Clones Waste Water Treatment Works

EPA Waste Water Discharge Licence Application

ARTICLE 16 COMPLIANCE REQUIREMENTS

Monaghan County Council

EPA Document Ref: D0133-01

REGULATION 16 COMPLIANCE REQUIREMENTS

1. Update the non-technical summary to reflect the information 'provided in response to this notice.

   An updated non-technical summary is attached in appendix 1.

2. Clarify if the reed-beds are used for the treatment of settled sewage, there are conflicting statements in the non-technical summary and elsewhere in the application, including drawing No. 02 and No. 09. If there is a discharge to the reed-beds provide an assessment of the impact of such discharge on ground/groundwater. If reed-beds are redundant clarify the decommissioning completed to date or proposed.

   At Clones WwTW sludge is treated in the sludge drying beds (reed-beds). Currently there are 2 rows of 5 beds located to the north-east of the works. In 2008 one row of sludge drying beds (reed beds) were refurbished. The other row, of sludge drying beds, are not to be decommissioned. They are to be refurbished at a later date and this is dependant on funding. No definite dates have been put in place. However, the current active beds are providing adequate treatment.

   The sludge from the Imhoff tanks flows, by gravity, to the sludge drying beds. Here, the water from the sludge drains through the porous material in the sludge bed. The floor of the beds are sloped to allow this water run off to be drained and returned to the inlet sump to join the influent for full treatment. As the water drains from the sludge in the beds, the volume decreases substantially. On average, the beds would only require emptying every 10 years.

   The reed beds are newly built, self contained, essentially bunded, concrete tanks. To our knowledge, there is no discharge to the ground/ground water.

3. Clarify/correct the statement in the non technical summary that 'no combined sewer overflows were located'.

   This statement is incorrect. The manhole location and sewer inspection survey, undertaken for the Preliminary Report, identified one overflow from the foul/combined system, which discharges directly to a tributary of the River Finn. The location of the CSO within the Clones catchment is shown in Figure 1 and the survey results are summarised below;

CSO Name: Inlet CSO

This overflow is located on a 300mm diameter concrete combined sewer at the wastewater treatment plant off Scothouse Road. Excess flow discharges to a nearby watercourse via an unscreened high level 300 mm pipeline. These excess flows are ultimately discharged to the River Finn.

It was noted, in consultation with local operations staff, that flooding occurred upstream of the overflow as a result of the overflow level being set higher than the ground level of manholes on the Newtownbutler Road sewer.

An outline schematic of the Clones Collection Network, Appendix 3, also shows the CSO.

The Non-Technical summary has been amended to reflect the statement above.

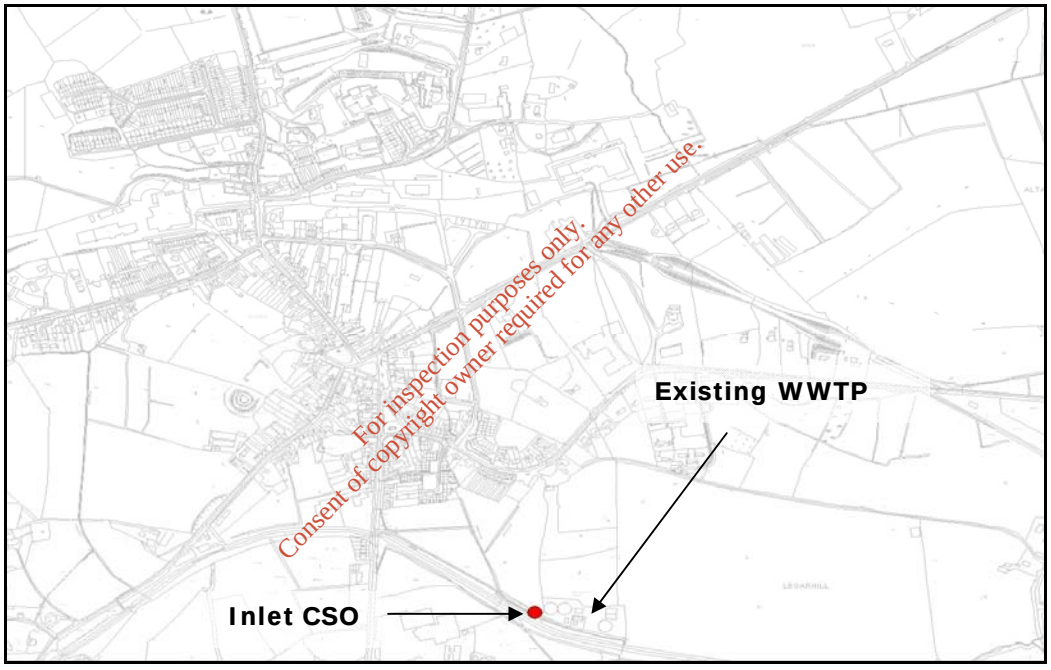

Figure 1 Overflow Locations within Clones

4. Please provide the name of the agglomeration to which the Waste Water Discharge Licence Application relates. Please also amend, if necessary, the name of the agglomeration on the Waste Water Licensing Web based data tool.

Agglomeration name: Clones and Environs
The name of the agglomeration on the Waste Water Licensing Web based data tool has been amended.

5. Provide a copy of the preliminary report submitted to the Department of Environment, Heritage and Local Government. Provide any details of feedback from the Department.

A revised Preliminary Report is currently being completed. This will be forwarded to the EPA upon completion and approval from Monaghan County Council.

6. Clarify the conflicting statements on page 34 and 35 of the application in relation to compliance with the Urban Waste Water Treatment Regulations.

   The DoEHLG completed the National Urban Waste Water Study in 2004. At that time, they concluded that the Clones WwTW was providing an adequate level of waste water treatment for compliance with the Urban Waste Water Treatment Regulations (S.I. No. 254 of 2001).

   However currently, in 2008/2009, Clones WWTP does not comply with the requirements of these regulations in terms of the quality of effluent being discharged and is considered to have inadequate capacity to achieve these standards.

   As the required discharge standards are not being met at present, modifications to the treatment systems at the WWTP are now necessary. Upgrading work at the plant is needed to ensure that future discharges meet the required standards while operating at satisfactory margins of safety. To alleviate the current situation, Monaghan County Council have commenced proceedings to install Emergency Works at Clones WwTW within 12 months. This will ensure that the effluent being discharged is in compliance with all necessary regulations. Details for the Emergency works will be forwarded to the EPA once finalised.

7. Clarify the source of the dichloromethane figure presented in Table D. 1 (i)(c), assess compliance with the Water Quality (Dangerous Substances) Regulations 2001 and identify measures to address the elevated concentration identified. Please amend as necessary the statement on page 55 in relation to the Water Quality (Dangerous Substances) Regulations 2001.

   The dichloromethane figures presented in Table D. 1 (i)(c), and F.1(i)(b) are incorrect. On investigation, it was discovered that there had been an error on behalf of the laboratory in question.
   The figures have been amended on the web based tool and comply with the Water Quality (Dangerous Substances) Regulations 2001.
   The confirmation email from the laboratory and the correct results are attached in Appendix 2.

8. Provide details of the frequency of overflow at each of the storm water overflows. Provide summary details of the draft Hydraulic Modelling Report referred to in the application and provide details of the conclusions and remedial works to be completed based on the results of the report.

   Details of the frequency of overflow at each of the storm water overflows

   As there are no facilities in place to record the frequency and volume of overflows at each of the storm water overflows, they are unknown. Further details of the current situation are included in the details of the hydraulic modelling below.

   Provide summary details of the draft Hydraulic Modelling Report

   The performance of the existing collection network during the occurrence of rainfall events with return periods of 1 in 1 year, 1 in 2 years and 1 in 10 years was assessed with the hydraulic model of the Clones catchment. This assessment identified a number of hydraulic deficiencies in relation to the spill frequency of the combined sewer and emergency pumping station overflows

within the collection network. These hydraulic deficiencies are detailed below in Table 2 (below).

A further assessment of the collection network was made using the Clones catchment model with the same design storms but with these overflows removed in order to assess the significance of their contribution to the prevention of flooding in the town. The results are summarised for both assessments and compared in Table 1.

Table 1 Hydraulic Performance of Network with & without CSOs.

Development Scenario	No. of Nodes w/ Flooding > 25m³ for RP = 10 Year	Total Volume of Flooding (m³)	No. of Links w/ Surcharging for RP = 2 Year
Existing w/ CSOs	0	5	60
Existing w/out CSOs	4	94	110

Details of the conclusions and remedial works to be completed based on the results of the report

It can be seen from Table 1, that the removal of the overflows is predicted to produce a number of flooding locations above trigger criteria, increase the total volume of flooding and surcharging for the recommended design standard. However, from an environmental perspective, the overflows spill to water courses that have insufficient assimilative capacity to cater for such untreated wastewater discharges and are likely to be deteriorating the water quality of the rivers and lakes downstream of Clones.

It is recommended that the need for these overflows is eliminated and that the overflows are removed from the collection network. This will have a significant impact on the capacity of the collection network downstream of each overflow and on the extents of upgrading works required to serve existing development in Clones in an environmentally sensitive manner.

Conclusions and Remedial Works

It has been established that the existing collection network in Clones is in good structural and service condition but does not have sufficient hydraulic capacity to serve the existing levels of development in an environmentally sensitive manner.

Therefore, the report recommends that the following works proceed in order to alleviate existing hydraulic deficiencies and to allow the development of Clones to take place in a sustainable and environmentally sensitive manner;

- *Remove one combined sewer overflow from the existing collection network.*
- *Construct a new main pumping station and storm tank with 100m³ storage capacity at 98 Avenue pumping station.*
- *Construct 720 metres of new 300 mm diameter rising main from 98 Avenue pumping station to proposed upgraded sewer off Annalore Street.*
- *Construct a new main pumping station at Roslea Road.*
- *Construct 290 metres of new 200 mm diameter rising main from Roslea Road pumping station to proposed upgraded sewer on Roslea Road.*
- *Upgrade size of existing local collector and main sewers*
- *Carry out structural and service rehabilitation of pipelines to 1,600 metres of foul/combined pipelines.*
- *Carry out rehabilitation to manholes*
- *Construct a new inlet pumping station and storm tank with 1,500m³ storage capacity at the wastewater treatment plant.*
- *Extend the collection network on the Monaghan Road and Roslea Road*

Table 2 – Hydraulic Deficiencies on Existing Clones Wastewater Collection Network

Hydraulic Deficiency No.	Location	Description
1	98 Avenue/ Church Hill	There is surcharging and flooding predicted upstream of the main pumping station at 98 Avenue during rainfall events with return periods of 1 in 2 years and 1 in 10 years respectively as a result of inadequate pumping capacity and undersized pipelines within the existing network.
2	98 Avenue PS	The main pumping station at 98 Avenue was predicted to spill 150 m^3 of stormwater to an adjacent water course during a rainfall event with a return period of 1 in 1 year as a result of inadequate pumping and storage capacity.
3	Annalore Street	There is surcharging and flooding predicted off Annalore Street during rainfall events with return periods of 1 in 2 years and 1 in 10 years respectively as a result of undersized pipelines within the existing network. The flooding occurrence in this area was confirmed and photographed by local operations staff in January 2008, as shown in Figure 3.69.
4	Newtownbutler Road	There is surcharging and flooding predicted between Newtownbutler Road and Cara Street during rainfall events with return periods of 1 in 2 years and 1 in 10 years respectively as a result of inadequate pumping capacity at the main lift to the WWTP and undersized pipelines within the existing network.
5	Main Lift PS	The storm pumps and combined sewer overflow from the main lift pumping station at the wastewater treatment plant off Scothouse Road are predicted to discharge a volume of 1,350 m^3 during a critical duration 1 year return period event. These discharges are to a tributary of the River Finn. The discharge results from inadequate pumping and storage capacity at the wastewater treatment plant.

