Clare County Council

Application for wastewater discharge licence for Clareabbey treatment plant

Non-technical summary

In accordance with Article 5 of Waste Water Discharge (Authorisation) Regulations, S.I. 684 of 2007

Section A: Non-technical summary

1. Introduction

Clare County Council is required to make an application to the Environmental Protection Agency (E.P.A) for a licence to discharge treated wastewater from the wastewater treatment plant (WWTP) at Clareabbey, serving the southern end of the Ennis town agglomeration, in accordance with Article 5 of the *Wastewater Discharge (Authorisation) Regulations 2007, (S.I No 684 of 2007*), on or before 22nd September 2008. The application form and its attachments are completed, as required by the E.P.A, in accordance with guidance notes provided by the Agency. Burke Environmental Services prepared the application for Clare County Council.

2. Description of Ennis town catchments

Ennis is the county town of Clare, located on the N18, some 24 miles north of Limerick City and 40 miles south of Galway City. The town is mainly concentrated in an area of low ground, generally below 10mOD, in the lower catchment of the River Fergus, within the tidally affected reaches of the river. Ennis town has experienced steady growth during recent years, with the level of housing development in line with national trends and due to its proximity to Shannon, Limerick and Galway. The Claureen/Inch River is tributary of the Fergus and joins the Fergus on the Western side of the town. Upstream of this confluence, the Fergus River branches into two parts. The major branch flows through the town centre. The minor branch flows in an easterly direction, rejoining the main river just downstream of the Clonroad Bridge. The major reaches of the Fergus and Claureen rivers, in the vicinity of Ennis town is provided as Attachment A-1.

The topography of the town has shaped the development of the sewerage system into four sub-catchments, namely Tulla Road, Francis Street, Clareabbey and Clarecastle, with each sub-catchment draining to a main pumping station. (Attachment A-2). Foul flows from the Westfields pumping station are directed to the Clareabbey WWTP, via rising mains, with an estimated population loading of 6,095, generating an average loading of 21 litres/sec, and a peak load of 34 litres/sec (based on the

August 2008 maximum pumping rate from Westfields pumping station). A map indicating the catchment served by the Clareabbey plant, the location of the Clareabbey treatment plant, and the pumping stations is provided as Attachment B-1, and an aerial view of the catchment is provided as Attachment A-3

Westfields pumping station is the main pumping station serving the southern area of Ennis and environs catchment. The Clareabbey sub-catchment stretches from St. Flannans College and Ard Aoibheann estate on the northern end to the Kildysert Cross Junction at the southern end, and from the railway line in Toberteaskan at the eastern end to College Green (St. Flannan's Drive) on the western boundary.

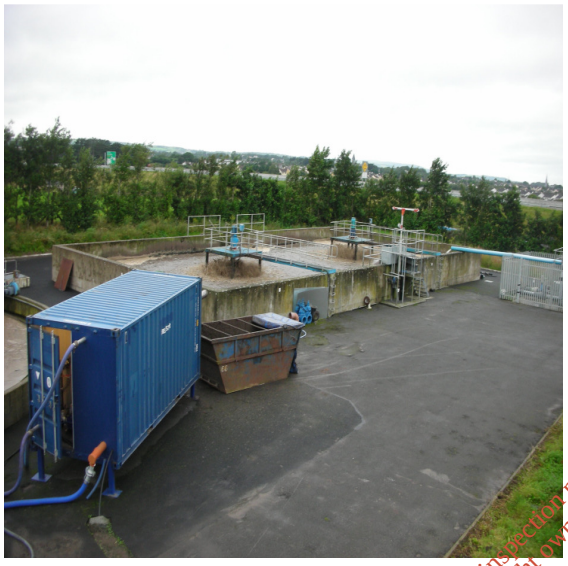
3. Wastewater sources

Domestic and commercial sources of wastewater are the main components of the discharge to the Clareabbey wastewater treatment plant. The commercial sector is made up of discharges from the West County Hotel, numerous Bed & Breakfast facilities and the Quin Road Industrial estate. The business activities located in the Quin Road Industrial Estates are primarily dry industries, with no trade effluent licences to discharge trade effluent to sewer (under Section 16 of the Local Government (Water Pollution) Act, 1977). The West County Hotel discharge is licensed under Section 16 of the Act, and appropriate grease removal facilities are fitted on this discharge line. A copy of this licence is provided as Attachment A-4 to this application.

The population of Ennis and Environs was calculated for each of the town's sub-catchments (Attachment A-2) for the Ennis Main Drainage and Flooding Study in 2001. The existing residential population in the Clareabbey catchment was estimated as 2,955 in this study**.** Significant older areas of housing development in the Clareabbey catchment (mainly Kildysert Road, Ballybeg and Tobarteascain) are not linked to the town sewer infrastructure, but operate on single house septic tank disposal units. While these houses are included in the population count, they will not be relevant in the context of existing flow volumes to the Clareabbey plant. The total industrial, commercial and institutional population in the Clareabbey catchment was calculated as 998, providing a total population of 3,953. In November 2001, (at the time of the survey) the population arising from planning applications pending

approval in the Clareabbey catchment was 324. Between 2003 and 2008 (inclusive) permission has been granted for 1185 residential units (both houses and apartments), with associated population equivalent estimated at 2920. The detail of permissions granted in recent years is provided in Attachment A-5 to this application.

