Comhairle Cathrach Chorcaí CORK CITY COUNCIL

Agglomeration: Cork City Annual Environmental Report 2012

Licence Register Number: D0033-01

Licensees: Cork City Council and Cork County Council

7/25/2013

Contents

1. Executive Summary and Introduction to the 2012 AER

1.1.Summary Report on 2012

Agglomeration: Cork City

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The Agglomeration comprises of Cork City and adjacent areas in Cork County, including Tramore Valley, Douglas, and Rochestown, and also includes Glanmire, Glounthaune and Little Island adjacent to the Waste Water Treatment Plant.

The Waste Water Treatment Plant is located at Carrigrennan on Little Island and was commissioned in 2004 with a capacity for an organic load of 413,000 Pop. Equiv. The design capacity of the plant was based on 53% of total load coming from industrial sources. The main discharge from the WWTP is located in Lough Mahon. The current organic plant loading for **2012** is calculated to be **284,696 Pop. Equiv.**

Drainage Network

A total pipe network of over **585 Kms** is in place in the City network comprising approximately 38% Combined Sewers, 32% Foul Sewers and 30% Surface Water Sewers. In addition there are approximately 28 km of Rising Mains. There are 34 Pumping Stations in total on the wastewater works, (27 in the City Council Network), a number of which have pumped overflows in the event of storm events, and the majority of which have gravity overflows in the event of emergencies associated with the operation of the pumps. In addition there are approximately fifty other stormwater overflow locations, largely associated with 62 Combined Sewer Overflows (CSO's) and including an untreated Secondary discharge into the River Lee North Channel adjacent to St. Patrick's Bridge in the City Centre.

A central collection chamber, incorporating screening and grit removal, gathers the flows from the City and adjacent areas, including Tramore Valley, Douglas, and Rochestown. Twin 1200mm diameter siphons are laid from this, the Ballinure Header Chamber, under Lough Mahon to the Treatment plant at Carrigrennan, a distance of over 4.5km. Local flows from Glanmire, Glounthaune and Little Island run directly to the plant at Carrigrennan.

Wastewater Treatment Plant

The works consists of essentially two treatment activities, namely Wastewater Treatment and Solids Treatment

Wastewater Treatment

The various treatment stages include the following:

- Screening (5mm) and De-gritting: Local flows only, flow from Ballinure previously screened and de-gritted.
- InFlow Measurement & Sampling
- Storm Water Treatment: 4 Tanks (storage/settlement/return/overflow)
- Pre-Aeration, with odour control treatment of removed gases
- Primary Clarification: 2 Settlement Tanks, (covered) sedimentation/ removal of settable solids
- Secondary Treatment: Sequencing Batch Reactor, 8 Rectangular basins
- OutFlow Measurement & Sampling
- Effluent Discharge

Solids Treatment

Stages include the following:

- Sludge Treatment
- Thickening
- Digestion
- Dewatering and Drying

The sludge is anaerobically digested during which Biogas is produced. This Biogas is used on site to mix the sludge in the digestors, heat the sludge as it is re-circulated, and pasteurise and dry the sludge to 90% dry solids. The Sludge contains 5% Nitrogen, 5% Phosphorous and it has no significant heavy metals making it ideal for agricultural use. Currently all sludge, in dry pellet form, is used for agriculture.

Waste Water Treatment Plant Management

The Cork City Waste Water Treatment plant at Carrigrennan is owned by Cork City Council and is operated by Northumbrian Water Projects Ltd on behalf of Consort Joint Venture on a twenty year contract.

AER 2012 Overview

The following Annual Environmental Report (2011 AER) has been prepared as per condition 6.11 of the Cork City and County Councils' Discharge licence D0033-01. This licence was granted on 17th December 2009. This is the Third AER report for D0033-01.

This Report includes a report on monitoring information for the operation of Carrigrennan WWTP, and a report on ambient monitoring data for the Rivers and Lee Estuary, Loch Mahon and Cork Harbour, associated with the Drainage network and WWTP outfall. Information is also included on complaints received regarding the plant and network and information requested by the EPA on various issues under the WWD licence.

Carrigrennan WWTP is not designed for Nutrient Removal. As a consequence, it is not compliant with the ELV limits in the licence or the UWWT regulations for Total N & Total P. In 2012 it did achieve partial compliance with the licence for Total P. Other parameters, COD, cBOD and TSS

were compliant with the licence. Infiltration into the network from tidal and/groundwater is estimated to be at a rate of 38% of total inflow into the WWTP.

A Procurement Process is underway to appoint consultants to review the operation of the WWTP, including Infiltration and Hydraulic Capacity, and to address the issue of Nutrient Removal as well as Disinfection of the Effluent. This latter is considered advisable due to the existence of shellfisheries within the Harbour.

Included as Appendices in this report are, (1) review of Priority Substances, as identified during the Effluent Characterisation Study carried out on behalf of the EPA, and (2) the Submission by Cork City Council, with respect to compliance with requirement for a Shellfish Assessment to be carried out. The report on Stormwater Overflows conditioned for the 2nd AER is outstanding and will be submitted later under separate cover as Appendix 3.

2. Monitoring Reports Summary

2.1.Summary Report on Monthly Influent Monitoring

Quantity

Influent and effluent flow is measured on a continuous daily basis at the plant. Summary flow statistics on the influent to and effluent from the plant during 2012 based on the 366 (daily) flow measurements are tabulated below.

Total influent data represents influent water from the agglomeration arriving at the Carrigrennan Waste Water Treatment Plant. It does not include wastewater lost in combined sewer overflows in the upstream waste water works of the agglomeration.

Month	Inflow to Primary Tanks	Inflow to Storm Tanks	Total Inflow	Dischage to Effluent Outfall	Storm Tank Overflow to Storm Outfall	Total Discharge	Rainfall for month	30 year Mean Rainfall (1981-2010)
January 2012	3,198,473	31,180	3,229,653	3,444,970	17,590	3,462,560	94	131
February 2012	2,727,745	240	2,727,985	2,917,640	-	2,917,640	42	98
March 2012	2,538,309	140	2,538,449	2,690,720	-	2,690,720	24	98
April 2012	2,663,811	18,790	2,682,601	2,829,290	5,330	2,834,620	83	77
May 2012	2,956,012	24,870	2,980,882	3,151,450	12,630	3,164,080	73	82
June 2012	3,891,487	237,740	4,129,227	3,881,440	465,980	4,347,420	**228**	81
July 2012	3,500,296	28,680	3,528,976	3,616,490	133,290	3,749,780	**113**	79
August 2012	4,193,659	111,910	4,305,569	4,198,210	383,190	4,581,400	**186**	97
September 2012	2,742,295	20	2,742,315	2,904,200	-	2,904,200	23	95
October 2012	3,160,103	50,740	3,210,843	3,369,890	77,540	3,447,430	100	138
November 2012	3,643,252	68,330	3,711,582	3,805,960	165,630	3,971,590	117	120
December 2012	4,178,495	137,930	4,316,425	4,358,140	262,760	4,620,900	145	133
Annual flow Year 2012	39,393,936	710,570	**40,104,506**	41,168,400	1,523,940	**42,692,340**	**1,228**	**1,228**
Average Daily flow 2012	107,634	1,941	**109,575**	112,482	4,164	116,646		
Max Daily flow 2012	181,562	49,060	**230,622**	167,440	86,740	238,680		
Min Daily flow 2012	66,649	-	**66,649**	68,270	-	68,270		
Max. Daily Flow 2012			**3.46**					
Min Daily Flow 2012								

Comments:

The discrepancy between inflow measured compared to discharge is a reflection of the method of flow measurement employed at the respective measurement locations. Discharges from the site are measured via Flume readings. The readings from two Mag. Flow meters in sequence are averaged and combined with a flume meter to the Storm overflow Tanks to calculate the inflow.

Outflows as measured by *Storm Tank overflow to Storm Outfall* (1,523,940 Total for 2012) are not directly comparable to the Inflows measured by *Inflow to Storm Tanks* (710,570 m3 for 2012) which is included as part of Total Inflow in Summary Table above. As part of the treatment process, overflows after Primary Treatment, i.e. over and above 1.83m3/sec, also flow to the Storm Tanks adding to the quantities that make up the outflows and similarly as flows vary/decrease over a time period, additional storm water will be added back into the effluent going for secondary treatment.

Original Design Data for the Carrigrennan WWTP, based on 2020 figures is as follows:				**Original Design Data Plus 20%**
2.1.1 Crude Sewage Flow (Excluding the returns)	M3/day	M3/Hr	M3/sec	M3/day
Crude Sewage Dry Weather Flow (DWF)	59,359	2,473.3	0.687	71,231
Crude Sewage Maximum Flow (WWF)	359,592	14,983	4.16	431,510
Design Factor, WWF/ DWF	6.06			6.06
2.1.2 Flow to Primary Treatment	M3/day	M3/Hr	M3/sec	M3/day
DWF	59,359			71,231
Multiplier	3			3
Maximum Flow	178,077	7,420	2.06	213,692
Excess flows are diverted to Storm Tanks				
2.1.3 Flow to Secondary Treatment	M3/day	M3/Hr	M3/sec	M3/day
DWF	59,359			71,231
Multiplier	2.5			2.5
Infiltration	9,741			11,689
Maximum Flow (2.5*DWF+ I)	158,139	6,589	1.83	189,766
Excess flows are diverted to Storm Tanks				
2.1.4 Annual Average Peak Flow	M3/day	M3/Hr	M3/sec	M3/day
DWF	59,359	2,473.3	0.687	71,231
The Average Daily Flow (ADF) is assumed to be 1.2 *DWF	71,231	2,968	0.824	85,477
Average Daily Flow Peak (ADFP) is assumed to be 1.6* ADF	**113,969**	4,749	1.319	136,763

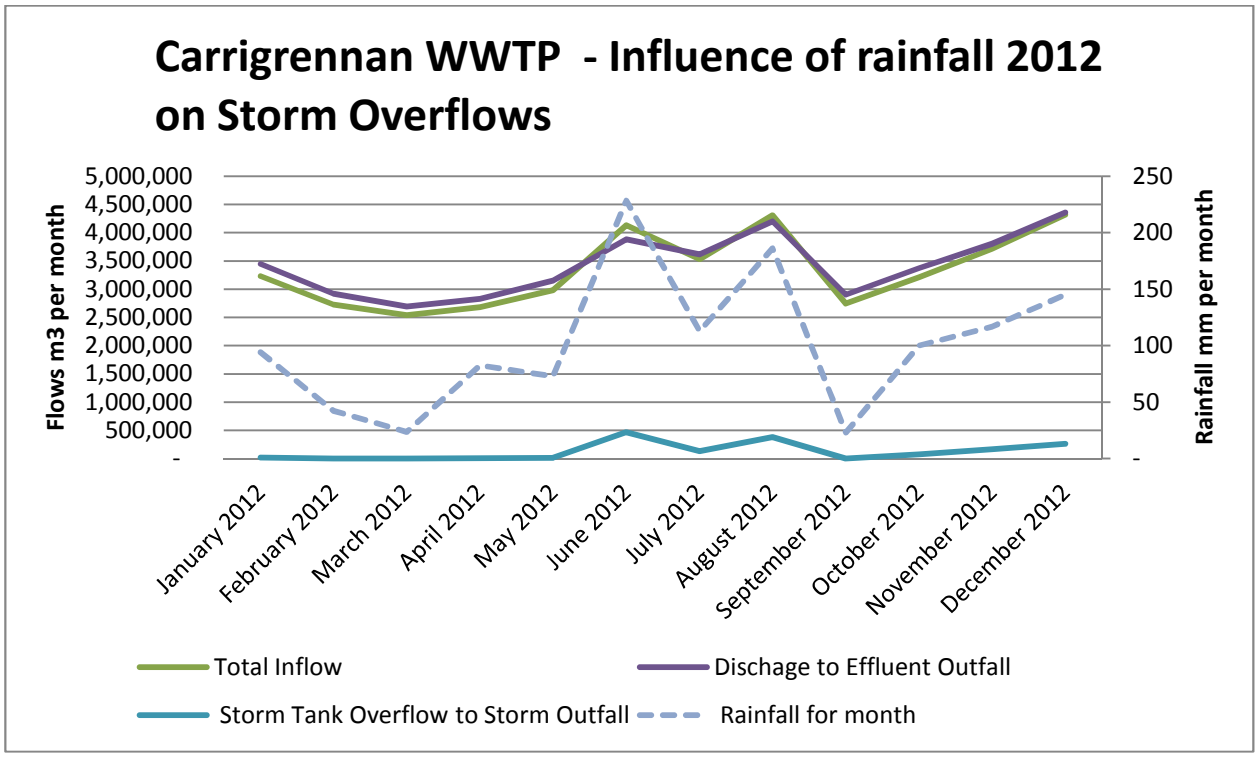
The Original design figures for the plant were increased by 20% under the Consort Joint Venture Contract entered into by Cork City/Cork County Councils for the construction and operation of the WWTP.

Treatment Capacity

Comparing the Maximum Daily flow in 2012 at 230,622m3/day with the design maximum daily flow design flow of 431,510m3/day, the flow received at the WWTP in 2012, at 54%, is well within the total flow capacity of the plant. The maximum design flow to secondary treatment is 189,766m3/day and during 2012 the maximum treated was 167,440m3/day measured at the discharge outfall. Over the year 96.43% of all effluent discharges had undergone Secondary Treatment.

Rainfall

The inflows received at the WWTP in 2012 were 10% over the average since the start of operation. This 10% or over 3,500,000 m3 additional inflow is proposed as being largely due to rainfall as tidal conditions and subsequent tidal infiltration do not vary much from year to year. Graph below supports this, showing influence of rainfall not just on overflows but also increased trends in Treated Effluent during rainfall periods for 2012



The unseasonal amount and pattern of the rainfall experienced in June July and August 2012 was responsible for large quantities of storm water inflow to the WWTP and subsequent storm water overflows to outfall for those periods. Storm overflows in June and August 2012 amounted to 982,560 m3 compared to an amount of 10,180 m3 for the same months in 2011. This accounted for a substantial amount, over 64% of the overflows experienced at the plant in 2012. While the 2012 rainfall overall was equal to the 30 year annual average at 1228mm, the intensity and pattern of the rainfall contributed more to determining greater runoff and inflow into the WWTP.

Infiltration & DWF

The maximum hydraulic flow to the Carrigrennan plant during 2012 was a factor of 3.46 times higher than the minimum flow. This quantifies the range of influent flows experienced in the plant, variations being caused mainly by inflow, surface water ingress after rainfall via the combined sewer systems in the agglomeration, and infiltration into the waste water network through various means, from groundwater and sea water ingress experienced at higher tides. The groundwater and tidal influence is evident by the infiltration experienced in periods of dry weather.

The flows received at the WWTP are most likely reflecting the location of the City which is at the head of the Estuary. A good proportion of the city centre, is either land reclaimed from the original marsh at the mouth of the River Lee, is within the tidal range, or is surrounded or adjacent to water. The majority of sewers in the centre city were relaid /separated during the Cork Main Drainage projects but questions arise as to the integrity of the older drain connections to these new sewers.

Infiltration by tidal waters is reinforced by the varying levels of Chloride that have been measured in the inflows to the WWTP. These Chloride levels increase incrementally at times of higher tides, i.e. normally on a fortnightly basis, and are particularly noticeable at Spring and Neap tides. Excavations in the city centre have traditionally been tide-dependent, and in fact this was a feature of work programmes for Cork Main Drainage.

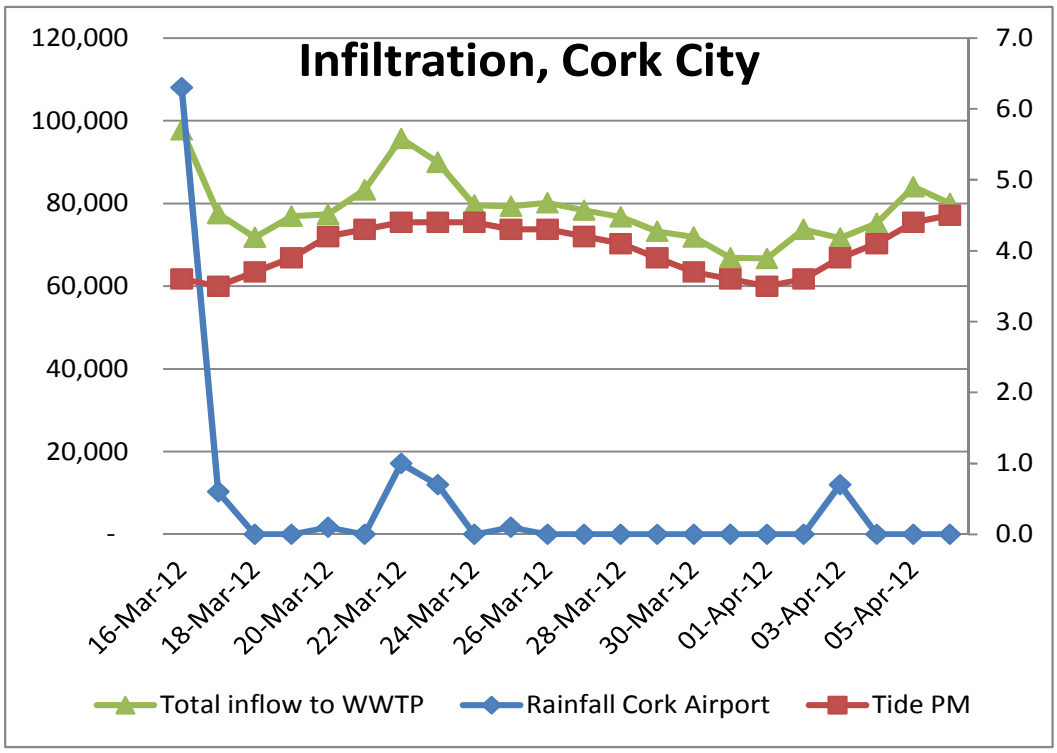
Calculating the DWF at the 10 percentile of flow for the year 2012 results in an overestimation at 81,096m3/day. However, while not fully complying with the definition for DWF, the dry period experienced from March 26 and April 1 2012 inclusive, yielded an average daily flow of 73,413m3/day, giving closer approximation to DWF figures calculated for previous years using the 10 percentile method. 2020 Design DWF is 71,231m3/day.

Definition for DWF :
“The average Daily flow during seven consecutive days without rain (excluding a period which includes public or local holidays) following seven days during which the rainfall did not exceed 0.25mm on any one day” (Ref. IWEM 1993)

The estimation of Infiltration from DWF = PG + I + E using this value of 73,413 m3/day, gives an estimate of infiltration due to Tidal and/or Groundwater of 38% of total inflow into the WWTP.

While reflecting fairly good dry weather conditions, this could result in an under-estimation of the infiltration experienced in Cork City. The period in question coincided with a period of relatively low tides in the catchment. Tides ranged from High tides 4.4m Admiralty (1.72m AOD) to 3.5m Admiralty (1.02m AOD). The predicted High Tide range for 2012 varied from 4.8m Admiralty, (2.22m AOD) to 3.2m Admiralty (0.62m AOD). An estimation of Tidal included Infiltration based on the figure above could therefore under-estimate the extent of the Tidal infiltration over the full annual cycle.

The variation of the Inflow into the WWTP with the Tidal Range is illustrated below for this period of relatively dry weather experienced in March/April 2012. The Inflow mirrors the Tidal Range and reflects also the minor rainfall that occurred during this period. For the segment of time with no rainfall at all, for a tide difference of 0.7 metres (from highest tide level to lowest for the period) the inflow into the treatment plant differed by an amount of 12,912m3 per day. Similarly, for a tide difference of 0.4 m it decreased by an amount of 6,560 m3 per day. Based on this it could be extrapolated very roughly that an increase in high tide to 4.8m Admiralty (0.4m over tide experienced) could increase inflow by up to 20,000 m3 per day over inflow experienced during a tide of 3.5m Admiralty. This would need to be studied more closely during higher tide /dry weather periods as intuitively it is considered that higher tides result in disproportionately greater inflows.



At the lowest tide experienced during this period the flow measured was 66,682m3/day. Compared to the theoretical original design flow, 54,763m3/day, this would still indicate infiltration at 31.4% of Total Inflow. The theoretical original design calculations included infiltration of 9000m3/day (13.5%), leaving an amount of 12,000m3/day (17.9%), "unaccounted for" or the base infiltration amount for 3.5m Admiralty Tide level /low ground water.

The six months prior to this dry period, 1st Oct 2011 to 31st March 2012 inclusive, had a rainfall 483.2mm. The 30 year mean rainfall for the same period is 718.1mm which would indicate that groundwater levels should have been low in the catchment at the time, as prior rainfall was just 67% of mean. Tidal water would therefore appear to be the major contributor, at that time, to infiltration.

Summary Table of Yearly Flow Values

	Influent, "Average Value FIT102/3", plus FIT 104				Treated Effluent Fit 1200				Storm Overflow Fit 300-2			Cork Airport
Year	Total Annual inflow	Annual Average Daily inflow	Annual Maximum Daily inflow	Annual Minimum Daily inflow	Total Annual Treated Effluent	Annual Average Daily Treated Effluent	Annual Max. Daily Treated Effluent	Annual Min. Daily Treated Effluent	Total Annual Storm Overflow	Annual Average Daily Storm overflow	Annual Max. Daily Storm overflow	Rainfall
	M3/Yr	M3/day	M3/day	M3/day	M3/Yr	M3/day	M3/day	M3/day	M3/Yr	M3/day	M3/day	mm / year
2012	40,104,506	109,575	230,622	66,649	41,168,400	112,482	167,440	68,270	1,523,940	4,164	86,740	1,228
2011	36,400,786	99,728	222,637	64,478	38,045,275	104,234	163,840	22,480	475,300	1,302	76,010	1,023
2010	35,337,991	96,816	237,172	54,487	36,439,570	99,834	161,840	45,120	807,460	2,212	87,900	903
2009	39,773,146	108,968	251,556	57,938	40,381,480	110,634	162,330	63,230	1,872,230	5,427	106,700	1,572
2008	36,963,177	101,269	209,152	32,442	38,802,080	106,307	157,120	34,800	541,830	1,484	67,860	1,341
2007	34,090,510	93,399	230,191	60,809	34,735,070	95,165	162,000	63,990	840,410	2,302	88,700	1,057
2006	35,363,499	96,886	229,681	57,670	35,877,800	98,295	163,310	58,770	1,061,790	2,909	79,600	1,197
2005	33,423,368	91,571	210,380	34,107	34,149,730	93,561	173,310	43,203	580,960	1,592	52,720	1,192
Average	**36,432,123**	**99,777**	**227,674**	**53,572**	**37,449,926**	**102,564**	**163,899**	**49,983**	**962,990**	**2,674**	**80,779**	**1228 ***
										*1981-2010		30 yr mean

Quality - Sampling

Influent samples are monitored on 5 out of each 7 days for each of the parameters COD, cBOD and TSS using a 24-hr composite sampler. Samples are collected from the composite sampler at 9.00 am each day, Monday to Friday. Results are as tested by the Accredited Laboratory on site

This information is presented below in a detailed monthly summary for 2012. A total of 261 samples of influent were analysed during 2012 for COD and TSS, with 260 samples analysed for cBOD. Values given are the Average (Mean), Maximum and Minimum of the Daily values for the relevant month.

A total of 26 samples each were monitored for Total N and Total P during 2012. The results of this monitoring is also included in the monthly summary table for 2012

pH and Visual Inspection results were reported in 2012, in all 237 inspections were reported for the year.

Hydraulic inflows are measured daily, i.e. 366 flow readings for 2012, and again the results are as tabulated.

Influent Monitoring, Annual Summary Table

	BOD	COD	TSS	TP	TN	Hydraulic Loading	Organic Loading
	mg/l	mg/l	mg/l	mg/l	mg/l	m3/d	PE/day
Number of Samples	260	261	261	26	26	366	260
Annual Max.	340.0	750	440	5.4	49.0	230,622	573,491
Annual Mean	165.9	387	194	3.8	32.0	109,575	284,696

Significance of Results

pH values were within a range of 7.1 minimum to 7.7 maximum (ELV range 6 to 9), and visual inspections all “Clear”. This is indicative of a steady and stable treatment process.

There was a reduction in strength of the inflow for 2012, i.e. the P.E equivalent 284,696 with an inflow of 40,104,506 m3, compared to P.E. Equivalent of 302,842 for 2011, when there was a lesser quantity of inflow of 36,400,786 m3.

The increase in hydraulic inflow over the previous year follows the rainfall pattern, i.e. is proposed as being mainly weather related. Other factors, such as a reduction in commercial and industrial flows, due to the economic downturn, are reflected in the reduction in P.E. Equivalent.

In contrast to understandable decreases seen for BOD and COD, flow weighted TSS showed a disproportionate increase compared to 2011, i.e. increasing from 84% to 87%, whereas COD dropped from 86% to 80% and BOD dropped from 73% to 69%. This may have been due to flushing of

solids through the network due to the pattern of rainfall. However, the trend will need to be monitored further, to determine the cause, if it is sustained into the future.
The average daily values for COD, cBOD and TSS in the table above are representative of a medium to weak strength urban wastewater. Despite the proportion of industrial effluent included in the total composition which should increase the strength of the influent considerably, the average values monitored support the argument for large volumes of infiltration into the system, thereby weakening the resultant strength.
Influent strength depends on discharges of wastewaters from the upstream agglomeration within any 24 hour sampling period. The 24 hour composite influent sewage quality is strongly influenced by rainfall, high tides and other infiltration prior to and during the sample collection period. The levels of Chloride measured give an indication of the level of influence of tidal inflows into the system. These chloride levels can be seen to fluctuate with the tides, having the largest values at times of the higher tides in particular. Months of high rainfall can show a dilution in the chloride concentrations reflecting the different relative influences in proportion of infiltration.

Compliance with Design

cBOD, COD and TSS are within the Daily Design Loads for the WWTP.
Hydraulic Inflows exceed the Daily Design Load but are within the overall Total Design Capacity of the plant. 96.43 % of all discharges from the plant in 2012 underwent Secondary Treatment.

Carrigrennan WWTP is not designed for Nutrient Removal and is not capable of treating the Total Nitrogen loading received at the plant. While similarly not designed to treat Total Phosphorus, the loadings received are substantially reduced by the existing Secondary Treatment.

Mass Loading Measurement

		Full Flow Weighted Crude Sewage Loads to Site (inc storm)		
Year 2012	Total Inflow	Flow Weighted COD	Flow Weighted BOD	Flow Weighted TSS
	m3	**Kg**	**Kg**	**Kg**
2012 Annual Totals	40,104,506	14,660,931	6,251,927	7,429,570
2012 Average Daily Value	109,575	40,057	**17,082**	20,299
Daily Design Loads Carrigrennan	71,231	49,938	**24,792**	23,320
Design P.E. Carrigrennan			**413,200**	
2012 Calculated P.E	(based on 1 P.E. to 60g BOD/day)		**284,696**	
2012 Average Daily Value, As % of Daily Design Load	**154%**	**80%**	**69%**	**87%**
Contracted Daily Design Loads Carrigrennan	85,477			
2012 Average Daily Value, as % of Contracted Daily Design Load	**128%**			

Influent Monitoring - Monthly Summary

Parameter	Type	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Annual Values 2012	No. Samples
COD	Max	650	620	610	650	750	420	480	470	710	480	540	530	750	261
mg/l	Mean	409	452	521	457	471	289	341	257	458	365	329	290	387	
	Min	240	330	370	270	230	160	160	140	240	160	97	150	97	
BOD	Max	230	310	340	260	340	230	230	190	290	250	330	230	340	260
mg/l	Mean	156	198	238	195	196	125	145	110	188	172	146	124	166	
	Min	110	110	180	120	100	60	68	49	120	57	39	60	39	
TSS	Max	440	320	310	420	370	240	340	360	360	280	280	280	440	261
mg/l	Mean	207	209	234	246	213	161	177	143	229	199	157	144	194	
	Min	140	140	160	110	120	80	96	46	130	86	60	68	46	
Hydraulic Loading	Max	150,888	110,897	95,687	145,375	145,146	230,622	168,876	186,119	109,808	166,751	187,482	182,579	230,622	366
m3/d	Mean	106,120	92,708	81,142	92,250	96,586	137,187	116,229	140,169	91,969	105,361	128,159	136,881	109,575	
(Total Inflow)	Min	88,943	81,841	71,809	66,649	77,703	89,632	78,634	98,480	80,605	79,367	86,245	98,675	66,649	
Organic Loading	Max	426,707	430,350	415,035	423,078	440,317	518,151	365,897	463,775	389,591	533,990	573,491	534,710	573,491	260
PE/day	Mean	272,455	303,860	319,409	291,585	301,937	271,342	266,388	249,060	284,435	295,561	284,893	270,422	284,696	
	Min	199,105	174,740	237,972	164,958	221,808	174,237	166,952	130,325	165,236	158,413	81,542	157,980	81,542	
COD/BOD Ratio	Max	5.4	3.0	2.8	3.4	5.4	3.3	3.2	3.0	3.5	3.8	3.2	3.8	5.4	260
	Mean	2.7	2.3	2.2	2.4	2.5	2.4	2.4	2.4	2.5	2.3	2.3	2.4	2.4	
	Min	1.5	1.7	1.8	1.5	1.9	1.6	1.7	1.7	1.3	1.2	1.6	1.7	1.2	
Chlorides	Max	2,300	2,000	2,800	4,700	2,400	2,400	2,600	1,500	4,100	3,200	3,900	1,500	4,700	260
mg/l	Mean	1,006	1,045	1,588	1,970	1,299	936	1,191	625	2,203	1,851	1,186	656	1,296	
	Min	380	380	690	450	370	160	160	110	620	190	210	210	110	

2.2.Discharges from the Agglomeration

Summary of ELV Exceedances

D0033-01 Licence Compliance											
2012	Flow	pH	cBOD	COD	Suspended Solids	Total N (as N)	TON (as N)	Total Ammonia (as N)	Total P (as P)	Orthophosphate (as P)	Visual Inspection
	m3/d	units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
WWDL ELV (Schedule A)	N/A	6-9	25	125	35	10	N/A	N/A	2.5	N/A	N/A
WWDL ELV with Condition 2 interpretation included, (Composite samples)	N/A	6-9	50	250	87.5	12	N/A	N/A	3.0	N/A	N/A
8 out of 10 samples, < or = ELV	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A	Y	N/A	N/A
No. of samples required by licence, B.1	366	260	26	26	26	26	26	26	26	26	366
No. of Samples Taken	366	237	260	261	261	26	26	26	26	26	232
No. sample results which may exceed ELV, B.3	25	18	19	19	19	3	3	3	3	3	17
No.sample results above WWDL ELV	N/A	0	0	3	4	26	N/A	N/A	5	N/A	N/A
No Samples above WWDL ELV with condition 2 interpretation included	N/A	0	0	0	0	25	N/A	N/A	1	N/A	N/A
8 out of 10 samples, < or = ELV	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	12	N/A	N/A
Annual Mean (For Parameters where a mean ELV applies)	N/A	N/A	N/A	N/A	N/A	23.92	N/A	N/A	2.17	N/A	N/A
Overall Compliance	N/A	Pass	Pass	Pass	Pass	Fail	N/A	N/A	Fail	N/A	N/A

Interpretation of Sampling Results -Total N and Total P

The discharge point from Carrigrennan Waste Water Treatment Plant, i.e. The Lee Estuary/Lough Mahon, was designated a sensitive area in July 2004 under the Urban Waste Water Treatment (Amendment) Regulations, 2004.

Cork City (Carrigrennan) Waste Water Treatment Plant was not designed for Nutrient Removal Treatment when it was commissioned in 2004.