9. Assess the design criteria of the storm water overflows. Demonstrate (providing available evidence) whether all storm water overflows meet the design criteria established in 'Procedures and Criteria for Storm Water Overflows ', published by the Dept. of the Environment, 1995. Identify any SWOs that may be impacting on surface water quality. Where a storm water overflow does not comply with these guidelines, give details of the plans, for improvement.

SW2 – WwTW Inlet Pump Station

Location: Tributary of the River Finn
National Grid Reference: E282879, N320154
Description: The Clones catchment Main Inlet Pumping Station is located at the entrance to the wastewater treatment works off Scotshouse Rd to the south east of the catchment. The facility consists of a foul and storm pumping wet well. Once the inlet flows are greater than the capacity of the foul and storm pumps, excess flows discharge into a storm wet well via a weir set at an approximate height of 0.7 metres above the invert of the incoming sewer. When the flow to the inlet pump station is in excess of 3DWF, excess flow will be pumped to the 2 stormwater holding tanks. In the unlikely event that the flow is so great or pumps fail the pump sump will fill up and will over flow and gravitate to the adjacent stream. Essentially, this is an emergency overflow.
However, even in the above event, this pump station is unlikely to overflow as the overflow from Manhole 55301 is set lower than the overflow in the inlet pump station.

Compliance with the Urban Waste Water Directive 91/271/EEC:
The flow rate in the River Finn at the discharge point of the overflow is: 0.001086m^3/s
The Dry Weather Flow to the wastewater treatment plant is 0.01159m^3/s. The dilution factor in the River Finn is: 0.001086/0.01159= 0.0934.
The Urban Wastewater Treatment Directive 91/271/EEC states that there must be a stormwater tank provides to allow for 120litres per head.

For a current p.e. of 3,082, at 120 litres per head, the volume of the storm tank required would be 369.84m^3. The total volume of the 2No stormwater tanks at the works is 486m^3. Therefore, the volume of the stormwater tanks is deemed to be adequate for the current population.

For the projected 2015 p.e. of 4,449, at 120 litres per head, the volume in the storm tank required would be 533.88m^3. The total volume of the 2No stormwater tanks at the works is 486m^3. The volume of the stormwater tanks is therefore deemed to be inadequate to cater for the projected 2015 p.e.

As per No.8 above, it has been recommended in the Preliminary Report that the overflows are eliminated.

SW3 – Manhole 55301

Location: Tributary of the River Finn
National Grid Reference: E282879, N320154
Description: This overflow is located on a 300mm diameter concrete combined sewer at the wastewater treatment plant off Scothouse Road. Excess flow discharges to a nearby watercourse via an unscreened high level 300 mm pipeline. These excess flows are ultimately discharged to the River Finn.

Compliance of SWO 2 with the Urban Waste Water Directive 91/271/EEC:

Formula A, as detailed in the Urban Wastewater Treatment Directive 91/271/EEC, relates to storm overflows within the sewerage network. There is one storm overflow within the sewerage network as detailed above.

P = design domestic population = 2,010 PE
E = design industrial effluent flow = 460.512 m^3/day
DWF = Design dry weather flow = 1,001.03 m^3/day

Formula A = DWF + 1.36P + 2E
Formula A *= (1,001.03 m^3/day)+(1.36x2,010)+(2x460.512)*
Formula A *= 4,655.65 m^3/day (53.88L/s)*

The capacity of the out going 375mm pipeline, at a roughness value of 1.5, is 95.73L/s. As this is greater than that calculated for Formula A above, Manhole 55301, SW3, is in compliance with the Urban Wastewater Treatment Directive 91/271/EEC; Procedures and Criteria in relation to Storm Water Overflows.

As per No.8 above, it has been recommended in the Preliminary Report that the overflows are eliminated.

SW4 – 98 Avenue Pump Station
Location: Tributary of the River Finn
National Grid Reference: E250356, N325962
Description: The facility contains an overflow set at approximately 1700mm above the invert of the main incoming sewer. The overflow discharges dry well which acts as a storm holding tank. If the flow to the pumping station is great enough, it will overflow from the dry well to a nearby stream.

Compliance of SWO 2 with the Urban Waste Water Directive 91/271/EEC:
Formula A, as detailed in the Urban Wastewater Treatment Directive 91/271/EEC, relates to storm overflows within the sewerage network. There is one storm overflow within the sewerage network as detailed above.

P = design domestic population = 1,434 PE
E = design industrial effluent flow = 253.125 m^3/day
DWF = Design dry weather flow = 1,001.03 m^3/day

Formula A = DWF + 1.36P + 2E
Formula A *= (1,001.03 m^3/day)+(1.36x1,434)+(2x253.125)*
Formula A *= 3,457.57m^3/day (40.02L/s)*

There are three submersible pumps, arranged in a duty/assist/standby configuration. Each pump can operate at 35l/s, allowing a max of 70l/s to be pumped. This is greater than Formula A above.

The storm water storage capacity of the existing stormwater tanks is inadequate.
The flow rate in the River Finn at the discharge point of the overflow is: 0.001086m^3/s
The Dry Weather Flow to the wastewater treatment plant is 0.01159m^3/s.
The dilution factor in the River Finn is: 0.001086/0.01159= 0.0934.
The Urban Wastewater Treatment Directive 91/271/EEC states that there must be a stormwater tank provided to allow for 120litres per head for dilution factors<1.
For a current contributing p.e to 98 Avenue pump station, of 2,559, at 120 litres per head, the volume of the storm tank required would be 307.08m^3.

The volume of the stormwater tank at the works is 43.75m^3. Therefore, the volume of the stormwater tanks is deemed to be inadequate for the current population and does not comply with the Urban Wastewater Directive 91/271/EEC.

As per No.8 above, it has been recommended in the Preliminary Report that the overflows are eliminated.

10. Monitoring results for water samples taken downstream of the primary discharge indicate elevated concentrations for a number of parameters including total P, ortho-phosphorus, BOD and dichloromethane, provide an assessment of the impact caused by the discharges from the agglomeration and identify remedial measures including timeframes, for their implementation.

With regard to the elevated concentrations of dichloromethane please refer to point No. 6 above.

Sewage discharges can potentially have several effects in receiving waters:

- *Addition of toxic substances resulting in decline of species diversity and abundance*
- *Addition of suspended solids leading to clogging of gills and feeding mechanisms of filter feeders and decreased photosynthesis activity*
- *Addition of pathogens*
- *Deoxygenation due to inputs of readily oxidizable organic matter*
- *Nutrient (P and N) enrichment causing increased algal growth leading to eutrophication and a possible fall in dissolved oxygen levels*

As discussed previously, Monaghan County Council is to install emergency works, within 12 months, to ensure that the effluent is sufficiently treated to prevent pollution of the receiving waters. Following that, a full refurbishment of the works, including provision of a new outfall to the River Finn, is to take place. However, under the current economic climate, construction is unlikely to commence before 2015.

11. Clarify the number of pumping stations within the agglomeration, the non technical summary refers to four, drawing no. 01 identifies eight, and nine are identified on page 29 (includes the pumping station at the WWTP). Provide details of the frequency of any overflows at the pumping stations identified.

- *Clarify the number of pumping stations within the agglomeration*
  There are 9No pumping station within the Clones agglomeration.
  Drawing No.1 shows 9No. pumping stations and corresponds to the table on page 29;

Table 3 Clones Pumping Stations

Pumping Station	Emergency Overflow	Pump No. of Pumps
Main Lift PS	0	2
98 Avenue PS	150mm	3
Roslea Road PS	0	2
Liosnaghoirtin PS	150mm	2
Feldhues PS	0	2
Enterprise Centre PS	0	1
McGaugheys PS	0	2
Halting Site PS	0	2
Largy College PS	0	2

The non-technical summary has been amended to show the correct figure.

- *Provide details of the frequency of any overflows at the pumping stations identified*
  There are no facilities at the above pump stations to record the frequency, duration or volume of any overflows.

12. Clarify the various figures provided for discharge from the WWTP throughout the application and identify the appropriate discharge figures and revise the assimilative capacity calculations as necessary, these figures include the following: DWF of 693m^3/day, normal flow 1500m^3/day, maximum/day flow of 2000m^3/day, pump at WWTP has capacity of 2419m^3/day (without the assist pump), DWF in assimilative capacity calculations of 1,000m^3/day, DWF in Clones Catchment report of 1150m^3/day, and influent flows listed in Attachment D greater than 2000m^3/day (four of the seven days results presented exceed 2000m^3).

- *DWF of 693m^3/day*
  This is the flow calculated for the current population of 3,082 p.e. Standard flow allowed per person = 225L.

- *Normal flow 1500m^3/day*
  This is the design flow for the plant for the phase 1 design capacity of 7,000 P.E.

- *Pump at WWTP has capacity of 2,419m^3/day (without the assist pump)*
  This is the size of the pumps installed. This does not reflect on the flows entering the plant. They are sized to ensure they can handle the maximum flow to the works with a margin of safety included.

- *DWF in assimilative capacity calculations of 1,000m^3/day*
  The projected p.e. for the treatment works in 2015 is 4,449. This covers the life span of the Wastewater Discharge Licence. A standard 225L per person is allowed to obtain the predicted flow to the plant. Therefore, the corresponding flow to the plant is 1,001.03m^3/day. The WAC calculations are based on the predicted 2015 influent loads to the works and the corresponding effluent to the receiving waters.

- *DWF in Clones Catchment report of 1150m^3/day*
  The Clones catchment report was completed by the Department of the Environment, Heritage and Local Government.