4. The Wastewater Treatment Plant (WWTP)



The Clareabbey WWTP was constructed in 1981/1982, on the west side of the Ennis-Limerick railway line, approximately 500m south of the ruins of the Augustinian Clare Abbey. The plant is now clearly visible from the Ennis by-pass, just south of the railway bridge. The access route to the plant is from the Limerick Road, near Kildysert Cross, via a lay-by, sharing the access route with the old GAA pitch and a small number of private dwellings.

The original design data for the plant indicates that the plant was constructed to serve a population equivalent (PE) of 4,000, and an upgrade to the plant in 2001/2002 provided improved screening and aeration, to provide treatment for 6,000 P.E. The design data is summarised in Table 1 hereunder:

Table 1: Design data for Clareabbey WWTP

Parameter	Initial plant	Upgrade
Design Load	4000	6000
DWF	900 m^3/day	1350 m^3/day
BOD_5 Load	240 kg/day	360 kg/day

The above design was based on previous definitions of population equivalent and dry weather flow, with 60grms BOD and 225 litres flow per head per day. Under the Waste Water Discharge (Authorisation) Regulations, 2007, the calculation of population equivalent is based the maximum average weekly flow entering the waste water works during the year and measurement of organic biodegradable load for this

flow, allowing 60g of BOD_5 per head of population. Flow measurements should exclude unusual situations such as those due to heavy rain.

5. Treatment Process Description

Clareabbey WWTP operates as an extended aeration activated sludge process, and consists of the following elements:

- Inlet pump house
- Inlet screening, fitted with screening removal and bypass
- Aeration tank fitted with open vane surface aerators
- Final settlement tank with sludge collection hopper
- Final outflow with venturi flume and flow measurement
- Sludge belt press
- Masko-Zoll sludge dewatering unit
- Administration control house

5.1 Inlet pump houses.

The inlet pumping station delivering wastewater loads to the Clareabbey WWTP is located at Westfields housing estate, on the east side of the Limerick Road, 600 metres north of the treatment works. This station was constructed in 1981. A 250mm rising main from this station delivers flow directly to the Clareabbey WWTP. At construction, three pumps were provided in the pumping station with design pumping capacities as follows:

- Single pump operation: 20litres/second
- Two pumps operating; 32 litres/second
- A third pump of equal capacity, providing 50% standby. When all three pumps operate the total combined output is 42litres/second.

The pumping station is currently being upgraded to provide three pumps of equal capacity. During the course of preparation for the licence application, the pump records for the pumping station were examined. The records indicate a maximum flow of 32 litres/sec to the Clareabbey WWTP. Details of the upgrading works already commenced for this pump house are described in Section 9 of this report, under the heading "Short and long term measures to address pumping facilities"

The Kildysert Cross pumping station was constructed in 2003 to cater for serviced lands in this area, in accordance with the Serviced Land Initiative. This pumping station has a design population equivalent of 6,500, at 4DWF (67 litres/sec), and delivers its flow to the Westfields pumping station. The station is currently well below capacity. This pumping station is also due to be examined during the process of construction of the new works at Clareabbey.

The Quin Road Pumping station, serves housing developments and the Quin Road Industrial Estates. This pumping station is owned by Shannon Development and will be licensed under Section 16 of the Local Government (Water Pollution) Act 1977 in the near future. This pumping station also delivers foul flows to the Westfields Pumping Station.

The locations of all pumping stations is indicated on the Map Attachment B-1 to this application.

5.2 Inlet Screening

The Automatic Screening Conditioning Equipment (ACE), manufactured by Haigh Engineering, was fitted on the inlet line at Clareabbey WWTP in 2001. This unit (Model LS303V) comprises a brush screen, a 152 ACE pump, a liquid separator station and a control panel. The function of the system is to screen raw sewage, depositing inorganic material into a collecting bin, while allowing the filtered sewage to flow into the treatment plant. A screen bypass is provided to divert overflow directly to the aeration basin (blue pipe).

5.3 Aeration Basin.

The single aeration tank is a flat-bottomed tank, with a reactor volume of 1500 m^3. Based on the Stage 1 design, (pre-2001) this should provide a retention time at design dry weather flow of 1.67 days (40 hours). With the increased flow through the system, approximating to 1450m^3, the retention time is approximately 24 hours. The aeration system is fitted with two open vane surface aerators. Four inlet pipes enter the baffled inlet area of the tank.

- Inlet 1 (250 mm diameter) is the feed line from the inlet screen.
- Inlet 2 (100 mm diameter) is the feed line from the sludge pumping station carrying return sludge from the final settlement tank to the aeration basin
- Inlet 3 (75mm diameter) is the return feed line from the sludge-handling unit, carrying supernatant from this system to the aeration basin.
- Inlet 4 (250mm diameter) is the overflow line from the inlet screen operating when inflows exceed the capacity of the ACE system.

5.4 Final settlement tank/Clarifier

The outlet from the aeration tank is opposite the inlet point, with a control weir operating at this outlet. A dissolved oxygen probe is located here, but the probe is not operational. The effluent passes (via a 300mm diameter pipe) from the aeration tank to the final settlement tank. The inlet pipe to the settlement chamber is laid under the tank in the centre and rises up toward the top water level.

The settlement tank is a flat bottom tank, with an internal diameter of 19.3m, a sidewall depth of 2m, and a 7.5^o slope to the sludge collection hopper. This provides a surface area of 292m^2. The final settled effluent flows over a weir, located all around the periphery of the tank. A rotating bridge operates around the tank. Based on Stage 1 design, the surface loading rates on the tank are

@ 3 DWF (31 litres/sec): 0.38m^3/ hour

@ 6 DWF (63 litres/sec): 0.77m^3/ hour

Retention times at 3 and 6 DWF are approx 4.5 and 2.25 hours respectively.