The ELV Exceedances as tabulated below for Total Nitrogen and Total Phosphorus reflect the fact that the plant is not designed for Nutrient removal. It is planned to incorporate nutrient removal into the plant in the near future, given the ELV limits set by both the WWD licence which were set in December 2009 and the UWW Regulations 2004. Approval has been received for procurement of consultants to enable these works to be carried out and the process is underway. All effort is made to optimize the process within the existing WWTP to achieve compliance.

Discharge Licence- Non Compliances

While the Annual mean for **Total Phosphorous** is within the Emission Limit Value for the Discharge Licence, more than the 3 samples allowed, i.e. 5 samples, from the 26 samples taken exceeded the ELV. 25 of the 26 samples were within the 120% ELV limit of 3.0mg/l for individual samples. On a rolling basis while compliance was not achieved on 8 out of 10 consecutive samples for the full year, it was achieved going forward from the sample taken on 20th March for the remainder of the year. **Total Nitrogen** is Non-compliant in all counts, only one sample for the year being within the 120%ELV limit.

UWWTD Compliance –

Nutrient Parameter that applies (SI-48/2010) is TN

8 samples for **Total Nitrogen** of the 26 taken were within the Daily Average Emission Limit Value of 20mg/l. No sample was equal to or under 10mg/l. While the maximum reduction achieved in Total Nitrogen was 57%, the average reduction in Total Nitrogen, based on mean values, not flow weighted, was 26% for 2012, i.e. non compliant.

Non-Compliances are reported quarterly to the EPA on the EDEN web based system, LMA, Licence Management Application.

Summary of Compliance with Licence D0033-01

Licence Requirements	Criteria	Total Nitrogen	Total Phosphorus
No of Samples required by Licence	Fortnightly	26	26
ELV, Concentration	Annual Mean	10 mg/l	2.5 mg/l
Individual Result limit	120% ELV	12 mg/l	3.0mg/l
Results not > ELV	8 out of 10 Samples	10 mg/l	2.5 mg/l
No of Samples Taken	Compliant	26	26
No of Samples which may exceed ELV		3	3
Final Effluent Concentration	Annual Mean	**23.92 mg/l**	2.165 mg/l
		Non-Compliant	**Compliant**
Final Effluent Individual Results	120% ELV	**1 no. compliant sample**	25 compliant samples
Final effluent Results not > ELV	8 out of 10 consecutive Samples	**All Non-compliant**	**Partial /Non compliant** (Compliant from 24/7/2012)
Overall Compliance		**Fail**	**Fail**

Summary of Compliance with UWWT

Discharge to Sensitive Areas

Compliance with UWWT	Criteria	Total Nitrogen	Total Phosphorus
No of Samples required	>50,000 P.E	24	24
Concentration (annual mean)	>100,000 P.E.	10 mg/l	1 mg/l
Daily Average	(Temp. >or = 12' C)	20 mg/l	N/A
Minimum Percentage of Reduction (related to load of the influent)		70%-80%	80%
No of Samples Taken		26	26
Concentration (annual mean)		**23.92 mg/l**	**2.165 mg/l**
		Non-Compliant	**Non-Compliant**
Daily Average	(Temp. >or = 12' C)	**Non compliant** (8 of 26 samples compliant)	N/A
Minimum Percentage of Reduction (related to load of the influent)		26%	44%
Overall compliance		**Fail**	**Fail**

	Mixed Crude Sewage	Final Effluent	Final Vs Crude	Mixed Crude Sewage	Final Effluent	Final Vs Crude
Date Collection period	Total Nitrogen (mg/L)	Total Nitrogen (mg/L)	% Reduction Total Nitrogen	Total Phosphorus (mg/L)	Total Phosphorus (mg/L)	% Reduction Total Phosphorus
09/01/2012	31.0	24.0	22.6%	3.6	2.1	41.7%
23/01/2011	33.0	29.0	12.1%	4.0	2.8	30.0%
06/02/2012	33.0	36.0	-9.1%	3.8	2.6	31.6%
20/02/2012	34.0	30.0	11.8%	4.3	2.4	44.2%
05/03/2012	38.0	31.0	18.4%	5.1	2.6	49.0%
20/03/2012	39.0	34.0	12.8%	4.7	3.0	36.2%
03/04/2012	40.0	33.0	17.5%	5.2	1.4	73.1%
16/04/2012	40.0	31.0	22.5%	5.4	5.0	7.4%
30/04/2012	41.0	28.0	31.7%	4.7	2.3	51.1%
14/05/2012	41.0	27.0	34.1%	5.0	2.4	52.0%
28/05/2012	36.0	23.0	36.1%	4.8	2.1	56.3%
11/06/2012	49.0	21.0	57.1%	3.9	1.7	56.4%
25/06/2012	26.0	21.0	19.2%	3.2	1.9	40.6%
09/07/2012	26.0	18.0	30.8%	2.9	1.9	34.5%
23/07/2012	28.0	12.0	57.1%	3.9	1.1	71.8%
06/08/2012	22.0	24.0	-9.1%	2.4	1.4	41.7%
21/08/2012	20.0	16.0	20.0%	2.5	1.2	52.0%
03/09/2012	25.0	19.0	24.0%	3.4	1.8	47.1%
17/09/2012	30.0	20.0	33.3%	4.1	2.5	39.0%
01/10/2012	44.0	21.0	52.3%	4.0	2.1	47.5%
15/10/2012	28.0	19.0	32.1%	3.5	2.2	37.1%
29/10/2012	26.0	22.0	15.4%	3.6	2.1	41.7%
12/11/2012	32.0	24.0	25.0%	3.9	2.2	43.6%
26/11/2012	18.0	15.0	16.7%	1.8	1.3	27.8%
10/12/2012	28.0	26.0	7.1%	3.7	2.4	35.1%
27/12/2012	24.0	18.0	25.0%	2.6	1.8	30.8%
Average 2012	**32.5**	**23.9**	26.4%	**3.9**	**2.2**	44.5%
No of samples	**26**	**26**		**26**	**26**	
		10			2.5	
		Annual Mean			Annual Mean	

COD, SS & CBOD Significance of Results -Compliances & Non Compliances

While there were individual results that were non-compliant, overall compliance was achieved for other parameters. 3 tests for cBOD and 4 for Suspended Solids exceeded the ELV but not the 120% ELV. COD results were all compliant with the licence. Non-compliances are tabulated below and compared to UWW regulation conditions, resulting in no additional non-compliances.

COD, SS & CBOD Table of Non-Compliances: Treated Effluent

	D0033-01 Licence Compliance			UWWTD Compliance					
2012	COD	Suspended Solids	cBOD	COD	Suspended Solids	cBOD	COD	SS	cBOD
Date	(mg/L)	(mg/L)	(mg/L)	% Reductions			ELV OR % Reduction		
ELV	125	35	25	75	90	70	<125 or 75%	<35 or 90%	<25 or 70%
ELV (Cond. 2)	250	87.5	50						
02/01/2012	64	28	13	81%	84%	91%	0	0	0
03/01/2012	67	32	13	78%	84%	89%	0	0	0
04/01/2012	50	25	12	88%	82%	89%	0	0	0
05/01/2012	72	33	15	79%	76%	89%	0	0	0
06/01/2012	71	25	13	82%	83%	91%	0	0	0
09/01/2012	53	24	9	86%	89%	94%	0	0	0
10/01/2012	63	24	7	88%	87%	95%	0	0	0
11/01/2012	61	30	10	84%	85%	94%	0	0	0
12/01/2012	71	33	13	89%	86%	89%	0	0	0
13/01/2012	77	31	13	82%	88%	92%	0	0	0
16/01/2012	57	30	10	84%	85%	93%	0	0	0
17/01/2012	54	27	10	85%	85%	94%	0	0	0
19/01/2012	77	32	11	83%	87%	93%	0	0	0
20/01/2012	60	29	9	85%	85%	94%	0	0	0
23/01/2012	73	34	9	86%	86%	95%	0	0	0
30/01/2012	51	16	8	87%	89%	94%	0	0	0
01/02/2012	56	20	12	84%	86%	93%	0	0	0
03/02/2012	68	25	17	85%	87%	91%	0	0	0
06/02/2012	61	23	8	83%	86%	95%	0	0	0
09/02/2012	63	21	14	82%	88%	91%	0	0	0
10/02/2012	74	21	15	80%	87%	91%	0	0	0
13/02/2012	59	18	9	82%	87%	92%	0	0	0
14/02/2012	68	17	11	86%	89%	95%	0	0	0
16/02/2012	78	29	13	85%	89%	93%	0	0	0
09/03/2012	66	32	13	87%	88%	93%	0	0	0
05/04/2012	99	32	11	84%	88%	95%	0	0	0
06/04/2012	100	32	10	82%	89%	96%	0	0	0
09/04/2012	120	20	12	73%	93%	91%	0	0	0
10/04/2012	150	17	14	66%	96%	90%	1	0	0
11/04/2012	140	17	11	67%	94%	94%	1	0	0
18/04/2012	81	32	13	80%	88%	94%	0	0	0
19/04/2012	74	13	9	73%	94%	92%	0	0	0
25/04/2012	97	32	19	74%	85%	85%	0	0	0
26/04/2012	69	23	14	75%	79%	91%	0	0	0
27/04/2012	68	20	10	83%	89%	96%	0	0	0
30/04/2012	80	22	14	88%	89%	94%	0	0	0
01/05/2012	72	25	12	82%	89%	93%	0	0	0
02/05/2012	78	32	16	90%	77%	89%	0	0	0
04/05/2012	64	22	12	80%	87%	93%	0	0	0
07/05/2012	75	46	12	67%	74%	88%	0	1	0
08/05/2012	78	26	12	68%	78%	89%	0	0	0
09/05/2012	83	22	12	78%	84%	91%	0	0	0
10/05/2012	100	63	17	87%	83%	90%	0	1	0
11/05/2012	79	44	14	79%	78%	91%	0	1	0
31/05/2012	78	33	7	84%	89%	96%	0	0	0
01/06/2012	88	33	8	87%	90%	98%	0	0	0
05/06/2012	65	29	7	74%	82%	95%	0	0	0
08/06/2012	53	17	8	77%	86%	91%	0	0	0

	D0033-01 Licence Compliance			UWWTD Compliance					
2012	COD	Suspended Solids	cBOD	COD	Suspended Solids	cBOD	COD	SS	cBOD
Date	(mg/L)	(mg/L)	(mg/L)	% Reductions			ELV OR % Reduction		
ELV	125	35	25	75	90	70	<125 or 75%	<35 or 90%	<25 or 70%
ELV (Cond. 2)	250	87.5	50						
11/06/2012	65	20	7	79%	88%	95%	0	0	0
15/06/2012	57	19	10	78%	88%	92%	0	0	0
18/06/2012	35	11	6	81%	86%	91%	0	0	0
22/06/2012	46	16	8	80%	87%	90%	0	0	0
26/06/2012	55	20	7	80%	89%	93%	0	0	0
29/06/2012	44	13	8	73%	88%	87%	0	0	0
03/07/2012	32	15	6	80%	84%	92%	0	0	0
11/07/2012	57	19	7	83%	89%	97%	0	0	0
16/07/2012	58	19	7	79%	89%	94%	0	0	0
17/07/2012	44	19	8	88%	89%	95%	0	0	0
03/08/2012	70	11	8	74%	93%	93%	0	0	0
08/08/2012	50	16	5	78%	89%	95%	0	0	0
13/08/2012	66	27	12	59%	71%	78%	0	0	0
14/08/2012	37	12	8	78%	84%	89%	0	0	0
15/08/2012	41	16	9	81%	83%	88%	0	0	0
16/08/2012	43	23	13	75%	77%	81%	0	0	0
17/08/2012	45	16	8	68%	65%	83%	0	0	0
20/08/2012	33	10	7	83%	88%	90%	0	0	0
27/08/2012	45	15	7	84%	89%	93%	0	0	0
30/08/2012	42	11	8	83%	89%	92%	0	0	0
31/08/2012	62	29	15	81%	79%	90%	0	0	0
03/09/2012	100	48	19	63%	75%	84%	0	1	0
04/09/2012	75	30	9	79%	83%	94%	0	0	0
05/09/2012	64	25	9	84%	88%	95%	0	0	0
18/09/2012	77	13	10	68%	93%	95%	0	0	0
25/09/2012	120	8	8	67%	97%	93%	0	0	0
03/10/2012	77	11	9	73%	94%	96%	0	0	0
15/10/2012	72	10	8	74%	95%	93%	0	0	0
18/10/2012	36	11	6	78%	87%	89%	0	0	0
30/10/2012	88	32	9	77%	89%	95%	0	0	0
31/10/2012	130	13	13	67%	95%	91%	1	0	0
02/11/2012	120	14	14	70%	95%	90%	0	0	0
05/11/2012	65	26	11	80%	85%	92%	0	0	0
06/11/2012	110	30	12	75%	85%	94%	0	0	0
14/11/2012	84	14	12	13%	77%	69%	0	0	0
19/11/2012	86	17	12	67%	91%	89%	0	0	0
20/11/2012	46	10	9	77%	89%	91%	0	0	0
21/11/2012	44	15	9	78%	86%	89%	0	0	0
23/11/2012	110	12	9	50%	91%	90%	0	0	0
26/11/2012	42	12	10	77%	88%	88%	0	0	0
27/11/2012	46	18	9	76%	79%	89%	0	0	0
28/11/2012	53	14	11	77%	88%	92%	0	0	0
29/11/2012	49	14	10	83%	89%	91%	0	0	0
30/11/2012	71	19	10	78%	86%	90%	0	0	0
03/12/2012	51	14	9	80%	89%	92%	0	0	0
07/12/2012	57	19	12	84%	86%	92%	0	0	0
11/12/2012	64	17	11	83%	89%	93%	0	0	0
13/12/2012	67	21	13	87%	89%	91%	0	0	0
18/12/2012	120	24	14	77%	85%	90%	0	0	0
19/12/2012	69	19	14	64%	80%	77%	0	0	0
21/12/2012	39	11	9	86%	89%	92%	0	0	0
25/12/2012	41	12	7	74%	88%	90%	0	0	0
26/12/2012	37	12	8	75%	87%	89%	0	0	0
27/12/2012	50	15	9	71%	88%	89%	0	0	0
28/12/2012	58	15	8	68%	78%	88%	0	0	0
31/12/2012	50	16	8	74%	84%	92%	0	0	0
Total No.samples above ELV	**3**	**4**	**0**	**28**	**90**	**1**	**3**	**4**	**0**

Cont.

Summary of ELV Exceedances for COD, Suspended Solids,and cBOD

	D0033-01 Licence Compliance			UWWTD Compliance					
2012	**COD**	**Suspended Solids**	**cBOD**	**COD**	**Suspended Solids**	**cBOD**	**COD**	**Suspended Solids**	**cBOD**
	(mg/L)	(mg/L)	(mg/L)	% Reductions			ELV OR % Reduction		
WWDL ELV (Schedule A)	125	35	25	75	90	70	<125 or 75%	<35 or 90%	<25 or 70%
ELV with Condition 2 interpretation included	250	87.5	50						
No. of samples required by licence	26	26	26				24	24	24
No. of Samples Taken	261	261	260				261	261	260
No. sample results which may exceed ELV	19	19	19				19	19	19
Total No.sample results above WWDL ELV	**3**	**4**	**0**						
Nett No.Sample results above WWDL ELV	0	0	**0**						
No Samples above WWDL ELV with condition 2 interpretation included	0	0	0						
Annual Mean (For Parameters where a mean ELV applies)									
Total UWWTD Non-Compliances							**3**	**4**	**0**
Nett UWWTD Non-Compliances							**0**	**0**	**0**
Overall Compliance	**Pass**	**Pass**	**Pass**				**Pass**	**Pass**	**Pass**
Mean 2012	**69.0**	**16.6**	**10.2**	**81%**	**91%**	**93%**			

Storm Discharges, Treated Discharges & Combined Discharge

In the following table, the values of Stormwater samples which exceed the ELVs are highlighted for the days in which Stormwater was discharged to outfall. Stormwater and Treated Effluent are discharged via the same outfall from Carrigrennan WWTP. While there were 109 instances of Stormwater parameter results exceeding the ELV, only 23 of these results exceeded ELV condition 2. The conclusion however when flows are combined is that overall there was one additional ELV exceedance for the calculated Combined Flow discharge and Resultant parameter value.

2012	Storm Discharge to Outfall				Treated Discharge to Outfall				Combined Discharge to Outfall			
Date Collection Period	Storm Tank Overflow FIT300	Storm COD	Storm SS	Storm cBOD	Flume to Outfall FIT1200	Treated Outfall COD	Treated Outfall SS	Treated Outfall cBOD	Combined Storm & Treated Outfall Flow	Combined Storm & Treated COD	Combined Storm & Treated SS	Combined Storm & Treated cBOD
	m3	mg/l	mg/l	mg/l	m3	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l
ELV		125	35	25		125	35	25		125	35	25
ELV (Cond. 2)		250	87.5	50		250	87.5	50		250	87.5	50
02-Jan-12	14,230	170	66	72	121,680	67	32	13	135,910	78	36	19
03-Jan-12	3,360	100	42	58	141,160	50	25	12	144,520	51	25	13
25-Apr-12	5,330	140	50	48	140,560	69	23	14	145,890	72	24	15
01-May-12	12,630	140	40	50	145,610	78	32	16	158,240	83	33	19
02-Jun-12	13,820	180	92	35	122,130	55	10	10	135,950	68	18	12
06-Jun-12	21,970	160	76	69	141,290	61	10	11	163,260	74	19	19
07-Jun-12	46,870	100	31	40	149,620	53	17	8	196,490	64	20	16
08-Jun-12	1,060				132,250				133,310			
14-Jun-12	57,040	110	35	46	139,610	57	19	10	196,650	72	24	20
15-Jun-12	70,330				154,790				225,120			
16-Jun-12	28,510				148,530				177,040			
17-Jun-12	21,630	92	18	32	139,270	35	11	6	160,900	43	12	10
18-Jun-12	32,290	170	35	52	145,660	34	8	6	177,950	59	13	14
19-Jun-12	6,050	120	35	36	137,160	42	9	6	143,210	45	10	7
20-Jun-12	22,440	140	36	56	146,610	41	8	8	169,050	54	12	14
21-Jun-12	9,530	120	39	49	141,510	46	16	8	151,040	51	17	11
27-Jun-12	9,700	190	56	86	128,100	59	19	10	137,800	68	22	15
28-Jun-12	86,740	96	35	42	151,940	44	13	8	238,680	63	21	20
29-Jun-12	21,500				144,590				166,090			
30-Jun-12	16,500				145,750				162,250			
01-Jul-12	12,610	90	36	39	138,100	41	14	5	150,710	45	16	8
02-Jul-12	14,470	120	24	43	142,810	32	15	6	157,280	40	16	9
03-Jul-12	22,660	96	28	35	147,810	36	6	5	170,470	44	9	9
04-Jul-12	15,830	110	30	40	142,770	39	6.5	5	158,600	46	9	9
05-Jul-12	9,610	88	24	38	134,140	33	10	5	143,750	37	11	7
06-Jul-12	5,850				136,270				142,120			
07-Jul-12	5,830				136,480				142,310			
08-Jul-12	1,360	95	34	33	101,920	48	7	5.5	103,280	49	7	6
12-Jul-12	7,880	140	52	72	141,870	49	7	8.7	149,750	54	9	12
13-Jul-12	6,800				127,490				134,290			
31-Jul-12	30,390	140	37	38	136,470	70	17	9.7	166,860	83	21	15

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2012	Storm Discharge to Outfall				Treated Discharge to Outfall				Combined Discharge to Outfall			
Date Collection Period	Storm Tank Overflow FIT300	Storm COD	Storm SS	Storm cBOD	Flume to Outfall FIT1200	Treated Outfall COD	Treated Outfall SS	Treated Outfall cBOD	Combined Storm & Treated Outfall Flow	Combined Storm & Treated COD	Combined Storm & Treated SS	Combined Storm & Treated cBOD
	m3	mg/l	mg/l	mg/l	m3	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l
ELV		125	35	25		125	35	25		125	35	25
ELV (Cond. 2)		250	87.5	50		250	87.5	50		250	87.5	50
01-Aug-12	13,600	81	35	25	133,500	60	12	8.2	147,100	62	14	10
02-Aug-12	7,340	160	38	57	132,010	70	11	7.9	139,350	75	12	10
03-Aug-12	20,070				140,620				160,690			
04-Aug-12	27,820				138,670				166,490			
06-Aug-12	140	120	48	46	125,970	47	8	5.4	126,110	47	8	5
07-Aug-12	13,100	110	38	34	140,230	50	16	4.8	153,330	55	18	7
12-Aug-12	20,470	130	50	45	143,770	66	27	12	164,240	74	30	16
13-Aug-12	14,000	78	32	30	146,010	37	12	7.8	160,010	41	14	10
14-Aug-12	16,480	96	24	36	140,230	41	16	9.4	156,710	47	17	12
15-Aug-12	44,680	84	28	29	153,930	43	23	13	198,610	52	24	17
16-Aug-12	21,480	98	23	36	150,000	45	16	8.2	171,480	52	17	12
17-Aug-12	18,980				144,900				163,880			
18-Aug-12	16,620				139,600				156,220			
19-Aug-12	14,470	100	28	30	143,310	33	10	6.6	157,780	39	12	9
20-Aug-12	24,670	100	23	80	139,020	47	11	3.6	163,690	55	13	15
21-Aug-12	9,670	130	34	42	141,300	41	9.5	8.8	150,970	47	11	11
22-Aug-12	490	77	14	14	133,910	50	9	6.4	134,400	50	9	6
24-Aug-12	39,340				142,280				181,620			
26-Aug-12	1,680	92	24	26	129,050	45	15	7.4	130,730	46	15	8
27-Aug-12	25,770	130	30	59	150,270	39	8	6.3	176,040	52	11	14
28-Aug-12	18,330	140	37	67	137,940	38	11	7.9	156,270	50	14	15
29-Aug-12	13,990	170	43	77	143,880	42	11	7.7	157,870	53	14	14
10-Oct-12	250	330	190	93	104,490	62	20	8.2	104,740	63	20	8
11-Oct-12	17,640	80	36	33	137,500	38	14	8.2	155,140	43	17	11
16-Oct-12	8,170	170	150	63	131,600	81	18	12	139,770	86	26	15
17-Oct-12	36,620	82	27	35	142,810	36	11	6.1	179,430	45	14	12
18-Oct-12	13,660	89	21	26	141,240	46	9	6.7	154,900	50	10	8
19-Oct-12	1,200				132,650				133,850			
21-Oct-12	0	69	12	12	110,390	48	8	7.4	110,390	48	8	7
18-Nov-12	34,400	150	59	68	140,450	86	17	12	174,850	99	25	23
19-Nov-12	31,150	98	21	43	151,980	46	10	8.6	183,130	55	12	14
20-Nov-12	10,460	130	28	57	155,930	44	15	9	166,390	49	16	12
21-Nov-12	4,950	180	44	73	153,090	42	11	11	158,040	46	12	13
22-Nov-12	31,080	100	23	48	155,800	110	12	8.8	186,880	108	14	15
23-Nov-12	6,860				152,760				159,620			
25-Nov-12	27,670	100	34	41	154,130	42	12	9.8	181,800	51	15	15
26-Nov-12	9,010	79	23	30	153,490	46	18	8.9	162,500	48	18	10
27-Nov-12	9,080	100	36	36	150,620	53	14	11	159,700	56	15	12
28-Nov-12	970	92	24	28	147,270	49	14	9.7	148,240	49	14	10
04-Dec-12	3,190				148,550	60	11	9.5	151,740	59	11	9
14-Dec-12	15,090				153,610				168,700			
15-Dec-12	9,580				145,590				155,170			
16-Dec-12	8,070	110	28	54	139,660	28	10	15	147,730	32	11	17
18-Dec-12	12,040	180	67	87	152,030	69	19	14	164,070	77	23	19
19-Dec-12	34,280	92	36	39	157,910	35	8.5	8	192,190	45	13	14
20-Dec-12	6,360	89	21	38	151,500	39	11	9	157,860	41	11	10
21-Dec-12	16,580				149,830				166,410			
22-Dec-12	38,210				167,440				205,650			
23-Dec-12	15,870	110	34	44	150,190	45	13	7.7	166,060	51	15	11
24-Dec-12	15,660	93	32	46	164,120	41	12	7.2	179,780	46	14	11
25-Dec-12	7,680				146,170	37	12	7.6	153,850	35	11	7
26-Dec-12	12,990	74	32	31	157,090	50	15	8.9	170,080	52	16	11
27-Dec-12	9,870	58	30	29	157,730	58	15	7.8	167,600	58	16	9
28-Dec-12	26,540				157,780				184,320			
29-Dec-12	8,870				161,800				170,670			
30-Dec-12	7,420	86	22	28	161,830	50	16	7.7	169,250	52	16	9
31-Dec-12	14,460				157,660				172,120			

Summary of Resultant Combined Discharges to Outfall for COD, SS and cBOD

When treated effluent and Storm Discharge flows and loads are combined and equivalent effluent quality compared, there is one additional discharge above the ELV limits in 2012 for these parameters.

2012	Storm Discharge to Outfall				Treated Discharge to Outfall during Storm Discharge				Combined Discharge to Outfall (same outfall)			
Date	Storm Tank Overflow FIT300	Storm COD	Storm SS	Storm cBOD	Flume to Outfall FIT1200	Treated Outfall COD	Treated Outfall SS	Treated Outfall cBOD	Combined Storm & Treated Outfall Flow	Combined Storm & Treated COD	Combined Storm & Treated SS	Combined Storm & Treated cBOD
	m3	mg/l	mg/l	mg/l	m3	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l
ELV		125	35	25		125	35	25		125	35	25
ELV (Cond. 2)		250	87.5	50		250	87.5	50		250	87.5	50
Sample Related Flow	1,136,510				9,491,670				10,628,180			
Total Flows	1,523,940				12,591,040				14,114,980			
No Days in which overflows took place	87											
No.Samples Taken		66	66	66		68	68	68		68	68	68
No Samples which may exceed ELV		6	6	6		6	6	6		6	6	6
No.Samples Above ELV		22	25	62		0	0	0		0	1	0
No.Samples Above ELV Cond. 2		1	3	19		0	0	0		0	0	0
Overall Compliance										Pass	Pass	Pass

Other Parameters, pH , Visual Inspection

All visual inspections were reported as Clear.

pH was well within the range on the licence of 6 to 9, ranging from a maximum of 7.7 to a minimum of 7.1. The number of samples at 237 were below the agreed number of 260 (5 per week Vs “Daily”) as up to February record of pH results was done only on a weekly basis.

2.3.Treatment Efficiency Report

2012	Flow M3/day	cBOD (Kg/day)	COD (Kg/day)	Suspended Solids (Kg/day)	Total Phosphorus (Kg/day)	Total Nitrogen (Kg/day)	Comment
Influent Mass Loading (kg/day)	109,575	17,082	40,057	20,299	404	3,383	
Effluent Mass Emmission (kg/day)	112,482	1,123	7,497	1,857	238	2,612	
% Efficiency (%reduction of Influent load)	**-2.7%**	**93.4%**	**81.3%**	**90.9%**	**41.2%**	**22.8%**	

The apparent increase in Effluent Flow over Influent Flow, as described previously, is due to different forms of measurement, i.e. Flume Vs Mag. Meters. If the remaining parameter figures were adjusted to reflect this "error" there would be improved efficiencies on the figures as stated above.

The major issue with respect to capacity at the plant is that of Nutrient Removal, treatment for removal of N & P.

A Procurement Process is underway to appoint consultants to review the operation of the WWTP, including Infiltration and Hydraulic Capacity, and to address the issue of Nutrient Removal as well as Disinfection of the Effluent. This latter is considered advisable due to the existence of shellfisheries within the Harbour.

2.4.Treatment Capacity Report

Hydraulic Capacity

The Crude Sewage Maximum flow received at the plant in 2012 is only **53.5%** of the Constructed Capacity. However, as previously discussed, there is a high level of infiltration into the Network with resultant implications at the WWTP. The Dry Weather Flow as designed is exceeded and the maximum daily inflow in 2012 undergoing Secondary Treatment was **88%** of the Constructed Capacity. Storm overflows are very much related to the rainfall pattern rather than quantity of rainfall experienced in the year. Notwithstanding the hydraulic issues from infiltration, **96.4%** of all effluent received Secondary Treatment in 2012. In addition it has been demonstrated previously that storm overflows did not result in any compliance issues for COD, cBOD or TSS. Hydraulic limits are not included in the WWD licence.

