify sources of background pollution potentially affecting the SAC. Laois Co. Co. is actively engaging with the farming community and examining farms in the Mountrath catchment to reduce background pollution loadings, through farm surveys and other work of their Environmental department. This work, together with improvements in plant operation until the proposed plant is operational will offer some reduction in the magnitude of impact affecting water quality within the SAC, with direct beneficial impacts affecting the qualifying interests of the site i.e. the water dependant Annex II species occurring within the Mountrath River.

4.5.3 Provision of a new WwTP for Mountrath

An upgraded WwTP system is proposed for Mountrath under the Laois Towns and Villages Waste Water Improvement Scheme. A waste assimilation capacity (WAC) assessment was undertaken to show the likely impact of the proposed discharge from the new plant to the Mountrath River. In this assessment, flow data for the river has been taken from the EPA Hydrometric Data System (see Appendix 3) and the 30%ile flow has been taken as the mean flow as indicated in 'Hydrological data' by MacCarthaigh (1997). Mean background values of parameters have been taken from the RWIA (Ecofact, 2009). The design standards for the proposed plant at Mountrath are provided by Laois County Council.

The design population equivalent for Mountrath was taken as 4,500 PE for the proposed plant. For the proposed plant with a design Population Equivalent (PE) of 4500, the dry weather flow is 11.7L/s with a peak flow to treatment of 35.2L/s. The proposed plant is designed to deliver an effluent BOD of 14mg/l, Total Phosphorus standard of 0.4mg/l and Total Ammonia level of 0.75mg/l.

It can be seen from the WAC assessment in Table 4 that there is no WAC for BOD, Total Ammonia or Ortho-phosphate using standards in the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009) for mean flow at 'high status'. This is due both to the existing elevated background concentrations of these parameters in the Mountrath River and also to the small size of the receiving waterbody. At 'good status' under mean flows there is no WAC for BOD or Total Ammonia, with limited WAC available for Ortho-phosphate where the proposed plant will require 83% of the available WAC. To meet 'good status' at mean flows, background levels in the Mountrath River would need to be reduced from 0.19mg/l to 0.056mg/l for Ammonia upstream of the WwTP. The river would then however have no additional WAC for any other effluents that could enter the river downstream of the plant. For BOD the background concentrations in the Mountrath River would need to be reduced from 1.73mg/l to 1.35mg/l at 'good status', under mean flow conditions to comply with the SWR (2009). When the theoretical maximum WAC is applied under mean flow conditions the proposed plant will meet the requirements of 'high status' and 'good status'. This is taking background water quality at a pristine condition.

Using the 95%ile flow in the Mountrath River at the discharge point, it was found that the proposed plant did not meet the requirements at 'high status' or 'good status', due to the elevated background concentrations in the receiving water. Where the theoretical maximum was calculated at pristine background water quality for both 'high status' and 'good status', it was found that the proposed plant did not meet the requirements of 'high status'. However, there was available assimilation capacity at 'good status'; but the WAC consumed by the

effluent at this theoretical maximum would be as high as 95%, 95% and 80% for BOD, Total Ammonia and Ortho-phosphate respectively. This requirement for

The predicted concentrations are based on the effluent discharge standard and background level downstream of the mixing zone (usually *ca.* 25 times the width of the river downstream). It is noted that there would be higher concentrations within the immediate vicinity of the outfall. Due to the natural recovery process that takes place in rivers, the concentration downstream of the mixing zone would be expected to decrease with distance from the discharge.

4.5.3.1 Conservation Objectives with regard to the new plant

The poor performance of the existing plant means that upgrading of the plant (Stage 1) should be undertaken as soon as possible, as per the Laois Towns and Villages Wastewater Improvement Scheme.

The proposal to upgrade the existing WwTP to include improved discharge standards and the proposal of a new plant are key mitigations in the AA. However, the limited assimilation capacity within the Mountrath River means that the discharge standards for the proposed plant may need to be revised and/or concrete proposals put in place for the reduction of background loadings to the river.

The current WAC assessment has determined that an improvement in water quality in the Mountrath River upstream of the discharge from the new plant is required, as the WAC in the Mountrath River is currently limited due to the small size of the river and current background water quality.

Although the proposed plant does not currently meet the required standards of the Surface Waters Regulations (2009) it is considered that any improvement in water quality either in relation to the proposed new WwTP or upstream background conditions would result in direct positive impacts on Annex II species for which the SAC was selected and which occur in the Mountrath River; i.e. floating river vegetation, Atlantic salmon, otter, and brook lamprey. No discernible impacts affecting terrestrial habitats for which the SAC is designated are identified in relation to the operation of the new plant.

As required in the EPA '*Note on Appropriate Assessments for the purposes of the Waste Water Discharge Authorisation Regulations, 2007 (S.I. No. 684 of 2007)*' the proposed mitigation measures require evidence of their efficacy and implementation and a timescale of when these will be undertaken. The degree of confidence of the success of these mitigation measures is also required. These issues are addressed in the submission by Laois County Council (Appendix 4) where the schedule for the delivery of the new WwTP is provided.

Waste Water Treatment Plant: Mountrath Proposed **Receiving Water:** Mountrath River (River Barrow and River Nore cSAC)				
WwTP Characterisitics				
Discharge volume DWF (m^3/day)		Discharge volume DWF (l/s)		
	BOD	**Total Ammonia**	**Ortho-phosphate**	**Total Phosphorus**
Design standard (mg/l)	[illegible]	[illegible]	[illegible]	[illegible]
Receiving Water Characteristics				
River mean flow[1,2] (m^3/sec)		Mean flow dilution factor		81.6
River 95%ile flow[2] (m^3/sec)		95%ile flow dilution factor		5.6
	BOD (mg/l)	**Total Ammonia**	**Ortho-phosphate**	**Total Phosphorus**
Background concentration[3] (mg/l)	[illegible]	[illegible]	[illegible]	[illegible]
Environmental Quality Standards[4]				
	BOD	**Total Ammonia**	**Ortho-phosphate**	**Total Phosphorus**
High Status mean flow (?mg/l)	1.3	0.04	0.025	N/A
Good Status mean flow (?mg/l)	1.5	0.065	0.035	N/A
High Status 95%ile flow (?mg/l)	2.2	0.09	0.045	N/A
Good Status 95%ile flow (?mg/l)	2.6	0.14	0.075	N/A
Predicted Loadings, Concentration Increases[4] and Waste Assimilation Capacity[6] (WAC)				
	BOD	**Total Ammonia**	**Ortho-phosphate[7]**	**Total Phosphorus**
Plant loading (Kg/day)	**14.15**	**0.76**	**0.344**	**0.40**
MEAN FLOW				
Concentration increase (mg/l)	**0.15**	**0.01**	**0.004**	**0.00**
- Resultant D/S concentration (mg/l)	**1.88**	**0.20**	**0.034**	**0.04**
- WAC (High Status)				
WAC (kg/day)	-35.48	-12.38	-0.41	
- Consumed by discharge (%)	N/A	N/A	N/A	
Theoretical maximum WAC[8] (kg/day)	107.27	3.30	2.06	
- Consumed by discharge (%)	13	23	17	
- WAC (Good Status)				
WAC (kg/day)	-18.98	-10.31	0.41	
- Consumed by discharge (%)	N/A	N/A	83	
Theoretical maximum WAC (kg/day)	123.77	5.36	2.89	
- Consumed by discharge (%)	11	14	12	
95%ile FLOW				
Concentration increase (mg/l)	1.85	0.08	0.047	0.05
- Resultant D/S concentration (mg/l)	**3.58**	**0.27**	**0.077**	**0.09**
- WAC (High Status)				
WAC (kg/day)	2.68	-0.57	0.09	
- Consumed by discharge (%)	528	N/A	402	
Theoretical maximum WAC (kg/day)	12.55	0.51	0.26	
- Consumed by discharge (%)	113	148	134	
- WAC (Good Status)				
WAC (kg/day)	4.96	-0.29	0.26	
- Consumed by discharge (%)	285	N/A	134	
Theoretical maximum WAC (kg/day)	14.83	0.80	0.43	
- Consumed by discharge (%)	95	95	80	

[1] *30%ile flow taken as the mean flow as indicated in 'Hydrological data' by MacCarthaigh (1997)*

[2] *Data from the EPA Hydrometric Data System: http://watermaps.wfdireland.ie/HydroTool (for receiving river segment 15_1907 - Mountrath River)*

[3] *Mean values taken from 'Receiving Water Impact Assessment: Durrow WwTP, Ecofact (2009) (mean values derived from WQ results between February 2007 and March 2008 - originally supplied by Laois Co. Co.). Ammonia taken as Total Ammonia.*

[4] *European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009).*

[5] *Formula for resultant concentration = [(background conc. X background vol.) + (effluent conc. X effluent vol.)] / (background vol. + effluent vol.)*

[6] *Formula for calculating WAC = (Environmental quality standard concentration - background concentration) X 86.4 X flow.*

[7] *Orthophosphate taken as 85% Total Phosphorus.*

[8] *Theoretical maximum WAC = WAC in the receiving water when background parameter concentration is not taken into account.*

Exceedences of SWR 'Good status' (2009) shown in red

Model title	
Waste Assimilation Capacity Assessment for the proposed Mountrath WwTP discharge to the Mountrath River	ecofact Environmental Consultants

Table 4 Waste Assimilation Capacity Assessment for the proposed Mountrath WwTP

5 STAGE 2 APPROPRIATE ASSESSMENT CONCLUSIONS

The current Appropriate Assessment has been prepared following the EPA (2009) '*Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)*'. The Department of the Environment, Heritage and Local Government guidance '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*' (DoEHLG, 2009) has also been taken into account. Therefore the current assessment for the Waste Water Discharge Licence investigates the potential adverse effects on the aquatic qualifying interests of the Natura 2000 network arising from the Mountrath plant discharge, in combination with other plans / projects affecting the aquatic environment. The assessment considers whether the Mountrath WwTP discharge, alone or in combination with other projects or plans, will have adverse effects on the *integrity* of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects.

The impact assessment for the current Stage 2 Appropriate Assessment draws upon the information supplied in the Receiving Water Impact Assessment (RWIA) for the existing Mountrath Waste Water Treatment Plant (WwTP) produced on behalf of the Water Services section of Laois County Council (Ecofact, 2009) and the WWDA licence application submitted to the EPA for the Mountrath site by Laois County Council. Proposed discharge standards for a new WwTP at the Mountrath site were also supplied by Laois County Council and have been utilised in the current assessment. The South Eastern River Basin Management Plan (SERBD, 2010) was assessed with reference to the Upper Nore Water Management Unit Action Plan which identifies the Mountrath WwTP as a priority point pressure within the WMU. The Freshwater Pearl Mussel Nore Sub-basin Management Plan (DoEHLG, 2010) also identifies poor water quality in the Mountrath River and the water quality impacts of the Mountrath WwTP, upstream of the Nore confluence, as a significant pressure on the pearl mussel populations in the Nore main channel.

The Mountrath WwTP is recognised as being overloaded by Laois County Council, with the requirement for greater capacity and a higher standard of treatment required recommended by the SERBD River Basin Management Plan (SERBD, 2010). It is considered that the existing plant is therefore likely to be in excess of the Urban Wastewater Treatment Directive 91/271/EEC for treatment plants discharging to sensitive areas during occasional or sustained flow conditions.

According to Laois County Council data, EPA chemical water quality monitoring data and the SERBD River Basin Management Plant both the Mountrath River and the River Nore main channel are affected by elevated loadings in the background chemical water quality which affects the waste assimilation capacity for WwTP discharges at point source; although there is greater capacity for dilution within the Nore, downstream of the Mountrath River confluence, which is reflected in the Q4 'Good Status' biological water quality rating recorded on the Nore downstream of the Mountrath River confluence by the EPA in 2010.

The existing Mountrath WwTP and its associated storm water outfalls discharge to the Mountrath River within the River Barrow and River Nore SAC and has been identified as having direct, localised impact on the qualifying interests of the SAC i.e. floating river vegetation, otter, lamprey and Atlantic salmon. These localised impacts are not evaluated as being significant with regard to adversely affecting the conservation objectives or the integrity of the River Barrow and River Nore SAC as a whole.

With regard to indirect and cumulative impacts there is currently a shortfall in monitoring data with regard to the extent of impacts from the existing Mountrath WwTP affecting the River Nore main channel downstream. This leads to uncertainty with regard to unquantified cumulative impacts affecting water quality, a key indicator of conservation value for the SAC and potentially affecting the endangered Irish Pearl Mussel and Freshwater pearl mussel populations in the Nore main channel downstream. The storm water outfalls associated with the Mountrath WwTP have also been identified as posing an unquantified water quality impact affecting the River Barrow and River Nore SAC.

It was not feasible to quantify the extent of the cumulative impacts arising from the plant within the current Appropriate Assessment study given that two or more years monitoring data, in addition to data regarding the discharges from the storm water outfalls would be required. This data is not currently available from Laois County Council.

According to DoEHLG (2010) the Nore sub-basin catchment currently fails all of the five Environmental Quality Objectives (EQOs) as specified in Schedule 4 of the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. 296 of 2009 (DoEHLG, 2010). It is clear that the overloaded Mountrath plant, taking cognisance of the unsatisfactory background water quality in the Mountrath River, is potentially contributing to this non-compliance with regard to cumulative impacts; however, the scale and significance of this contribution is currently unknown. The mitigation measures provided in the current assessment with regard to the existing plant are limited to the introduction of a performance management system and the provision of more monitoring to establish the extent of impacts arising from the plant.

The proposal for the provision a new WwTP at Mountrath has been evaluated as a mitigation measure in the current Stage 2 Appropriate Assessment. The design standards for a new WwTP were provided by Laois County Council for inclusion in the current assessment. As required in the EPA '*Note on Appropriate Assessments for the purposes of the Waste Water Discharge Authorisation Regulations, 2007 (S.I. No. 684 of 2007)*' the proposed mitigation measures require evidence of their efficacy and implementation and a timescale of when these will be undertaken. The degree of confidence of the success of these mitigation measures is also required.

The design standards provided for a new WwTP were inputted into a Waste Assimilation Capacity Model (see Table 4) which demonstrated that the requirements of the Surface Water Regulations (2009) standards would not be achieved by the proposed design standards for the new plant at Mountrath. It was found that even under pristine i.e. zero background loadings to the Mountrath River, the proposed plant would require 95% of the available WAC for BOD, 95% of the available WAC for Ammonia and 80% of the available WAC for Orthophosphate under 95%ile flow conditions at 'Good Status' limits. Under mean flow conditions at 'Good status' limits, the theoretical maximum WAC available i.e. pristine background conditions, would be greater where 13% of the available BOD, 23% of the available Ammonia and 12% of the available Orthophosphate would be required.

The proposed discharge design standards for the Mountrath WwTP will deliver significant benefits over the existing situation, but this discharge will not be compliant with the requirements of the Surface Waters Regulations (2009). This is due to existing elevated background levels of key parameters in the Mountrath River, and also poor dilution capacity at 95%ile flows. There is therefore the potential for ongoing significant adverse negative effects on the conservation interests of the River Barrow and River Nore SAC. Improved design standards are required for the delivery of a new WwTP at Mountrath, in combination with significant improvements in background water quality, taking account of the need to provide storm water collection and treatment at the new facility. It is recommended that higher design standards are implemented in relation to BOD, Orthphosphate and Ammonia.

Due to the uncertainty regarding the scale and significance of cumulative effects resulting from the Mountrath WwTP affecting the Mountrath River downstream and the River Nore main channel, with specific regard to the populations of Freshwater pearl mussel, it is considered that there remains the potential for indirect and cumulative impacts on the conservation objectives of this Natura 2000 site which may affect the integrity of the site (see Table 5). The existing WwTP at Mountrath therefore must progress to Stage 3: Consideration of Alternatives.

Table 5 Integrity of Site Checklist (adapted from DoEHLG, 2009) for the existing WwTP discharge at Mountrath with regard to the River Barrow and River Nore SAC.

Integrity of Site Checklist Conservation objectives **Does the project or plan have the potential to:**	**Yes/No**
Cause delays in progress towards achieving the conservation objectives of the site?	Yes – unquantified cumulative impacts affecting water quality within the SAC.
Interrupt progress towards achieving the conservation objectives of the site?	Yes – unquantified cumulative impacts affecting water dependant qualifying interests of the SAC
Disrupt those factors that help to maintain the favourable conditions of the site?	Yes – water quality is identified as a key indicator of conservation value for the SAC
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	Yes – unquantified impacts affecting Annex I habitats and Annex II species leads to uncertainty with regard to the significance of impacts affecting the favourable conservation status of these interests.
Other objectives **Does the project or plan have the potential to:**	**Yes / No**
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	Yes
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	Yes
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	Yes
Reduce the area of key habitats?	Yes – with regard to localised direct water quality impacts and indirect cumulative water quality impacts affecting the aquatic habitat of qualifying interests of the SAC.
Reduce the population of key species?	Yes – unquantified cumulative impacts affecting water quality are identified as having uncertain impacts on key species.
Change the balance between key species?	Yes – unquantified cumulative impacts affecting water quality are identified as having uncertain impacts on key species.
Reduce diversity of the site?	Yes – unquantified cumulative impacts affecting water quality are identified as having uncertain impacts on the diversity of the site.
Result in disturbance that could affect population size or density or the balance between key species?	Yes – unquantified cumulative impacts affecting water quality are identified as having uncertain impacts in this regard.
Result in fragmentation?	Yes – with regard to the potential for water pollution resulting in habitat loss.
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No – direct or indirect habitat loss is not a feature of the discharge, with the exception of loss of aquatic habitats due to pollution

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APPENDIX 1 NPWS Site Synopsis

SITE NAME: RIVER BARROW AND RIVER NORE
SITE CODE: 002162

This site consists of the freshwater stretches of the Barrow/Nore River catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Mountrath. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also runs through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a candidate SAC selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate CSAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, *Vertigo moulinsiana* and the plant Killarney Fern.