Influent flows listed in Attachment D greater than 2000m^3/day (four of the seven days results presented exceed 2000m^3).

The Maximum flow per day, presented in Table D.1, is incorrect. The Maximum design flow per day is 4,720m^3/day (54.7l/sec). This has been amended on the web based licensing tool.

Table 4 Design Loading on Clones WwTW

Parameter	Current P.E	2015 P.E.	Phase 1 P.E.
Population Equivalent	3,082	4,449	7,000
Daily Dry Weather Flow (m^3/day)	693.8	1,001.59	1,575
Dry Weather flow (l/sec)	8.03	11.59	18.2
Peak Flow to Outfall (m^3/day)	-	3003.07	4,720
Peak Flow to Full Treatment(l/sec)	-	34.76	54.7

13. Clarify conflicting statements on page 28 in relation to adequacy of storm water storage capacity.

The storm water storage capacity of the existing stormwater tanks is inadequate to serve the projected 2015 p.e.

Compliance with the Urban Waste Water Directive 91/271/EEC:
The flow rate in the River Finn at the discharge point of the overflow is: 0.001086m^3/s
The Dry Weather Flow to the wastewater treatment plant is 0.01159m^3/s. The dilution factor in the River Finn is: 0.001086/0.01159= 0.0934.
The Urban Wastewater Treatment Directive 91/271/EEC states that there must be a stormwater tank provides to allow for 120litres per head.

For a current p.e. of 3,082, at 120 litres per head, the volume of the storm tank required would be 369.84m^3. The total volume of the 2No stormwater tanks at the works is 486m^3. Therefore, the volume of the stormwater tanks is deemed to be adequate for the current population.

For the projected 2015 p.e. of 4,449, at 120 litres per head, the volume in the storm tank required would be 533.88m^3. The total volume of the 2No stormwater tanks at the works is 486m^3. The volume of the stormwater tanks is therefore deemed to be inadequate to cater for the projected 2015 p.e.

14. Clarify the source of the figures used in the Formula A calculations presented in the application; provide an assessment and recommendation based on the figures calculated.

SW3 – Manhole 55301

P	*= design domestic population*	*= 2,010 PE*
E	*= design industrial effluent flow*	*= 460.512 m^3/day*
DWF	*= Design dry weather flow*	*= 1,001.30 m^3/day*

SW4 – 98 Avenue Pump Station

P	*= design domestic population*	*= 1,434 PE*
E	*= design industrial effluent flow*	*= 253.125 m^3/day*
DWF	*= Design dry weather flow*	*= 1,001.30 m^3/day*

The design domestic population and the design industrial effluent flow are obtained using data from the network model. By selecting the appropriate CSO, all contributing flows and populations from all sub-catchments can be obtained.

The DWF is the predicted dry weather flow calculated for the year population equivalent in 2015 (i.e. the life span of the Wastewater Discharge Licence).

15. For the assimilative capacity calculations provided, clarify the location on the receiving water where the capacity is calculated and clarify the source of the background figures. In the assimilative capacity calculation of BOD 2mg/L is used in the calculation in the text, clarify and revise as necessary. Provide calculations for suspended solids. Provide justification for using a background ortho-phosphorus figure of 0.03 when the actual background is 0.18mg/l. Clarify the background figures used for ammonia.

- *Clarify the location on the receiving water where the capacity is calculated*

The receiving waters for the effluent from Clones WwTW is the small, unnamed stream running parallel to the southern edge of the plant. There is no data available on the flow in this stream. Therefore, the flow was calculated from first principles, based in the area of the stream and the data from the nearest OPW hydro station at Analore Bridge.

- *In the assimilative capacity calculation of BOD 2mg/L is used in the calculation in the text, clarify and revise*
  Yes, in the assimilative capacity calculation a BOD of 2mg/L is used in the calculation. This is the average background concentration of BOD in the river as recorded by Monaghan County Council between January 2007 and July 2008. However, the WAC calculations have been revised to reflect the data recorded for 2008-2009. The revised WAC calculations are attached in Appendix 6. The 2008-2009 Monaghan County Council downstream data is attached in Appendix 5.

- *Clarify the source of the background figures*
  No monitoring of substances or flow is conducted on this stream by the EPA or the OPW. Monaghan County Council takes grab samples of the stream on a regular basis. The background concentrations used in the WAC calculations are the average of these results from January 2007 to July 2008.

- *Provide calculations for suspended solids*
  See Appendix 6 – Revised WAC Calculations

- *Provide justification for using a background ortho-phosphorus figure of 0.03*
  As per Appendix 6 – Revised WAC Calculations, the background ortho-phosphorus figure has been amended. The figure is now the average background concentration of ortho-phosphorus in the river as recorded by Monaghan County Council between February 2008 and March 2009. The background ortho-phosphorus figure is 0.6mg/L.

- *Clarify the background figures used for ammonia*
  As per Appendix 6 – Revised WAC Calculations, the background Ammonia figure has been amended. The figure is now the average background concentration of Ammonia in the river as recorded by Monaghan County Council between February 2008 and March 2009. The Ammonia figure is 0.6mg/L.

16. Identify measures to address the limited BOD and ortho-phosphorus capacity in the receiving waters, include timeframes for completion of any identified measures. Identify measures for achievement of 'good surface water status' in the receiving waters.

Monaghan County Council are to install emergency works at the WwTW within the next 12 months. This will ensure that the current wastewater treatment is improved before it is discharged to the receiving waters. Details of the emergency works will be forwarded upon the completion and approval of the report.
Following this, a full upgrade of the plant, including final effluent discharge to the River Finn, is due. However, under the current economic climate, construction is unlikely to commence before 2015. At that time Part VII planning will be sought, following approval, construction will take completed over a 2 year construction period (approximate).

17. In relation to the proposed waste water treatment plant provide details in relation to timeframes for planning approval, construction and commissioning.

The Water Services Investment Programme 2007-2009 indentifies the scheme as commencing in 2008. However, under the current economic climate, construction is unlikely to commence before 2015. At that time Part VII planning will be sought, following approval, construction will take completed over a 2 year construction period (approximate).

The Preliminary Report is currently at draft stage. The report is currently receiving final edits and is to be submitted to Monaghan County Council for final approval. Upon approval by MCC, it will be submitted to the Department of the Environment, Heritage and Local Government.

18. Provide details of the proposed outfall to the River Finn, including discharge point, assimilative capacity calculations based on the proposed discharge point, identify appropriate emission limit values and a timeframe for installation of the new outfall.

- *Discharge point of proposed Outfall to the River Finn*
  Details of the exact location of the proposed Outfall to the River Finn have not been finalised as the design is only at Preliminary design stage. However, it is proposed in the draft Preliminary Report that the outfall will be at Cumber Bridge on the Finn River.

- Assimilative capacity calculations based on the proposed discharge point
  Water Quality
  The EPA Ecological Assessment of Rivers 2003 states that the water quality of the Finn River had shown an overall improvement that was most marked in the reach below the Magherarney River. The latest biological quality rating, from 2004, at Station No. 0400, Scarvy Bridge, upstream of Clones is Q4 and downstream of the proposed outfall, at Station No. 0500, Cumber Bridge, the rating is Q3-4. The ratings have improved from Q3 in 2001.

  The 1997 biological quality rating, at Station No. 0400, was Q3-4 and downstream of the existing outfall, at Station No. 0500, the rating was Q3.

  Hydrometric Data

  There is flow monitoring data available for the Finn River at Anlore approximately 5km upstream of the proposed outfall location. The OPW has flow measurement and catchment area data at Anlore as follows:

  Average flow (m^3/s): 3.5923
  95-percentile flow (m^3/s): 0.19
  Catchment Area (km^2): 175

  The 95-percentile flow at the proposed outfall location at Cumber Bridge is estimated to be 10% higher than the flow at Cumber Bridge. The flowrate is therefore estimated as: 0.209m^3/s and 3.952 m^3/s for the 95-percentile flow and average flow respectively.

  Waste Assimilative Capacity - BOD
  The Waste Assimilative Capacity (WAC) for BOD is therefore calculated as follows:

$WAC = [(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})] \times 86.4$ kg Pollutant/day

C_{max} = maximum permissible BOD concentration in river = 4 mg/L
C_{back} = background (upstream) pollutant concentration = 2.4 mg/L
F_{river} = F_{95} (for BOD calculations) = 0.0209 m^3/s
F_{eff} = effluent flow, i.e. DWF/(3600 x 24) = 1575/(3600 x 24) = 0.01823 m^3/s

The Finn River is not designated as a salmonid water. However as Lough Erne is used for fisheries it is considered appropriate that the salmonid water standards be adopted for the calculation of the assimilative capacity, i.e. a C_{max} standard for the receiving waters of 4 mg/L BOD will be used. The background B.O.D. concentration, C_{back}, has been taken as 2.4 mg/L based on the 1998-200 EPA data (see Appendix 3). The resultant WAC is therefore calculated as follows:

$WAC = [(4 \times (0.209 + 0.01823)) - (2.4 \times 0.209) \times 86.4 = 35.19$ kg BOD/day

Taking a Design PE of 7,000 the influent load to the treatment plant is calculated as 420 kg BOD/day. The minimum standard of effluent BOD required is 25 mg/L. This equates to an effluent load of 39.37kg BOD/day. This is greater than the WAC of the stream therefore a higher level of treatment is required. With an effluent **BOD of 20 mg/L**, the effluent load will be 31.5 kgBOD/day. This less than the WAC and therefore acceptable.

This level of BOD will be readily achieved with conventional secondary treatment.

It is recommended that, for discharge to the current outfall location, a minimum level of BOD removal of 91.67%, which will result in an effluent BOD standard of 20 mg/L. An effluent **suspended solids** standard of **30mg/L** will be readily achieved with secondary treatment at this level of BOD removal.

Phosphorus

The phosphorus loads in the river are governed by the Phosphorus Regulations (S.I. 258 of 1998). The regulations state that the existing biological quality rating assigned between 1st January 1995 and 31st December 1997 is the rating upon which the improvements in Water Quality will be judged.

The Q-rating for the Finn River at Station No. 0500, Cumber Bridge at the proposed outfall, was 3 for the 1995-1997 Water Quality Data and is unchanged since. The minimum target ratings and concentrations for these stretches of water as defined in the Phosphorus regulations are given below.

Table 5 Phosphorus Regulations Target Ratings and Concentrations

Existing Biological Quality (Q) Rating/Q Index	Minimum Target Biological Quality (Q) Rating /Q Index	Molybdate Reactive Phosphate Median Conc. (mg P/l)
3	3-4	0.05

As the regulations determine the Q index using the median of 10 samples over 12 months the enforcement of the load determined from 95%ile flows is extremely onerous. A more realistic load is given by using the average flow in the river as this is more representative of the variable flows to be encountered during the 12-month sampling period.