Organic Capacity

Organic loading capacity is running at **69%** of the design capacity of the plant. There has in fact been a decrease in the load received at the plant from **302,842 P.E**. in **2011** to **284,696 P.E** in **2012.**

Treatment Capacity Report Summary Table

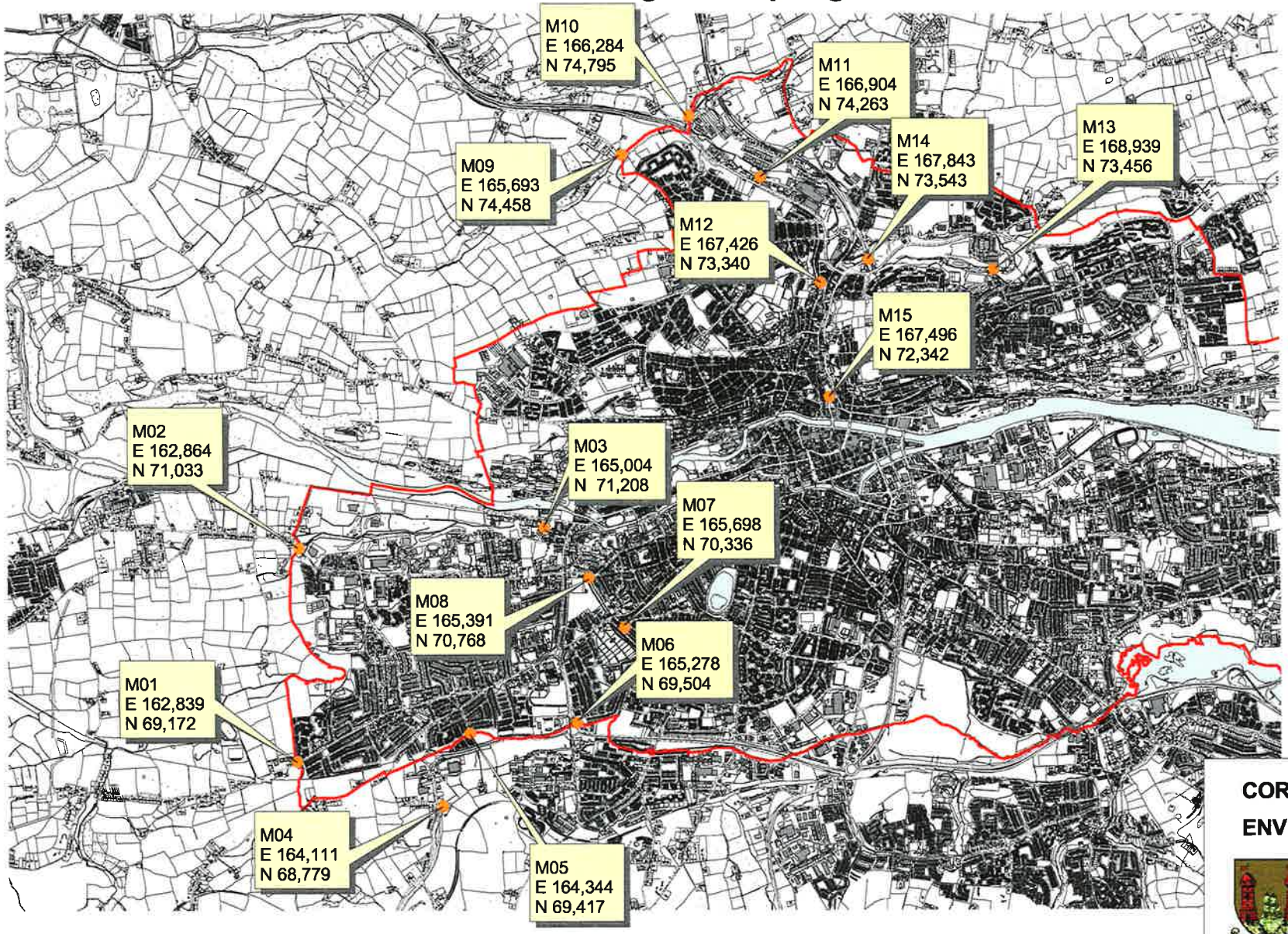
	Original Design	As Constructed	Year 2012	Remaining Capacity
Hydraulic Capacity- Crude Sewage Dry Weather Flow (m3/day)	59,359	71,231	73,413	- 2,182
Hydraulic Capacity- Crude Sewage Maximum flow (m3/day)	359,592	431,510	230,622	200,888
Hydraulic Capacity- Secondary Treatment Maximum (m3/day)	158,139	189,766	167,440	22,326
Hydraulic Capacity- Average Daily Flow (m3/day)	71,231	85,477	109,575	- 24,098
Organic Capacity- Design / As Constructed (PE)	**413,200**			
Organic Capacity- Current Loading (PE)	**284,696**			
Organic Capacity- Remaining (PE)	**128,504**			

2.5. Ambient Monitoring Summary

Ambient River Monitoring Summary

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Irish Grid Reference Easting:	Northing:	EPA Feature Coding Tool Code	Does assessment of the ambient monitoring results indicate that the discharge is impacting on water quality Yes/No, List impact(s) for each Yes answer	Comment
M01 Curraheen Road Bridge	162,843	69,176	RS19T050890	No	Upstream of any city discharge
M02 Carrigrohane Bridge	162,863	71,034	RS19C120110	No	
M03 County Hall	165,003	71,212	RS19C120740	Yes -See below, Curraheen River	
M04 Bandon Road	164,101	68,782	RS19G040140	No	Upstream of any city discharge
M05 Woodhaven Estate	164,344	69,415	RS19G040190	Yes -See below, Glasheen River	
M06 GLASHEEN (Cork City) - Sandbrook Estate	165,278	69,503	RS19G040300	Yes -See below, Glasheen River	
M07 Clashduv road	165,697	70,336	RS19G040490	Yes -See below, Glasheen River	
M08 Glasheen Bridge	165,401	70,768	RS19G040700	Yes -See below, Glasheen River	
M09 Blackstone Bridge	165,691	74,463	RS19B140110	No	Upstream of any city discharge
M10 Kilnap	166,291	74,796	RS19G880990	No	Upstream of any city discharge
M11 BRIDE (Cork City) - Fitz's Boreen	166,925	74,246	RS19B140300	No	
M12 Blackpool (Bride RS19B14)	167,422	73,340	RS19B010050	Yes-See below, Bride River	
M13 Glen Rec. Park	168,942	73,453	RS19B140120	Yes-See below, Glen River	
M14 Spring Lane	167,868	73,539	RS19B140350	Yes-See below, Glen River	
M15 leitrim Street (Bride(RS19B14)	167,496	72,342	Not possible to code	Yes- See below, Kiln River	
			No River on EPA System		

E.P.A. Waste Water Licence Application
E3 Monitoring & Sampling Points



LEGEND
River sampling
River_lee_extended

N
W E
S

CORK CITY COUNCIL
ENVIRONMENT DIRECTORATE

Water Services
Drainage Section

shp file ref: m/Dir/Env/Drain/GisData

Date :- 24-11-2008	Prepared by : B.O'F.	Drg. No. WWLA-056

Monitoring Locations

Monitoring is conditioned to be carried out at a frequency of 10 samples per year at locations designated M1 to M15 along the 5 water bodies under surveillance.
The Glasheen Stream (points M04 to M08) is a tributary of the Curraheen River (M01 to M03). The Glasheen Stream joins the Curraheen River downstream of point M03.
The Kiln River, (M15), is made up of the confluence of the both the Bride (M09, M11 & M12) and the Glen (M13 & M14) Rivers. These rivers join at Blackpool, downstream of M12 on the Bride and M14 on the Glen. M15, on the Kiln, is the only point monitored that incorporates both flows. M10 is on the Glenamought River, a tributary of the Bride, upstream of M11.
M01 on the Curraheen, M04 on the Glasheen, M09 on the Bride and M10 on the Glenamought are situated close to the boundary of the city. At these locations they represent rivers that have experienced an increasingly urban pressure as they approach the city proper. The first monitoring point on the Glen, M13, is a good distance into the city.

Compliance with Standards

The 5 river water bodies have not been individually monitored and assessed for status under the WFD. Under WFD they have been assigned overall ecological status by extrapolation, the Curraheen and both the Bride and the Glen are deemed *Moderate* and the Twopot which is upstream of the Curraheen is classified as *Poor*. No rating has been assigned to the Kiln or the Glasheen.

These rivers do not have any designation attached to them, Pearl Mussel, Bathing water etc.

River Monitoring Summary

Refer to Table, attached, labelled ***Ambient River Monitoring 2012*** and **Graphs** depicting trends for various parameters as highlighted, together with threshold conditions under S.I.272 of 2009. In order to better show trends, the colour codes for the WISE SOE classification, as per Water Framework Directive, are included in the Table where applicable.

Samples

Monitoring was carried out at 10 times at each location in accordance with the licence requirements.

pH

In all instances pH was between the range of 6.0 to 9.0 in accordance with conditions for Hard Water under S.I.272 of 2009, i.e. compliant.

Dissolved Oxygen

S.I. 272 of 2009. Condition is 80% < 95%ile<120% saturation. **Graphs** attached

No location on any water body complied with being above the lower limit of 80% saturation for 95%ile Dissolved Oxygen. The boundary condition for each river into the city was over 60% . In the case of the Curraheen, dissolved oxygen improved marginally from 69.7% to

74.2% before dis-improving to 64.9%. at County Hall. The value for the Glasheen declined quite sharply through Sandbrook and Cashduv Rd and showed a slight improvement by Glasheen Bridge but not a full recovery. The Bride River (Blackstone Bridge) improved after the confluence of the Glenamought (Kilnap) and maintained this value around 70%. The Glen also improved from its initial monitoring point at the Glen Recreational Park to Spring Lane but after confluence with the Bride the monitoring point at M15 on the Kiln exhibited a marked deterioration in quality.

All locations were under 120% upper Limit for 95%ile Dissolved Oxygen, the lowest value being 90.5% at Clashduv on the Glasheen.

Overall the values for DO for 2012 showed an improvement from those of 2011, this is most probably as a result of increased rainfall during the summer months when low flows would typically have resulted in reduced DO.

BOD

S.I. 272 of 2009. Conditions for Good Status are Annual Mean <1.5 and 95%ile < 2.6 mg O2/l.

Graphs attached.

M01 & M02 Curraheen, M04 Glasheen as well as M11 & M12 Bride, complied with conditions for Good Status under S.I. 272 0f 2009. While these locations complied with both conditions of S.I. 272 of 2009, other locations complied with the annual mean or 95%ile alone.

Overall the Curraheen exhibited a *Good* status with respect to BOD under Wise SOE Classification. The Glasheen similarly was of good status for M04 & M05 M06 and M08 and only decreased to a moderate status for M07.

The Bride and the Glen, while *Good to Moderate* under Wise SOE Classification, decreased to *Bad* after confluence, i.e. at M15, the Kiln. The annual mean at M15 was 6.3 mg/l and the 95%ile at 16.1 mg/l were out of scale in comparison with the upstream values.

Once again overall quality values showed an improvement over those of 2011

Temperature

The condition in S.I. 272 of 2009 for Temperature relates to rise in ambient temperature outside mixing zones, i.e. not relevant to the overall monitoring of the river. Maximum temperatures were however well below the value of 21.5 degrees C which is a standard upper limit for Summer Time.

Orthophosphate (as P)

Testing was carried out for Total Phosphorus as alternate for MRP (as P).

S.I. 272 of 2009.

Conditions for Good Status for MRP are Annual Mean <0.035 and 95%ile < 0.075 mg /l.

Conditions for Good Status for Total P were estimated at *Annual Mean <0.070 and 95%ile < 0.15 mg /l.* for comparison of test results purposes.

WISE SOE parameter classification levels for MRP were similarly doubled for Total P
Graphs attached

Under this scenario almost all points monitored would be deemed to be *Moderate* with M01 on the Curraheen and M07 on the Glasheen being designated *Poor* and M15, the Kiln again being *Bad.*

M02 on the Curraheen, M08, the last point on the Glasheen, and M09 the initial point on the Bride were the only points which would achieve a better *Good* status.

TON (as N) and Nitrate Tests

5 samples only at each location were tested for TON and 10 samples for Nitrate

An inconsistency is shown in test results for TON and Nitrate. Samples were tested independently but more samples are taken for Nitrate than TON. On the balance it is considered that the method used for Nitrate is not the most accurate and therefore the Result for TON is considered most representative. The Nitrate results however are included on the spreadsheet below to show the trend observed within each water body.

Quality control measures will be put in place to verify the outside laboratory results and also to review a new method to be used in-house for Nitrates.
Testing was carried out for Nitrate –N but not for Nitrite –N which did not allow for calculation of TON-N. However when the values were compared to WFD Wise SOE Classification it is obvious that for this parameter values improve as the rivers and streams flow through the city.
Values were *Bad,* but improving, for the whole of the Curraheen, the Glasheen and the Bride. There was a marked increase in values for 2012 over 2011, which could reflect major runoff upstream in the catchment during summer months due to heavy unseasonal rainfall.

Total Nitrogen

5 samples only were tested for Total Nitrogen. Results mirrored those for TON-N being consistently approx. 0.1mg/l higher.

Ammonia- N

S.I. 272 0f 2009. Conditions are Annual Mean <0.065 and 95%ile < 0.14 mg /l.
Graphs attached.
A number of locations in the upper reaches of the water bodies complied with S.I.272 or came very close to it. These were M01 on the Curraheen, M05 on the Glasheen and M09 and M11 on the Bride. Overall the trend is for a gradual decline in quality as one travels down each river with both the Curraheen and the Kiln declining to *Poor* at M03 and M15 respectively and the Glasheen declining to a *Moderate* at M06, M07 & M08 status under Wise SOE Classification. The Glen River showed an improvement from *Moderate* to *Good* under Wise SOE Classification from M13 to M14 prior to confluence with the Bride and subsequent deterioration as the Kiln.

Interpretation of results: Impact of Discharges

Curraheen River:

The upper section of the river between monitoring points M01 and M02 showed an improvement in water quality but between M02 and M03 there was a distinct dis-improvement, apparent in Ammonia and Dissolved Oxygen Saturation. There are three small package pump stations with overflows to river on this stretch of river, but these have telemetry fitted, and have not been the cause of any concern. There are no combined sewer overflows on this stretch but intermittent discharges to a storm outfall from an adjacent industrial estate has proved problematic in the past and may be the source of the pollution being experienced.

Glasheen Stream

The bed gradient of this stream is irregular with intermittent peaks, and over long stretches it has zero gradient. While required to cater for flash floods, the background and dry weather flows in the stream are quite low. This is an *Ungauged River* and estimates of Flow Duration Curve for the Catchment by the EPA using a Hydrometric Data Tool demonstrate a 95%ile flow of 0.021m3/sec, with a 5%ile flow of 0.239m3/sec. This type of low flow, combined with the flat gradient, leads to large build ups of silt along the bed of the stream and acts as a barrier to the dispersing of discharges.

Apart from Nitrate and Total P, all parameters show a decline in quality from the upper to the lower end on the stream. Review of individual datasets would indicate that downstream of M04, all points, M05 to M08, are subject to pressures at varying times and to different extents. Overall, M06 & M07 were most impacted by inflows. The largest impact is in shown again in Ammonia and Dissolved Oxygen parameters with M07 also experiencing an increase in BOD. Some recovery is evident by M08, Glasheen Bridge.
There are multiple discharge sources into the Glasheen Stream. The two pump stations in the locality have been upgraded and are linked with telemetry. These are not considered problematic. The 3 Combined Sewer Overflows are consistently monitored and cleaned, and may be a pollution source during times of heavy rainfall. This however is when there is most flow in the river and so least risk of build up of pollutants. Of most concern are the storm outfalls to the stream from separated sewer systems, together with the storm culverts crossing under the N25.

Bride/Glen/Kiln

The monitoring points on the **Bride River** are fairly consistent from the Boundary point, M09 to M12. Quality is stable, Lower limit Dissolved Oxygen Saturation from the Glenamought(Kilnap,M10) is near *Good* (80%) level for SI 272 of 2009 at 77.2%, but there is a fall off in quality as one travels downstream to 71.4%. There is Compliance with the 95%ile upper limit Dissolved Oxygen throughout the system. BOD levels in the Bride improve downstream of inflow to the city to reach a Good Quality.

Ammonia-N Levels for the Bride show a gradual deterioration from 0.047 mg/l, rated as Good by SI 272 0f 2009 (0.065mg/l) to a level which would still be considered Good under WFD, at 0.093mg/l.

Total P levels would indicate a consistent *Moderate* rating from a start at Good for the Bride at M09, moderate onwards including the Glen River but declining to Bad at the Kiln River.

There are multiple stormwater sewers discharging into the River Bride and one Combined Sewer Overflow. None of these are considered problematic.

While quality is not as good as the Bride River, the **Glen River** is similarly consistent. Lower limit dissolved Oxygen Saturation improved slightly from 68% to 74% from M13 to M14 while there is compliance with the upper limit Dissolved Oxygen Saturation at both points i.e. at *Good*. Similarly BOD improved at M14 over M13 to a mean of 1.6 and 95%ile of 2.3, borderline Good under SI 272 of 2009.

Ammonia improves from M13 to M14, becoming close to compliance with Good for SI 272 of 2009. Total P levels indicate a *Moderate* rating while Nitrate is a consistent *Bad* rating from M13 to M14 under the Wise SOE Classification

There are multiple stormwater sewers discharging into the Glen River and one CSO /Combined Sewer Overflow. The Stormwater discharges from the large housing areas were problematic in the past due to foul cross connections. Housing refurbishment and regeneration projects addressed these issues in the Glen housing area and there appears to have been an improvement overall. A similar problem at Mayfield housing area upstream of M13 was addressed by temporarily diverting flows to the foul sewer.

The **Kiln River** as represented by point M15 at Leitrim Street shows the most deterioration in water quality for the city. Almost all parameters are either rated *Bad* or *Poor* under the Wise SOE Classification.

The Kiln River has a lower limit dissolved Oxygen Saturation of 47.4% which is the poorest in the system but is compliant with the upper limit Dissolved Oxygen Saturation at 90%. BOD levels are Bad in the Kiln. Ammonia declines from *Good* in the Bride to Poor in the **Kiln River**. Nitrate is a consistent *Bad* rating from entry to the city at M09 to M15 under the Wise SOE Classification. Improvement is only seen in Nitrate levels, consistent with the initial inflow upstream from the Bride and Glen.

The **Kiln River** is not depicted on the EDEN mapping system. This is likely attributable to the fact that the Kiln River is culverted for the majority of the river's length. The Kiln in fact divides into two separate culverts, one, the new large culvert, taking the major flow from the Bride and flow from the Glen River, also culverted at point of confluence. The other, the original old culvert, takes a small portion of the onward Bride flow, and re-unites with the Glen /Bride major flow just before discharge into the River Lee. The old culvert takes approx 20% of the maximum flood flow of the Glen/Bride/Kiln system.

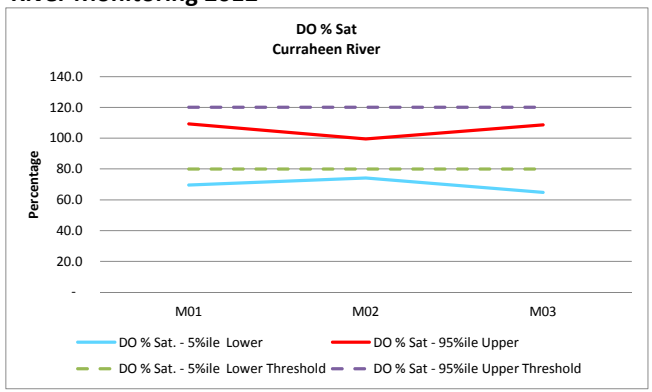
The monitoring point at M15, which is Tidal, is close to the exit point from the old culvert and it gives cause for doubt as to samples being representative of the combined flow.

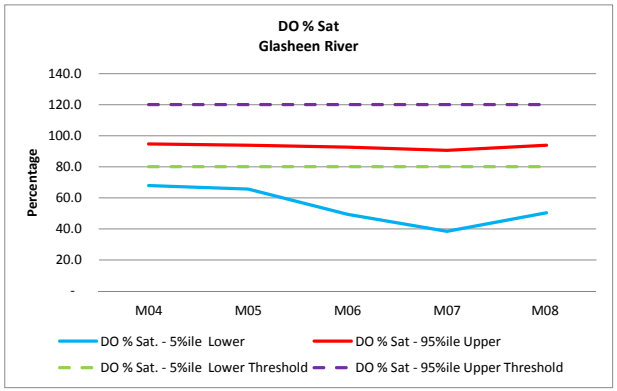
There are 6 Combined Sewer overflows discharging to the Kiln River upstream of M15 in combination with stormwater discharges, 5 of these CSOs discharge to the old lesser culvert and 1 to the new large culvert. A number of properties have also been found to be discharging directly into the old Kiln culvert upstream of M15 and these are also problematic. This is consistent with the peaks in values occurring at times of low river flows and no rainfall events.

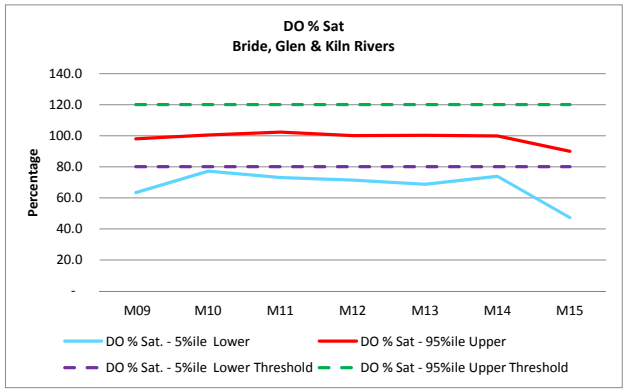
As stormwater and CSOs discharge direct into culverts it is difficult at times to identify individual pollution sources. Regular inspection and Preventative maintenance is carried out to reduce incidents.

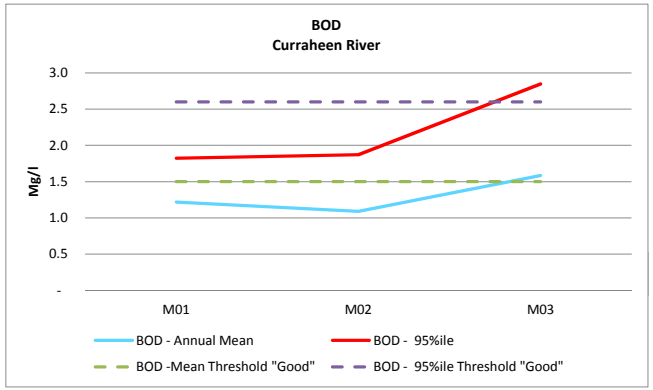
Ambient River Monitoring 2012			WFD					Curraheen River			Glasheen Stream					Bride River				Glen River		Kiln River
		SI 272 of 2009						Curragheen Road Bridge	Carrigrohane Bridge	County Hall	Bandon Road	Woodhaven Estate	Sandbrook Estate	Clashduv Road	Glasheen Bridge	Blackstone Bridge	Kilnap	Fitz's Boreen	Blackpool	Rec Park	Spring Lane	Leitrim Street
Licence	Parameter	Threshold	High	Good	Moderate	Poor	Bad	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12	M13	M14	M15
10 /yr	Samples Taken		Number of Samples unless stated otherwise					10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
pH	pH - Max	9.0						8.1	8.0	7.7	7.7	7.9	7.5	7.5	7.7	8.0	8.3	8.5	8.0	8.4	8.2	8.0
	pH - Min	6.0						7.7	7.5	7.4	7.1	7.5	7.4	7.4	7.5	7.3	7.8	7.4	7.4	7.5	7.5	7.4
DO	DO % Sat. - 5%ile Lower	80						69.7	74.2	64.9	67.8	65.7	49.3	38.5	50.3	63.5	77.2	73.1	71.4	68.8	74.0	47.4
	DO % Sat - 95%ile Upper	120						109.2	99.6	108.7	94.6	94.0	92.7	90.5	94.0	98.0	100.5	102.2	100.0	100.2	99.8	90.0
BOD	BOD - Annual Mean	1.5 (Good)	<1.4	1.4-2.0	2.0-4.0	4.0-5.0	>5.0	1.2	1.1	1.6	0.8	1.5	1.7	2.3	1.7	1.6	2.1	1.3	1.2	2.1	1.6	6.3
	BOD - 95%ile	2.6 (Good)						1.8	1.9	2.8	1.4	3.4	2.3	5.0	3.5	4.4	5.9	2.5	1.9	4.3	2.3	16.1
Temp.	Temp. - Max	Not > 1.5C rise mixing zone						14.9	15.1	14.7	13.8	14.1	15.1	15.1	15.2	15.7	15.1	15.7	15.5	14.8	14.6	15.5
	Temp. - Min							7.4	7.4	7.8	8.9	8.8	8.7	8.5	8.5	7.3	6.9	7.1	6.9	7.1	6.4	7.0
Orthophosphate (as P)	MRP -P - Annual Mean	0.035 (Good)	<0.02	0.02-0.05	0.05-0.1	0.1-0.2	0.2-0.4	Not tested, Total P, alternate test			Not tested, Total P, alternate test					Not tested, Total P, alternate test						
	MRP-P - 95%ile	0.075 (Good)																				
Note: Taken as double MRP	Total P - Annual Mean	*(0.07)*	*<0.04*	*0.04-0.1*	*0.1-0.2*	*0.2-0.4*	*0.4-0.8*	*0.248*	*0.093*	*0.181*	*0.119*	*0.134*	*0.140*	*0.397*	*0.055*	*0.082*	*0.139*	*0.131*	*0.119*	*0.178*	*0.164*	*0.568*
	Total P - 95%ile	*(0.15)*						0.71	0.31	0.69	0.43	0.47	0.56	1.40	0.14	0.13	0.21	0.17	0.15	0.23	0.23	1.85
TON (as N)	TON - N Annual Mean		5 samples only					4.3	5.5	5.5	4.3	5.4	6.6	4.9	3.8	2.9	4.6	4.9	5.0	2.3	2.9	1.3
	TON-N - 95%ile		5 samples only					10.1	20.7	19.5	13.8	20.6	21.8	15.8	18.1	8.6	6.6	15.4	13.8	7.1	12.0	4.6
	Nitrate - N Annual Mean		<0.8	0.8-2.0	2.0-3.6	3.6-5.6	5.6-11.3	9.11	8.14	8.09	10.41	7.98	5.96	5.77	5.62	7.68	8.63	8.55	8.06	7.92	7.39	7.27
	Nitrate-N - 95%ile							11.08	10.66	9.97	13.42	10.85	7.88	8.80	7.88	10.50	11.11	10.93	9.99	8.59	8.08	8.64
Total Nitrogen (as N)	Total N - N Annual Mean		5 samples only					4.4	5.6	5.6	4.3	5.5	6.7	5.0	3.9	3.0	2.4	5.0	5.1	2.5	3.1	1.4
	Total N-N - 95%ile		5 samples only					10.2	20.8	19.7	13.8	20.7	22.0	15.9	18.4	8.9	6.7	15.7	14.1	7.5	12.1	4.8
Ammonia	Ammonia - N Annual Mean	0.065 (Good)	<0.04	0.04-0.1	0.1-0.2	0.2-0.4	>0.4	0.042	0.091	0.327	0.092	0.059	0.199	0.168	0.186	0.047	0.060	0.060	0.093	0.148	0.093	0.291
	Ammonia-N - 95%ile	0.14 (Good)						0.079	0.329	0.617	0.401	0.125	0.417	0.343	0.329	0.111	0.194	0.131	0.358	0.312	0.183	0.522