Good examples of Alluvial Forest are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Grey Willow (*S. cinerea*), Crack Willow (*S. fragilis*), Osier (*S. viminalis*), with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*). Three rare invertebrates have been recorded in this habitat at Murphy's of the River. These are: *Neoascia obliqua* (Diptera: Syrphidae), *Tetanocera freyi* (Diptera: Sciomyzidae) and *Dictya umbrarum* (Diptera: Sciomyzidae).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the EU Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Cratoneuron commutatum* var. *commutatum* and *Eucladium verticillatum*, have been recorded.

The best examples of old Oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the sixteenth century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator

species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides*. It has a typical bird fauna including Jay, Long-eared Owl and Raven. A rare invertebrate, *Mitostoma chrysomelas,* occurs in Abbeyleix and only two other sites in the country. Two flies *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by Oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Birch (*Betula pubescens*) with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*) Wood Rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore about 5 km west of New Ross, in County Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of a relatively undisturbed, relict Oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown a small, mature Oak-dominant woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Cowwheat (*Melampyrum* spp.) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broad-leaved woodland in very good condition. There is quite a high degree of natural re-generation of Oak and Ash through the woodland. At the northern end of the estate Oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly Oak species. The woods have a well established understorey of Holly (*Ilex aquifolium*), and the herb layer is varied, with Brambles abundant. Whitebeam (*Sorbus devoniensis*) has also been recorded.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places. Floating River Vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include Water Starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), Milfoil (*Myriophyllum* spp.), *Potamogeton* x *nitens,* Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and Crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry Heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken (*Pteridium aquilinum*) and Gorse (*Ulex europaeus*) species with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove (*Digitalis purpurea*), Common Sorrel (*Rumex acetosa*) and Bent Grass (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry (*Vaccinium myrtillus*) and Wood Rush (*Luzula sylvatica*) are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of Clover species including the legally protected Clustered Clover (*Trifolium glomeratum*) – a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e.

English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry Heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather (*Calluna vulgaris*), Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Saltmeadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) (Flora Protection Order, 1987) are found. The very rare Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Sea Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Salicornia and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, Willowherb (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

The dunes which fringe the strand at Duncannon are dominated by Marram grass (*Ammophila arenaria*) towards the sea. Other species present include Wild Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift (*Armeria maritima*), Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reed swamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge (*Carex divisa*), Clustered Clover (*Trifolium glomeratum*), Basil Thyme (*Acinos arvensis*), Hemp nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh Grass (*Puccinellia fasiculata*), Meadow Barley (*Hordeum secalinum*), Opposite-leaved Pondweed (*Groenlandia densa*), Autumn Crocus (*Colchicum autumnale*), Wild Sage (*Salvia verbenaca*), Nettle-leaved Bellflower (*Campanula trachelium*), Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Broomrape (*Orobanche hederae*) and Greater Broomrape (*Orobanche rapum-genistae*). Of these the first nine are protected under the Flora Protection Order 1999. Divided Sedge (*Carex divisa*) was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge (*Carex strigosa*), Field Garlic
(*Allium oleraceum*) and Summer Snowflake (*Leucojum aestivum*). Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria.* The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of EU Habitats Directive Annex II animal species including Freshwater Pearl Mussel (*Margaritifera margaritifera* and *M. m. durrovensis*), Freshwater Crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax fallax*), three Lamprey species - Sea (*Petromyzon marinus*), Brook (*Lampetra planeri*) and River (*Lampetra fluviatilis*), the marsh snail *Vertigo moulinsiana* and Otter (*Lutra lutra*). This is the only site in the world for the hard water form of the Pearl Mussel *M. m. durrovensis* and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (*Myotis daubentoni*), Badger (*Meles meles*), Irish Hare (*Lepus timidus hibernicus*) and Frog (*Rana temporaria*). The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater Mussel species, *Anodonta anatina* and *A. cygnea.*

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bartailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country.

Landuse at the site consists mainly of agricultural activities – many intensive, principally grazing and silage production. Slurry is spread over much of this area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs.

Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New

Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Pearl Mussel which is limited to a 10 km stretch of the Nore, add further interest to this site.

APPENDIX 2 RECEIVING WATER IMPACT ASSESSMENT (RWIA) FOR THE MOUNTRATH WWTP (ECOFACT, 2009)

APPENDIX 3 ESTIMATION OF FLOW DURATION CURVE FOR RECEIVING WATER

APPENDIX 4 PROPOSAL FOR THE NEW WwTP AT MOUNTRATH (LAOIS COUNTY COUNCIL)

Laois County Council

RECEIVING WATER IMPACT ASSESSMENT

MOUNTRATH

Prepared on behalf of

WATER SERVICES
LAOIS COUNTY COUNCIL
County Hall
Portlaoise
Co Laois

Version: 31st July 2009

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Foreword – response to EPA consultation letter (17th June-Ref D0156-01)

Following the receipt of comments from the EPA this report was updated to include additional information. The comments from the EPA are listed below with a response directing the reader to the section of the report where this information is contained.

- *"Where it is considered that any of the substances listed in Annex X of the Water Framework Directive (2000/60/EC) or any of the relevant pollutants listed in Annex VIII of the Water Framework Directive (2000/60/EC) are being discharged from the waste water works or are seen to be present in the receiving water environment downstream of a discharge from the works (as a result of any monitoring programme) the applicant shall screen the discharge for the relevant substance" "Provide information on any further zinc sampling carried out on the discharges from the plant. What is the possible source of the zinc found in the WWTP discharges?"*

All available information on these substances in relation to the Mountrath River and Mountrath plant is provided in 'Appendix 5 Dangerous substances' of this report. No exceedances for dangerous substances were recorded during the monitoring completed by Laois Counbty Council to date.

"*Provide the 50%ile, 95%ile and dry weather flow for the Mountrath River. Carry out assimilative capacity calculations for the discharge from the primary discharge point. 95%ile flow shall be used to calculate the capacity of the receiving waterbody for BOD, Suspended Solids, total nitrogen, nitrates, COD, and total phosphorus. In addition, a calculation shall be presented for the capacity of the surface waterbody, based on the 50%ile flow, for ortho-phosphate. Provide all figures used in your calculations*"

Flows in the receiving water are given in Section 3.1.2 The Mountrath River. Assimilative capacity calculations are provided in Section '3.2.5 Assimilation capacity of receiving waters'.

- *"Conduct an appropriate assessment based on Circular Letter L8/08 (Water Services Investment and Rural Water Programmes - Protection of Natural Heritage and National Monuments) issued by the Department of the Environment, Heritage and Local Government in relation to a determination as to the likelihood of discharges from the waste water works having a significant effect on a European site. If the discharges are deemed likely to have a significant effect, an appropriate assessment of the implications for the designated site in view of the sites conservation objectives must be carried out in accordance with 'waste water discharge licensing appropriate assessment guidance notes'. Any assessment, should it be deemed necessary, shall be submitted as part of the reasoned response to this notice"*

Areas designated for nature conservation which could be affected by the operation of the existing (and proposed) plant are described in Section 3.4. Protected species and habitats are described in Section 3.5. An Appropriate Assessment (Stage 1, Screening Assessment) has been completed in Section 4.3 Impact on Areas designated for Nature Conservation and also in Appendix 6 Screening Assessment. An appropriate Assessment for the Laois Towns & Villages Wastewater Improvement Scheme has also been prepared by Entec O'Dwyer (2006).

- *"Provide details of any drinking water abstraction points downstream of your wastewater treatment plant (in your response pay attention to any risk assessments carried out for the abstraction points and outline if the discharges from your wastewater treatment plant have an impact on the quality of water at the downstream abstraction points). If the discharges from your wastewater treatment plant are impacting on downstream abstraction points outline what measures will be taken to minimise this impact"*

All available information on water abstractions is provided in Section 3.7 water Abstractions of this report.

- *"Submit 'Figure 1 The location of the Mountrath WWTP and the outfall, along with EPA and Laois County Council monitoring locations, Ecofact 2008 kick sampling sites, and sensitive receptors' which was omitted from the 'Receiving Water Impact Assessment - Mountrath' first draft report".*

This Figure can be found on Page 13 of this report.

- "*Provide a description of the existing environment in terms of water quality with particular reference to environmental quality standard regulations and other legislative standards. Your response should include: A copy of the Draft River Basin Management Plan in place for the receiving water body. Provide an evaluation of the discharge in relation to the objectives of the water quality management or catchment plan. Indicate the levels of dilution available within the receiving water body, and the estimated volumetric contribution by the site emissions to dry weather flow of the receiving waters*"

The existing environment in terms of water quality and environmental standards is described in Section 3.2 water Quality. A copy of the Draft River Basin Management Plan for the South Eastern River Basin District (December 2008) can be downloaded from http://www.wfdireland.ie/docs/1_DraftRiverBasinManagementPlans/South%20Eastern%20Tier%202.pdf. An evaluation of the discharge from the existing plant in relation to the objectives of the water quality management plan is included in Section 4.2 Impact on Water Quality. All available information on dilution in the receiving water is provided in 'Section 3.2.5.1Available dilution in the Mountrath River.

Other issues raised in the response from the EPA are addressed separately by Laois County Council.

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1. INTRODUCTION

1.1 Background

This report provides a Receiving Water Impact Assessment for the Mountrath Waste Water Treatment Plant (WwTP). This facility discharges waste water treated to secondary level into the Mountrath River, a tributary of the River Nore. The Nore main channel is a designated salmonid water under the European Communities (Quality of Salmonid Waters) Regulations of 1988 (S.I. No. 293, 1988), implementing the Freshwater Fish Directive (78/659/EEC). The main channel of the River Nore is also protected as a component of the River Nore and River Barrow candidate Special Area of Conservation (SAC) under the Habitats Directive (92/43/EEC). The NPWS site synopsis for this site is provided in Appendix 1.

This report has been prepared under the Waste Water Discharge (Authorisation) Regulations, 2007, using Section F of the Environmental Protection Agencies Waste Water Discharge Licensing Application Guidance Note (EPA, 2008). The purpose of the report is to assess whether the existing waste water discharge(s) from the plant are having a significant adverse impact on the receiving waters, or any Natura 2000 Site. The current plant will be upgraded shortly by Laois County Council and is expected to become operational by the end of 2011.

This report was prepared during July/August 2008 by Ecofact Environmental Consultants Ltd. on behalf of the Water Services Section of Laois County Council.

1.1 Legislation

The current report was prepared with consideration to the following water quality legislation:-

- Waste Water Discharge (Authorisation) Regulations 2007 (SI No. 684 of 2007);
- Urban Wastewater Treatment Regulations, 2001 (S.I. No. 254 of 2001);
- Water Policy Regulations (S.I. No. 722 of 2003) and Water Policy Regulations (Amendment) (S.I. No. 413 of 2005) implementing the EU Water Framework Directive (2000/60/EC);
- Local Government (Water Pollution) Acts, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998. (S.I. No. 258 of 1998), and Local Government (Water Pollution) (Amendment) Act, 1990. (Act No. 21 of 1990);
- European Communities (Quality of Salmonid Waters) Regulations, 1998 (S.I. No. 293 of 1988) implementing Freshwater Fish Directive (78/659/EEC);
- Quality of Bathing Waters Regulations, 1992, and Quality of Bathing Waters Regulations (Amendment), 1996. (implementing Bathing Water Directive, 76/160/EEC);
- European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations, 1989. (Implementing the Surface Water Directive, 75/440/EEC);
- Water Quality (Dangerous Substances) Regulations, 2001.(Implementing the Dangerous Substances Directive, 76/464/EEC);
- Protection of Groundwater Regulations, 1999. (S.I. No. 41 of 1999);
- Water Quality (Dangerous Substances) Regulations, 2001 (S.I. No. 12 of 2001).

In addition, cognisance was also made to the following legislation relating to nature conservation and fisheries:-

- The European Communities (Natural Habitats) (Amendment) Regulations 2005 (S.I. No. 378/2005), The European Communities (Natural Habitats) (Amendment) Regulations 1998 (S.I. No. 233/1998), and the European Community (Natural Habitats) Regulations 1997 (S.I. No. 94/1997) (implementing Council Directives 92/43/EEC and 97/62/EC on the conservation of natural habitats and of wild fauna and flora);
- Wildlife Act, 1976 (S.I. No. 39 of 1976) and the Wildlife (Amendment) Act, 2000 (S.I. No. 71 of 2001);
- Fisheries (Amendment) Act, 1997, (S.I. No. 23 of 1997) and Fisheries (Consolidation) Act, 1959 (S.I. No. 14 of 1959);
- The EU Birds Directive (79/409/EEC).

1.2 Methodology

This report has been prepared under the Waste Water Discharge (Authorisation) Regulations, 2007, using Section F of the Environmental Protection Agencies Waste Water Discharge Licensing Application Guidance Note (EPA, 2008). The current study was carried out as a desk study, and a field assessment. The literature review and field sampling programme was designed primarily as a descriptive study to provide information on the existing environmental status of the surface water area under investigation. An integrated assessment approach was employed. This approach merges biological (effects) and physical/chemical (causes) using a combination of field and desk study evaluations.

2.2.1 Desktop Review

A desktop review was carried out to identify features of surface water importance within the study area and surrounding region. A review of areas designated (or being considered for designation) for nature conservation was carried out by consulting the National Parks and Wildlife Service (NPWS). These included Special Areas of Conservation, Special Protection Areas for birds (both internationally important) and proposed Natural Heritage Areas (of national importance). The locations of any designated salmonid waters, recreational and bathing waters and nutrient sensitive areas within the study area were identified though consultation with the Environmental Protection Agency (EPA). Likewise the presence of any important recreational or commercial fisheries was identified thought consultation with the Southern Regional Fisheries Board (SRFB).

Technical files and previous reports prepared for the WwTP were supplied by Laois County Council for review in the current assessment. These reports included the catchment report for the town prepared as part of the National Urban Waste Water Study. Also, monitoring information on the discharges from the WwTP and the receiving waters were obtained from Laois County Council and used in this assessment. A review of the published literature, including the Laois County Development Plan 2006-2012, was undertaken in order to collate data on aquatic species and habitats of conservation concern in the study area. A range of additional sources of information including scientific reports produced by, and information on the websites of the EPA, NPWS, Laois County Council, and other agencies were also

reviewed. A full bibliography of information sources reviewed is given in the references section. Ordinance Survey Maps and OS aerial photographs were also reviewed during the desk assessment.

2.2.2 Field Survey Work

The field survey comprised a systematic walk over of the WwTP site, outfalls, and receiving waters. A kick sampling assessment of benthic macro-invertebrates was undertaken a point located upstream (control) and downstream (receptor) of the primary discharge to supplement information collected during the desk study. The exact location and description of these sites is provided in Table 1.

The kick-sampling assessment followed the EPA standard methodology (Toner *et al*, 2005). This procedure involved the use of a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged on the river bed with its mouth directed upstream. The substrate upstream of the net was then kicked for one minute in order to dislodge invertebrates, which were subsequently caught in the net. This procedure was undertaken at three points across the watercourse, where depth/access allowed. Stone washings and vegetation sweeps were also undertaken to ensure a representative sample of the fauna present at each site was collected. All samples of invertebrates were combined for each site and live sorted on the river bank for 20 minutes. Specimens retained were preserved in ethanol for later identification. Identification was undertaken in the laboratory using high-power and low-power binocular microscopes.

Specimens were identified using the standard keys which are listed in the bibliography section. The abundances of organisms present was assessed as follows: Present (1 or 2 individuals), Scarce/Few (<1%), Small Numbers (<5%), Fair Numbers (5-10%), Common (10-20%), Numerous (25-50%), Dominant (50-75%) and Excessive (>75%)

The Quality Rating (Q) System (Toner *et al*, 2005) was used to obtain a water quality rating for each site. The use of this particular biotic index allows the comparison with data published by the EPA. This method categorizes invertebrates into one of five groups, depending on their sensitivity to pollution. The higher the biological diversity and the greater the abundance of invertebrate species sensitive to organic pollution, the higher the water quality is assumed to be, and the higher the 'Q value' assigned to that sampling station. The revised BMWP scheme (Walley and Hawkes, 1997) is another biotic index of water quality that was used in the current appraisal. In this system, each family recorded in the sample is assigned a habitat specific score. This score depends on the pollution sensitivity of the invertebrate family together with the characteristics of the site where the invertebrates were found. A higher BMWP score is considered to reflect a better water quality and a score over 100 is indicative of very good water quality.

Table 1 Location of the 2008 survey sites.

