9. Water Environment

9.1 Introduction

This chapter considers the potential effects of the Castleblayney WwTW capacity upgrade on the water environment, including both surface water and groundwater resources.

The existing WwTW outfall discharges treated effluent into a river (on the west branch of the River Fane) to the northeast of the WwTW site and in turn into the main waterbody of Lough Muckno to the east. Lough Muckno outflows to the Clarebane River and the main channel of the River Fane (via Lough Ross) as shown in **Figure 9.1**. These interconnected waterbodies are the main aquatic receptors identified in relation to the WwTW capacity upgrade.

9.2 Scope

9.2.1 Scope

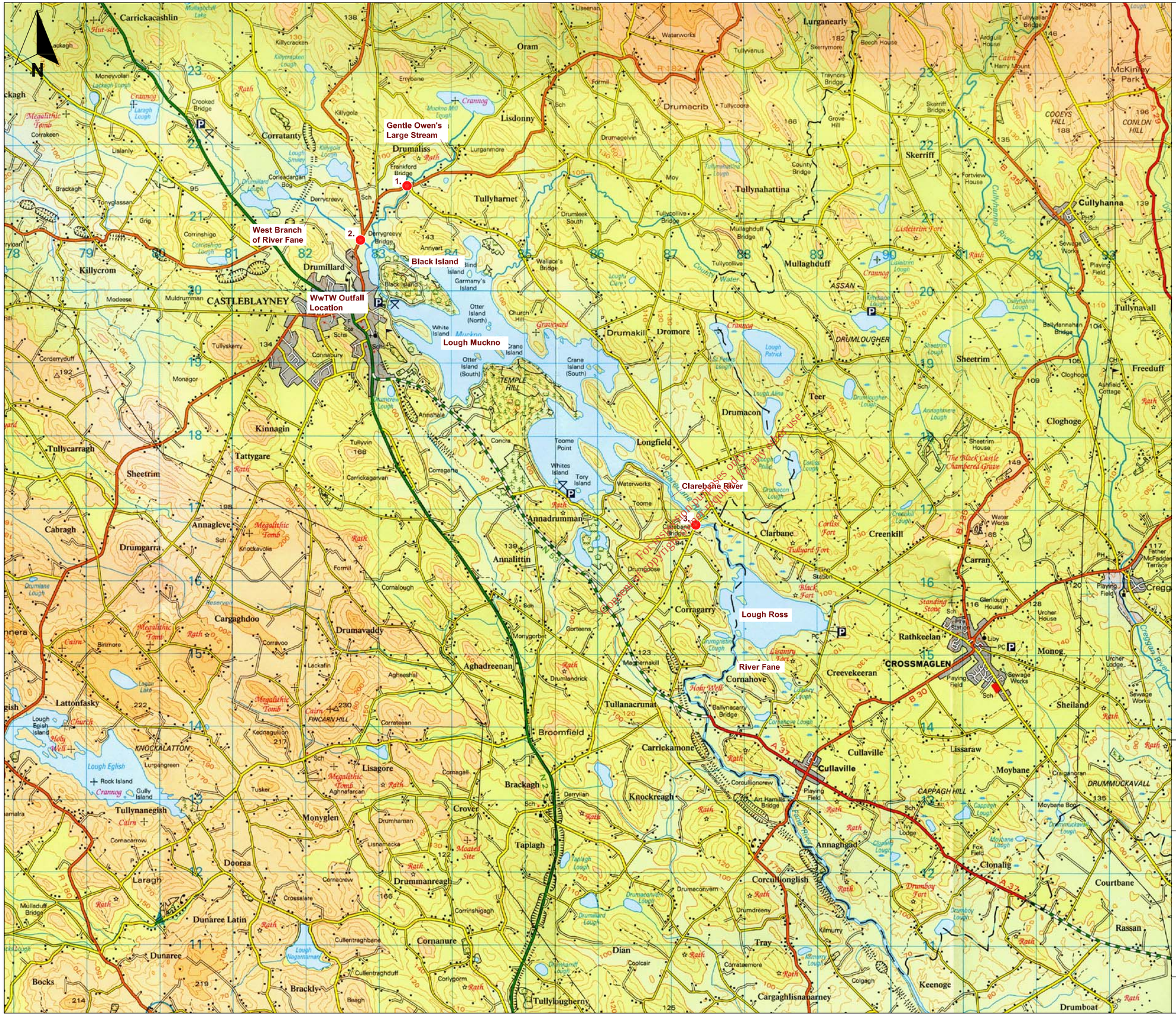
In order to ascertain the scope of this assessment a Scoping Report was submitted to Monaghan County Council identifying the following potential effects:

- Risk to the aquatic environment due to the potential for accidental releases of fuels/oils/chemicals during the construction works. The effect of construction works on the water environment has been considered through use of a source-pathway-receptor model.
- Liberation of sediment during earthworks due to the presence of exposed soils and soil stockpiles. The effect of construction works on the water environment has been considered through use of a source-pathway-receptor model.
- Loading of critical pollutants affecting the water quality of Lough Muckno and interconnected waterbodies downstream of the WwTW outfall. The effect of the discharge from the upgraded WwTW to the west branch of the River Fane is to be calculated using accepted Waste Assimilative Capacity[28] criteria to quantitatively determine the dilution of pollutants within the receiving watercourse.

The Area Engineer for Castleblayney reported on flood events in the town on 9 September 2005. The record of this meeting (obtained from www.floodmaps.ie) shows that no flood events have been recorded in the vicinity of the WwTW site. Therefore it is not considered necessary to undertake a Flood Risk Assessment for the proposed development site.

No other potential effects on the water environment were identified following consultation on the Scoping Report.

[28] Waste Assimilative Capacity (WAC) is the capacity of receiving waters to accept the discharge of final effluent. It is a general approach based on river flow and background pollutant concentrations which is used to calculate the maximum final effluent discharge loads which could be accommodated while still achieving compliance with in-river water quality standards.



Key

● Water quality monitoring station

1. Bridge D/S Muckno Mill Lough
   Station No. 0100
2. Derrycreevy Bridge
   Station No. 0200
3. Clarebane Bridge
   Station No. 0300

0 km 3 km
Scale 1:50,000 @ A3

Entec and O'Dwyer
Nutgrove Office Park
Nutgrove Avenue
Dublin 14

Castleblayney WwTW
Environmental Impact Statement

Figure 9.1
River Systems and Water Quality Monitoring Stations

February 2008
19925-R19.dwg marsa01

Entec

9.2.2 Methodology

For a significant risk of pollution or environmental harm to be caused all the following elements must simultaneously be present:

Source – substance capable of causing pollution or harm.

Receptor – something which could be adversely affected by the contaminant.

Pathway – route by which the contaminant could reach the receptor.

If one of these elements is missing there can be no significant risk. If all are present then the magnitude of the risk is a function of (i) the magnitude and mobility of the source (ii) the sensitivity of the receptor(s) and (iii) the nature of the migration pathways. The source-pathway-receptor model has been adopted for this assessment of potential effects on the water environment. If a pathway exists between a pollution source and surface water receptor(s) then there is the potential to result in significant effects on the quality of surface water resources.

The assessment of potential construction effects is based on anticipated changes through qualitative judgement. The assessment of potential operational effects is quantitative being based on the WAC calculations.

9.3 Existing Environment

9.3.1 Baseline Information Sources

Baseline information has been obtained from the following sources:

Topic	Sources of Information
Biological Water Quality	EPA (2004) Interim Report on the Biological Survey of River Water Quality Results of the 2003 Investigations from www.epa.ie
Groundwater	Groundwater vulnerability information from www.gsi.ie
River Flows	Dry Weather Flows and 95%ile Flows from www.epa.ie
Flood Incidents	Report on flood events to the Office of the Public Works from the Castleblayney Area Engineer obtained from www.floodmaps.ie

9.3.2 Existing Situation

River System

The existing WwTW outfall discharges treated effluent into a watercourse upstream of Lough Muckno (on the west branch of the River Fane) to the northeast of the WwTW site and in turn the main waterbody of Lough Muckno to the east as shown in **Figure 9.1**. Lough Muckno outflows to the Clarebane River and the main channel of the River Fane via Lough Ross.

The catchment of the west branch of the River Fane at Derrycreevy Bridge (upstream of the outfall) is 43.4km^2 and has a long term average rainfall of 1075.4mm/annum from 1977 to 2000. Lough Muckno itself has a catchment area of 162 km^2 and a long term average rainfall of 1108.8 mm/annum from 1977 to 2000. The average flow of the River Fane at Clarebane (downstream of Lough Muckno) is 3.17 m^3/s with a 95%ile flow of 0.2 m^3/s. No gauging

information exists for the river upstream of the lough, it has therefore been estimated by Nicholas O'Dwyer that at the outfall location flows will be approximately half of the downstream flow giving an average flow of 1.58 m^3/s and a 95%ile flow of 0.1 m^3/s.

Surface Water Quality

Lough Muckno has been classified as a "sensitive area" under the Urban Wastewater Treatment Regulations 2001 (S.I. No. 254/2001) (UWWTR) because there is a risk of excess nutrient concentrations (in particular nitrogen and phosphorus) leading to unacceptable algal growth and dominance by nutrient tolerant species (development of eutrophic conditions) if special measures are not taken. Phosphorus is generally considered to be the bio-limiting element in freshwaters. This imbalance in the aquatic ecosystem can cause adverse effects on the fish population, due to fluctuations in dissolved oxygen concentrations, and the excessive growth of plants can also cause physical alterations to river channels and increased accumulation of silt.

December 2000 saw the introduction of one of the most significant pieces of water-related legislation in Europe to date, the EU Water Framework Directive 2000/60/EC (WFD) which fully embraces certain key environmental management principles. Firstly, it adopts a holistic approach covering all waters - rivers, lakes, transitional waters/estuaries, coastal waters and groundwater as well as their dependant wetlands. Secondly, it recognises that water systems do not stop at administrative boundaries, such as county boundaries, requiring waters to be managed at a catchment or River Basin District (RBD) level. The targets set in the WFD are ambitious and by 2015 all waters should have 'good status' (unless classified as heavy modified in which case they must achieve 'good ecological potential' by 2015) and deterioration in existing water quality status is not acceptable. The WFD is an umbrella directive in that it incorporates the requirements of some other earlier pieces of European legislation.

Ireland completed the first step in implementing the WFD in December 2003 by making the European Commission (Water Policy) Regulations (S.I. No. 722/2003) which transposed the WFD into Irish law. Eight RBD have been identified within the island of Ireland with Castleblayney and its environs situated in the Neagh Bann River Basin District. The Article 5 Summary Characterisation Report analysis for the Neagh Bann RBD was completed in 2006 and concluded that Lough Muckno and the western branch of the River Fane were "at significant risk" of failing to meet the WFD target of achieving good ecological status.

The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) (the Surface Water Regulations) apply to all surface waters and are made to give effect to the measures needed to achieve the environmental objectives established for bodies of surface water by the Water Framework Directive. These regulations set out maximum concentrations of pollutants permitted in watercourses. The River Fane must comply with the requirements set out in the Surface Water Regulations.

Under the Surface Water Regulations it is required that waterbodies with a less than good status must achieve "Good Status" as defined in the regulations by not later than 22 December 2015, The River Fane at Derrycreevy Bridge (**Figure 9.1**) was classified by the EPA in 2009 as Q3-4 (slight pollution), at Station No. 0200, upstream of the existing discharge and Q3 (moderate pollution) at Station No. 0400 downstream of the existing discharge.

Lough Muckno was classified as strongly eutrophic in a 2001 – 2003 EPA monitoring survey. In recent years Monaghan County Council have reported extensive blue-green algal blooms on the lough, these have flowed downstream towards Inniskeen.

The EPA Ecological Assessment of Rivers (2004) states that, as in previous survey years, sensitive macro-invertebrate species were not observed anywhere on the west branch of the River Fane, indicating some considerable pollution. The low Dissolved Oxygen (47% saturation) content recorded by the EPA in 2003 at Derrycreevy Bridge, approximately 1km

upstream of the outfall, confirms this assessment. Since this monitoring station is upstream of the WwTW outfall it indicates that there are other pollution sources impacting on the quality of the west branch of the River Fane. The latest biological quality rating (2009) at Station No. 0200, Derrycreevy Bridge, **Figure 9.1**, is Q3-4[29] whilst downstream of the outfall at Station No. 0400, Ballynacarry Bridge, **Figure 9.1**, the biological quality rating is Q3. Monitoring in 2000/2001 reported elevated concentrations of phosphorus upstream and downstream of the Castleblayney WwTW outfall, with the ortho-phosphate concentration rising by 0.49 mg/l P in August 2000 and these elevated concentrations persisting in 2001. Elevated nitrate concentrations were also reported in 2000, with reduced levels reported for 2001.

Table 9.1 provides further details of the water quality in the River Fane as monitored by the EPA between 2003 and 2005.

Table 9.1 Water Quality in the River Fane 2003-2005

Parameter	Upstream of WwTW Discharge			Downstream of WwTW Discharge		
	Min	Median	Max	Min	Median	Max
Biochemical Oxygen Demand (BOD5) mg/l	1.55	4.53	265	2.27	4.67	9.53
Ortho Phosphate mg P/l	0.05	0.21	8.6	0.04	0.7	0.37
Total Ammonia mg N/l	0.19	0.33	12.7	0.21	0.86	0.61

It should be noted that the River Fane is not designated as a salmonid water under the European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293/1998) which is aimed at protecting and improving waters capable of supporting fish life. However Lough Muckno holds huge stocks of fish including bream, rudd, roach, hybrids, tench, perch and pike. The Eastern Regional Fisheries Board notes there are a number of excellent fishing locations the lough including White Island, Black Island, Concra Wood, South Lodge and Toome Point. The water quality standards set out in the Surface Water Regulations require lower concentrations of pollutants than that required for Salmonid Waters. These regulations do not therefore need to be considered further.

There is a drinking water abstraction from Lough Ross at Newry Water Treatment Plant, from the River Fane at Inniskeen Water Treatment Plant approximately 8km downstream and from the River Fane at Dundalk Water Treatment Plant towards the mouth of the river.

Traditionally, there has been an informal bathing area at Black Island approximately 0.5km downstream of the outfall. The lough is also used for canoeing and other water sports. However, it is not designated under the EU Bathing Water Directive. Compliance with European and national bathing water quality standards is therefore not a legislative

[29] River water quality is graded by the EPA from Q1 (seriously polluted) through to Q5 (unpolluted) based on the presence or absence of macro invertebrate communities. The Q3 (moderately polluted) rating means that the diversity of macro invertebrates at the monitoring station is significantly reduced from that expected in an unpolluted river with similar characteristics.

requirement.[30] However Monaghan County Council monitor the bathing water and have highlighted that there have been problems with microbiological contamination.

Effluent Discharge

The Castleblayney Catchment Report (DoEHLG, 2004) states that routine monitoring data has shown that the WwTW has consistently discharged treated effluent in compliance with the discharge standards specified in the UWWTR [31]. Treated effluent samples for 2001 had an average BOD concentration of less than 9 mg/l, suspended solids concentration of less than 13 mg/l and an ortho-phosphate concentration of less than 1.5 mg/l. **Table 9.2** details the results of EPA monitoring for the existing Castleblayney WwTW undertaken in December 2005 to examine the performance of the treatment plant.

Table 9.2 Flow and Load Survey Results

Parameter	Influent	Effluent
Biochemical Oxygen Demand	248 mg/l	10.4 mg/l
Chemical Oxygen Demand	598 mg/l	32 mg/l
Suspended Solids	165 mg/l	8 mg/l
Total Ammonia	15.4 mg/l	0.65 mg/l
Phosphorus	28.21 mg/l	2.91mg/l

Flood Risk

The Area Engineer for Castleblayney reported on flood events in the town on 9 September 2005. The record of this meeting (obtained from www.floodmaps.ie) shows that no flood events have been recorded in the vicinity of the WwTW site.

Groundwater

Sub-soils across the existing WwTW site comprise made ground whilst beneath the extension site they comprise cut-raised peat. The bedrock comprises Ordovician Metasediments. The strata below the WwTW are classified as a locally important aquifer which consists of bedrock which is moderately productive only in local zones. The vulnerability map (obtained from www.gsi.ie) shows that the aquifer is extremely vulnerable to contaminants released at depths of 1m to 2m below the ground surface.

9.3.3 Predicted Trends

It is predicated that any changes to the water quality of the River Fane and Lough Muckno will stem from increased human populations in Castleblayney Town and its immediate hinterland. In future years, if residential development and commercial activity expands in Castleblayney Town at the same pace as at present, the existing secondary treatment system will not be able to cope with the increase in influent flows. If increased capacity is not provided, then the future development of Castleblayney Town will be constrained and/or the environmental quality of the River Fane is likely to become degraded.

[30] The mandatory standard for designated bathing waters is less than 10,000 total coliforms per 100ml as a 95%ile and less than 2,000 faecal coliforms per 100ml as a 95%ile.

[31] <25mg/l BOD, <35mg/l suspended solids and <2mg/l Total Phosphorus

9.3.4 Information Gaps

There is limited flow and chemical monitoring data for the west branch of the River Fane in the vicinity of the WwTW site but this gap in the baseline data is not considered critical to the assessment.

9.4 Potential Effects and Incorporated Mitigation

9.4.1 Potential Effects during Construction and Incorporated Mitigation

Under the Local Government (Water Pollution) Act 1977 (as amended) there is a general prohibition on entry of polluting matter to waters. However every construction site provides some level of risk to the aquatic environment and groundwater due to the potential for accidental releases of fuels/oils/chemicals from construction plant.

Releases could enter Lough Muckno via surface water runoff from the site, subsequent effects on water quality and associated local aquatic ecology could result in the immediate vicinity or, if spill volumes are large, a significant distance downstream. Concrete and cement in particular are very alkaline and on entering Lough Muckno could result in a significant increase in pH. As pH increases, the proposal of dissolved ammonia present as un-ionised ammonia, which is particularly toxic to fish, increases.

Releases of fuels/oils/chemicals could also infiltrate through to the locally important aquifer beneath the WwTW site affecting the quality of groundwater supplies in the long term.

The liberation of sediment can also occur during earthworks due to the presence of exposed soils, mud and dust on roads and soil stockpiles. Stockpiles located in close proximity to the watercourse could be washed away during high flows. Excessive discharges of highly turbid water can cause water pollution and the settling out of large quantities of sediment can smother benthic organisms. Suspended sediment could also be generated during construction of the new access track and the Stage 2 works both of which involve crossing drainage ditches entering Lough Muckno.

These risks are temporary for the duration of the construction works (over two stages each of 18 months duration) but, since the WwTW is above a locally important aquifer, adjacent to Lough Muckno and will involve construction over drainage ditches in order to install the new access road and Phase 2 works, environmental best practice as listed in **Table 9.7** will need to be implemented on site to reduce the risk of polluted run-off impacting on groundwater and Lough Muckno to the lowest practicable level.

9.4.2 Predicted Effects during Operation and Incorporated Mitigation

The WwTW capacity upgrade will mean that the level of treatment will be improved over the current arrangement and better effluent quality will result following Stage 1 in respect of the current load being treated. However it is proposed to increase the capacity of the WwTW to 28,000 p.e. during Stage 2. Thus the actual load being treated by the WwTW will increase as development occurs within Castleblayney Town.

This may affect the total loading of critical pollutants and cause a degree of water quality deterioration the receiving watercourse. For example, nutrient enrichment could lead to eutrophication, a high organic loading could lead to oxygen depletion, excessive ammonia concentrations could lead to toxic effects on aquatic biota and high sediment loads could cause a reduction in light penetration and smothering of the river bed.

To ensure the final effluent does not result in a significant effect on Lough Muckno it will be necessary to set effluent standards reflecting the legislative water quality requirements of this watercourse. The main mechanisms employed in setting environmentally protective effluent standards are the UWWTR and the WAC of the receiving water as follows.

The final effluent discharged from the Castleblayney WwTW must be compliant with the UWWTR which requires secondary treatment for all discharges to freshwaters from towns with a population equivalent of over 10,000 by 31st December 2005.[32] The concentration standards and percentage removal standards set out in the UWWTR are shown in **Table 9.3a** but the approach adopted in Ireland is based on the use of concentration standards for compliance assessment.

In addition, as Lough Muckno has been classified as a "sensitive area" under the UWWTR the concentration standards detailed in **Table 9.3a** for total phosphorus or total nitrogen must be complied with. In this case, a total nitrogen standard is not required as phosphorus is generally considered to be the bio-limiting element in freshwaters. The water quality standards as set out in the Surface Water Regulations are set out in **Table 9.3b.**

Table 9.3a UWWTR Effluent Concentrations (Second Schedule, Part 1, S.I. 254/2001)

Parameter	Maximum concentration (mg/l)	Minimum % Reduction
Biochemical Oxygen Demand (BOD_5)	25	70-90
Total Suspended Solids (TSS)	35	75
Chemical Oxygen Demand (COD)	125	90
Total Phosphorus	2	80
Total Nitrogen	15	70-80

Table 9.3b Surface Water Directive Concentrations (Schedule 3)

Parameter	Mean concentration (High Status) (mg/l)	Mean concentration (Good Status) (mg/l)	95% ile concentration (Good Status) (mg/l)
Biochemical Oxygen Demand (BOD_5)	1.2	1.5	2.2
Total Ammonia (NH_3.N)	0.04	0.065	0.14
Molybdate Reactive Phosphorus (MRP)	0.025	0.035	0.075

[32] Compliance with the emission control standards set by the UWWTR is identified within the WFD as one of the "basic measures" to be included in the river basin management process. Consequently it remains valid to assess the effluent standards in relation to the UWWTR.

The Waste Assimilation Capacity (WAC) of the receiving water of the River Fane has been examined to determine if there are any specific environmental needs that are more stringent than the generic standards from the UWWTR. The WAC for each parameter has been calculated based on the 95 percentile flow in the river and the 95%ile concentration required and the mean flow and the mean concentration. The target concentrations used for the WAC calculations is the 95 percentile target concentrations for the BOD as this is standard practice. The target concentrations for the phosphorus and ammonia are the mean concentrations based on mean flows. This is based on the compliance requirements of the UWWTR which measure compliance for nutrients on an annual mean basis. Further to a conversation with the EPA[33] regarding the methodology for setting the standards for the Wastewater Discharge Licences[34], the background concentration being used by the EPA is that of "clean water body". The background concentrations have therefore been assumed to be the mean concentration for high status surface water body. It is anticipated that the implementation of the Surface Water Regulations across the full catchment will lead to an overall improvement in the river quality with high status to be achieved by 2015 in accordance with the Water Framework Directive. The results of the WAC calculations are included in **Table 9.4** below. Further details are included in **Appendix I**.

The WAC has shown that insufficient assimilative capacity for effluent concentrations in line with the UWWTR is available at the discharge location, this will be especially so during the summer months when flows are lower, thus a more onerous standard than required by the UWWTR will be required as shown in **Table 9.4**.

Biochemical Oxygen Demand (BOD)

The UWWTR secondary treatment standard for BOD concentrations is 25mg/l and this has been used as a starting parameter for the discharge concentration of BOD within the WAC calculation.

It can be seen from **Table 9.4 and Appendix I** that in order to achieve this target concentration an effluent standard of 6.4mg/l is required at Stage 1 and 5.1mg/l and 4.5mg/l at Stages 2 and 3 respectively. Tertiary treatment, such as sand filtration, will need to be provided to meet this target. Residual suspended solids have an associated BOD load and a further reduction in suspended solids through tertiary treatment can further reduce the BOD concentration.

Ammonia

The 95 percentile concentration of ammonia required by the Surface Water Regulations is 0.14mg.N/l and the mean concentration is 0.065mgN/l. This is substantially lower than the guideline value of 1 mg/l of ammonia required for Salmonid Waters. The limit used for the purpose of the WAC calculations was therefore 0.065mgN/l based on average flows in the river.

It can be seen from **Table 9.4** that in order to achieve this target concentration an effluent standard of 1.1mg/l is required for Stage 1 and 0.79mg/l and 0.61mg/l at Stages 2 and 3 respectively

[33] Conversation between Sinead Hanrahan of Nicholas O'Dwyer Ltd. and Kate Stafford of the EPA, 22nd February 2010 regarding calculation of WAC for Wastewater Discharge Licence Applications

[34] Local Authorities with responsibility for water services must apply to the EPA for a Wastewater Discharge Licence for all discharges from agglomerations with a population equivalent of > 1,000 under the Waste Water Discharge (Authorisation) Regulations 2007 (SI 684 of 2007). The Wastewater Discharge Licence application for the existing Castleblayney Wastewater Treatment Plant is currently being reviewed by the EPA.

Ortho-Phosphate

Under the Surface Water Regulations it is required that waterbodies with a less than good status must achieve "Good Status" as defined in the regulations by not later than 22 December 2015, The River Fane at Derrycreevy Bridge (**Figure 9.1**) was classified by the EPA in 2009 as Q3-4 (slight pollution), at Station No. 0200, upstream of the existing discharge and Q3 (moderate pollution) at Station No. 0400 downstream of the existing discharge.

The 95 percentile concentration of phosphorus (MRP) required by the Surface Water Regulations is 0.0.35mg.P/l and the mean concentration is 0.075mgN/l. The limit used for the purpose of the WAC calculations was therefore 0.035mgN/l based on average flows in the river.

It can be seen from **Table 9.4** that in order to achieve this target concentration an effluent standard of 0.47mg/l is required for Stage 1 and 0.32mg/l and 0.25mg/l at Stages 2 and 3 respectively

Table 9.4 Predicted in River Concentrations

		BOD	Ammonia	Ortho-Phosphate
Upstream concentration (based on high status water upstream)	mg/l	1.2	0.04	0.025
95%ile upstream flow	m^3/s	0.1		-
Average annual flow	m^3/s	-	1.583	1.583
WAC – Stage 1	kg/d	20.29	3.62	
WAC – Stage 2	kg/d	24.38	3.73	
WAC – Stage 3	kg/d	28.48	3.83	0.7
Downstream concentration (95%ile)	mg/l	1.5	-	-
Downstream concentration (mean)		-	0.065	0.035

*Values are based on a design p.e. of 14,000, 21,000 and 28,000 for Stages 1, 2 and 3 respectively

Suspended Solids

Secondary treatment is considered adequate to reduce the suspended solids content of the influent to ensure compliance with the UWWTR standard of 35mg/l. However inclusion of tertiary treatment to reduce BOD to 6mg/l will means that lower concentration of suspended solids would be achieved.