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5.5 Final outflow with venturi flume and flow measurement

The effluent from the final settlement tanks is directed by gravity outfall to the River Fergus, which is located due East of the treatment works. A site layout map is provided as Attachment B-2 and the map indicating both the location of the treatment plant and the main discharge point to surface water is provided as Attachment B-1. The treated wastewater discharge is the primary discharge, and is designated SW1 on the maps accompanying the application. This outflow discharges from the plant via a venturi flume, fitted with a flow meter, recorded on an Akron System 10 pressure transducer and recorder. The accuracy of this system has not been crosschecked during the application process, but the most recent calibration of the unit took place in early August 2008. The discharge point to the Fergus River is located between the railway bridge (on the Ennis by-pass) and the Clarecastle tidal barrage, (See photographs of the location of the plant, including the location of outfalls to surface waters, Attachment A-6)

5.6 Sludge Management

Settled sludge is drawn via a 150mm pipe, from the central sludge hopper, into the sludge processing system. This area is fitted with two pumps to pump sludge via the sludge return feed line to the aeration basin, and to discharge waste sludge to the sludge handling system. Sludge thickening takes place in a picket fence thickener, with supernatant return to the aeration basin.

The waste sludge is processed in either the belt press (housed in the administration building) or in the Masko-Zoll unit (installed on site in early 2008). This unit is a mechanical de-watering system housed in a container on site. The sludge is fed into the system, from the holding tank and flocculant is dosed automatically into the feed. The de-watering unit removes waters from the flocculated sludge and solids are separated, pressed and further de-watered in the final screw press. The sludge is collected in an external skip, which is removed off site to a composting facility, McGill Environmental Systems (Irl) Ltd, Ballinvoher, Co. Cork (Waste Permit Mcgill CK (S) 302-06). The contractor removing this material is permitted under WCP/LK/047/02b and WCP/LK/047/07c. Details of sludge volumes and solids content are provide in Attachment C-3

5.7 Administration Control House

The control room and sludge de-watering room are housed in one building on site. The control room houses the main control panel for the treatment plant, with the Arkon System 10 pressure transducer and recorder, a dissolved oxygen recorder, disused flow equipment and basic office facilities provided therein. Daily record sheets with flow data and sludge handling details are maintained on site. In-process monitoring and final effluent monitoring is undertaken on a once per month basis at the plant, to provide appropriate control of the facility performance. The WWTP is manned by one part time operative and an environmental technician on a part time basis (Monday to Friday) and a part-time basis at the weekends.

6. Wastewater Flow volumes

The impact of direct inflows (from storm water) and infiltration inflows (from the ground through service connections) is evident in the historical flow data for the Clareabbey WWTP. The original approach to calculation of population equivalent (in the design documents, using flow data) was based on the estimate of wastewater flow of 175 litres/head/day and 50 litres /head/day infiltration flow. As the collection sewers serving the Clareabbey catchment is laid in very low lying areas (Doora Industrial Estates and Doora Housing Estates, Abbey Court, Westfields and Kildysert

Road) this steady infiltration volume is likely to be an ongoing feature of the hydraulic loading to the system.

Flow records for January-March 2008 and the period from 13th –31st August 2008 have been examined. The most reliable readings (due to calibration of the flow meter) are the August 2008 readings, but this coincided with several days of heavy rainfall, which means that there is a significant infiltration volume included even in the flow measurements taken on several consecutive dry days towards the end of August 2008. The flows recorded 13th –31st August 2008 are provided in Attachment E-1

Based on influent BOD measurement on, this provides a population equivalent of 6095. The total hydraulic load arriving at the Clareabbey WWTP was calculated by measurement of total flow over a seven day period in August 2008, and this measurement was used to estimate the final population equivalent, based on the average influent BOD values in 2007 and 2008. The estimated flow value arriving at the treatment works is 1750m^3 per day, with an average BOD of 209 mg O_2/litre. The population equivalent for this loading is 6,095. This approach to estimation of population equivalent is in accordance with the definition provided in the Waste Water Discharge (Authorisation) Regulations, 2007 ("population equivalent" is a measurement of organic biodegradable load and a population equivalent of 1 (1 p.e.) means the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60g of oxygen per day; the load being calculated on the basis of the maximum average weekly load entering the waste water works during the year, excluding unusual situations such as those due to heavy rain).

7. Combined storm overflows

The only pumping station delivering wastewater flow to the Clareabbey treatment plant is the Westfields station, providing the combined flows from the Kildysert Road and Quin Road sub-catchments. Flows arriving at the station discharge to a wet well, equipped with a storm overflow, which discharges to a small stream due East of the pumping station (behind the Westfields Housing estate). This stream crosses under the railway line just above the ruins of Clareabbey, and discharges to the River Fergus, approximately 20 metres upstream of the Clareabbey ruin, accessed from the

road to the Clareabbey ruin and the railway track. Samples of the stream were taken during the preparation of this application and results of this exercise are set out in Table F.1 (ii) a of the application form.