	Moneymutton	Mountpratt
Location	Forest, approx. 500m below discharge.	Immediately downstream of town park in Dysartbeagh
NOS Grid Reference	S 35598 93123	S 35465 94211

2.2.3 Assessment Methodology

Impact significance is a combined function of the value of the affected feature (its water quality, fisheries or aquatic ecology importance), the type of impact and the magnitude of the impact. It is therefore necessary to identify the value of surface water features within the study area in order to evaluate the significance and magnitude of possible impacts. To achieve this, the results of the desk and field assessment were evaluated to determine the significance of identified features located in the study area on an importance scale ranging from international-national-county-local. The criteria used are shown in Table 2.

The means of assessing impact significance was based on the Institute of Ecology and Environmental Management's "*Guidelines for Ecological Impact Assessment in the United Kingdom*" (IEEM, 2006) and the EPA's "*Waste Water Discharge Licensing Application Guidance Note*" (EPA, 2008). The significance of impacts was assessed on a combined basis of the value of the feature being affected and the magnitude of the impact.

2.2.4 Appropriate Assessment

A Stage One Screening / Test of Significance Assessment was carried out to identify the effects of the discharge(s) upon the nearest Natura 2000 site(s) and consider whether these impacts are significant. The Department of the Environment, Heritage and Local Government has not published guidelines for undertaking Appropriate Assessment in Ireland. The current screening assessment was carried out using the following guidance:

- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC 2000);
- Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC 2001);
- Guidance for Competent Authorities when dealing with proposals affecting SAC freshwater sites, Scottish Natural Heritage, Perth (SNH, 2006); and
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. Office for Official Publications of the European Communities, Luxembourg (EC 2007).

An Appropriate Assessment Report for the proposed Mountrath WwTP has also been prepared as a separate document by Entec and O'Dwyer (2006).

1.3 Consultation

Preparation of this report included consultation with the following agencies and state bodies:-

- Laois County Council (Laois Co. Co.);
- National Parks and Wildlife Service (NPWS);
- Environmental Protection Agency (EPA);

- Southern Regional Fisheries Board (SWRFB);
- South Eastern River Basin District Office (SERBDO);
- Department of Communications, Marine and Natural Resources (DCMNR);
- Marine Institute (MI);
- BirdWatch Ireland (BWI);
- Botanical Society of the British Isles (BSBI);

Table 2 Criteria used in assessing the importance of surface water features (taken from NRA, 2004).

Rating	Qualifying Criteria
A	Internationally Important Sites designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries Major salmonid lake fisheries.
B	Nationally Important Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity value. Commercially important coarse fisheries.
C	High Value, Locally Important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Small water bodies with known salmonid populations or with good potential salmonid habitat. Sites containing any resident or regularly occurring populations of Annex II species under the EU habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries.
D	Moderate Value, Locally Important Sites containing some semi-natural habitat or locally important for wildlife. Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value 4-5).
E	Low Value, Locally Important Artificial of highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries value and no significant potential fisheries value.

2. SCHEME DESCRIPTION

2.1 Introduction

The Mountrath WwTP is located approximately 0.5km to the west of Mountrath in the townland of Tullyroe. The existing outfall is to the Mountrath River (or Ballyroan River), a tributary of the River Nore. The outfall is approximately 450m long and the approximate location of the discharge to the stream is 700 metres downstream of Ballydire Bridge and is close to the confluence of the Mountrath River and its tributary, the Ballydire Stream. The location of the Mountrath WwTP and the outfall is shown in Figure 1.

According to Nicholas O'Dwyer (2002), Mountrath WWTP was commissioned in approximately 1970 and comprises of preliminary works and secondary treatment. Preliminary treatment comprises of manual screens and manual grit removal from a grit channel. Secondary treatment comprises of aeration in an extended aeration tank using a surface aerator, followed by settling in a secondary clarifier. Final effluent discharge is to the Mountrath River. Since the 2002 report was prepared, a new packet plant extension was added to the facility.

2.2 Design

Nicholas O'Dwyer (2002) reported that the design capacity of the plant in 2002 was 1,300 p.e. with an estimated load of 2,500 p.e. The Mountrath Sewerage Scheme was upgraded since the 2002 report as part of the Laois Grouped Towns and Villages Scheme. There are plans to again upgrade this plant.

Nicholas O'Dwyer (2002) described the Mountrath plant as a conventional extended aeration process, designed for a population equivalent of 1,300 P.E. with a BOD load of 70.2 kg/day (54g/h/day) and a hydraulic load (DWF) of 234m^3/day (180 l/h/day). Nicholas O'Dwyer (2002) noted that there was no storm water screening or detention tanks at Mountrath and wastewater flows in excess of 10.5 l/sec discharged without screening to the Mountrath River. It was concluded therefore that the treatment plant was serving a population equivalent of approximately 2,500 and was therefore considered to be biologically overloaded and also subject to hydraulic overloading on a regular basis.

Nicholas O'Dwyer (2002) reported that in 2002 sludge (approximately 710m^3/year) was produced at the Mountrath WwTP with an estimated solids concentration of 1 %. Final disposal of sludge from the plant is to Portlaoise WWTP for further treatment. The Sludge Management Plan for County Laois (August 2001) designated Portlaoise as the main hub centre for sludge treatment in County Laois. Biosolids arising from the treatment of municipal wastewater sludge are promoted for use as a fertilizer in agriculture in County Laois.

2.4 Discharge Standards

The requirements of Urban Wastewater Treatment Directive **91/271/EEC** for treatment plants serving more than 2000 population equivalent are:

- Biochemical Oxygen Demand (BOD5) 25 mg/l O2
- Chemical Oxygen Demand 125 mg/l O2

- Suspended Solids (p.e. >10 000) 35 mg/l
- Suspended Solids (p.e. 2000 - 10 000) 60 mg/l

The following additional requirements apply for discharges to areas that are deemed to be sensitive:

- Total Phosphorus (10 000 – 100 000 p.e.) 2 mg/l
- Total Phosphorus (over 100 000 p.e.) 1 mg/l
- Total Nitrogen (10 000 – 100 000 p.e.) 15 mg/l
- Total Nitrogen (over 100 000 p.e.) 10 mg/l

The following revised design parameters for the Mountrath Plant (4.000 p.e.) were provided by Laois County Council in a copy of an email from Nicholas O'Dwyer Consulting Engineers (dated 29 August 2008):-

- BOD 25mg/l
- Total Suspended Solids 35mg/l
- COD 125 mg/l
- Total Phosphorous 1.0 mg/l

It is understood that these will now be the adopted standards for the new Mountrath plant and these design parameters are used in assessments in this report.

2.4.1 Discharge flow rates

According to Laois County Council the effluent volume emitted under normal circumstances each day is 1680m^3. This is based on influent data between 29/08/2008 – 09/09/2008. The normal flows per day are likely to be far less in reality than the figure quoted as these figures were influenced by extreme heavy rain over the period during which flow measurement took place. .) There are two discharges from the Mountrath WwTP. Primary discharge (P) from the Package treatment Plant is approximately 20m3/hr or 480m3/day. Predicted normal flows from the Old treatment works [which is acting as secondary discharge (S)] during normal conditions is 10m3/hr or 240m3/d. However, because of the extreme heavy rain over the period during which flow measurement took place the average flows to the Old treatment works is 50m3/hr or 1200m3/day.

The Design Dry Weather Flow (DWF) for the new Mountrath WwTP is 747 m^3 day^{-1}.

2.6 Monitoring

Monitoring of the water quality of the outfall from the old plant and the extended plant is undertaken by Laois County Council on an approximate monthly basis. Water quality is also monitored in the Mountrath River both upstream and downstream of the primary discharge. The parameters measured in the water samples are; Ammonia, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Conductivity, Nitrates, Ortho-phosphate, and pH and Suspended Solids.

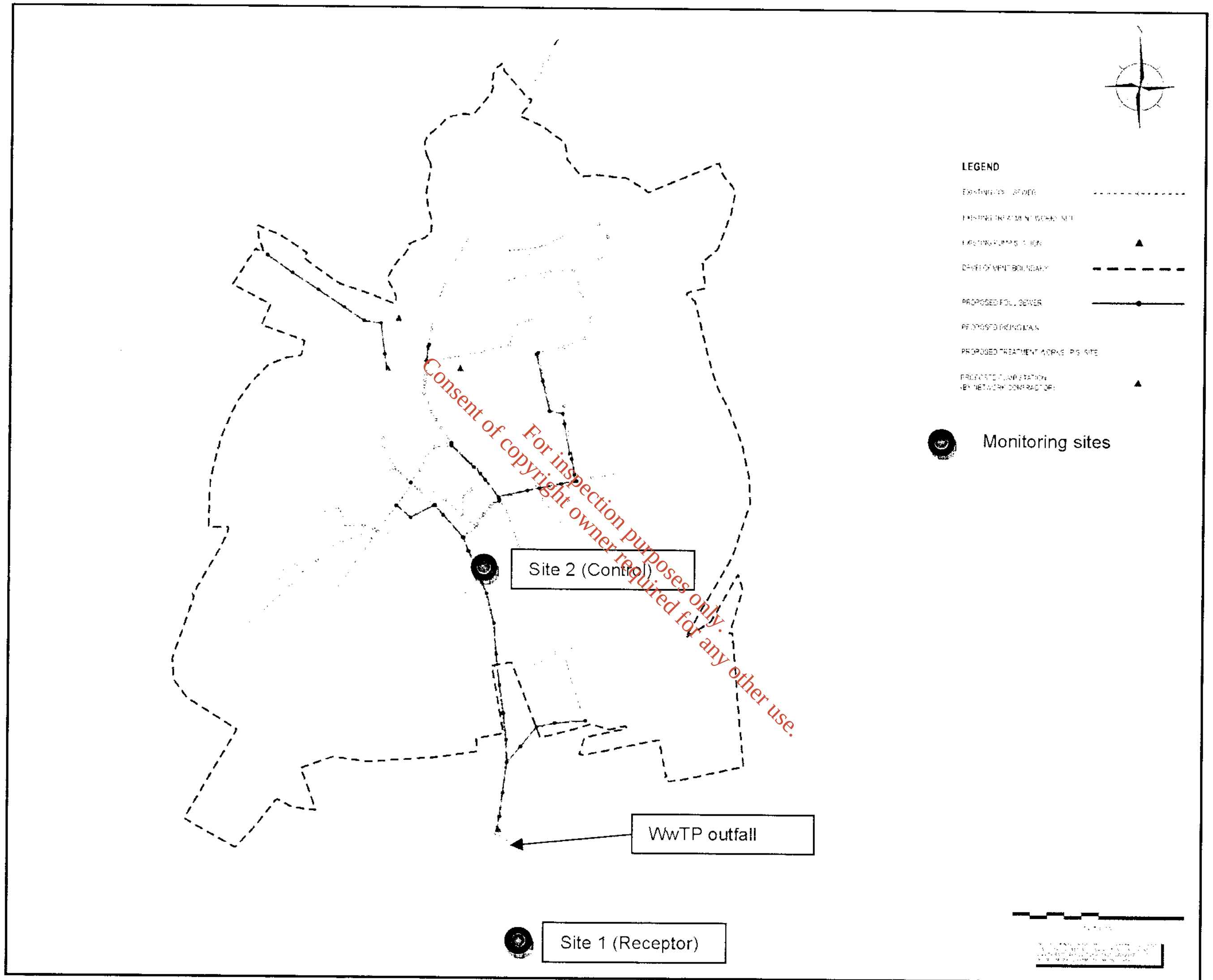

Figure 1 The location of the Mountrath WwTP and the outfall. Laois County Council monitoring locations are indicted. Kick samples were also taken at the same sites during the current assessment.

3. RECEIVING ENVIRONMENT

3.1 Hydrology

3.1.1 The Nore catchment

The River Nore rises on the eastern slopes of the Devil's Bit Mountain in Co Tipperary, and at first flows east through Borris-in-Ossory and then turns south through Co. Kilkenny, passing through Ballyragget, Kilkenny City, and Thomastown before meeting the tide at Inistoge. The river has a total length of 118km, a catchment area of 2,359km^2, and an annual mean discharge of 40 m^3 sec^{-1} (Lucey, 1998, McGarrigle, 2002). The Nore for a large part of its course traverses limestone planes of Carboniferous age and then Old Red Sandstone below Thomastown, and before joining the Barrow, runs over Ordovician shales. The river is, for the most part floored with, or influenced by Carboniferous limestone and this is reflected in its natural characteristics (Lucey, 1998). According to O'Reilly (2004) '*The river has a fairly steep gradient but the flow is checked by numerous weirs.* He also notes that *'the surrounding land is used for mixed farming; mostly pasture and dairy with some tillage and bloodstock'.*

The River Nore is a designated salmonid water under the EU Freshwater Fish Directive and designated Special Area of Conservation under the EU Habitats Directive. It has 36 tributaries, the largest of which are the Kings, the Erkina, and the Dinin.

3.1.2 The Mountrath River

The Mountrath River rises in the eastern slopes of the Slieve Bloom Mountains at an elevation of 360 meters in the townland of Bawnrush. It drains an area of approximately 40 square kilometres and is over 15 km long. In approximately the first 6 km to Roundwood Bridge, the river becomes a 2nd order stream and falls in excess of 240 meters while flowing in a southerly direction. This part of the catchment is mainly under commercial forestry. In the next 5 km of its course form Roundwood Bridge to Mountrath, the river flows in a south-easterly direction for approximately 5 km through land with a medium gradient. This section of the river is crossed by 5 bridges, including two bridges on the R440 (Rushin Bridge and at Rushin crossroads. The river then passes through the town of Mountrath where its flow is impeded by a series of weirs. For approximately 1km south of Mountrath town, the R430 is between 150 and 200 meters from the Mountrath River and the intermediate strip of land has various uses including some light industry and residential houses that extend to the river. After the town of Mountrath, the river flows south for a further 4 km before meeting the River Nore in the townland of Forgeland. The last bridge on the Mountrath River is Forest Bridge, less than 1 km upstream of the Mountrath-Nore confluence. Lands around the mid to lower reaches of the Mountrath River are mostly pastures with some tillage use. The Mountrath River catchment mainly drains peaty acidic gleys in its upper reaches and acid brown earths elsewhere (EPA mapviewer). The underlying geology of the upper reaches of the Mountrath River catchment (Slieve Bloom area) is of Upper Devonian – Lower Carboniferous Old red Sandstone, conglomerate and siltstone. The remainder of the catchment is underlain by tourasian argillaceous bioclastic limestone, sandstone, mudstone and limestone.

The 95%ile flow in the Mountrath River at the WwTOP site is 0.11 m^3 sec^{-1}. The mean flow at this site is 0.5 m^3 sec^{-1} (Source Laois County Council).

3.2 Water quality

3.2.1 The River Nore

The Nore is a Designated Salmonid river under EU Freshwater Fish Directive (78/659/EEC). The River Nore has a significant length of channel in which water quality is considered to be unsatisfactory. For example, during the most recent published EPA biological water quality study (2004) just less than 50% of the river channel length was rated as Class A unpolluted (see Table 4). The EPA has reported widespread eutrophication in the river in recent years, with just 8 of the 23 locations examined having satisfactory water quality conditions. Numbers of both protected species, the freshwater pearl mussel and white clawed crayfish have declined recently with an unexplained collapse of the Nore crayfish population occurring in August 2004 (Clabby *et al*, 2006).

Table 4 The overall water quality results (2001-2003) for the Nore and Mountrath Rivers. The surveyed channel length is shown in km with the four corresponding biological quality classes - A - Unpolluted, B - Slightly polluted/eutrophic, C - Moderately polluted and D - Seriously polluted. Data is taken from EPA biological surveys during the year 2001-2003 (adapted from Toner *et al*, 2005).

Catchment	Class A	Class B	Class C	Class D	Total (km)
Nore (km)	249	217.5	47.5	4.0	518
Mountrath (km)	13.0	1.0	-	-	14.0

3.2.2 The Mountrath River

3.2.2.1 Existing information

EPA data

The EPA monitors the Mountrath River (EPA code 15/M/01) and did so most recently during July 2005. The nearest upstream and downstream sampling stations to the Mountrath WWTP discharge are approximately 2km away; at Rushin Bridge (sampling station 0160) upstream and at Forest Bridge (sampling station 0300) downstream. Both stations were rated as 'Class B, Slightly Polluted (Q3-4) during the 2005 assessment. The EPA assessment of the Mountrath River was as follows: *Mostly unsatisfactory following deterioration at three of the four locations since previous survey. Significant change'.*

EPA Chemical water quality results for the Mountrath River at the nearest EPA sites located upstream and downstream of the outfall where such data is collected is presented in Table 7. The results indicate significant elevation of orthophosphate levels in the receptor site during the study period.

Laois County Council data

Laois County Council monitors water quality in the Mountrath River immediately upstream and downstream of the WwTP outfall points. The location of these monitoring points are shown in Figure 1. The results of this monitoring during the period January 2007 to July 2008 are summarised in Appendix 3. A detailed discussion for each parameter at the upstream and downstream monitoring locations is presented below.

Ammonia: The EPA consider that levels above 0.1mg/l N indicate sewage or industrial contamination (EPA, 2001). Ammonia levels downstream of the discharge point were found to be elevated when compared with the upstream samples. The mean upstream Ammonia values were 0.19mg/l (+/-0.45), while the downstream values were 0.35mg/l (+/-0.24). This equates to a significant increase of 84.2%.