The median background Ortho-Phosphate concentration, from the 1998-2000 EPA data, is 0.10 mg/L. As other factors are currently contributing to the upstream phosphorus levels, it is assumed that measures will be taken to reduce the phosphorus to a target concentration upstream of 0.03mg.P/l. Using the Waste Assimilation Capacity calculation the maximum allowable phosphorus load to the river is calculated as follows:

$WAC = [(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})] \times 86.4$ *kg Pollutant/day*

C_{max} = *maximum permissible P concentration in river = 0.05 mg/L*
C_{back} = *background (upstream) pollutant concentration = 0.03 mg/L*
F_{river} = F_{avg} *(for P calculations) = 3.952* m^3/s
F_{eff} = *effluent flow, i.e. DWF/(3600 x 24) = 1575/(3600 x 24) =* $0.01823 m^3/s$

MRP WAC = [(0.05 x (3.952 + 0.01823)) - (0.03 x 3.952)] x 86.4 [kg P/day]
= 6.91 kg MRP/day

Based on the above, the proposed effluent treatment standard should ensure that the MRP load to the river should be no more than 6.91 kg MRP/day.

With an effluent phosphorus standard of 2.0 mg/L, the phosphorus load for this concentration is calculated as follows:-

MRP (2.0 mg/L) = F_{eff} *(*m^3*/day) x =* C_{eff} *(mg/L) / 1000 = 1575 x 2 /1000*
= 3.15 kg MRP / day (< 6.28 kg / day)

The resulting MRP concentration is less than the available assimilative capacity. An effluent phosphorus standard of 2.0 mg/L is therefore acceptable.

Ammonia

As detailed above it is considered appropriate that the salmonid water standards be adopted for the calculation of the assimilative capacity. A guideline for the maximum allowable ammonia concentration in a Salmonid River, C_{max}*, is 0.5 mg/L. The stripping of ammonia from the effluent is easily achieved by ensuring that the D.O. level in the Aeration Process is maintained at or above 2 mg/L.*

The background ammonia concentration, C_{back}*, has been taken as 0.19 mg/L based on the 1998-200 EPA data (see Appendix 3). The resultant WAC is therefore calculated as follows:*

The increase in ammonia levels without any nitrification in the wastewater plant is calculated as follows:-

Maximum effluent ammonia concentration:	*25 mg/L*
WWTP Flowrate:	$1575\ m^3$*/day*
Effluent Nitrogen:	*39.38 kg / day*

The increase in river ammonia.N concentration is calculated as follows:

Effluent NH_3(N)(kg/day) x 1000 [mg/L] = (39.38 x 1000) / 341,412
Flow m^3/day

Increase in river ammonia nitrogen concentration: = 0.127 mg/L

The background ammonia level from EPA data is 0.19 mg/L. The total ammonia would therefore be 0.305mg/L which is acceptable. There is therefore no requirement for ammonia reduction for discharge to the River Finn.

- *Appropriate emission limit values of proposed Outfall to the River Finn*

  The effluent standards for the Clones Wastewater Treatment Works for discharge to the River Finn at Cumber Bridge are summarised below.

Table.6 Clones Effluent Standards – Discharge to Finn River

Parameter	Effluent Load (kg/d)	Effluent Concentration (mg/L)
BOD	15.75	20
Suspended Solids	18.9	30
Orthophosphate (P)	3.15	2

- *Timeframe for installation of the new outfall*

  The Water Services Investment Programme 2007-2009 indentifies the scheme as commencing in 2008. This is to include the construction of the new outfall to the Finn River. However, under the current economic climate, construction is unlikely to commence before 2015. At that time Part VII planning will be sought, following approval, construction will take completed over a 2 year construction period (approximate).

19. Amend page 56 as appropriate to reflect this application and delete reference to Ballybay.

The paragraph on page 56 should state the following;

Describe, where appropriate, measures for minimising pollution over long distances or in the territory of other states.

The impact of the discharge from the waste water treatment works in Clones has been calculated in the Waste Assimilative Capacity calculations in Appendix 6. This shows that the impact of the BOD, phosphorous and Ammonia discharge can not be assimilated into the receiving water and will have a polluting effect within the unnamed stream. However, this is currently being addressed by Monaghan County Council (MCC). It should also be noted that the impacts are limited to the stream. Once the stream reaches the River Finn sufficient dilution is provided to assimilate the load. As full scale works for the plant, addressed in the draft preliminary report, have no definitive timescale for commencement, MCC are putting in place, emergency works within the next 12 months to ensure the quality of the effluent from the Clones WwTW will comply with all regulations. Details on the implementation of the emergency works are to follow.

20. Identify the abstraction of water for industrial use, noted in the Clones Catchment Report.

21. Clarify the hydrometric data for Anglore/Anlore presented as 0.19m^3/sec in the assimilative capacity calculations and as 0.1m^3/sec in the Clones Catchment report. Amend the assimilative capacity calculations as necessary.

    The hydrometric data used in the assimilative capacity calculations was obtained from the most recent OPW results, from Station 36015 at Analore, at the following address; http://www.opw.ie/hydro/index.asp. Appendix 4 shows the results from the website for the station at Analore. The 95 percentile flow at this station is 0.19m^3/sec.

    Regarding the Clones Catchment Report, this was not completed by Monaghan County Council or Nicholas O'Dwyer Consulting Engineers Ltd. and therefore no comment can be made on the figures used in Clones Catchment report.

22. Provide details, including summary water quality results of water quality monitoring undertaken by Monaghan County Council in the receiving waters.

    Please see Appendix 5 for Clones WwTW water quality results from 25/1/07 to 16/03/09.

APPENDIX 1

Updated Non-Technical summary

NON-TECHNICAL SUMMARY

1. The waste water works and the activities carried out

Introduction

1.1 Summary of Wastewater Treatment Plant Units

Clones is a small town in the west of County Monaghan, close to the border with County Fermanagh. It has a current residential population of approximately 3,082. The town serves as a retail and service centre to the agricultural community in the surrounding hinterland. The drainage catchment in Clones includes the main urban area and also extends outwards to service ribbon development along roads leading into the town. The area of the current drainage catchment is circa 123ha.

Clones Wastewater treatment works at Legarhill was built in the 1960's and was upgraded in the 1980's. The plant provides secondary treatment with primary settlement and a percolating filter system preceded by course screening. The plant discharges treated effluent to a tributary of the River Finn.

The waste water treatment plant is managed on a part time basis by a technician and operated by a caretaker. There is no SCADA or remote monitoring of the plant in place.

1.2 Description of Waste water treatment process

The plant consists of the following main components:

Preliminary Treatment

- Inlet pumping station with coarse screening
- 2 No. storm tanks with return to inlet pumping station

Primary Treatment

- Primary settlement tanks – 2No. Imhoff tanks
- 2 No. percolating filters

Secondary Treatment

- 1 No. Imhoff/Humus tank

Sludge Treatment

- Sludge Drying bed (Reed bed)

Administration and control building

Preliminary Treatment

Incoming waste water from the Clones sewerage scheme gravitates to the preliminary treatment system. This comprises of a manually raked coarse screen (30mm aperture). The screenings are stored temporarily on site prior to disposal at Scotch corner landfill.

Downstream of the preliminary treatment system flows gravitate to a pumping station with foul and storm pumps. The sump in this station has an overflow weir which allows incoming waste water to overflow to an adjoining storm water sump when the capacity of the main foul pumps has been exceeded. Under normal operating conditions only the duty foul pumps pump waste forward for treatment at a maximum rate of 28 L/s. At higher flows a second foul pump forwards wastewater to the treatment plant. During storm conditions the storm pumps convey waste water forward to the stormwater tanks. The stormwater is returned by gravity to the wet well. There is an overflow from the storm tanks to the outfall. The combined pumping capacity under these conditions is approximately 92L/s. When incoming flow rates exceed this, waste water is allowed to build up the screening chamber and inlet sewers.

The total flow into the WWTW is measured electromagnetically at the plant inlet downstream of the preliminary treatment system, and the discharge is measured in a venture flume at the outlet. In addition, automatic samplers are provided at the WWTW to sample the influent the effluent at the plant.

Primary Treatment

Primary treatment comprises of two horizontal flow Imhoff tanks operating in parallel and fitted with chain scraper mechanisms, which scrap primary sludge to the hoppers located at the inlet end of the tanks. Settled sewage gravitates via a dosing siphon to the secondary treatment system, while settled sludge gravitates directly to the reed beds.

Following primary treatment, flows up to 28L/s (2.2DWF) gravitate to a flow splitting chamber. This chamber incorporates adjustable plate weirs which allow flows to be accurately split to the secondary treatment system.

Sludge is removed from the primary settlement tanks by tanker.

Secondary Treatment

Secondary treatment is carried out in a conventional percolating filter system. The percolating filter system consists of two circular trickling filters which operate in parallel and are fitted with randomly packed stone media. The filters

have a media bed volume of 2,080m^3. Flow from the percolating filter system gravitates to a secondary settlement tank (Imhoff/Humus tank).
The secondary settlement tank is 7m square hopper bottomed tank (not fitted with cleaning mechanism).

Sludge Treatment

Settled sludge from the Imhoff/Humus tank flows, by gravity, to the sludge drying beds. Here, the water from the sludge drains through the porous material in the sludge bed. As the water drains from the sludge in the beds, the volume decreases substantially and hence the dry solids contents of the sludge increases. On average, the beds only require emptying every 10 years The floor of the beds are sloped to allow the water run off to be drained and returned to the inlet sump to join the influent for full treatment.

Treated Effluent

Treated effluent, which overflows from the secondary settlement tank, gravitates to an on site chamber. From there the flow gravitates to the outfall which is a tributary of the River Finn.

2.0 The sources of emissions from the waste water works

Primary Discharge (PSW1) – Effluent Outfall

The treated effluent from the existing wastewater treatment plant discharges into a small stream (tributary of the River Finn) approximately 3m to the south of the works. The discharge consists of a stepped cascade. This is used to increase the DO concentration prior to entering the stream. Refer to drawing 04, attachment B2 in the Wastewater Discharge licence application.

Storm Water Overflows (SW2) – Inlet Pump Station

This storm water overflow is located at the WWTW inlet pumping station. The overflow consists of a 150mm diameter pipe discharging to a small stream (tributary of the River Finn) approximately 8m from the pumping station.

Storm Water Overflows (SW3) – Manhole 55301

This overflow is located on a 300mm diameter concrete combined sewer at the wastewater treatment plant off Scothouse Road. Excess flow discharges to a nearby watercourse via an unscreened high level 300 mm pipeline. These excess flows are ultimately discharged to the River Finn.