Dissolved Oxygen

The European Communities (Quality of Salmonid Waters) Regulations 1988 set out a guideline for compliance of greater than or equal to 6mg/l of oxygen in salmonid waters. In addition to this the Surface Water Regulations set a limit of 95%ile >80% saturation for dissolved oxygen. The discharge from the wastewater treatment plant will represent approximately 42% of the 95%ile flow on the west branch of the River Fane. It may be necessary to provide post-aeration of the treated effluent at the later states of the scheme. If, in the long term, ongoing monitoring of the River Fane identifies that dissolved oxygen is being lowered below the required 80% saturation due to the final effluent a post-aeration system will be retrofitted.

The effluent standards summarised in **Table 9.5** should ensure that relevant statutory regulations are met and provide adequate protection of aquatic receptors when the WwTW is fully operational at each of the development phases. Further details of the WAC calculations and effluent standards are included in **Appendix I**.

Table 9.5 Proposed Effluent Standards

Parameter	Concentration (mg/l)		
	Phase 1 14,000 PE	**Phase 2 21,000 PE**	**Phase 3 28,000 PE**
Biochemical Oxygen Demand (BOD_5)	6.4	5.1	4.5
Suspended solids	15	15	15
Ortho Phosphorous	0.47	0.32	0.25
Total Ammonia	1.15	0.79	0.61

Faecal Coliforms

Lough Muckno is not designated as a bathing water under the Quality of Bathing Waters Regulations 1992 (S.I. 155/1992) however it is used as an informal bathing area and for canoeing and other water sports. Upgrading of the WwTW will mean that the final effluent contains a lower concentration of suspended solids than at present, thus also reducing the amount of bacteria in the final effluent. If, in the long term, ongoing monitoring of Lough Muckno identifies that disinfection of the final effluent is necessary to ensure the ongoing use of Lough Muckno for recreation then a ultra violet disinfection system could be retrofitted.

Storm Water

The upgraded WwTW will be designed to treat 3DWF and above this it is normal operational procedure for WwTW to discharge storm water in the event of long duration/high intensity storm events to ensure that the treatment processes dot not become overloaded or a high concentration of mixed liquors is washed out of the plant into the watercourse. Storm water discharges will be screened and sufficient storm water storage will be provided to ensure a minimum retention time of 2 hours for peak flows prior to discharge. Effluent discharged under these conditions will be diluted by the storm water component.

Table 9.6 Summary of Incorporated Mitigation

Receptor	Potential Effects	Incorporated Mitigation Measures and Rationale for their Likely Effectiveness
Construction Phase		
Lough Muckno	Sediment laden surface water runoff entering Lough Muckno resulting in a deterioration in water quality and causing the river bed to be smothered	It is anticipated that dewatering of excavations will be required due to shallow groundwater levels being encountered during installation of the treatment tanks below ground level. During dewatering of excavations all water is to be discharged to an infiltration trench following appropriate treatment for the removal of sediments. HIGHLY EFFECTIVE Stockpiles of soil to be kept to a minimum and stored at least 50m away from any watercourses / outside the 1 in 100 year floodplain to minimise the risk of the soil being washed away during high flows. Permanent and semi permanent stockpiles of soil will be seeded as soon as practicable after deposition to minimise erosion. HIGHLY EFFECTIVE Site drainage / surface water runoff from the construction site will be discharged to Lough Muckno following appropriate treatment for the removal of settlement. HIGHLY EFFECTIVE
	Contaminant laden surface water runoff entering Lough Muckno resulting in a deterioration in water quality	The contractor will prepare a method statement detailing how spillages will be dealt with. Pollution prevention equipment will be kept in the construction area and procedures for use put in place. Spill kits to contain absorbent materials, empty containers for catching leaking fluids and appropriate personal protective equipment. HIGHLY EFFECTIVE Construction vehicles will only be active when required and regularly maintained to reduce the risk of leakage or spillage. Refuelling operations will be carried out within a designated construction site compound sited at least 50m away from any watercourses / outside the 1 in 100 year floodplain and carried out on impervious drip trays. Maintenance work will be carried out on impervious drip trays to prevent spillage of fuel and oils. Fuels, oils and chemicals will be stood on impervious drip trays or be secured/locked in appropriately bunded areas at 110% of volume situated at least 50m from a watercourse. Leaking or empty drums will be removed from site at once. HIGHLY EFFECTIVE Concrete/cement washing will be carried out in an appropriately bunded area sited away from watercourses. The washings are to be pumped to a sealed tank without an overflow for disposal off site. HIGHLY EFFECTIVE
Operational Phase		
Lough Muckno	Effluent discharge entering Lough Muckno resulting in a deterioration in water quality	The WwTW will be designed and operated to ensure that the effluent standards specified in **Table 9.5** will be complied with. Sufficient storm water storage will be provided to ensure a minimum retention time of 2 hours for peak flows. HIGHLY EFFECTIVE

9.4.3 Implementation of Mitigation and Enhancement Measures

The implementation mechanisms for the identified mitigation measures are given in **Table 9.7.**

Table 9.7 Implementation of incorporated mitigation and enhancement measures

Description of measures including any monitoring requirement	Responsibility for implementation	Implementation mechanism
Construction		
Environmental best to reduce the risk of run-off impacting on Lough Muckno to the lowest practicable level.	Contractor	Contract Documents
Operation		
Design and operation of the WwTW to achieve the UWWTR quality standards.	Site Designer and Operator	Contract Documents

9.5 Assessment of Effects

9.5.1 Significance Evaluation Methodology

The following significance descriptors are used in this assessment:

- Major Significance – effects of the development which cause a breach of *mandatory* European or Irish water quality standards or would constitute a pollution incident. Risk of WwTW infrastructure being flooded during a storm event with a return period of less than 1 in 100 years.
- Minor Significance – effects of the development which cause breach of *guideline* European or national water quality standards.
- Non-Significant – effects that cause changes to water quality in a localised area which are perceptible but do not breach any mandatory or guideline standards or any effects which are below normal levels of detection. Negligible risk of WwTW infrastructure being flooded during a storm event with a return period of less than 1 in 100 years.

9.5.2 Predicted Effects during Construction and their Significance

Construction of the WwTW will be undertaken over two phases each lasting 18 months in duration. There is a residual risk to the aquatic environment from polluted run-off entering Lough Muckno and to groundwater due to releases of fuels/oils/chemicals. However significant effects are not anticipated if the environmental best practice as listed in **Table 7.6** is implemented on site to minimise the likelihood of polluted run-off and effectively deal with any pollution events that do arise.

During construction the existing WwTW will continue to treat wastewater from Castleblayney Town to the required standards.

9.5.3 Predicted Effects during Operation and their Significance

The final effluent will be treated to meet the effluent standards set out in **Table 9.5** which reflect the relevant statutory regulations and provide adequate protection of aquatic receptors given the assimilative capacity of the River Fane. It has been established that a secondary treatment plant, including chemical dosing for phosphorus reduction, plus tertiary treatment to further reduce BOD levels will be able to provide sufficient protection of the River Fane in this respect. Thus

whilst there will be some minor deterioration of water quality around the discharge point significant effects are not anticipated.

No significant effects in relation to groundwater or flooding are anticipated during operation.

9.5.4 Cumulative Effects

The effluent standards take into account anticipated upstream pollutant concentrations and will therefore be protective of the receiving water considering catchment wide inputs.

The WwTW upgrade is part of a wider sewerage improvement programme for Castleblayney Town which will include the provision of associated pumping stations and sewerage network improvements. These other elements fall outside of the scope of this EIA but cumulatively should help improve water quality within Lough Muckno.

9.5.5 Compensation Measures

No compensation measures have been identified.

9.5.6 Additional Mitigation/Enhancement Measures

No additional mitigation or enhancement measures have been identified.

9.5.7 Summary of Significance Evaluation

Table 9.8 summarises the significant water quality effects arising from construction and operation of the Castleblayney WwTW capacity upgrade.

Table 9.8 Effects and Evaluation of Significance

Environmental Effect	Type of Effect	Probability of Effect Occurring	Policy Importance (or sensitivity)	Magnitude of Effect	Significance	
					Level	Rationale
Construction						
Risk to the aquatic environment from polluted run-off entering Lough Muckno and to groundwater due to releases of fuels/oils /chemicals	-	Unlikely	Local	Minor	Not Significant	The use of environmental best practice to reduce the risk of run-off impacting on Lough Muckno to the lowest practicable level.
Operation						
Effluent discharge entering Lough Muckno resulting in a deterioration in water quality	+	Likely	Local	Minor	Not Significant	Water quality immediately around the discharge point will decrease due to increased flows to treatment but the WwTW will be designed and operated to achieve the UWWTR quality standards and provide adequate protection of aquatic receptors given the assimilative capacity of the River Fane.

Key:	Type	Probability	Policy Importance	Magnitude	Significance
	- = Negative	Certain	International	Major	Major Significance
	+ = Positive	Likely	National	Moderate	Minor Significance
	? = Unknown	Unlikely	Regional	Minor	Not Significant
			District	Negligible	
			Local		

10. Ecology

10.1 Introduction

This chapter describes and evaluates the current nature conservation interest of the site, presents the mitigation measures incorporated in the Castleblayney WwTW and assesses the predicted residual effects of the proposed development.

10.2 Scope and Methodology

10.2.1 Scope

The initial scope of this assessment, before formal consultation was made to Monaghan County Council, was derived from a general knowledge of which potential nature conservation receptors could be affected by the construction and operation of the WwTW, combined with a desk study and a general consultation exercise undertaken separately from the formal scoping process.

The relevant consultees with respect to ecology were the National Parks and Wildlife Service (NPWS) within the Department of Environment, Heritage and Local Government (DoEHLG) and the Eastern Regional Fisheries Board (EWRFB). The consultees were asked to provide any information on protected species[35] or areas of botanical interest on, or within the vicinity of the site. Consultee views on the proposed ecological surveys and their opinions on the outline proposal were also sought.

A Scoping Report was submitted to Monaghan County Council, detailing the intended scope of the ecological assessment, no responses have been received back to date.

There are two designated sites of nature conservation interest within 2km of the existing WwTW and one of these has been scoped out of the assessment.

Lough Smiley NHA[36] is located approximately 2 km north of the proposed WwTW and is an area of extensive wetland, including lakes, freshwater marsh, fen, raised bog, cutover bog mosaic and wet woodland lying in a basin between drumlins. It contains a wide diversity of habitats and since they occur over a large area, there is an interesting variation in vegetation communities which provides a good example of ecological succession. As this site is 2km away from the proposed WwTW and there is no aquatic pathway between this site and Lough Muckno, into which the effluent discharges, the effect the proposed development will have upon this designated site is considered to be negligible and thus it has been scoped out of the assessment.

The net result of the consultations and collation of baseline data to date is a scope that encompasses the following:

[35] Those species listed within the Wildlife Act 1976 (as amended) and the Natural Habitats Regulations 1997

[36] In 1996, the Department of Arts, Culture and Heritage designated forty one sites in County Monaghan for inclusion in the Register of Natural Heritage Sites. In order to protect these areas the DoEHLG has designated the areas as proposed National Heritage Areas (NHA) with the object of conserving natural and semi-natural habitats and species of flora and fauna. Under the Wildlife (Amendment) Act (2000) NHAs will be legally protected from the date they are formally proposed.

- A survey of the habitats and potential protected species that may be present at the site following best practice and appropriate guidance, at the appropriate time of year;
- An assessment of the impacts of construction and operation of the WwTW upon protected species and design of appropriate mitigation if impacts are predicted to occur; and
- Identification of the need for further ecological surveys and potential mitigation before construction works commence.

10.2.2 Methodology

Ecological receptors are usually sites, habitats, species assemblages/communities or populations or groups of a species. Effects can be permanent or temporary; direct or indirect, and can be cumulative. These factors are brought together to assess the magnitude of the impact on particular valued ecological receptors and, wherever possible, the magnitude of the impact is quantified. Professional judgement is then used to assign the effects on the receptors to one of four classes of magnitude:

- Negligible: A short-term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group that is within the normal range of annual variation.
- Low: a short-term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
- Medium: a permanent or long-term effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial, this is likely to be sustainable but is unlikely to enhance its conservation status.
- High: a permanent or long-term effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.

10.3 Baseline Environment

10.3.1 Baseline Information Sources - Desk Study

Baseline data on the nature conservation interest of the site and its surroundings, including information on designated nature conservation sites[37] and protected species records[10] were sought up to 2km from the site boundary from the following:

- National Parks and Wildlife Service (NPWS);
- Northern Regional Fisheries Board (ERFB); and
- Internet Databases[38].

[37] e.g. Natural Heritage Area (NHA) or European sites such as Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).

- Irish Wetland Birds Survey (I WeBS)

10.3.2 Baseline Information Sources - Field Survey

Vegetation

An Extended Phase 1 Habitat Survey, based on standard methodology described by the Joint Nature Conservation Committee (2003)[39], was undertaken on 27 September 2007 by Entec Ecologist Ruth Jones BSc (Hons) MIEEM. This survey method is widely used and allows for the broad classification of habitat types and rapid assessment of the ecological potential of an area. This standard method was also 'extended' to include recordings of the most abundant plant species in each habitat type. The JNCC methodology was used[40] and the principal habitats present recorded and categorised according to this system, as well as using guidance published by The Heritage Council[41] which is widely used in the Republic of Ireland.

Fauna

In addition to mapping out habitats, searches for evidence indicating the presence of protected species[10] or potentially suitable habitat for them was also undertaken. Survey methodology for each protected species is summarised below in **Table 10.1.**

Table 10.1 Evidence and Habitats Surveyed to Reveal the Presence of Protected Species

Species	Habitats Surveyed	Characteristic Indicator Signs and Activity
Otter	Within the proposed development area and adjacent ditches and streams up to 50m from the site boundary.	Faeces (spraints), holts and couches[42], footprints, feeding remains.
Badger	Within the proposed development area and beyond to appropriate habitat up to 50m from the site boundary.	Setts, paths, scratching posts, hair traces, footprints.
Bats	Mature trees and associated vegetation within the proposed development area.	Droppings, foraging, feeding remains, roost sites, hole "staining", roost noise, roost smell.

Bat Survey

During the field survey a number of mature trees within the proposed extension area were considered suitable for providing habitat for roosting bats. These mature trees occurred along the two well established field boundaries which run the length of the proposed extension area which could be the remnants of boundaries between old gardens (Section 12). These trees contained a number of cracks and crevices and supported a large amount of epiphytic growth such as ivy growing on their bark. The range of scrub and grassland within the proposed extension site was also thought to provide good foraging habitat. Thus a bat survey of the site

[38] NPWS interactive map www.npws.ie and National Biodiversity Network Gateway (http://www.searchnbn.net/)

[39] Joint Nature Conservancy Council (2003). Handbook for Phase 1 Habitat Survey. Peterborough, UK

[40] This methodology is recommended for use in Ireland and the guide sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. (www.heritagecouncil.ie/publications/habitats/2.html)

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

[42] A couch is an uncovered nest-like structure whereas holts are considered to be underground or covered structures. Both are used by otters as resting places (Chanin, P (2003)). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

was undertaken to establish the level of bat usage on site, to identify which species were present and to identify any potential roost sites which may need further investigation. This survey followed guidelines set out by the Bat Conservation Trust (BCT)[43] and involved a dusk survey in the evening of the Extended Phase 1 Habitat Survey on the 27 September 2007.

During the habitat survey a transect route through the site was identified and 'listening'[44] stops were undertaken at set locations along the transect, targeting trees which were considered to provide suitable habitat for bats. The transect route covered the proposed area for construction, the existing WwTW and the proposed access route. Based on BCT guidelines, the activity survey started 15 minutes before sunset (sunset recorded as 19:20 hours) and continued until 2 hours after sunset to ensure that all bat species could be detected[45]. The transect route was walked slowly, incorporating listening stops and bats were detected using a bat detector (BATBOX Duet frequency division detector). The detector was linked into a recording device (digital Edirol recorder) and bat calls were analysed later using BatSound software to help identify the species present.

10.3.3 Existing Situation - Desk Study

There are two designated sites of nature conservation interest within 2km of the existing WwTW (**Figure 10.1**). Lough Smiley NHA has been scoped out of the assessment, as detailed in Section 10.2.

Lough Muckno NHA lies approximately 70m east of Castleblayney WwTW and is the largest lake in County Monaghan. A moderate number (500) of wintering waterfowl, including tufted duck (*Aythya fuligula*), cormorant (*Phalacrocorax carbo*), coot (*Fulica atra*), lapwing (*Vanellus vanellus*) and goldeneye (*Bucephala clangula*) were recorded using the Lough in the 1980's. However, development of the Lough for recreation over the past 25 years has caused a dramatic decline in the numbers recorded. Only four species are mentioned in the I-WeBS summary data covering the five consecutive winters from 1997/98 to 2001/02:- great crested grebe (*Podiceps cristatus)*, cormorant, grey heron (*Ardea cinerea*) and mute swan (*Cygnus olor*). Cormorant is the only species to have been recorded at more than 0.1% of the national population with a peak count in 1998/99 of 106 (0.75% of the national population) and a five year mean of 48 (0.34% of the national population). The figures apply to the entire lough rather than just the zone of influence in the immediate vicinity of the development.

The relatively large concentrations of waterfowl recorded in the 1980s compared to the present day may have been due to the ingress of more nutrient rich effluents when the discharge of partially treated sewage into inland waterbodies was standard practice. These nutrient rich conditions are particularly favoured by the diving duck species such as tufted duck and pochard.

The lough also supports a range of invertebrates and fish species, including brown trout (*Salmo trutta*), pike (*Esox lucius*), rudd (*Scardinius erythrophthalmus*), bream (*Abramis brama*), perch (*Perca fluviatus*), and eels (*Anguilla anguilla*).

[43] Bat Conservation Trust (2007) Bat Surveys: Good Practice Guidelines.

[44] Listening stops are pre-designated areas which are considered to be of particular interest for bats, such as potential roost sites, commuting roots or those of good foraging potential.

[45] Some bat species, such as daubenton bats (*Myotis daubentoni*) do not emerge from their roosts up to 2 hrs after sunset.

N

Lough Smiley

Muckno Lake

Drumakill Lough

Key

- Total development site boundary
- Natural Heritage Area (NHA)
- Extended 2km search area

0 m 50 m

Scale 1:1000 @ A3

Castleblaney WwTW
Environmental Statement

Figure 10.2
Phase 1 Habitat Survey

January 2008
19925-R10.dwg bernb

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Reproduced from 'Nicholas O'Dwyer Ltd'. Drawing Number '20384-CY-02'.

10.3.4 Existing Situation - Field Visit

Habitats

A description of the habitats present within the existing WwTW, the proposed extension site, the proposed access track and within the surrounding area is provided in the following sections. These habitats are shown on **Figure 10.2.**

Existing WwTW

The existing WwTW site comprises a tightly mown sward of amenity grassland and areas of hardstanding with existing buildings associated with the WwTW. Species present within the sward include those indicative of improvement such as perennial rye-grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), with occasional false oat grass (*Arrhenatherum elatus*), white clover (*Trifolium repens*), meadow buttercup (*Ranunculus acris*), daisy (*Bellis perennis*), dandelion (*Taraxacum japonicum*) and ribwort plantain (*Plantago lanceolata*). A number of non-native shrubs have been planted close to the administration buildings along with native deciduous trees such ash (*Fraxinus excelsior*). Mature deciduous trees, consisting predominately of ash and English oak (*Quercus robor*) along with associated scrub of hawthorn (*Crategus monogyna*), bramble (*Rubus fruticosus*) and ivy (*Hedera helix*) are located around the south western perimeter of the works.

Proposed Extension Site

This area comprises a series of field boundaries planted with mature deciduous trees interspersed with areas of poor semi-improved grassland, which may suggest they were previously managed as residential gardens (Section 12). Tree species present include ash, English oak, alder (*Alnus glutinosa*) and sycamore (*Acer pseudoplatanus*). A more diverse range of tree species is present in the south west of the proposed development including beech (*Fagus sylvatica*), common lime (*Tilia x europaea*) and Norway spruce (*Picea abies*) and a range of non-native shrubs. The areas of rough grassland within these tree boundary lines supports species indicative of improved grassland, consisting of Yorkshire fog, false oat grass, perennial rye, broadleaved dock (*Rumex obtusifolius*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), agrimony (*Agrimonia pilosa*), dandelion (*Taraxacum officinale*), bush vetch (*Vicia sepium*), common nettle (*Urtica dioica*), hedge bindweed (*Calystegia sepium*), cow parsley (*Anthriscus sylvestris)* and goosegrass (*Galium Aparine*).

An area of Japanese knotweed (*Fallopia japonica*) lies outside and immediately adjacent to the existing WwTW south western boundary.

Species indicative of wetter environments are present in the parts of the poor-semi improved grassland nearer to Lough Muckno and adjacent to the small watercourse which runs from the development site to the lough. The majority of this watercourse was dry during the site visit in September and seems to only be a drainage channel from the site into the Lough. The ditch starts within the centre of the area proposed for extension and then flows north east until it reaches the lough. These wetter areas are dominated by common reed (*Phragmites australis*) and canary reed grass (*Phalaris arundinacea*) along with areas of scrub with species such as downy birch (*Betula pubescens*) and willow (*Salix spp*).

Proposed Access Track

As the proposed access track leaves the WwTW to the north, it will cross an area of poor semi-improved grassland. Species present within this area comprise Yorkshire fog, perennial rye-grass, smooth meadow grass (*Poa pratensis*), Timothy (*Phleum pratense*), common bent (*Agrostis capillaris*), cocksfoot, crested dogs tail (*Cynosurus cristatus*), red clover (*Trifolium pratense*), white clover, ribwort plantain, broadleaved dock, woolly thistle (*Cirsium eriophorum*), soft rush (*Juncus effusus*), scentless mayweed (*Tripleurospermum inodorum*),

Key

- Total development site boundary
- Swamp
- Japanese knotweed
- Bare ground
- A — Amenity grassland
- Open water
- Scattered scrub
- Broad-leaved scattered trees
- SI — Poor semi-improved grassland
- I — Improved grassland

0 m 50 m

Scale 1:1000 @ A3

Castleblaney WwTW
Environmental Statement

Figure 10.2
Phase 1 Habitat Survey

January 2008
19925-R11.dwg bernb

Entec

dandelion and autumn hawkbit (*Leontodon autumnalis*). This area is reasonably disturbed as the proposed access track follows an existing small footpath and also an area used for materials storage immediately north of the existing WwTW. The proposed access track will also cross stand of Japanese knotweed which is located along the track to the north west of the existing WwTW (**Figure 10.2**).

Surrounding Land

The surrounding land is mainly residential with small business units and associated gardens and planted deciduous trees within the town centre. Lough Muckno lies approximately 70m from the existing WwTW and extension site.

Fauna

Badgers

No signs of badger were seen during the survey. The combination of broadleaved planted trees and rough grassland provides suitable foraging habitat for this species. However, due to the relatively wet and flat nature of the site it is unlikely that badgers would use this area for sett construction. In addition, the site is situated close to residential areas and the surrounding land provides limited suitable habitat for this species.

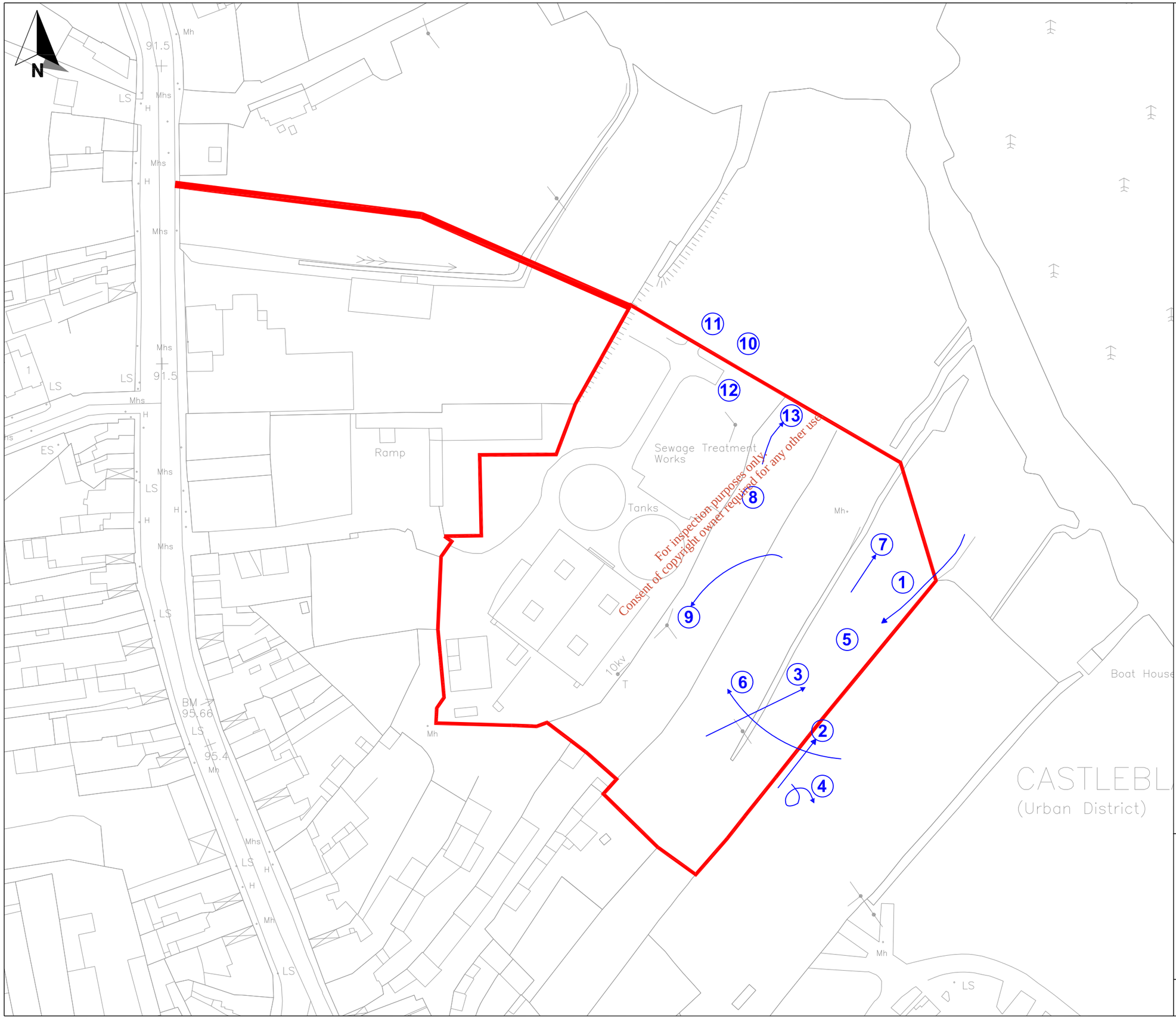
Bats

Foraging habitat

The full results of the bat detector survey are shown in **Table 10.2** and the number of flight passes recorded along with the transect routes are shown on **Figure 10.3**. Detailed information on the direction of flight paths of those bats detected which could be seen during the survey are also listed within **Table 10.2** and shown within **Figure 10.3**. By far the most commonly encountered species was the common pipistrelle (*Pipistrellus pipistrelles*), with occasional recordings of *Myotis* species and Leisler's bat (*Nyctalis leisleri*). The majority of bat activity recorded was within extension site. Pipistrelles were seen using the lines of deciduous trees for commuting and moving into the more open intervening areas of rough grassland to forage. Leisler's and *Myotis* spp were recorded within these areas of open grassland and further to the north of the site foraging within slightly wetter areas. However, they were only identified on the detector and numbers or exact location of these species could not be confirmed due to insufficient light and faint signal detected (for the *Myotis* spp). The survey continued until 21:20 (2 hours after sunset) and by this time activity seemed to have reduced. The last recorded bat was at 21:08.