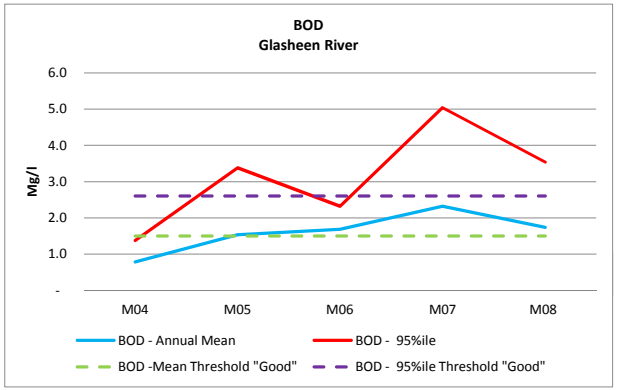
River Monitoring 2012

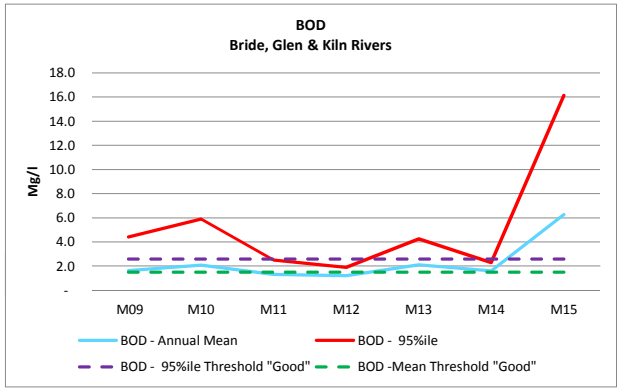


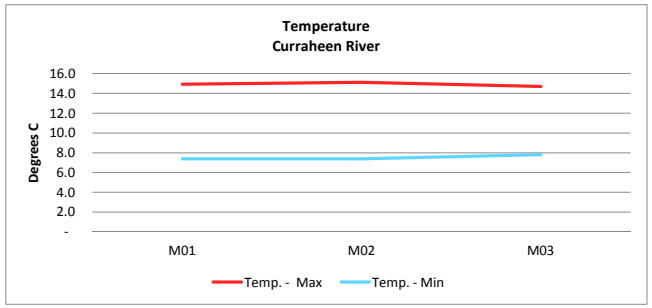


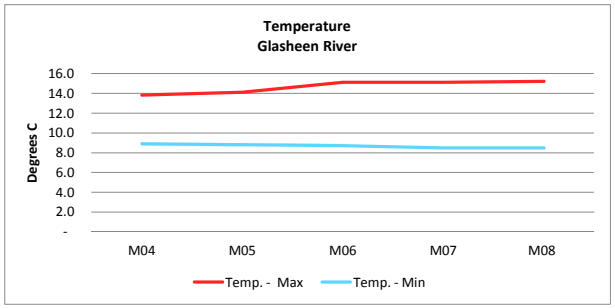


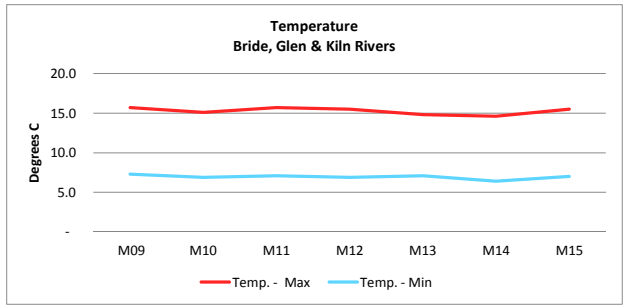




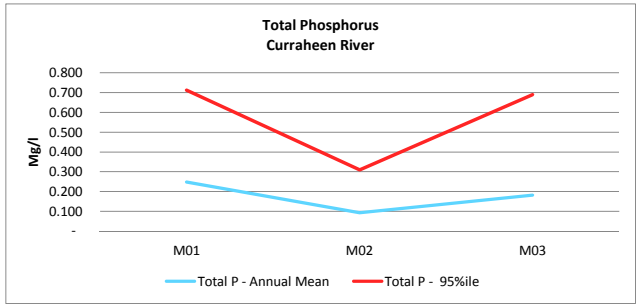


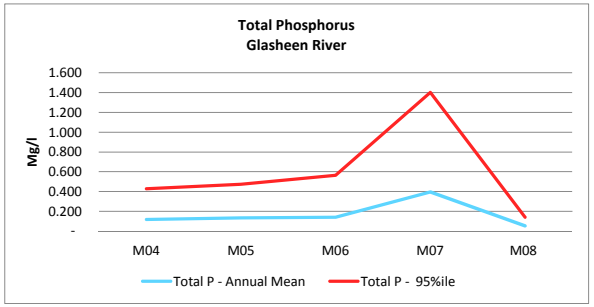


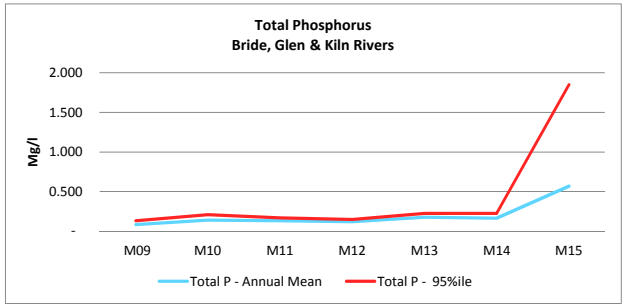


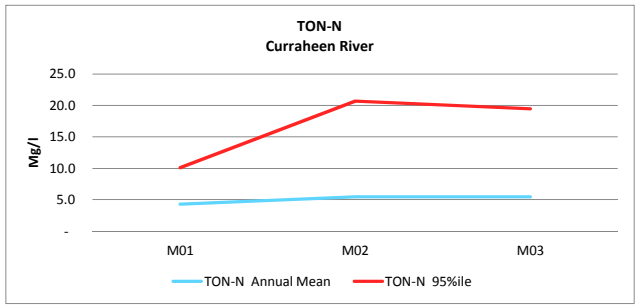


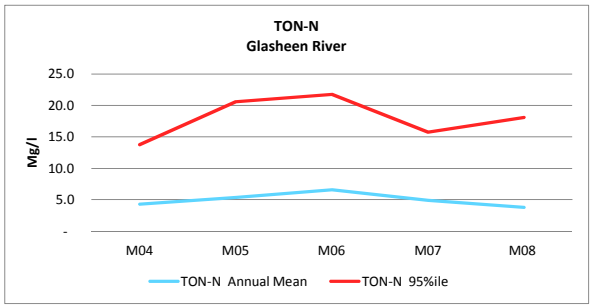
River Monitoring 2012

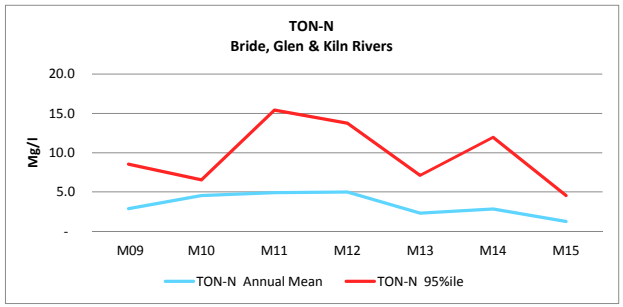


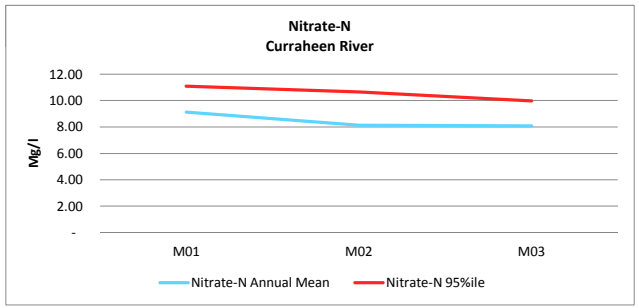


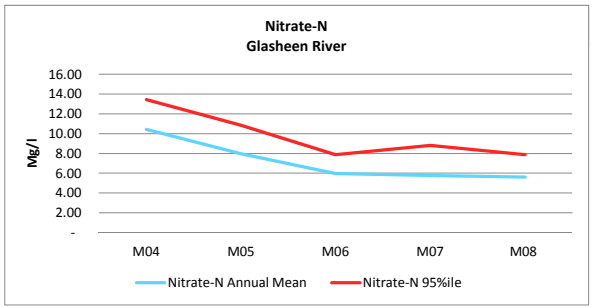


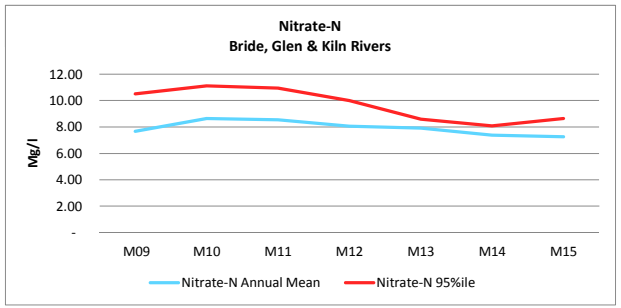




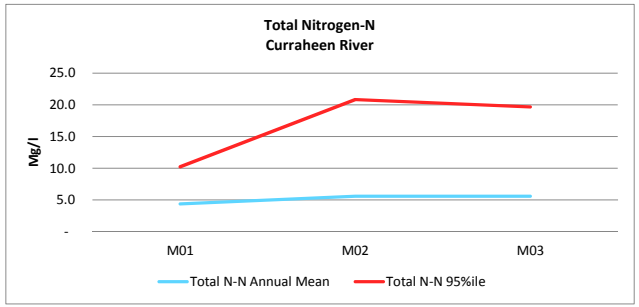


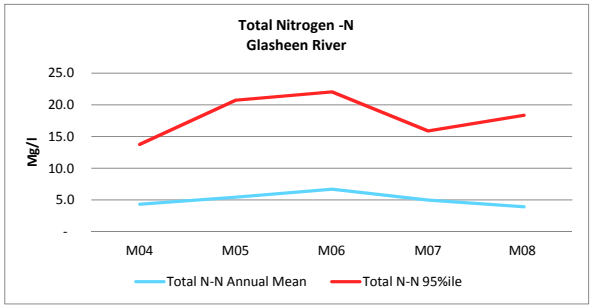


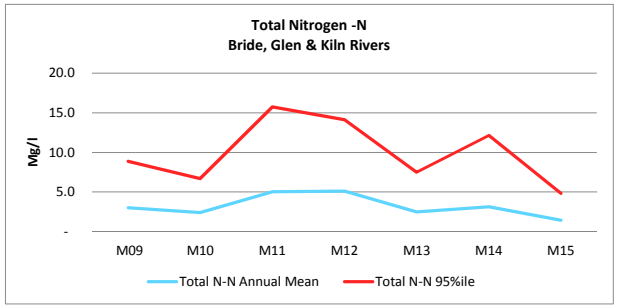


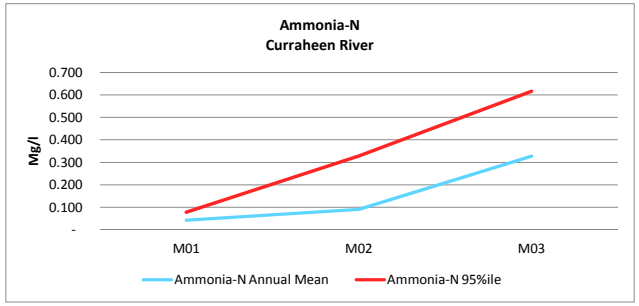


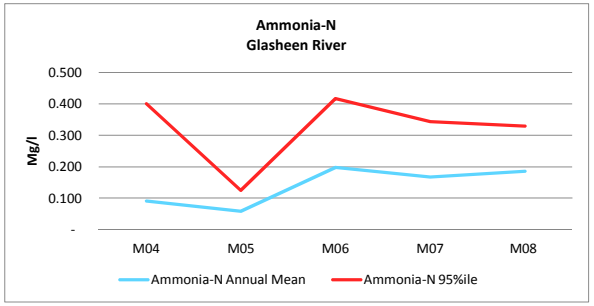
River Monitoring 2012

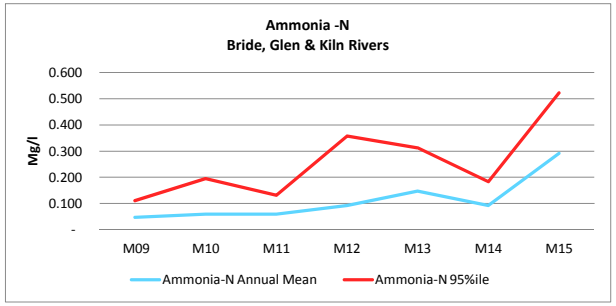












Harbour Monitoring Summary

Monitoring is conditioned to be carried out at a frequency of 10 samples per year at locations designated C5 to C9 within the Harbour. C5, *Haulbowline*, is located in the outermost point monitored, in the Coastal zone of Cork Harbour, C6, *End Lough Mahon* and C8, *Mid Lough Mahon* are in Transitional Waters, with C6 nearest the coastal zone. C8 is quite close to the location of the discharge outfall for the WWTP at Carrigrennan. C7, *Blackrock Castle* and C9, *Tivoli* are in the *Lower Lee Estuary*, Transitional Waters, with C9 being the most upstream monitoring point.

Monitoring was carried out on 7 dates between July and December 2012, at each location. For C5, C6, C7 & C8 a sample was taken at High and Low Tide, at Bottom, Middle and Top levels in the water. For C9 a sample was taken at High and Low Tide, at Bottom and Top levels in the water. In all, 42 samples were taken at C5, C6, C7,& C8 and 28 were taken at C9, rather than the 10 samples as indicated in the licence.

Trophic Status Assessment Scheme

The Status of individual estuarine and coastal water bodies is assessed using the EPA's Trophic Status assessment Scheme (TSAS). The scheme compares the compliance of individual parameters against a set of criteria indicative of trophic state. These criteria fall into three different categories which broadly capture the cause –effect relationship of the euthrophic process, namely Category A, Nutrient Enrichment (DIN & MRP), Category B, Accelerated plant growth (Chlorophyll & Macroalgae) and Category C, Disturbance to the level of dissolved oxygen normally present (DO % Saturation).

Eutrophic water bodies are those in which each of the criteria are breached, i.e. where elevated nutrient concentrations, accelerated growth of plants and undesirable water quality disturbance occur simultaneously;

Potentially Eutrophic water bodies are those in which two of the criteria are breached and the third falls within 15 per cent of the relevant threshold value;

Intermediate Status water bodies are those which do not fall into the Eutrophic or Potentially Eutrophic classes but in which breaches one or two of the criteria occur;

Unpolluted waterbodies are those which do not breach any of the criteria.

Assessment

The Status of each individual test location as monitored is assessed using the Trophic Status Assessment Scheme (TSAS) with the exception that tests were not carried out for Microalgae.

Thresholds are broadly in line with the limits set out in Table 8 (Biological Quality Elements) & Table 9 (Physico-Chemical conditions supporting the Biological elements) of S.I. 272 of 2009

S.I.272 of 2009

DIN is only assessed for Coastal Water bodies and not Transitional Water bodies. TSAS Thresholds are consistent with "Good" Status for Coastal waters in Table 9.

Molydate Reactive Phosphorous (MRP) is used to assess Transitional Water Bodies and not Coastal. TSAS Thresholds are consistent with Transitional water limits in Table 9

Chlorophyll limits for the Good to Moderate Boundary conditions in Table 8 are lower than those used as TSAS thresholds, i.e. 5 to 10 microg/l (Median) and 10 to 20 microg/l (90%ile) versus TSAS values of 10 to 15 median and 20 to 30 (95%ile).

DO % Sat, 95%iles, Upper and Lower limits. TSAS Thresholds are consistent with Transitional water limits in Table 9. In addition, TSAS Thresholds, dictated by salinity values, result in consistency with Coastal water limits in Table 9.

In addition

BOD (95%ile) value < or =4 mg/l applies to Transitional water bodies only in Table 9

Compliance with Standards

Trophic Status Assessment

Refer to Summary, 2012-2008 Trophic Status Tables of Results and in addition graphs of individual parameters for years 2008 to 2012. Note: While 2012 Threshold values are given in the graphs and are indicative of quality overall, they are relevant for 2012 only and reference should be made to tables only for pass/failure of particular years parameters.

Category A: Nutrient Enrichment

DIN: Dissolved Inorganic Nitrogen, (Ammonium plus Nitrate & Nitrite)

Apart from location C9, Tivoli, lower Lee Estuary, i.e. the location nearest Cork City, Winter DIN test results did not exceed the Threshold. This is at varience with, and a major improvement on, previous years, as demonstrated by Tables and Graph of Winter DIN- Median between 2008 and 2012 inclusive, whereby all Winter DIN thresholds were exceeded each year in each location apart from 2012.

Summer DIN results for 2012 were all in compliance with Threshold. While results from locations nearest the City were closest to the Threshold, the greatest difference, i.e. better overall quality was lower down the Estuary /Harbour at C8, C6,and C5.

This would appear to correct the deterioration shown in 2011 and shows an overall improvement in quality of the waters, building on the trend shown in 2010.

Below average rainfalls in summer 2011 and corresponding above average rainfall in 2012 may have contributed to the variation in results.

In 2010 the Cork Harbour and Lough Mahon, 3 locations, all passed, and there were exceedances of just 17% and 30% for C7 and C9 in the Lower Lee Estuary, respectively. Issues with Salinity results in 2011 also may have contributed to a skewed adverse judgement on results for 2011,

whereby 4 locations were deemed to fail. Salinity variations would have resulted in only the same 2 locations as 2010, those nearest the City, failing.

MRP, Orthophosphate:

Both Summer and Winter MRP values for all years 2012 to 2008 were in compliance with thresholds. Winter MRP values for 2012 were better than 2010 and 2011 but not as good as 2009. The closest median value to the winter threshold was calculated for C7, Blackrock Castle,Lower Estuary, in 2012. In contrast values for 2012 Summer MRP were higher than previous years but still under the threshold by a large margin.

Category B: Accelerated Growth

Chlorophyll-a

All Chlorophyll-a concentration results (median and 90%ile) in 2012 for each of the 5 locations were in compliance with thresholds for TSAS and also in compliance with Table 8 of SI 272 of 2009, Good-Moderate boundary conditions, ranking as Good. Results were comparable with those of 2009 and better marginally than 2008.
This is an improvement on recent years. While in 2011 all locations passed in both median and 90%ile results, the results did not meet SI 272 of 2009 standards.

In 2010 while both Median and 90%ile value at C8, Mid Lough Mahon, rose over the TSAS threshold. C7, (Blackrock Castle) Lower Lee Estuary, failed for median Chlorophyll only. C9, (Tivoli) Lower lee Estuary failed in both Median and 90%ile in 2010. The values for C9 were only marginally over the threshold, and a case could be made to deem them to pass on the basis of a salinity calculation correction.

Category C: Undesirable Disturbance

DO% Saturation

All 2012 DO% Saturation results (5%ile and 95%ile) were in compliance with standards, i.e. above lower limits and below upper limits.
2011 and 2009 values showed similar trends for DO% Saturation, 5%ile and 95%ile.
Both years had pass values above the lower 5%ile threshold at C5, C6, and C8 and fail values below it at C7 and C9 the points nearest the city. Both years also had fail values above the upper 95%ile threshold at C5 and C6, and pass values below it at C7 and C9. In 2011 the value at C8 passed but 2010 failed by a small margin of 1%. There would be no correction for salinity.

DO Sat 5%ile for 2010 was more erratic with pass values at C5, C8 and C7 and fail values at C6 and C9. Values for all locations failed, i.e. were above the upper DO Sat 95%ile threshold limit, in 2010.

BOD

While a maximum value of 4.3 mg/l O2 for BOD was recorded in winter at location C7, Blackrock Castle, all mean and 95%ile values were within the Good status requirements of SI 272 of 2009 for all 5 monitoring locations in 2012.

Trends

The trend in general is for an improvement in water quality as one travels downstream from the smaller water body towards the larger water body and from the more dense settlement towards the more diffuse population. Over the five years analysed 2010 showed wider variation in values with 2011 appearing to recover and 2012 improving again, resulting in values that indicate an Unpolluted Status or Good quality in 4 of the five locations samples. The only point remaining at Intermediate Status or Moderate quality being the Lower Lee Estuary at C9 Tivoli.

Overall Trophic Status

The locations tested by Cork City Council, C7, C8, C6 & C5, qualify as ***Unpolluted*** Status in 2012. C9 at Tivoli, nearest the city qualifies as ***Intermediate*** Status

The locations tested by Cork City Council, C5 to C9, qualify as ***Intermediate*** status in 2011 and 2009.

In 2010 however the values for C8, Mid Lough Mahon and C7, Blackrock Castle, Lower lee Estuary result in a ***Potentially Eutrophic*** status, due to the exceedances of the Category B, Chlorophyll parameters, unlike other years tested. C9 was on the balance point in 2010 between *Intermediate* and *Potentially Eutrophic*, when salinity is taken into consideration as explained previously. The Category B, Chlorophyll, parameters did not exceed the thresholds by more than 15%.

Comparison with EPA /WFD monitoring

An assessment of the Trophic Status of estuaries and bays in Ireland, was completed by the EPA in March 2001, before the WWTP was constructed at Carrigrennan for the Cork city agglomeration. In the Lee Estuary/Lough Mahon the criteria for DIN, MRP and Chlorophyll were exceeded and there was deoxygenation which breached the lower limit (5%ile) for dissolved oxygen. With all three elements of the criteria breached the area was assessed as ***Eutrophic*** at that time.

Water Quality in Ireland 2007-2009 published by the EPA, indicates that the quality of the estuarine and coastal waters for Cork Harbour, Lough Mahon and the Lower Lee Estuary were ***Intermediate*** status for that period time using the Trophic Status Assessment Scheme as required for the UWWT Directive and Nitrates Directive. This was an improvement from pre-Cork City WWTP era. Of the 9 locations tested by the EPA in Cork Harbour, only North Channel Great Island was designated as ***Potentially Eutrophic*** in the *Water Quality in Ireland 2007-2009 report.* http://www.epa.ie/downloads/pubs/water/coastal/name,30851,en.html

EPA Monitoring Data: No data was available from the EPA for 2012

EPA Sample data for 2011 (see following tables) when analysed, collaborates the City Council data for that period, indicating the status for Lee Estuary, Lough Mahon & Cork Harbour all as *Intermediate*. In addition, the EPA sourced data indicates a better quality of water overall, with less failures on individual items than the Cork City Council data. This gives weight to the issues of salinity experienced by Cork City Council for that reporting period which may have resulting in thresholds being set too severe .

Other Monitored Parameters

Acidification Status, pH

pH for all locations and seasons ranged between a maximum of 8.1 and a minimum of 7.5. This is well within the range between 6.0 and 9.0 cited in IS 272 of 2009 Table 9

Temperature

Temperature ranged from a maximum of 17.2 degrees C. in summer, to a minimum of 7.0 degrees C. in winter. Differences noted in temperatures, at the nearest points to Primary discharge at each sampling event , changes with sampling depth, and is not dissimilar to comparable changes at other sampling locations.

Total Ammonia

There is no standard requirement for Transitional or Coastal waters for Total Ammonia in SI 272 of 2009. For River water, the Good status, mean and 95%ile limits, is Less than or equal to 0.065 and 0.14 mg/l respectively. When ammonia is present in levels much above 0.1 mg/l N, sewage or industrial contamination may be indicated. Both C9 & C7, winter 95%ile values were above this level, with C9 also breaching the SI 272 95%ile Limit. These locations are closest to the City, and results likely reflect the number of Storm outfalls from the City Drainage Network.

TON, Total Oxidized Nitrogen (Nitrate + Nitrite)

Given that Nitrite concentrations are normally only 1-2 % of Nitrate, the value of TON generally reflects the concentration of nitrate in the water. High levels of nitrate in rivers can indicate significant run off from agricultural land but also can indicate the presence of sewage. Monitoring of tributories contributing to the Lee within the City shows that Nitrate levels are quite high, i.e. rated *Bad*, (in excess of 5.6 mg/l N,) at levels of 7 to 10 mg/l N, as these rivers enter the city from the agricultural land surrounding it. Data from EPA monitoring of the River Lee itself at the waterworks, before it enters the city, LE040, (2011,latest data available) has a mean of 2.86 and 95%ile of 3.8 mg/l N

Both Median and 95%ile values for Summer TON, decrease gradually with distance from the city, i.e. from C9 to C5, reflecting increased dilution factors in moving from the smaller to the larger water bodies, from the Estuary, to Lough Mahon, to Cork Harbour. 95%ile concentrations at C9 in 2012 is 2.26 mg/l whereas concentration is 0.371mg/l N at C5, Cork Harbour. Winter TON 95%ile values vary throughout, ranging from 3.3 at C7,

Blackrock Castle to 0.34 mg/l at C5, Cork Harbour. The initial higher values are directly comparable to the Nitrate concentration values at entry to the city.

Total Nitrogen (organically bound Nitrogen incl Ammonia, plus Nitrate and Nitrite)
Concentration values are not dissimilar to TON with increases reflecting the addition of ammonia. The impact of nitrate concentrations would appear to make up the largest percentage of the Total Nitrogen impact on the waters. i.e. Worst case, Winter 95%ile values at C7 of 3.235mg/l for Total Nitrogen Vs 0.26mg/l for Ammonia and 3.327 mg/l for TON at same location.

Conclusions

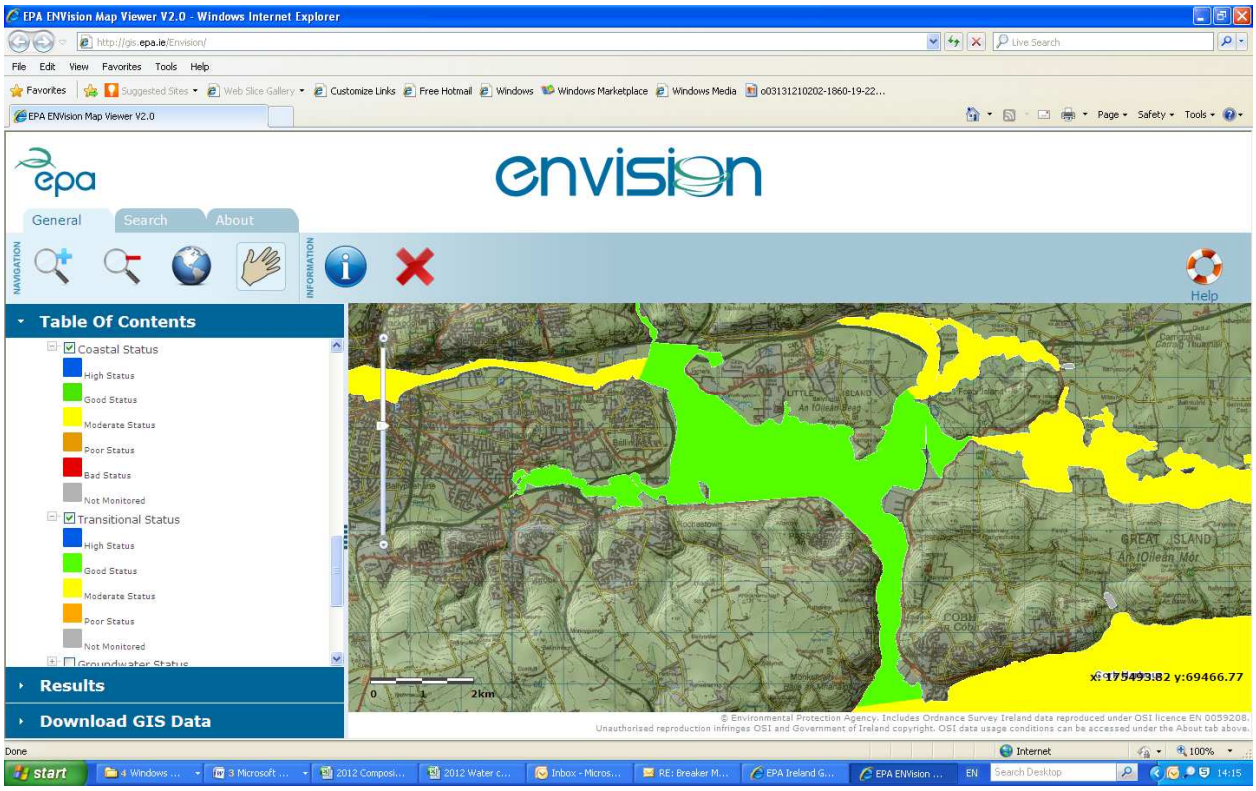
While conditions are not yet ideal, major improvement has been made to the Trophic Status of the Lee Estuary and Cork Harbour. This improvement should be attributed in the main to the construction of the Carrigrennan WWTP, as well as other treatment plant improvements in the area. Due to the complexity of the Harbour it is difficult to assign responsibility for parameter improvements or indeed exceedances to any particular input, being a product of the diffuse inputs into the water body. Nitrate levels in the rivers before entry to the city would appear to be a factor in the levels of Nitrate, DIN etc monitored in the Lower Lee Estuary and would also indicate similar Nitrate inflows from other river sources are also a possibility within the Harbour itself.

The Primary Discharge from Cork City is into Lough Mahon at Carrigrennan. This is the water body that has shown the greatest improvement in water quality over the past number of years since construction of the WWTP. The effects of secondary discharges are still evident in the poorer quality of water in the Lower Lee Estuary, although sampling results would indicate that these levels have improved also over time. This area is closest to the City population and the bulk of the secondary discharges and is an area also influenced by inflows from the Glashaboy River.

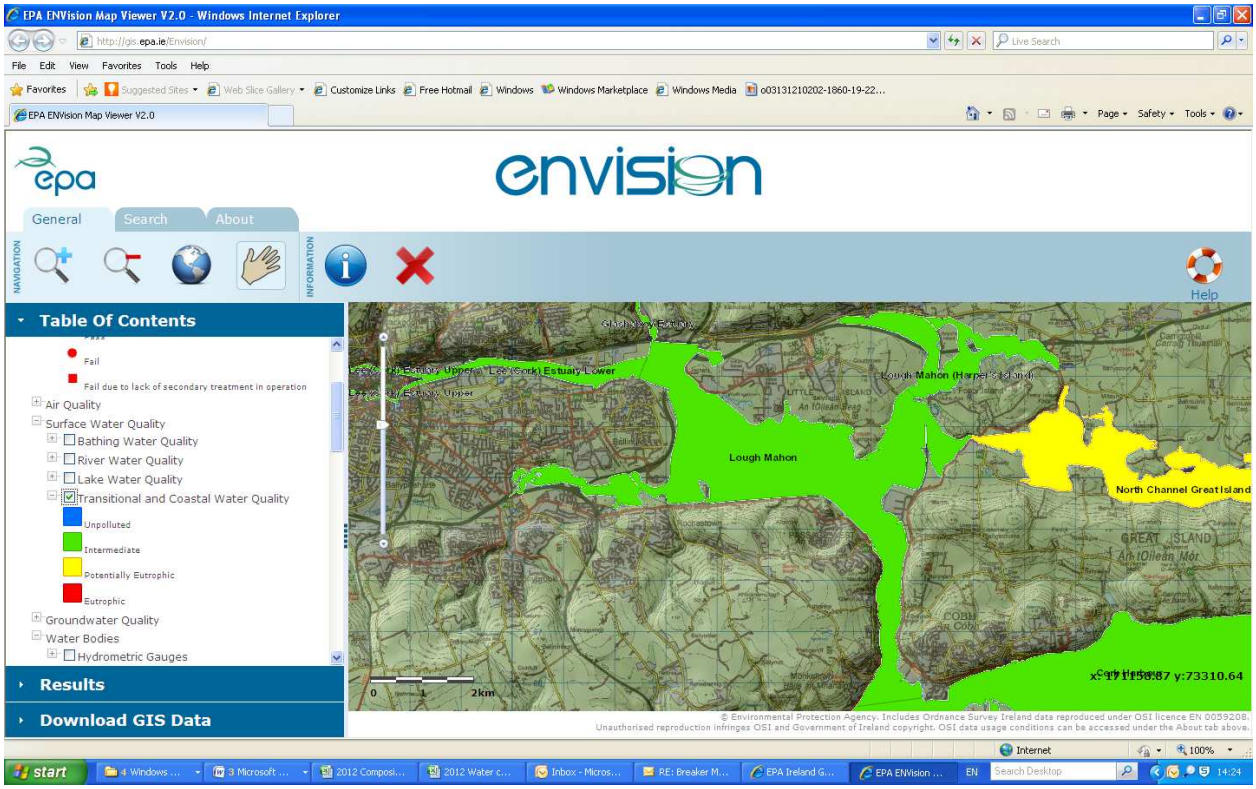
Ecological Status

The most recent **Water Framework Directive** information available on the EPA Envision designates the overall status of the Upper and Lower Lee Estuaries and North Channel Great Island as Transitional Water Body –**Moderate**- Status, Lough Mahon Estuary is designated as **Good** Status and Cork Harbour coastal waters is designated as **Moderate** Status. The overall objective is to restore waters to Good status by 2021. They are all designated at Risk Level 1a- At Risk. Ref *Water Matters SWRBD July 2010.*

http://maps.epa.ie/internetmapviewer2/mapviewer.aspx



The most recent **Surface Water Quality** information available on the EPA Envision website designate Lower Lee Estuary, Lough Mahon as Transitional Water Body –**Intermediate**- Status, North Channel Great Island are designated as Transitional Water Body –**Potentially Eutrophic**- Status, and Cork Harbour, Coastal waterbodies as -**Intermediate** –Status



Cork Lee Estuary & Harbour						EPA Monitoring 2011														
LE170	**C9**													Salinity		**15.24**		**21.07**		
LE160	**2011**	ID	Salinity	Temperature	DO_Saturation	pH	NH3	TON	DIN	PO4	BOD	Chl_a	**TSAS Criteria**	G/M Threshold	G/M Threshold	Winter Threshold	**Value**	Summer Threshold	**Value**	
Minimum		S	1.2	12.5	60.1	7.5	0.0	0.2	0.4	5.0	1.0	1.2	**Winter DIN - Median**	2.6	0	1.524	2.71			**Fail**
Median		S	21.1	15.0	85.6	7.8	0.2	0.5	1.0	37.0	1.0	4.2	**Winter MRP - Median**	60	40	60	26.0			Pass
Maximum		S	31.3	16.4	107.5	8.2	0.8	2.4	2.6	77.0	2.0	21.0	**Summer DIN - Median**	2.6	0			1.144	0.98	Pass
5%ile		S	21.1	15.0	85.6	7.8	0.2	0.5	1.0	37.0	1.0	4.2	**Summer MRP - Median**	60	40			56	37.0	Pass
95%ile		S	31.3	16.2	100.4	8.2	0.8	2.4	2.5	71.1	1.5	9.7	**Chloro-Median**	15	10			13.9	4.15	Pass
No Of Samples		S	18	18	18	18	16	18	16	18	10	18	**Chloro-90 Percentile**	30	20			27.8	9.72	Pass
Minimum		W	2.0	6.1	86.1	7.6	0.1	0.9	1.1	24.0	1.0	0.7	**Opportunistic Algae**							
Median		W	15.2	6.6	90.5	7.8	0.2	2.6	2.7	26.0	1.0	1.3	**DO %Sat - 5 Percentile**	70	80	70	90.45	72	85.55	Pass
Maximum		W	25.9	7.1	93.5	7.8	0.2	4.3	4.4	31.0	1.0	1.7	**DO %Sat - 95 Percentile**	130	120	130	93.35	128	100.36	Pass
5%ile		W	15.2	6.6	90.5	7.8	0.2	2.6	2.7	26.0	1.0	1.3	BOD G/M	4					1.0	
95%ile		W	25.9	7.1	93.4	7.8	0.2	4.2	4.4	30.3	1.0	1.6	BOD H/G	3				3		Pass
No Of Samples		W	6	6	6	6	6	6	6	6	2	6						**Intermediate**		
LE180	**C7**													Salinity		**16.65**		**27.99**		
LE310	**2011**	ID	Salinity	Temperature	DO_Saturation	pH	NH3	TON	DIN	PO4	BOD	Chl_a	**TSAS Criteria**	G/M Threshold	G/M Threshold	Winter Threshold	**Value**	Summer Threshold	**Value**	
Minimum		S	13.3	12.1	70.1	7.7	0.1	0.2	0.3	27.0	1.0	1.9	**Winter DIN - Median**	2.6	0	1.424	2.20			**Fail**
Median		S	28.0	15.2	86.6	7.9	0.2	0.5	1.0	35.0	1.0	5.2	**Winter MRP - Median**	60	40	60	23.0			Pass
Maximum		S	31.8	16.6	108.4	8.2	0.5	2.0	2.1	47.0	1.0	16.0	**Summer DIN - Median**	2.6	0			0.697	0.95	**Fail**
5%ile		S	28.0	15.2	86.6	7.9	0.2	0.5	1.0	35.0	1.0	5.2	**Summer MRP - Median**	60	40			48	35.0	Pass
95%ile		S	31.6	16.5	108.1	8.2	0.4	1.8	2.1	47.0	1.0	8.3	**Chloro-Median**	15	10			11.9	5.15	Pass
No Of Samples		S	14	14	14	14	13	14	13	14	2	14	**Chloro-90 Percentile**	30	20			23.9	8.30	Pass
Minimum		W	6.3	6.3	91.7	7.7	0.1	0.8	0.9	19.0	1.0	1.0	**Opportunistic Algae**							
Median		W	16.7	6.6	92.7	7.8	0.1	2.1	2.2	23.0	1.0	1.4	**DO %Sat - 5 Percentile**	70	80	70	92.70	76	86.55	Pass
Maximum		W	27.0	7.0	93.7	7.9	0.1	3.4	3.5	27.0	1.0	1.8	**DO %Sat - 95 Percentile**	130	120	130	93.60	124	108.14	Pass
5%ile		W	16.7	6.6	92.7	7.8	0.1	2.1	2.2	23.0	1.0	1.4	BOD G/M	4					1.0	
95%ile		W	26.0	7.0	93.6	7.9	0.1	3.3	3.4	26.6	1.0	1.7	BOD H/G	3				3		Pass
No Of Samples		W	2	2	2	2	2	2	2	2	2	2						**Intermediate**		
	C8													Salinity		**24.22**		**30.29**		
LE330	**2011**	ID	Salinity	Temperature	DO_Saturation	pH	NH3	TON	DIN	PO4	BOD	Chl_a	**TSAS Criteria**	G/M Threshold	G/M Threshold	Winter Threshold	**Value**	Summer Threshold	**Value**	
Minimum		S	24.0	11.6	75.9	7.8	0.1	0.1	0.2	10.0	1.0	3.5	**Winter DIN - Median**	2.6	0	0.939	1.46			**Fail**
Median		S	30.3	14.2	93.4	7.9	0.2	0.3	0.5	31.0	1.0	5.6	**Winter MRP - Median**	60	40	51.78	18.0			Pass
Maximum		S	33.2	16.4	116.4	8.3	0.4	1.1	1.3	58.0	2.0	18.7	**Summer DIN - Median**	2.6	0			0.551	0.547	Pass
5%ile		S	30.3	14.2	93.4	7.9	0.2	0.3	0.5	31.0	1.0	5.6	**Summer MRP - Median**	60	40			46.71	31.0	Pass
95%ile		S	32.9	16.2	113.9	8.3	0.4	0.8	1.1	53.1	1.6	14.6	**Chloro-Median**	15	10			11.3	5.60	Pass
No Of Samples		S	10	10	10	10	10	10	10	10	8	10	**Chloro-90 Percentile**	30	20			22.626	14.61	Pass
Minimum		W	14.3	6.5	90.8	7.8	0.1	0.6	0.6	12.0		1.3	**Opportunistic Algae**							
Median		W	24.2	6.8	91.9	7.9	0.1	1.3	1.5	18.0		1.3	**DO %Sat - 5 Percentile**	70	80	74	91.85	77.3	93.35	Pass
Maximum		W	29.7	7.2	95.7	7.9	0.2	2.8	2.9	24.0		1.5	**DO %Sat - 95 Percentile**	130	120	126	95.24	123	113.93	Pass
5%ile		W	24.2	6.8	91.9	7.9	0.1	1.3	1.5	18.0		1.3	BOD G/M	4					1.0	
95%ile		W	29.4	7.2	95.2	7.9	0.2	2.6	2.8	23.9		1.4	BOD H/G	3				3		Pass
No Of Samples		W	4	4	4	4	4	4	4	4	2	4						**Intermediate**		