It was noted, in consultation with local operations staff, that flooding occurred upstream of the overflow occurred as a result of the overflow level set higher than the ground level of manholes on the Newtownbutler Road sewer.

Storm Water Overflows (SW4) – 98 Avenue Pump Station

This storm water overflow is located at the 98 Avenue pumping station. The overflow consists of a 150mm diameter pipe discharging to a small stream (tributary of the River Finn) approximately 52m from the pumping station.

Existing Sewerage Network Overview

Clones catchment is drained by a combination of gravity sewers and four pumping stations to the wastewater treatment plant, with final effluent discharging into a tributary of the River Finn. The network is largely combined and only recent developments have separate foul and storm systems. One combined sewer overflow was located during the pre-site survey for the Flow and Rainfall Contract. It is located just before the treatment works, off Scotshouse Road. The existing system was last upgraded in the 1960's and there are significant hydraulic and structural problems in the network. Separation of the storm component was completed in specific problem areas within the town.

3.0 The nature and quantities of emissions from the waste water works into the receiving aqueous environment

The existing plant has a design capacity of 4,500pe and a design effluent quality (to the primary discharge point) as follows;

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

Phosphorus removal and outfall to the river Finn are recommended in the draft Preliminary Report for Clones, Castleblayney and Ballybay sewerage schemes. This will provide for compliance with the Phosphorus Regulations (SI258 of 1998) and provide a greater waste assimilative capacity.

4.0 Identification of significant effects of the emissions on the environment

The only significant emission from the wastewater treatment plant is the effluent to the stream. The effect of this has been examined in terms of the waste assimilative capacity of the stream and the River Finn in terms of BOD_5, suspended solids, phosphorus, ammonia and oxidised nitrogen. The current effluent limits are not within the waste assimilative capacity of the river. Monaghan County Council is to install emergency works within the next 12 months to address this issue.

5.0 The proposed technology and other techniques for preventing or reducing emissions/pollution from the waste water works

The existing Clones Wastewater Treatment Plant is well maintained. There have been some recent improvements. However, it is an old plant, built originally in the 1960's and upgraded in the 1980's. Consequently it requires an upgrade in order to improve the current plant condition and treatment levels and reduce the overflow of untreated effluent during storm conditions in addition to providing the capacity for a phase one population estimate of 7,000. Therefore, the draft Preliminary Report proposes the following to be provided during the upgrade works:

Stormwater Tank: a stormwater tank with 2 hours capacity for overflows at peak flows (8 DWF) is required. A new storm tank with cleaning facilities should be provided. The required tank capacity will be the peak hourly flow minus the peak flow to full treatment for two hours, i.e. (8 -3) x 18.2 (DWF (l/s)) x 3.6 x 2 = 655m^3.

Inlet Works: A new inlet works with automatic screening and grit removal will be required.

Secondary Treatment: Two main process options are available; conventional activated sludge and sequencing batch reactors (SBR's).

Aeration Tanks: It is recommended a diffused air aeration system with air blowers be provided.

Settlement Tanks: The recommended upflow rate for a settlement tank 1.00 m^3/ m^2/hr and the recommended retention time is 2 hours.

Sludge Return / Sludge Waste: A sludge drawoff chamber and sludge return and sludge waste pumping station is required as part of the conventional

activated sludge process. The sludge return rate is normally up to 1.5 DWF and the sludge waste pump at a maximum rate of 0.5 DWF.

Nutrient Reduction: A chemical dosing facility for phosphorus removal should be provided.

Sludge Treatment: A picket fence thickener will be required for storage and thickening of waste activated sludge on the site prior to dewatering. The tank should be sized to store four days sludge at 1% dry solids. The quantity of sludge produced will be approximately 75g/h/d including chemical sludges, i.e. (75 x 5000 / 1000) kg/day = 525 kg/day

Other facilities to be provided under Phase 1 include the following:

- New administration and control building
- Inlet / air blower building
- Sludge dewatering building
- Odour control plant
- Site cable ducts and pipework
- New main and sludge dewatering control panels
- Final effluent pumping station and outfall rising main
- New telemetry and SCADA system
- New outfall to the River Finn

6.0 Measures planned to monitor emissions into the environment

Flowmeters are provided at the wastewater treatment plant to monitor the process and the emissions to the environment. The flowmeters and process instrumentation provided are as follows:

- Electromagnetic flowmeter at inlet chamber
- Venturi flume at effluent outlet
- Automatic influent sampler
- Automatic effluent sampler

Monaghan County Council currently carry out monthly monitoring of the final effluent from the wastewater treatment plant in addition to ongoing monitoring carried out in the receiving water (tributary of the River Finn) to monitor the water quality. No additional monitoring is considered necessary to monitor emissions to the environment.

APPENDIX 2

Laboratory Confirmation Results and Corrected Results;

Pauline McAree

From: Donna Heslin [dheslin@euroenv.ie]
Sent: 29 April 2009 14:28
To: gmccarthy@monaghancoco.ie; Pauline McAree
Subject: Supplementary certs 0810/038 & 0810/039 batches
Attachments: Monaghan Co Co supplementary 29.04.09.pdf

Hi Pauline,

Following your query re the positive Dichloromethane (DCM) results for samples 0810/038/01-11 & 0810/039/01-08, we investigated the results in our GC lab.

We had a DCM contamination issue and blank samples were analysed with each batch of Volatile organic compounds so that it can be subtracted from the samples, in order to reflect the true DCM concentration of the samples.

On review, it was observed that for both of the above batches, the blank DCM concentration had not been subtracted from the sample results. This was an oversight on our part and apologies for the inconvenience caused.

Please find supplementary certs attached with the amended DCM results.

Any queries, please contact me.

Regards
Donna

Donna Heslin
Laboratory Manager
EURO environmental services
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Customer	Gearoid McCarthy Monaghan Co. Co. County Offices The Glen Co Monaghan	*Lab Report Ref. No.*	0810/039/05S
		Date of Receipt	18/06/2008
		Date Testing Commenced	18/06/2008
		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Inflow	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia	114	Colorimetry	31.27	mg/L as N	UKAS
Arsenic	177	ICPMS	1	ug/L	
Atrazine	191	HPLC	<0.01	ug/L	
Barium	177	ICPMS	49	ug/L	
BOD	113	Electrometry	185	mg/L	
Boron	177	ICPMS	514	ug/L	
Cadmium	177	ICPMS	<0.09	ug/L	
Chromium	177	ICPMS	1	ug/L	
COD	107	Colorimetry	618	mg/L	UKAS
Conductivity	112	Electrometry	1484	uscm -1@25C	UKAS
Copper	177	ICPMS	78	ug/L	
Cyanide	138	Colorimetry	16	ug/L	
Dichloromethane	154	GCMS	<1	ug/L	
Fluoride	115	Colorimetry	0.92	mg/L	
Lead	177	ICPMS	3	ug/L	
Mercury	178	ICPMS	<0.2	ug/L	
Nickel	177	ICPMS	3	ug/L	
Nitrate	103	Colorimetry	<0.09	mg/L as N	
Nitrite	118	Colorimetry	0.005	mg/L as N	
Nitrogen (Total Kjeldahl)	104	Digestion/ Distillation/ Titrim	38.08	mg/L as N	
Nitrogen (Total Oxidised)	151	Colorimetry	<0.03	mg/L as N	
Nitrogen (Total)	0	Calculation	38.08	mg/L as N	
pH	110	Electrometry	7.0	pH Units	UKAS
Phenols (Total)	223	GCMS	<0.10	ug/L	
Phosphate (Ortho)	117	Colorimetry	5.004	mg/L as P	UKAS

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of EURO environmental services
Results contained in this report relate only to the samples tested

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Customer Ref	Clones Inflow	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Phosphate (Total)	166	Digestion/ Colorimetry	8.785	mg/L as P	UKAS
Selenium	177	ICPMS	3	ug/L	
Simazine	191	HPLC	<0.01	ug/L	
Solids (Total Suspended)	106	Filtration/ Drying @ 104C	317	mg/L	
Sulphate	119	Colorimetry	51.86	mg/L as SO4	UKAS
Temperature	715	DO Meter	14.3	degrees C	
Toluene	179	GCMS	<1	ug/L	
Tributyltin*	0	GCMS	<0.02	ug/L as Sn	
Xylene	179	GCMS	<1	ug/L	
Zinc	177	ICPMS	129.2	ug/L	

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

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		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Outflow	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia	114	Colorimetry	<0.09	mg/L as N	
Arsenic	177	ICPMS	1	ug/L	
Atrazine	191	HPLC	<0.01	ug/L	
Barium	177	ICPMS	26	ug/L	
BOD	113	Electrometry	11	mg/L	
Boron	177	ICPMS	259	ug/L	
Cadmium	177	ICPMS	<0.09	ug/L	
Chromium	177	ICPMS	2	ug/L	
COD	107	Colorimetry	39	mg/L	UKAS
Conductivity	112	Electrometry	958	uscm -1@25C	UKAS
Copper	177	ICPMS	17	ug/L	
Cyanide	138	Colorimetry	<5	ug/L	
Dichloromethane	154	GCMS	<1	ug/L	
Fluoride	115	Colorimetry	0.60	mg/L	
Lead	177	ICPMS	2	ug/L	
Mercury	178	ICPMS	<0.2	ug/L	
Nickel	177	ICPMS	3	ug/L	
Nitrate	103	Colorimetry	6.16	mg/L as N	
Nitrite	118	Colorimetry	0.524	mg/L as N	
Nitrogen (Total Kjeldahl)	104	Digestion/ Distillation/ Titrim	3.92	mg/L as N	
Nitrogen (Total Oxidised)	151	Colorimetry	6.68	mg/L as N	UKAS
Nitrogen (Total)	0	Calculation	10.60	mg/L as N	
pH	110	Electrometry	7.6	pH Units	UKAS
Phenols (Total)	223	GCMS	<0.10	ug/L	
Phosphate (Ortho)	117	Colorimetry	3.305	mg/L as P	UKAS

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

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		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Outflow	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Phosphate (Total)	166	Digestion/ Colorimetry	3.387	mg/L as P	UKAS
Selenium	177	ICPMS	2	ug/L	
Simazine	191	HPLC	<0.01	ug/L	
Solids (Total Suspended)	106	Filtration/ Drying @ 104C	16	mg/L	
Sulphate	119	Colorimetry	53.67	mg/L as SO4	UKAS
Temperature	715	DO Meter	14.2	degrees C	
Toluene	179	GCMS	<1	ug/L	
Tributyltin*	0	GCMS	<0.02	ug/L as Sn	
Xylene	179	GCMS	<1	ug/L	
Zinc	177	ICPMS	21.9	ug/L	