Table 10.2 Bat Activity Recorded

Flight direction on Figure 10.3	Time	Minutes after sunset first recorded	Species	Number of passes made by bat and other notes
1	19:30 – 19:35	11	Common pipistrelle	3 passes. Commuting up and down along the edge of the strip of deciduous planted trees.
2	19:35 – 19:42	15	Common pipistrelle	4 passes. Commuting up and down along the edge of the strip of deciduous planted trees.
3	19:43	23	Common pipistrelle	1 pass. Foraging within open grassland.
4	19:43 – 19:47	23	Common	9 passes. Foraging within open grassland and



Key

- Total development site boundary
- (1) Bat flight line number

0 m 50 m

Scale 1:1000 @ A3

Castleblaney WwTW
Environmental Statement

Figure 10.3
Bat Activity Survey

January 2008
19925-R12.dwg bernb

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Flight direction on Figure 10.3	Time	Minutes after sunset first recorded	Species	Number of passes made by bat and other notes
			pipistrelle	along the length of deciduous trees.
5	19:48	28	Common pipistrelle	1 pass. Foraging within open grassland.
6	19:48	28	Common pipistrelle	1 pass. Commuting across the site.
7	20:05	45	Common pipistrelle	1 pass. Commuting across the site.
8	20:22-20:33	62	Leisler's	Bat heard but not seen. Location of bat call detected noted on map.
9	20:40-20:47	80	Common pipistrelle	5 passes. Foraging within open grassland and along the length of deciduous trees.
10	20:54	93	*Myotis* spp	Bat heard but not seen. Location of bat call detected noted on map.
11	20:56 – 21:06	96	Leisler's	6 passes. Bat heard but not seen. Location of bat call detected noted on map.
12	21:06	106	Leisler's	2 passes. Bat heard but not seen. Location of bat call detected noted on map.
13	21:08	108	Leisler's	1 pass. Bat heard but not seen. Location of bat call detected noted on map.

Roosting Sites

The first pipistrelle recorded was 10 minutes after sunset and thus the early emergence recorded for this species may indicate that a roost is on site or close to it (refer to **Table 10.3** for emergence times for bats). Pipistrelles tend to prefer to roost within the roofs in houses or within other built structures such as bridges, but will occasionally roost in trees. Thus the pipistrelles recorded on site may have been from a roost within one of those trees identified as having the potential for supporting a roost. However, from the activity survey it could not be confirmed which tree, if any, the bat may have originated from. Leisler's were recorded approximately one hour after sunset which may indicate that a roost is located a greater distance from site (as the median emergence time after sunset is 18 minutes – **Table 10.3**). *Myotis* spp was recorded but only very faintly approximately and hour and a half after sunset. Although this bat was only faintly heard and could not be accurately identified (either using the detector or by using BatSound) the possibility of a *Myotis* spp roosting on site can not be discounted (**Table 10.3**). Whiskered (*Myotis mystacinus)* and Daubenton's (*Myotis daubentonii)* both roost almost exclusively in trees and thus could use trees on site.

Table 10.3 Average emergence times of British Bats[46]

Species	Median emergence time (minutes after sunset)
Leisler's bat (*Nyctalis leisleri)*	18

[46] Table taken from Aldringham, J.D. (2003) British Bats, p102. This table shows only 13 of the 17 species recognised as present in Britain. Greater mouse-eared bat, Barbastelle bat, grey long-eared bat, Nathusius's pipistrelle and Brandt's bat have not been included. Barbastelle bat, grey long-eared bat and Nathusius's pipistrelle only occur in the south of Britain, and are uncommon. Brandt's bat is easily confused with Whiskered bat, and their emergence times are thought to be similar. There is only one known live greater mouse-eared bat currently in Britain, and it is present in Sussex.

Lesser Horseshoe bat (*Rhinolophus hipposideros)*	31
Common and soprano Pipistrelle (*Pipistrellus pipistrellus, Pipistrellus pygmaeus)*	32
Whiskered bat (*Myotis mystacinus)*	32
Brown long-eared bat (*Plecorus auritus)*	54
Natterer's bat (*Myotis natterer)*	75
Daubenton's bat (*Myotis daubentonii)*	84

Otter

No signs of otter were seen at the time of the survey and NPWS were not able to confirm if this species is present at the lough[47]. The small watercourse which runs through the centre of the extension site was relatively dry at the time of the survey. It was approximately 50cm wide and 20cm deep with water which had no perceptible flow. It appeared to be a drainage ditch originating from within the centre of the area proposed for extension and flowing north east from the site into Lough Muckno and it was highly vegetated with canary reed grass and common reed. It is unlikely that this watercourse would hold a large amount of fish or other aquatic prey species that would encourage otters to visit it for foraging. Loch Muckno is known for its wide variety of fish species present and as such provides better foraging opportunities.

There are also a number of well vegetated areas including woodland surrounding parts of the Lough which could support holts or couches. The banks of Loch Muckno are over 70m north of the existing WwTW and the extension site and thus it is considered that the risk of disturbing holts close to this waterbody is negligible. As the small watercourse through the extension site only supports a relatively small amount of water and is relatively open (i.e. areas of scrub and trees are not present along its banks) it is unlikely that this species would use the site for holts or couches. In addition, the line of hedgerows and mature trees within the extension site are also over 70m away from the banks of the lough and so it is unlikely that otters would visit these areas for this purpose as well.

Birds

No specific surveys have been undertaken for birds, however they and potential for them, was observed during the habitat surveys. The habitats present within the site boundary and surrounding area of the development are expected to support a range of breeding bird species associated with woodland, scrub and marginal habitats such as song thrush (*Turdus philomelos*), blackbird (*Turdus merula*), dunnock (*Prunella modularis*), wren (*Troglodytes troglodytes*), robin (*Erirthacus rubecula*), blue tit (*Parus caeruleus*) coal tit (*Parus ater*), long tailed tit (*Aegithalos caudatus*) and great tit (*Parus major*); and with species such as willow warbler (*Phylloscopus trochilus*), chiffchaff (*Phylloscopus collybita*), blackcap (*Sylvia atricapilla*), whitethroat (*Sylvia communis*), lesser whitethroat (*Sylvia curruca*), garden warbler (*Sylvia borin*), sedge warbler (*Acrocephalus schoenobaenus*), grasshopper warbler (*Locustella naevia*), linnet (*Carduelis cannabina*), lesser redpoll (*Carduelis cabaret*), goldfinch (*Carduelis carduelis*), green finch (*Carduelis chloris*), chaffinch (*Fringilla coelebs*) and reed bunting (*Emberiza schoeniclus*) in the scrub and reed habitats. Due to the stream and associated habitats in the proposed extension area other species such as moorhen (*Gallinula chloropus*), coot, water rail (*Rallus aquaticus*), great crested grebe, dabchick (*Tachybaptus ruficollis*), may be present.

Wintering birds are likely to be similar with the addition of winter thrushes and the absence of the migrant warblers. Small numbers of ducks and other wildfowl would be expected though

[47] Personal communication with Denis O`Higgins, NPWS Ranger

the I-WeBS data would suggests that this is no longer the case despite the lough being designated originally as an NHA for its wintering wildfowl interest.

10.3.5 Predicted Trends

The development site is likely to remain much the same if no works are undertaken. The amenity grassland within the existing WwTW site is unlikely to change significantly if current management (such a mowing and pruning of the vegetation) is maintained. It is likely that over time the extension site, which is comprised of open grassland and areas of successional scrub, will become dominated with rank grasses and aggressive species ultimately, turning in to woodland if no management is undertaken. In the wider countryside, the land use is unlikely to change significantly from its current use as amenity grassland associated with residential buildings and areas of hard standing (i.e. roads, car parks).

10.3.6 Information Gaps

The habitat survey and initial bat activity survey undertaken on site has revealed that a number of trees within the proposed extension area have the potential to support roosting bats. Further, more detailed surveys for bats on those trees identified as providing suitable roosting habitat will be required to establish if any roosts are present prior to works commencing. Therefore, no assessment into what impact the Stage 2 works may have upon bats can be made until these surveys have been undertaken. Surveys should be undertaken between the months of April-September and consist of a range of dawn and dusk surveys at each tree considered potentially suitable for roosting bats. If roosts are found, a proposed mitigation plan must be agreed within NPWS and a licence obtained to allow the works to proceed. Mitigation may involve removing trees supporting bat roosts at a certain time of the year that would be least detrimental to the bats, compensation planting and erection of bat boxes to ensure that there is no net loss of suitable roosting habitat available.

10.4 Nature Conservation Evaluation

10.4.1 Policy Importance or Sensitivity

The approach used to evaluate the nature conservation receptors in terms of their policy importance/sensitivity is based on emerging guidelines from the Institute of Ecology and Environmental Management (IEEM) (2006) and is outlined in **Table 10.4.**

Table 10.4 Definitions of nature conservation policy importance/sensitivity relevant to the proposed development at Castleblayney WwTW (adapted from IEEM 2006)

Level of Value	Examples of Definitions
International	An internationally important site e.g. SPA, SAC, Ramsar (or a site considered worthy of such designation); A viable area of a habitat type listed in Annex 1 of the Habitats Directive, or smaller area of such habitat which are essential to maintain the viability of a larger whole; A regularly occurring population of an internationally important species (listed on Annex IV of the Habitats Directive).
National (Republic of Ireland)	A nationally designated site e.g. NHA, or a site considered worthy of such designation;

Level of Value	Examples of Definitions
	A viable area of a priority habitat type identified in the Irish National Biodiversity Plan (NBP) or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; Any regularly occurring population of a nationally important species, e.g. protected by the Wildlife Act 1976 (as amended) A feature identified as of critical importance in the Irish NBP.
Regional (Monaghan County)	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; A regularly occurring, locally significant population of a species listed as being nationally scarce; A regularly occurring, locally significant number of a regionally important species.
Local (site and its vicinity, including areas of habitats contiguous with or linked to those on site)	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the region.

10.4.2 Designated Sites of Nature Conservation Interest

Lough Muckno NHA lies approximately 70m east of Castleblayney WwTW and is the largest lake in County Monaghan. As outlined within Section 10.3 Lough Muckno is important for wintering waterfowl and also supports a range of invertebrates and fish species. As stated within the site synopsis, development of the lake for recreation over the past 25 years has caused a dramatic decline in the numbers of birds recorded. However, detailed surveys of the lough have not been undertaken since the initial bird count in 1979 and thus the decline cannot be quantified accurately. Although the value of the lough to birds and indeed to other wildlife may have reduced over the years, it has been considered to still be of national value due to insufficient evidence to suggest otherwise.

10.4.3 Habitats

The amenity grassland within the existing WwTW is an extremely common habitat found throughout Ireland, occurs within the surrounding area and is considered to be of less than local value. The areas of hardstanding within the works are considered to have no ecological value. The lines of broadleaved planted trees and areas of poor semi-improved grassland within the area for the proposed development are of relatively higher ecological interest but these habitats are also widespread within the surrounding area, are found throughout Ireland and are also considered to be of less than local value.

There are stands of Japanese Knotweed on site within the area proposed for development and along the proposed access track. Section 52 (7) of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000, states that a person who "plants or otherwise causes to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of [exotic] flora, otherwise than in accordance with a licence granted in that behalf by the Minister [for the Environment, Heritage and Local Government] shall be guilty of an offence". While not specific, this would apply to the dispersal of Japanese knotweed by translocation in spoil[48]. As this species is non-native, invasive and is likely to affect the growth of other plants, its presence on site is considered to reduce the overall nature conservation value of the site.

[48] Personal communication with Peter Carvill, Assistant Director, Legislation Unit NPWS.

10.4.4 Badgers

Badgers are protected under the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000, which makes it illegal to wilfully interfere with or destroy their breeding places (i.e. setts). Although there is potential for badgers to occur at the site, no signs of badgers were seen during the survey and it is unlikely that any setts would be constructed. Therefore the value of the site for this species can only be considered as less than local.

10.4.5 Otters

Otters are protected under both the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000 and the Habitats Directive 92/43/EEC, which was implemented into national law by the European Communities (Natural Habitats) Regulations, 1997 as amended[24]. The Wildlife Act makes it illegal to wilfully interfere with or destroy the breeding place of otters and in addition the Natural Habitats Regulations prohibit the deliberate disturbance and destruction of breeding sites or resting places (i.e. holts or couches).

The ditch located within the proposed area for extension is considered to be of limited value to otters as it is unlikely to provide suitable habitat conditions (as discussed above). Thus the value of the site for this species is considered less than local.

10.4.6 Bats

Bats are protected under both the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000 and European Communities (Natural Habitats) Regulations, 1997 as amended[49]. The Wildlife Act makes it illegal to wilfully interfere with or destroy the breeding place (i.e. roosting sites) of bats and in addition the Natural Habitats Regulations prohibit the deliberate disturbance and destruction of breeding sites or resting places.

The bat survey identified that the most bat activity recorded was within the area proposed for extension of the WwTW. The combination of mature planted broadleaved trees and rough grassland provides good foraging and roosting habitat within this area. In contrast, there was no activity recorded within the existing WwTW, which is considered to provide limited foraging and roosting habitat. Although a number of trees have been identified as having the potential to support roosting bats, it can only be confirmed if a roost is present after further more detailed survey work is undertaken. Thus, at this point in time an assessment of the value of the site for this receptor can not be undertaken.

10.4.7 Birds

Lough Muckno has historically supported a range of wildfowl species with moderate numbers of the diving ducks (tufted duck and pochard). However, the site is now considered to be relatively unsuitable for wildfowl due to much higher levels of recreational activities and possibly due to decreased levels of nutrients being discharged into the waterbody. This is supported by the I-WeBS data which records relatively low numbers of only four species and no wildfowl. Despite this local decline, these species have been increasing elsewhere and all remain widespread and common within Ireland [50]. It is considered that species afforded special protection under the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000 or listed on Annex 1 of the EU Birds Directive 79/409/EEC would be unlikely to be present. Therefore the site is considered to be of local value at best.

[49] S.I. No. 94 of 1997, as amended by S.I. No. 233 of 1998

[50] Info from Countryside Bird Survey available on Birdwatch Ireland web site and from The New Atlas of Breeding Birds in Britain and Ireland 1988-91 (Gibbons *et al* 1993)

Breeding terrestrial bird species are expected to be unremarkable within the immediate vicinity of the development given the quality and extent of habitat present. The marginal vegetation around the lough, such as common reed and canary reed grass, is likely to support breeding birds, such as sedge warbler and grasshopper warbler, which are more restricted to this type of habitat.

10.5 Potential Effects and Incorporated Mitigation

10.5.1 Potential Effects during Construction and Incorporated Mitigation

Designated Sites of Nature Conservation Interest

As Lough Muckno NHA lies approximately 70m east of the proposed development no direct impacts upon this designated site are predicted. The construction works will only be temporary and, due to the works being relatively distance from the lough, the potential for disturbance to birds using this waterbody is considered to be low. In addition, the lough is of considerable size (325ha) and as such there is other suitable habitat available for birds whilst construction is being undertaken. Although this site has been designated as an NHA, none of the birds recorded are those listed within Section 22 (6) of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000 or Annex 1 of the EU Birds Directive 79/409/EEC. As the bird species which could be temporarily displaced during construction works are of neither national nor international value, there is more suitable habitat for them to move to during works, and the works area is only likely to affect one year's activity, the impact the development would have upon birds (and thus the integrity of the NHA) is considered to be negligible and no mitigation is proposed.

Habitats

The main effect on terrestrial habitats would be the permanent loss of approximately 0.04ha amenity grassland within the existing WwTW for upgrading works and 0.43ha poor semi-improved grassland within the area proposed for the new WwTW. These habitat types are considered to be of less than local value and the effect the development would have upon them is considered to be negligible and as such no mitigation is proposed. However, if any areas are left disturbed after construction their regeneration could be aided through the sowing of a native seed mix.

A number (approximately 0.02ha) of broadleaved planted trees would also require felling within the proposed area for extension. These trees are considered to be of less than local value and the impact construction would have upon this species is considered negligible. However, they offer suitable habitat for nesting birds and potential roost sites for bats and so compensation planting of a ratio of 2:1 of native broadleaved deciduous trees will be undertaken to ensure that there is no net loss of this habitat. The tree planting will occur around the extension site to provide screening from the works.

The construction of the access track and new WwTW extension area would potentially disturb areas of Japanese Knotweed. As this species is considered as 'exotic' under Section 52 (7) of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000, its disposal should follow best practice guidelines. The Republic of Ireland do not currently have guidelines for the management or disposal for Japanese Knotweed but NPWS have agreed that guidelines used within the UK would be suitable[51]. Mitigation outlined within guidelines issued by the

[51] Peter Carvill, Assistant Director, Legislation Unit NPWS.

Environment Agency[52] includes removing the plant material and digging down to a depth of 3m and up to 7m from around the base of the plant. Chemical control using herbicides can also be used in conjunction with removal of the plant material can be used to ensure no re-growth. Any soil removed should either be treated (using sieving methods and herbicide) before re-used on site or can be taken away to landfill. The material removed should be burnt or buried 10m deep or again, disposed of in landfill.

Fauna

Badgers

As the site is considered not suitable for the construction of setts (due to its flat and wet nature) the effect construction would have upon this species is considered negligible. However, the combination of planted broadleaved trees and rough grassland provides suitable habitat for foraging and thus badgers could occasionally visit the site. Best practice guidelines would be issued to contractors (**Appendix H**) which would include such measures as the use of escape ladders or ramps within any trenches left open over night, no dogs allowed on site and further guidance on site working.

Otters

Based on the habitat present within the site there is negligible potential for otter to occur. However if otters do use the small ditch to forage, construction work would only be temporary and there is other suitable habitat along the banks of the river (i.e. highly vegetated) which could provide shelter for foraging otters during construction. Thus, the effect of construction work upon this species is considered to be negligible. To ensure that any potential disturbance to foraging otters using the small drainage ditch within the proposed extension area during construction is kept to a minimum, best practice guidelines would be issued to contractors (**Appendix H**). This would include such measures as the use of escape ladders within any trenches left open over night, no dogs allowed on site and further information about guidance if a holt/couch is located.

Bats

As previously outlined within **Section 10.5.5**, an assessment to the value of the site for bats can not be made at this point in time until further bat surveys are conducted and any potential roosts identified. Thus, an assessment of what effect construction during Stage 2 may have upon bats (and measures to reduce any effects) can not be detailed.

Birds

During construction some disturbance to common bird species may occur but such disturbance would be temporary and is likely to affect only one breeding season. Thus the effect construction would have upon birds is considered to be negligible. In addition, there would be some loss of nesting habitat through removal of trees and scrub, although it is proposed to compensate for this by the planting of native trees following construction. Mitigation to prevent damage to active nests will include the removal of any areas of scrub and trees outside of the breeding bird season (March – July). If scrub is to be removed during the breeding season an Ecological Advisor must be present to check any areas for active nests before they are removed. Works that would be likely to cause noise disturbance would not be carried out during the winter months when waterfowl are most likely be present.

[52] Environment Agency '*Managing Japanese Knotweed on Development Sites*' http://www.environment-agency.gov.uk/commondata/acrobat/japnkot_1_a_1463028.pdf

10.5.2 Predicted Effects during Operation and Incorporated Mitigation

Designated Sites of Nature Conservation Interest

The impacts of the development on birds using Lough Muckno during operation is considered to be negligible, given the distance between the lough and the WwTW. In addition, the increased recreational use of the lough over the last 25 years is likely to have resulted in an increase in human disturbance experienced by the avifauna using the lough. Thus, any birds using the lough are likely to have developed a level of habituation to disturbance and as such the low noise level produced during operation on birds is considered to be negligible.

Upgrading works within the existing WwTW will mean that the level of treatment will be improved and effluent discharged will be of better quality. However, the actual load being treated by the WwTW will increase as development occurs within Castleblayney Town and this may affect the total loading of critical pollutants such as nutrients, organic constituents that can strip oxygen from the water column, ammonia and suspended solids. If the capacity upgrade results in the effluent discharge having a higher nutrient load or significantly higher Biochemical Oxygen Demand (BOD) then, depending on the assimilative capacity of Lough Muckno, there is potential to alter species assemblage (abundance and dominance of macro invertebrate species) in the immediate vicinity of the outfall and, in a worst-case, cause a change in habitat type. High nutrient loading can be attractive for diving ducks such tufted duck and pochard and so the improvement in water quality, which is otherwise greatly beneficial for the ecology and environment as a whole, can negatively impact on the numbers of these species. However it would appear from the I-WeBS data that these species are no longer recorded in any numbers (as compared to the late 1970s) possibly for this reason. It is therefore considered that a change in nutrient loads within the range predicted would not have a significant effect on populations of wildfowl.

Any changes to the aquatic environment within the Lough could lead to alterations to the macro invertebrate population which, in turn, may affect the fish population, and subsequently the foraging success of mammals, such as, otter, and bird species that may feed on fish within the Lough. A more detailed assessment of the affects on the lough is dealt with within Section 9 on Water Quality.

Habitats

No disturbance of terrestrial habitats in the vicinity of the site is expected as a result of the operation of the proposed development. Thus the effect during operation is considered to be negligible. Landscaping works would be agreed with the statutory authority and these works would mitigate for and potentially enhance, degraded or disturbed habitat.

Fauna

Badgers

Since no setts or badger activity has been found in the vicinity of the proposed works, no effects on badgers are expected during the operation of the WwTW. Any low level noise effects caused from the operation of the WwTW or traffic along the proposed access track are not considered to affect this species significantly and thus the effect is assessed to be negligible.

Otters

No effects on otters are expected during the operation of the WwTW. The proposed area for extension and the existing WwTW would be located over 70m away from the banks of Lough Muckno and thus any otters using this waterbody will not be affected due to the relatively large distance from the development.

Bats

Until further bat surveys are conducted an assessment of what effect operations may have upon bats can not be made.

Birds

No effects on birds are expected during the operation of the WwTW. The planting of native tree species after works have been completed would compensate for the loss of any potentially suitable nesting habitat.

Table 10.5 Summary of Incorporated Mitigation

Receptor	Predicted Effects	Incorporated Mitigation Measures and Rationale for their Likely Effectiveness
Construction		
Grassland (poor semi-improved and amenity)	Disturbance and permanent loss of 0.43ha of poor semi-improved grassland and 0.04ha amenity grassland.	Disturbed areas of ground would be sown with a native seed mix to aid regeneration.
Broadleaved planted trees	Disturbance and permanent loss of habitat	Compensation planting of native species of a ratio of 2:1 to account for the loss of trees felled.
Invasive species – Japanese Knotweed	Disturbance and removal of plant	UK Guidelines followed and soil and plant material either disposed of on site or in landfill.
Badger	Disturbance to foraging badgers	Best practice guidelines adhered to.
Bats	Disturbance to and potential loss of roosting and foraging habitat	Further survey required before mitigation can be identified.
Otter	Disturbance to foraging otters	Best practice guidelines adhered to.
Breeding Birds	Disturbance to and loss of foraging/nesting habitat	All scrub clearance and tree felling to be undertaken outside of the breeding bird season (March-July). If undertaken within breeding season, then pre-removal surveys for active nests would be undertaken.

10.5.3 Implementation of Mitigation and Enhancement Measures

The implementation mechanisms for the identified mitigation measures are given in **Table 10.6.**

Table 10.6 Implementation of Mitigation and Enhancement Measures

Incorporated Mitigation Measures	Responsibility for Implementation	Implementation Mechanism
Construction		
Scrub removal outside of breeding bird season (March – July)	Contractor	Contract Documents
Compensation planting with native tree (2:1 ratio) and grass species	Contractor along with seeking guidance from qualified ecologist as to the planting scheme	Contract Documents
Safe disposal of Japanese Knotweed	Contractor to source an invasive species control specialist with guidance sort from a qualified ecologist	Contract Documents
Best practice guidelines adhered to for otters and badgers.	Contractor	Contract Documents

10.6 Assessment of Effects

10.6.1 Significance Evaluation Methodology

The significance of the effect depends primarily on:

- the policy importance or sensitivity of the resource under consideration, in a geographical context:- international, national (Republic of Ireland), regional (County Monaghan), or local (site and its vicinity, including areas of habitats contiguous with or linked to those on site) (see Table 10.2); and
- the magnitude of the effect in relation to the resource that has been evaluated. The definition of magnitude is different for each potential impact. Where possible, the magnitude is quantified, if not a scale of high, medium, low or negligible is used and the rationale explained (see Section 10.6.1).

Table 10.7 illustrates a matrix which can be used for guidance in assessment of significance.

Table 10.7 Impact significance table

Value of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
International	NS	Minor	Major	Major
National	NS	Minor	Major	Major
Regional	NS	Minor	Minor	Major
Local	NS	NS	NS	Minor

NS = Not Significant

In order to fully describe the effects, two further criteria are presented in **Table 10.8:**

- the type of the effect, i.e. whether it is positive, negative, neutral or uncertain; and
- the probability of the effect occurring based on the scale of certain, likely or unlikely.

Professional judgement is used to assess the findings in relation to each of these criteria to give an assessment of significance for each effect. Effects are considered to be of major or minor significance, or not significant (**Table 10.8**).