8. Impact of emissions from the Clareabbey WWTP on River Fergus

The impact of discharges from the Clareabbey WWTP on the receiving waters of the River Fergus is considered under a number of headings:

8.1 Description of receiving waters
8.2 Statutory Designations of the Receiving Waters
8.3 Estimation of dilution/assimilative capacity of the receiving waters
8.4 Total maximum nutrient load discharging to receiving waters
8.5 Monitoring undertaken on receiving waters
8.6 Statutory Designation of the receiving waters
8.7 Studies undertaken on the Fergus River, adjacent to Clareabbey WWTP
8.8 Impact of combined storm overflows to River Fergus

8.1 Description of receiving waters

The Fergus is one of the main tributaries of the River Shannon, and is included in the catchment of the Shannon River Basin and in the EPA hydrometric and biological monitoring programs (Code 27F01). The river rises to the northwest of Corofin village. The river is 59 kilometres long and has a catchment area of 1043 km^2. The upper reaches of the catchment are primarily well draining agricultural lands. This area of the catchment includes several interconnected lakes and streams, which also drain parts of the Burren region. Karst features and underground drainage also affect Fergus river flows.

There are no downstream abstractions of water for potable supplies or for agricultural purposes. The river waters in this area are classified as tidal freshwater from a fish habitat perspective, with the Clarecastle barrage artificially controlling the tidal inflow and salinity levels in the area. In addition to the brackish nature of the waters, there is an extensive network of flood defence embankments present in the area of the discharge from the Clareabbey WWTP and upstream of the discharge point. This

work has disturbed the natural development of the estuarine form, and is probably responsible for a reduced number of natural habitats in the area

8.2 Statutory designations of River Fergus

The Shannon and Fergus estuary area is an area of high ecological interest supporting a range of species listed by the EU "Habitats " Directive (92/43/EC) transposed into national law through the European Communities (Natural Habitats) Regulations 1997. These Regulations require an appropriate assessment of the implications of all development proposals, irrespective of their location, liable to impact on any designated area. The main channel of the River Fergus is designated "salmonid" water, under the *European Communities (Quality of Salmonid Waters) Regulations, S.I. 293 of 1988.* The channel segment between Doora Bridge and Clarecastle Bride is not included in this designation due to the brackish nature of the waters. Notwithstanding this exclusion area, Clare County Council undertake monitoring of the river at all the main bridges, including the Doora and Clarecastle bridges. A summary of monitoring data for critical parameters for Clarecastle Bridge (in accordance with the parameters listed in the *European Communities (Quality of Salmonid Waters) Regulations, S.I. 293 of 1988)* is provided in Attachment A-10. No breaches in limit values set in these regulations have been identified over the most recent 46 monthly sampling events at Clarecastle Bridge or Doora Bridge.

The Fergus Estuary, up to the Lake Ballyallia is included in the Lower River Shannon candidate Special Area of Conservation (SAC, Site No 002165). The discharge from the Clareabbey WWTP takes place to waters, which are included in the area of this site. Atlantic salmon, sea lamprey, river lamprey and otter (species listed under the EU Habitats Directive) occur in the vicinity of the discharge[1, 2]. There is potential for the existing discharge from the Clareabbey plant to have a negative impact on the conservation status of the SAC. This includes impacts on water quality as a result of the discharge and risks to water quality arising from malfunction of the plant or associated infrastructure.

[1] *N18 Ennis Bypass and Trunk Main Works: Environmental Assessment of Fergus Crossing of the River Fergus at Skehanagh, Ennis, Co Clare. Report compiled by Howard Williams, Inis Environmental Services*

[2] *The River Fergus, Co Clare. An Investigation of the distribution, abundance and ecology of species designated under the EU Habitats Directive*

The Fergus Estuary, downstream of the Clarecastle barrage also forms part of the estuarine complex named "River Shannon and River Fergus Estuaries Special Protection Area", (Site Code 004077), designated under *The European Communities (Conservation of Wild Birds) (Amendment) Regulations 1997*. The site is an important coastal wetland site for wintering waterfowl, with several significant populations of wild birds over wintering at the site. The site details of all designated sites are provided as Attachment A-7

Numerous studies of the River Fergus at this point and of the Fergus estuary have been undertaken. These studies are referenced hereunder, and where reference is made to the section of the river in the vicinity of the outfall, these sections are quoted in Section D of this report, with the permission of the authors. The conclusion drawn from the data available is that the area of the river in the vicinity of the discharge is likely to be used for spawning and nursery to some degree by three spined stickle back, smelt and flounder. The possibility that juvenile lamprey occur in the lateral silt beds in the area is not ruled out, and the area is also considered suitable for adult salmon resting, but unsuitable for spawning or nursery of game fish. It was considered likely that trout use this area of the river for feeding or foraging[1,2].

8.3 Assimilative capacity of receiving waters

Flows in this lower catchment of the Fergus River, in the vicinity of the treatment plant discharge are controlled by a tidal barrage, located just downstream of the discharge point (approx 200m). The barrage was installed in 1954 to control flooding above Clarecastle. The barrage consists of a number of sluice gates, which open and close with outgoing and incoming tides. This section of the river is significantly influenced by the tidal movements, as evidenced by high levels of chloride in the waters during incoming tides. An Foras Forbartha between 1972 and 1977 undertook flow monitoring of the River Fergus in the Ennis town catchment. flow values for each month, in m^3/sec, is provided in Table 2.