Cork Lee Estuary & Harbour						EPA Monitoring 2011														
	C6													Salinity		23.72		30.45		
LE340	2011	ID	Salinity	Temperature	DO_Saturation	pH	NH3	TON	DIN	PO4	BOD	Chl_a	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value	
Minimum		S	24.4	11.9	82.5	7.9	0.1	0.1	0.2	14.0	1.0	3.6	**Winter DIN - Median**	2.6	0	0.9709	1.293			**Fail**
Median		S	30.4	14.2	91.9	7.9	0.2	0.3	0.5	27.5	1.5	4.8	**Winter MRP - Median**	60	40	52.28	19.5			Pass
Maximum		S	33.1	16.3	117.2	8.3	0.4	0.7	0.9	32.0	2.0	15.3	**Summer DIN - Median**	2.6	0			0.541	0.497	Pass
5%ile		S	30.4	14.2	91.9	7.9	0.2	0.3	0.5	27.5	1.5	4.8	**Summer MRP - Median**	60	40			45.1	27.5	Pass
95%ile		S	32.9	16.1	117.0	8.3	0.3	0.6	0.9	32.0	2.0	13.6	**Chloro-Median**	15	10			11.3	4.75	Pass
No Of Samples		S	10	10	10	10	10	10	10	10	4	10	**Chloro-90 Percentile**	30	20			22.53	13.64	Pass
Minimum		W	14.2	6.3	90.1	7.8	0.1	0.8	0.9	15.0		1.4	**Opportunistic Algae**							
Median		W	23.7	6.8	91.4	7.9	0.1	1.1	1.3	19.5		1.7	**DO %Sat - 5 Percentile**	70	80	74	91.40	77	91.85	Pass
Maximum		W	27.9	7.1	92.9	7.9	0.2	2.4	2.6	24.0		2.1	**DO %Sat - 95 Percentile**	130	120	126.27	92.80	122.55	117.02	Pass
5%ile		W	23.7	6.8	91.4	7.9	0.1	1.1	1.3	19.5		1.7	BOD G/M	4					1.5	
95%ile		W	27.8	7.0	92.8	7.9	0.2	2.3	2.4	23.9		2.0	BOD H/G	3				3		Pass
No Of Samples		W	4	4	4	4	4	4	4	4	4	4						**Intermediate**		
	C5													Salinity		29.38		33.49		
LE380	2011	ID	Salinity	Temperature	DO_Saturation	pH	NH3	TON	DIN	PO4	BOD	Chl_a	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value	
Minimum		S	29.2	10.4	81.9	7.9	0.1	0.0	0.1	12.0	1.0	3.0	**Winter DIN - Median**	2.6	0	0.545	0.69			**Fail**
Median		S	33.5	13.6	91.7	8.0	0.1	0.1	0.2	18.0	1.0	3.8	**Winter MRP - Median**	60	40	46.68	9.5			Pass
Maximum		S	34.1	15.9	119.8	8.3	0.2	0.5	0.7	25.0	1.0	15.3	**Summer DIN - Median**	2.6	0				0.23	Pass
5%ile		S	33.5	13.6	91.7	8.0	0.1	0.1	0.2	18.0	1.0	3.8	**Summer MRP - Median**	60	40				18.0	Pass
95%ile		S	34.0	15.6	117.3	8.3	0.2	0.4	0.6	25.0	1.0	15.3	**Chloro-Median**	15	10			10.5	3.80	Pass
No Of Samples		S	10	10	10	10	10	10	10	10	6	10	**Chloro-90 Percentile**	30	20			20.85	15.30	Pass
Minimum		W	23.6	6.7	92.6	7.9	0.0	0.3	0.3	2.5		1.3	**Opportunistic Algae**							
Median		W	29.4	7.2	93.4	7.9	0.1	0.6	0.7	9.5		1.6	**DO %Sat - 5 Percentile**	70	80	77	93.40	79	91.65	Pass
Maximum		W	33.1	7.6	94.3	7.9	0.1	1.1	1.2	16.0		1.9	**DO %Sat - 95 Percentile**	130	120	123	94.18	121	117.33	Pass
5%ile		W	29.4	7.2	93.4	7.9	0.1	0.6	0.7	9.5		1.6	BOD G/M	4					1.0	
95%ile		W	32.7	7.6	94.2	7.9	0.1	1.0	1.1	15.3		1.9	BOD H/G	3				3		Pass
No Of Samples		W	4	4	4	4	4	4	4	4	4	4						**Intermediate**		

2012 WFD Physio-Chem	Summer					
	Cork Harbour	Cork Harbour North Channel	Rostellan North	Rostellan South	Rostellan West	
Median Salinity (PSU) S	33.96	NT	31.36	29.42	30.41	
Chlorophyll-a (probe) (ug/L)median	**3.47**	NT	**3.90**	**5.20**	**5.79**	Accelerated Growth
Threshold	10.30		11.0	11.5	11.2	
Chlorophyll-a (probe) (ug/L)(90%ile)	**10.62**	NT	**12.50**	**5.51**	**29.62**	
Threshold	20.60		21.85	22.60	22.40	
Dissolved oxygen (%) (5%ile)	**97.0**	NT	**110.55**	**103**	**111.45**	Undesirable Disturbance
Threshold	79.0		78.0	77.0	77.6	
Dissolved oxygen (%)95%ile	**112.0**	NT	**134.5**	120	**131.0**	
Threshold	121.0		122	123	122.4	
Nutrient Enrichment not assessed						
No Test Values for DIN or MRP						

2012 WFD Physio-Chem	Winter					
	Cork Harbour	Cork Harbour North Channel	Rostellan North	Rostellan South	Rostellan West	
Median Salinity (PSU) W	34.35	26.65	29.17	29.77	30.73	
Chlorophyll-a (probe) (ug/L)median	**1.73**	**2.55**	**1.82**	**1.25**	**1.20**	Accelerated Growth
Threshold	10.20	12.3	11.7	11.5	11.2	
Chlorophyll-a (probe) (ug/L)(90%ile)	**2.21**	2.60	**2.37**	**1.70**	**1.53**	
Threshold	20.40	24.60	23.30	23.00	22.40	
Dissolved oxygen (%) (5%ile)	**85.8**	95.9	**89.58**	**89.93**	**91.4**	Undesirable Disturbance
Threshold	79.4	75.7	77.0	77.0	77.7	
Dissolved oxygen (%)95%ile	**98.5**	96.3	**92.9**	91.4	**95.6**	
Threshold	120.7	124.3	123	123	122.3	
All Passed / Within thresholds						
Nutrient Enrichment not assessed						
No Test Values for DIN or MRP						

Ambient Monitoring, C5 to C9

Lee Estuary, Lough Mahon & Cork Harbour

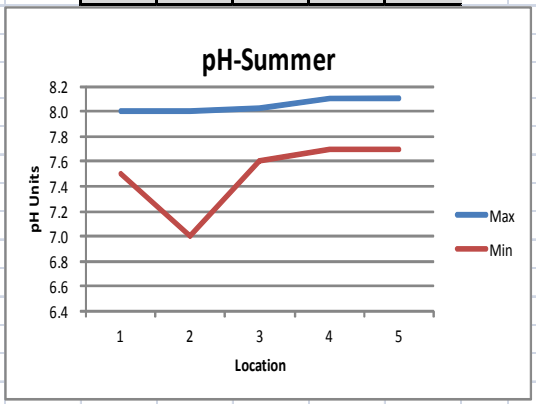
Monitoring Test Results Summary

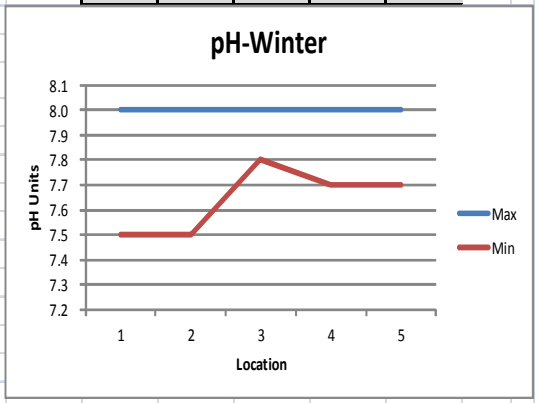
Cork City Council Data 2012

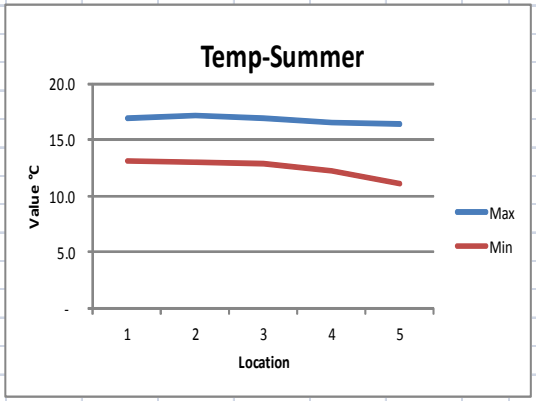
and

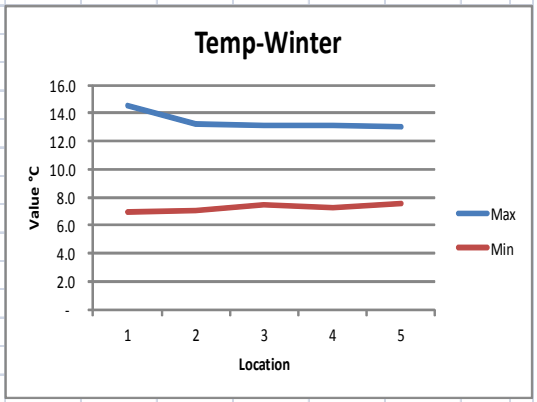
Summary 2012-2008 Trophic Status

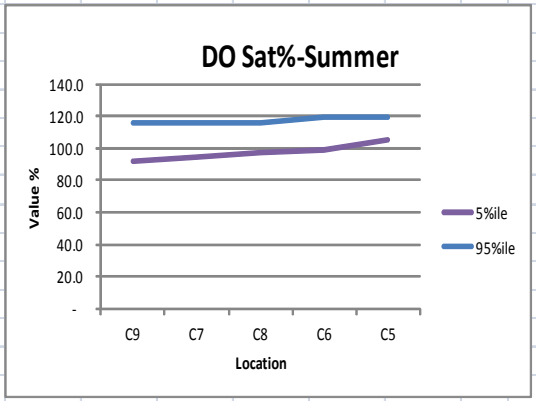
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
pH-Summer	C9	C7	C8	C6	C5
5%ile	7.6	7.5	7.7	7.7	7.8
95%ile	8.0	8.0	8.0	8.0	8.1
Max	8.0	8.0	8.0	8.1	8.1
Median	7.8	7.9	7.9	8.0	8.0
Min	7.5	7.0	7.6	7.7	7.7
No.Samples	20	30	30	30	30
pH-Winter	C9	C7	C8	C6	C5
5%ile	7.5	7.6	7.8	7.8	7.8
95%ile	8.0	8.0	8.0	8.0	8.0
Max	8.0	8.0	8.0	8.0	8.0
Median	7.8	7.9	7.9	8.0	8.0
Min	7.5	7.5	7.8	7.7	7.7
No.Samples	12	18	18	18	18
Temp-Summer	C9	C7	C8	C6	C5
5%ile	13.1	13.1	13.2	12.6	12.4
95%ile	16.9	16.5	16.6	16.3	15.9
Max	16.9	17.2	16.9	16.5	16.4
Median	15.1	15.1	14.9	14.5	14.5
Min	13.1	13.0	12.9	12.2	11.1
No.Samples	20	30	30	30	30
Temp-Winter	C9	C7	C8	C6	C5
5%ile	7.1	7.6	7.8	7.6	7.9
95%ile	14.4	13.1	13.0	13.0	13.0
Max	14.5	13.2	13.1	13.1	13.0
Median	10.1	10.4	10.4	10.0	10.7
Min	7.0	7.1	7.5	7.3	7.6
No.Samples	12	18	18	18	18
DO sat% - Summer	C9	C7	C8	C6	C5
5%ile	91.6	94.8	97.6	99.4	105.3
95%ile	115.7	116.0	115.5	119.4	119.6
Max	117.2	118.2	115.5	121.7	120.5
Median	100.4	107.2	109.6	110.5	112.7
Min	91.2	91.4	91.8	92.7	96.6
No.Samples	12	18	18	18	18
DO sat% -Winter	C9	C7	C8	C6	C5
5%ile	79.1	79.7	88.3	88.3	93.0
95%ile	110.7	112.0	109.2	109.6	115.6
Max	116.0	116.0	109.7	111.4	115.8
Median	91.5	98.4	100.2	101.1	101.9
Min	78.3	78.2	86.5	87.0	86.9
No.Samples	12	18	18	18	18

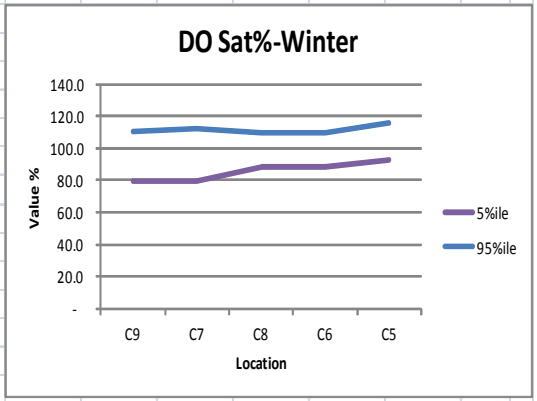




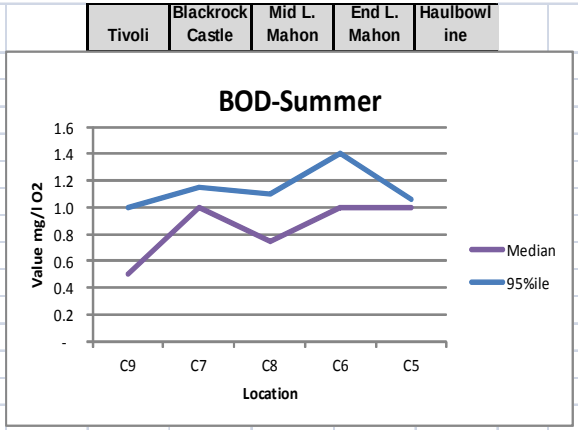


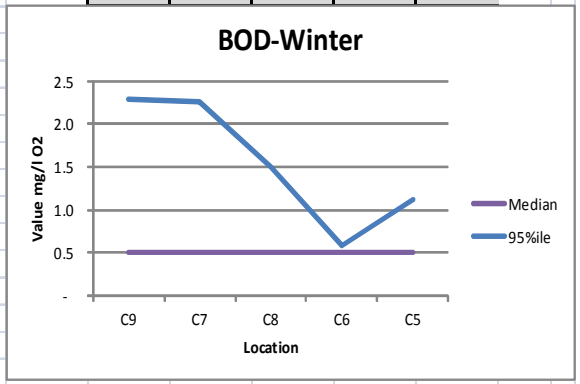


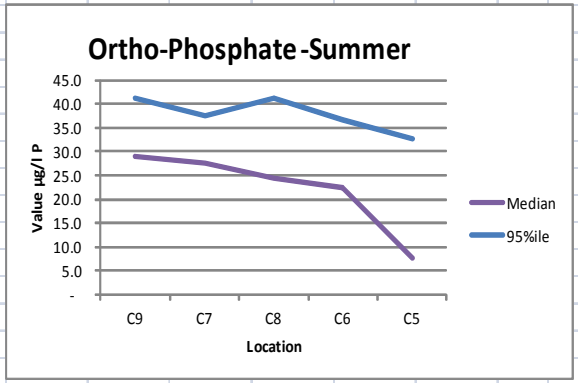


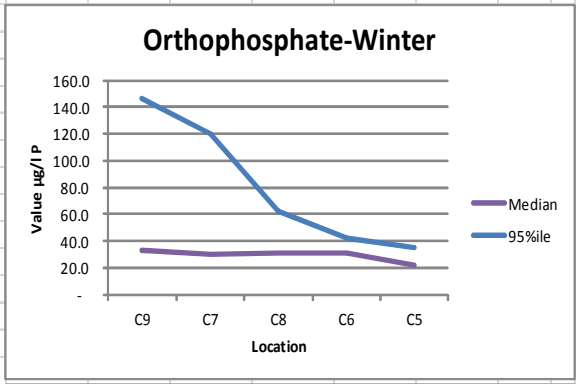


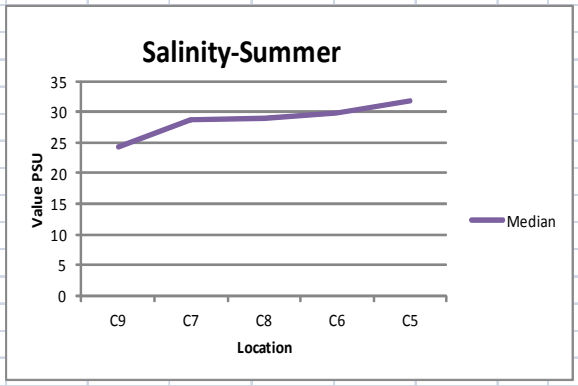
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
BOD -Summer	C9	C7	C8	C6	C5
5%ile	0.5	0.5	0.5	0.5	0.5
95%ile	1.0	1.2	1.1	1.4	1.1
Max	1.0	1.2	1.3	1.5	1.2
Median	0.5	1.0	0.8	1.0	1.0
Min	0.5	0.5	0.5	0.5	0.5
No.Samples	20	30	30	30	30
BOD -Winter	C9	C7	C8	C6	C5
5%ile	0.5	0.5	0.5	0.5	0.5
95%ile	2.3	2.3	1.5	0.6	1.1
Max	3.0	4.3	2.6	1.0	1.2
Median	0.5	0.5	0.5	0.5	0.5
Min	0.5	0.5	0.5	0.5	0.5
No.Samples	12	18	18	18	18
Ortho-Phosphate -Summer	C9	C7	C8	C6	C5
5%ile	5.0	5.0	5.0	5.0	3.6
95%ile	41.2	37.6	41.1	36.7	32.7
Max	44.0	40.0	60.0	220.0	75.0
Median	29.0	27.5	24.5	22.5	7.5
Min	5.0	5.0	5.0	5.0	2.5
No.Samples	20	30	30	30	30
Ortho-Phosphate-Winter	C9	C7	C8	C6	C5
5%ile	26.6	27.0	20.9	17.4	17.0
95%ile	146.1	119.8	62.1	42.4	35.2
Max	184.0	209.0	91.0	50.0	36.0
Median	33.5	30.0	31.0	31.0	22.5
Min	26.0	27.0	20.0	14.0	17.0
No.Samples	12	18	18	18	18
Salinity-Summer	C9	C7	C8	C6	C5
5%ile	1.075	4.315	11.11	19.77	23.1
95%ile	32.175	32.3	32.485	33.31	34.295
Max	32.4	32.5	32.7	33.4	35.3
Median	24.2	28.75	28.95	29.9	31.9
Min	1	3.5	10.3	11.7	17.3
No.Samples	16	24	24	24	24
Salinity -Winter	C9	C7	C8	C6	C5
5%ile	3.32	4.305	18.705	18.46	24.64
95%ile	37.78	32.5	32.79	33.345	33.93
Max	44.6	32.5	33.3	33.6	34.1
Median	17.7	29.5	29.75	28.35	31
Min	3.1	3.2	15.9	17.1	20.9
No.Samples	12	18	18	18	18

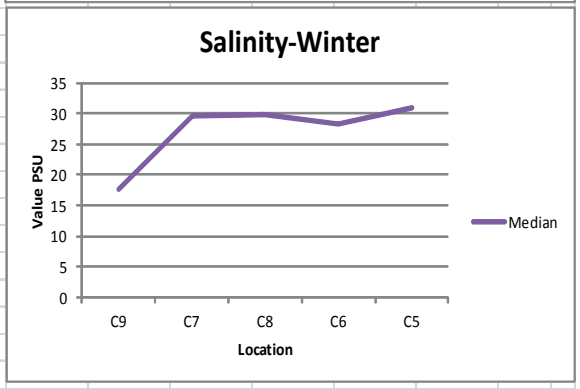




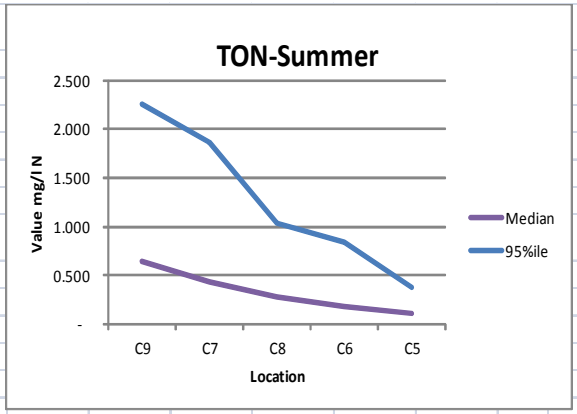


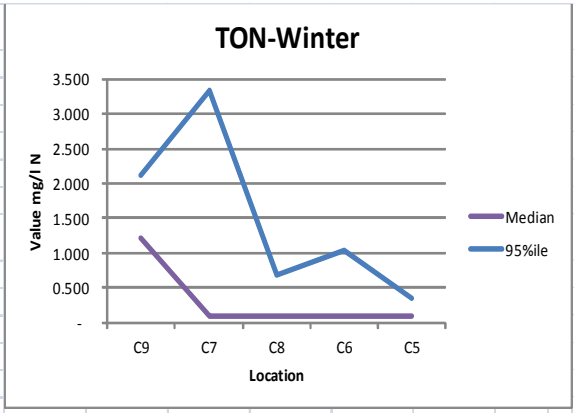


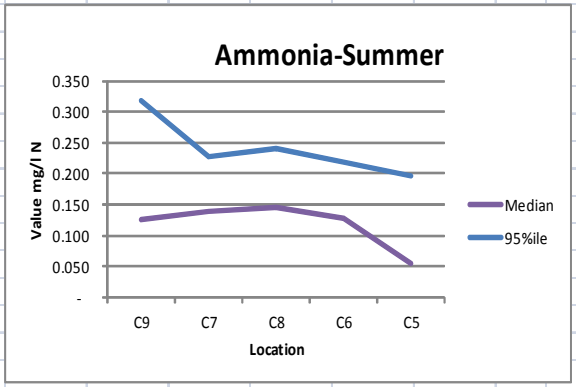


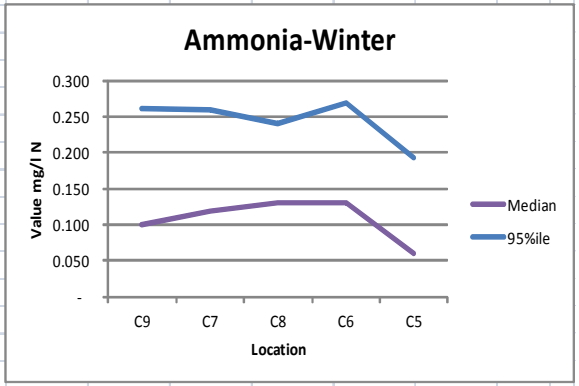


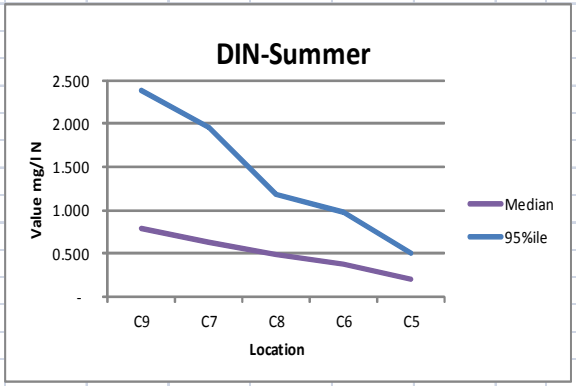
Total Oxidised Nitrogen - Summer	C9	C7	C8	C6	C5
5%ile	0.100	0.100	0.100	0.100	0.100
95%ile	2.261	1.869	1.033	0.843	0.372
Max	2.470	2.310	1.390	1.060	0.730
Median	0.639	0.436	0.281	0.186	0.110
Min	0.100	0.100	0.100	0.100	0.100
No.Samples	20	30	30	30	30
Total Oxidised Nitrogen - Winter	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	0.100	0.100	0.100	0.100	0.100
95%ile	2.114	3.327	0.687	1.046	0.342
Max	2.130	5.180	1.240	1.080	0.980
Median	1.215	0.100	0.100	0.100	0.100
Min	0.100	0.100	0.100	0.100	0.100
No.Samples	12	18	18	18	18
Ammonia -Summer	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	0.050	0.070	0.044	0.035	0.010
95%ile	0.319	0.228	0.242	0.218	0.196
Max	0.340	0.282	0.264	0.243	0.219
Median	0.126	0.140	0.145	0.128	0.055
Min	0.050	0.060	0.030	0.010	0.010
No.Samples	20	30	30	30	30
Ammonia -Winter	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	0.076	0.069	0.039	0.010	0.010
95%ile	0.262	0.260	0.240	0.269	0.193
Max	0.300	0.260	0.240	0.320	0.210
Median	0.100	0.120	0.130	0.130	0.060
Min	0.070	0.060	0.030	0.010	0.010
No.Samples	12	18	18	18	18
DIN-Summer	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	0.179	0.170	0.144	0.135	0.110
95%ile	2.381	1.957	1.179	0.977	0.509
Max	2.564	2.396	1.593	1.237	0.850
Median	0.793	0.629	0.485	0.369	0.205
Min	0.160	0.160	0.130	0.110	0.110
No.Samples	20	30	30	30	30
DIN-Winter	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	0.235	0.179	0.139	0.110	0.110
95%ile	2.204	3.430	0.841	1.183	0.529
Max	2.220	5.240	1.360	1.200	1.150
Median	**1.405**	**0.320**	**0.255**	**0.390**	**0.160**
Min	0.180	0.170	0.130	0.110	0.110
No.Samples	12	18	18	18	18
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline

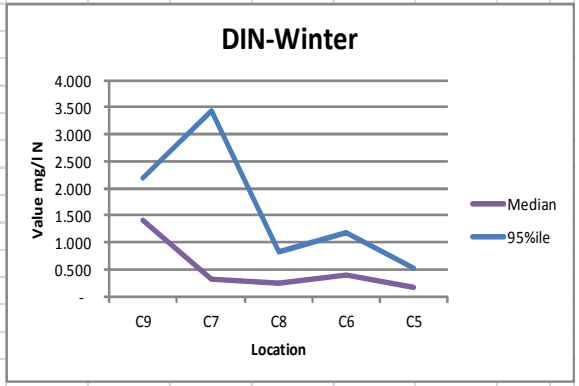








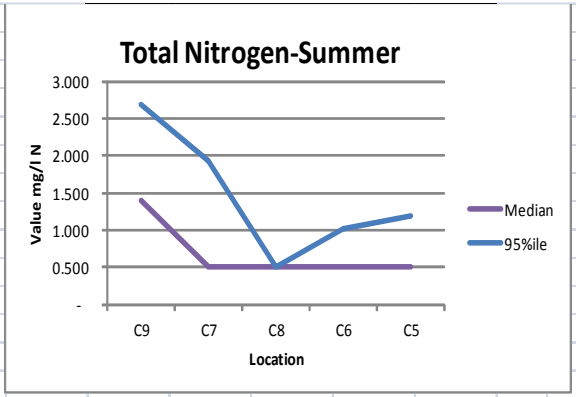




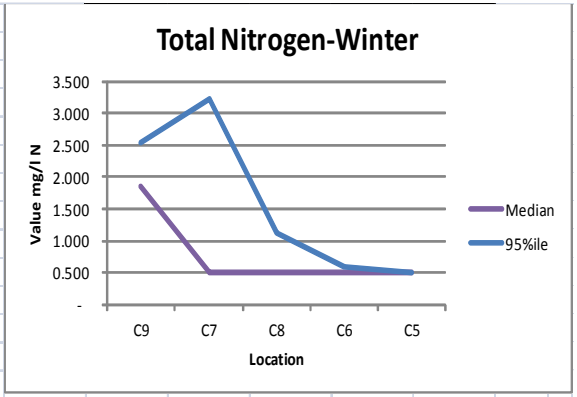
Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline

Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline

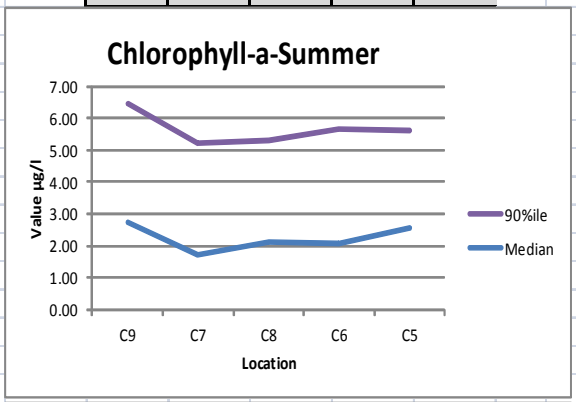
Total Nitrogen-Summer	C9	C7	C8	C6	C5
5%ile	0.500	0.500	0.500	0.500	0.500
95%ile	2.690	1.930	0.500	1.015	1.195
Max	2.800	2.100	0.500	1.100	2.300
Median	1.400	0.500	0.500	0.500	0.500
Min	0.500	0.500	0.500	0.500	0.500
No.Samples	12	18	18	18	18