10.6.2 Predicted Effects and their Significance

Habitats

The small amount of amenity grassland and poor semi-improved grassland on site (0.04ha and 0.43ha respectfully) which would be lost to the development are considered to be of less than local value and no mitigation has been recommended. Compensation planting of a ratio of 2:1 of native tree species would ensure that there is no net loss of this habitat type and as such no residual effects are predicted for these habitats.

The safe disposal of Japanese knotweed on site will ensure that this species is not spread to other areas of the site and ensure that not residual effects will be experienced.

Fauna

Badgers

As there is suitable foraging habitat for badgers on site, best practice guidelines (**Appendix H**) would be followed to ensure that no badgers using the site for this purpose are harmed. With the mitigation implemented no residual effects are predicted during construction or operation.

Otters

To ensure that any potential disturbance to foraging otters using the river during construction is kept to a minimum, best practice guidelines would be issued to contractors (**Appendix H**). With this mitigation measure implemented no residual effects are predicted during construction or operation.

Bats

Residual effects caused by the development in relation to bats can not be considered at this stage until further survey work is undertaken.

Birds

With the mitigation implemented, such as scrub removal outside of breeding bird season (March – July), no residual effects are predicted during construction or operation.

10.6.3 Cumulative Effects

No cumulative effects have been identified.

10.6.4 Compensation Measures

No compensation measures are required.

10.6.5 Additional Mitigation/Enhancement Measures

No additional mitigation or enhancement measures are required.

10.6.6 Summary of Significance Evaluation

Table 10.8 summarises the significant ecological effects arising from construction and operation of the Castleblayney WwTW capacity upgrade.

Table 10.8 Effects and Evaluation of Significance

Effect on receptor	Type of Effect	Probability of Effect Occurring	Value of the Site to the Receptor	Magnitude of Effect	Significance	
					Level	Rationale
Construction						
Disturbance to and permanent loss of approximately 0.43ha poor semi-improved grassland and 0.04ha amenity grassland	-ve	Certain	Less than local	Negligible	Not Significant	A very small amount of a habitat extremely common throughout the wider area and within the Republic of Ireland. Thus, no mitigation proposed.
Disturbance to foraging badgers	-ve	Unlikely	Less than local	Negligible	Not Significant	Best practice guidelines adhered to.
Disturbance to and loss of bat foraging and roosting habitat	-ve	Uncertain	Unknown	Unknown	Unknown	Further surveys are required before significance can be evaluated.
Disturbance to foraging otters	-ve	Unlikely	Less than Local	Negligible	Not Significant	Best practice guidelines adhered to.
Disturbance to breeding birds and loss of breeding habitat	-ve	Likely	Local	Negligible	Not Significant	All scrub clearance and tree felling to be undertaken outside of the breeding bird season (March-July)

Effect on receptor	Type of Effect	Probability of Effect Occurring	Value of the Site to the Receptor	Magnitude of Effect	Significance	
					Level	Rationale
						Compensatory tree planting following construction.

Key:	Type	Probability	Policy Importance	Magnitude	Significance
	- = Negative	Certain	International	High	Major Significance
	+ = Positive	Likely	National	Medium	Minor Significance
	? = Unknown	Unlikely	Regional	Low	Not Significant
			Local	Negligible	

11. Traffic

11.1 Introduction

This section presents an assessment of the potential effects of road traffic as a result of construction of the Castleblayney WwTW capacity upgrade.

The assessment compares the volume of development related traffic against baseline traffic flows. Those environmental effects which could be considered as potentially significant are then assessed on those receptors that are likely to be sensitive to change and where increases in traffic and the composition of HGV traffic is likely to be high. If environmental effects are judged to be significant, appropriate mitigation measures would be proposed that seek to minimise the overall disruption potentially created during construction.

This assessment has been based on information supplied to Entec UK Ltd.

11.2 Scope and Methodology

11.2.1 Scope

Construction

Castleblayney WwTW is approximately 20 years old and in need of a capacity upgrade. The upgrade will take place in two stages. It is envisaged that Stage 1 of the WwTW capacity upgrade will commence in 2010/2001 for approximately 18 months (78 weeks), based upon construction taking place between Monday to Friday, between the hours of 08:00-18:00, and on Saturday mornings, between the hours of 08:00-13:00.

Transport effects, if any, will be associated with the movements of Heavy Goods Vehicles (HGVs) and other contractors' vehicles (e.g. vans) travelling to and from the site during this phase of the development.

The WwTW will be constructed wholly within the confines of the proposed site and will require large-scale earthworks, concrete pouring and other civil engineering works. During Stage 1 a new access road to the WwTW will be constructed to provide a more suitable access for large vehicles such as sludge tankers. The existing access road will be retained for access to the cattle market but will no longer be utilised by WwTW traffic.

HGV traffic movements will vary throughout the construction period as the requirement for materials will vary. Consequently, whilst construction traffic flows will be low generally, there will short periods during the construction phase when the traffic levels will be higher.

Nicholas O'Dwyer has calculated that during Stage 1 of the construction of the WwTW, the site is likely to generate an average of 2 HGVs (4 two-way movements) per day. The maximum generation is approximately 15 HGVs (30 two-way movements) in any one day.

Construction workers will also access the site during this phase with a likely maximum of 30 commercial light vehicles (60 two-way movements) per day.

Stone and concrete for foundations, hardstanding and track construction will be sourced from local quarries and concrete suppliers, but at this stage, the actual suppliers have not yet been identified.

Stage 2 is unlikely to take place for another 10-15 years as it is reliant on the expansion of Castleblayney Town. As population expansion occurs in future years, the WwTW will require a capacity upgrade to cope with the increase in influent flows from the town. Stage 2 of the WwTW capacity upgrade will last approximately 18 months (78 weeks). Given the extended time horizon (2017-2022) and the fact that any baseline data collected for the purposes of the current assessment may not be relevant at that time, no consideration of the construction impacts for Stage 2 is included as part of this assessment.

Operation

Once the WwTW is operational, traffic impacts will be similar to the current situation as it is envisaged that only small numbers of staff will work at the site and similar levels of vehicles will be present on the roads accessing the site. It is estimated that the site will generate 1-2 light commercial vehicles per day and 1-2 HGVs per week. The operation of the WwTW is not, therefore, predicted to result in significantly increased levels of traffic generation.

Given that no likely significant effects are predicted during this phase, an assessment of operational traffic has been scoped out of the EIS.

Environmental Effects

The Institute of Environmental Assessment's[53] (IEA's) *'Guidelines for the Environmental Assessment of Road Traffic'* (further details of which are set out in Section 11.5) include a recommended list of environmental effects which could be considered as potentially significant whenever a new development is likely to give rise to changes in traffic flows. These effects are summarised in **Table 11.1** and have been grouped under separate headings to put them into the context of what will potentially be considered in this chapter and those that might be considered in other chapters of the EIS.

Table 11.1 IEMA Guidelines: Summary of Environmental Effects

Effects considered as part of wider EIS	Traffic and Road User Effects (Section 11)
Noise	Severance
Vibration	Driver Delay
Visual Effects	Pedestrian Delay
Air Pollution	Pedestrian Amenity
Dust and Dirt	Fear and Intimidation
Ecological Effects	Accidents and Safety
Heritage and Conservation Areas	Hazardous Loads

Hazardous loads are not considered in this assessment as none are expected during construction.

Potential Receptors

The potential receptors for assessment are based on the roads that are likely to be subject to change in traffic characteristics as a result of traffic generated during construction, affecting users of those roads and the land uses that front them.

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

A description of the existing road network is provided in Section 11.3. Based on a desk-study of the area and the highway network, it is assumed that the majority of construction related traffic would travel to and from the site from the north or south on the recently constructed N2 Castleblayney bypass to its junction with the R183 before heading south on the Monaghan Road to Backlands Road at the Glencarn Hotel which leads to Muckno Street opposite the cattle market. Traffic would then travel the short section of Muckno Street to a newly constructed access road to the north of the existing site access.

It should be noted that Backlands Road and the N2 Castleblayney Bypass were only opened at the end of 2007 and no traffic data has been available at the time of completing this assessment.

- It is not considered necessary to consider the impacts of additional traffic on the highway network any further afield than the R181 and Castleblayney Bypass, as impacts are likely to be negligible as development traffic disperses and becomes diluted by other traffic flows.

11.2.2 Methodology

The National Roads Authority (NRA), Traffic and Transport Assessment Guidelines, September 2007, refers to Table 1.4 of the Traffic Management Guidelines (Department of Transport (DoT) / Department of Environment, Heritage and Local Government (DoEHLG) / Dublin Transport Office (DTO), 2003) which provides the thresholds above which a Transport Assessment is automatically required. The relevant thresholds which apply to this type of development are:

- Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road;
- Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists of the location is sensitive

The Institute of Environmental Assessment's[54] (IEA's) *'Guidelines for the Environmental Assessment of Road Traffic'*. The methodology used in this assessment adheres to that set out in that document and therefore focuses on:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%); and
- Rule 2: Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

The IEA guidelines elaborate on Rule 1 stating that projected changes in traffic of less than 10% create no discernable environmental impact, given that daily variations in background traffic flow may fluctuate by this amount, and that a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment.

Those areas which may be 'sensitive' to changes in traffic conditions are defined in the IEA guidelines as residential properties directly fronting the road, schools, hospitals, churches or other areas of high pedestrian activity.

In this case, there is only a short section of Muckno Street which could be described as 'sensitive' with houses fronting the street. However, as no baseline data exists at the time of the assessment, no percentage impact can be undertaken.

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

11.3 Existing Environment

11.3.1 Baseline Information Sources

In order to establish the baseline situation, traffic data has been sought along the preferred route for construction traffic vehicles to the site. Monaghan County Council were contacted to determine what baseline survey data exists on the N2 (Monaghan Road); Backlands Road and the Castleblayney Bypass. Given the new road construction, Monaghan County Council has not been able to provide any baseline survey data that would be valid for use in this assessment.

11.3.2 Existing Situation

Local Road Network

The existing WwTW is located on the northeast edge of Castleblayney Town, adjacent to Lough Muckno. The site is currently accessed via an unclassified lane that connects with the R181 (Muckno Street) as it runs through Castleblayney. The unclassified lane also accesses a cattle market. The R181 is a two-way single carriageway that connects Castleblayney to Keady in the northeast of County Monaghan. The section of the R181 in the vicinity of the WwTW passes through an area that consists if a mix-use of commercial properties and residential dwellings.

Backlands Road is a newly constructed, two-way, relief road for Main Street. It is hoped that the road will ease congestion through Castleblayney.

The N2 Monaghan Road is a two-way road which used to be the main route between Carrickmacross and Monaghan. With the construction of the N2 bypassing Castleblayney, traffic flows on the existing N2 Monaghan Road are likely to be dramatically reduced.

Road Safety

Statistics of personal injury accidents (PIAs) over a three-year period between January 2003 to December 2005 have been obtained from Monaghan County Council for the R181 between the R182 and the cattle market site access adjacent to Brambury Grove and the N2 (Monaghan Road) between the R183 and Glencarn Hotel.

An evaluation of this data reveals that there have been 4 recorded PIAs, all occurred in different locations. Three of these PIAs are recorded as slight injuries and one resulting in a serious injury. Records are not specific to identify whether any of these involved HGVs.

The accident evaluation area is shown on **Figure 11.1.**

11.3.3 Predicted Trends

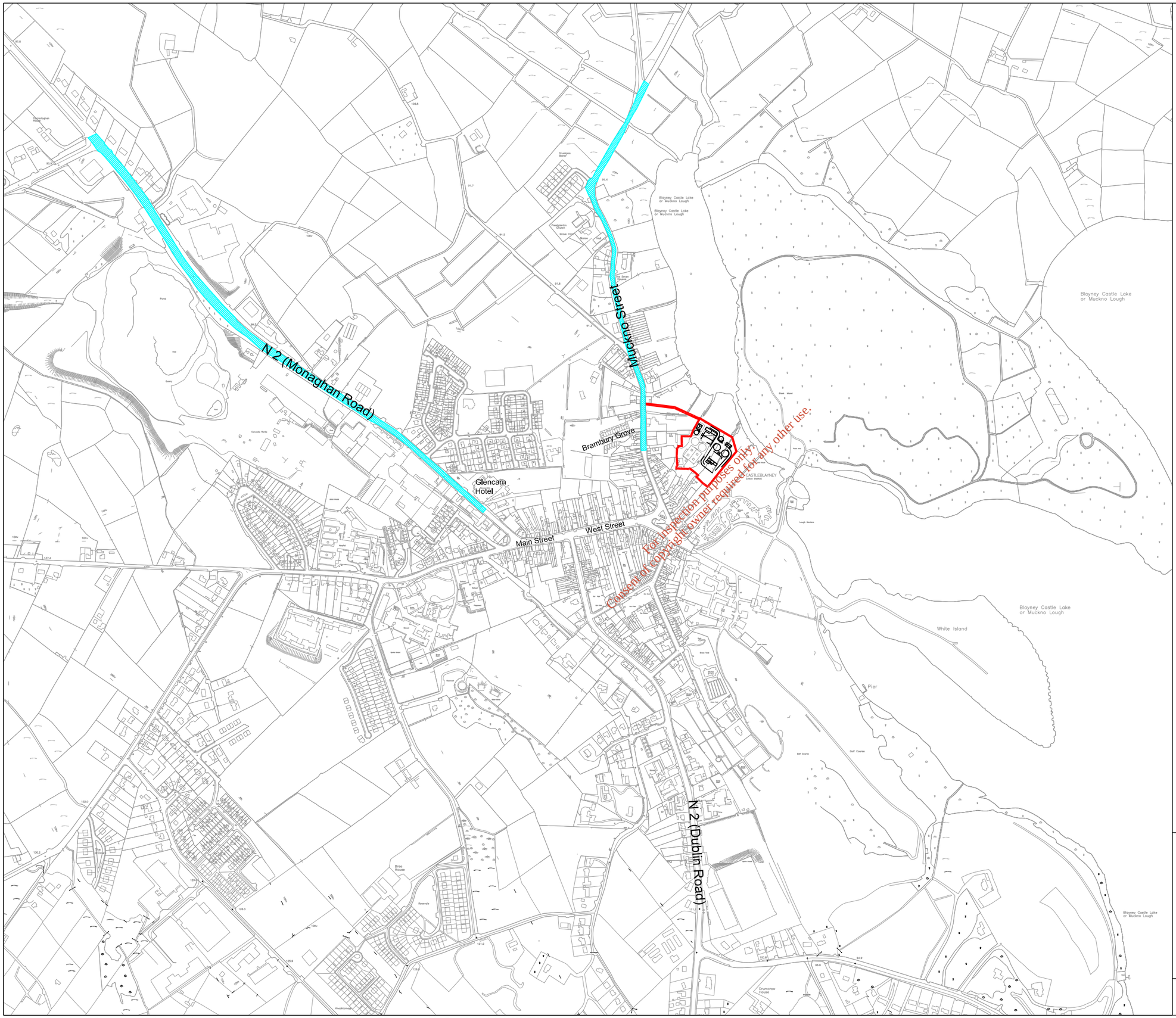
As no baseline data was available at the time of assessment, the predicted flows for the year of construction (2010) cannot be calculated.

As a result of the N2 strategic route, there is likely to be a reduction in flows along the Monaghan Road. The Backlands Road is a through route for local traffic thereby reducing traffic and congestion along Main Street.

11.3.4 Information Gaps

Information gaps that may constrain the predictions of environmental effects or assessments of significance are detailed below:

No baseline traffic flow data is currently available for the N2 Monaghan Road; Backlands Road or the R181 due to the recent highway improvements.



Key

- Approximate Site Boundary
- Accident Assessment Area

0 m — 300 m
Scalebar @ A3

Castleblayney WwTW
Environmental Impact Assessment

Figure 11.1
Accident Assessment Area

December 2008
19925-L09.dwg simma

Entec

11.4 Potential Effects and Incorporated Mitigation

11.4.1 Potential Construction Effects and Mitigation

During construction a maximum of 30 two-way HGVs movements and 60 two-way non-HGV movements per day would be generated during the working week.

Mitigation measures to avoid, reduce or compensate for potential adverse effects of road traffic as a result of construction have not been incorporated into the development proposals as none are expected.

11.4.2 Potential Operational Effects and Mitigation

As identified in Section 11.2, traffic movements will be insignificant and therefore have not been included within the assessment.

11.4.3 Implementation of Mitigation and Enhancement Measures

No mitigation and enhancement measures have been identified, therefore no implementation mechanisms for compliance monitoring are provided.

11.5 Assessment of Effects

11.5.1 Significance Evaluation Methodology

Having identified which environmental effects and highway links are to be considered for assessment, the next stage would be to quantify the magnitude of each environmental effect (i.e. the level of change) and to identify the level of significance that such change may have.

However, the IEMA guidelines state at paragraph 4.5 that

> *'for many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.'*

If environmental effects are judged to be significant, appropriate mitigation measures would be proposed that seek to minimise the overall disruption potentially created during construction.

The criteria and standards that have been used to determine the magnitude and significance of each environmental effect identified for assessment are based on guidance contained within Section 4 of the IEA guidelines.

11.5.2 Predicted Effects during Construction and their Significance

Consideration of the likely significance of each effect occurring on the local road network is summarised as follows:

i) Severance

Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a

heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities.

The effects of severance can be applied to motorists, pedestrians or residents. However, there are no predictive formulae which give simple relationships between traffic factors and levels of severance.

The IEA guidelines state that marginal changes in traffic flow are unlikely to create or remove severance, but that consideration in determining whether severance is likely to be an important issue should be given to factors such as road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

In this case, it is considered that an additional 30 two-way HGV movements and 60 two-way light vehicle movements over a 10 hour (08:00-18:00) short temporary period, is unlikely to cause concern regarding severance on the local road network.

Furthermore, traffic flows used within the assessment are for a temporary, worst-case, period only when on average it is predicted that only 4 two-way HGV and 6 two-way non-HGV movements will be generated.

Therefore the effect is considered to be not significant.

ii) Driver delay

Delays to non-development traffic can occur on the network due to the additional traffic generated by development. The IEA guidelines note that these additional delays are only likely to be significant when the traffic on the network in the study area is already at, or close to, the capacity of the system.

In this instance it is not known whether or not HGV flows along the R181 would increase by 10% or more as a result of the development.

The newly constructed Castleblayney bypass will have alleviated the traffic congestion on the N2 Monaghan Road. The Backlands Roads will have reduced congestion on Main Street. The current network is not considered to be at capacity.

The worst case scenario maximum traffic generation over a 10 hour period (8:00-18:00) is unlikely to cause driver delay.

Therefore the effect of driver delay is considered to be not significant.

iii) Pedestrian delay

Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads, and therefore, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend upon the general level of pedestrian activity, visibility and general physical conditions of the crossing location.

Given the range of local factors and conditions which can influence pedestrian delay, the IEA guidelines do not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead. However the IEA guidelines do note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road.

The relatively low, worst case scenario additional flows generated by the development are unlikely to create delays to pedestrians.

Therefore the effect of pedestrian delay is considered to be not significant.

iv) Pedestrian amenity

Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.

The IEA guidelines note that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a beneficial effect and the latter an adverse effect.

It is unlikely that traffic flows along the local road network would be doubled as a result of the development and an additional 30 two-way HGV movements over a 10 hour period (08:00-18:00) is unlikely to impact on pedestrian amenity. Therefore, the effect on pedestrian amenity is considered to be not significant.

v) Fear and intimidation

The scale of fear and intimidation experienced by pedestrians is dependant on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths, as well as factors such as the speed and size of vehicles.

Given the low levels of construction traffic generation, it is considered that the effect of fear and intimidation will be not significant.

vi) Accidents and safety

Due to the numerous local causation factors involved in personal injury accidents, the IEA guidelines do not recommend the use of thresholds to determine significance. In this case, the evaluation of PIAs detailed earlier in this chapter suggest that there are no existing issues regarding road safety within the assessed area and is therefore not considered to be specifically sensitive to changes in traffic volume, speed or composition.

In addition, a road safety audit would address any concerns regarding the proposed new access into the site.

The effect is therefore considered to be not significant.

11.5.3 Predicted Effects during Operation and their Significance

As identified in Section 11.3, traffic movements will be insignificant and therefore have not been included within the assessment.

11.5.4 Cumulative Effects

No cumulative effects are anticipated.

11.5.5 Compensation Measures

Compensation has not been proposed.

11.5.6 Additional Mitigation/Enhancement Measures

Additional mitigation/enhancement measures may include the following:

- A Traffic Management Plan (TMP) which could be agreed between the contractor, local authority and the Garda Siochana in order to:

- limit access to the WwTW site via the proposed new access road only;
- limit the delivery times to 08:00-18:00, Monday to Friday 08:00-13:00 on Saturday;
- restrict construction traffic to use suitable routes to and from the site;
- ensure appropriate timing of deliveries within quiet periods to mitigate against the effects of any construction HGVs;

• Provide wheel and vehicle body washing facilities, use water bowsers, dust suppression or similar apparatus and street sweepers in order to keep construction route free from vehicle deposits and debris;

• Provision of appropriate information and temporary signage along the construction route; and

• Ensure vehicle loads are securely sheeted and restrained, where appropriate, prior to dispatch.

Additional mitigation/enhancement measures may also be proposed following consultation with the local highway authority and it is recommended that the highway authority be consulted in order to address any concerns they may have regarding accidents and road safety along the proposed route.

11.5.7 Summary of Significance Evaluation

Table 11.2 summarises the potential adverse effects on the local network and its users as a result of construction generated traffic and evaluates their significance.

Table 11.2 Effects and Evaluation of Significance

Environmental Effect	Type of Effect	Probability of Effect Occurring	Policy Importance (or sensitivity)	Magnitude of Effect	Significance	
					Level	Rationale
Construction						
Severance	+ ve	Unlikely		Minor	Not Significant	Low numbers of vehicles over a 10 hour (08:00-18:00) working period.
Driver Delay	+ ve	Unlikely		Minor	Not Significant	Routes not considered to be operating at capacity. Delays to traffic are unlikely to occur as a result of low numbers of development traffic.
Pedestrian Delay	+ ve	Unlikely		Minor	Not Significant	Given the low levels of construction generated traffic (30 two-way movements over 10 hour period 08:00-18:00) pedestrian delay is

Environmental Effect	Type of Effect	Probability of Effect Occurring	Policy Importance (or sensitivity)	Magnitude of Effect	Significance	
					Level	Rationale
						unlikely.
Pedestrian Amenity	+ ve	Unlikely		Minor	Not Significant	Low numbers of vehicles over a 10 hour (08:00-18:00) working period.
Fear and Intimidation	+ ve	Unlikely		Minor	Not Significant	Given the low levels of construction trip generation, pedestrians are unlikely to experience fear and intimidation.
Accidents and Safety	+ ve	Unlikely		Minor	Not Significant	PIA evaluation suggests there are no existing concerns regarding road safety. A safety audit could address any issues regarding the new access road.
Key:	**Type**	**Probability**	**Policy Importance**	**Magnitude**	**Significance**	
	- = Negative	Certain	International	Major	Major Significance	
	+ = Positive	Likely	National	Moderate	Minor Significance	
	? = Unknown	Unlikely	Regional	Minor	Not Significant	
			District	Negligible		
			Local			

12. Cultural Heritage

12.1 Introduction

Cultural heritage is represented by a wide range of features, both visible and buried, that result from past human use of the landscape. These include standing buildings, many still in use, sub-surface archaeological remains and artefact scatters. It also includes earthwork monuments as well as landscape features such as field boundaries and industrial remains. This assessment considers the physical affects on features within the area of land take/disturbance, together with the potential effects on the setting of features within the study area.

The site of the proposed extension to Castleblayney WwTW is located within the town and adjacent to Lough Muckno. The site incorporates sections of a number of long thin plots of land to the rear of shops and workshops on the main street. These do not appear to be gardens, but it is likely that they originally served to give the buildings access to the lake and providing outdoor working areas to the businesses.

There are no recorded features within the site but in the wider are there is an oval enclosure or rath, as well as the site of Hope Castle (19th century estate house) and the potential for subsurface remains of the original 17th century Blayney Castle. Raths are sometimes described as ring forts and can be found across Ireland in various forms, including raised circular platforms and small enclosures surrounded by circular or oval banks.

12.2 Scope and Methodology

12.2.1 Scope

The assessment has considered all recorded features of cultural heritage interest within the site and within an appropriate study area. The study area includes a buffer of 500m around the development site boundary.

In completing an assessment of the effects of any development on cultural heritage it is important to identify the known and potential nature of features that may be involved. This requires consideration of a number of factors.

- Development can affect features of cultural heritage interest not only through direct impacts (e.g. land take) but also indirect impacts, such as the setting of monuments.
- Desk-based assessment involves a review of current information only and there may be further features within the application area that are not yet known. The potential for this may be assessed from the conditions within the proposed development, features within the wider area and a history of land use within the area of proposed development.
- Not all cultural heritage features are considered of equal “importance” and it is important to identify the significance of the features. This is done through reference to legislation, policy guidance and professional judgement.

Physical Effects

Information is required on any features that are known to be or could potentially be within the area physically affected by the development. This includes the footprint of the development area and land to be landscaped and managed as part of the overall scheme.

Effects on settings

Effects on the setting of features of cultural heritage interest can occur as a result of significant changes to the setting of a feature, whether permanent or temporary.

Consultations

The County Archaeologist for Monaghan, Christine Grant, was consulted and asked to provide comment on the proposed scope of the assessment. She confirmed that the 500 m study area was sufficient for this assessment.

12.2.2 Methodology

Desk-based assessment involves a review of current information and the potential for further features may be assessed from ground conditions, features within the wider area and a history of land use within the area of proposed development. This assessment was undertaken in accordance with the Institute of Field Archaeologists' *Standard and Guidance for Archaeological Desk Based Assessments* (2001) and the Institute of Archaeologists of Irelands' *Code of Professional Conduct* (2007).

Evaluation Criteria

Four criteria were used in our evaluation of the predicted effects of the proposed development:

- the type of effect, (i.e. whether it is positive, negative or unknown);
- the probability of the effect occurring based on the scale of certain, likely or unlikely. If there is uncertainty this will be noted;
- the policy importance (or sensitivity) for the evaluation, (i.e. international, national, county, district or local/parish importance). An effect can have a policy importance (or sensitivity) at more than one level; and
- the magnitude, which is quantified using a simple scale of major, some, minor or no effect. In some cases it is not possible to quantify the magnitude of effect and therefore not quantified is used in these instances.