[1]*N18 Ennis Bypass and Trunk Main Works: Environmental Assessment of Fergus Crossing of the River Fergus at Skehanagh, Ennis, Co Clare. Report compiled by Howard Williams, Inis Environmental Services*

[2]*The River Fergus, Co Clare. An Investigation of the distribution, abundance and ecology of species designated under the EU Habitats Directive*

Table 2: River Fergus Flow Data (An Foras Forbartha 1972-77) in m^3/sec

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
12.02	19.06	24.81	25.83	23.12	11.83	7.58	5.62	1.42	2.07	3.88	10.93

Estimates of total effluent discharge volumes and associated nutrient loads are used to assess the likely impact of the discharge from the Clareabbey WWTP on the river water quality in the Fergus.

The Office of Public Works has collated flow data for the Fergus and Claureen Rivers for the period 1954 to 2005. The 50%ile flow, dry weather flow (DWF) and 95%ile combined flow values, as set out in Table 3, are used to assess the assimilative capacity of the Fergus river (with the Claureen flow data combined) for the discharge from the treatment plant. It should be noted that the Ballycorey Bridge station represents 53% of the Fergus catchment, so that the assimilative capacity calculation is extremely conservative. The full assimilative capacity calculation is provided in Attachment A-8 to this application.

Table 3 Flow statistics for Fergus and Claureen Rivers

Area	Dry weather flow (EPA hydrometric data)	95%ile flow (EPA data)	50%ile flow (EPA data)
Fergus river	0.15 m^3/sec	0.75 m^3/sec	7.61 m^3/sec
Claureen river	0.01 m^3/sec	0.02 m^3/sec	1.64 m^3/sec
Clonroadmore	0.18 m^3/sec	0.18 m^3/sec	0.18 m^3/sec
Total flow	0.34 m^3/sec	0.95 m^3/sec	9.43 m^3/sec

Discharges from the agglomeration of Ennis town, via the Clonroadmore WWTP also contribute flow volumes to the Fergus River. The total volume of this discharge is presented as 15,500 m^3/day, which approximates to 0.18 m^3/sec. This flow is added to the base flow of the river to complete the assimilative capacity calculation for the discharge from the Clareabbey WWTP.

Consideration of the nutrient loading to the waters from the Clareabbey WWTP and integrating this data with the existing water quality indicates that there is adequate assimilative capacity for the discharge from the facility for all parameters, with the exception of phosphate. The median concentration of molybdate reactive phosphate

(MRP) at Doora Bridge (upstream of the discharge), measured over the 2006-2007 period indicates a value of 0.0375 mg/litre. A minimum requirement of the *Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus Regulations) S.I. 258 of 1998* is that the waters would achieve a median MRP value of 0.03 mg/litre. Elevated MRP levels in the waters at Doora Bridge are likely to be associated with the discharge from the Clonroadmore WWTP, located just above the Doora Bridge. Improvement works are scheduled to reduce the level of MRP in the discharge from the Clonroadmore facility. These works will largely determine the final discharge load to the waters, and the downstream quality of the waters. The existing discharge at Clareabbey will also be subject to a schedule of improvement works, which will include MRP reduction in the final effluent. Further comment will be made on the results associated with the monitoring over the past 46 months, under Section 8.5 hereunder.

8.4 Total maximum nutrient load discharging to River Fergus

Analytical data for the wastewater discharge from the Clareabbey WWTP is available on a monthly basis for several years, up to an including August 2008. The influent and effluent streams are monitored for biochemical oxygen demand (BOD), chemical oxygen demand (COD), and suspended solids (SS). Monitoring for total nitrogen (TN) and total phosphorus (TP) is undertaken on the discharge on an intermittent basis, with analysis undertaken at an external laboratory (City Analysts, Limerick). Results for 2007 and 2008 are used for this application.

The volume of *treated* wastewater discharged from the WWTP is recorded daily at the WWTP. The hours of operation of the pumps at the Westfields pumping station (together with pump capacity) provides the flow data for the influent load to the plant. These flow records indicate the range of flow volumes through the system is 1000-1500 m^3/day. The calculation of discharge load uses the maximum flow data readings over a one-week period during August 2008 to present the typical discharge load from the facility. This approach takes account of the requirements of the Waste Water Discharge (Authorisation) Regulations, 2007 in relation to calculation of population equivalent, *"population equivalent" is a measurement of organic biodegradable load and a population equivalent of 1 (1 p.e.) means the organic biodegradable load having a five-day*

biochemical oxygen demand (BOD5) of 60g of oxygen per day; the load being calculated on the basis of the maximum average weekly load entering the waste water works during the year, excluding unusual situations such as those due to heavy rain"

The discharge of the treated waste stream is used to assess the impact of the discharge on the receiving waters for biochemical oxygen demand (BOD) chemical oxygen demand (COD), suspended solids (SS) total nitrogen (TN) and total phosphorus (TP), to waters. The nutrient discharge load is synopsised in Table 4, based on the estimated maximum flow readings and mean analytical values for the dates presented.