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

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		Date Testing Commenced	18/06/2008
		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Upstream	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia	114	Colorimetry	0.98	mg/L as N	UKAS
Arsenic	177	ICPMS	1	ug/L	
Atrazine	191	HPLC	<0.01	ug/L	
Barium	177	ICPMS	54	ug/L	
BOD	113	Electrometry	<2	mg/L	
Boron	177	ICPMS	147	ug/L	
Cadmium	177	ICPMS	<0.09	ug/L	
Chromium	177	ICPMS	<0.93	ug/L	
COD	107	Colorimetry	28	mg/L	UKAS
Conductivity	112	Electrometry	662	uscm -1@25C	UKAS
Copper	177	ICPMS	6	ug/L	
Cyanide	138	Colorimetry	5	ug/L	
Dichloromethane	154	GCMS	<1	ug/L	
Fluoride	115	Colorimetry	0.42	mg/L	
Lead	177	ICPMS	3	ug/L	
Mercury	178	ICPMS	<0.2	ug/L	
Nickel	177	ICPMS	2	ug/L	
Nitrate	103	Colorimetry	<0.09	mg/L as N	
Nitrite	118	Colorimetry	0.012	mg/L as N	
Nitrogen (Total Kjeldahl)	104	Digestion/ Distillation/ Titrim	1.68	mg/L as N	
Nitrogen (Total Oxidised)	151	Colorimetry	0.04	mg/L as N	
Nitrogen (Total)	0	Calculation	1.72	mg/L as N	
pH	110	Electrometry	7.8	pH Units	UKAS
Phenols (Total)	223	GCMS	<0.10	ug/L	
Phosphate (Ortho)	117	Colorimetry	0.291	mg/L as P	UKAS

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

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Customer	Gearoid McCarthy Monaghan Co. Co. County Offices The Glen Co Monaghan	*Lab Report Ref. No.*	0810/039/07S
		Date of Receipt	18/06/2008
		Date Testing Commenced	18/06/2008
		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Upstream	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Phosphate (Total)	166	Digestion/ Colorimetry	1.206	mg/L as P	UKAS
Selenium	177	ICPMS	1	ug/L	
Simazine	191	HPLC	<0.01	ug/L	
Solids (Total Suspended)	106	Filtration/ Drying @ 104C	7	mg/L	
Sulphate	119	Colorimetry	37.16	mg/L as SO4	UKAS
Temperature	715	DO Meter	13.6	degrees C	
Toluene	179	GCMS	<1	ug/L	
Tributyltin*	0	GCMS	<0.02	ug/L as Sn	
Xylene	179	GCMS	<1	ug/L	
Zinc	177	ICPMS	11.5	ug/L	

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

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Customer	Gearoid McCarthy Monaghan Co. Co. County Offices The Glen Co Monaghan	*Lab Report Ref. No.*	0810/039/08S
		Date of Receipt	18/06/2008
		Date Testing Commenced	18/06/2008
		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Downstream	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia	114	Colorimetry	2.71	mg/L as N	UKAS
Arsenic	177	ICPMS	1	ug/L	
Atrazine	191	HPLC	<0.01	ug/L	
Barium	177	ICPMS	41	ug/L	
BOD	113	Electrometry	5	mg/L	
Boron	177	ICPMS	386	ug/L	
Cadmium	177	ICPMS	<0.09	ug/L	
Chromium	177	ICPMS	<0.93	ug/L	
COD	107	Colorimetry	43	mg/L	UKAS
Conductivity	112	Electrometry	811	uscm -1@25C	UKAS
Copper	177	ICPMS	9	ug/L	
Cyanide	138	Colorimetry	8	ug/L	
Dichloromethane	154	GCMS	<1	ug/L	
Fluoride	115	Colorimetry	0.50	mg/L	
Lead	177	ICPMS	2	ug/L	
Mercury	178	ICPMS	<0.2	ug/L	
Nickel	177	ICPMS	2	ug/L	
Nitrate	103	Colorimetry	2.81	mg/L as N	
Nitrite	118	Colorimetry	0.277	mg/L as N	
Nitrogen (Total Kjeldahl)	104	Digestion/ Distillation/ Titrim	3.36	mg/L as N	
Nitrogen (Total Oxidised)	151	Colorimetry	3.09	mg/L as N	UKAS
Nitrogen (Total)	0	Calculation	6.45	mg/L as N	
pH	110	Electrometry	7.6	pH Units	UKAS
Phenols (Total)	223	GCMS	<0.10	ug/L	
Phosphate (Ortho)	117	Colorimetry	2.059	mg/L as P	UKAS

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

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A copy of this certificate is available on www.euroenv.ie

Customer	Gearoid McCarthy Monaghan Co. Co. County Offices The Glen Co Monaghan	*Lab Report Ref. No.*	0810/039/08S
		Date of Receipt	18/06/2008
		Date Testing Commenced	18/06/2008
		Received or Collected	Collected by Euro
		Condition on Receipt	Acceptable
Customer PO	400092317	*Date of Report*	29/04/2009
Customer Ref	Clones Downstream	*Sample Type*	Trade Effluent

CERTIFICATE OF ANALYSIS - Supplementary

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Phosphate (Total)	166	Digestion/ Colorimetry	2.236	mg/L as P	UKAS
Selenium	177	ICPMS	1	ug/L	
Simazine	191	HPLC	<0.01	ug/L	
Solids (Total Suspended)	106	Filtration/ Drying @ 104C	13	mg/L	
Sulphate	119	Colorimetry	44.60	mg/L as SO4	UKAS
Temperature	715	DO Meter	13.7	degrees C	
Toluene	179	GCMS	<1	ug/L	
Tributyltin*	0	GCMS	<0.02	ug/L as Sn	
Xylene	179	GCMS	<1	ug/L	
Zinc	177	ICPMS	18.6	ug/L	

Signed : Donna Heslin ***Date :*** 29/04/09

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

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APPENDIX 3

Outline Schematic of Clones Collection Network

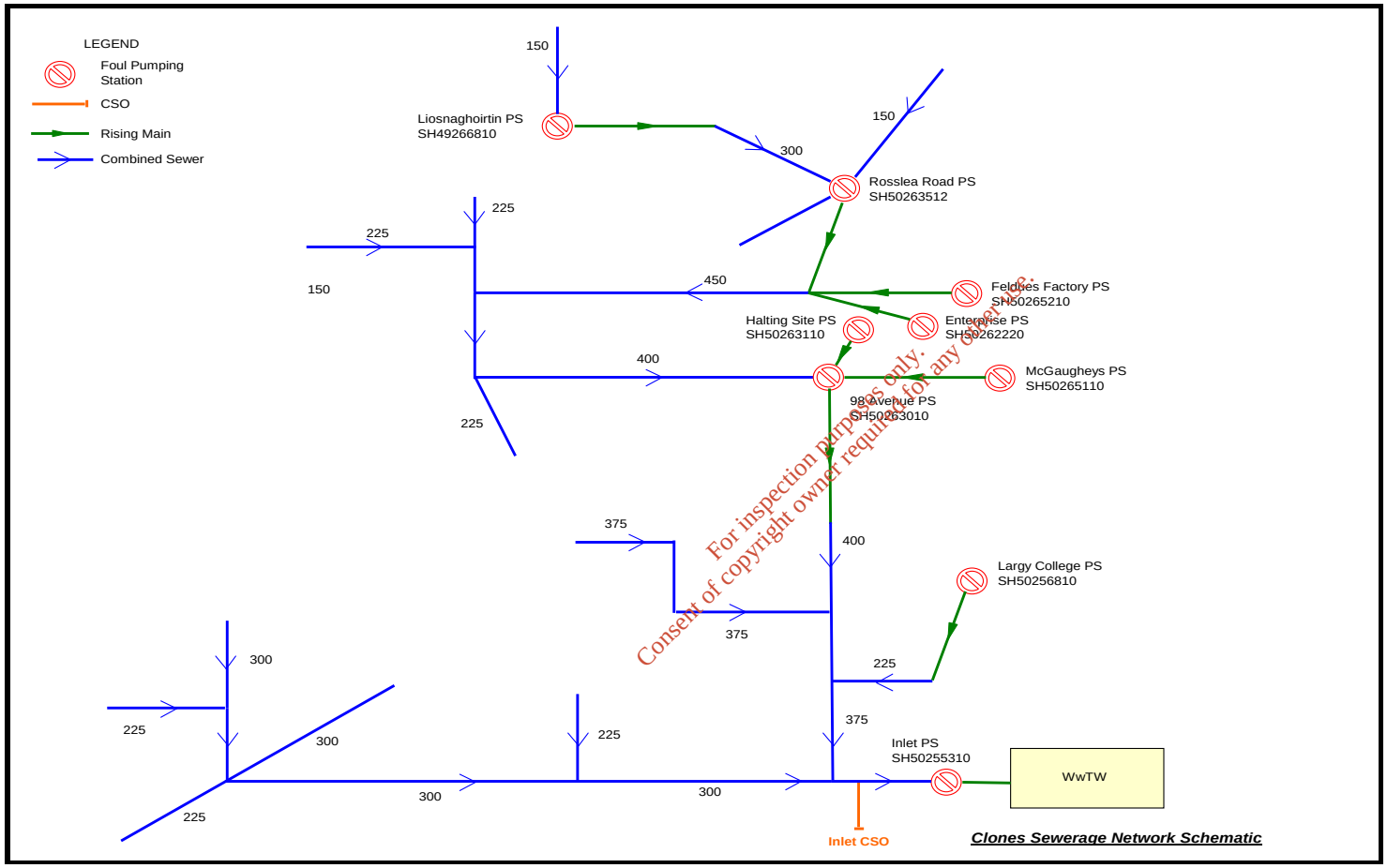

Figure 3.49 – Outline Schematic of Clones Collection Network

APPENDIX 4

2001- 2003 EPA Water Quality Statistical Data

Upstream - Station No. 0400 Scarvy Br

Downstream - Station No. 0500 Cumber Br

OPW Hydrometric Data

Station No. 36015 - Anlore

Hydrometric Area 36

Erne

River and Code : **FINN (MONAGHAN)** **36/F/01**
Tributary of : Upper Lough Erne OS Catchment No: 123
OS Grid Ref : H 422 200