The findings in relation to all of these criteria were brought together to give an assessment of significance for each effect, based on professional judgement. Effects were considered to be of major, minor or no significance.

12.3 Existing Environment

12.3.1 Baseline Information Sources

The baseline description includes all recorded features of cultural heritage interest within 500m study area surrounding the site boundary. The potential for unrecorded features has been considered through the examination of documentary sources and a walkover of the site to identify any visible remains. A description of the historical development of the site is also included, based on maps and documentary sources. The following sources were consulted:

- County-based Sites and Monuments Record (SMR) register of known archaeological and historical sites;
- Database of Monuments in State Care;
- Database of Building of Ireland;
- Database of Historic Gardens and Designed Landscapes;
- Cartographic and historic documents;
- Place name evidence; and
- Published sources.

These were obtained from the following organisations:

- Department of Public Works;
- Department of Environment, Heritage and Local Government (www.heritagedata.ie);
- National Inventory of Architectural Heritage (NIAH);
- National Library of Ireland (NLoI);
- National Museum of Ireland; and
- Entec's library and internet sources.

The SMR is a computerised database of all known archaeological sites in the county. It is maintained by the archive section of the Office of Public Works, and is available to the County Archaeologists who provide advice concerning cultural heritage matters to the local planning authority.

A site visit and walkover by an archaeologist was made on the 17 September 2007 to view features of potential interest, identify any additional features not recognised from the desk-based assessment and to assess general ground conditions.

12.3.2 Existing Situation

All identified features within the study area are listed in **Table 12.1**, including additional features identified as part of this assessment. The locations of all features identified are shown in **Figure 12.1**.

Recorded Features

There are no Monuments in State Care (MSC) located within the site and the nearest MSC is a cairn at Mullyash, located approximately 7 km to the north east. The database of the buildings of architectural interested has currently not been completed for County Monaghan, although there are a number of buildings within the study area of historic interest, including the Court House (**E**). None of these buildings are directly adjacent to the site.

The recorded feature recorded within the study area is the site of the original castle (**B**: MO020-018) from which the town took its name. It is believed that the site of this castle was built directly adjacent to the existing house, approximately 270m south of the site. It was built shortly after 1607 by Edward Blayney, and was a substantial building being made "with lyme and stone". Woodcarvings and prints of the castle show that it was more akin to large fortified

283000

320000

N

C

G

D

E

A

E

B

283000

Key:

- Site_boundary
- Study area (500 m)
- Land divisions / boundaries
- Feature identified from SMR
- Feature identified by this assessment

0 25 50 100 150 200 Metres

Scale: 1:5,000 @ A3

Wastewater Treatment Works at Castleblayney, County Monaghan

Figure 12.1
Identified Features of Cultural Heritage Interest

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manor house than a military castle. The building was described as 18 ft high with turrets and stood within some form of defensive enclosure.

This castle was eventually demolished and replaced by a grange estate house built without any form of fortifications. Originally called Blayney Castle or Blayney House, its name was changed to Hope Castle in the 19th century when the lands were sold to the Hope family. The grounds of Hope Castle are recorded as a designated Historic Park. The part is approximately 125 m to the south of the site, comprising the land immediately around Hope Castle, including formal gardens, a golf course and sections of parkland.

The National Museum of Ireland records no finds or features related to the townland of Castleblayney. The nearest recorded find to the site is that that of a knife blade (**C**: NMI Reg 1968.419), recorded in 1968 as being discovered on Black Island. The origins of the knife remain unknown, although initial inspection suggested the iron blade was still sound, suggesting it was relatively modern.

There are no recent excavations recorded on the database of excavations that are located within or close to the site. The nearest excavation was that of a pipeline to the south of the site. However, little of archaeological interest was recorded from the monitoring and it does not provide additional information concerning the archaeological potential of the proposal site.

Historical Background:

The site is located in Castleblayney, which is a market town in the Parish of Muckno, founded in the 17th century. The parish is located in the Barone of Cremoane, in the County of Monaghan, which is one of the counties that formed the province of Ulster (Lewis, 1837).

Little is known about the early history of the site and no settlement prior to the Iron Age has been positively identified in the area of the site. Iron Age activity has been identified in the wider area, and the SMR records a rath approximately 1.75 km to the south of the site (SMR MO020-19). The rath takes the form of an oval earthwork built along a ridge. The detail of the enclosure is partially hidden due to its overgrown nature, and there appears to be modifications that have taken place as part of the landscaping carried out for Blayney Castle (now Hope Castle) grounds. Although the date of this has not been confirm from by archaeological investigations, it is likely that it originated from the Iron Age or early medieval period (Deane, 1960).

Approximately 440AD St. Patrick is recorded as visiting County Monaghan and is believed to have been within the area of Castleblayney, which at the time was called Ferta-Lerga, and later Bally-Leargan (Deane, 1960). There are also later associations with St. Maelgold, and there was formerly a monastery on the other side of Lough Muchnae, about 700m to the north east of the site. The name of "Muchnae" is thought to originate from the Gaelic for "where pigs swim / cross water" and it is assumed to relate to Black Island (which is located close to the site).

During the period of unrest in the late 16th century, the area around the lake was important as it was located midway along the route between the English controlled towns of Newry and Monaghan. Confiscated estates in this area were promised to whoever built and occupied a defensible building between the two towns, suitable for providing refuge for travelling English soldiers (Deane, 1960). The job first fell to Sir Henry Bagenal in *c.*1591, the General Marshall of Ireland, and later Roger Wilbraham *c.*1601, who both failed to fulfil their intentions. The opportunity then fell to Edward Blayney who was the Governor of Monaghan at the time. Edward Blayney took up the challenge and successfully established a fortified house shortly after 1607, receiving the promised estates (Keithblayney.com, 2007). The name "Castleblayney" derived directly from "Blayney's Castle" and appears to have come into common usage from the 17th century, after the castle's construction (Deane, 1960).

The first settlement at "Blayney's castle" (**B**) was a small hamlet, built around the castle walls. However the settlement appears to have grown quickly and by 1613 the settlement was licensed to hold fairs and markets and a few years later a church was built (Anon, 1970). However, the hamlet appears to have been suffered during the civil war of 1641, when 17 inhabitants are recorded as having been killed and the village abandoned (Anon, 1999).

The castle is also recorded as being severely damaged at this time (Deane, 1960). This can be seen from contemporary pictures. Two pictures of Castle Blayney have been identified (NLoI, 2007), and although their backgrounds are significantly different the details of the castle are clearly the same. In both case the image of the castle reflects the early descriptions of a fortified manor house built predominantly out of stone, although no outer defences, described in earlier accounts, are shown.

Richard Blayney, 4th Lord Blayney, re-established a settlement in 1662, although again the settlement was destroyed by fighting in 1690. The existing town originates from the third attempt to establish a village by William Blayney, the 6th Lord, between 1693 and 1706 (Anon, 1999). This village was built to the west of the lake, rather than to the east as the previous settlements had been, taking advantage of the Dublin to Derry road (Keithblayney.com, 2007). The village further expanded between 1725-1740 when additional leases were granted in the town and a local market was held. Around this time the ban preventing Irish exports to the UK was lifted, a Grand Jury was set up in the town, building new roads and bridges in the area and the Linen Market was set up in 1762. These factors all resulted in an economic boom period for the town and resulting growth.

The founder of the modern Castleblayney is also said to be the 11th Lord Blayney, Andrew Thomas (1784-1834) who further developed the linen trade to serve the ever expanding textile industry in the area and in rebuilding parts of the town. Around 1790-1830, the increasing population resulted in the capacity of the town to be exceeded. This lead to the realignment of the town layout and the construction of new streets and buildings, which included 3 storey town houses, a court house, tannery and steel works (Anon, 1999).

It is thought that the castle grounds, and the surviving remains of the castle had remained in partial use by the British Army during the intervening years since it was built, even with the castle itself was badly damaged. Around *c*.1783, two companies of the British Army were stationed in Castleblayney under the command of Author Noble. They were stationed in or around the original castle, and were probably making use of surviving defensive features. It was during this period that construction commenced on a new "castle" to be built within the same location. Completed at the turn of the 19th century, the new building was named after its ruined predecessor. However, this Blayney Castle was built as a grand estate house and was built with design and not defence in mind (Deane, 1960).

The first detailed Ordnance Survey map was produced in 1835, which is the first detailed reference to the site. The site is covers an areas of long thin plots (**D**), subdivided by a series of tree lined ditches leading to the lake from the back of houses and shops on the Muckno Street. These plots appear to have been mostly undeveloped and may have functioned to give businesses and residents easy access to the lake. The exception is a building labelled as a tannery (**A**) located to the south of the site, although it appears to extend to within the edge of the site boundary. The site is also adjacent to a narrow gap between the land and Black Island, within Lough Muckno. There appears to be no significant developments on Black Island, although the map does shows the island mostly wooded with some enclosures and a small building (**F**). The land forming the shore of the lake is likely to have been prone to flooding was therefore would probably have been an unsuitable location to build permanent structures.

Although Castleblayney survived relatively unharmed by the initial ravages of the potato famine of 1841, it eventually succumb to its affect on the textile industry in which it traded, and that

was severely harmed. One expression of the change in circumstance of the town is in the building of the work house and fever hospital in *c.*1842 to deal with the increasing number of the poor. The population of Castleblayney, previously rising on the success of the linen trade, dipped after 1841 from 2134 to 2084 in 1851, and then to 1725 in 1936. Only after this period did the town's population recover, after almost 100 years of decline. (Deane, 1960)

At the turn of the 20th century a detailed OS survey of the town was carried out. This shows the site in greater detail than on previous maps. The site is shown as a series of long thin plots of land behind the shop fronts/houses of the Muckno Street. It is unclear what function these plots of land served except that they provided land owners access to the lake, although they may have served as gardens, smallholding or working areas for workshops. There is little development within the site, although this map does show a tannery (**A**) that appears to encroach within the site's southern boundary. It is difficult to ascertain with certainty the tannery's exact location, however, it appears that the eastern tip may have encroached within the site. The map also shows areas demarcated areas to the rear of the tannery but there function is not identified. These may represent outdoor working areas or channels to drains remove waste materials from the tannery process to the lake. It is therefore possible that both sections of the building were located in the sites, as well as other associated infrastructure (such as, drains and outside processing areas).

The Castle Blayney remained in possession of the Blayney family until 1853 when the Hope family, renowned as owners of the famous Hope Diamond, bought it and the surrounding lands. With the change of ownership the building was renamed Hope Castle, although at this point the estate was in decline, and the building was abandoned as a residence after the turn of the 20th century and used for a wide range of purposes throughout the 20th century. However, its continued use did not stop the decline that lead to two-thirds of the building having to be demolished during renovations in the latter part of the century. The Castle is now in use as a hotel and bar, with much of the estate around the castle becoming open parkland and a golf course.

Table 12.1 Identified Features of Cultural Heritage Interest

Reference	NGR	Name and Description	Location
A		Tannery: Built probably in the early 19th century and identified on the 1835 OS map, this tanner was built within the centre of town and may have been associated with an abattoir.	Adjacent to the sites southern boundary.
B (MO020-018)		Hope Castle: Built in the mid 19th century it replaces the original castle, Castle Blayney and was built as a grand estate house. Only a third of the castle remains after a fire damaged it at the turn of the 20th century, and it a large section was demolished during its recent redevelopment. The original castle is thought to be located adjacent to Hope Castle and it would be anticipated that remains of the foundations would exist. The original castle was a stone built fortified house built within a defensive enclosure.	275 m south of the site
C NMI Reg 1968.419		Knife Blade: recorded by the National Museum of Ireland but whose origins are unknown. The knife was made of iron and is thought to have been relatively recent.	East of the site on Black Island, exact location unknown
D		Plot boundaries: built in the late 18th or 19th centuries, these plots appear to belong to the buildings they back	Within the site

	onto and are tree lines, and appear not to have been developed at any time. As well as providing a "yard" area for workshops, shops and houses, and gives the occupiers access to the lake.	
E	Court House: early 19th century building built during the redevelopment of the town.	125 m west of the site
F	Agricultural development on Black Island	650 m east of the site
G	Small building located on *c*1900 large scale OS plan	700 m east of site

Site Walkover

The site is located adjacent to the existing WwTW, although currently separated from it by a high security fence. The site is in an area of overgrown plots of land that currently appear to be out of use. The plots are separated by tree lined boundaries which appear to have originally been made up of banks and ditches. The vegetation was overgrown to such an extent that it was not possible to survey the entire site. However, each plot was visited and there are no additional features of cultural heritage interest visible.

Site Summary

No previously recorded features of cultural heritage interest are present exists either within the site, and the only features identified during the site visit were the field boundaries that subdivide the land into plots, which have been clearly mapped. No remaining tannery buildings are visible from the site, although there would be an expectation that subsurface remains may survive. Map evidence also indicates that the land to the rear of the tannery may have been used in part of the tannery process, with channels and other demarcated areas being shown. Subsurface features may help identify whether this area was extensively used and if so, for what purpose.

The site has a potential for previously unidentified archaeology. The shores of lakes are known for attracting people intent on exploiting their natural resources. It is possible that remains of wooden structures related to fishing or accessing the lake (boat mooring, working platforms, etc), were built within the site and may survive as buried features. Activities relating to the lake may also extend to a crossing to Black Island (a bridge or boat moorings), which appears to have been rich in resources, and is known to have been partially developed for agriculture by the late post-Medieval period. There may also be the potential for features or artefacts from the period of when the original Blayney's castle was built, including evidence of the original defensive structures. The apparent low level of historic disturbance within the site, and the potential for the waterlogged soils preserving organic materials, both increase the potential for buried features to survive.

Aerial Photographs

Copies of four aerial photographs from the Cambridge Aerial Photographic Collection, as well as a number published photographs, were examined. The site appears to have been overgrown throughout the latter half of the 20th century and no additional features have been identified.

12.3.3 Predicted Trends

No changes to the baseline conditions of the site are expected in the immediate future. The site and its boundaries appear to be unused and there is no evidence of change occurring.

12.3.4 Information Gaps

An attempt has been made to consult all available sources, although there may be papers relating to the site in obscure collections or in private collections. However, it is anticipated that there is no further information that is likely to significantly alter the conclusions of this assessment.

12.4 Potential Effects and Incorporated Mitigation

12.4.1 Potential Effects during Construction and Incorporated Mitigation

Previously for Remains for Infrastructure Relating to the Tannery

Should remains of the tannery survive within the site, it would be anticipated that these would include possible foundations of the tannery building, and associated drains or channels. There may also be pits, foundation for drying areas and other features used in the tannery process that may survive as subsurface remains. Should such features exist, it would be expected that they would be damaged or lost during the construction of the waste water tanks and infrastructure. To ensure that any surviving features are recorded, archaeological investigation should take place concurrently with the construction phase. This would include a watching brief in areas where soil stripping will occur, as well as limited trial trenches to assess the presence and extent of any remains associated to the tannery. This work will be carried out to a detailed written scheme investigation (WSI), and in consultation with the County Archaeologist.

Previously Unidentified Features of Cultural Heritage Interest

There is the potential for the loss of previously unidentified features of cultural heritage within the site. The potential for archaeology is suggested by the sites close proximity the site of Blayney Castle and to Hope Castle, as well as Lough Muckno's shore. A watching brief during the initial soil stripping will be sufficient to identify and record any features of cultural heritage interest. This work will be incorporated into the sites archaeological investigation as described by above.

12.4.2 Predicted Effects during Operation and Incorporated Mitigation

No additional affects or necessary mitigation during the operational phase has been identified. **Table 12.2** summarises the incorporated mitigation measures.

Table 12.2 Summary of Incorporated Mitigation

Receptor	Predicted Effects	Incorporated Mitigation Measures and Rationale for their Likely Effectiveness
Previously unidentified remains for infrastructure relating to the tannery	Loss or damage of features that may exist within the site and associated with the 19th century tannery.	It is possible that a portion of the tannery extended within the site, and therefore there is a potential for remains of the tannery's foundations and infrastructure (particularly drainage channels, open working areas, drying areas, pits) to survive. It is anticipated that any such features would be lost or damaged during the construction phase. Archaeological investigations to determine their presence, coupled with a watching brief to record any features encountered, will be sufficient to ensure their preservation by record.
Previously unidentified features of cultural heritage interest	Loss or damage to features that may exist within the site that predate the 18th century development of Castleblayney.	There is a clear potential for features to exist within the site due to its history and proximity to centres of activity, including the castle and the lake. Potential remains would likely be of local interest and would not require *in situ* preservation. As such, their recording and, if required, physical preservation off site, preservation by record would be sufficient. This work would be implemented as part of a watching brief throughout the development site.

12.4.3 Implementation of Mitigation and Enhancement Measures

The implementation mechanisms for the identified mitigation measures are given in **Table 12.3.**

Table 12.3 Implementation of Incorporated Mitigation and Enhancement Measures

Description of measures including any monitoring requirement	Responsibility for implementation	Implementation mechanism
Construction		
A programme of archaeological investigations to be carried out concurrently with the development. This may include trial limited trial trenches to determine the presence and extent of any features associated with the 19th century tanner, and a watching brief during the soil stripping across the whole of the site.	Developer	The exact details of the programme of archaeological investigations to be agreed with the County Archaeologist, and implemented under a planning condition.

12.5 Assessment of Effects

12.5.1 Significance Evaluation Methodology

In order to evaluate the importance of an effect upon cultural heritage, features of cultural heritage are classified in terms of whether they have a local, county or national importance, with

reference to their policy importance, above. This can be a subjective process, with features being assessed in terms of their rarity, state of preservation, date, group value and historical associations.

The assessment of significance of any effect is largely a product of the importance/sensitivity of a feature, as informed by legislation and policy, and the magnitude of the effect on it, qualified by professional judgement.

Assessment of magnitude essentially relies on professional judgement rather than any scoring of criteria. In the assessment of direct effects on cultural heritage receptors are assigned to one of four classes of magnitude, defined in **Table 12.4.**

Table 12.4 Definition of Magnitude

Magnitude	Definition
Major	Total or substantial loss of a feature.
Medium	Partial loss or alteration of a feature.
Minor	Minor loss to or alteration of a feature.
None	Minor alteration of a feature.

Effects are considered to be of major or minor significance, or not significant according to the matrix shown in **Table 12.5**. For this assessment, only changes of high magnitude may result in effects of major significance, depending on the importance of the feature and the exercise of professional judgement.

Table 12.5 Significance Matrix

Magnitude	Policy Importance		
	International/National	**Regional**	**District/Local**
Minor	Not Significant	Not Significant	Not Significant
Medium	Significant	Not Significant	Not Significant
Major	Significant	Significant	Not Significant

Only information presented in this section has been used to judge sites, and it is possible that their importance could be evaluated differently if further information were to become available

12.5.2 Predicted Effects during Construction and their Significance

Construction

Potential for remains for the tannery foundations/infrastructure

There is a clear potential for remains associated with the 19th century tannery to exist within the site. However, any such remnants would be expected to be subsurface features, possibly taking the form of foundations, channels or drainage leading to the lake. Should such features exist they would be of local importance, and their physical loss (with appropriate preservation in record) would not be significant.

Previously unidentified features of cultural heritage interest

There is no direct evidence suggesting that features of cultural heritage interest exist within the site. However, the site appears to be relatively undisturbed apart from the separation of the area into long thin plots in the 18th century. Activity is known of around the lake since the Iron Age, and which appears to have increased in the early medieval period with the establishments of the monastery on the other side of the lake. It would be anticipated that the shore of a lake would attract human activity, as resources were exploited. Remains of features such as moorings, platforms or crossings to Black Island may exist, as well as for the potential of stray artefacts. The waterlogged nature of much of the site is also likely to have assisted in the preservation of organic deposits and features. There is no evidence to suggest that should any features exist within the site they would be of no greater than regional importance, and as such their physical loss (and appropriate preservation in record) would not be significant.

12.5.3 Predicted Effects during Operation and their Significance

No additional effects during the operational phase of the proposed development have been identified.

12.5.4 Cumulative Effects

No cumulative effects have been identified.

12.5.5 Compensation Measures

Should any features of interest be identified during the construction phase, appropriate recording will take place and the results of which will be published.

12.5.6 Additional Mitigation/Enhancement Measures

No additional mitigation or enhancement measures have been identified in relation to this proposal.

12.5.7 Summary of Significance Evaluation

Table 12.6 summarises the significant cultural heritage effects arising from construction and operation of the Castleblayney WwTW capacity upgrade.

Table 12.6 Effects on Features of Cultural Heritage Interest and Evaluation of Significance

Environmental effect	Type of effect	Probability of effect occurring	Policy importance (or sensitivity)	Magnitude of effect	Significance Level	Rationale
Construction						
Loss or damage to remains of the tannery	-ve	Unlikely	Local	minor	Not significant	It is possible that there are remains of the tannery surviving with the site. If there is, however, it would only represent ancillary areas of the original tannery, such as drains or drying areas.
Loss of previously unrecorded features of cultural heritage interest	-ve	Unlikely	Local	Unknown	Not significant	The lack of ground disturbance in the area and the history of human activity around the site indicate a potential for previously unrecorded subsurface archaeology to exist within the site. However, no evidence suggests that any features would be of greater than local importance and any features encountered will be preserved by record.

Key:	Type	Probability	Policy Importance	Magnitude	Significance
	- =	Certain	International	Major	Major
	+ =	Likely	National	Medium	Minor
	? =	Unlikely	Regional	Minor	Not Significant
			District	None	
			Local		

13. Land Quality

This chapter considers the potential effects of the WwTW capacity upgrade on land quality in terms of the historical and future potential for the ground to be contaminated. In order to ascertain the scope of this assessment a Scoping Report was submitted to Monaghan County Council in August 2007 which stated that land quality would not be subject to a full assessment.

The potential for ground contamination to harm is based on the presence of three factors:

- Contaminant: Substances that are potential contaminants or pollutants that may cause harm;
- Pathway: A potential route by which contaminants can move from the source to the receptor; and
- Receptor: A receptor that may be harmed for example the water environment, humans, flora and fauna.

Where all three factors are present a pollutant linkage exists and mitigation measures may be required in order to protect both the quality of the wider environment and the health and safety of personnel involved at all stages of site development.

A review of the 1835 Ordnance Survey map identified a building labelled as a tannery located to the south of the development site, although it appears to extend to within the edge of the WwTW site boundary. The tannery is also shown on the detailed OS survey of the town from the turn of the 20th Century along with a demarcated area adjacent to it whose function was not identified. It is therefore possible that infrastructure associated with the tannery extended onto the WwTW site.

Contaminants associated with the tannery could include heavy metals, inorganic chemicals, hydrocarbons, semi-volatile and volatile organics. There are potential pathways to human receptors (construction workers and adjacent residents) via direct contact, ingestion and inhalation. No visual evidence of contamination was observed during a site visit, but since the WwTW is still operational most of these pathways will be negated by the presence of hard standing and grassed areas.

As no geotechnical or contamination data currently exists for the development site it is recommend that this be obtained prior to construction to confirm the presence of ground contamination.

Given that earthworks could open up a pathway between any contamination present and human receptors the Contractor will be required to provide construction workers with the correct Personal Protective Equipment and implement a dust management plan to ensure no significant effects arise.

14. Summary of Predicted Residual Effects

Air Quality, Dust and Odour

Existing odour emissions from the WwTW were determined by an odour survey which was undertaken on the 25 October 2007. Modelling of odour emissions from the existing WwTW identified that odour levels at discrete receptors are consistently above both the 5 ou_E m^{-3} significance criteria.

Modelling of the WwTW capacity upgrade has shown that in order to meet the significance criterion of 5 ou_E m^{-3} a single odour control unit comprising a three stage wet chemical scrubber plus carbon with a stack height of 20m situated in the centre of the site will be required. To this all sources except the four settlement tanks will be extracted. The settlement tanks will be chemically dosed to reduce odour emissions.

It is possible that a planning condition of 2 ou_E m^{-3} may be imposed in which case the settlement tanks will also need to be extracted to the odour control unit.

No significant effects are anticipated with respect to air quality or dust.

Noise and Vibration

In order to characterise the existing noise environment, a noise survey was undertaken on 27 September 2007 at sensitive receptors in the vicinity of the WwTW site. The existing local noise sources include road traffic noise from local roads and noise associated with the WwTW itself.

Predicted construction noise levels will be in compliance with relevant guidelines whilst an Environmental Noise Criterion has been developed to ensure that, once the WwTW capacity upgrade is fully operational, noise levels at sensitive receptors do not exceed relevant guidelines.

Socio-economics

Development of Castleblayney Town is set to take place based on its key assets; namely its strategic location on a national road corridor and its potential for tourism based on recreation in and around Lough Muckno. The WwTW capacity upgrade will enable future residential and commercial development to take place without compromising the water quality and ecological interests of Lough Muckno.

Landscape and Visual

The WwTW capacity upgrade will result in the loss of a mix of vegetation types, including trees and hedgerows, across the development site. However whilst the loss of vegetation and the addition of new treatment infrastructure will increase the influence of the industrial built form on the landscape character it is not introducing a different land use to it. Thus the overall effect of the development on the landscape is not considered significant.

Effects on visual amenity during the operational stage are associated with the introduction of new treatment infrastructure, including vertical elements that will break the amenity tree dominated skyline.

Those most affected will be visual receptors situated along Muckno Street, in particular those immediately adjacent to the entrance to the proposed access road and those located on the east side of Muckno Street immediately to the west of the development site. The majority of these views will be filtered by existing vegetation intercepting views and effects are therefore of minor significance.

Water Environment

The existing WwTW outfall discharges treated effluent into a river (on the west branch of the River Fane) to the northeast of the WwTW site and in turn the main waterbody of Lough Muckno to the east. Lough Muckno outflows to the Clarebane River and the main channel of the River Fane via Lough Ross.

The final effluent will be treated to meet effluent standards which reflect the relevant statutory regulations and provide adequate protection of aquatic receptors given the assimilative capacity of the River Fane thus no significant effects are anticipated.

Ecology

The main effect on terrestrial habitats will be the permanent loss of approximately 0.04ha of amenity grassland within the existing WwTW site and 0.43ha of poor semi-improved grassland on the extension site. Broad-leaved planted trees (covering approximately 0.02ha in area) will also require felling to accommodate the WwTW capacity upgrade. These trees are considered to be of less than local value and thus there loss is not considered significant. However, they do offer suitable habitat for nesting birds and potential roost sites for bats and so compensation planting of a ratio of 2:1 of native broad-leaved deciduous trees will be undertaken to ensure that there is no net loss of this habitat.