Table 4: Estimated nutrient load from Clareabbey WWTP to Fergus River

Date	Max flow (m^3/day)	BOD (kg/day)	COD kgs/day	SS kgs/day	TN kgs/day	TP kgs/day
09/01/08	1500	4.5	19.5	12	16.5	3
27/02/08	1500	9	28.5	0	10.5	3
09/04/08	1500	3	105	4.5	-	-

TN: total nitrogen, TP: Total phosphate, SS; suspended solids; BOD: biochemical oxygen demand COD: chemical oxygen demand

8.5 Monitoring undertaken on receiving waters

Monitoring of the Fergus River is undertaken by various groups, under a number of statutory codes, as set out hereunder:

a) Clare County Council undertake monitoring in accordance with the *European Communities (Quality of Salmonid Waters) Regulations, S.I. 293 of 1988-,* as the Fergus River is designated water under this statute. Summary results of monitoring at Doora Bridge (upstream of the WWTP discharge) and Clarecastle Bridge (downstream of the WWTP discharge) for the past 46 sampling events are provided in Attachment A-9. These results indicate that the BOD and total oxidised nitrogen levels in the receiving waters are well within their required criteria standards (as set by the above Regulations). The results for ammoniacal nitrogen (NH_4-N) indicate levels which are within the standard set by the Regulations, but are slightly above the requirements for a defined "high quality" status. An examination of the incidents of high results indicates that these events are associated with high tides (correlating with high chloride values. Under these circumstances, the barrage is closed and the wastewater load from Ennis (Clonroadmore WWTP) and Clareabbey WWTP

discharge to a receiving water with quiescent flow. No standard is defined for molybdate reactive phosphate (MRP) under the Salmonid Regulations. MRP values for rivers are defined under the *Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus Regulations) S.I. 258 of 1998.* The median MRP values for waters in the Phosphorus Regulations are correlated with biological quality ratings, or Q values. The Doora and Clarecastle Bridges are unsuited to the Q rating methodology, due to river channel and estuarine characteristics. Nonetheless, the MRP values defined in these Phosphorus Regulations are used as a benchmark to define the standard of water quality required for protection of conservation objectives and habitats in surface waters. The median MRP concentration for the Clarecastle Bridge, downstream of the outfall from the Clareabbey WWTP is 0.039mg/litre. Ideally, this value should be 0.03mg/litre. Improvement works at the plant, which include provision of phosphate reduction technology will reduce the level of phosphate in the discharge from the facility, and consequently will reduce the level in the receiving waters. It should be noted that the long term improvement works for the Ennis town catchment will provide for the discharge of treated effluent to the estuary, rather than the main river channel. This discharge arrangement will provide significantly greater assimilative capacity for the treated effluent.

Quality standards for surface waters are likely to be updated in the near future, to provide for compliance with the Water Framework Directive, (2000/60/EC, implemented in Ireland by the Water Policy Regulations, S.I. 722 of 2003). This will provide an integrated approach to the protection and improvement of the ecological status, ecological potential and chemical status of surface waters.

The discharge for the main Ennis town catchment is located above Doora Bridge, on the Fergus River. An application for licensing under the *Wastewater Discharge (Authorisation) Regulations 2007, (S.I No 684 of 2007)* has been made to the EPA (Register Number D0048-01). The discharge from the Roche Ireland plant is licensed by the Environmental Protection Agency, Integrated Pollution Control Licence (Issued on 12/05/06) - Licence Register No P0012-04

b) Biological quality monitoring (Q rating) in accordance with the *Local Government (Water Pollution) Act 1977 Water Quality Standards for Phosphorous Regulations*

1998 is undertaken on a national basis by the E.P.A. Clare County Council also commission Conservation Services to undertake biological monitoring of surface waters. The Clarecastle Bridge station is unsuited to this type of monitoring, due to the sampling methodology, and, the twice-daily saline nature of the waters, the estuarine mud substrate and the estuarine nature of the site.

c) During the course of this licence application Clare County Council are required to establish the impact of the discharge from the treatment plant on the waters of the Fergus River, with particular reference to the conservation objectives associated with any habitats or species in these waters. The waters are part of the Lower River Shannon catchment, named as a candidate Special Area of Conservation (Site Number 002165). A desk study was undertaken to examine the available data on this section of the river. The published data includes the following studies:

- N18 Ennis Bypass and Trunk Main Works: Environmental Assessment of Fergus Crossing of the River Fergus at Skehanagh, Ennis, Co Clare, compiled (for Gama Construction) by Mr. Howard Williams MIEEM, Inis Environmental Services, Edenvale, Ennis

This study was undertaken approximately 100 metres upstream of the point of discharge from the Clareabbey WWTP. The study uses a habitat rating index for the waters in this area (published by the Heritage Council in *A Guide to Habitats in Ireland* (Fossitt 2000). The index works on a scale of 1-5 where 1= Unsuitable, 2 = Poor, 3 = Satisfactory, 4 = Good and 5 = Excellent. A rating of 1 indicates that the ecologist carrying out the assessment regarded it as impossible that the river could support salmonid fish in the relevant life stage. A rating of 1-2 indicates that it was regarded as possible but unlikely that the river could support salmonid fish in the relevant life stage. The rating found in the study for this particular stretch of river for various species is reproduced (with the permission of the author) in Table 5 hereunder:

Table 5: Fish Species recorded in Fergus and Rine Estuaries and the potential utilisation by these species of habitats in the affected stretch of river

Species	Spawning	Nursery	Rearing	Foraging
European eel	n/a	3	3-4	3-4
Three spined stickleback	3	4-5	4-5	4-5
Smelt*	1-2	4-5	2-3	2
Flounder+	1	3	3-4	4-5
River Lamprey*	1	2	2	3
Sea Lamprey*	1	2	2	1
Greater pipefish	1	1	1	1-2
Estuarine Goby*	1	2	2	2-3
Thick lipped grey mullet	1	1	1	3-4
Sprat	1	1	1	1
Perch	1	2	2	2
Brown/slob/sea trout	1	1	2	4-5
Bass+	1	1	1	1
Lesser sandeel	1	1	1	1
Atlantic salmon*+	1	1	1-2	2