Orthophosphates: The phosphorus loads permitted in a river are governed by the Phosphorus Regulations (S.I. 258 of 1998). These regulations require water quality to be maintained or improved by reference to the biological quality rating (of rivers) or trophic status (of lakes) that the EPA assigned in the 1995-97 review period or at the first occasion thereafter. This represents the baseline water quality data. The minimum Orthophosphate (measured as MRP) concentrations for the upstream and downstream stretches of the River Mountrath, under the regulations, are 0.03mgP/l. These also take into account a target Q-rating of Q4 for the upstream and downstream stations respectively in 1995. From the Laois County Council monitoring data it can be seen that the mean Orthophosphate values for the downstream station exceeds the prescribed limits for this river by 100%. The mean orthophosphate levels at the upstream and downstream stations were 0.03mg/l (+/-0.03) and 0.06mg/l (+/-0.03) respectively.

Table 5 Mountrath (EPA code 15/M/01) and River Nore (EPA code 15/N/01) Biological Quality Ratings (Q values) from four sites. Two of these sites were u/s and one d/s of the Mountrath WwTP the other two sites were and u/s and d/s of the Mountrath River and River Nore confluence. Adapted from Toner *et al*, 2005 and Clabby *et al.*, 2006.

Sampling Station	15 M 010160	15 M 010300
Station Name	Rushin Bridge	Forest Bridge
Location	1.5km u/s of Mountrath WwTP on Mountrath River	2km d/s of Mountrath WwTP on Mountrath River
1971	-	Q5
1976	-	Q4
1979	-	-
1980	Q4-5	Q4-5
1984	-	-
1985	Q4	Q4
1987	Q3-4	Q4
1991	Q4	Q4
1995	Q4	Q4
1998	Q4	Q3-4
2001	Q4	Q3-4
2004	-	-
2005	Q3-4	Q3-4

Nitrites: The Salmonid Waters Regulations (1988) set a limit of 0.05mg/l NO_2, while the EPA (2001) state that levels in unpolluted waters are normally below 0.03mg/l, with values greater than this indicating sewage pollution. It is this more stringent limit that is taken in this assessment. Nitrite analysis was only carried out on two occasions in the Mountrath River, limiting an assessment of the baseline conditions existing upstream and downstream of the discharge site. Both the upstream and downstream minimum and mean values were not found to exceed the above limit. The mean Nitrite levels at the upstream and downstream stations were 0.01mg/l (+/-0.00) and 0.02mg/l (+/-0.01) respectively. The mean levels at the downstream station were found to be 100% higher than at the upstream reference station.

BOD: A BOD limit is set at 5mg/l by the Salmonid Waters Regulations (1998) where this value is to be conformed to by 95% of samples. The mean values for the upstream and downstream stations on the Mountrath River are within this limit at 1.73mg/l (+/-0.88) and 2.64mg/l (+/-1.69) respectively. However, these results indicate a significant increase of 52.6% in the BOD downstream, calculated from the mean values. Although both the mean and maximum values for both stations were within the 5mg/l limit, the maximum value recorded downstream of the plant during the study period was slightly elevated (6 mg/l).

Table 6 Mountrath (EPA code 15/M/01) and River Nore (EPA code 15/N/01) Biological Quality Ratings (Q values) from four sites. Two of these sites were u/s and one d/s of the Mountrath WwTP the other two sites were and u/s and d/s of the Mountrath River and River Nore confluence. Adapted from Toner *et al*, 2005 and Clabby *et al.*, 2006.

Sampling Station	15 M 010580	15 N 010760
Station Name	Danganroe Bridge	Kilbricken Bridge
Location	3.5km u/s of the Mountrath River and River Nore confluence	2.3m d/s of Mountrath River and River Nore confluence
1971	-	-
1976	-	-
1979	-	Q4
1980	-	-
1984	-	Q3-4
1985	-	
1987	-	Q4
1991	-	Q4
1995	Q3-4	Q4
1998	Q3-4	Q3-4
2001	Q4	Q4
2004	Q4	Q3-4
2005	-	-

Nitrates: The concentration of nitrate in rivers is an important quality indicator, as it is responsible for enriching effects in the aquatic environment. A maximum level of 2 mg/l N has been deemed appropriate for protecting the most sensitive freshwater species. However, a lower level, i.e. <1.7 mg/l N, has been suggested nationally as the quality requirement for sustainable Pearl Mussel water bodies (Lucey, 2007). Mean upstream values for the Mountrath River were 1.24mg/l (+/-0.48) during the study period, while the mean downstream Nitrate values were 1.38mg/l (+/-0.46). Both these values are within the recommended limit but indicate an increase in Nitrates (11.3%) at the sampling station downstream of the discharge. Maximum levels recorded were 2.09mg/l and 2.16mg/l at the upstream and downstream stations, respectively, indicating fluctuations in Nitrate levels upstream of the discharge, independent of the WwTP effluent. Maximum values for both sites greater than the suggested EPA limits.

3.2.2.2 Results of the current assessment

In the current assessment the control sampling station was located immediately downstream of Mountrath Town Park, or less than 0.5 km downstream of the N7 Bridge. Between the N7 Bridge and the sampling station the river has a series of weirs but is in a semi-natural state from the sampling station downstream. The river at this point averaged 6 meters wide, had a mean depth of 45 cm, and had a substrate of rock (35%), cobble (40%), gravel (20%) and fine (5%). The river was higher than normal following the previous heavy rainfall.

The Mountrath River was also investigated approximately 400 meters downstream of the WwTP discharge in the townland of Forest. The river is approximately 7 meters wide at this location and was no more than 45 cm deep. The substrate was composed of cobble (50%) and gravel (40%) and finer materials (10%). This site was well shaded with semi-mature trees and had about 5% instream vegetation.

Table 7 EPA Chemical water quality results for the Mountrath River at the nearest EPA sites located upstream and downstream of the outfall where such data is collected. Adapted from Toner *et al* (2005).

Parameter	Unit	Bridge (New Ruskin House (Sampling Station 15/M/01/0100) EPA results (2km u/s of Mountrath)				Forest Bridge (Sampling Station 15/M/01/0300) 2km d/s of Mountrath WwTP on Mountrath River			
		Min	Med	Max	N	Min	Med	Max	N
MRP (Ortho Phosphate as PO_4)	mg/l	0.01	0.02	0.02	6	**0.02**	**0.03**	**0.10**	11
Water temperature	°C	6.5	9.1	16.1	13	6.7	9.1	16.0	12
Dissolved Oxygen	%	93	97	125	13	90	96	115	12
Dissolved Oxygen	ppm	10.1	11.3	**12.5**	13	9.7	11.0	**13.0**	12
pH		6.9	7.8	8.2	13	7.5	8.1	8.3	12
Chloride	mg/l	9	12	15	13	10	14	23	12
Total Ammonia	mg/l	<0.01	0.02	0.05	13	0.02	0.06	0.08	12
Unionised Ammonia	mg/l	<0.001	<0.001	0.003	13	<0.001	0.001	0.004	12
Oxidised Nitrogen	mg/l	0.3	1.0	1.8	13	0.8	1.4	2.4	12
Colour Hazen		20	70	200	13	20	55	225	12
BOD	mgO_2/l	0.3	1.0	2.1	13	0.5	1.3	3.3	12

Control site

A total of 85 macroinvertebrates were recorded in 13 families at this site. Pollution tolerant larvae of true flies (Diptera) were the most diverse group. Blackfly larvae and pupae along with cranefly larvae of *Dicranota sp.* and the bloodworm *Chironomous sp.* were all present. Green chironomid larvae were found in small numbers. Riffle beetles (Elmidae) were represented by larvae of *Helmis sp.* (present), *Limnius sp.* (present) and *Elmis aenea* (fair numbers). The most abundant organism at this site was large dark olive mayfly larvae of *Baetis rhodani*, which were numerous. Another Ephemeropteran larva, the blue-winged olive *Ephemerella ignita* was common. Stonefly larvae of the needlefly *Leuctra fusca* was present and was the only member of the stonefly group recorded. Fair numbers of northern cased caddisfly larvae of *Potamophylax sp.* were recorded while *Halesus radiatus* larvae in the same family were present. Snails present were the wandering snail *Lymnaea peregra* and the river limpet *Ancylus fluviatilis*. The freshwater shrimp *Gammarus deubeni* and the hog louse *Asellus aquaticus* were common and present, in that order.

Using the EPA freshwater biological monitoring system (Toner *et al.*, 2005), this part of the river is deemed to be 'Moderately Polluted, Class C (Q3)'. This is due to the absence of pollution sensitive group A indicators in combination with the relative abundance of other pollution sensitivity groups. The BMWP score for this site was 75.2, implying that this part of the river is 'Clean but slightly impacted'. The corresponding average score per taxon for this site was 5.78.

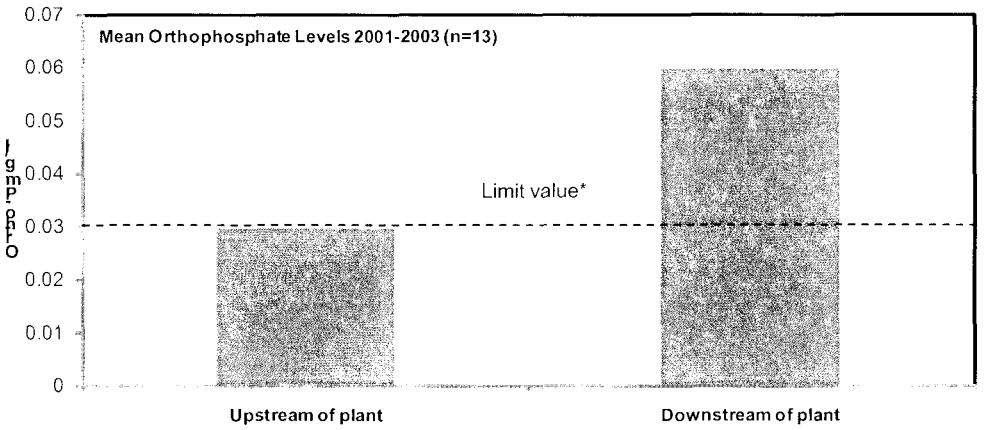

Figure 2 Mean orthophosphate levels in the Mountrath River at sites located upstream and downstream of the Mountrath WwTP. Analyses based on data supplied by Laois County Council for the period January 2007 to July 2008. *Limit value is taken as 0.03 mg/l which is the interim statutory M.R.P. (broadly equivalent to Orthophosphate) annual median standard for rivers (EPA, 2001). DOELG (2008) limit for WFD Good Status is 0.035 mg/l for mean flows.

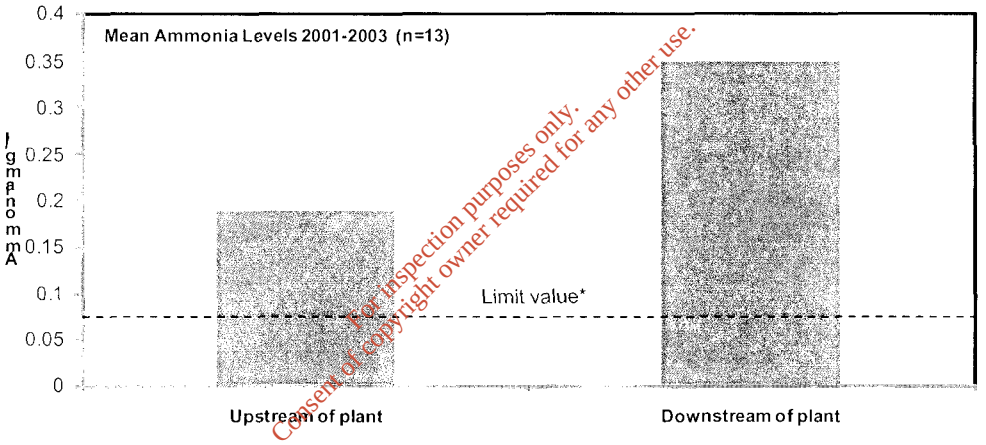

Figure 3 Mean Ammonia levels in the Mountrath River at sites located upstream and downstream of the Mountrath WwTP. Analyses based on data supplied by Laois County Council for the period January 2007 to July 2008. *Limit value is taken as 0.065 mg/l (DOELG, 2008 standard for good status under mean flows).

Receptor site

There was a slight reduction in macroinvertebrate diversity at this site with only 11 families recorded. For a total of 322 organisms, 276 were blackfly (larvae and pupae) making this group of true flies excessive. Other true fly larvae recorded were those of cranefly (including *Dicranota sp.*) and the green chironomid, all of which were present. Blue-winged olive and large dark olive mayfly larvae were both scarce at this site as was an indeterminate species of cased caddisfly at pupa stage. Small numbers of caseless sandfly larvae (*Rhyacophila dorsalis*) were recorded. Small numbers of river limpets were recorded while wandering snails were present. Small numbers of the freshwater shrimp and the hog louse were also recorded.

This site mainly supported group C and group D pollution indicators and had no pollution sensitive group A indicators. Therefore, this part of the river is considered to be 'Moderately Polluted, Class C (Q3)' using the EPA Q-rating system. This site scored 58.6 on the BMWP

scale for riffles. With this score, the river at this point is interpreted as being 'Moderately impacted'. The ASPT for this site is 5.33.

Table 8 Classification of macroinvertebrate species recorded at each site in terms of their pollution sensitivity (EPA methods).

Pollution indicator group	Control site				Receptor site			
	Number	% of total	Families	% of families	Number	% of total	Families	% of families
Group A (Most sensitive)	0	0	0	0	0	0	0	0
Group B (Less Sensitive)	11	12.9	2	14.3	3	0.9	1	9.1
Group C (Tolerant)	69	81.2	9	64.3	314	97.5	8	72.7
Group D (Very Tolerant)	3	3.5	2	14.3	5	1.6	2	18.2
Group E (Most tolerant)	2	2.4	1	7.1	0	0	0	0
Total	85	100	14*	100	322	100	11	100

*14 families by sensitivity groups since family Chironomidae has members in group C and group E.

3.2.3 Monitoring data for the WwTP discharge

Appendix 2 provides a statistical summary of the water quality monitoring results for the two treated effluent streams from the Mountrath WwTP during the period February 2007 to March 2008. This data is collected by Laois County Council.

The Urban Wastewater Treatment Directive 91/271/EEC provides limits for the following parameters in discharge effluent: BOD & COD. From the data provided by Laois County Council the effluent discharged from the Mountrath WwTP has been assessed based on both the discharges from the new and old outlets.

The maximum BOD values for the old outlet significantly exceeded the 25mg/l limit by 6416%, while the maximum discharge value from the new outlet were found to be higher than the prescribed limit by 88%. However the mean BOD levels for the new outlet were below the limit at 9.69mg/l (+/-12.11). The mean BOD value from the old outlet significantly exceeded the limit by 628% (182.18 mg/l +/-379.97).

The Urban Wastewater Treatment Directive (91/271/EEC) sets a limit of 125mg/l for COD. The maximum COD values for the old outlet significantly exceeds the 125mg/l limit by 2328% (3035 mg/l +/-713.08), while the maximum discharge value from the new outlet were found to be lower than the prescribed limit by 15.2% (106mg/l +/-23.14). The mean COD levels for the old outlet were significantly higher than the prescribed limit by 219% (398.94mg/l +/- 713.08). The mean COD value from the new outlet was significantly lower than the limit by 68% (39.23mg/l +/-23.14).

Table 9 Functional group characteristics of the two survey sites. Dominant FFG (%) (Dominant group and its mean relative %); P/R (ratio of Scrapers to total collectors + shredders, a surrogate for ratio of gross primary production to community respiration); Heterotrophy vs Autotrophy based on a P/R threshold of > 0.75 = autotrophic) (Rabenil *et al*, 2005).

Functional group	Control site		Receptor site	
	Numbers	%	Numbers	%
Filtering Collector	7	8.3	186	82.3
Gathering Collectors	37	44	6	2.7
Predator	4	4.8	15	6.6
Scraper	11	13.1	7	3.1
Shredder	25	29.8	12	5.3
Total	84	100	226	100
P/R	0.159		0.034	
Heterotrophy Vs Autotrophy	Heterotrophic		Highly Heterotrophic	

Table 10 Juvenile salmonid food index. Predictable invertebrate supply is the ratio of behavioral drifters (filtering and gathering collectors) to accidental drifters (scrapers, shredders and predators). Based on a threshold of >0.50 for predictable supply (Rabenil *et al*, 2005).

Site	Behavioral drifters/accidental drifters	Predictable Vs Unpredictable
Control	1.1	Predictable
Receptor	5.65	Predictable

3.2.4 Dangerous substances

An assessment of the presence of dangerous substances in the River Mountrath upstream and downstream of the Mountrath WwTP, along with an assessment of the presence of such substances in the discharge, is provided in Appendix 5. This assessment is based on sampling undertaken by Laois County Council on two occasions during 2007 and 2008. Copper was the only substance that exceeded guideline limits at 83.3 µg/L.

3.2.5 Assimilation capacity of receiving waters

The primary regulatory guideline for effluent standards is the EU Urban Wastewater Treatment Regulations, 2001 which is implemented in Ireland through S.I. 254 of 2001 and the Water Quality Standards for Phosphorus (S.I. 258 of 1998). The Urban Wastewater Treatment Regulations requires the provision of secondary treatment for all discharges to freshwaters and estuaries from towns with a population equivalent of between 2,000 and 10,000. While the requirements of the Urban Wastewater Treatment Regulations are set, water quality requirements are dependent on the background values and the 95 percentile flow in the river (i.e. assimilation capacity). A worked example for BOD assimilation capacity is provided below.