Sampling Stations No.	Biological Quality Ratings (Q Values) 1971	1973	1977	1980	1982	1984	1989	1993	1997	1998	2001
0010	-	-	-	-	-	-	**3-4**	4-5	4-5	4	**3**
0080	-	-	-	-	-	-	**3**	4	**3**	4	4
0100	5	5	4-5	4	4-5	4-5	**3-4**	4	**3-4**	4	**3-4**
0200	5	4-5	4-5	4	4	4	**3-4**	4	**3**	**3-4**	**3**
0300	-	-	-	-	-	-	-	-	-	-	-
0400	-	-	**3-4**	**3-4**	**3-4**	**3-4**	**3-4**	**3**	**3-4**	**3-4**	**3**
0500	**3-4**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

No.	Location	No.	Location
0010	Br at Mill NW of Kilcreen	0300	Anlore Bridge
0080	E of Aghafin Lough	0400	Scarvy Br
0100	Stone Br	0500	Cumber Br
0200	Annamakiff Br	0600	Annie's Br

Results of Chemical Analyses 2001 to 2003:
Data Set: 1 36F01 EPA

Station No.	pH				Conductivity µS cm^{-1}				Temperature oC			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0080	*11*	7.6	7.8	8.1	-	-	-	-	*10*	2.0	11.0	19.0
0100	*12*	7.5	8.0	8.2	-	-	-	-	*12*	3.0	11.0	17.0
0200	*12*	7.7	7.9	7.9	-	-	-	-	*12*	3.0	11.5	18.0
0300	*8*	7.6	7.9	8.0	-	-	-	-	*8*	4.0	14.0	18.0
0400	*4*	7.8	7.8	7.9	-	-	-	-	*4*	3.0	9.5	17.0
0500	*12*	7.7	7.8	7.9	-	-	-	-	*12*	3.0	11.5	18.0

Station No.	Dissolved Oxygen % Saturation				Dissolved Oxygen mg $O_2 1^{-1}$				B.O.D mg $O_2 1^{-1}$			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0080	*10*	86	92	101	*10*	8.3	10.1	**13.2**	*11*	1.2	2.1	3.7
0100	*12*	90	94	105	*12*	9.0	10.2	**13.4**	*12*	1.1	1.9	**5.2**
0200	*12*	**65**	86	99	*12*	**6.1**	9.4	**12.6**	*12*	1.2	2.3	4.0
0300	*8*	**64**	84	90	*8*	**6.0**	8.8	11.7	*8*	1.0	2.2	2.8
0400	*4*	74	87	95	*4*	7.1	10.1	**12.5**	*4*	1.1	1.8	2.6
0500	*12*	**41**	80	96	*12*	**3.9**	8.6	**12.0**	*12*	1.2	2.0	4.6

Station No.	Chloride mg Cl 1^{-1}				Total Ammonia mg N 1^{-1}				Un-Ionised Ammonia mg NH_3 1^{-1}			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0080	*11*	9	15	22	*11*	<0.03	0.06	0.26	*10*	<0.001	0.001	0.005
0100	*12*	10	15	21	*12*	<0.03	0.04	0.14	*12*	<0.002	0.001	0.003
0200	*12*	**18**	25	**41**	*12*	0.04	**0.11**	**0.35**	*12*	0.001	0.002	0.008
0300	*8*	**18**	24	27	*8*	<0.03	0.08	0.20	*8*	<0.001	0.002	0.003

Station No.	Chloride mg Cl 1^{-1}				Total Ammonia mg N 1^{-1}				Un-Ionised Ammonia mg NH_3 1^{-1}			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0400	*4*	**21**	24	27	*4*	0.04	0.09	0.12	*4*	0.001	0.001	0.003
0500	*12*	**17**	24	31	*12*	0.06	**0.14**	**0.63**	*12*	0.001	0.002	0.019

Station No.	Oxidised Nitrogen mg N 1^{-1}				Ortho-Phosphate mg P 1^{-1}				Colour Hazen			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0080	*10*	0.4	0.8	1.1	*11*	<0.02	**0.04**	**0.11**	*11*	53	84	166
0100	*11*	0.5	0.9	1.2	*12*	**0.02**	**0.04**	**0.08**	*12*	49	81	166
0200	*11*	1.0	1.3	2.2	*12*	**0.02**	**0.05**	**0.15**	*12*	38	58	117
0300	*8*	1.0	1.4	2.2	*8*	**0.02**	**0.06**	**0.16**	*8*	36	59	110
0400	-	-	-	-	*4*	**0.02**	**0.04**	**0.06**	*4*	34	48	100
0500	*11*	1.1	1.8	2.5	*12*	**0.02**	**0.08**	**0.25**	*12*	33	57	104

River and Code : **KNAPPAGH** **36/K/01**
Tributary of : Annalee OS Catchment No: 123
OS Grid Ref : H 678 099

Sampling Stations No.	Location	Biological Quality Ratings (Q Values) 1977	1981	1985	1989	1993	1997	1998	2001
0100	Cross Roads NE of Bocks L	-	-	-	-	-	-	-	-
0200	Br u/s Bellatrain L	-	4	**3-4**	**3-4**	**3**	**3**	**3**	**3**
0300	Br d/s Bellatrain L	-	-	-	-	-	-	-	-
0400	Lackan Br	4	4	**3-4**	**3**	**3-4**	**3**	**3**	**3-4**
0700	Br u/s Annalee R confl	-	4-5	4	**3**	**3-4**	**3-4**	**3**	3-4

Results of Chemical Analyses 2001 to 2003:
Data Set: 1 36K01 Cavan Co Co

Station No.	pH				Conductivity µS cm^{-1}				Temperature oC			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0700	*16*	7.5	7.9	8.1	*16*	144	163	180	*15*	4.3	12.8	18.4

Station No.	Dissolved Oxygen % Saturation				Dissolved Oxygen mg $O_2 1^{-1}$				B.O.D mg $O_2 1^{-1}$			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0700	*15*	73	91	120	*15*	7.0	10.0	**13.8**	*12*	<2.0	<2.0	3.0

Station No.	Chloride mg Cl 1^{-1}				Total Ammonia mg N 1^{-1}				Un-Ionised Ammonia mg NH_3 1^{-1}			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0700	-	-	-	-	*16*	<0.01	0.02	0.16	*9*	<0.001	<0.001	0.002

HYDRO-DATA

Summary Statistics Data

GENERAL STATION DETAILS			
Station Name: Anlore	Station No: 36015	Watercourse: Finn	NGR: H 537 256
Catchment Area (km^2): 175	Catchment: Erne	Gauge Type: AR	Datum: Poolbeg

SUMMARY HYDROMETRIC STATISTICS
Annual Average Rainfall (mm)[1]: 1058
Est'd Annual Losses (mm)[1]: 447
Mean Annual Flow (m^3/s): 3.5923 (Data derived for the period 1956 to 2001)

STATION HISTORY
Period of Continuous Hardcopy Records: 1956 to 2005
Period of Digitised Record: 1956 to 2004

Note 1 : Data extracted from the Environmental Protection Agency publication 'Hydrological Data', July 1997

DURATION PERCENTILES							
Flows equalled or exceeded for the given percentage of time (m^3/s) (Data derived for the period 1956 to 2001)							
1%	5%	10%	50%	80%	90%	95%	99%
17.6	12.1	9.55	2.17	0.65	0.33	0.19	0.08
Levels equalled or exceeded for the given percentage of time (mAOD Poolbeg) (Data derived for the period 1956 to 2004)							
1%	5%	10%	50%	80%	90%	95%	99%
51.84	51.48	51.28	50.85	50.64	50.57	50.53	50.49

Summary Statistics Data

GENERAL STATION DETAILS			
Station Name: Anlore	Station No: 36015	Watercourse: Finn	NGR: H 537 256
Catchment Area (km^2): 175	Catchment: Erne	Gauge Type: AR	Datum: Poolbeg

SUMMARY HYDROMETRIC STATISTICS
Annual Average Rainfall (mm)[1]: 1058
Est'd Annual Losses (mm)[1]: 447
Mean Annual Flow (m^3/s): 3.5923 (Data derived for the period 1956 to 2001)

STATION HISTORY
Period of Continuous Hardcopy Records: 1956 to 2005
Period of Digitised Record: 1956 to 2004

Note 1 : Data extracted from the Environmental Protection Agency publication 'Hydrological Data', July 1997

DURATION PERCENTILES							
Flows equalled or exceeded for the given percentage of time (m^3/s) (Data derived for the period 1956 to 2001)							
1%	5%	10%	50%	80%	90%	95%	99%
17.6	12.1	9.55	2.17	0.65	0.33	0.19	0.08
Levels equalled or exceeded for the given percentage of time (mAOD Poolbeg) (Data derived for the period 1956 to 2004)							
1%	5%	10%	50%	80%	90%	95%	99%
51.84	51.48	51.28	50.85	50.64	50.57	50.53	50.49

Daily Mean Flow Data

GENERAL STATION DETAILS			
Station Name: Anlore	Station No: 36015	Watercourse: Finn	NGR: H 537 256
Catchment Area (km^2): 175	Catchment: Erne	Gauge Type: AR	Datum: Poolbeg

VIEWING OPTIONS

Please choose the **Year** & **Layout** required and press **View**.

Year: 2001 View

Tabular Graph

DOWNLOAD OPTIONS

Please choose the time interval (**From** & **To**) required and press **Download**.