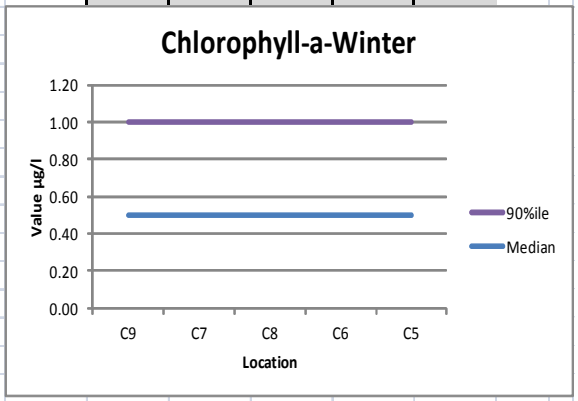
Total Nitrogen-Winter	C9	C7	C8	C6	C5
5%ile	0.500	0.500	0.500	0.500	0.500
95%ile	2.535	3.235	1.130	0.590	0.500
Max	2.700	5.700	1.300	1.100	0.500
Median	1.850	0.500	0.500	0.500	0.500
Min	0.500	0.500	0.500	0.500	0.500
No.Samples	12	18	18	18	18



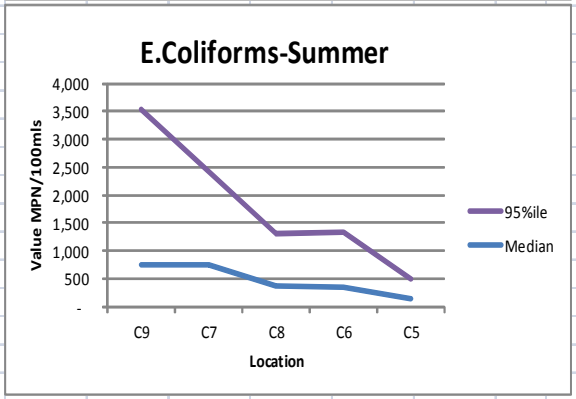
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
Chlorophyll-a _Summer	C9	C7	C8	C6	C5
5%ile	1.000	1.000	1.000	1.000	1.000
90%ile	6.45	5.20	5.32	5.65	5.63
Max	7.500	6.900	5.800	7.200	7.200
Median	2.750	1.700	2.100	2.055	2.550
Min	1.000	0.600	1.000	1.000	1.000
No.Samples	20	30	30	30	30



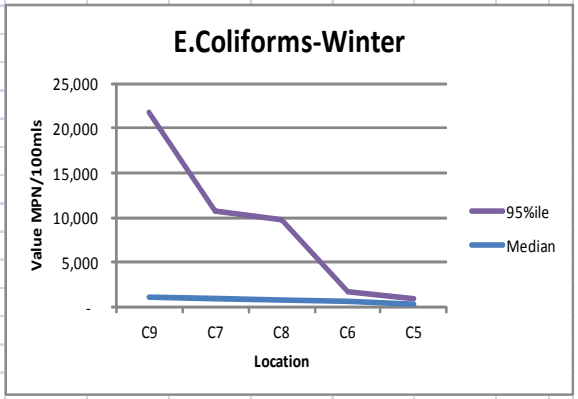
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
Chlorophyll-a -Winter	C9	C7	C8	C6	C5
5%ile	0.500	0.500	0.500	0.500	0.500
90%ile	1.00	1.00	1.00	1.00	1.00
Max	1.100	1.000	1.100	2.700	1.000
Median	0.500	0.500	0.500	0.500	0.500
Min	0.500	0.500	0.500	0.500	0.500
No.Samples	12	18	18	18	18



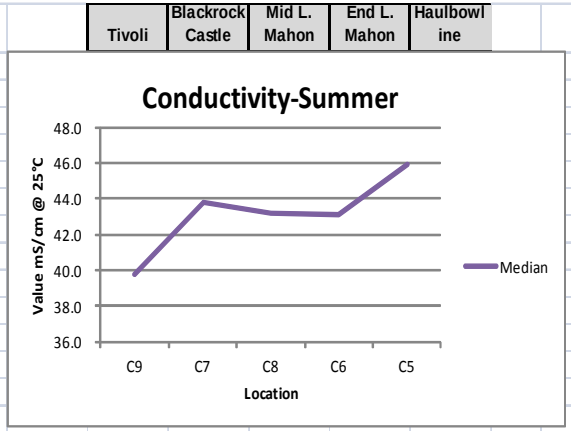
	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
E. Coliforms -Summer	C9	C7	C8	C6	C5
5%ile	69	98	70	32	12
95%ile	3,534	2,419	1,300	1,333	489
Max	5,172	2,420	1,722	1,722	1,259
Median	745	753	381	346	146
Min	19	1	43	23	6
No.Samples	20	30	30	30	30

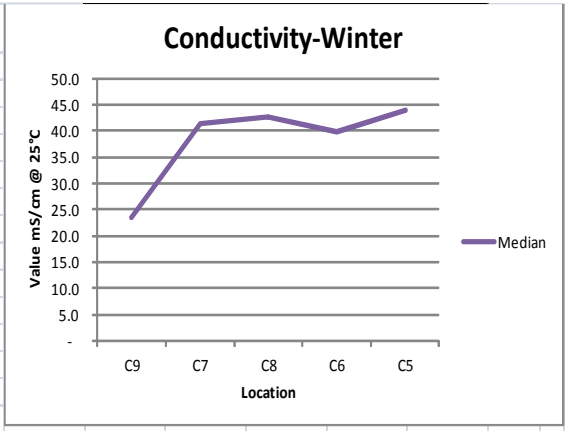


	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
E. Coliforms -Winter	C9	C7	C8	C6	C5
5%ile	543	449	525	116	116
95%ile	21,813	10,682	9,809	1,705	857
Max	24,196	24,196	24,196	1,904	1,106
Median	1,150	946	839	654	345
Min	537	226	404	84	86
No.Samples	12	18	18	18	18



	Tivoli	Blackrock Castle	Mid L. Mahon	End L. Mahon	Haulbowline
Conductivity-Summer	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	2.2	8.0	18.6	32.2	36.9
95%ile	51.2	51.2	53.5	54.6	57.1
Max	51.4	52.1	55.3	56.5	58.4
Median	39.8	43.8	43.2	43.1	45.9
Min	2.1	5.9	15.6	17.5	25.5
No.Samples	20	30	30	30	30
Conductivity-Winter	**C9**	**C7**	**C8**	**C6**	**C5**
5%ile	5.6	7.0	27.3	27.1	35.3
95%ile	43.3	45.1	45.4	46.2	46.8
Max	44.6	45.1	46.0	46.5	47.1
Median	23.5	41.5	42.6	39.9	43.9
Min	5.3	5.4	23.6	25.1	30.3
No.Samples	12	18	18	18	18





Summary 2012 Trophic Status

Table 9, S.I. 272 of 2009

And

Comparison, Years 2012 to 2008

				Lower Estuary C9 Tivoli 2012					Lower Estuary C7 Blackrock Castle 2012					Lough Mahon C8 Mid Mahon 2012					Lough Mahon C6 End Lough Mahon 2012					Cork Harbour C5 Haulbowline 2012				
		Salinity		17.70		24.20			29.50		28.75			29.75		28.95			28.35		29.90			31.00		31.90		
		0 PSU	35 PSU	PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU	
Category	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value	
A	Winter DIN - Median	2.6	0	1.355	1.41			FAIL	0.601	0.32			PASS	0.585	0.26			PASS	0.675	0.39			PASS	0.506	0.16			PASS
	Winter MRP - Median	60	40	59.30	33.5			PASS	46.50	30.0			PASS	46.25	31.0			PASS	47.65	31.0			PASS	44.00	22.5			PASS
	Summer DIN - Median	2.6	0			0.940	0.79	PASS			0.649	0.629	PASS			0.633	0.49	PASS			0.575	0.37	PASS			0.448	0.205	PASS
	Summer MRP - Median	60	40			51.80	29.0	PASS			47.25	27.5	PASS			47.05	24.5	PASS			46.10	22.5	PASS			43.10	7.5	PASS
B	Chloro-Median*	15	10			13.04	2.75	PASS +			11.85	1.70	PASS +			11.71	2.10	PASS +			11.44	2.06	PASS +			10.83	2.55	PASS +
	Chloro-90 Percentile*	30	20			26.00	6.45	PASS +			23.45	5.20	PASS +			23.33	5.32	PASS +			22.85	5.65	PASS +			22.26	5.63	PASS +
	Opportunistic Algae																											
C	DO %Sat - 5 Percentile	70	80			74.00	91.60	PASS			76.75	94.80	PASS			76.95	97.60	PASS			77.00	99.40	PASS			78.00	105.30	PASS
	DO %Sat - 95 Percentile	130	120			126.00	115.70	PASS			123.25	116.00	PASS			123.05	115.50	PASS			123.00	119.40	PASS			122.00	119.60	PASS
	BOD 95%ile	4			2.3		1.0	PASS		2.3		1.2	PASS		1.5		1.1	PASS		0.6		1.4	PASS		1.1		1.1	PASS
						Intermediate					Unpolluted /Good					Unpolluted /Good					Unpolluted /Good					Unpolluted /Good		

				Lower Estuary C9 Tivoli 2011					Lower Estuary C7 Blackrock Castle 2011					Lough Mahon C8 Mid Mahon 2011					Lough Mahon C6 End Lough Mahon 2011					Cork Harbour C5 Haulbowline 2011				
		Salinity		24.75		31.05			27.50		33.30			30.55		33.95			30.95		34.30			31.45		36.25		
		0 PSU	35 PSU	PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU	
Category	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value	
A	Winter DIN - Median	2.6	0	0.909	1.93			FAIL	0.729	1.50			FAIL	0.534	1.30			FAIL	0.509	1.15			FAIL	0.477	0.88			FAIL
	Winter MRP - Median	60	40	51.25	39.0			PASS	48.50	40.5			PASS	44.90	44.0			PASS	44.00	40.5			PASS	43.55	34.5			PASS
	Summer DIN - Median	2.6	0			0.503	0.86	FAIL			0.359	0.594	FAIL			0.317	0.33	FAIL?			0.276	0.35	FAIL			0.250	0.185	PASS
	Summer MRP - Median	60	40			43.95	17	PASS			41.70	14	PASS			41.00	14	PASS			40.70	12	PASS			40.00	7	PASS
B	Chloro-Median	15	10			11.10	7.60	PASS			10.50	7.30	PASS			10.30	8.40	PASS			10.20	8.60	PASS			10.00	6.60	PASS
	Chloro-90 Percentile	30	20			22.20	11.06	PASS			20.94	19.12	PASS			20.60	15.20	PASS			20.40	14.60	PASS			20.00	11.74	PASS
	Opportunistic Algae																											
C	DO %Sat - 5 Percentile	70	80			78.00	57.41	FAIL			79.00	68.90	FAIL			79.00	91.72	PASS			79.30	92.39	PASS			80.00	92.19	PASS
	DO %Sat - 95 Percentile	130	120			122.00	105.03	PASS			121.00	114.18	PASS			121.00	119.44	PASS			120.70	121.47	FAIL			120.00	123.24	FAIL
	BOD 95%ile	4			2.0		3.0	PASS		2.0		9.0	FAIL		2.0		3.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS
						Intermediate					Intermediate					Intermediate					Intermediate					Intermediate		

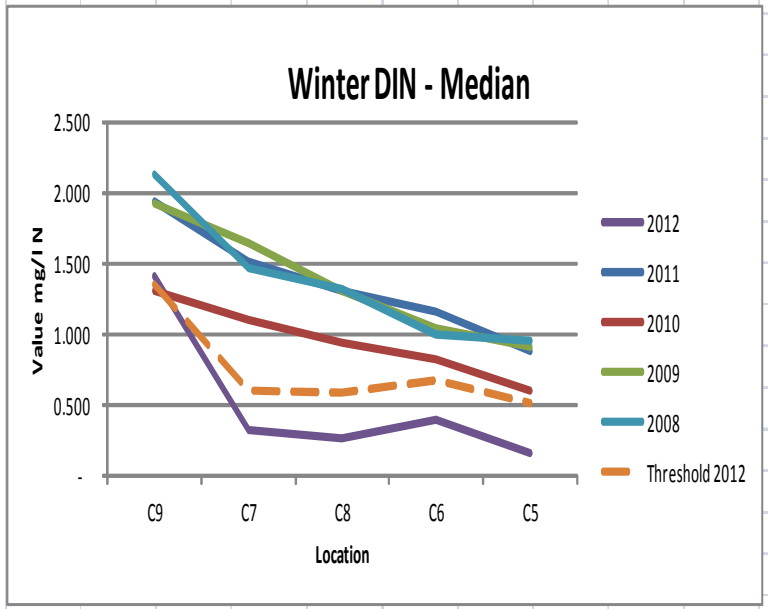
Note:

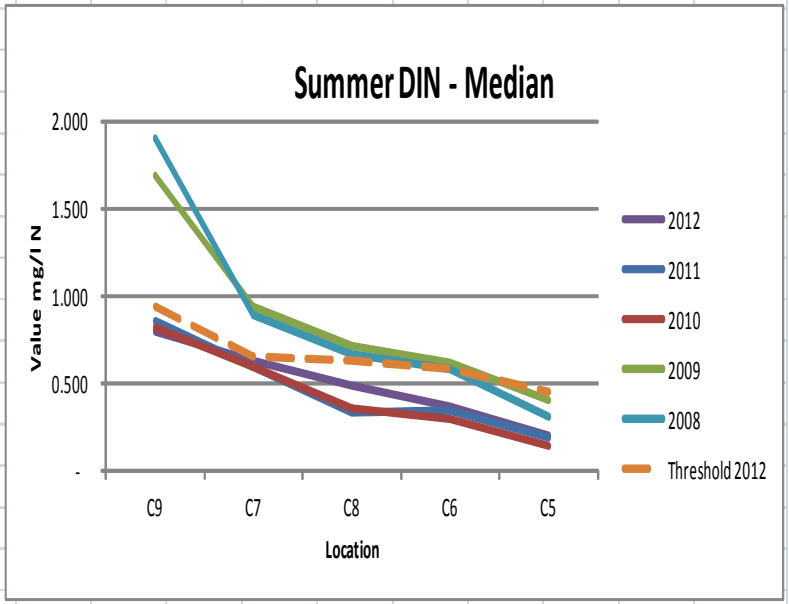
Ref SI 272 of 2009	G/M Threshold	G/M Threshold		
Chloro-Median*	5	10	PASS +	indicates satisfies this standard also
Chloro-90 Percentile*	10	20	PASS +	indicates satisfies this standard also

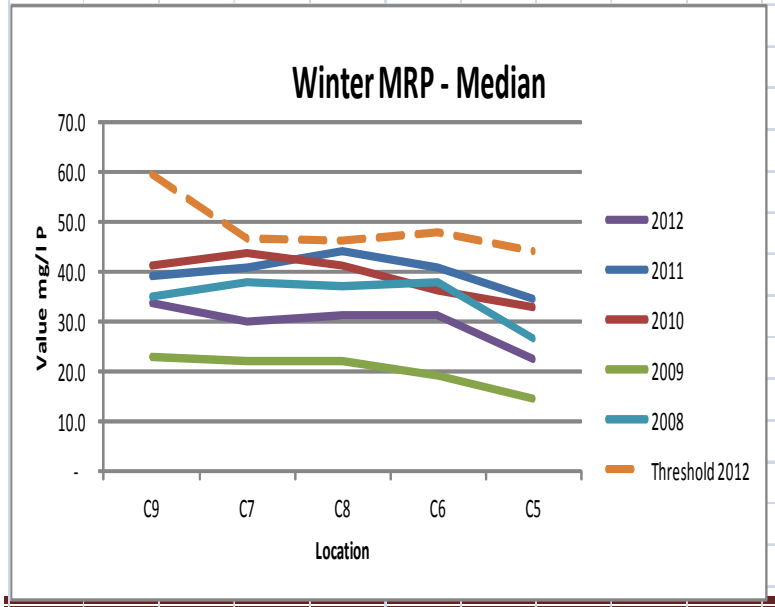
				Lower Estuary C9 Tivoli 2010					Lower Estuary C7 Blackrock Castle 2010					Lough Mahon C8 Mid Mahon 2010					Lough Mahon C6 End Lough Mahon 2010					Cork Harbour C5 Haulbowline 2010				
		Salinity		28.75		29.20			31.00		31.05			32.20		33.10			32.35		33.65			33.85		34.90		
		0 PSU	35 PSU	PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU	
Category	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value	
A	Winter DIN - Median	2.6	0	0.649	1.31			FAIL	0.506	1.11			FAIL	0.429	0.93			FAIL	0.42	0.82			FAIL	0.324	0.60			FAIL
	Winter MRP - Median	60	40	47.25	41.0			PASS	44.00	43.5			PASS	42.80	41.0			PASS	42.65	36.0			PASS	41.15	33.0			PASS
	Summer DIN - Median	2.6	0			0.62	0.81	FAIL			0.503	0.591	FAIL			0.372	0.36	PASS			0.336	0.29	PASS			0.250	0.143	PASS
	Summer MRP - Median	60	40			46.80	29	PASS			44.00	20	PASS			41.90	21	PASS			41.35	19	PASS			40.10	12	PASS
B	Chloro-Median	15	10			11.64	11.80	FAIL ?			11.05	12.05	FAIL			10.57	10.90	FAIL?			10.40	9.80	PASS			10.10	6.65	PASS
	Chloro-90 Percentile	30	20			23.20	23.56	FAIL ?			22.10	20.60	PASS			21.05	24.20	FAIL			20.76	12.90	PASS			20.10	12.34	PASS
	Opportunistic Algae																											
C	DO %Sat - 5 Percentile	70	80			77.00	74.67	FAIL			78.00	83.75	PASS			79.00	80.39	PASS			79.00	57.76	FAIL			79.90	80.56	PASS
	DO %Sat - 95 Percentile	130	120			123.00	132.68	FAIL			122.00	136.63	FAIL			121.00	136.36	FAIL			121.00	138.91	FAIL			120.10	134.96	FAIL
	BOD 95%ile	4			2.0		3.9	PASS		2.0		8.0	FAIL		2.0		2.5	PASS		2.0		2.0	PASS		2.0		2.0	PASS
						Potentially Eutrophic					Potentially Eutrophic					Potentially Eutrophic					Intermediate					Intermediate		

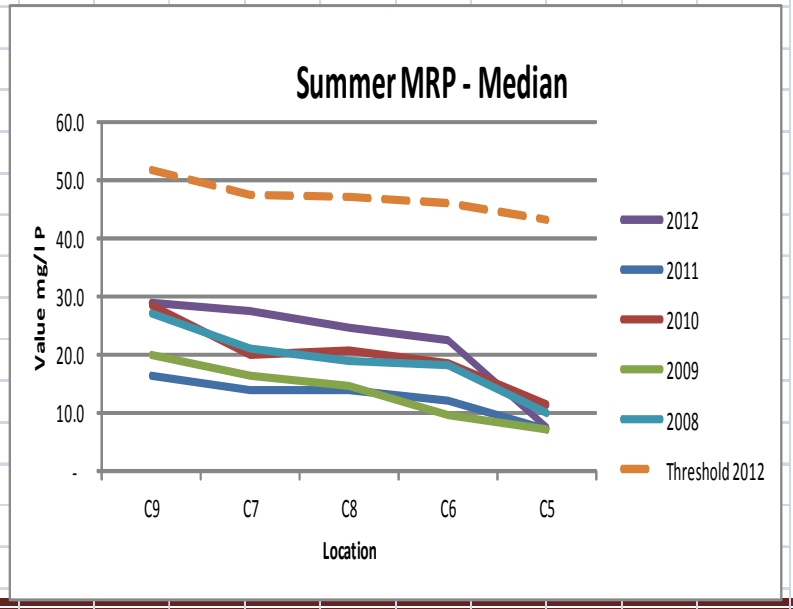
				2009					2009					2009					2009					2009				
		Salinity		19.65		30.70			27.75		31.30			29.45		32.60			30.15		32.85			31.05		35.25		
		0 PSU	35 PSU	PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU	
Category	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value	
A	Winter DIN - Median	2.6	0	1.229	1.93			FAIL	0.713	1.65			FAIL	0.604	1.31			FAIL	0.56	1.04			FAIL	0.503	0.90			FAIL
	Winter MRP - Median	60	40	48.77	23.0			PASS	48.25	22.0			PASS	46.55	22.0			PASS	45.70	19.0			PASS	44.00	14.5			PASS
	Summer DIN - Median	2.6	0			0.53	1.68	FAIL			0.487	0.941	FAIL			0.404	0.71	FAIL			0.388	0.62	FAIL			0.250	0.402	FAIL
	Summer MRP - Median	60	40			44.60	20	PASS			43.70	17	PASS			42.40	15	PASS			42.15	10	PASS			40.00	7	PASS
B	Chloro-Median	15	10			11.20	2.20	PASS			11.00	2.85	PASS			10.68	2.90	PASS			10.63	3.20	PASS			10.00	2.80	PASS
	Chloro-90 Percentile	30	20			22.38	5.67	PASS			22.00	5.90	PASS			21.40	4.90	PASS			21.20	5.40	PASS			20.00	5.25	PASS
	Opportunistic Algae																											
C	DO %Sat - 5 Percentile	70	80			77.70	26.06	FAIL			78.00	53.82	FAIL			78.60	89.21	PASS			78.85	93.46	PASS			80.00	93.99	PASS
	DO %Sat - 95 Percentile	130	120			122.30	105.38	PASS			122.00	106.63	PASS			121.40	122.78	FAIL			121.15	129.32	FAIL			120.00	120.95	FAIL
	BOD 95%ile	4			2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS
						Intermediate					Intermediate					Intermediate					Intermediate					Intermediate		

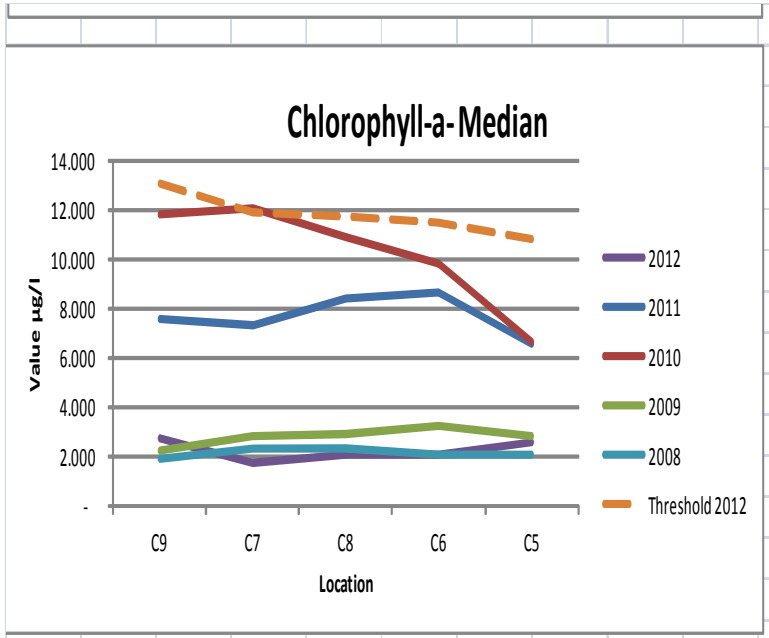
				2008					2008					2008					2008					2008				
		Salinity		8.90		24.60			27.60		27.50			29.40		29.30			28.60		29.80			28.65		31.85		
		0 PSU	35 PSU	PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU		PSU	PSU	PSU	PSU	
Category	TSAS Criteria	G/M Threshold	G/M Threshold	Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value		Winter Threshold	Value	Summer Threshold	Value	
A	Winter DIN - Median	2.6	0	1.99	2.13			FAIL	0.723	1.47			FAIL	0.607	1.32			FAIL	0.659	1.00			FAIL	0.655	0.95			FAIL
	Winter MRP - Median	60	40	60.00	35.0			PASS	48.40	38.0			PASS	46.60	37.0			PASS	47.40	38.0			PASS	47.35	26.5			PASS
	Summer DIN - Median	2.6	0			0.921	1.90	FAIL			0.729	0.895	FAIL			0.614	0.66	FAIL			0.582	0.583	PASS?			0.452	0.304	PASS
	Summer MRP - Median	60	40			51.40	27	PASS			48.50	21	PASS			46.70	19	PASS			46.20	18	PASS			43.15	10	PASS
B	Chloro-Median	15	10			12.95	1.90	PASS			11.05	2.35	PASS			11.60	2.30	PASS			11.46	2.10	PASS			10.85	2.10	PASS
	Chloro-90 Percentile	30	20			25.70	10.06	PASS			24.15	12.00	PASS			23.15	10.40	PASS			22.92	8.68	PASS			21.80	8.16	PASS
	Opportunistic Algae																											
C	DO %Sat - 5 Percentile	70	80			74.00	55.65	FAIL			76.00	72.38	FAIL			77.00	75.22	FAIL			77.00	65.91	FAIL			78.00	78.51	FAIL
	DO %Sat - 95 Percentile	130	120			126.00	106.68	PASS			124.00	112.20	PASS			123.00	120.33	PASS			123.00	115.67	PASS			122.00	114.26	PASS
	BOD 95%ile	4			2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS		2.0		2.0	PASS
						Intermediate					Intermediate					Intermediate					Intermediate					Intermediate		

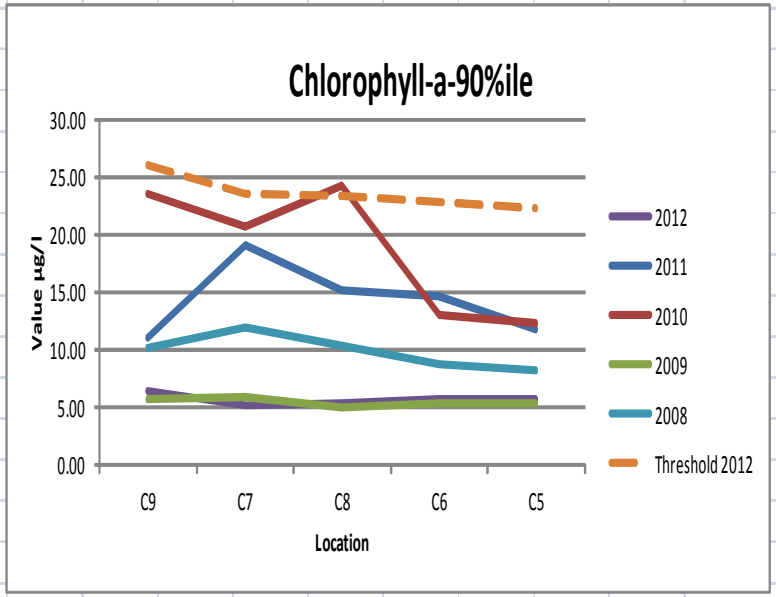

Winter DIN - Median
Value mg/l N
2.500
2.000
1.500
1.000
0.500
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

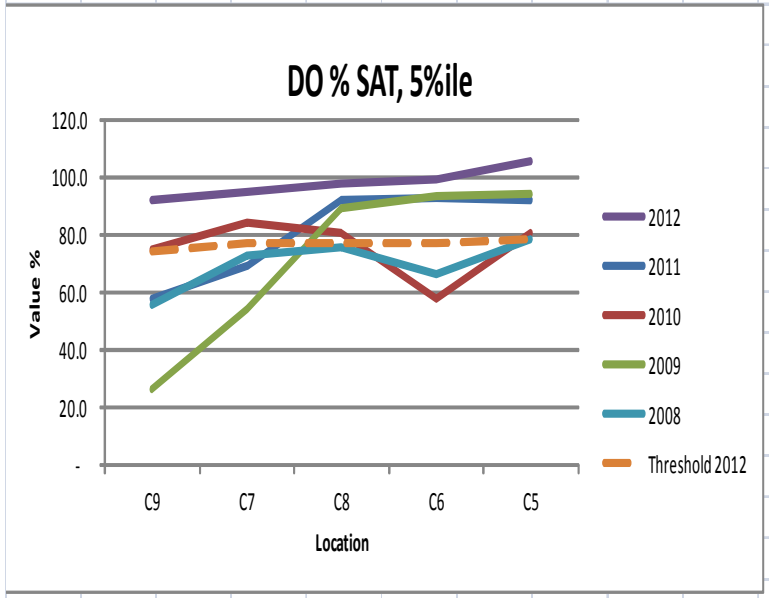

Summer DIN - Median
Value mg/l N
2.000
1.500
1.000
0.500
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

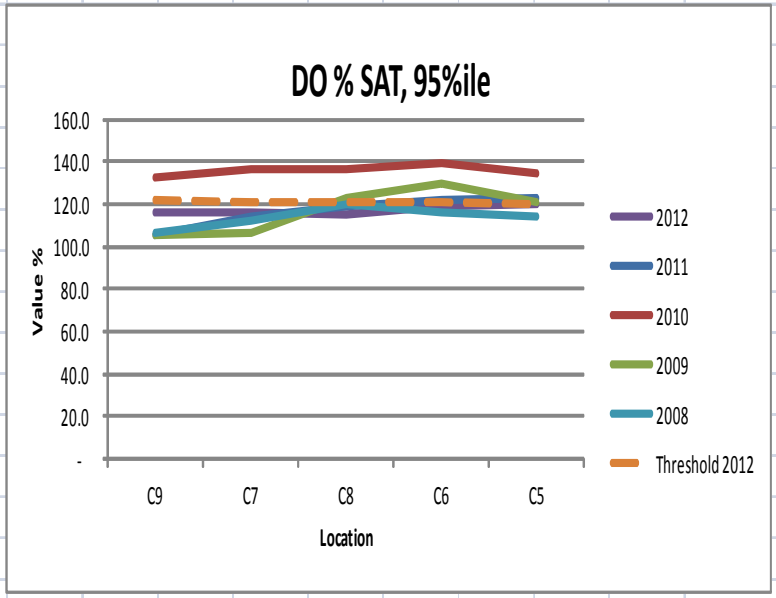

Winter MRP - Median
Value mg/l P
70.0
60.0
50.0
40.0
30.0
20.0
10.0
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

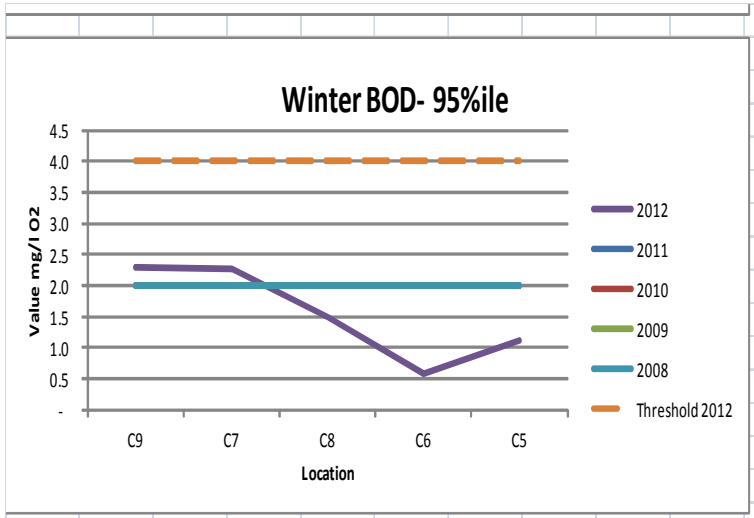

Summer MRP - Median
Value mg/l P
60.0
50.0
40.0
30.0
20.0
10.0
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