The **BOD** Waste Assimilation Capacity (WAC) is defined as:
$WAC = (C_{max} - C_{back}) \times F_{95} \times 86.4$ kg BOD/day
where: C_{max} = maximum permissible BOD concentration (= 3 mg/l)
C_{back} = background (upstream) BOD concentration
F_{95} = 95 percentile flow (m^3/s) (or otjer flow rated used, i.e. median flow).
86.4 = conversion factor

From the data presented in Appendix 3, the background value for BOD for the Mountrath River is taken as 1.73 mg/l. Therefore the BOD WAC = (3-1.73) x 0.11 x 86.4 = 12.07kg BOD/day (based on mean BOD concentrations upstream of plant). The phosphorus loads permitted in a river are governed by the Phosphorus Regulations (S.I. 258 of 1998). These regulations require water quality to be maintained or improved by reference to the biological quality rating (of rivers) or trophic status (of lakes) that the EPA assigned in the 1995-97 review period or at the first occasion thereafter. This represents the baseline water quality data. In the case of the Mountrath River the Q value rating upstream and downstream of the existing treatment plant was determined as Q4 in 1995 (Toner *et al*, 2005). The minimum target ratings and associated Phosphorous (measured as MRP) concentrations for the upstream and downstream stretches of the Mountrath River for Phosphorous under the regulations are given in Table 11. Associated MRP values are taken from EPA (2001). Therefore, the limit for orthophosphate for the Mountrath River is 0.045mg orthophosphate/L.

Table 11 Phosphorus Regulations Target Ratings and Concentrations for the Mountrath River.

	Existing Q rating	Target Q Rating	Mean Orthophosphate (mg/L)
U/S	4	Maintain Q4	0.030
D/S	4	Maintain Q4	0.030

The assimilative capacity of the Mountrath River with respect to several parameters were calculated for a 95 Percentile flow and median flow in the Mountrath River and background parameter concentrations upstream of the plant (data from Laois County Council in Appendix 3). Laois Co. Co. carried out the sampling between during the period February 2007 to March 2008.

Table 12 Assimilation Capacity for Orthophosphate aand BOD in the Mountrath River at the discharge point. *It is noted that Limit standards for Total Nitrogen, COD, Total Phosphorous, and Nitrates are not provided in the EPA manual EPA (2001) or in DOELG (2008).*

95%ile Flow	Orthophosphate		BOD	
Environmental standard	WFD HS*	WFD GS*	WFD HS*	WFD GS*
Environmental standard limit concentration (mg/L)	0.045	0.075	2.2	2.6
WAC (kg/day)	0.143	0.428	4.5	8.3

Median Flows*	Orthophosphate		BOD	
Environmental standard	WFD HS*	WFD GS*	WFD HS*	WFD GS*
Environmental standard limit concentration (mg/L)	0.025	0.035	1.3	1.5
WAC (kg/day)	**-0.216**	0.216	**-18.6**	**-9.9**

**Note Mean flows for the site were not available so median flows had to be used.*

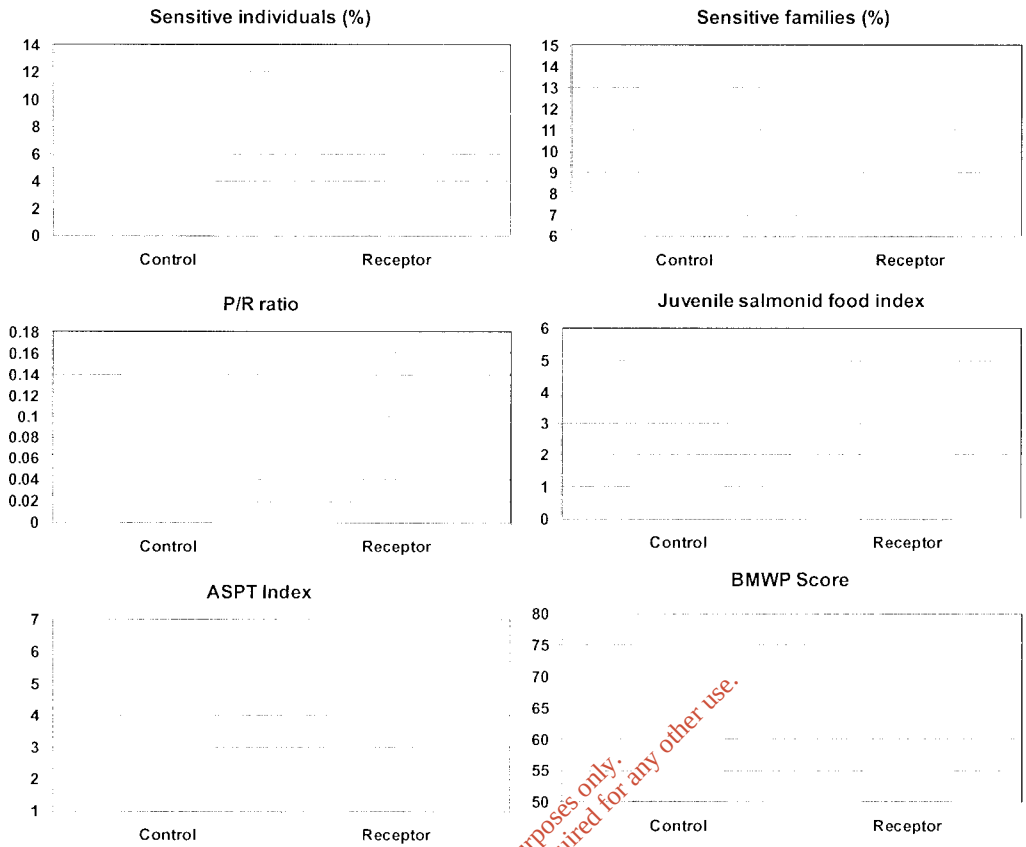

Figure 4 Variation in selected biological indices between upstream (control) and downstream (receptor) sites on the Mountrath River. All indices are suggesting a decline in ecological status between the control and receptor sites. Based on data collected during August 2008 study.

3.3 Sediment quality

A spillage of Polychlorinated biphenyls (PCBs) occurred in the Nore at Kilkenny in the 1980's (Lucey, 1998), and localized contamination of sediments still persists. There are no reports of any other significant sediment contamination in the Nore catchment. No other information on sediment quality in the Nore catchment was found during the current assessment.

3.4 Areas designated for nature conservation

Sites of international conservation importance are designated Special Protection Areas (under the Birds Directive) or Special Areas for Conservation (under the Habitats Directive). Together, SPAs and SACs make up the Natura 2000 network of wildlife sites. The nearest SAC to the Mountrath WwTP is the 'River Barrow and River Nore' SAC (site code 002162). The primary discharge from the Mountrath WwTP is to the Mountrath River which is part of this SAC. The Mountrath River joins the River Nore approximately 2 km downstream of the WwTP discharge. The site is a selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a cSAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. As well as habitats, the cSAC has been selected due to the presence of invertebrate, fish and mammal species which are listed under Annex II of the EU Habitats Directive, including freshwater pearl mussel (*Margaritifera margaritifera* and its hardwater form *M. m. durrovensis*), freshwater crayfish

(*Austropotamobius pallipes*), Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax fallax*), the three Irish Lamprey species - sea (*Petromyzon marinus*), brook (*Lampetra planeri*) and river (*Lampetra fluviatilis*), the Desmoulin's whorl snail *Vertigo moulinsiana* and Eurasian otter (*Lutra lutra*).

Table 13 Sites designated for nature conservation within 5km of the discharge of the WwTP in Mountrath town.

Name	Site Code	Distance from site	Status	Notes
River Barrow and River Nore	002162	2km west	SAC	This SAC is designated for 12 Annex I habitats e.g. floating river vegetation and tall herb fringes, and 12 Annex II species including white clawed crayfish *Austropotamobius pallipes*, river lamprey *Lampetra fluviatilis*, brook lamprey *Lampetra planeri* and sea lamprey *Petromyzon marinus* freshwater pearl mussels *Margaritifera margaritifera* and Nore freshwater pearl mussel *Margaritifera M. durrovensis*, Atlantic salmon *Salmo salar* and otter *Lutra lutra*. The Abbeyeix WwTP discharges into the Mountrath River. This then flows into the River Nore 2.5km downstream of the WwTP. The River Nore forms part of the River Barrow and River Nore SAC.
River Nore / Mountrath woods complex	002076	2km southwest	NHA	This site runs inside the larger River Barrow and River Nore SAC. It is an important site for ancient broadleaved woodland. The WwTP in Abbeyeix town discharges into the Mountrath River. This then flows into the River Nore 2.5km downstream of the WwTP. The River Nore forms part of the River Barrow and River Nore SAC.
Lisbigney bog	000869	5km south	NHA	This site is designated for the whorl snail *Vertigo moulinsiana* and the Annex I habitat *Cladium* fen. This NHA is not in the catchment area affected by the Mountrath WwTP.

The Nore is the only site in the world where the hard water form of the pearl mussel *M. m. durrovensis* occurs. The Nore is one of only a handful of spawning grounds in the country for twaite shad. However, this species spawns in the lower reaches of the river. Other important animal species are also found in the Barrow/Nore cSAC. These include Daubenton's bat (*Myotis daubentoni*), badger (*Meles meles*), Irish hare (*Lepus timidus hibernicus*) and frog (*Rana temporaria*), all species listed in the Irish Red Data Book. The rare Red Data Book fish species smelt (*Osmerus eperlanus*) occurs in the estuary. Two other freshwater Mussel species, *Anodonta anatina* and *A. cygnea* are also found in the Nore (Lucey, 1998). Sites of national importance for wildlife are designated as Natural Heritage Areas (NHAs) under the Irish Wildlife Act 2000. There are two Natural Heritage Areas located within 5km of the WwTP. The first of these is the River Nore / Mountrath woods complex NHA (site code 002076). This NHA lies within the River Barrow and River Nore SAC area and its boundary is also located 2.5 km downstream of the discharge (i.e. at the Mountrath River confluence with the Nore). This NHA is designated for its ancient broadleaved woodland. The second NHA is Lisbigney bog (site code 000869). This NHA is located approximately 5km south of the WwTP and is not within the catchment area affected by the discharge from the Mountrath WwTP. This bog

is designated for the whorl snail *Vertigo moulinsiana* and the Annex I habitat *Cladium* fen. Areas designated for nature conservation located within five kilometers of the Mountrath WwTP are listed in Table 13

3.5 Protected aquatic flora and fauna

The status of fauna listed in the European Union Directive on the Conservation of Natural and Semi-Natural Habitats and of Wild Fauna and Flora (Habitats Directive, 92:43:EEC) in the Nore catchment is presented in Table 14.

Table 14 Status of fauna listed in the Habitats Directive (2:43:EEC) in the Nore catchment (adapted from Lucey, 1998).

Common Name	Scientific Name	Main channel	Tributaries
Pearl mussel	*Margaritifera margaritifera*	Rare	Rare
White-clawed crayfish	*Austropotamobius pallipes*	Common	Common
Brook lamprey	*Lampetra planeri*	Common	Common
River lamprey	*Lampetra fluviatilis*	Rare	Rare
Sea lamprey	*Petromyzon marinus*	Rare	Rare
Twaite shad	*Alosa fallax*	Rare	Absent
Atlantic salmon	*Salmo salar*	Common	Common
Eurasian Otter	*Lutra lutra*	Common	Common

3.5.1 Pearl mussels

Freshwater Pearl-Mussel (*Margaritifera margaritifera* and its hard water variety *M. margaritifera durrovensis*), occur in the River Nore SAC. The River Nore is the only site in the world designated for *M. m. durrovensis* (Moorkens,1999). The species is now on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List of threatened animals. It is also listed under Annexes II and V of the Habitats Directive (92:43:EEC) and Appendix 3 of the Bern Convention. It is legally protected in Ireland under Statutory Instruments No. 112, 1990 and No. 94, 1997.

This species is now confined to a stretch of the River Nore between Watercastle and Attanagh Bridge on the River Nore. The population is considered to be on the verge of extinction (Moorkens & Costello, 1994; Costello *et al*, 1997). From studies carried out between 1990 and 1994, it was estimated that the total mussel numbers in the Nore had fallen from 2,000 to 420 (Moorkens and Costello, 1994). In the most recent mussel counts, carried out in 2004, a total population of around 500 individuals was estimated, with no evidence of juvenile survival (Moorkens, 2004). The latest results confirm that the Nore population is at a critically low level, and the indications are that it is unable to successfully recruit young.

The Pearl Mussel was once widespread in mainland Europe, Britain and Ireland. However, there has been a decline of more than 90% in European populations during the 20th century and the situation for the mussel continues to deteriorate. Recent surveys have shown that there may be only seven to ten sustainable recruiting populations left in Ireland (Moorkens, 2005). Indeed, less than 10% of pearl mussel populations in Ireland are healthy enough to produce young mussels (Moorkens, 2000). The majority of Ireland's pearl mussel rivers last bred successfully in the 1970's. Some of these still retain a small population of adult mussels, but they can be measured, and range in age from a minority of 30 to a majority of 60 to over 100 years old.

Pearl mussels have a complicated life cycle, involving native salmon or trout. The key cause of decline in pearl mussel populations in Ireland is unsuitable habitat for juvenile mussels after they fall off the gills of host salmonids (Moorkens, 2005). This stage requires the safety of remaining within the river bed gravels, before growing to a size that allows the emergence of the filtering siphons into the open water body. While the juvenile mussels remain within the river bed gravels, they filter the interstitial water within the gravels. Where the gaps between the gravel/stones get clogged with fine silt, either physical (from suspended solids entering the river) or organic (from algal growth and decay prompted by nutrients in the water), the flow of water in the interstices becomes very restricted. Without adequate water movement and replacement, oxygen levels are exhausted and young mussels die. The decline in interstitial water quality in silted gravels has been detailed by a number of authors in the scientific literature. Fine sediments in gravels have been shown to increase mortality in juvenile mussels to 100%. As river quality becomes depressed, breeding stops and populations become "*functionally extinct*", i.e. older adults persist, but are not replaced by a new generation (Moorkens, 2005). The mussel population eventually dies out when the older individuals die of old age. Once breeding stops, it becomes very difficult to save a population. No mussel river in this situation has yet been recovered to a fully independent, recovered and breeding colony. In this knowledge, the pearl mussel has been identified as being internationally endangered.

3.5.1.1 Water Quality requirements for Pearl Mussels

The water quality requirements for Pearl Mussels have recently been reviewed by Young (2005). The main findings of this review are as follows:-

- Juvenile mussels and glochidia are often more susceptible than adults to poor water conditions.
- Interstitial water chemistry is of crucial importance to juvenile mussels but only one study has been carried out on the requirements of juvenile freshwater pearl mussels.
- Unnaturally high levels of nutrients, conductivity, nitrates, phosphates, BOD, metals and some pesticides are detrimental to Pearl Mussels, as well as unnaturally high and low pH.
- Eutrophication is widely regarded as very damaging to mussel populations but few studies have quantified this problem.
- Biocides have frequently been shown to be toxic to mussels of all species.

Guidance on water quality requirements for Pearl Mussels has also been given in an Irish context by Moorkens (2000) and the draft guidelines provided in NPWS (2005). General recommendations for favourable Water Quality Objectives for Pearl Mussels for a number of sources are provided in Table 15.

3.5.2 White-clawed crayfish

The white-clawed crayfish is the only freshwater crayfish recorded in Ireland. Populations of the species in the rest of Europe have declined dramatically and Ireland is seen as a unique stronghold for this species in a European context (Reynolds 1998). It is classified as vulnerable and rare in the IUCN Red List and is protected in Ireland under the schedules of the Wildlife Act 1976. It is also listed in Appendices II and V of the Habitats Directive

(92:43:EEC). It is generally considered to be widespread in lowland lakes and rivers such as the River Nore, which are underlain by Carboniferous limestone, or its derivative - glacial drift (Reynolds, 1998). There are no records of crayfish from the Mountrath River and this species was not recorded during the current assessment.

3.5.3 Lampreys

The brook lamprey is the smallest of the three lampreys native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). The river lamprey is larger in size than the brook lamprey and exhibits an anadromous[1] life cycle. The sea lamprey is the largest of the Irish lampreys. Brook lamprey and Sea lamprey are listed in Appendix II, while river lamprey is listed in both Appendices II and IV of the Habitats Directive (92:43:EEC). All three species are listed in Appendix III of the Bern Convention. All three lamprey species have been recorded from the Nore catchment (Kurtz & Costello, 1999).

Table 15 General recommendations for favourable Water Quality Objectives for Pearl Mussels.