From: 2001 **To:** 2001 Download

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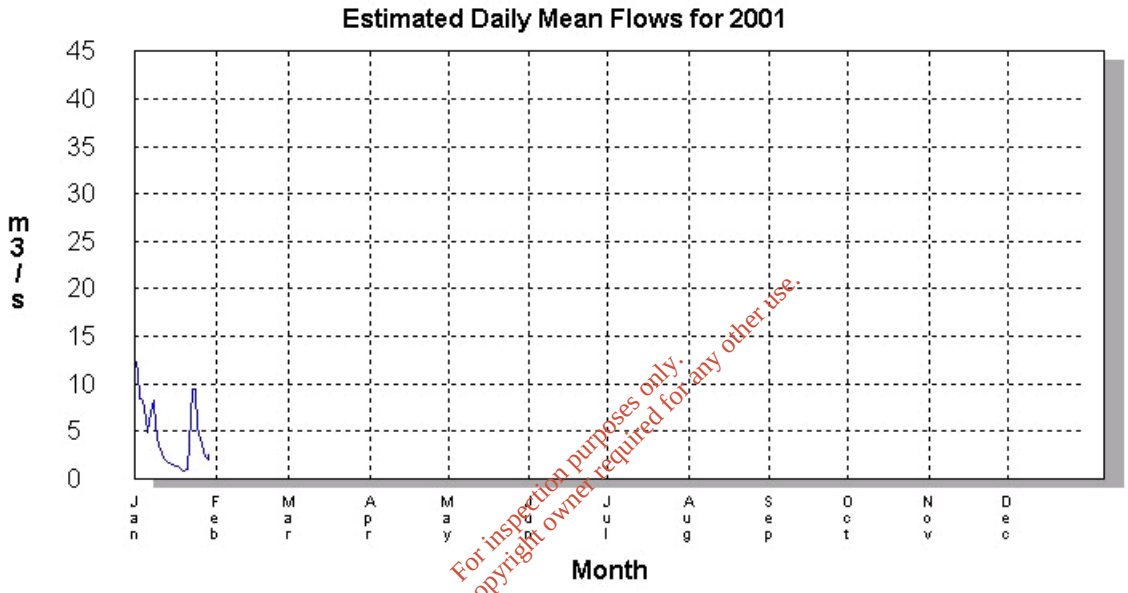

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APPENDIX 5

Monaghan County Council – 2008-2009 Upstream Monitoring Results

Clones WWTW Monitoring Results 2008-2009 - UPSTREAM SAMPLES											
USW	Date of Sampling	Sample Type (C or G)	BOD mg/l	COD mg/l	TSS mg/l	Total P mg/l P	Ortho P mg/l P	Total N mg/l N	NH3-N mg/l N	TON mg/l N	TKN mg/l N
USW	19/02/2008	G	< 2	22	10	0.18	0.54	4.37		1.01	3.36
USW	22/04/2008	G	5	36.3	8	0.21	0.64	1.90	0.30		
USW	09/07/2008	G	3	22	11.2	0.53	1.61	1.90	0.24		
USW	24/09/2008	G	< 2	24	5	0.11	0.32			0.44	< 1.00
USW	12/11/2008	G	2	19	3	0.09	0.27	1.46		0.46	1.00
USW	16/03/2009	G	2	25	3	0.07	0.20	1.99		0.99	1.00
AVERAGE			**2.57**	**24.72**	**6.70**	**0.20**	**0.60**	**2.32**	**0.27**	**0.73**	**1.59**

APPENDIX 6

Revised Waste Assimilative Capacity (WAC) Calculations

There are no impacts on ground water or other environmental media. The impact of the primary discharge point on the stream which the outfall discharges to is evaluated in the WAC assimilative capacity calculations below.

Water Quality

Parameter	Value
Population equivalent	4449
Flow per person per day:	225.0
Daily flow (m^3/day):	1001.03
Daily flow (m^3/s):	0.01159
Daily BOD (kg/day)	266.94

The Clones wastewater treatment plant currently discharges to a small stream which is a tributary of the Finn River. There is no EPA monitoring stations on this river and no flow monitoring. The current water quality status has been estimated based on the water quality in the Finn River and data from Monaghan County Council. The EPA Ecological Assessment of Rivers 2003 states that the water quality of the Finn River had shown an overall improvement that was most marked in the reach below the Magherarney River. The latest biological quality rating, from 2004, at Station No. 0400, Scarvy Bridge, upstream of Clones is Q4 and downstream of the proposed outfall, at Station No. 0500, Cumber Bridge, the rating is Q3-4. The ratings have improved from Q3 in 2001.

The 1997 biological quality rating, at Station No. 0400, was Q3-4 and downstream of the existing outfall, at Station No. 0500, the rating was Q3.

Hydrometric Data

There is no flow monitoring data for the stream which the wastewater treatment plant outfall discharges. The flow has been estimated based on the catchment area (4km^2) and the flows in the River Finn. There is flow monitoring data available for the Finn River at Anlore. The OPW has flow measurement and catchment area data at Anlore as follows:

Average flow (m^3/s):	3.5923	
95-percentile flow (m^3/s):	0.19	
Catchment Area (km^2):	175	
Average flow (m^3/s):	(3.5923/175)	= 0.020527
95-percentile flow (m^3/s):	(0.19/175)	= 0.0010857

Approximate catchment Area for stream (km^2): 4

Average flow (m^3/s): (0.020527 x 4) = **0.08211 m^3/s**

95-percentile flow (m^3/s): (0.0010857 x 4) = **0.004343 m^3/s**

Waste Assimilative Capacity - BOD

The Waste Assimilative Capacity (WAC) for BOD is therefore calculated as follows:

$WAC = [(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})] \times 86.4$ kg Pollutant/day

C_{max} = maximum permissible BOD concentration in river = 4 mg/L

C_{back} = background (upstream) pollutant concentration = 2.57 mg/L

F_{river} = F_{95} (for BOD calculations) = 0.004343m^3/s

F_{eff} = effluent flow, i.e. DWF/(3600 x 24) = 1001/(3600 x 24) = 0.01159 m^3/s

The Finn River is not designated as a salmonid water. However as Lough Erne is used for fisheries it is considered appropriate that the salmonid water standards be adopted for the calculation of the assimilative capacity, i.e. a C_{max} standard for the receiving waters of 4 mg/L BOD will be used. The background B.O.D. concentration, C_{back}, has been taken as 2.0 mg/L based on the 2001-2003 EPA data for Cumber Bridge, station number 0500 (see Appendix 3). The resultant WAC is therefore calculated as follows:

WAC BOD = [(4 x (0.004343+ 0.01159)) – (2.57 x 0.004343) x 86.4

WAC BOD = 4.54 kgBOD/day

Taking a Design PE of 4,449 the influent load to the treatment plant is calculated as 267kg BOD/day. The minimum standard of effluent BOD required is 25 mg/L. This equates to an effluent load of 25.03kg BOD/day. This is greater than the WAC of the stream at 95 percentile flows. An effluent BOD of 4.5 mg/L would be required to be within the calculated WAC. A new outfall to the River Finn has been recommended for the upgraded Clones Wastewater Treatment Plant to provide a greater level of dilution of the effluent.

Suspended Solids

The allowable level of suspended solids in the effluent from the wastewater treatment plant is 35mg/l.

WWTP Flow (m^3/day) = 1,001.03m^3/day

Max level of S.S. allowed = 35mg/L

Effluent load to the River; (35 x 1,001.03)/1000 = 35.04 kg/d

F_{river} = F_{95} (for SS calculations) = 0.004343 m^3/s

Increase in River concentration @ 95%ile flow;

35.04 x 10^3/[0.004343 x 60 x 60 x 24] = 93.275mg/L

There is no background monitoring of suspended solids in the river. The increase in suspended solids is extremely high relative to the limit allowed.

Phosphorus

The phosphorus loads in the river are governed by the Phosphorus Regulations (S.I. 258 of 1998). The regulations state that the existing biological quality rating assigned between 1st January 1995 and 31st December 1997 is the rating upon which the improvements in Water Quality will be judged.

The Q-rating for the Finn River at Station No. 0500, Cumber Bridge at the proposed outfall, was 3 for the 1995-1997 Water Quality Data and is unchanged since. There are no Q-ratings for the effluent stream. The Q-ratings for the Finn River have been used in the WAC calculations. The minimum target ratings and concentrations for these stretches of water as defined in the Phosphorus regulations are given below.

Phosphorus Regulations Target Ratings and Concentrations

Existing Biological Quality (Q) Rating/Q Index	Minimum Target Biological Quality (Q) Rating /Q Index	Molybdate Reactive Phosphate Median Conc. (mg P/l)
3	3-4	0.05

As the regulations determine the Q index using the median of 10 samples over 12 months the enforcement of the load determined from 95%ile flows is extremely onerous. A more realistic load is given by using the average flow in the river as this is more representative of the variable flows to be encountered during the 12-month sampling period.

The median background Ortho-Phosphate concentration, based on measurements by Monaghan County Council, from 19/02/08-16/03/09 is 0.6 mg/L. Using the Waste Assimilation Capacity calculation the maximum allowable phosphorus load to the river is calculated as follows:

WAC = $[(C_{max} \times (F_{river} + F_{eff})) - (C_{back} \times F_{river})] \times 86.4$ kg Pollutant/day

C_{max} = maximum permissible P concentration in river = 0.05 mg/L
C_{back} = background (upstream) pollutant concentration = 0.6 mg/L
F_{river} = F_{avg} (for P calculations) = 0.08211m^3/s
F_{eff} = effluent flow, i.e. DWF/(3600 x 24) = 1001/(3600 x 24) = 0.01159 m^3/s

MRP WAC = [(0.05 x (0.08211+ 0.01159)) - (0.6x 0.08211)] x 86.4 [kg P/day]

= -0.11kg MRP/day

It is clear from the above calculations that the receiving water cannot assimilate any phosphorous from the WwTW. Measures to combat this problem are dealt with in question 18 above.

Ammonia

As detailed above it is considered appropriate that the salmonid water standards be adopted for the calculation of the assimilative capacity. A guideline for the maximum allowable ammonia concentration in a Salmonid River, C_{max}, is 0.5 mg/L.

The background ammonia concentration, C_{back}, has been taken as 0.265 mg/L based on analysis carried out by Monaghan County Council from 19/02/08-16/03/09. The resultant WAC is therefore calculated as follows:

The increase in ammonia levels without any nitrification in the wastewater plant is calculated as follows:-

Maximum effluent ammonia concentration:	5 mg/L
WWTP Flowrate:	1001 m^3/day
Effluent Ammonia.Nitrogen:	5.0 kg / day

The background ammonia level is 0.25 mg/L.

The target ammonia level in the river is taken as 0.5mg/l.

NH_3 WAC = $(C_{max} - C_{back}) \times F_{avg} \times 86.4$

Where;

C_{max} = maximum permissible Ammonia concentration in river = 0.5 mg/L

C_{back} = background (upstream) pollutant concentration = 0.27 mg/L

F_{avg} = average flow in m^3/sec = 0.08211 m^3/sec

86.4 = conversion factor (to kg/day)

NH_3 WAC = (0.5 – 0.265) x 0.08211 x 86.4 = 1.06 kg /day

At 25mg/L, the maximum effluent ammonia of 25.03kg/day is much greater than the calculated waste assimilative capacity of 1.06 kg/day. To ensure that the effluent to the receiving water is within its maximum assimilative capacity, the effluent would need to be treated to a standard of 1mg/L. As can be seen in section E4, none of the effluent results for Castleblayney WwTW from the 16/01/07 – 16/03/09 have been <1mg/L.

Effluent Standards

The effluent standards for the Clones Wastewater Treatment Works are summarised below.

Clones Effluent Standards – Discharge to Finn River

Parameter	Effluent Concentration (mg/L)
BOD	4.5
Ammonia	1
Orthophosphate (P)	*

* It is clear from the WAC calculations that the phosphorus load in the effluent is greater than the WAC for the stream. It has been recommended in the draft Preliminary Report for the scheme that an outfall pipeline to the River Finn is constructed and that chemical dosing for phosphorus removal be provided.

NOTE: these effluent loads and increases in concentration are based on the 2015 PE design load to the plant.