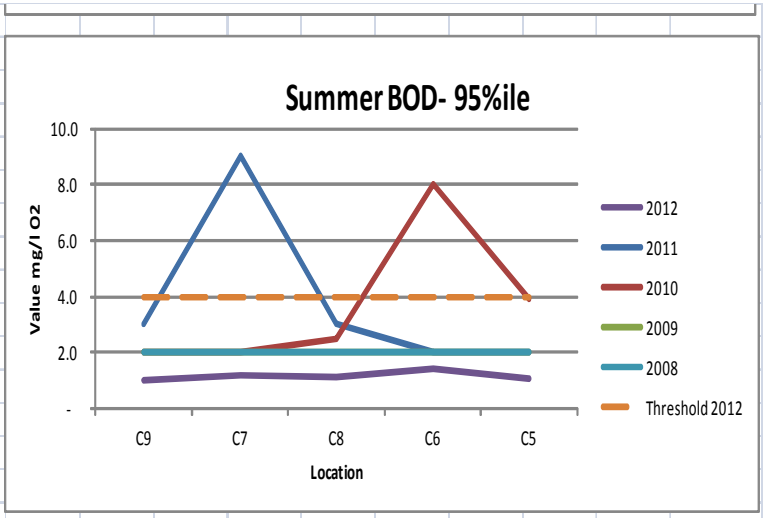

Chlorophyll-a-Median
14.000
12.000
10.000
8.000
6.000
4.000
2.000
-
Value µg/l
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012


Chlorophyll-a-90%ile
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Value µg/l
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012


DO % SAT, 5%ile
120.0
100.0
80.0
60.0
40.0
20.0
-
Value %
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

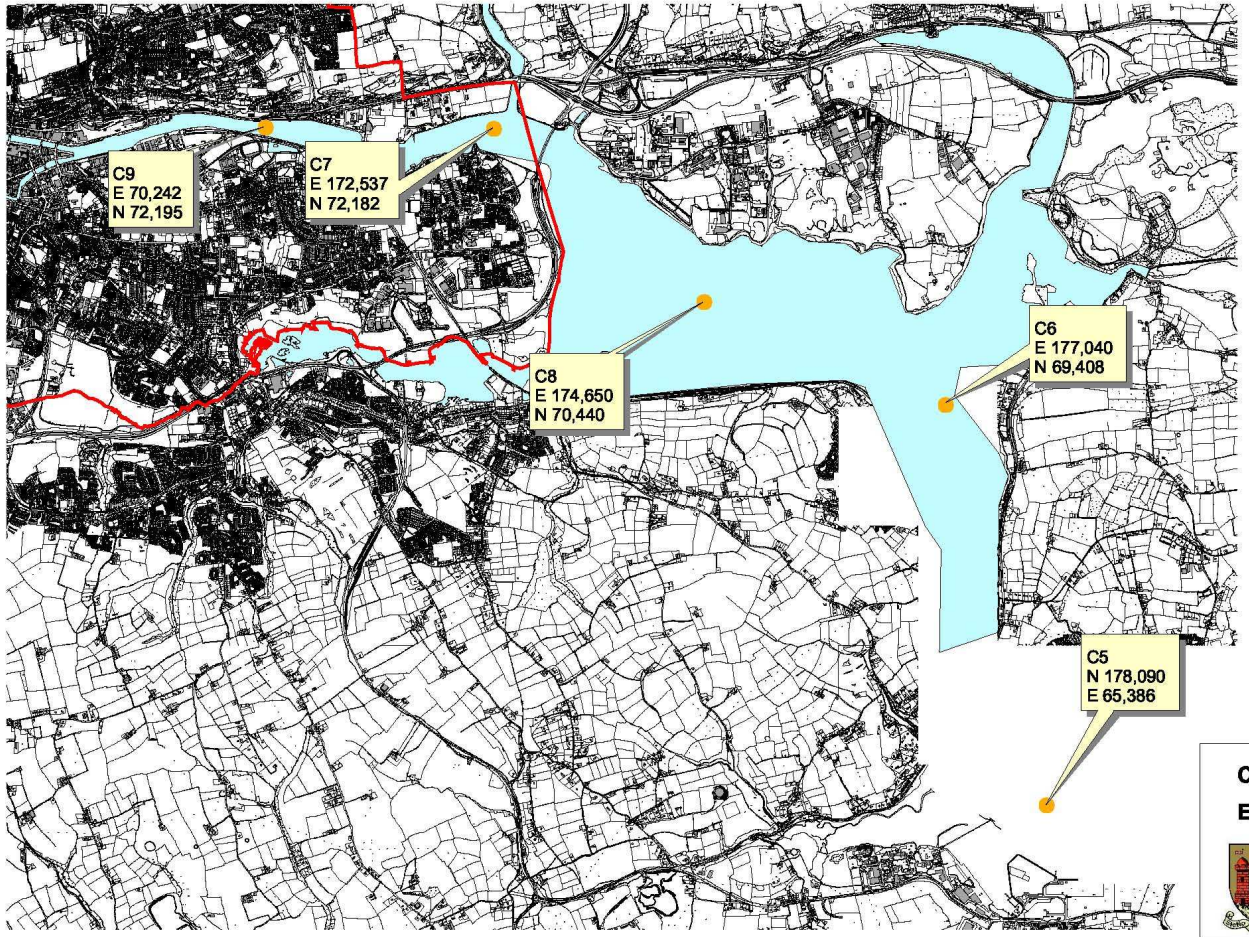

DO % SAT, 95%ile
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
-
Value %
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012


Winter BOD- 95%ile
Value mg/l O2
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012


Summer BOD- 95%ile
Value mg/l O2
10.0
8.0
6.0
4.0
2.0
-
C9
C7
C8
C6
C5
Location
2012
2011
2010
2009
2008
Threshold 2012

Note: Error: C9 should be E 170,242 - N 72,195

E.P.A. Waste Water Licence Application
E3 Monitoring & Sampling Points



CORK CITY COUNCIL
ENVIRONMENT DIRECTORATE

Water Services
Drainage Section

shp file ref: m/Dir/Env/Drain/GisData

Date :- 24-11-2008	Prepared by : B.O'F.	Drg. No. WWLA-059

2.6. Data Collection and Reporting Requirements under the Urban Waste Water Treatment Directive

The Electronic submission of the UWWT Data returns, in XML format, was uploaded to the EPA EDEN system.

Influent waste water was tested for BOD, COD, Suspended Solids, Total Nitrogen and Total Phosphorus and results were uploaded on 21st February 2013.

Effluent waste water was tested for pH, cBOD, COD, Suspended Solids, Total Nitrogen, Total Oxidized Nitrogen (as N), Ammonia, (Total as N), Total Phosphorus (as P), Orthophosphate (as P), and Visual Inspection, and results were uploaded on 28th January 2013.

Ambient monitoring results for **freshwater** were uploaded on 21st February 2013. River Samples were tested for pH, DO, cBOD, Temperature, Total Oxidized Nitrogen (as N), Total Nitrogen, and Ammonia, (Total as N). Testing for Total Phosphorus (as P) was carried out by the laboratory as an alternative to Orthophosphate (as P). 15 stations were monitored but due to GIS technical difficulties on EDEN, results from 14 stations only were accepted on the system.

Ambient Monitoring results for **Transitional and Coastal** waters were uploaded on 1st May 2013 when the EDEN site became operative for this type of data.

UWWT Data returns information for the agglomeration, treatment plant and summary data on sludge treatment was entered on the EPA, Urban Waste Water site on 21st February 2013. Also returned on this system were data on complaints, odour & noise.

There were a number of minor corrections notified and carried out on data / EDEN submissions post initial submission and approval.

2.7. Pollutant Release and Transfer Register (PRTR)-Report for 2012

The PRTR Report for 2012 was submitted to the EPA on 21st February 2013

A Copy of the 2012 PRTR report is included in the Section following.

| PRTR# : D0033 | Facility Name : Cork City Waste Water Treatment Plant | Filename : D0033_2012.xls | Return Year : 2012 |

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.15

REFERENCE YEAR	2012

1. FACILITY IDENTIFICATION

Parent Company Name	Cork City Council
Facility Name	Cork City Waste Water Treatment Plant
PRTR Identification Number	D0033
Licence Number	D0033-01

Waste or IPPC Classes of Activity

No.	class_name
30.4	General

Address 1	Carrigrenan
Address 2	Little Island
Address 3	Co. Cork
Address 4	
	Cork
Country	Ireland
Coordinates of Location	-8.33527 51.8878
River Basin District	IESW
NACE Code	3700
Main Economic Activity	Sewerage
AER Returns Contact Name	ANNE HENNESSY
AER Returns Contact Email Address	anne_hennessy@corkcity.ie
AER Returns Contact Position	Senior Executive Engineer
AER Returns Contact Telephone Number	+353 21 4924256
AER Returns Contact Mobile Phone Number	+353 86 2772648
AER Returns Contact Fax Number	+353 21 4924006
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	21
User Feedback/Comments	Directly employed number is 20,plus 1 to 2 contract workers over year, 44208 total manhours worked in 12 months
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5(f)	Urban waste-water treatment plants

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

Guidance on waste imported/accepted onto site

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : D0033 | Facility Name : Cork City Waste Water Treatment Plant | Filename : D0033_2012.xls | Return Year : 2012 | 21/02/2013 12:07

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	3.0	0.0	3.0
02	Carbon monoxide (CO)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1885.0	2374.0	0.0	489.0
03	Carbon dioxide (CO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	555416.0	7113284.0	0.0	6557868.0
05	Nitrous oxide (N2O)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	36.0	0.0	36.0
07	Non-methane volatile organic compounds (NMVOC)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	154.0	0.0	154.0
08	Nitrogen oxides (NOx/NO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	5764.0	7259.0	0.0	1495.0
11	Sulphur oxides (SOx/SO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	146.0	0.0	146.0
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Cork City Waste Water Treatment Plant

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	0.0				N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

4.2 RELEASES TO WATERS Link to previous years emissions data | PRTR# : D0033 | Facility Name : Cork City Waste Water Treatment Plant | Filename : D0033_2012.xls | Return Year : 2012 | 31/01/2013 16:16

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
34	1,2-dichloroethane (EDC)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
25	Alachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
26	Aldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
61	Anthracene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.114	0.117	0.0	0.003
17	Arsenic and compounds (as As)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	91.257	93.314	0.0	2.057
27	Atrazine	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.43	0.448	0.0	0.018
62	Benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.692	0.945	0.0	0.253
91	Benzo(g,h,i)perylene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.085	0.0	0.003
63	Brominated diphenylethers (PBDE)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
18	Cadmium and compounds (as Cd)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.127	2.546	0.0	0.419
28	Chlordane	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
29	Chlordecone	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
30	Chlorfenvinphos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
79	Chlorides (as Cl)	M	OTH	SCA Method	48804603.011	49472359.992	0.0	667756.981
31	Chloro-alkanes, C10-C13	E	ESTIMATE	EPA UWWTP Tool Version 5.0	8.646	8.966	0.0	0.32
32	Chlorpyrifos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.003	0.003	0.0	0.0
19	Chromium and compounds (as Cr)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	12.694	12.846	0.0	0.152
20	Copper and compounds (as Cu)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	502.941	511.551	0.0	8.61
82	Cyanides (as total CN)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	120.698	124.965	0.0	4.267
33	DDT	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
70	Di-(2-ethyl hexyl) phthalate (DEHP)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	37.763	42.274	0.0	4.511
35	Dichloromethane (DCM)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.871	2.054	0.0	0.183
36	Dieldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
37	Diuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.085	1.085	0.0	0.0
38	Endosulphan	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
39	Endrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
65	Ethyl benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.683	0.857	0.0	0.174
88	Fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.096	0.115	0.0	0.019

83	Fluorides (as total F)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	22642.62	23145.52	0.0	502.9
40	Halogenated organic compounds (as AOX)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	98.263	101.9	0.0	3.637
41	Heptachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
90	Hexabromobiphenyl	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
42	Hexachlorobenzene (HCB)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
43	Hexachlorobutadiene (HCBD)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
89	Isodrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
67	Isoproturon	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.309	0.332	0.0	0.023
23	Lead and compounds (as Pb)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	125.127	141.586	0.0	16.459
45	Lindane	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.021	0.0	0.002
21	Mercury and compounds (as Hg)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.152	0.0	0.152
46	Mirex	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
68	Naphthalene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.165	0.385	0.0	0.22
22	Nickel and compounds (as Ni)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	175.278	180.764	0.0	5.486
64	Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.415	5.074	0.0	1.659
87	Octylphenols and Octylphenol ethoxylates	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
69	Organotin compounds (as total Sn)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
48	Pentachlorobenzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
49	Pentachlorophenol (PCP)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
71	Phenols (as total C)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	37.454	160.689	0.0	123.235
50	Polychlorinated biphenyls (PCBs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
72	Polycyclic aromatic hydrocarbons (PAHs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.51	0.838	0.0	0.328
51	Simazine	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.58	0.601	0.0	0.021
52	Tetrachloroethylene (PER)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.433	2.433	0.0	0.0
53	Tetrachloromethane (TCM)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
73	Toluene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	20.306	41.524	0.0	21.218
12	Total nitrogen	M	OTH	SCA Method	955847.911	997779.12	0.0	41931.209
76	Total organic carbon (TOC) (as total C or COD/3)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	379563.292	399529.954	0.0	19966.662
13	Total phosphorus	M	OTH	SCA Method	86988.829	91944.682	0.0	4955.853
59	Toxaphene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
74	Tributyltin and compounds	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
54	Trichlorobenzenes (TCBs)(all isomers)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0

57	Trichloroethylene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
77	Trifluralin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
75	Triphenyltin and compounds	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
60	Vinyl chloride	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
78	Xylenes	E	ESTIMATE	EPA UWWTP Tool Version 5.0	4.772	7.192	0.0	2.42
24	Zinc and compounds (as Zn)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2032.222	2217.99	0.0	185.768

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
370	Selenium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	195.55	196.566	0.0	1.016
205	Antimony (as Sb)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	6.362	7.093	0.0	0.731
368	Molybdenum	E	ESTIMATE	EPA UWWTP Tool Version 5.0	62.439	64.573	0.0	2.134
358	Tin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	124.534	124.534	0.0	0.0
373	Barium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	945.844	1000.147	0.0	54.303
374	Boron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	12082.925	12578.713	0.0	495.788
356	Cobalt	E	ESTIMATE	EPA UWWTP Tool Version 5.0	7.236	7.724	0.0	0.488
386	Vanadium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	112.277	120.201	0.0	7.924
388	Dichlobenil	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.177	0.181	0.0	0.004
383	Linuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
385	Mecoprop Total	E	ESTIMATE	EPA UWWTP Tool Version 5.0	4.407	4.588	0.0	0.181
380	2,4 Dichlorophenol (2,4 D)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.101	2.155	0.0	0.054
384	MCPA	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.649	3.664	0.0	0.015
382	Glyphosate	E	ESTIMATE	EPA UWWTP Tool Version 5.0	63.1	63.7	0.0	0.6
389	Benzo[a]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.085	0.0	0.003
390	Benzo[b]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.085	0.0	0.003
391	Benzo[k]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.085	0.0	0.003

392	Indeno[1,2,3-c,d]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.091	0.094	0.0	0.003
393	Carbon tetrachloride	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
394	2,6-Dichlorobenzamide	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.312	3.403	0.0	0.091
395	Dicofol	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
396	Hexabromocyclodecane (HBCD)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
397	PFOS	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.02	0.02	0.0	0.0
238	Ammonia (as N)	M	OTH	SCA Method	618765.169	641669.987	0.0	22904.818
303	BOD	M	OTH	SCA Method	411189.979	479767.279	0.0	68577.3
306	COD	M	OTH	SCA Method	2744038.534	2913994.419	0.0	169955.885
362	Kjeldahl Nitrogen	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
327	Nitrate (as N)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
372	Nitrite (as N)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
332	Ortho-phosphate (as PO4)	M	OTH	SCA Method	214940.216	222896.707	0.0	7956.491
240	Suspended Solids	M	OTH	SCA Method	679607.947	733976.03	0.0	54368.083
379	**Total Oxidised Nitrogen (TON)**	M	OTH	SCA Method	215916.1	223908.7	0.0	7992.6

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.4 RELEASES TO LAND

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	13 01 11	Yes	4.274	synthetic hydraulic oils	R9	M	Volume Calculation	Offsite in Ireland	Enva Ireland Ltd,W0145-02	Unit 9 Raffeen Industrial Estate,Raffeen,Monkstown,County Cork,Ireland	Enva Ireland Ltd,W0145-02,Unit 9 Raffeen Industrial estate,Raffeen,Monkstown,County Cork,Ireland	Unit 9 Raffeen Industrial estate,Raffeen,Monkstown,County Cork,ireland
Within the Country	19 08 01	No	1.88	screenings	D5	M	Weighed	Offsite in Ireland	Greenstar Munster,W013602	Sarsfield Court Industrial Estate,Glanmire,.,County Cork,Ireland		
Within the Country	19 08 02	No	8.26	waste from desanding	D5	M	Weighed	Offsite in Ireland	Greenstar Munster,W013602	Sarsfield Court Industrial Estate,Glanmire,.,County Cork,Ireland		
Within the Country	19 08 05	No	201.4	sludges from treatment of urban waste water	R10	M	Weighed	Offsite in Ireland	Ormonde Organics,W023701	Killowen,Portlaw,.,County Waterford,Ireland		
Within the Country	19 08 05	No	2734.8	sludges from treatment of urban waste water	R10	M	Weighed	Onsite of generati	Quinns of Baltinglass,.	Main Street,.,Baltinglass,County Wicklow,Ireland		
Within the Country	20 01 01	No	5.299	paper and cardboard	R3	M	Weighed	Offsite in Ireland	Greenstar Munster,W013602	Sarsfield Court Industrial Estate,Glanmire,.,County Cork,Ireland		
Within the Country	20 03 01	No	44.52	mixed municipal waste	D5	M	Weighed	Offsite in Ireland	Greenstar Munster,W013602	Sarsfield Court Industrial Estate,Glanmire,.,County Cork,Ireland		
Within the Country	19 08 05	No	7632.0	sludges from treatment of urban waste water	R10	M	Weighed	Offsite in Ireland	Dairygold Food Ingredients Ltd,P0404-02	Castle Farm,Mitchelstown,.,County Cork,Ireland		

* Select a row by double-clicking the Description of Waste then click the delete button

Air Emission - Inputs

CELL COLOUR KEY	
	INPUT - type in your facility value in cell
	OUTPUT - automatically generated cell value

RELEASES TO AIR

Air: Emissions from WWTP Works

Data Entry Table: Characteristics of the WWTP

For use where no data from on-site monitoring of air emissions from the plant are available.
Nitrous Oxide (N_2O) calculated directly for actual p.e. data

For information only:
Calculated Values (see Calculations Worksheet)

1 Loadings and Works

A Facility Loadings Data for Reporting Year	**Value**		TOW kg BOD / annum	*TOW = "Total Organically biodegradable material in domestic (=municipal) Wastewater"*
Total p.e. served	284,696	*Enter Actual Population Equivalent of catchment*	6,239,113	Total p.e. served TOW equivalent
Design p.e.	413,200	*Enter Design Population Equivalent of facility*	9,055,278	Design p.e. TOW equivalent
Total influent BOD kg/annum (measured)	6,251,927	*Enter total annual quantity;* ***NB note units: kg/annum***	*285,281*	**Quality check: p.e. of influent BOD kg/annum**
Total Sludge removed offsite kg Dry Matter / annum		*Enter total annual quantity;* ***NB note units: kg/annum***	0	*BOD content of sludge removed kg/annum*
Total Sludge digested on-site kg Dry Matter / annum	2,805,130	*Enter total annual quantity;* ***NB note units: kg/annum***	1,122,052	*BOD content of sludge digested kg/annum*
			5,129,875	Residual BOD net of sludge removed/digested kg/annum

B Characteristics of the Works	**Status**		
B1 Aerobic plant			
Does the aerobic section of the plant contain dissolved oxygen?		*Y / N (default is "Y")*	**Methane Conversion factor for the aerobic plant will be determined by this answer**
All tanks covered and extracted to on-site flare?		*Y / N (default is "N")*	**Releases will be reported as "Fugitive"**
% of Headspace biogas utilised on site (0 - 100)		*Only required if Headspace extraction on site; Calculate by % operation of engine. Default assumption is Zero utilisation*	
% of Headspace biogas flared (0 - 100)		*Only required if Headspace extraction on site; Calculate by % operation of flare. Default assumption is Zero flaring*	
Total % biogas utilised or flared onsite			

B2 Onsite Anaerobic Digestion for sludge treatment	**Status**		
Anaerobic digestion on site?	Y	*Y / N (default is "N")*	**Releases will be reported as "Emission Point 1"**
% of Digester biogas utilised on site (0 - 100)	95	*Only required if Anaerobic digestion on site; Calculate by % operation of engine. Default assumption is Zero utilisation*	
% of Digester biogas flared (0 - 100)	5	*Only required if Anaerobic digestion on site; Calculate by % operation of flare. Default assumption is Zero flaring*	
Total % biogas utilised or flared onsite			

2 Estimated Fuel use at the UWWTP	Diesel Usage Tonnes/annum		
Total Diesel Use on site in the year	45.589	***Tonne / annum***	**Releases will be reported as "Fugitive"**

The output data is presented on this worksheet in the precise format for transfer directly into the "**Releases to Air**" Worksheet of your AER/PRTR Emissions Reporting Workbook			ESTIMATED QUANTITIES			
	PRTR No. Annex II	Name	**Emission Point 1**	**T (Total) KG/Year**	**A (Accidental) KG/Year**	**F (Fugitive) KG/Year**
	1	Methane (CH4)	0	3	0	3
	2	Carbon Monoxide (CO)	1,885	2,373	0	489
	3	Carbon Dioxide (CO2)	555,416	7,113,284	0	6,557,868
	5	Nitrous oxide (N2O)		36	0	36
	7	Non-methane volatile organic compounds (NMVOC)		154	0	154
	8	Nitrogen oxides (NOx/NO2)	5,764	7,259	0	1,495
	11	Sulphur oxides (SOx/SO2)		146	0	146

Wastewater Treatment Data Input

CELL COLOUR KEY:

INPUT - Select value from drop down list

INPUT - type in your facility value in cell

OUTPUT - automaticaly generated cell value

Facility Name	Cork City Waste Water Treatment Plant
Address	Carrigrennan, Little Island, Co.Cork
Reporting Year	2012
Licence Reg. No.	D0033-01

Enter Facility Details

P.E. (Actual Treated)	>50000 p.e.
Saline Intrusion	Yes saline intrusion
Type of Treatment	Secondary Treatment - Activated Sludge
Nutrient Removal	No Nutrient Removal

These parameters are required to generate estimated PRTR mass emission values.

Click on the cell and select from the drop down menu.

Refer to the Definitions below for further information.

Please enter Total Annual Flow (m^3/annum):

Treated (Predominant/Main Emission):	41168400 m3/annum
Fugitive Emissions:	1523940 m3/annum
TOTAL:	42692340 m3/annum

Final effluent volume released via the main emission point

Additional estimated volume released in storm bypasses

Definition of Input Requirements

P.E. (Actual Treated): P.E. (population equivalent) is a measurement of the average organic biodegradable load received daily at the treatment plant. 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. Select a P.E. band (**<10,000 p.e., 10,000 - 50,000 p.e., >50,000 p.e.**) into which the actual operating P.E. of the treatment plant falls. (Please note: the operating P.E. is based on the existing population served and not the design population size of the UWWTP).

Saline Intrusion: Identify whether saline intrusion is known to occur within the sewage network serving the treatment plant. This will be the case for some coastally located UWWTPs.

Type of Treatment: Identify the type of treatment provided at the plant. Treatment options are "No Treatment", "Primary Treatment Only", "Secondary Treatment - Activated Sludge", "Secondary Treatment - Attached Growth", "Tertiary Treatment - Filtration", and "Tertiary Treatment - Disinfection".

Nutrient Removal: Identify whether nutrient removal is employed at the treatment plant. Nutrient removal options are "Phosphorus Removal Only - Biological/Chemical/Wetland", "Nitrogen Removal Only", "Phosphorous and Nitrogen Removal", and "No Nutrient Removal".

Measured Values

CELL COLOUR
INPUT - type in your facility value in cell
OUTPUT - automaticaly generated cell value

Enter all measured values in this sheet

Note: If you do not have measured values then LEAVE THE CELL BLANK

Measured values reported in this worksheet should be the average concentration of the pollutant measured over the previous reporting year. Measured values should be used when they are available rather than estimated values from the Toolset. Measured values relate to parameters that are analysed in a laboratory. Please enter the measured values to the orange cells in mg/l for the year.

Note: the unit of measurement must be in mg/l for all parameters entered on this sheet.

Where measured values are reported, the Method Code must be indicated in the "Method of Measurement" column. The method code used shall be in accordance with the internationally approved measurement methods - please refer to the UWW PRTR Electronic Toolset Guidance Document on the EPA website. The method description should also be provided as indicated below.

Note: Wastewater licensed pollutants such as BOD and COD, Ortho- P are included at the bottom of this sheet - please enter annual measured data in mg/l for these.

Method Codes

ISO/CEN Standard - If the laboratory is working to an ISO/CEN standard that is on the approved list of standards, you should use this as the method code. Example for Total Nitrogen is EN ISO 11905-1:1998. Leave the Description Field Blank in the PRTR Workbook.	**Example for Total Nitrogen**	**EN ISO 11905-1:1998**	**Method Description: Blank**
OTH - If the method you are using is not an ISO/CEN standard or does not fall under any of the other method codes then use OTH. This method code would apply when using methods from the Standard Methods for the Analysis of Water and Wastewater series or when using a Hach Spectrophotometric Method for Total Nitrogen, for example. Use the method code OTH and please put a description of the method in the method description field in the PRTR Emissions Reporting Workbook.	**Example for Total Phosphorus**	**OTH**	**Method Description: Standard Methods for the Analysis of Water and Wastewater - Total P Analysis**

UWWT Facility Details:	>50000 p.e., Yes saline intrusion, Secondary Treatment - Activated Sludge, No Nutrient Removal

Enter your measured values in these two columns

Double-click the cells below to select the method code

Enter your method description in this column

PRTR Substances:

PRTR Nr.	CAS No.	Parameter	Treated Effluent Concentration (mg/l)	Fugitive Emission Concentration (mg/l)	Treated Effluent Mass emission (kg/annum)	Fugitive Emission Mass emission (kg/annum)	Method of Measurement (Method Code)	Method Description (Analytical Method)
12		Total nitrogen (as N)	23.218	27.515	955847.911	41931.209	OTH	SCA Method
13		Total phosphorus (as P)	2.113	3.252	86988.829	4955.853	OTH	SCA Method
76		Total organic carbon			0.000	0.000		
79		Chlorides (as total Cl)	1185.487	438.178	48804603.011	667756.981	OTH	SCA Method
82		Cyanides (as total CN)			0.000	0.000		
83		Fluorides (as total F)			0.000	0.000		
17		Arsenic and compounds (as As)			0.000	0.000		
18		Cadmium and compounds (as Cd)			0.000	0.000		
19		Chromium and compounds (as Cr)			0.000	0.000		
20		Copper and compounds (as Cu)			0.000	0.000		
21		Mercury and compounds (as Hg)			0.000	0.000		
22		Nickel and compounds (as Ni)			0.000	0.000		
23		Lead and compounds (as Pb)			0.000	0.000		
24		Zinc and compounds (as Zn)			0.000	0.000		
31	85535-84-8	Chloroalkanes (C10-C13)			0.000	0.000		
25	15972-60-8	Alachlor			0.000	0.000		
26	309-00-2	Aldrin			0.000	0.000		
36	60-57-1	Dieldrin			0.000	0.000		
39	72-20-8	Endrin			0.000	0.000		
41	76-44-8	Heptachlor			0.000	0.000		
28	57-74-9	Chlordane			0.000	0.000		
29	143-50-0	Chlordecone			0.000	0.000		
46	2385-85-5	Mirex			0.000	0.000		
38	115-29-7	Endosulphan			0.000	0.000		
45	58-89-9	Lindane (1,2,3,4,5, 6 -hexachlorocyclohexane)			0.000	0.000		
89	465-73-6	Isodrin			0.000	0.000		
33	50-29-3	DDT - sum of all isomers			0.000	0.000		

77	1582-09-8	Trifluralin			0.000	0.000		
42	118-74-1	Hexachlorobenzene (HCB)			0.000	0.000		
43	87-68-3	Hexachlorobutadiene (HCBD)			0.000	0.000		
30	470-90-6	Chlorfenvinphos			0.000	0.000		
32	2921-88-2	Chlorpyrifos			0.000	0.000		
27	1912-24-9	Atrazine			0.000	0.000		
51	122-34-9	Simazine			0.000	0.000		
37	330-54-1	Diuron			0.000	0.000		
67	34123-59-6	Isoproturon			0.000	0.000		
75		Triphenyltin			0.000	0.000		
69		Organotin			0.000	0.000		
74		Tributyltin			0.000	0.000		
72		PAH, Total			0.000	0.000		
91	191-24-2	Benzo[ghi]perylene			0.000	0.000		
61	120-12-7	Anthracene			0.000	0.000		
68	91-20-3	Naphthalene			0.000	0.000		
88	206-44-0	Flouranthene			0.000	0.000		
50	1336-36-3	Polychlorinated biphenyls (PCBs) - sum of 11 congenors			0.000	0.000		
40		Halogenated organic compounds (as AOX)			0.000	0.000		
52	127-18-4	Tetrachloroethylene (PER)			0.000	0.000		
53	56-23-5	Tetrachloromethane (TCM)			0.000	0.000		
57	79-01-6	Trichloroethylene			0.000	0.000		
60	75-01-4	Vinyl chloride			0.000	0.000		
34	107-06-2	1,2-dichloroethane (EDC)			0.000	0.000		
35	75-09-2	Dichloromethane (DCM)			0.000	0.000		
71	108-95-2	Phenols (as total C)			0.000	0.000		
87	1806-26-4	Octylphenols and Octylphenol Ethoxylates			0.000	0.000		
64		Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)			0.000	0.000		
54	12002-48-1	Trichlorobenzenes (TCBs) (all isomers)			0.000	0.000		
49	87-86-5	Pentachlorophenol (PCP)			0.000	0.000		
48	608-93-5	Pentachlorobenzene			0.000	0.000		
62	71-43-2	Benzene as BTEX			0.000	0.000		
73	108-88-3	Toluene as BTEX			0.000	0.000		
78	1330-20-7	Xylenes (total mass of ortho, para and meta-xylene)BTEX			0.000	0.000		
65	100-41-4	Ethyl benzene (BTEX)			0.000	0.000		
70	117-81-7	Di(2-ethylhexyl)phthalate			0.000	0.000		
59	8001-35-2	Toxaphene			0.000	0.000		
90	36355-1-8	Hexabromobiphenyl			0.000	0.000		

63		Brominated diphenylethers (PBDE)			0.000	0.000		
Non-PRTR Substances:								
PRTR Nr.	**CAS No.**	**Parameter**	**Treated Effluent Concentration (mg/l)**	**Fugitive Emission Concentration (mg/l)**	**Treated Effluent Mass emission (kg/annum)**	**Fugitive Emission Mass emission (kg/annum)**	**Method of Measurement (Method Code)**	**Method Description (Analytical Method)**
370		Selenium			0.000	0.000		
205		Antimony (as Sb)			0.000	0.000		
368		Molybdenum			0.000	0.000		
358		Tin			0.000	0.000		
373		Barium			0.000	0.000		
374		Boron			0.000	0.000		
356		Cobalt			0.000	0.000		
386		Vanadium			0.000	0.000		
388		Dichlobenil			0.000	0.000		
383		Linuron			0.000	0.000		
385		Mecoprop Total			0.000	0.000		
380		2,4 Dichlorophenol (2,4 D)			0.000	0.000		
384		MCPA			0.000	0.000		
382		Glyphosate			0.000	0.000		
389		Benzo[a]pyrene			0.000	0.000		
390		Benzo[b]fluoranthene			0.000	0.000		
391		Benzo[k]fluoranthene			0.000	0.000		
392		Indeno[1,2,3-c,d]pyrene			0.000	0.000		
393		Carbon tetrachloride			0.000	0.000		
394		2,6-Dichlorobenzamide			0.000	0.000		
395		Dicofol			0.000	0.000		
396		Hexabromocyclododecane (HBCD)			0.000	0.000		
397		PFOS			0.000	0.000		
238		**Ammonia (as N)**	15.030	15.030	618765.169	22904.818	OTH	SCA Method
303		**BOD**	9.988	45.000	411189.979	68577.300	OTH	SCA Method
306		**COD**	66.654	111.524	2744038.534	169955.885	OTH	SCA Method
362		**Kjeldahl Nitrogen**			0.000	0.000		
327		**Nitrate (as N)**			0.000	0.000		
372		**Nitrite (as N)**			0.000	0.000		
332		**Ortho-phosphate (as PO4)**	5.221	5.221	214940.216	7956.491	OTH	SCA Method
240		**Suspended Solids**	16.508	35.676	679607.947	54368.083	OTH	SCA Method
		Licensed Pollutants listed above						