Traffic

The existing WwTW is located on the northeast edge of Castleblayney Town and is currently accessed via an unclassified lane that connects with the R181 (Muckno Street) as it runs through Castleblayney Town. The unclassified lane also provides accesses a cattle market. Following construction of the proposed access road directly off the R181 WwTW traffic will no longer utilise this entrance. No significant effects on drivers or pedestrians are anticipated during the construction phase.

Cultural Heritage

From a review of historic Ordnance Survey maps there is a clear potential for remains associated with a 19th century tannery to exist within the development site. These remains would be subsurface features possibly taking the form of foundations or drainage channels leading to Lough Muckno. Due to the possibility of remains being encountered a watching brief during the initial soil stripping will be put in place in order to identify and record any features of cultural heritage interest.

Land Quality

A review of historical maps highlighted that there could be potential for infrastructure associated with a tannery to extend onto the WwTW site. Given that earthworks could open up a pathway between any contamination present and human receptors the Contractor will be required to provide construction workers with the correct Personal Protective Equipment and implement a dust management plan to ensure no significant effects arise.

15. References

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Ordnance Survey (1835) County Monaghan Sheet 20, 6" to 1 Mile Scale

O'Dwyer and Entec (2007) Castleblayney Sewerage Scheme Environmental Impact Statement Scoping Report

Websites:

www.Keithblayney.com (2007) (Local History Website)

www.Heritage.ie (2007) Heritage website containing details of Buildings of Architectural Interest and Designated Historic Park and Gardens.

Appendix A
Noise Monitoring Results

Receptor	Time	L_{Amax}	L_{Amin}	L_{Aeq}	L_{A10}	L_{A90}	Comments
1	14:43:40	82.0	---.-	62.5	64.0	41.0	Vehicle movements on nearby road
	14:58:40	85.0	---.-	65.0	68.0	41.0	
	15:13:40	82.4	---.-	64.1	67.0	43.0	
	15:28:40	82.1	---.-	64.2	67.0	43.5	
	Average			64.0	66.5	42.1	
2	18:52:59	70.4	48.3	50.7	51.5	49.5	STW noise, vehicles on nearby road
	19:07:59	67.0	49.2	53.0	54.5	50.5	
	19:22:59	60.4	48.0	50.9	52.0	49.5	
	19:37:59	62.3	48.4	50.4	51.0	49.5	
	Average			51.4	52.3	49.8	
3	15:53:18	68.9	41.4	47.8	50.0	44.5	Distant vehicles
	16:08:18	64.8	---.-	47.0	49.0	42.5	
	16:23:18	58.9	41.1	47.5	50.0	44.0	
	16:38:18	77.8	39.8	49.9	50.5	44.0	
	Average			48.2	49.9	43.8	
1	01:53:09	80.1	---.-	59.8	58.5	---.-	Vehicle movements on nearby road
	01:58:09	83.2	---.-	58.8	59.0	---.-	
	02:03:09	82.3	---.-	56.8	51.0	---.-	
	02:08:29	80.0	---.-	55.5	48.0	---.-	
	02:13:29	61.1	---.-	36.7	39.0	---.-	
	02:18:29	60.1	---.-	38.3	41.5	---.-	
	02:23:29	54.5	---.-	38.7	42.0	---.-	
	02:28:29	60.1	---.-	36.1	37.5	---.-	
	02:33:29	60.8	---.-	37.6	40.0	---.-	
	02:38:29	75.7	---.-	52.3	44.5	29.0	
	02:43:29	58.9	---.-	39.6	43.5	---.-	
	02:48:29	75.5	---.-	51.4	50.0	31.5	
	Average			53.8	46.2	30.3	
2	23:22:47	60.0	49.0	50.4	51.0	49.5	STW noise, vehicles on nearby road
	23:27:47	59.6	48.9	50.8	51.5	49.5	
	23:32:47	55.9	48.8	50.6	51.5	50.0	
	23:37:47	56.8	48.9	50.6	51.5	50.0	
	23:42:47	59.8	48.9	50.4	51.0	49.5	
	23:47:47	58.8	49.4	51.0	51.5	50.0	
	23:52:47	58.9	49.3	50.8	51.5	50.0	
	23:57:47	57.3	49.0	50.6	51.0	50.0	
	00:02:47	55.3	49.1	50.6	51.5	50.0	
	00:07:47	53.8	48.9	50.5	51.5	49.5	
	00:12:47	59.5	48.6	50.4	51.0	49.5	
	00:17:47	62.8	49.2	50.7	51.5	50.0	
	Average			50.6	51.3	49.8	
3	00:45:57	59.5	35.0	44.6	48.5	37.5	Distant vehicles
	00:50:57	56.6	33.7	44.7	48.0	36.0	
	00:55:57	57.2	34.8	44.7	48.5	37.0	

Receptor	Time	L_{Amax}	L_{Amin}	L_{Aeq}	L_{A10}	L_{A90}	Comments
	01:00:57	51.6	32.6	43.4	46.5	36.0	
	01:05:57	57.6	33.2	44.9	48.5	37.0	
	01:10:57	58.0	33.1	45.5	49.0	36.5	
	01:15:57	62.1	34.3	43.6	46.5	37.5	
	01:20:57	63.9	32.7	45.4	48.0	36.5	
	01:25:57	69.7	31.4	46.1	48.5	35.5	
	01:30:57	58.1	32.1	43.4	47.0	34.5	
	01:35:57	59.6	32.2	43.2	47.0	35.0	
	01:40:57	69.7	30.5	45.3	48.0	34.5	
	Average			44.7	47.8	36.1	

Appendix B Scoping Responses

To **Martin Murray, S.E. Environment.**

From **Bernie O'Flaherty, Exec Chemist**

Re **Comments on Scoping Report on the EIS for Castleblayney Waste Water Treatment Plant**

Some Important Background:
Lough Muckno is an area of high amenity value, is a "sensitive area" under the UWW Regulations and is in use for local bathing and water sports. Lough Muckno has been identified as a Surveillance Monitoring Site under the Water Framework Directive Monitoring Programnme.

Water Quality Problems:
In recent years the bathing water quality (although not a designated area) has been found to be very poor with microbiological contamination a significant problem. A further problem is that extensive and long lasting algal blooms have occurred in recent years resulting in algal blooms from the lake flowing down the Fane River to the Inniskeen area and beyond. The algae have been identified as blue green algal, a type that may be toxic to humans and animals. Water supply sources are located downstream of Lough Muckno – these include Lough Ross (Newry WSS) (omitted from this report), Fane River at Inniskeen (Inniskeen WSS) and Dundalk WSS is abstracted further downstream.

Unsatisfactory Discharges in Recent Past
The effluent quality data available for Castleblayney STP may not give a true picture of discharges from the waste water collection and treatment system over the past number of years. There have been a number of overactive storm overflows (from collection system and pumping station) allowing the discharge of untreated/dilute sewage a short distance upstream of the final outfall. Such overflows were also at times active during normal weather conditions. Given this history, the level of contamination in the sediment in the vicinity of the storm overflows and final outfall of the WWTP would be of interest and whether this sediment could be a ongoing source on enrichment to Lough Muckno.

Recommended Data Sources
It is considered important that the EIS Report should include not only EPA water quality data but also the extensive data sets that may be available at the Local Authority offices. In Monaghan the annual monitoring programme planned by the Environment Section is contracted out to the local EPA Regional Lab. Data from the lake monitoring programme, the bathing water monitoring programme and the river monitoring programme would be useful in the EIS preparation.
It is also advisable that where any water or effluent quality data is quoted – the source of this data is identified and whether the data is from an accredited laboratory or not should also be included.

Additional Items for Consideration
Given the need to achieve "good status" in Lough Muckno and the fact that it is used for water sports and some bathing the EIS should consider the following

- the elimination of polluting discharges including storm overflows,
- the inclusion of effluent polishing and
- effluent disinfection to minimise microbial contamination

Measures to minimise the discharges of soil/silt laden waters to surface waters from site works during construction should be included in EIS.

Anna O'Reilly

Mr D Woods SE

Please discuss w Fallon
31/3/08

epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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Mr David Fallon
Director of Services
Water Services
Monaghan County Council
County Offices
The Glen
Monaghan

27th March 2008

Re: Proposed Wastewater Treatment Plant at Castleblayney, Co Monaghan

Dear Mr Fallon

I refer to your letter received in our Wexford Office on 10th March 2008 regarding the above.

As the Environmental Protection Agency has not yet received an application for this activity to be licensed we have no comment at this time.

I trust this advice assists.

Yours sincerely,

Marie Harris
Programme Officer
Office of Climate, Licensing & Resource Use

15. MAY. 2008 15:52 NICHOLAS O DWYER NO.129 P.2

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Environmental Health Service,
Local Health Office (Cavan and Monaghan)
PCCC Directorate, Dublin/North East,
The Arcade,
Main St,
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Tel: +353 (0) 49-437 3414
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Ref: FB/FS
Date: 18/03/08

Fergus Barry
Senior Environmental Health Officer

Brian McKeever
Principal Environmental Health Officer

RE: Castleblayney Sewerage Scheme Wastewater Treatment Plant. Scoping Report

From a public health viewpoint the provision of an improved wastewater treatment facility to cater for the expansion of this area is to be welcomed, as indeed is this scoping report. This scoping report has identified the major concerns from an environmental view which needs to be further addressed in the EIS. These include, the overall effects of increased pollution load on the receiving waters and environment, and the effect on local residents of noise, dust, etc.

From a public health perspective, it would be desirable if the EIS also addressed the potential and/or controls for transfer of infection to humans, particularly in relation to:

- Exclusion zone on the use of the receiving waters as sources of drinking water, or relevant industrial use, eg food industries, horticulture.
- Exclusion zone (if any) on use of the receiving waters for recreational uses.
- Control measures in the event of treatment plant failure.
- Control measures to prevent infection spread to local inhabitants by wildlife, rodents, birds and insects.
- Control of infection to workers associated with the facility.

If there are any current industrial discharges which could have a possible Public Health significance eg, anti-biotic ingredients, laboratory waste etc these would best be included in the assessment of the treatment plant to safely assimilate them.

Signed: _____
Fergus Barry
Senior Environmental Health Officer

EIS - Castleblayney bundle

Eastern Regional Fisheries Board
Bord Iascaigh Réigiúnach an Oirthir

Fisheries Ireland
Our Natural Heritage

Mr Dominick Mahon
Monaghan Co Co
County Offices,
The Glen,
Monaghan

Our Ref: MK/3b

MONAGHAN CO. COUNCIL
0 6 MAR 2008
CORPORATE AFFAIRS

5th March, 2008

Re: Castleblayney Sewerage Scheme Wastewater Treatment Plant EIS- SCOPING REPORT

Dear Mr Mahon,

We refer to your letter dated 26th February last in relation to the above proposal to upgrade the wastewater treatment works at Castleblayney.

The Board welcomes the proposal to upgrade the treatment plant and the scoping report has addressed most of the concerns from a fisheries perspective

However, we would ask that the following issues are taken on board when planning the development.

- If the proposal intends to continue with the chemical precipitation of Phosphorous in the treatment process, all chemicals used should be stored in adequately bunded areas.
- The board should be consulted in relation to any bandside or instream works that may take place during the construction phase.
- It must be ensured that Lough Muckno and the larger Fane catchment has the assimilative capacity to handle the potential increase in discharge volume as the population of Castleblayney increases.
- All precautions should be taken during the construction phase to prevent discharges of suspended solids or any other deleterious matter to the water course.

MONAGHAN CO. COUNCIL
WATER SERVICES SECTION
8 MAR 2008

The Eastern Regional
Fisheries Board
15a Main Street
Blackrock
Co. Dublin
T: (01) 278 7022
F: (01) 278 7023

Eastern Regional Fisheries Board
Bord Iascaigh Réigiúnach an Oirthir

Fisheries Ireland
Our Natural Heritage

The treated effluent from the plant discharges to Lough Muckno and ultimately to the River Fane. As this lake provides rich coarse fishing and the river is a valuable salmonid river, it is important to ensure that the proposed development does not have a negative impact on the aquatic habitat.

Please keep the Board notified of your progress with this application in due course.

Yours faithfully,

Pat Doherty
Acting Chief Executive Officer

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Appendix C
Olfactometry and Odour Units

An odour unit is defined as the number of times a samples needs to be diluted with odour free air to reach at point at which half of the panel can detect the odour.

The European odour unit (ou_E) is the amount of odorant that when evaporated into 1 m^3 at standard conditions, elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM) evaporated in 1 m^3 of neutral gas at standard conditions.

One EROM, evaporated into 1 m^3 of neutral gas at standard conditions, is the mass of substance that will elicit the 50% detection threshold (D_{50}) physiological response assessed by an odour panel in conformity with this standard and has by definition a concentration of 1 ou_E/m^3.

For n-butanol (CAS-Nr. 71-36-3) one EROM is 123 µg. Evaporated in 1 m^3 of neutral gas, at standard conditions, this produces a concentration of 0.040 µmol/mol (equal to 40 ppb by volume).

The relationship between ou_E for the reference odorant and that for any mixture of odorants at the D_{50} concentration;

1 EROM ≡ 123 µg n-butanol ≡ 1 ou_E (for a mixture of odorants)

By definition odour units are expressed as n-butanol mass equivalents.

Measurement of Odour Concentration Using Olfactometry

Odour concentration of a gaseous sample of odorants is determined by presenting a panel of selected and screened human subjects (see photo[55]) with that sample, varying the concentration by diluting with neutral gas in order to determine the dilution factor at D_{50}.

UKAS TESTING 0609

At that dilution factor the odour concentration is 1 ou_E/m^3 by definition. The odour concentration of the sample is then expressed as a multiple (equal to the dilution factor at 1 ou_E/m^3) of one European odour unit per cubic metre at standard conditions for olfactometry.

The measurement of odour concentration is the subject of British Standard BS EN 13725:2003(E)[56]. Odour laboratories used by Entec are UKAS accredited.

[55] Photo courtesy of the Silsoe Odours Limited

[56] British Standards Institute (2003) Air Quality - Determination of Odour Concentration by Dynamic Olfactometry. BS EN 13725:2003 (E)

Appendix D
Odour Model Inputs

AERMOD Dispersion Modelling

Over the last 10 years, new generation dispersion modelling codes have been developed (ADMS and AERMOD), which more precisely simulate the effect of atmospheric physical parameters on material dispersion and current best practice dictates that one of these two models should now be used for dispersion modelling assessments. It is the experience of Entec that in using these dispersion models for predicting odour dispersion from wastewater and sludge treatment facilities is that there is little to choose technically in most applications between the two. AERMOD however has been used extensively in Ireland for numerous odour and air quality assessments at wastewater and sludge treatment works, as such has been used for this assessment. AERMOD is the result of work conducted by the AERMIC (American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee) to introduce state-of-the-art modelling concepts into the United States Environmental Protection Agency (USEPA) local scale air quality models.

Special features of the AERMOD include its ability to treat the vertical in homogeneity of the planetary boundary layer, special treatment of surface releases, circular and irregularly shaped area sources, a three plume model for the convective boundary layer, limitation of vertical mixing in the stable boundary layer, and fixing the reflecting surface at the stack base[657].

The output of AERMOD is the predictions of ambient concentrations at receptor points for the averaging periods including 1hour an annual. The AERMOD output allows for post processing, allowing the prediction of percentiles, which is essential for the assessment of odour and short term air quality. Within this assessment post processing to predict the 98%ile for odour annoyance and other percentiles appropriate to the air quality standards was conducted.

A dispersion model assessment has been constructed using the most recent 5 years' meteorological data from Belfast Airport Meteorological station. Meteorological data for the years 2002-2006 were obtained from Connaught meteorological station which is located approximately 72 km to the north of Castleblayney. The concentrations of specific odour at critical receptors within the vicinity of the site have been calculated, the baseline scenario making use of the sampled emission data for odour, with the proposed scenarios modelled utilising the sampled odour data in addition to source inputs from Entec's extensive library of emission rates. This database has been compiled through sampling exercises undertaken by Entec in the UK and Ireland over the past 5 years.

Dispersion Model Outputs

For each of the receptors forming part of the model input, the dispersion model predicts an ambient concentration averaged over an hour. The data is post processed to predict concentrations as a percentile of hourly averages. The output to the dispersion model is then transferred to a contour plotting package which produces isopleths laid over a base map. The AERMOD output allows for post processing, allowing the prediction of percentiles, which is essential for ambient air quality and odour assessment.

In addition to the receptor grid, critical receptors, identified as discrete Cartesian receptors, have been included in the dispersion model, against which the odour annoyance criterion of 5 $ou_E\ m^{-3}$ and 2 $ou_E\ m^{-3}$ has been assessed.

[57] USEPA (2002) www.usepa.gov/scram001

Figure D1 Receptor Locations

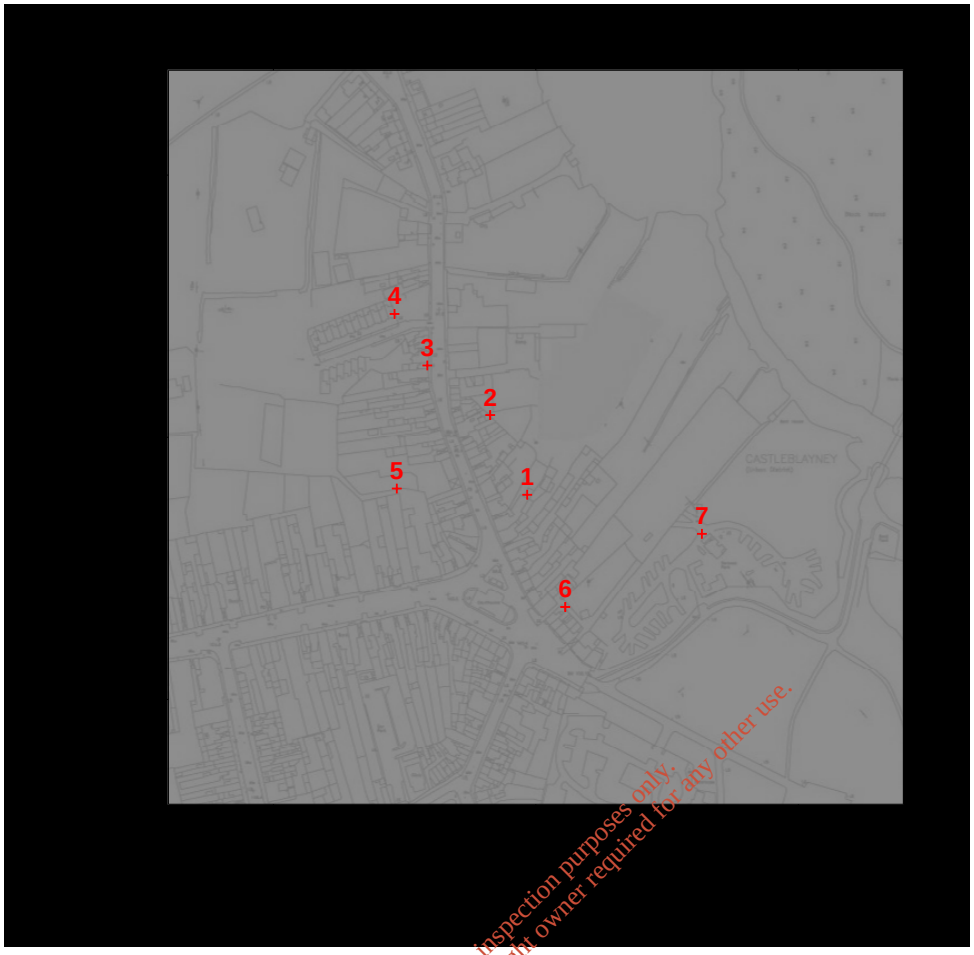


Table D.1 Monitored Existing Odour Emissions

Source	Odour Concentration (ou_E m^{-3})		Odour Emission Rate (ou_E m^2 s^{-1})
	Sample 1	Sample 2	
Inlet Channel and Screen	3737	2219	20.7
Beltpress	873	873	6.3
Secondary Settlement Tank	142	248	1.3
Storm Tank (covered with 5 point sources)	231	164	2.53
Aeration Tank	295	295	2.1
Sludge Cake	213	384	2.1

Table D.2 Model Inputs for Each Scenario: Area Sources

Source Name	Source Type	Length (m)	Width (m)	Coordinates of centre	Emission Rate (ou_E m^2 s^{-1})	Scenario
Aeration tank	Area	32.2	30.9	14.3, 28.1	2.1	Existing and proposed
Sludge Cake	Area	6.5	14	47.4, 97.7	2.1	Existing
Distribution	Area	1.4	8.8	41.3, 47.3	1.3	Existing
Distribution	Area	5	5.1	92.9, 34.2	1.3	Proposed
Beltpress	Area	2	3.5	3.9, 21.1	6.3	Existing
Storm	Area	21.2	26.2	56.1, 67.8	2.53	Proposed
Tertiary Treatment	Area	28.7	6.7	65.3, 89.2	1	Proposed

Table D.3 Model Inputs Circular sources

Source	Coordinates (x,y)	Emission Rate (ou_E m^2 s^{-1})	Scenario
PFT 1	45.8,82.0	12.1	Proposed
PFT 2	101.9,68.1	12.1	Proposed
Settlement Tank 1	42.4,62.1	1.3	Existing and Proposed
Settlement Tank 2	59,48.1	1.3	Existing and Proposed
Settlement Tank 3	110.9,34.5	1.3	Proposed
Settlement Tank 4	91.9,48.1	1.3	Proposed

Table D.4 Model Inputs Polygon area

Source	Coordinates (x, y)	Emission Rate(ou_E m^2 s^{-1})	Scenario
Inlet	15.1, 4.5	20.7	Existing and Proposed
Stage2 Aeration Tank	68.8	18.7	Proposed

Table D.5 Assessment Scenarios

Source	Existing	Scenario one	Scenario two	Scenario three	Scenario four	Scenario five (a,b,c)
Inlet	✓	✓	✓	✓		
Aeration tank	✓	✓	✓	✓		
Settlement tank 1	✓	✓	✓	✓	✓	
Settlement tank 2	✓	✓	✓	✓	✓	
Stage 1 PFT		✓	✓	✓		
Storm tank		✓	✓	✓		
Beltpress		✓	✓	✓		
OCU 1		✓	✓	✓		
Tertiary Treatment		✓	✓	✓		
Stage 2 PFT		✓	✓	✓		
Stage 2		✓	✓	✓	✓	

Source	Existing	Scenario one	Scenario two	Scenario three	Scenario four	Scenario five (a,b,c)
Settlement tank						
Stage 3 Settlement tank		✓	✓	✓	✓	
Distribution		✓	✓	✓		
Stage 2 Aeration (x2)		✓	✓	✓		
2nd OCU		✓	✓	✓		
Single OCU (located in centre of the site)					✓	✓

Table D.6 Emission Parameters

Source	Efflux Temp. (ºC)	Efflux Velocity (m/s)	Odour ($ou_E m^{-3}$)
Point Sources; Storm Tank (Existing)	Ambient	0.01	2.53
Proposed Shell Biofilter with a 2nd Stage of Carbon (OCU1)	Ambient	15	Scenario 1: 731.25 Scenario 2: 1494.72
2nd OCU (Scenario 2 and 3)	Ambient	15	763
Single OCU (located in centre of site) (Scenario 4 and 5). Consisting 3-stage wet chemical scrubber followed by carbon.	Ambient	15	18,000

Table D.7 Building Parameters

Building	Coordinates	Height (m)	Width (m)	Length (m)
Sludge dewatering building	45.0, 91.9	5	8.9	12.2

Appendix E
Schematics of Scenarios

Figure E.1 Diagrammatic illustration of scenario one.