Parameter	Target (Oliver, 2000)	Target (Bauer, 1999)	Proposed Minimum Standard (Moorkens, 2000)	Proposed Standard (NPWS, 2005)
Ammonia	N/A	N/A	<0.10	0.01
Nitrate (mg/l)	<1.0	<0.5	<1.7	0.125
Phosphate (mg/l)	<0.03	<0.03	<0.005	<0.005
pH (pH units)	6.5-7.2	N/A	<8.0 - >6.3	
Conductivity (µs/cm)	<100	<70	<200	
Calcium (mg/l Ca CO_3)	<10	<2	N/A	
BOD (mg/l)	<1.3	<1.4	<3	
Suspended solids (mg/l)	N/A	N/A	N/A	N/A
Dissolved Oxygen (% saturation)	90-100	N/A	50% >8	

3.5.4 Shad

Twaite Shad and Allis Shad are among the rarest species of fish breeding in Irish freshwaters and are listed under Annexes II and V of the EU Habitats Directive. Both species are also listed in Appendix III of the Bern Convention. Shad have an anadromous life cycle and both species are thought to occur in the Nore estuary. However, it is clear that these species are confined to the lower reaches of the river and would therefore not occur in the study area.

3.5.5 Atlantic salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Bern Convention. It an economically important species and salmon recreational and commercial fisheries occur throughout Ireland. Salmon are present throughout the Nore catchment (O'Grady & Sullivan, 1987). Salmon are likely to spawn in the River Nore within the study area. The salmon fishing on the Nore is said to be patchy, and what fishing there is on the river is confined to the stretch from the tide upstream to the

[1] *Anadromous fish spend most of their adult lives in salt water, and migrate to freshwater rivers and lakes to reproduce.*

confluence with the River Dinin. The River Nore fishery is currently open only for catch and release of salmon (Southern Regional Fisheries Board website).

3.5.6 Eurasian Otter

The otter *Lutra lutra* is a legally protected species under the Wildlife Act, 1976 (and Wildlife (Amendment) Act, 2000). It is listed under Annex II of the EU Habitats Directive and under Annex II of the Berne Convention. It is found throughout Ireland where it has apparently avoided the population declines that have occurred in many other countries (Hayden and Harrington, 2000). Otters tend to occupy linear territories along watercourses and are rarely found far away from water. Evidence of otter activity has been recorded from the study area and this species is widespread in the River Nore catchment.

3.6 Recreational and Commercial fisheries

3.6.1 The River Nore

The fish fauna of Ireland is not as diverse as other European countries due to the impact of glaciation. Most of the fish species present in Irish river catchments, such as the River Nore, have colonized from the sea or have been artificially introduced. Native fish species in the Nore catchment include the three Irish lamprey species (brook lamprey, river lamprey, and sea lamprey) (Kurz & Costello, 1999), the Atlantic salmon, (O'Grady & Sullivan, 1987) and the rare Twaite Shad, (Lucey, 1998) all of which are listed under the EU Habitats Directive. The European eel, brown trout, and three-spined stickleback, are other common native species present in the Nore catchment, while introduced fish species include northern pike, stone loach, roach, dace, and minnow (Lucey, 1998).The smelt *Osmerous eperlanus*, a species listed as vulnerable in the red data list (Whilde, 1993), is present in the Nore estuary (King, 2002).

The freshwater stretches of the River Nore main channel is a designated salmonid river under the EU Fish Directive (78/659/EEC). The Nore is an important salmon and trout fishery which was once regarded as being one of the finest salmon rivers in the country (O'Reilly, 2004). It is mainly a grilse fishery though spring salmon fishing is reported to be good in the vicinity of Thomastown and Inistioge. Due to the presence of a number of weirs on the river, salmon are generally confined to the lower areas of the river until late in the year and very few salmon are now caught above Kilkenny (O'Reilly, 2004). Recent installation of two new weirs at Kilkenny (in particular Lacken Weir) as part of the Kilkenny Drainage Scheme is believed to have further impacted on upstream passage of salmon in the river (Irish Examiner, 3 January 2005). Brown trout angling is important in the River Nore, and the best stocks in the entire river are reportedly found downstream of the Dinin confluence (O' Reilly, 2004).

Fisheries surveys carried out by the Central Fisheries Board in the River Nore Catchment during the period 1990 and 1992 indicated that it is one of the most valuable salmonid catchments in Ireland (O' Grady and Sullivan, 1994). Atlantic Salmon *Salmo salar* and Brown Trout *Salmo trutta* are distributed throughout the catchment, and occur in tributary streams such as the River Mountrath. The three species of lamprey that occur in Ireland are found in the Nore catchment (Lucey, 1998, Kurtz & Costello, 1999). Sea lampreys have been recorded as far upstream as Ballyragget, and there are records of Brook Lamprey from the River Mountrath. The Nore is one of only three spawning grounds in the country for the Annex II

listed Twaite Shad (*Alosa fallax*), however this species is confined to the lower reaches of the river.

3.6.2 The Mountrath River

The Mountrath River is known locally as the White Horse River and has '*substantial numbers of small brown trout downstream of Mountrath'* (O' Reilly, 2004). The entire River Nore catchment is classed as a salmon and sea trout river (McGinnity et al., 2003), so the Mountrath River has the same designation.

3.7 Water abstractions

There are no Drinking water RPAs on the River Mountrath or River Nore within 10km downstream of the study area (Source EPA Envision). Both watercourses can however be expected to be used by farms for animal drinking water. The nearest Drinking water RPA is the River Dinin, which flows into the River Nore near Ballragget, County Kilkenny.

3.8 Designated recreational and bathing waters

There are no designated recreational or bathing water on the River Mountrath or River Nore (Source EPA Envision).

3.9 Nutrient sensitive areas

The nearest nutrient sensitive area to the Mountrath WwTP is the main channel of the River Nore downstream of the Kilkenny (Purcellsinch) sewage outfall to Inistioge Bridge.

4. IMPACT ASSESSMENT

4.1 Introduction

According to the EPA (2008), a discharge from a WwTP would be considered to have a significant adverse effect on the receiving waters if it were to:-

(1) Cause a deterioration in the chemical status or ecological status (or ecological potential as the case may be) in the receiving body of surface water;
(2) Cause a deterioration in the chemical status in the receiving body of groundwater;
(3) Cause the input into groundwater of hazardous substances, except where it is established that the input concerned is in a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater;
(4) Cause deterioration or result in significant and sustained upward trends in the concentrations of pollutants in groundwater in the case of pollutants that are not hazardous,
(5) Permanently exclude or compromise the achievement of the objectives established for protected species and natural habitats in the case of European sites where the maintenance or improvement of the status of water is an important factor in their protection or which is inconsistent with the achievement of environmental quality standards established under national Regulations in relation to designated bathing waters, designated shellfish waters, areas designated for the protection of freshwater fish and areas designated

As there is no discharge directly into groundwater no assessment of local groundwater is made in this assessment. It is considered that though the interaction between surface and ground waters that any significant impact on the receiving surface waters could also potentially result in a similar impact on local groundwater.

The receiving water for the Mountrath WwTP discharge is the Mountrath River. Due to its proximity to the discharge the River Nore could also be affected. The Mountrath River is a nursery stream for salmon and trout and is also likely to be used by brook lampreys and otters; species listed under Annex II of the EU Habitats Directive. The Nore River is a designated salmonid river under the EU Freshwater Fish Directive and is also designated as a Special Area of Conservation under the EU Habitats Directive. The only global population of the hard water form of the Pearl Mussel occurs on the River Nore downstream of the Mountrath River confluence and this species has particularly high water quality requirements (Moorkens, 2000).

A summary of the receiving water impact assessment is provided in Table 16. The impact on identified receptors is outlined in the following sections.

4.2 Impact on water quality

4.2.1 Chemical water quality

Laois County Council chemical water quality assessments indicate that background water quality in the Mountrath River upstream of the WwTP discharge was found to be affected with

Ammonia and Orthophosphate above statutory or guideline limits. Downstream of the WwTP however the concentrations of these nutrients were amplified with mean Orthophosphate increasing by 100% and mean Ammonia increasing by 84%. In addition to raised Orthophosphate and Ammonia, Nitrates, Nitrites and BOD were also elevated downstream of the WwTP discharge. One of the samples taken upstream of the discharge had an Ammonia concentration of 1.82mg/l or 18.2 times the statutory limit. This result was probably due to a pollution episode and highlights that there are also factors upstream of the WwTP discharge contributing to degraded water quality in the Mountrath River.

EPA data (Toner *et al,* 2005) corresponds with Laois Co. Co. data for Orthophosphate levels. Minimum, median and maximum concentrations were below the limit upstream of the Mountrath WwTP discharge but were all elevated downstream. Concentrations increased by 100%, 50% and 500% for minimum, median and maximum levels, respectively.

This deterioration in the chemical status of the Mountrath River at the receptor site is a significant adverse effect most likely brought about by the Mountrath WwTP discharge.

4.2.2 Biological water quality

The current study found that the biological communities upstream and downstream of the WwTP discharge were comparable and

Biological water quality indices obtained from both sites indicated that both sites were impacted and supported macroinvertebrates considered to be typical of an organically polluted river. Both sites were deemed to be 'Moderately Polluted' using the EPA system, due to the absence of group A indicators and abundance of Group C indicators (81.2% at control vs 97.5% at receptor). Group B macroinvertebrates accounted for 12.9% and 0.9% of the faunal community at the control and receptor sites, correspondingly. Generally, the relative abundances of the pollution sensitivity groups signify a negative change in water quality between the control and receptor site. The inclination towards reduced water quality at the receptor site was further emphasized by the proportion of very pollution tolerant group D families; 14.3% at the control site and 18.2% at the receptor site. These changes are deemed to be brought about by the WwTP discharge so is having a significant adverse impact on the biological water quality of the Mountrath River. In addition, the control site had a more diverse macroinvertebrate community with 13 families, compared to 11 families at the receptor site. The control site had group B stonefly and cased caddisfly larvae as well as riffle beetles - organisms absent from the receptor site.

The BMWP score for the control and receptor site was 75.2 (Clean but slightly impacted) and 58.6 (Moderately impacted), in that order. The respective ASPT for these sites were 5.78 and 5.33. These scores clearly indicate that there is a decline in water quality between the control site upstream of the Mountrath WwTP discharge and receptor site downstream.

The relative abundance of scrapers and filtering collectors in the riffle/run habitat is an indication of the periphyton community composition, availability of suspended fine particulate organic material (FPOM), and availability of attachment sites for filtering. Scrapers increase with increased diatom abundance and decrease as filamentous algae and aquatic mosses (which scrapers cannot efficiently harvest) increase. The functional group composition of the two sites, less than 3 km apart varies significantly. This was attributed to the abundance of

filtering collectors (predominantly blackfly larvae) at the receptor site and the more balanced community at the control site. 82.3% of the macroinvertebrate assemblage consisted of filtering collectors at the receptor site in contrast to 8.3% at the control (the high percentage at the receptor does not include the blackfly pupae which were numerous). Gathering collectors recorded at both sites were mayfly larvae of the large dark olive and the blue-winged olive. Relative abundance of mayfly larvae dropped significantly at the receptor site (37 at the control vs 6 at receptor).

The ratio of scrapers to total collectors and shredders (P/R ratio) gives the ratio of gross primary production to community respiration. The P/R ratio was low for both sites (0.159 for control, 0.034 for receptor) and showed that the ecosystems at both sites were dependent on inputs from outside the river for continuation. A higher P/R ratio means increased ability for primary production in the system, or less community respiration. Though both sites are well below the 0.75 threshold so are heterotrophic, the P/R ratio for the receptor declines by a factor of 4.68 so is highly heterotrophic. This indicates that the control is more dependent on external sources than the upstream site and has greater community respiration. It should be noted that the feeding strategy of the large dark olive is sometimes by grazing i.e. a scraper. Taking this into account would further broaden the P/R difference between the two sites. Organic inputs from the WwTP are obviously changing the feeding strategy of macroinvertebrates in the Mountrath River downstream of the discharge so is having a significant adverse effect on the trophic condition of the river.

The biological water quality monitoring carried out by the EPA in 2005 showed no difference in biological water quality between the sampling stations upstream and downstream of the WwTP discharge. The EPA noted that a *significant change* had taken place in the Mountrath River from their previous survey so it would appear as though the biological water quality of the Mountrath River is gradually worsening. However, the EPA noted a decline in biological quality on the River Nore downstream of the Mountrath river confluence (Q4 upstream, Q3-4 downstream) and this result could have been influenced by the Mountrath River.

The juvenile Salmonid food index suggested that 'Predictable' supply of invertebrate food was available for juvenile salmonids at the control and the receptor site. This index is based on the ratio of behavioral drifters (filtering and gathering collectors) to accidental drifters (scrapers, shredders and predators) where a score of over 0.5 a predictable supply. The ratio for the control and receptor site was 1.1 and 5.65, respectively. The high value for the receptor site was due to the numbers of blackfly recorded but the macroinvertebrate assemblage at this site is unbalanced. The lower value obtained for the control site was due to the more diverse community it supported.

In conclusion, the stretch of the Mountrath River downstream of Mountrath is thought to be under considerable ecological stress. The receptor site, with less diversity than the control is considered to be more impacted than the control site due to the Mountrath WwTP discharge, which is having a significant adverse effect on the Mountrath River.

4.2.3 Dangerous substances

The current study found that there are no elevated levels of dangerous substances in the Mountrath River upstream of the Mountrath WwTP and all levels of these substances are

compliant with required limits downstream of the WwTP discharge point. Therefore there are no impacts in relation to dangerous substances from the WwTP affecting either the surface waters or ground waters within the study area.

4.2.4 Assimilation capacity

The assimilative capacity of the Mountrath River upstream of the WwTP is considered to be above its limit with respect to Orthophosphate and Ammonia. In addition to these nutrients the assimilation capacity of the Mountrath River for BOD, nitrates and nitrites was exceeded downstream of the WwTP. A further decline in the assimilative capacity for Orthophosphate and Ammonia resulted in the river downstream of the WwTP discharge.

In this regard, inputs from the WwTP were found to be compounding the problem of poor water quality in the Mountrath River and are therefore having a significant adverse impact on the river. The operation of plant would not be complaint with the objectives of the draft River Nore Water Quality management Plan.

4.3 Impact on areas designated for nature conservation

The discharge from the Mountrath WwTP is directly into the Mountrath River which is part of the 'River Barrow and River Nore' SAC (site code 002162). The Mountrath River was found to be moderately polluted downstream of Mountrath but was more impacted downstream of the WwTP discharge. Therefore there is the potential for ongoing direct water quality impacts on both the Mountrath River and River Nore components of the SAC, as a result of the operation of the Mountrath WwTP.

The ongoing operation of the WwTP creates the potential for an accidental pollution episode that may affect water quality in the SAC. Although the risk of such an event occurring is generally considered to be low in a well-managed plant. However, according to Entec and O'Dwyer (2006) the Mountrath site is known to occasionally flood. This results in the release of untreated sewage into the Mountrath River. Entec and O'Dwyer (2006) considered that "*the impacts from flooding will be transient and high flows will dilute any effluents diluted into the SAC*". There overall conclusion was therefore that such releases would not be "*expected to have significant adverse effects on the SAC features*". However, it is considered that this issue was considered sufficiently by Entec and O'Dwyer (2006) and such releases would certainly have the potential to cause significant adverse effects on both local and downstream areas of the SAC, both on their own or as a cumulative impact, and would require further appraisal.

It is also noted that apart from the above conclusion, the case of the Mountrath WwTP was larger ignored by the Entec and O'Dwyer (2006) report and the Mountrath River / WwTP is not even mentioned in the conclusion sections of this report. It is therefore considered that on the basis of the observed water quality deterioration in the Mountrath River downstream of the existing plant and the presence of the Nore Pearl Mussel in the receiving catchment of the plant, it must be concluded that the ongoing operation of the plant has the potential to have a significant effect on the SAC itself and it is considered that a formal Stage 2. 'Appropriate Assessment' would be required. Furthermore, on consideration of the results of the assessment undertaken in Section 4.9 which considers the likely impact of the new plant, it is concluded that the same assessment should also be completed for the proposed plant.

4.4 Impact on protected flora and fauna

The River Barrow and River Nore SAC is designated for the presence of protected aquatic fauna listed on Annex II of the EU Habitats Directive, 1992; these include Atlantic salmon, three species of lamprey, white-clawed crayfish, freshwater pearl-mussel and otter which are listed on Annex II of the EU Habitats Directive, 1992. The favourable conservation status of these species is directly dependant on the integrity of the ecosystem, with particular reference to water quality in the river. Aquatic habitats listed on Annex I of the EU Habitats Directive are also present in the Mountrath River and would be affected by any deterioration in water quality. Any decline in water quality within the Mountrath River would also impact on River Nore downstream of the Mountrath River confluence.

4.4.1 Pearl mussels

The pearl mussel occurs in the River Nore downstream of the Mountrath River confluence but the population is at a critically low level. Salmonids and good water quality are both crucial for the sustenance of the pearl mussel. As water quality becomes depressed, breeding stops and populations become inert. If water quality in the stretch of the River Nore where the pearl mussel occurs declines further (or perhaps does not improve), it is probable that the endangered River Nore pearl mussel will become extinct. This would be a major negative impact.

4.4.2 White-clawed crayfish

There are no records of crayfish from the Mountrath River study but the species is known to occur in the River Nore. This species is rated as Group C in the EPA Q-value system and is known to be tolerant of moderately polluted conditions. With the current water quality status of the Mountrath River, it is deemed capable of supporting white-clawed crayfish but the impact of the WwTP on water quality downstream of the discharge is noteworthy. Therefore, the Mountrath WwTP is significantly affecting the conservation status of this species in the Mountrath River downstream of the discharge and to a lesser degree the River Nore downstream of the Mountrath River confluence.