*Rare, notable or protected species +Commercial/recreational importance

- The River Fergus, Co Clare; An investigation of the distribution, abundance and ecology of fish, mammal and invertebrate species designated under the EU Habitats Directive. The specific aim of the project is the collection of scientific data on the flora, fauna and wildlife habitat of the section of the river Fergus in line with the stated objective of the 2003 Wildlife Grant Scheme. The study was undertaken by The Ennis and District Trout Anglers Association (EDTAA), a voluntary body committed to the conservation and development of the River Fergus This baseline ecological heritage survey of the River Fergus System was undertaken to investigate the distribution, abundance and ecology of fish, mammal and invertebrate species, designated under the EU Habitats Directive, in the catchment. The survey personnel were Howard Williams BSc, Inis Environmental Services, and William O'Connor MSc, BSc, CBiol, MIBiol, MIEEM, MIFM, and consultations with Mr. Eamonn Cusack, Chief Executive Officer, Shannon Regional Fisheries Board, and

Dr. Enda Mooney, Duchas National Parks & Wildlife, Deputy Regional Manager. This study records significant numbers of salmon in the River Fergus in the Ennis town catchment. However, the survey concludes that unsatisfactory water quality in the lower Fergus may be impacting on salmonid and lamprey reproductive success.

d) The E.P.A has published monitoring data for the Shannon and Fergus estuaries, in the "Water Quality in Ireland 2001-2003" publication. Extracts referring to the Fergus estuary from this publication are provided in Attachment A-10. Salinity values determine the acceptable levels of dissolved inorganic nitrogen (sum of nitrate, nitrite and ammonium) and molybdate reactive phosphate (MRP) to prevent nutrient enrichment in partially saline waters. Using these limit values (calculation of limit values is provided in the EPA report), the lower Fergus River is compliant with limits for dissolved inorganic nitrogen and MRP, and is deemed unpolluted. Using these limit values for dissolved inorganic nitrogen and MRP, the Fergus Estuary is deemed intermediate status .

e) A survey of the River Fergus was undertaken in November 2007 and March 2008, by Clare County Council, during the course of preparing the application for a discharge authorisation**,** under the *Wastewater Discharge (Authorisation) Regulations 2007, (S.I No 684 of 2007)* for the Clonroadmore WWTP, to the EPA (Register Number D0048-01). During the course of surveying for the Clonroadmore WWTP, the Ennis town catchment was assessed to identify any facility liable to generate substances listed in Annex X of the Water Framework Directive (2000/60/EC) or relevant pollutants listed in Annex VIII of the Water Framework Directive. Monitoring for these substances was undertaken in November 2007 and results on this monitoring did not indicate any substance on the list was present in the waters of the Fergus or in the discharges to the river from the Clonroadmore WWTP (see Attachment F-1. A further survey of water quality for priority listed substances is now being undertaken for the Clareabbey WWTP discharge and downstream of the discharge to ensure the discharge does not contain any listed substance. No potential source of these pollutants has been identified in the sewer catchment, so it is unlikely that the discharge will contain the listed substances. Results from the survey will be collated and included in the licence application data as soon as may be on receipt of the results of the sampling exercise.

The monitoring programs described above provide a good overview of the water quality status in the River Fergus, both upstream and downstream of the WWTP discharge. In conclusion, there is no indication of significant deterioration in quality status of the Fergus River downstream of the discharge from the treatment plant. Overall, the impact of tidal flows reduces the impact of low flows in the river, in the vicinity of the wastewater treatment plant outfall, to the extent that the 95%ile or dry weather flow values are not relevant to the location.

8.6 Impact of storm overflows to River Fergus

One storm overflow is located in the Clareabbey catchment, associated with the main pumping station at Westfields, at the rear of the Westfields housing estate (marked on the map provided as Attachment B-1). During long periods of pump dysfunction, or power outages, the configuration at the pumping stations is such that there is potential for overflow from the system. Normal operations of the unit, even during heavy rainfall do not result in overflow. Any such overflow discharges to a drain which runs along the eastern boundary of the Westfields and Abbey court housing estates, and then runs east to join the Fergus River, just upstream of Clareabbey and the N18 Ennis bypass bridge crossing. Sampling of this drain was undertaken on September 9th 2008, during the course of preparing the licence application. Results from the survey will be collated and included in the licence application data as soon as may be on receipt of the results of the sampling exercise. No complaints have arisen in connection with this overflow.

9. Proposed technology for improving emissions from WWTP

The proposals for upgrading of the wastewater treatment facilities for the Clareabbey WWTP and the associated pumping stations, to cater for the existing and projected loading arising in the agglomeration are set out under the following headings:

9.1 Short-medium term measures to address infrastructure deficiencies

9.2 Long term measures to address infrastructure deficiencies

9.1 Short-medium term measures to address infrastructure deficiencies

The wastewater treatment plant on the Clareabbey site was constructed in 1981 for a population equivalent of 4,000. Upgrading works were undertaken in 2001 to provide for an increase in the plant capacity to cater for a population equivalent of 6,000. It was considered at that time (2001) that this upgrade would enable the ongoing function of the system, in accordance with regulatory requirements, until a combined plant was provided at the Clareabbey site, to serve the entire Ennis catchment (See Section 9.2 of this report). This project is unlikely to be completed until 2012, and interim works are required to provide for the increase in the volume of wastewater in the catchment.