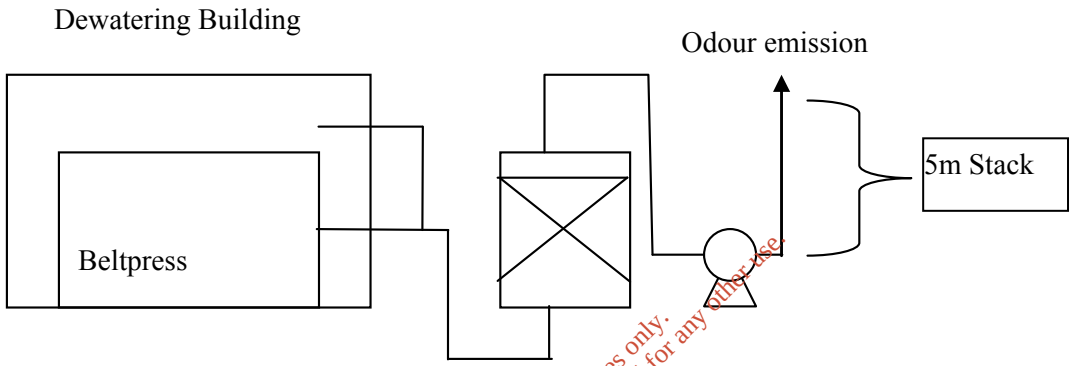


Figure E.2 Diagrammatic Illustration of scenario two

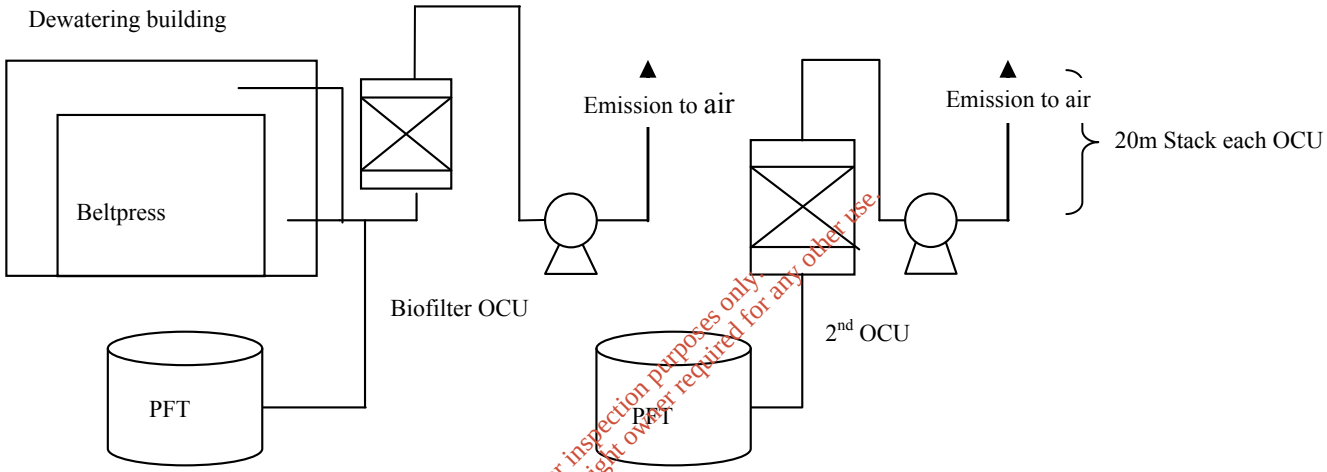
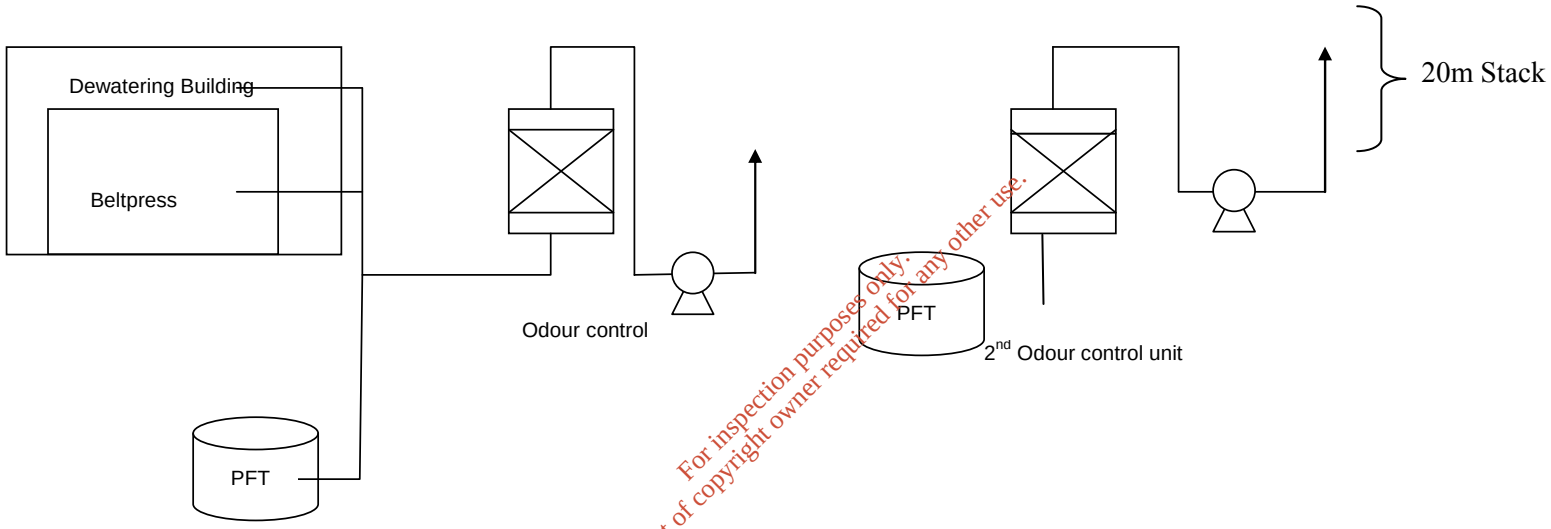


Figure E.3 Diagrammatic illustration of scenario three



Note: Scenario also includes chemical dosing of all none extracted sources; inlet works, the upgraded and proposed aeration tanks, the four settlement tanks, storm tank, tertiary treatment and the distribution network

Figure E.4 Diagrammatical illustration of scenario four

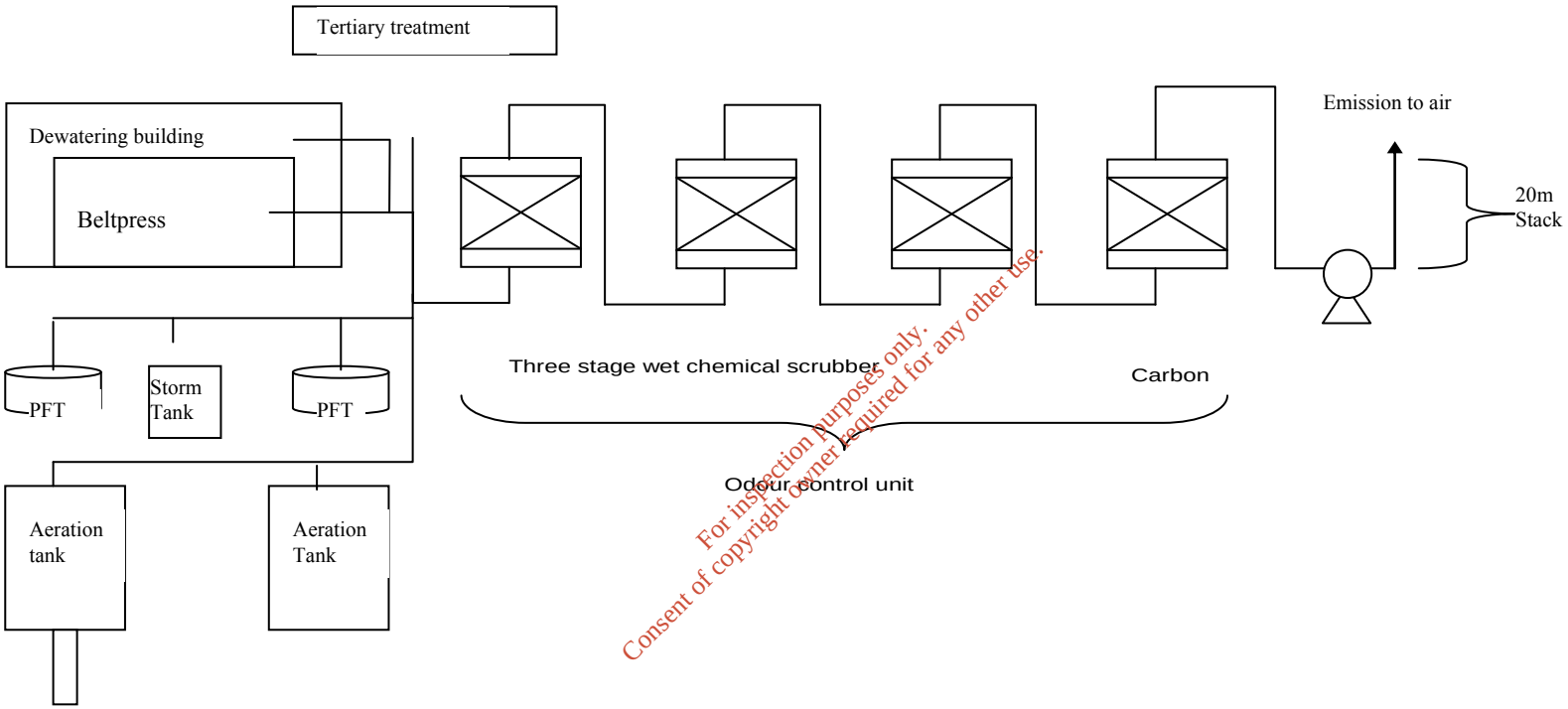
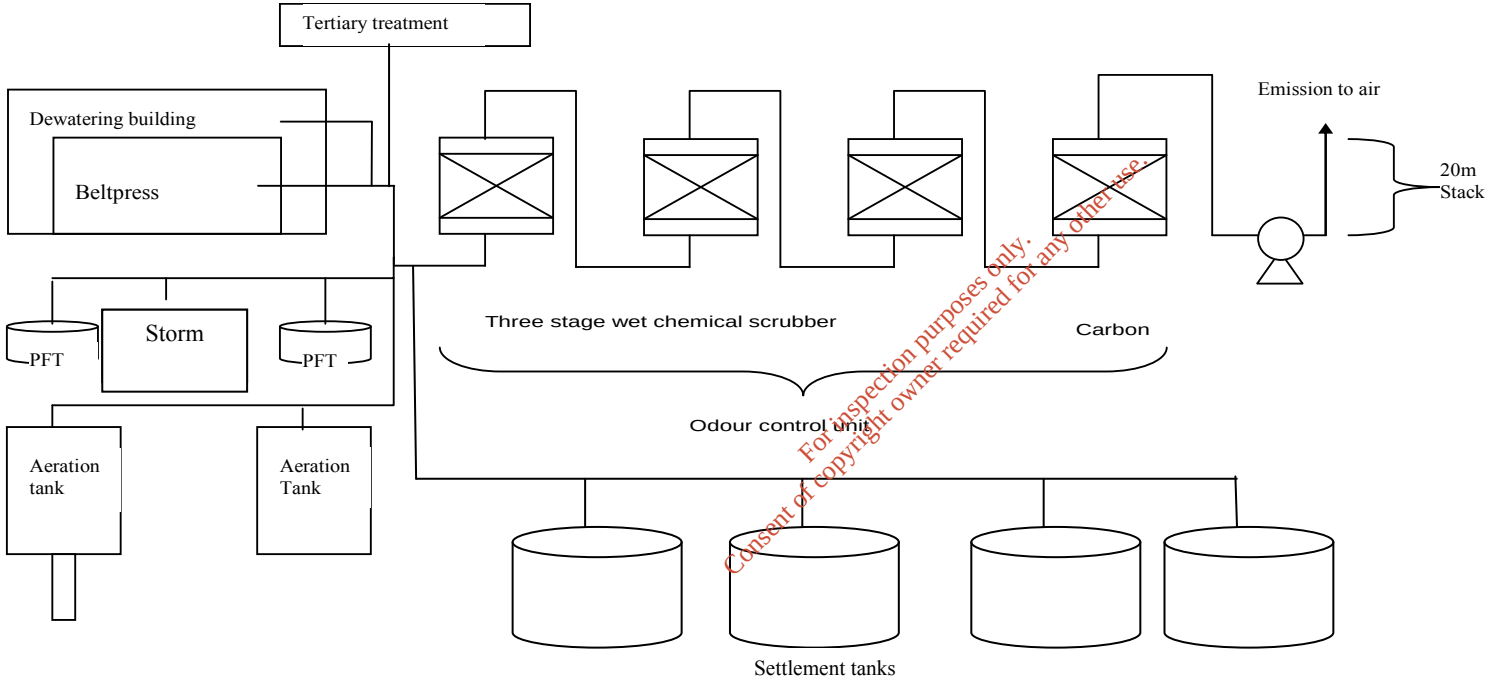


Figure E.5 Diagrammatic Illustration of scenario 5a (20m stack), 5b (13m stack) 5c (relocation OCU to NE boundary)



Appendix F
Predicted Odour Concentrations

Table F.1 Odour concentrations at discrete receptor locations for existing site for each year of meteorological data

Receptor Number	Receptor Location (coordinates x, y)	Concentration $ou_E m^{-3}$ at 98th percentile of hourly averages for each year of available meteorological data				
		2002	2003	2004	2005	2006
1	-34.8, 16.9	18.5	24.6	10.1	17.4	31.4
2	-6.6, 43.9	2.9	3.2	3.3	2.6	6.5
3	-82.7, 54.8	5.1	7.1	2.1	3.6	10
4	-107.7, 94.1	3.5	4	1.2	1.5	4.3
5	-45.9, 201.4	2.5	1.7	1.3	1.5	2.7
6	22.4, -129.5	0.9	1.0	1.0	1.7	1.9
7	126.5,-73.7	1.1	2.6	6.2	3.6	2.7

Table F.2 Odour concentrations at sensitive receptor locations for proposed development for each year of meteorological data

Receptor Number	Receptor Location (x, y coordinates)	Concentration $ou_E m^{-3}$ at 98th percentile of hourly averages for each year of available meteorological data				
		2002	2003	2004	2005	2006
1	-34.8, 16.9	30.2	36.5	19.6	28.9	43.5
2	-6.6, 43.9	9.4	10.7	12.1	5.1	18.0
3	-82.7, 54.8	11.4	17.5	5.0	12.7	23.4
4	-107.7, 94.1	6.4	10.0	2.3	4.0	12.8
5	-45.9, 201.4	6.7	4.2	3.0	3.6	7.9
6	22.4, -129.5	2.4	2.5	3.3	2.8	7.2
7	126.5,-73.7	5.8	12.5	17.6	14.4	14.1

Table F.3 Odour concentrations at sensitive receptor locations for scenario two for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	25.2	31.5	13.8	25.0	39.1
2	-34.8, 16.9	8.7	9.9	11.1	4.8	15.3
3	-82.7, 54.8	8.6	12.3	3.5	7.8	18.0
4	-107, 94.1	5.6	7.8	1.9	2.9	9.2
5	-106, -39.1	4.9	8.2	3.8	3.3	10.6
6	22.4, -129.5	2.3	2.4	2.9	2.5	6.9
7	126.5, -73.7	4.6	10.6	14.8	11.5	10.4

Table F.4 Odour concentrations at sensitive receptor locations for scenario three for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	13.0	16.0	7.2	12.8	20.0
2	-34.8, 16.9	4.6	5.1	5.7	2.6	8.0
3	-82.7, 54.8	4.5	6.6	2.2	4.5	9.5
4	-107, 94.1	3.0	4.3	1.3	2.0	5.0
5	-106, -39.1	2.6	4.4	2.2	1.7	5.6
6	22.4, -129.5	1.3	1.3	1.6	1.4	3.7
7	126.5, -73.7	2.6	5.7	7.7	6.1	5.5

Table F.5 Odour concentrations at sensitive receptor locations for scenario four for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	1.00	2.21	0.91	0.95	2.45
2	-34.8, 16.9	0.50	0.56	0.57	0.28	0.95
3	-82.7, 54.8	0.41	0.63	0.26	0.43	0.75
4	-107, 94.1	0.35	0.39	0.22	0.28	0.41
5	-106, -39.1	0.39	0.52	0.31	0.28	0.56
6	22.4, -129.5	0.21	0.24	0.24	0.21	0.43
7	126.5, -73.7	0.43	0.62	1.17	1.00	0.95

Table F.6 Odour concentrations at sensitive receptor locations for Scenario five- a for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	0.03	0.02	0.01	0.01	0.03
2	-34.8, 16.9	0.04	0.03	0.02	0.02	0.04
3	-82.7, 54.8	0.08	0.07	0.06	0.05	0.07
4	-107, 94.1	0.14	0.17	0.11	0.08	0.12
5	-106, -39.1	0.17	0.09	0.07	0.11	0.16
6	22.4, -129.5	0.06	0.06	0.04	0.05	0.08
7	126.5, -73.7	0.06	0.06	0.06	0.05	0.07

Table F.7 Odour concentrations at sensitive receptor locations for scenario five -b for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	0.35	0.12	0.11	0.11	0.17
2	-34.8, 16.9	0.17	0.14	0.08	0.15	0.17
3	-82.7, 54.8	0.48	0.50	0.31	0.31	0.35
4	-107, 94.1	0.69	1.04	0.41	0.37	0.48
5	-106, -39.1	0.53	0.36	0.26	0.38	0.45
6	22.4, -129.5	0.10	0.13	0.09	0.20	0.16
7	126.5, -73.7	0.32	0.26	0.41	0.50	0.32

Table F.8 Odour concentrations at sensitive receptor locations for scenario five c for each year of meteorological data

Receptor	Receptor Location (x, y coordinates)	Concentration ou_E m^{-3} at 98th percentile of hourly averages for each year of Meteorological data.				
		2002	2003	2004	2005	2006
1	-6.6, -43.9	0.09	0.05	0.04	0.04	0.08
2	-34.8, 16.9	0.08	0.06	0.04	0.06	0.08
3	-82.7, 54.8	0.14	0.09	0.09	0.10	0.11
4	-107, 94.1	0.17	0.17	0.14	0.13	0.14
5	-106, -39.1	0.22	0.12	0.07	0.15	0.21
6	22.4, -129.5	0.06	0.07	0.04	0.07	0.08
7	126.5, -73.7	0.08	0.06	0.07	0.07	0.08

Figure F.1 Worst Case Odour Contour for Scenario 1

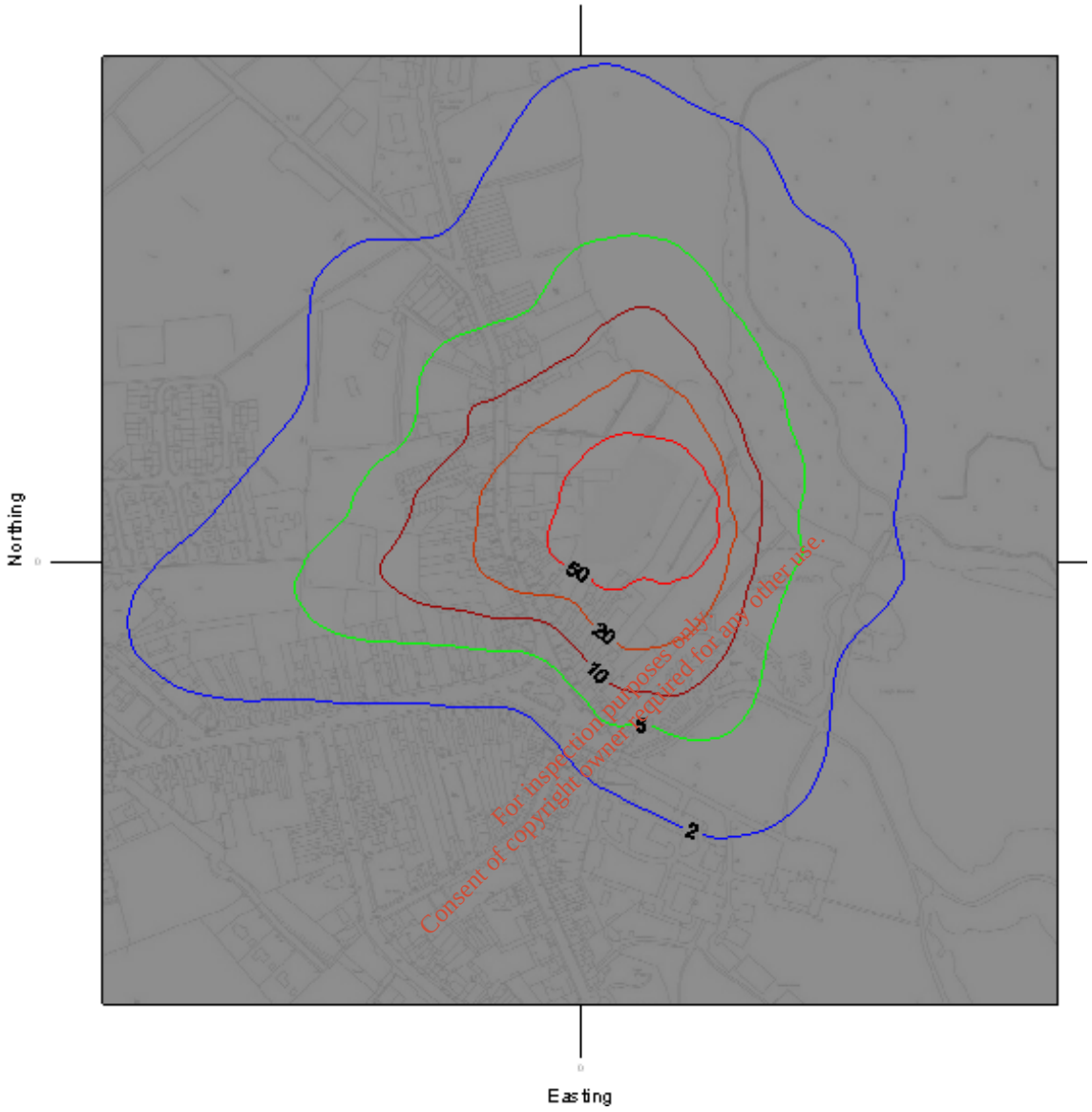
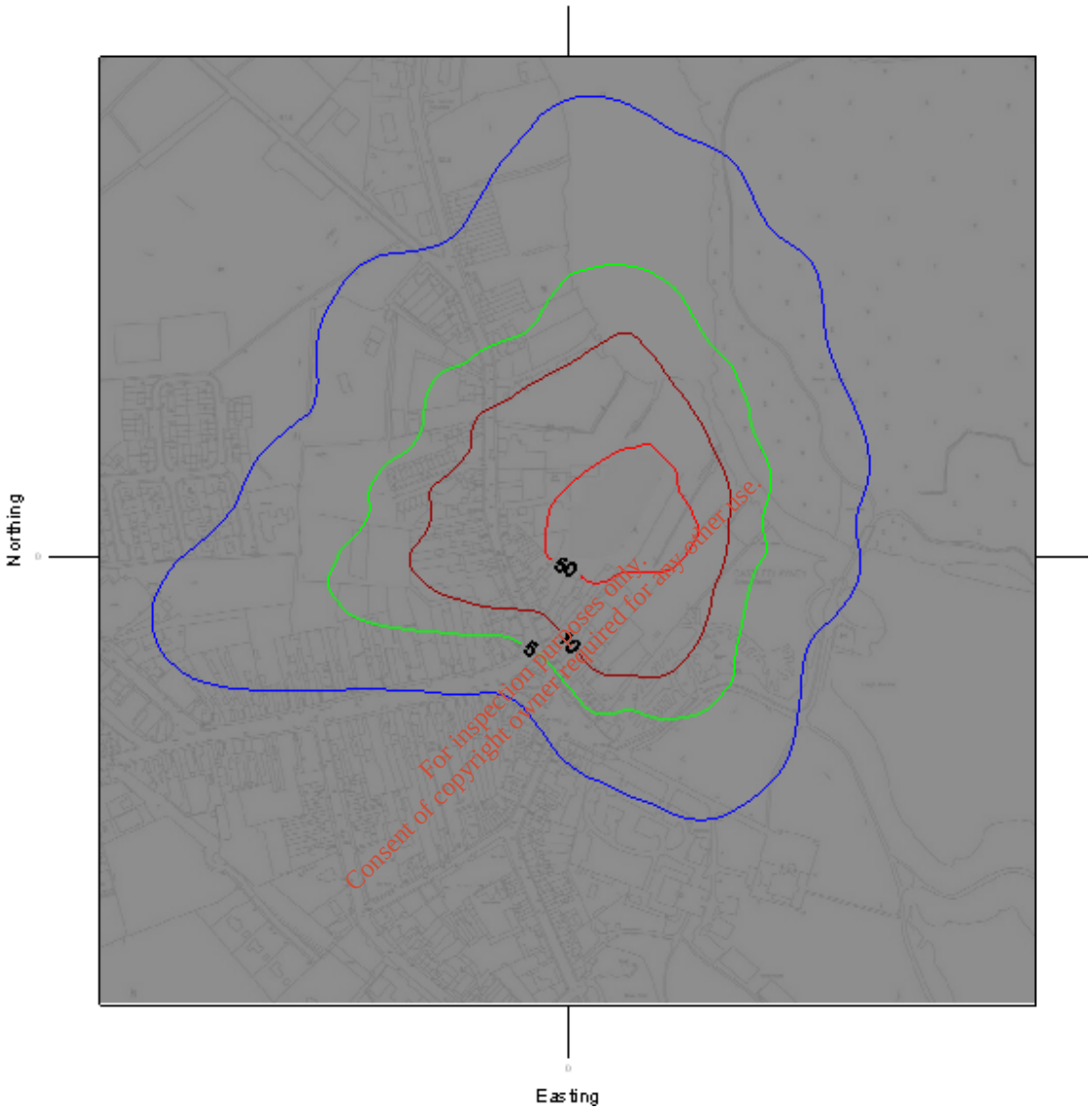


Figure F.2 Worst Case Odour Contour for Scenario 2



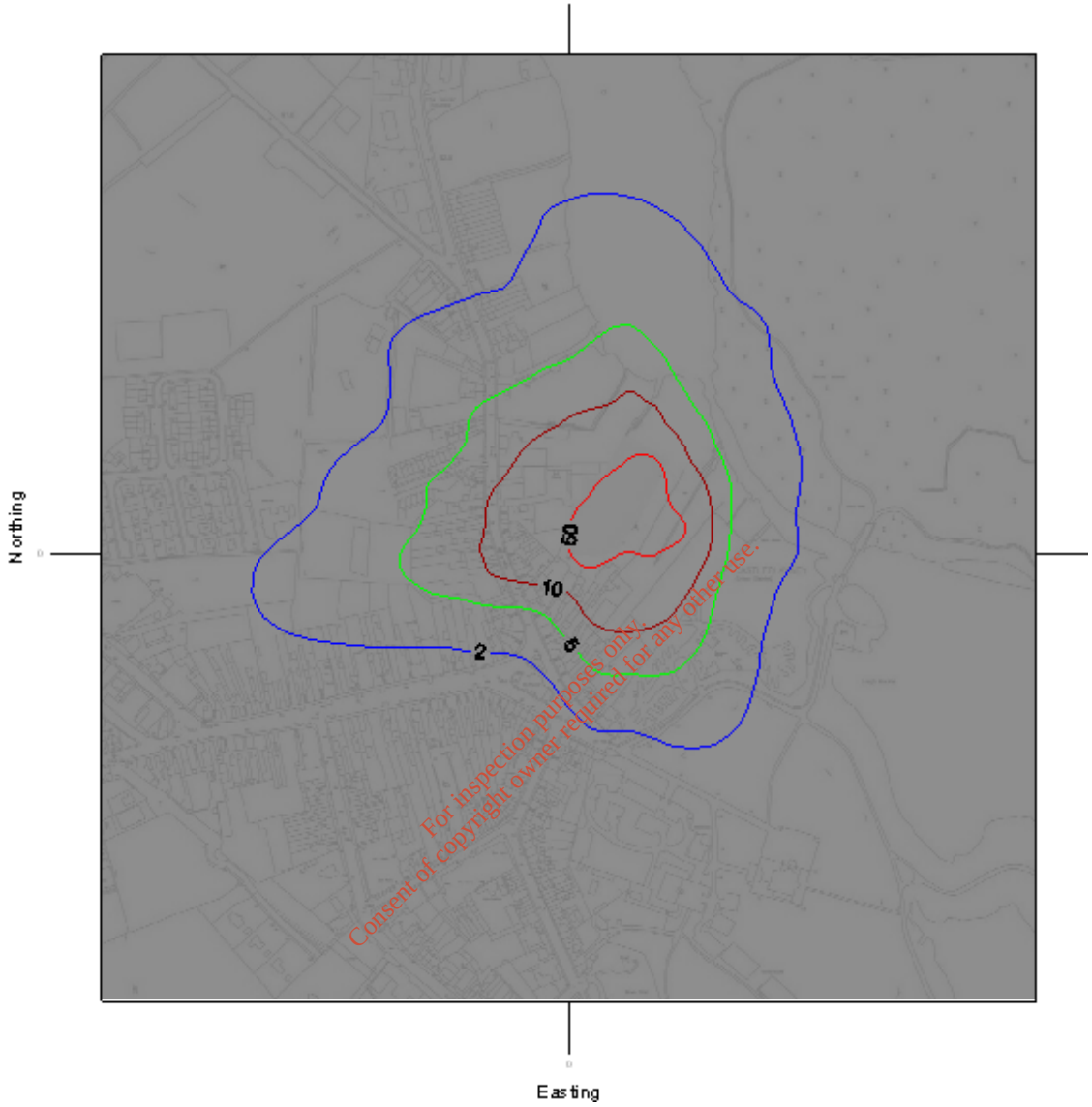


Figure F.3 Worst Case Odour Contour for Scenario 3

Figure F.4 Worst Case Odour Contour for Scenario 4 (2006)