3.4.3 Lampreys

Lamprey species have the same clean water requirements for spawning and early life stages; however, juvenile lamprey (ammocetes) are more tolerant of pollution and will settle in finer sediments where they feed by filtration. They are even known to settle downstream of WwTP outfalls where nutrient inputs are higher. A continued decline in water quality within the study area is significantly affecting the conservation status of this species.

4.4.4 Shad

This species does not occur in the study area and it is highly unlikely that they are affected by the operation of the Mountrath WwTP.

4.4.5 Atlantic salmon

Poor water quality is affecting the conservation status of salmon in the Mountrath River, a designated Salmonid River. This species requires clean water (Q4) for spawning and early life stages. The juvenile salmonid food index suggested that a 'Predictable' supply of invertebrate food was available for juvenile salmonids at both sites. The change in the macroinvertebrate community downstream of the WwTP is noteworthy and indicates that the ecological status has declined. This is a significant adverse effect on suitable salmon habitat.

4.4.6 Eurasian Otter

Otters are not as sensitive to water quality deterioration but could be affected by the effects of same through impacts on fish.

4.5 Impact on fisheries

As a conservation measure, the River Nore fishery is currently open only for catch and release of salmon. Salmonids are considered to be under pressure in the River Nore within the study area due to poor water quality conditions. Unsatisfactory water quality will also affect other native species within the river such as brown trout. Though background pollution in the Mountrath River is considerable, inputs from the Mountrath WwTP are adding to the problem by causing a shift in the trophic structure of the macroinvertebrate community downstream of the WwTP discharge. Subsequently, this affects the fisheries value of the river and constitutes a significant adverse effect.

The ongoing operation of the Mountrath WwTP presents the potential for ongoing impacts to water quality and further deterioration in the fish communities present within the study area. This would have significant adverse impacts on the fisheries and recreational angling taking place on the Mountrath River.

4.6 Impact on water abstractions

There are drinking water abstractions downstream of the Mountrath River confluence on the River Nore in County Kilkenny, in excess of 20 km from the current study area. It is unlikely that the Mountrath WwTP does not impact on any designated water abstraction sites.

4.7 Impact on recreation and bathing areas

There are no designated recreational or bathing waters on the Mountrath or Nore Rivers. Poor water quality can result in excessive algal and macrophyte growth and reduce the amenity value of the Mountrath and Nore Rivers.

4.8 Impact on nutrient sensitive areas

The nearest nutrient sensitive area to the Mountrath WwTP that could be affected by the discharge is the main channel of the River Nore downstream of the Kilkenny (Purcellinsinch) sewage outfall, to Inistioge Bridge. This stretch of the River Nore is in excess of 30 km from the Mountrath WwTP discharge so impacts on this nutrient sensitive area are unlikely.

4.9 Likely impact of new plant on receiving waters

Table 17 gives the projected concentrations of selected parameters in the Mountrath River downstream of the outfall of the new Mountrath WwTP. The background levels of these parameters are based on the mean values from the period February 2007 to March 2008 provided in Appendix 3. The 95%ile flow in the Mountrath River is used. The discharge standards are taken as the limit values provided in DOELG (2008) and EPA (2001).

Based on this assessment the proposed discharge from of the new plant as currently proposed will also result in pollution of the Mountrath River. This is because the river has poor assimilation and dilution capacity. The quality of the effluent discharged from the new plant can be expected to be greatly improved over the existing situation. However, this is not apparent with comparisons with the predicted values and baseline observed data (Appendix 3). This may be as a result of the predictions approaching a *'worst case scenario'* and it is likely that the plant will operate much better than predicted here.

Table 16 Summary of receiving water impact assessment. The criteria for assessing impact magnitude are explained in Appendix 6. All impacts are negative.

	Scale of impact (existing plant)	Scale of impact (new plant)
Water quality	Moderate impact	Minor to Moderate impact
Designated conservation Sites	Moderate impact	Minor to Moderate impact
Protected flora and fauna	Moderate impact	Minor to Moderate impact
Fisheries	Moderate impact	Minor to Moderate impact
Water abstractions	No impact	No impact
Designated recreation and bathing areas	Imperceptible impact	None to Imperceptible impact
Nutrient sensitive areas	Imperceptible impact	Imperceptible impact

Table 17 Projected concentrations of selected parameters in the Mountrath River downstream of the outfall resulting from the operation of the new Mountrath WwTP. Based on a 95 Percentile flow of 0.11 m^3/sec, plant DWF of 747 m^3 day^{-1} and mean values of background water quality in the Mountrath Stream from Laois Co. Co. monitoring data from the period February 2007 to March 2008. Parameters in bold exceed limit values.

Parameter	Design standard (mg/L)	Background concentration of parameter (mg/L)	Resulting downstream concentration of parameter (mg/L)	Discharge standard (mg/L)	Compliance with limit values (EPA, 2001)
Suspended solids	35	10	11.8	<25	Compliant
Total phosphorous (TP)	1	0.0353	**0.11**	<0.062	Not compliant
Orthophosphate (=85% TP)	0.85	0.03	**0.09**	<0.075 (DOELG, 2008) WFD Good Status	Not compliant
BOD	25	1.73	**3.43**	<3	Not compliant

5. RECOMMENDATIONS

The requirements of the Urban Wastewater Treatment Directive 91/271/EEC for treatment plants serving more than 2000 population equivalent must be met by the existing Mountrath WwTP. Further statutory limits given in the Salmonid Regulations (1988) and guidelines provided by the EPA (2001 and 2006) should be complied with, taking account of the Water Policy Regulations (S.I. No. 722 of 2003) which transposed the Water Framework Directive (2000).

The Mountrath River forms part of the River barrow and River Nore SAC so must be considered to be of international importance. The Water Policy Regulations provide for the protection of the status of all waters, preventing deterioration and the achievement of at least "*good status*" by December 2015 for all waters.

The Mountrath WwTP is currently biologically overloaded and also subject to hydraulic overloading on a regular basis so an upgraded scheme is required to meet the current demand. Given the elevated levels of Orthophosphates and Ammonia it is recommended that the upgraded sewerage scheme include both Ammonia and Phosphate removal.

Background levels of pollution in the Mountrath River remain high and the current study suggests that a recent decline in the status of the river has occurred both upstream and downstream of the town. It is recommend that increased efforts be made to identify point and diffuse sources in the catchment and attempt to reverse this trend.

As planned, the plant will be upgraded in the near future to ensure that the plant is operating within the design standards required under the Urban Waste Water Treatment Regulations (2001) and that these standards can continue to be met in the future. This scheme is presently at the preliminary report stage and a tender for construction will be issued during the second quarter of 2009. However, based on the calculations made during the current study, the discharge from this plant will also have a significant adverse effect on the Mountrath River due to poor dilution and assimilation capacity in the receiving water. However, the upgraded plant will offer a much higher level of protection to the River Nore SAC.

Monitoring of the water quality of the discharge, upstream of the discharge and downstream of the discharge should be continued by Laois County Council.

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APPENDIX 1 NPWS Designated site description

SITE SYNOPSIS
SITE NAME: RIVER BARROW AND RIVER NORE
SITE CODE: 002162

This site consists of the freshwater stretches of the Barrow/Nore River catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also runs through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a candidate CSAC selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate CSAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, *Vertigo moulinsiana* and the plant Killarney Fern.

Good examples of Alluvial Forest are seen at Rathsnagadan, Murphy's of the River, in Mountrath estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Grey Willow (*S. cinerea*), Crack Willow (*S. fragilis*), Osier (*S. viminalis*), with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*). Three rare invertebrates have been recorded in this habitat at Murphy's of the River. These are: *Neoascia obliqua* (Diptera: Syrphidae), *Tetanocera freyi* (Diptera: Sciomyzidae) and
Dictya umbrarum (Diptera: Sciomyzidae).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the EU Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Cratoneuron commutatum* var. *commutatum* and *Eucladium verticillatum*, have been recorded.

The best examples of old Oak woodlands are seen in the ancient Park Hill woodland in the estate at Mountrath; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Mountrath Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded

since the sixteenth century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides.* It has a typical bird fauna including Jay, Long-eared Owl and Raven. A rare invertebrate, *Mitostoma chrysomelas,* occurs in Mountrath and only two other sites in the country. Two flies *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Mountrath.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by Oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Birch (*Betula pubescens*) with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*) Wood Rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore about 5 km west of New Ross, in County Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of a relatively undisturbed, relict Oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown a small, mature Oak-dominant woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Cowwheat (*Melampyrum* spp.) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broad-leaved woodland in very good condition. There is quite a high degree of natural re-generation of Oak and Ash through the woodland. At the northern end of the estate Oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly Oak species. The woods have a well established understorey of Holly (*Ilex aquifolium*), and the herb layer is varied, with Brambles abundant. Whitebeam (*Sorbus devoniensis*) has also been recorded.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places. Floating River Vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include Water Starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), Milfoil (*Myriophyllum* spp.), *Potamogeton* x *nitens,* Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and Crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry Heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken (*Pteridium aquilinum*) and Gorse (*Ulex europaeus*) species with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove (*Digitalis purpurea*), Common Sorrel (*Rumex acetosa*) and Bent Grass (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry (*Vaccinium myrtillus*) and Wood Rush (*Luzula sylvatica*) are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of Clover species including the legally protected

Clustered Clover (*Trifolium glomeratum*) – a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry Heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather (*Calluna vulgaris*), Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Saltmeadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) (Flora Protection Order, 1987) are found. The very rare Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Sea Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Salicornia and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, Willowherb (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

The dunes which fringe the strand at Duncannon are dominated by Marram grass (*Ammophila arenaria*) towards the sea. Other species present include Wild Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift (*Armeria maritima*), Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reed swamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge (*Carex divisa*), Clustered Clover (*Trifolium glomeratum*), Basil Thyme (*Acinos arvensis*), Hemp nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh Grass (*Puccinellia fasiculata*), Meadow Barley (*Hordeum secalinum*), Opposite-leaved Pondweed (*Groenlandia densa*), Autumn Crocus (*Colchicum autumnale*), Wild Sage (*Salvia verbenaca*), Nettle-leaved Bellflower (*Campanula trachelium*), Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Broomrape (*Orobanche hederae*) and Greater Broomrape (*Orobanche rapum-genistae*). Of these the first nine are protected under the Flora Protection Order 1999. Divided Sedge (*Carex divisa*) was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge (*Carex strigosa*), Field Garlic
(*Allium oleraceum*) and Summer Snowflake (*Leucojum aestivum*). Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria.* The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of EU Habitats Directive Annex II animal species including Freshwater Pearl Mussel (*Margaritifera margaritifera* and *M. m. durrovensis*), Freshwater Crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax fallax*), three Lamprey species - Sea (*Petromyzon marinus*), Brook (*Lampetra planeri*) and River (*Lampetra fluviatilis*), the marsh snail *Vertigo moulinsiana* and Otter (*Lutra lutra*). This is the only site in the world for the hard water form of the Pearl Mussel *M. m. durrovensis* and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery, though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (*Myotis daubentoni*), Badger (*Meles meles*), Irish Hare (*Lepus timidus hibernicus*) and Frog (*Rana temporaria*). The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater Mussel species, *Anodonta anatina* and *A. cygnea*.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bartailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country.

Landuse at the site consists mainly of agricultural activities – many intensive, principally grazing and silage production. Slurry is spread over much of this area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs.
Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks

at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to igrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt eadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Pearl Mussel which is limited to a 10 km stretch of the Nore, add further interest to this site.

APPENDIX 2 Quality of WwTP effluent streams

Table A2.1 Summary water quality results for the two treated effluent streams from the Mountrath WwTP during the period February 2007 to March 2008. Derived from data supplied by Laois County Council.

Ammonia (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	17	19.59	0.29	60.16	15.19	230.85	7.22
New Plant Outlet	13	8.44	0.11	7.99	6.41	41.10	3.48

BOD (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	17	182.18	7.00	1629.00	379.97	144378.40	180.62
New Plant Outlet	13	9.69	2.00	47.00	12.11	146.56	6.58

COD (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	16	398.94	22.00	3035.00	713.08	508476.33	349.40
New Plant Outlet	13	39.23	10.00	106.00	23.14	535.53	12.58

Conductivity (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	16	743.38	400.00	1044.00	154.49	23868.65	75.70
New Plant Outlet	13	675.38	573.00	973.00	103.20	10650.26	56.10

Nitrates (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	17	3.53	0.00	14.34	3.51	12.29	1.67
New Plant Outlet	13	3.95	0.00	10.83	3.95	15.58	2.15

Nitrites (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	2	0.39	0.23	0.55	0.23	0.05	0.31
New Plant Outlet	2	0.01	0.01	0.02	0.00	0.00	0.00

Orthophosphate (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% c.l.
Old Plant Outlet	17	2.47	0.06	7.74	1.94	3.77	0.92
New Plant Outlet	13	0.95	0.29	2.05	0.52	0.27	0.28

APPENDIX 3 Laois County Council river water quality monitoring results

Table A3.1 Limits for physiochemical values taken in this report to suggest elevated levels. These limits are based on values provided in EPA (2001). Some of these criteria may be low and do not represent mandatory limits for one off samples. However chronic exceedance above these limits would be considered to be harmful to aquatic ecology and fisheries.

Parameter	Limit Value	Standard
pH	<6 or >9	Salmonid Water Regulations (1988)
Conductivity (µS cm^{-1})	none	EPA (2001)
Total Suspended Solids mg/l	>25	Salmonid Water Regulations (1988)
Temperature (°C)	>21.5	Salmonid Water Regulations (1988)
Dissolved Oxygen (%)	<70 or >130	Salmonid Water Regulations (1988)
Dissolved Oxygen (mg $O_2 l^{-1}$)	<9	Salmonid Water Regulations (1988)
BOD (mg $O_2 l^{-1}$)	>3	Level for salmonid fish in the EU Freshwater Fish Directive 78/659/EEC. Salmonid Water Regulations (1988) limit value is 5mg/l.
Total ammonia (mg N l^{-1})	>0.1 (or >0.3)	Strict value taken from EPA (2001), levels above 0.3 mg/l would be harmful. However EPA (2001) notes that these limits may be unduly low in certain circumstances. Limit of 1mg/l given in Salmonid Water Regulations (1988).
Un-ionised ammonia (mg $NH_3 l^{-1}$)	>0.02	Salmonid Water Regulations (1988)
Nitrate as NO_3 mg/l	>2	This is a strict limit value suggested in Lucey (2007) for protecting sensitive aquatic species. Limit of 1.7mg/l required to protect Pearl Mussels. Limit of 50 mg/l given in Surface water Regulations (1989).
Nitrite as NO_2 mg/l	>0.01	Strict value taken from Freshwater Fish Directive 78/659/EEC for salmonids. Value of 0.05 given in Salmonid Water Regulations (1988)
ortho-phosphate (mg P l^{-1})	>0.03	Interim statutory standard for unpolluted rivers (EPA, 2001)
Total Phosphorous (mg/l)	>0.062	Level suggested for salmonid waters to reduce eutrophication (EPA, 2001)
Total Alkalinity as $CaCO_3$	none	EPA (2001)
Total Hardness (mg/l)	none	EPA (2001)

Table A3.2 Summary water quality results for the Mountrath River upstream and downstream of the outfall of the Mountrath WwTP during the period February 2007 to March 2008. Derived from data supplied by Laois County Council. Parameters considered to be elevated are shown in bold (based on criteria given in EPA, 2001).

Ammonia (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	13	**0.35**	0.04	**0.74**	0.24	0.06	0.129681
Upstream of Plant	15	**0.19**	0.02	**1.82**	0.45	0.21	0.229806

BOD (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	14	2.64	1.00	**6.00**	1.69	2.86	0.886272
Upstream of Plant	15	1.73	1.00	**4.00**	0.88	0.78	0.447213

COD (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	2	13.00	11.00	15.00	2.83	8.00	3.919928
Upstream of Plant	2	7.50	6.00	9.00	2.12	4.50	2.939946

Conductivity (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	13	366.15	223.00	484.00	72.77	5295.47	39.5575
Upstream of Plant	14	359.29	196.00	453.00	74.27	5515.45	38.90224

Nitrates (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	13	1.38	0.63	**2.16**	0.46	0.21	0.251869
Upstream of Plant	15	1.24	0.57	**2.09**	0.48	0.23	0.244325

Nitrites (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	2	0.02	0.01	**0.03**	0.01	0.00	0.02058
Upstream of Plant	2	0.01	0.00	0.01	0.00	0.00	0.00294

Orthophosphate (mg/l)

	N	Mean	Minimum	Maximum	St.Dev.	Variance	95% C.L.
Downstream of Plant	13	**0.06**	0.02	**0.12**	0.03	0.00	0.018581
Upstream of Plant	15	**0.03**	0.01	**0.11**	0.03	0.00	0.014704

APPENDIX 4 Biological water quality assessment (2008)

Table A4.1 Macroinvertebrates recorded during the kick sampling survey on the Mountrath River at sites located upstream and downstream of the outfall from the Mountrath WwTP. Samples were taken on the 1st August 2008.