Permission has been granted, on 2nd March 2007, for the construction of a temporary wastewater treatment facility, adjacent to the Clareabbey WWTP (Permission Reference P06/1754, Attachment B-6). Contract documents have been drawn up to provide for the commencement of this contract on a public/private partnership basis, and a contractor is currently being appointed for the construction of the facility (Response Engineering Ltd). The design flow for the temporary WWTP is 5000PE, with some existing flow to the Clareabbey plant to be diverted to the new plant as soon as may be. The agreement refers to diversion of 1000PE flow from the existing Clareabbey plant to the new temporary facility. This new facility will also provide for phosphorus reduction in the discharge from the system.

The plant specified is an aeration plant, but the permission granted (and contract details) refer to a "design, build, operate" approach, so final design details on the new temporary plant are not available at this stage.

Drawing details, site location and design calculations are provided as an attachment to this report (Attachment G-3). The rationale behind the design and the estimation of population equivalent takes account of the existing and forthcoming developments in the catchment, to ensure the adequacy of wastewater treatment provisions for the existing and medium term period (up to 2012 as a minimum)

The upgrading of pumping stations is included in the schedule of works associated with the DBO contract for the temporary WWTP. This will include the upgrading

and sealing of the Kildysert Road pumping station, and construction of a new pumping station to divert flow from the existing treatment works to the new temporary facility.

In addition, the works have already commenced on the upgrading of pumps at the Westfields pumping station. Three NT 3153.181 pumps are currently on order to provide for adequate flow management from the facility to the Clareabbey old and new plants. These units will operate on the basis of two duty and one standby pump, capable of delivering flows of 50- 75 litres per second (based on 3m rising main head). The pumps will be installed at the station in the near future. This will ensure the pumping station will adequately cater for flows in excess of 6DWF, with no overflow from the system during prolonged wet weather.

Arrangements for licensing of the discharge from the Quin Road pumping station (under the control of Shannon Development) are also underway, under Section 16 of the Local Government (Water Pollution) Act, 1977.

9.2 Long term measures to address infrastructure deficiencies

The improvement in wastewater treatment infrastructure for Ennis town was included in the National Water Services Investment Programme, scheduled to commence construction in 2005, with a completion date of 2007. This project provides for the construction of a single wastewater treatment facility, to cater for 50,000 population equivalent, adjacent to the site of the Clareabbey WWTP. The project involves pumping the discharges from the Ennis town catchments to the Clareabbey location, with de-commissioning of both the Clonroadmore and Clareabbey WWTPs, as they currently exist. The project is due to be completed in 2012. As indicated in Section 9.1, Clare County Council are now actively involved with the provision of a temporary treatment facility, which will cater for some of the existing loading to the Clareabbey plant, and also for any additional loading arising in the period between now and construction of the new permanent facility.

The existing discharge volumes and associated nutrient loads present a limited risk of pollution to water quality in the Fergus River. Taking account of the projected increase in the population of the entire Ennis agglomeration, the typical cost of nutrient reduction in wastewater treatment plants, and the land footprint available for

expansion of the existing treatment plants, the proposal (in the National Water Services Investment Programme) is to provide a new 50,000 capacity treatment works at the site of the existing Clareabbey waste water treatment plant. The Council has already acquired the site for the proposed treatment works. A brief to facilitate the appointment of consultants proceeding to the full design stage- is currently being considered by the Department of Environment, Heritage and Local Government (DoEHLG). The DoEHLG already approved a preliminary report on the scheme. The time frame for completion of the design and approval of design criteria and performance targets is linked to the time frame for approval of this data by the DoEHLG. The final contract will be based on a design-build-operate (DBO) approach.

The Fergus River upstream of the Clarecastle barrage will not provide adequate assimilative capacity for the treated effluent from a 50,000 capacity treatment plant. Studies have been undertaken on the Upper Fergus Estuary, downstream of the Clarecastle barrage. A 2D hydrodynamic model was constructed for the Hydro Environmental Ltd study "Fergus Estuary Water Quality Model Study- Outfall Site Selection" was assembled in 2002. This predictive model was used to assess a range of options for discharge of treated wastewater from the Ennis agglomeration. The model considered a B.O.D load from 50,000 population equivalent, (@ 25mg/litre) providing 225 kgs/day to the Fergus estuary, discharged via a diffuser arrangement. This load combined with the Roche Ireland Ltd load of 200 kgs/day would be within the assimilative capacity of the estuary, which is thought to be circa 500 kgs/day. It was further considered that the Fergus estuary would be able to assimilate the total nitrogen load from the 50,000-population equivalent (circa 115 kgs/day). Phosphorus loading was not considered in this exercise due to the tidal nature of the estuary.

10. Measures planned to monitor emissions into the environment

Provisions for monitoring emissions from the wastewater treatment plant are in place at the Clareabbey WWTP. A full time laboratory technician is employed to cater for the operational requirements in terms of monitoring at both the Clonroadmore and Clareabbey treatment plants. Monitoring of influent and effluent waste water streams, and receiving waters is undertaken on a monthly basis for the parameters biochemical

oxygen demand (BOD), chemical oxygen demand (COD) and suspended solids (SS). Total nitrogen (TN) and total phosphorus (TP) measurements are undertaken on the influent and effluent streams on a sporadic basis. Methods of analysis and sampling.procedures are provided in Attachment E 2 of this application. Sampling is currently undertaken as grab samples, but it is anticipated that composite samplers will be used on all influent and effluent streams in the near future.

View of the Clareabbey WWTP from the eastern bank of the Fergus river