Figure F.5 Worst case odour contour for scenario 5a (2003)

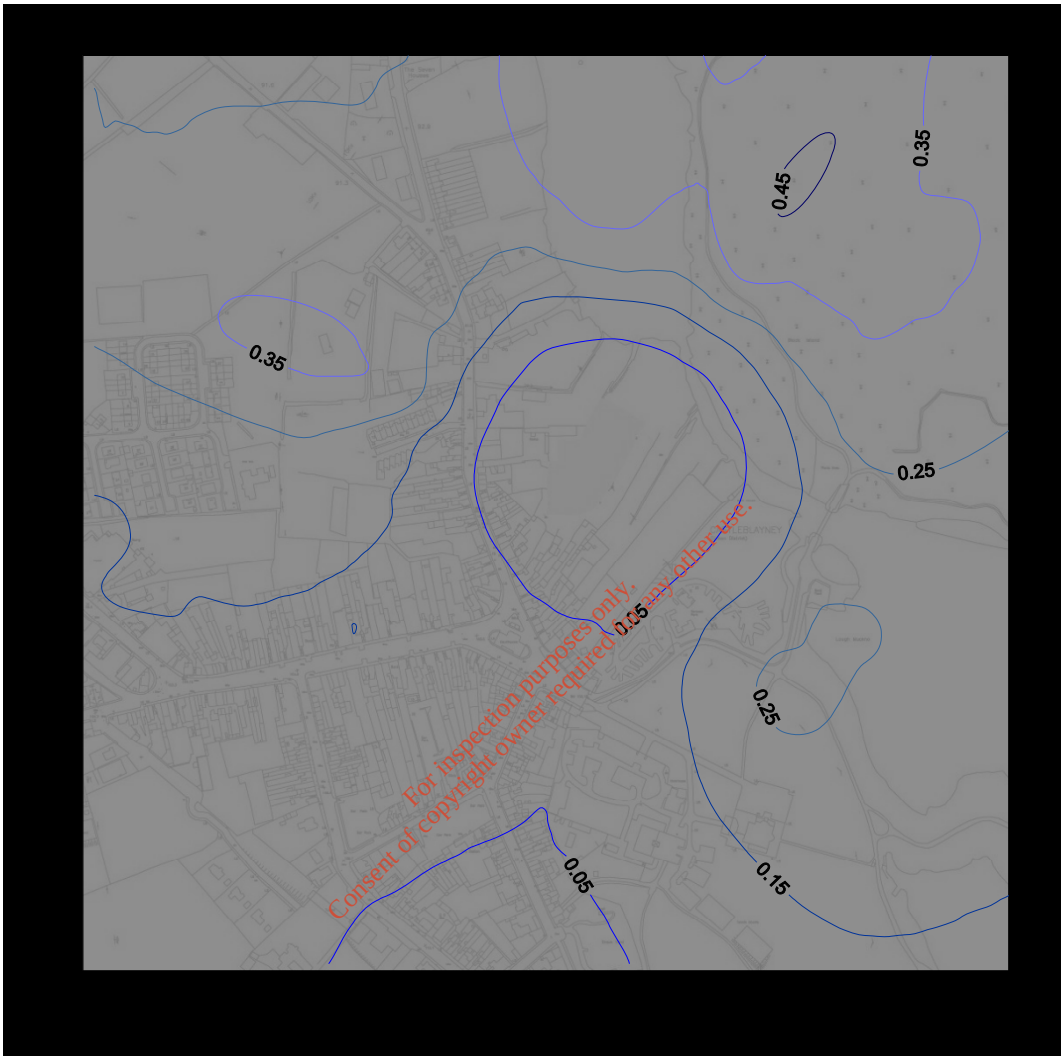


Figure F.6 Worst Odour Contour for Scenario 5b (2003)

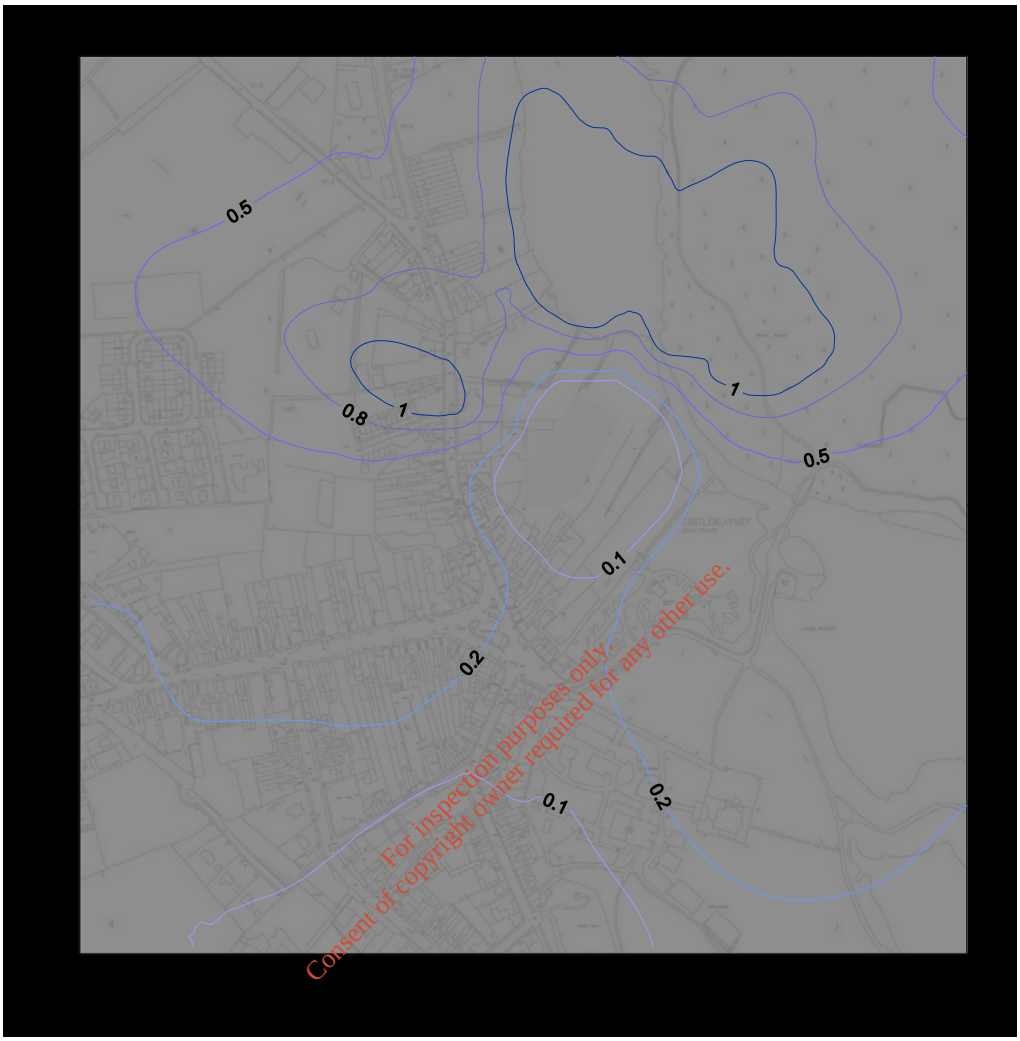
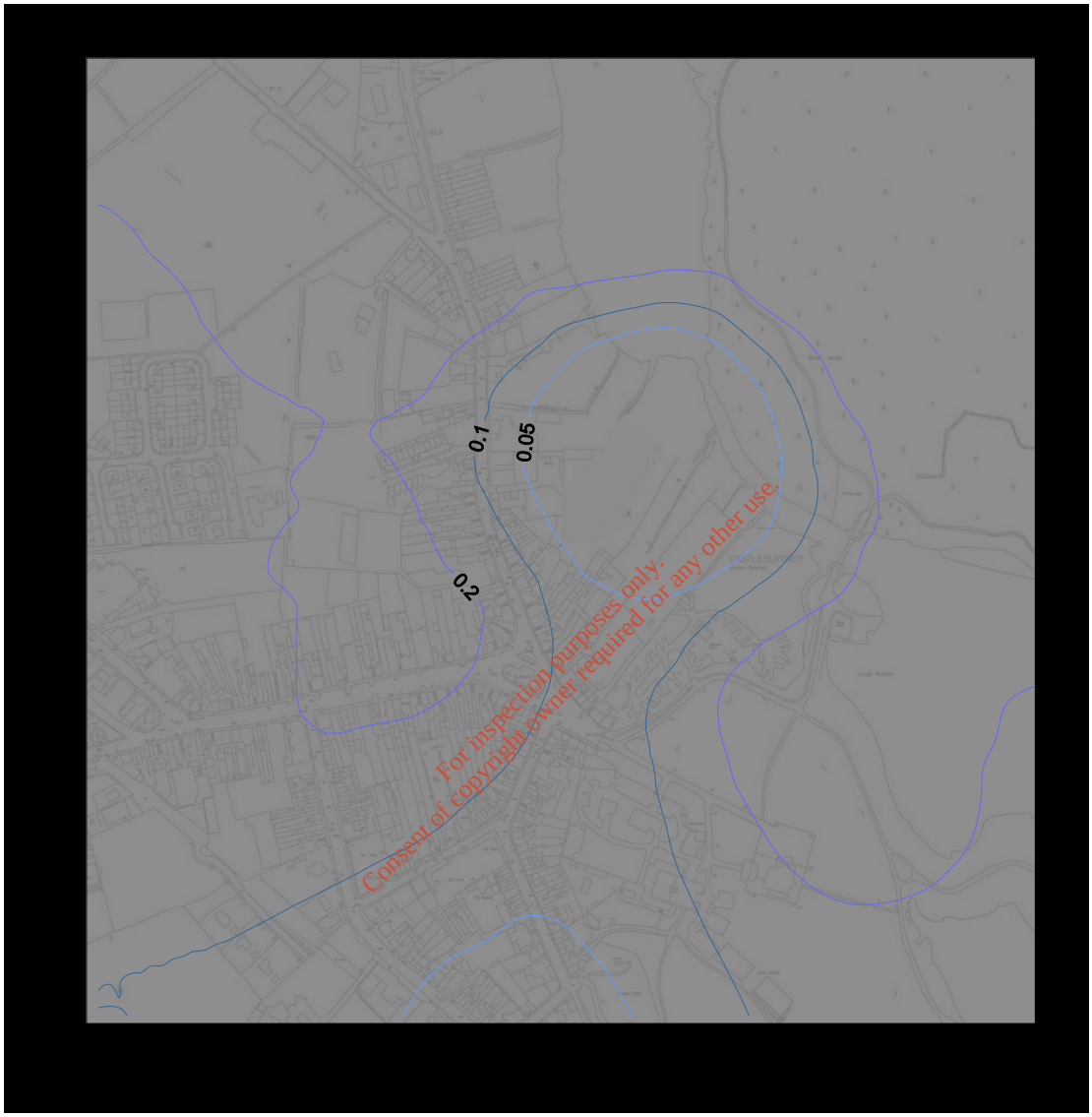


Figure F.7 Worst Case Odour Contour for Scenario 5c (2006)



Appendix G
Meteorological Wind Roses

Figure G.1 2002

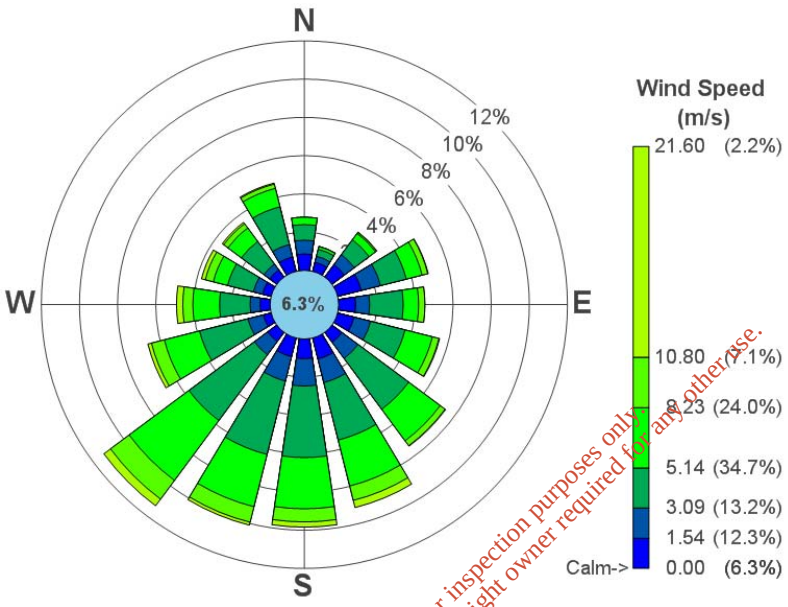


Figure G.2 2003

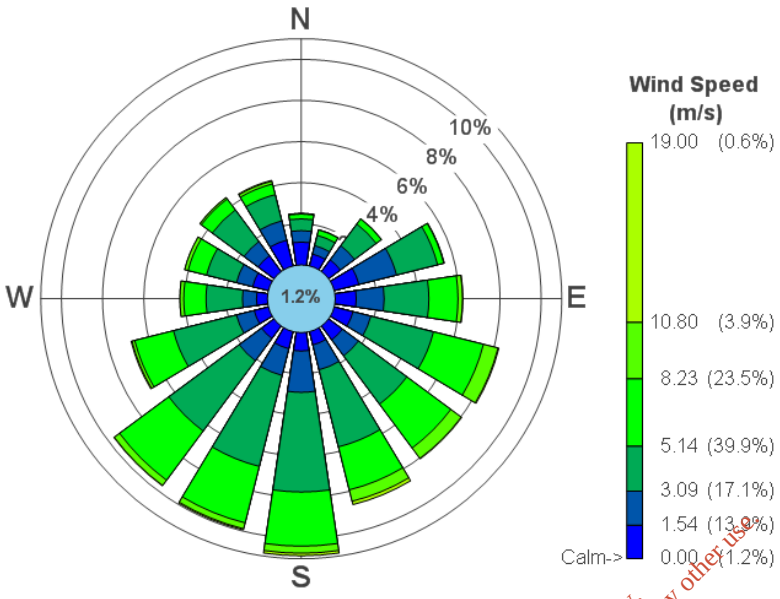


Figure G.3 2004

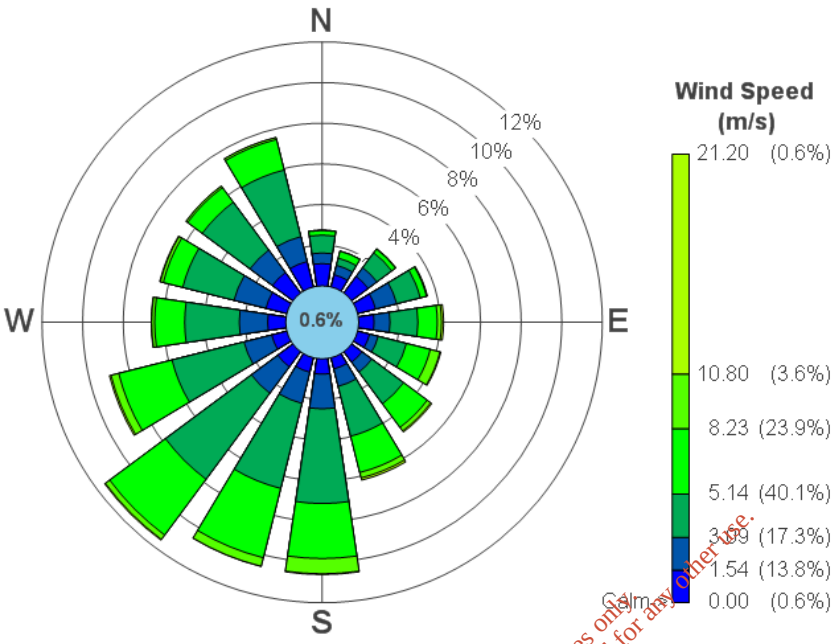
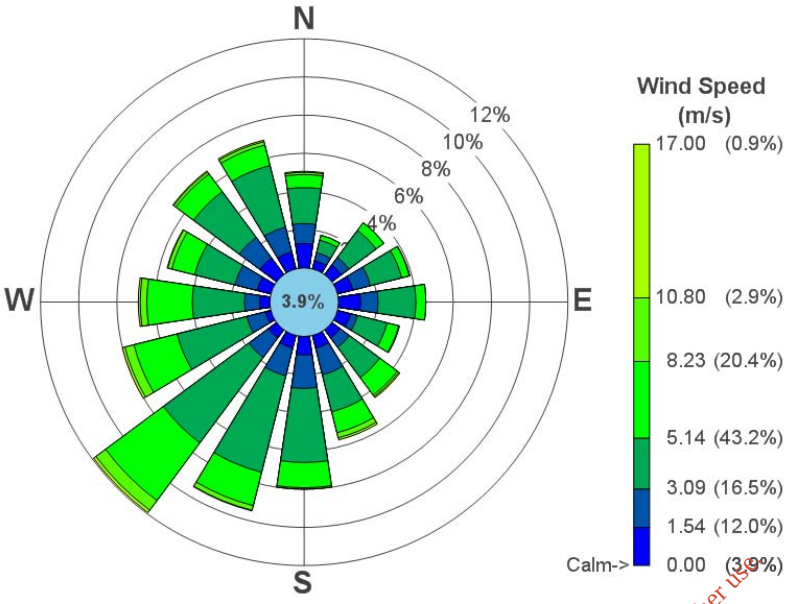


Figure G.4 2005



Appendix H
Ecological Best Practice

Otters

Legislation

Otters are protected under both the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000 and the Habitats Directive 92/43/EEC, which was implemented into national law by the European Communities (Natural Habitats) Regulations, 1997 as amended[24]. The Wildlife Act makes it illegal to wilfully interfere with or destroy the breeding place of otters and in addition the Natural Habitats Regulations prohibit the deliberate disturbance and destruction of breeding sites or resting places (i.e. holts or couches).

Working Guidelines

- The work may be undertaken only if it is necessary and unavoidable and must be limited to causing the minimum amount of disturbance or damage necessary to achieve the purpose for which it is being carried out.
- If holts/lie up areas are developed/become apparent during the proposed works, an ecologist should be consulted to ensure that any risk of disturbance or injury is kept to a minimum. If such a risk exists a suitably experienced person should be on hand to advise.
- Operations involving use of machines near ditches should only be undertaken by those suitably trained or competent in the use of the equipment. The operators should be made aware of the possible presence of the voles and the need to take extra care in that area.
- No chemicals should be used in the immediate vicinity of a ditch unless absolutely necessary, and in these circumstances only those known to be safe for animals should be used. NB EPA may need to be consulted regarding the use of chemicals near to a watercourse. Chemicals should be stored safely away from the ditch.
- All rubbish would be safely removed from site – after examination for any animal that may be using it.
- If necessary, trees and shrubs should be felled away from the obvious direction of any burrows and should not be uprooted but cut to ground level. (Forestry operations are licensable, woodland management is not).
- All trenches left open overnight should include a means of escape for any animals that may fall in.
- Obvious mammal pathways should be left clear of obstruction.
- Dogs should not be taken onto the site by any of the workforce.
- Reinstatement of any damage should be under the guidance of an experienced mammal worker.

- Entrances may be protected against materials falling in accidentally. Any methods used should not restrict air-flow and must be removed before leaving the site at the end of the day.
- If the ditch area is to be marked off to avoid interference, this should be done with rope, fencing or wire. Plastic tape can be very disturbing to mammals in windy weather and should be avoided.
- Where it is necessary to walk over the top of the ditches, planking should be provided to spread the load if the soil is very light, or there is a chance of burrow collapse.
- All work should be carried out as quickly and quietly as possible.

Badgers

Legislation

Badgers are protected under the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act 2000, which makes it illegal to wilfully interfere with or destroy their breeding places (i.e. setts).

Working Guidelines

No disturbance near to any sett may be undertaken unless appropriate advice and licensing has already been obtained.

- The work may be undertaken only if it is necessary and unavoidable and must be limited to causing the minimum amount of disturbance or damage necessary to achieve the purpose for which it is being carried out.
- Any disturbance within 30 m of a sett may need to be licensed by National Parks and Wildlife Service (NPWS).
- All digging within 10 metres of the nearest sett entrance should be done by hand.
- Noisy machinery near setts should be used before mid-day, if possible, to allow badgers to settle down afterwards so that their normal foraging activity is not disrupted any more than is necessary.
- Operations involving use of machines near setts should be undertaken by only those suitably trained or competent in the use of the equipment. The operators should be made aware of the likely extent of the sett and the need to take extra care in that area.
- Work near active badger setts should be carried out between the months of July and November, thus avoiding the badger breeding season (December to June) and also remembering to avoid the bird breeding season when scrub clearance is undertaken.
- No chemicals should be used in the immediate area of a sett unless absolutely necessary and in these circumstances, only those known to be safe for animals should be used. Chemicals should be stored safely away from the sett area.
- All rubbish would be safely removed from site – after examination for any animal that may be using it.

- Where badgers may be forced to move from the sett, or place of shelter, because the structure, such as a garden shed, fence or farm outbuilding, is being dismantled, the work should be carried out as late in the day as possible to avoid badgers being bolted above ground in broad daylight.
- Scrub clearance should be avoided over the tops of setts and close to sett entrances.
- Trees and shrubs should be felled away from the obvious direction of a sett and should not be uprooted but cut to ground level where necessary. (Forestry operations are licensable, woodland management is not).
- All trenches left open overnight should include a means of escape for any animals which may fall in.
- Buildings and structures, such as sheds, may be dismantled, but in such cases the floor should be left in place, if possible, if it forms the top of the sett.
- Fires should be lit at the furthest distance possible from the sett.
- Obvious badger/mammal pathways should be left clear of obstruction.
- Where avoidable, dogs should not be taken onto the site by any of the workforce.
- Reinstatement of sett damage should be under the guidance of an experienced badger worker.
- Entrances may be protected against materials falling in accidentally. Any methods used should not restrict air-flow and must be removed before leaving the site at the end of the day.
- If the sett area is to be marked off to avoid interference, this should be done with rope, fencing or wire. Plastic tape can be very disturbing to badgers in windy weather and should be avoided.
- Where it is necessary to walk over the top of a sett, planking should be provided to spread the load if the soil is very light, or there is a chance of sett collapse.
- All work should be carried out as quickly and quietly as possible.

Appendix I
Waste Assimilative Capacity Calculations

Nicholas O'Dwyer CONSULTING ENGINEERS

Calculation Sheet

		Rev	Date		By
Project Number:	20384	*1.0*	*25-Feb-10*		*F. Lane*
Project Name:	Castleblayney				
Sheet:	1 of 1				

Waste Assimilative Capacity (WAC) Calculation

Name of River Fane

	m³/s	Data Source	m³/d
Dry Weather Flow	0.050	Estimated	4,320
95% Flow	0.100	OPW-estimated	8,640
Mean Annual Flow	1.583	OPW-estimated	136,771

Average Measured Background Conc			Allowable Downstream Conc		
	mg/l	Data Source	95%ile mg/l	Mean mg/l	Data Ref
Carbonaceous BOD	1.20	Assume high status	2.60	1.50	Surface water regs - good status
Ammonia Nitrogen (NH)	0.040	Assume high status	0.14	0.065	Surface water regs - good status
Oxidised Nitrogen (TON)	50.00		50.00	50.00	Drinking Water Regs
Total Nitrogen (TN)	1.00	Calculated	1.00	1.00	n/a
Ortho Phosphate (OP)	0.025	Assume high status	0.075	0.035	Surface water regs - good status
Ortho P to Total P Ratio	1.000				

Dry Weather Flow	Flow in River	Allowable effluent conc	WAC		Comments
m³/d	95 Percentile m³/d	BOD mg/l	BOD kg/d		
3150	8,640	6.44	20.29		Phase I Flow
4725	8,640	5.16	24.38		Phase II Flow
6300	8,640	4.52	28.48		Phase III Flow
m³/d	Mean m³/d	BOD mg/l	BOD kg/d		
3150.0	136,771	14.53	45.76		Phase I Flow
4725.0	136,771	10.18	48.12		Phase II Flow
6300.0	136,771	8.01	50.48		Phase III Flow
m³/d	95 Percentile m³/d	NH mg/l	NH kg/d		
3150.0	8,640	0.41	1.31		Phase I Flow
4725.0	8,640	0.32	1.53		Phase II Flow
6300.0	8,640	0.28	1.75		Phase III Flow
m³/d	Mean m³/d	NH mg/l	NH kg/d		
3150.0	136,771	1.15	3.62		Phase I Flow
4725.0	136,771	0.79	3.73		Phase II Flow
6300.0	136,771	0.61	3.83		Phase III Flow
m³/d	95 Percentile m³/d	OP mg/l	OP kg/d		
3150.0	8,640	0.21	0.67		Phase I Flow
4725.0	8,640	0.17	0.79		Phase II Flow
6300.0	8,640	0.14	0.90		Phase III Flow
m³/d	Mean m³/d	OP mg/l	OP kg/d		
3150.0	136,771	0.47	1.48		Phase I Flow
4725.0	136,771	0.32	1.53		Phase II Flow
6300	136,771	0.25	1.59		Phase III Flow
m³/d	Mean m³/d	TP mg/l	TP kg/d		
3150.0	136,771	0.47	1.48		Phase I Flow
4725.0	136,771	0.32	1.53		Phase II Flow
6300.0	136,771	0.25	1.59		Phase III Flow

Additional Comments