Group/organism	Pollution sensitivity group	Functional group	Relative abundance at site	
			Control site	Receptor site
MAYFLIES (Uniramia, Ephemeroptera)				
Spiny crawler mayflies (Ephemerellidae)				
Blue-winged olive *Ephemerella ignita*	C	Gathering collector	11	3
Baetidae				
Large dark olive *Baetis rhodani*	C	Gathering collector	26	3
STONEFLIES (Order Plecoptera)				
Needleflies (Leutridae)				
Leutra fusca	B	Shredder	2	
CASED CADDIS FLIES (Tricoptera)				
Northern caddisflies (Limnephilidae)				
Potamophylax sp.	B	Shredder	8	
Halesus radiatus	B	Shredder	1	
Indeterminate sp.	B	Scraper		3
CASELESS CADDIS FLIES (Trichoptera)				
Green sedges (Rhyacophilidae)				
The sandfly *Rhyacophila dorsalis*	C	Predator	2	15
TRUE FLIES (Diptera)				
Blackfly larvae(Simulidae)	C	Filtering collector	1	180
Blackfly pupae	C	N/A	1	96
Craneflies (Tipulidae)	C	Shredder		1
Dicronata sp.	C	Shredder	1	1
Family Chironomidae				
Bloodworm *Chironomous sp.*	E	Filtering collector	2	
Green chironomid	C	Filtering collector	4	6
BEETLES (Coleoptera)				
Riffle Beetle (Elmidae)				
Helmis sp. (larvae)	C	Scraper	8	
Limnius sp. (larvae)	C	Scraper	2	
Elmis aenea	C	Predator	2	
SNAILS (Mollusca, Gastropoda)				
Family Lymnaeidae				
Wandering snail *Lymnaea peregra*	D	Shredder	2	1
Family Ancylidae				
River limpet *Ancylus*	C	Scraper	1	4

Group/organism	Pollution sensitivity group	Functional group	Relative abundance at site	
			Control site	Receptor site
fluviatilis				
CRUSTACEANS (Crustacea)				
Amphipods (Amphipoda, Gammaridae)				
Freshwater shrimp *Gammarus deubeni*	C	Shredder	10	5
Isopods, Asellidae				
Hog louse *Asellus aquaticus*	D	Shredder	1	4
Total number of organisms			85	322
Number of families			13	11
Q value			3	3
Quality class			C	C
BMWP score			75.2	58.6
ASPT			5.78	5.33

Table A4.2 Selected chemical characteristics of the two sites surveyed on the River Mountrath on the 1st August 2008.

	Mountrath River (Receptor)	Mountrath River (Control)
Temperature (°C)	15.2	15.2
Dissolved Oxygen (%)	102.4	92.8
Dissolved Oxygen (mg O2l-1)	10.28	9.31
Conductivity (µS cm-1)	412	363

Table A4.3 Selected physical characteristics of the two sites surveyed on the River Mountrath on the 1st August 2008.

	Mountrath River (Receptor)	Mountrath River (Control)
Wetted width (m)	7	6
Mean depth (cm)	20	45
Maximum depth (cm)	45	65
Rock (%)	-	35
Cobble (%)	50	40
Gravel (%)	40	20
Fine (%)	10	5
Shade (%)	40	10
Instream vegetation (%)	5	5
Bank height (m)	1	1
Bank slope (°)	80	80
Bank cover (%)	95	100
Evaluation	Riffle habitat surveyed, suitable site for Q rating assessment.	Riffle habitat surveyed, ideal site for Q rating assessment.

APPENDIX 5 Dangerous substances

	Upstream Mountrath WwTP		Old Mountrath WwTP combined outlet	New Mountrath WwTP combined outlet	Downstream Mountrath WwTP		Dangerous Substances standards (µg/l) for freshwater		Dangerous substances standards (µg/l) for all freshwater	Freshwater Fish Directive (78/659/EEC) limit	Salmonid Water Regulations (1998) limit	Compliant /Not Compliant
Sample date	24/04/08	08/05/08	08/05/08	08/05/08	23/04/08	08/05/08	mg CaCO3/l					
							<100	>100				
Arsenic (µg/l)	0.2	0.4	2.0				25	25	-	N/A	N/A	✓
Atrazine (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	1	N/A	N/A	✓
Barium (µg/l)	324.2	573.4	341.2	261.6	323.2	561.1	-	-	N/A	N/A	N/A	✓
Boron (µg/l)	<0.02	<0.02	<0.2	<0.2	0.02	0.02	-	-	2000	N/A	N/A	✓
Cadmium (µg/l)	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	-	-	5	N/A	N/A	✓
Chromium (µg/l)	<1.0	<1.0	<10.0	<10.0	<1.0	1.0	5	30	-	N/A	N/A	✓
Copper (µg/l)	<3.0	<3.0	**83.80**	<30.00	<3.0	<3.0	5	30	-	< 0.04 mg/l Cu	depends on water hardness - 0.005 – 0.112 mg/l Cu	Not compliant at the old WwTP outlet.
Cyanide (µg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	10	10	-	N/A	N/A	✓
Dichloromethane (µg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-	10	N/A	N/A	✓
Fluoride (µg/l)	<100	<100	200	300	<100	100	500	500	-	N/A	N/A	✓
Lead (µg/l)	<0.3	<0.3	4.6	<3.0	<0.3	<0.3	5	10	-	N/A	N/A	✓
Mercury (µg/l)	<0.02	<0.02	<0.2	<0.2	<0.02	<0.02	-	-	N/A	N/A	N/A	✓
Nickel (µg/l)	0.8	1.0	5.5	<5.0	0.8	1.0	8	50	-	N/A	N/A	✓
o xylene (µg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	10.0	N/A	N/A	✓
p.m xylene (µg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	10.0	N/A	N/A	✓
Selenium (µg/l)	<0.2	<0.2	2.1	2.1			-	-	N/A	N/A	N/A	✓
Simazine (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	1	N/A	N/A	✓
Toluene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	10.0	N/A	N/A	✓

(µg /l)												
Tributyl Tin (µg /l)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	0.001 (applies to tidal rivers only)	N/A	N/A	✓
Zinc (µg /l)	3.9	1.5	83.9	41.6	7.2	4.6	See note[1]	100	-	N/A	depends on water hardness <0.03 - 0.5 mg l Zn	✓

APPENDIX 6 Screening Assessment

DOEHLG Circular L8/08 Assessment

The Department of the Environment, Heritage and Local Government (DOEHLG) Circular L8/08 'Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments' issued in September 2008 provides guidance on identifying potential issues relating to protection of natural heritage (including sites, habitats and species) during the planning of water services schemes. The requirements of this circular were followed during the preparation of the section. In order to identify potential ecological constraints, this report examines the current project (existing and proposed) in accordance with the checklist provided in Appendix 1 of L8/08 for natural heritage, and the checklist in Appendix 2 of L8/08 for archaeological heritage. The flow diagram provided in Circular L8/08 and replicated in Figure A6.1 of this report was also utilized. The outcome of the assessment is provided in Table A6.1.

Table A6.1 Natural heritage check-list (from DOELG Circular L8/08).

Checklist	Response	Conclusion
Is the development in or on the boundary of a nature conservation site NHA/SAC/SPA?	No	No likely impacts
Will nationally protected species be directly impacted? Wildlife Acts (1976 and 2000), Flora Protection order (S.I. 94 of 1999)	Yes	Further assessment required.
Is the development a surface water discharge or abstraction in the surface water catchment or immediately downstream of a nature conservation site with water dependant qualifying habitats/ species?	No	No likely impacts
Is the development a groundwater discharge or abstraction in the ground water catchment or within 5 km of a nature conservation site with water-dependant qualifying habitats/species?	No	No likely impacts
Is the development in the surface water or groundwater catchment of salmonid waters?	Yes	Further assessment required.
Is the treatment plant in an active or former floodplain or flood zone of a river, lake, etc?	Yes	Further assessment required.
Is the development a surface discharge or abstraction to or from marine waters and within 3km of a marine nature conservation site?	No	No likely impacts
Will the project in combination with other projects (existing and proposed) or changes to such projects affect the hydrology or water levels of sites of nature conservation interest or the habitats of protected species?	No	No likely impacts
Conclusion		**Assess Impacts**

Article 6 Screening Assessment (summary)

An Appropriate Assessment (Stage 1, Screening Assessment) has been completed in Section 4.3 Impact on Areas designated for Nature Conservation. The flow diagram provided in Figure A6.2 of this report was utilized. The outcome of the assessment is provided in Table A6.2.

Table A6.2 Summary of Article 6 Screening Assessment.

Checklist	Response	Conclusion
Is the PP directly connected with or necessary to the site management for nature conservation?	No	Screening necessary
Is the PP likely to have significant effects on the site?	Yes	Stage 2 Assessment required
Conclusion		**Assess Impacts**

An appropriate Assessment for the Laois Towns & Villages Wastewater Improvement Scheme, which includes the proposed upgrade to the Mountrath WwTP, has been already prepared by Entec O'Dwyer (2006). According to Laois County Council, this has already been accepted by NPWS.

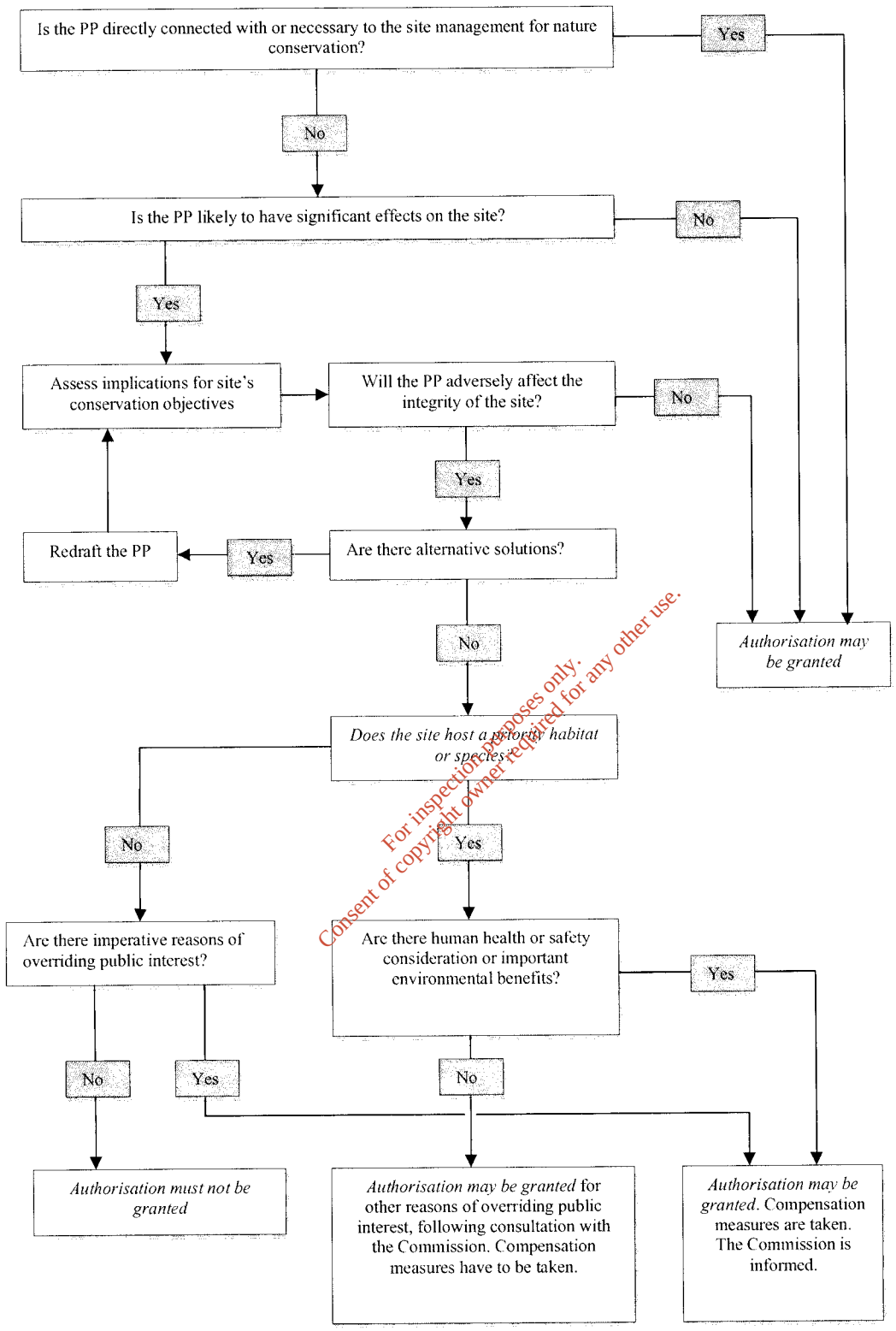

Figure A6.1 Flowchart outlining the appropriate assessment process (Adapted from EC, 2001).

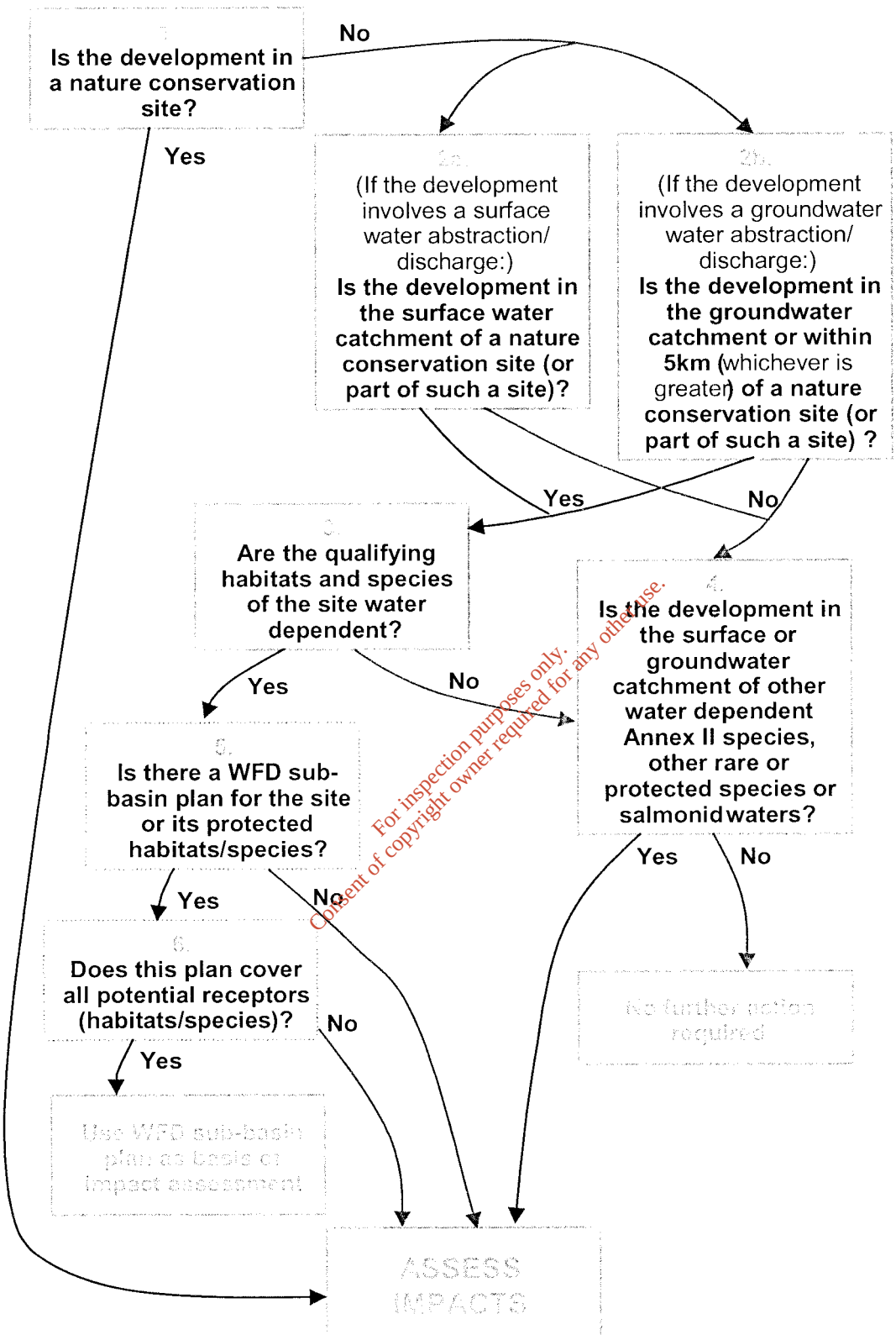

Figure A6.2 Flow chart for assessing screening requirements (from DOEHLG circular L8/08).

Appendix 7 Assessment of Impacts and Impact Significance

Criteria for assessing impact type and magnitude are presented in Tables A6.1 and A6.2, respectively.

In assessing the magnitude and significance of impacts it is important to consider the value of the affected feature, this is taken into account in Table A2.2.

Table A7.1. Criteria for assessing impact type.

Impact type	Criteria
Positive impact:	A change is likely to improve the ecological feature in terms of its ecological value.
Neutral	No effect.
Negative impact:	The change is likely to adversely affect the ecological value of the feature.

Table A7.2 Criteria for assessing impact magnitude.

Impact magnitude	Definition
No change:	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	A change in the ecology of the affected site, the consequences of which are strictly limited to within the development boundaries.
Minor Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution or abundance of species or habitats of conservation importance.
Moderate Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area.
Major Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in the wider area[2] is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).