Note: There are no user input requirements in this worksheet

These values are generated in the Toolset based on the data filled in on the Waste Water Treatment Data Input Sheet (i.e. Generated by the Estimation Toolset)

UWWT Facility Details:	>50000 p.e., Yes saline intrusion, Secondary Treatment - Activated Sludge, No Nutrient Removal

PRTR substances estimated by tool:

PRTR Nr.	CAS No.	Parameter	Treated Effluent Concentration (mg/l)	Fugitive Emission Concentration (mg/l)	Treated Effluent Mass emission (kg/annum)	Fugitive Emission Mass emission (kg/annum)	Total Mass Emission (kg/annum)
12		Total nitrogen (as N)	14.694	23.480	604943.908	35782.111	640726.019
13		Total phosphorus (as P)	2.258	4.295	92942.809	6545.322	99488.131
76		Total organic carbon	9.220	13.102	379563.292	19966.662	399529.953
79		Chlorides (as total Cl)	878.000	1014.667	36145855.200	1546291.120	37692146.320
82		Cyanides (as total CN)	0.003	0.003	120.698	4.267	124.965
83		Fluorides (as total F)	0.550	0.330	22642.620	502.900	23145.520
17		Arsenic and compounds (as As)	0.002	0.001	91.257	2.057	93.314
18		Cadmium and compounds (as Cd)	0.000	0.000	2.127	0.419	2.546
19		Chromium and compounds (as Cr)	0.000	0.000	12.694	0.152	12.846
20		Copper and compounds (as Cu)	0.012	0.006	502.941	8.610	511.551
21		Mercury and compounds (as Hg)	0.000	0.000	0.000	0.152	0.152
22		Nickel and compounds (as Ni)	0.004	0.004	175.278	5.486	180.764
23		Lead and compounds (as Pb)	0.003	0.011	125.127	16.459	141.586
24		Zinc and compounds (as Zn)	0.049	0.122	2032.222	185.768	2217.990
31	85535-84-8	Chloroalkanes (C10-C13)	0.000	0.000	8.646	0.320	8.967
25	15972-60-8	Alachlor	0.000	0.000	0.000	0.000	0.000
26	309-00-2	Aldrin	0.000	0.000	0.000	0.000	0.000
36	60-57-1	Dieldrin	0.000	0.000	0.000	0.000	0.000
39	72-20-8	Endrin	0.000	0.000	0.000	0.000	0.000
41	76-44-8	Heptachlor	0.000	0.000	0.000	0.000	0.000
28	57-74-9	Chlordane	0.000	0.000	0.000	0.000	0.000
29	143-50-0	Chlordecone	0.000	0.000	0.000	0.000	0.000
46	2385-85-5	Mirex	0.000	0.000	0.000	0.000	0.000
38	115-29-7	Endosulphan	0.000	0.000	0.000	0.000	0.000
45	58-89-9	Lindane (1,2,3,4,5, 6 -hexachlorocyclohexane)	0.000	0.000	0.019	0.002	0.020
89	465-73-6	Isodrin	0.000	0.000	0.000	0.000	0.000
33	50-29-3	DDT - sum of all isomers	0.000	0.000	0.000	0.000	0.000
77	1582-09-8	Trifluralin	0.000	0.000	0.000	0.000	0.000
42	118-74-1	Hexachlorobenzene (HCB)	0.000	0.000	0.000	0.000	0.000
43	87-68-3	Hexachlorobutadiene (HCBD)	0.000	0.000	0.000	0.000	0.000
30	470-90-6	Chlorfenvinphos	0.000	0.000	0.000	0.000	0.000
32	2921-88-2	Chlorpyrifos	0.000	0.000	0.003	0.000	0.003
27	1912-24-9	Atrazine	0.000	0.000	0.430	0.018	0.448
51	122-34-9	Simazine	0.000	0.000	0.580	0.021	0.601
37	330-54-1	Diuron	0.000	0.000	1.085	0.000	1.085
67	34123-59-6	Isoproturon	0.000	0.000	0.309	0.023	0.332
75		Triphenyltin	0.000	0.000	0.000	0.000	0.000
69		Organotin	0.000	0.000	0.000	0.000	0.000
74		Tributyltin	0.000	0.000	0.000	0.000	0.000
72		PAH, Total	0.000	0.000	0.510	0.328	0.838
91	191-24-2	Benzo[ghi]perylene	0.000	0.000	0.082	0.003	0.085
61	120-12-7	Anthracene	0.000	0.000	0.114	0.003	0.117
68	91-20-3	Naphthalene	0.000	0.000	0.165	0.220	0.385
88	206-44-0	Flouranthene	0.000	0.000	0.096	0.019	0.115
50	1336-36-3	Polychlorinated biphenyls (PCBs) - sum of 11 cong	0.000	0.000	0.000	0.000	0.000
40		Halogenated organic compounds (as AOX)	0.002	0.002	98.263	3.637	101.900
52	127-18-4	Tetrachloroethylene (PER)	0.000	0.000	2.433	0.000	2.433
53	56-23-5	Tetrachloromethane (TCM)	0.000	0.000	0.000	0.000	0.000
57	79-01-6	Trichloroethylene	0.000	0.000	0.000	0.000	0.000
60	75-01-4	Vinyl chloride	0.000	0.000	0.000	0.000	0.000
34	107-06-2	1,2-dichloroethane (EDC)	0.000	0.000	0.000	0.000	0.000
35	75-09-2	Dichloromethane (DCM)	0.000	0.000	1.871	0.183	2.054
71	108-95-2	Phenols (as total C)	0.001	0.081	37.454	123.235	160.689
87	1806-26-4	Octylphenols and Octylphenol Ethoxylates	0.000	0.000	0.000	0.000	0.000
64		Nonylphenol and Nonylphenol ethoxylates (NP/NPE	0.000	0.001	3.415	1.659	5.075
54	12002-48-1	Trichlorobenzenes (TCBs) (all isomers)	0.000	0.000	0.000	0.000	0.000
49	87-86-5	Pentachlorophenol (PCP)	0.000	0.000	0.000	0.000	0.000

48	608-93-5	Pentachlorobenzene	0.000	0.000	0.000	0.000	0.000
62	71-43-2	Benzene as BTEX	0.000	0.000	0.692	0.253	0.945
73	108-88-3	Toluene as BTEX	0.000	0.014	20.306	21.218	41.524
78	1330-20-7	Xylenes (total mass of ortho, para and meta-xylene	0.000	0.002	4.772	2.420	7.192
65	100-41-4	Ethyl benzene (BTEX)	0.000	0.000	0.683	0.174	0.857
70	117-81-7	Di(2-ethylhexyl)phthalate	0.001	0.003	37.763	4.511	42.274
59	8001-35-2	Toxaphene	0.000	0.000	0.000	0.000	0.000
90	36355-1-8	Hexabromobiphenyl	0.000	0.000	0.000	0.000	0.000
63		Brominated diphenylethers (PBDE)	0.000	0.000	0.000	0.000	0.000
non PRTR substances estimated by tool:							
PRTR Nr.	**CAS No.**	**Parameter**	**Treated Effluent Concentration (mg/l)**	**Fugitive Emission Concentration (mg/l)**	**Treated Effluent Mass emission (kg/annum)**	**Fugitive Emission Mass emission (kg/annum)**	**Total Mass Emission (kg/annum)**
N/A		Total Hardness (mg/l CaCO3)	428.813	483.667	17653524.525	737078.980	18390603.505
N/A		Selenium	0.005	0.001	195.550	1.016	196.566
N/A		Antimony	0.000	0.000	6.362	0.731	7.094
N/A		Molybdenum	0.002	0.001	62.439	2.134	64.572
N/A		Tin	0.003	0.000	124.534	0.000	124.534
N/A		Barium	0.023	0.036	945.844	54.303	1000.147
N/A		Boron	0.294	0.325	12082.925	495.788	12578.714
N/A		Cobalt	0.000	0.000	7.236	0.488	7.723
N/A		Vanadium	0.003	0.005	112.277	7.924	120.202
N/A		Dichlobenil	0.000	0.000	0.177	0.004	0.180
N/A		Linuron	0.000	0.000	0.000	0.000	0.000
N/A		Mecoprop	0.000	0.000	4.407	0.181	4.588
N/A		2,4-D	0.000	0.000	2.101	0.054	2.155
N/A		MCPA	0.000	0.000	3.649	0.015	3.664
N/A		Glyphosate	0.002	0.000	63.100	0.600	63.700
N/A		Benzo[a]pyrene	0.000	0.000	0.082	0.003	0.085
N/A		Benzo[b]fluoranthene	0.000	0.000	0.082	0.003	0.085
N/A		Benzo[k]fluoranthene	0.000	0.000	0.082	0.003	0.085
N/A		Indeno[1,2,3-c,d]pyrene	0.000	0.000	0.091	0.003	0.094
N/A		Carbon tetrachloride	0.000	0.000	0.000	0.000	0.000
N/A		2,6-Dichlorobenzamide	0.000	0.000	3.312	0.091	3.404
N/A		Dicofol	-	-	#VALUE!	#VALUE!	#VALUE!
N/A		Hexabromocyclododecane (HBCD)	0.000	0.000	0.000	0.000	0.000
N/A		PFOS	0.000	0.000	0.020	0.000	0.020

Facility Name:	Cork City Waste Water Treatment Plant
Address:	Carrigrennan, Little Island, Co.Cork
Reporting year:	2012

Treated: Final effluent volume released via main emission point	41,168,400
Fugitive: Estimated additional volume released in storm bypasses	1,523,940
Total Annual Flow (m³/annum):	*42692340*

SECTION A : WWTP SPECIFIC PRTR POLLUTANTS

Note '#VALUE!' error messages will disappear when flow data are entered above

POLLUTANT					QUANTITY				
			Method Used						E-PRTR reporting threshold kg/annum
No. Annex II	Name	M/E	Method of Measurement	Designation or Description	Emission Point 1	F (Fugitive) kg/year	A (Accidental) kg/year *(Enter site specific data)*	T (Total) kg/year	
12	Total nitrogen	M	OTH	SCA Method	955,847.911	41,931.209		997,779.120	50,000
13	Total phosphorus	M	OTH	SCA Method	86,988.829	4,955.853		91,944.682	5,000
76	Total organic carbon (TOC) (as total C or COD/3)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	379,563.292	19,966.662		399,529.953	50,000
79	Chlorides (as total Cl)	M	OTH	SCA Method	48,804,603.011	667,756.981		49,472,359.992	2,000,000
82	Cyanides (as total CN)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	120.698	4.267		124.965	50
83	Fluorides (as total F)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	22,642.620	502.900		23,145.520	2,000
17	Arsenic and compounds (as As)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	91.257	2.057		93.314	5
18	Cadmium and compounds (as Cd)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.127	0.419		2.546	5
19	Chromium and compounds (as Cr)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	12.694	0.152		12.846	50
20	Copper and compounds (as Cu)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	502.941	8.610		511.551	50
21	Mercury and compounds (as Hg)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.152		0.152	1
22	Nickel and compounds (as Ni)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	175.278	5.486		180.764	20
23	Lead and compounds (as Pb)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	125.127	16.459		141.586	20
24	Zinc and compounds (as Zn)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2,032.222	185.768		2,217.990	100
31	Chloroalkanes (C10-C13)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	8.646	0.320		8.967	1
25	Alachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
26	Aldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
36	Dieldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
39	Endrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
41	Heptachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
28	Chlordane	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
29	Chlordecone	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
46	Mirex	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
38	Endosulphan	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
45	Lindane	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.002		0.020	1
89	Isodrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
33	DDT	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
77	Trifluralin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
42	Hexachlorobenzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
43	Hexachlorobutadiene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
30	Chlorfenvinphos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
32	Chlorpyrifos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.003	0.000		0.003	1
27	Atrazine	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.430	0.018		0.448	1
51	Simazine	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.580	0.021		0.601	1
37	Diuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.085	0.000		1.085	1
67	Isoproturon	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.309	0.023		0.332	1
75	Triphenyltin and compounds	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
69	Organotin compounds(as total Sn)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	50
74	Tributyltin and compounds	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1

72	Polycyclic aromatic hydrocarbons (PAHs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.510	0.328		0.838	5
91	Benzo(g,h,i)perylene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.003		0.085	1
61	Anthracene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.114	0.003		0.117	1
68	Naphthalene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.165	0.220		0.385	10
88	Fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.096	0.019		0.115	1
50	Polychlorinated biphenyls (PCBs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	0,1
40	Halogenated organic compounds (as AOX)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	98.263	3.637		101.900	1,000
52	Tetrachloroethylene (PER)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.433	0.000		2.433	10
53	Tetrachloromethane (TCM)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
57	Trichloroethylene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	10
60	Vinyl chloride	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	10
34	1,2-dichloroethane (EDC)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	10
35	Dichloromethane (DCM)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.871	0.183		2.054	10
71	Phenols (as total C)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	37.454	123.235		160.689	20
87	Octylphenols and Octylphenol ethoxylates	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
64	Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.415	1.659		5.075	1
54	Trichlorobenzenes (TCBs) (all isomers)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
49	Pentachlorophenol (PCP)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
48	Pentachlorobenzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
62	Benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.692	0.253		0.945	200
73	Toluene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	20.306	21.218		41.524	200
78	Xylenes	E	ESTIMATE	EPA UWWTP Tool Version 5.0	4.772	2.420		7.192	200
65	Ethyl benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.683	0.174		0.857	200
70	Di-(2-ethyl hexyl) phthalate (DEHP)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	37.763	4.511		42.274	1
59	Toxaphene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1
90	Hexabromobiphenyl	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	0,1
63	Brominated diphenylethers (PBDE)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000	1

SECTION C : REMAINING NON-PRTR SUBSTANCES AND POLLUTANT EMISSIONS AS REQUIRED IN YOUR LICENCE

POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/E	Method Code	Designation or Description *(Note: replace with site-specific data if applicable)*	Emission Point 1	F (Fugitive) kg/year	A (Accidental) kg/year *(Enter site specific data)*	T (Total) kg/year
370	Selenium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	195.550	1.016		196.566
205	Antimony (as Sb)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	6.362	0.731		7.094
368	Molybdenum	E	ESTIMATE	EPA UWWTP Tool Version 5.0	62.439	2.134		64.572
358	Tin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	124.534	0.000		124.534
373	Barium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	945.844	54.303		1,000.147
374	Boron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	12,082.925	495.788		12,578.714
356	Cobalt	E	ESTIMATE	EPA UWWTP Tool Version 5.0	7.236	0.488		7.723
386	Vanadium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	112.277	7.924		120.202
388	Dichlobenil	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.177	0.004		0.180
383	Linuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
385	Mecoprop Total	E	ESTIMATE	EPA UWWTP Tool Version 5.0	4.407	0.181		4.588
380	2,4 Dichlorophenol (2,4 D)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.101	0.054		2.155

384	MCPA	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.649	0.015		3.664
382	Glyphosate	E	ESTIMATE	EPA UWWTP Tool Version 5.0	63.100	0.600		63.700
389	Benzo[a]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.003		0.085
390	Benzo[b]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.003		0.085
391	Benzo[k]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.082	0.003		0.085
392	Indeno[1,2,3-c,d]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.091	0.003		0.094
393	Carbon tetrachloride	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
394	2,6-Dichlorobenzamide	E	ESTIMATE	EPA UWWTP Tool Version 5.0	3.312	0.091		3.404
395	Dicofol	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
396	Hexabromocyclodecane (HBCD)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
397	PFOS	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.020	0.000		0.020
238	Ammonia (as N)	M	OTH	SCA Method	618,765.169	22,904.818		641,669.987
303	BOD	M	OTH	SCA Method	411,189.979	68,577.300		479,767.279
306	COD	M	OTH	SCA Method	2,744,038.534	169,955.885		2,913,994.418
362	Kjeldahl Nitrogen	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
327	Nitrate (as N)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
372	Nitrite (as N)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.000	0.000		0.000
332	Ortho-phosphate (as PO4)	M	OTH	SCA Method	214,940.216	7,956.491		222,896.707
240	Suspended Solids	M	OTH	SCA Method	679,607.947	54,368.083		733,976.031

3. Section 3. Operations Reports Summary

3.1.Complaints Summary

Waste Water Treatment Plant

There were no complaints received for the Waste Water Treatment Plant in 2012 related to discharges.

In all, 7 individual odour related complaints were received and 2 noise related complaints received. The complaints received were over 3 particular short periods in time. Causes/ Potential causes were identified for 2 of these periods in time. One of these related to a fault/breakdown while the other was a non-routine maintenance issue.

Number	Date & Time	Nature of complaint	Cause of complaint	Actions taken to resolve issue	Closed
12-01	25/07/2012 14:50	Odour from WWTP for past couple of days	None found	NWPL checked all OCR Stack ommissions, Conducted odour survey & checked ongoing operations	YES
12-02	26/07/2012 10:00	Noise from WWTP for past week	None found	Staff investigated, no issues found. External Noise survey carried out on 25 June and 11 July showed operations all within limits.	YES
12-03	26/07/2012 15:40	Odour from WWTP for past week	None found	NWPL checked all OCR Stack ommissions, Conducted odour survey & checked ongoing operations	YES
12-04	02/08/2012 14:50	Foul smell from WWTP	Pipework on Odour control unit in Sludge building had come loose	Repaired and replaced, Unit up and working within an hour.	YES
12-05	03/08/2012 15:00	Odour Complaint, relayed by Cork City Co.to WWTP	This refers to Previous Complaint , 12-04	As per previous	YES
12-06	09/08/2012 09:20	Noise from WWTP at night , also 3 weeks ago	None Found	Staff investigated,discussed with complainant, no issues found.	YES
12-07	08/09/2012 14:00	Odour from WWTP for Since 11:00 am, also Friday night	None found	NWPL checked all OCR Stack ommissions, Conducted odour survey & checked ongoing operations	YES
12-08	10/09/2012 11:05	Smell bad from Friday through to date	Emptying PST-B, Potential cause of odours	OCR Controls all reviewed, all working, PST-B was emptying to replace scraper blades	YES
12-09	15/09/2012 09:50	Smell for last few days, reported to City Co.	Emptied PST-B, Potential cause of odours	OCR Controls all reviewed, all working, PST-B has been emptied	YES

Sewer Network

The Drainage Section of Cork City Council maintains a Complaints Database which logs queries and complaints for the Drainage Network and Rivers within the city.

CORK CITY DRAINAGE NETWORK DATABASE SUMMARY				
		CallOut		
Category of Item	**Complaint**	FALSE	TRUE	Grand Total
OPERATIONS COMPLAINT CALLS	PRIVATE DRAIN	36	2	38
	MANHOLE	46	19	65
	SEWER	376	68	444
	GULLY	7		7
	FLOOD	29	26	55
	ODOURS	43		43
	RATS	20		20
	N/A to DRAINAGE	14	3	17
	RIVER DEBRIS	16	2	18
	RIVER POLLUTION	13		13
PREVENTATIVE MAINTENANCE	SEWER FLUSHED BY STAFF	40	1	41
TOTAL NO. OF ITEMS LOGGED	**Grand Total**	**640**	**121**	**761**
Nett Calls /Operations	Normal hours	**600**		
	Out of Hours /Call out		**120**	
	Total			**720**

There were 720 issues logged on the Drainage Complaints Database in 2012. Only a very small number of calls received are complaints of an environmental nature related to the discharge to waters from the Wastewater Works. 13 calls were categorised as type River Pollution. These 13 calls are detailed in full in the following Summary of Complaints Tables.

41 items logged related to routine preventative maintenance sewer flushing works carried out by Drainage staff, i.e. actions to prevent sewer blockages or smells building up. These actions are carried out on known stretches of the network where low flows or shallow gradients in pipes could cause problems.

720 items logged consisted of complaint calls, 600 of these were received during normal working hours, and 120 were received, and responded to, out of normal working hours.

Drainage ground staff responds as quickly as possible to issues /complaints received to ensure all problems are addressed as quickly as possible. Typically calls from the public relate to blocked private drains, sewers, or road gullies, displaced manhole covers, or localised stormwater flooding. These are operational and maintenance issues related to the sewer network.

Summary of Complaints Table — **File Source: CCC Drainage Section**

Number	Date	Time	Location	Nature of Complaint/ Complaint Details	Cause of complaint	Actions Taken to resolve issue	Closed (Y/N)
12-04027	19/01/2012	09:00:29	Curraheen River, WALKWAY BEHIND TENNSI VILLAGE	Serious pollution incident along the new walkway behind the Tennis Village off Model Farm Road.	Cross Connections Foul to Storm	Private Commercial premises: Diverted to Foul by owner	Y
12-04145	08/03/2012	11:20:12	River lee at Horgans Quay	Report of sewage seen at outfall on Horgans Quay. CSO at Grattans Hill needs to be inspected.	Not Found, Grattans Hill CSO was perfect.	CSO Inspected, CSO not problematic	Y
12-04194	29/03/2012	14:47:30	GLASHEEN STREAM	Pollution in the Glasheen Stream over the last couple of days, whitish in colour and looks like domestic sewage. 10/04/11 Caller rang again to say that problem still there.	Minor cross connections - low rainfall of late	Continued monitoring	N
12-04200	05/04/2012	14:37:23	River lee, South channel, PARLIAMENT STREET	Caller says their connection to the main sewer in the river has come away and waste is going into river	Private Drain	Referred to Owner to address	y
12-04254	25/04/2012	08:47:01	River lee North Channel SUNDAY'S WELL ROAD	Sewage seen in the river at the Red House on Sunday's Well Road. Pumping Station overflow and CSO overflow enter the river at this point.	No problem found- Algae from river bed - Other	Check outfalls in the area from CSO's and pumping station , CSO cleared	y
12-04262	27/04/2012	13:04:09	River lee North Channel, UCC	Pollution in river at the shaky bridge.	No problem found- Algae from river bed - Other	Checked outfalls in the area from CSO's and pumping station , CSO cleared	y
12-04289	14/05/2012	13:56:52	River lee South Channel, RE OUTFALL AT CLARKES BRIDGE	Call from Internal Fisheries re outfall of sewage into river upstream of Clarkes Bridge.	Intermittent cross connection,	Source Not found, ongoing monitoring	N
12-04312	22/05/2012	16:20:30	River lee, NEAR BUS STATION & DOGS HOME	Large flow of sewage into river - smells horrific	Contractor working on behalf of CCC mistook foul sewer for storm water - once off incident no lasting detremental effects	Mistake rectified, Procedure for checking sewer records reiterated	y
12-04320	24/05/2012	16:13:41	River Bride, Commons Road	Complaint received regarding raw sewage flowing into the River Bride	Flow from Storm sewer into minor watercourse at rear of house	Storm attenuation tank cleaned, storm sewer extended to main river channel.	Y
12-04456	09/07/2012	14:57:25	River lee, north Channel, SUNDAY'S WELL ROAD	Sewage seeping from CSO	Seepage/Smell from CSO	CSO Tank cleaned	Y
12-04553	22/08/2012	13:06:10	Carrigrohane, Curraheen River	Complaint of broken main. Pungent /sewerage and a lot of ponding on the grass.	No public sewer in this area, Sports ground, club issue. No spill to water	Private issue	Y
12-04610	26/09/2012	11:31:10	River Lee South Channel, PROBYS QUAY	Complaint raw sewage flowing into the river from a pipe that can be seen at low tide.	CSO Overflow blocked	Freed overflow with rods	Y
12-04632	08/10/2012	14:32:16	River lee South Channel, Gaol Cross	Message from Inland fisheries re discharge at Gaol Cross over weekend	Overflow from CSO - Normal CSO operation	CSO inspected & reported back to Fisheries	Y

The City Council Environment Pollution Control Section also maintains a Complaints Register, and in addition Cork County Council was referenced in compiling the following tables of Summary of Complaints of an environmental nature related to discharges to waters within the Agglomeration.

Items which are duplicated are highlighted in Red, i.e. these items are either logged on multiple databases or consist of multiple calls about the same event.

The number of calls received /recorded in 2012 regarding pollution or related issues were increased from the number received in 2011. This may be a reflection on the rainfall pattern of the year or an increased awareness of this type of issues among the general public.

Summary of Complaints Table			File Source : CCC Environment Pollution Section		
Number	**Date**	**Location**	**Nature of Complaint/ Complaint Details**	**Actions Taken to resolve issue**	**Closed (Y/N)**
PC12/599	12/01/2012	Lr Glanmire Rd	Allegation of green paint in river	No evidence , possible source identified , newly painted sign across the road. Company written to , no response received	Yes
PC12/603	19/01/2012	Westside Business Park	Pollution along walkway behind Tennis Village	Cross Connection - Resolved by Drainage	Yes
PC12/608	26/01/2012	Coffee's Lane , Tramore River	Allegation of pollution	Reported previously , legal proceedings initiated against alleged offender	Yes
PC12/610	02/02/2012	Grand Parade	Unauthorised Discharge - allegation of polluting run off from car wash	dye test carried out. No evidence to suggest car park repsonsible	Yes
PC12/611	02/02/2012	Mahon Point	Unauthorised Discharge - allegation of polluting run off from car wash	dye test carried out. No evidence to suggest car park repsonsible	Yes
PC12/612	02/02/2012	City Hall	Unauthorised Discharge - allegation of polluting run off from car wash	dye test carried out. No evidence to suggest car park repsonsible	Yes
PC12/613	02/02/2012	Merchant's Quay	Unauthorised Discharge - allegation of polluting run off from car wash	dye test carried out. No evidence to suggest car park repsonsible	Yes
PC12/614	02/02/2012	Carroll's Quay	Unauthorised Discharge - allegation of polluting run off from car wash	no car washing being carried out	Yes
PC12/625	02/03/2012	Lr Glanmire Rd	Foul Water seeping into garden of house	Referred to Building Control & Water Dept	Yes
PC12/626	02/03/2012	Depot Kinsale Rd	Allegation of Polluting run off from washing of vehicles to Tramore River	Location (by Kinsale Rd roundabout) in County , referred to County Council	Yes

Summary of Complaints Table cont.			File Source : CCC Environment Pollution Section		
Number	Date	Location	Nature of Complaint/ Complaint Details	Actions Taken to resolve issue	Closed (Y/N)
PC12/633	26/03/2012	Glasheen Stream	Allegation of pollution near ESB office	No pollution observed apart from small area from discharge pipe near Donscourt - passed to Drainage	Yes
PC12/653	14/05/2012	Garage Ballyvolane	Allegation of polluting run off from car wash	Premise written to , to apply for discharge licence	Yes
PC12/656	21/05/2012	Bride River , Commons Rd	Allegation of pollution in River	No visible sign when inspected - Resolved by Drainage Dept	Yes
PC12/657	22/05/2012	Fr Matthew Quay	Allegation of building material being dumped in river	Work being carried out on behalf of CCC , material Clause 804 being used at bottom of quay wall to prevent material being washed down river	Yes
PC12/658	23/05/2012	Anderson's Quay	Discharge of sewage into River at Jury's Inn	Contractor working on behalf of CCC mistook foul sewer for storm water - once off incident no lasting detremental effects	Yes
PC12/656	11/06/2012	Hartlands Road	trail of cement on road and draining to surface water drain	No evidence that washings entering the drain , company working instructed to carry out clean up of roadway	Yes
PC12/672	05/07/2012	Grenville Place	Allegation of fish kill in river	No evidence of fish kill found. Likely that someone had dumped fish in river and these had washed away with the tide	Yes
PC12/673	18/07/2012	Ballyhooley Rd -	Trees dying in residents back garden	Only possible source was oil tank in neighbouring property. Tank checked found to be secure. Resident to follow up himself	Yes
PC12/683	15/08/2012	Clontarf Bridge	Floating Debris behind pontoon	Debris removed	Yes
PC12/686	24/08/2012	River Lee - " North and South Channel	Polystyrene floating in river	Exact source not discovered - washed away	Yes
PC12/688	04/09/2012	Market Avenue	Concrete washings from work being washed into drain	Offender identified , cleared rains. Drainage Dept reinspected drains found to be clear	Yes
PC12/709	11/10/2012	Kyrl's Quay	Oil leak into river	Source identified as ESB ducting , ducting isolated and leak repaired	Yes
PC12/716	16/10/2012	Glasheen River	Polluting discharge into river	Source identified as pipe is County area referred to County Council	Yes
PC12/714	22/10/2012	Pope's Quay	Moped in the river	Removed by Meitheal Mara	Yes
PC12/727	31/10/2012	Curraheen River	Allegation of pollution	No evidence of pollution found - no further complaints received	Yes
PC12/738	06/12/2012	Lr Glanmire Rd	Unauthorised Discharge - allegation of polluting run off from car wash	Apply for discharge licence	Yes
PC12/740	12/12/2012	City Quays South Jetty	Report of ship discharging "black substance into river at kennedy quay	Reported to Port of Cork - under investigation	No

Summary of Complaints Table			File Source: Cork CoCo Environment Pollution Section			
Number	Date/Time	Location	Nature of Complaint/ Complaint Details		Actions Taken to resolve issue	Closed (Y/N)
001-00-059367	17/01/2012 16:34	Glanmire	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-059769	25/01/2012 09:12	Curraheen River	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	closed
001-00-061239	20/02/2012 11:21	Glashaboy.	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	
001-00-063160	29/03/2012 11:29	Stream Church Hill, Glanmire,Co.Cork	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-063468	03/04/2012 14:46	Curaheen Road, Bishopstown,Cork	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-063903	12/04/2012 15:49	Two pot and curraheen river in Murphy's Farm area	grey colour of water and farm yard smell from water	Illegal Discharge of Water	Investigated by Environment	closed
001-00-064843	30/04/2012 16:34	Grey Water Discharge - Doman's Wood Stream, Grange, Douglas	Grey Water Discharge - Doman's Wood Stream, Grange, Douglas	Illegal Discharge of Water	Investigated by Environment	In process
001-00-070320	24/07/2012 16:28	Knocknahorgan, Glanmire	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-071106	03/08/2012 13:28	Douglas village	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	closed
001-00-072565	27/08/2012 10:24	Douglas	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-073004	31/08/2012 13:57	Barnavara Hill, Glanmire	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	closed
001-00-075745	05/10/2012 09:07	Sallybrook , Glanmire.	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process
001-00-080863	14/12/2012 09:43	Douglas River estuary.	Illegal Discharge of Water	Illegal Discharge of Water	Investigated by Environment	In process

3.2.Reported Incidents Summary

Incident Type	Incident Description	Cause	No.Of Incidents	Authorities contacted	Reported to EPA	Closed
Non-Compliance	ELV exceedences for Total Phosphorous and Total Nitrogen	Plant not designed for Nutrient Removal	1, Ongoing	No	Yes, Quarterly reports via EDEN	No
No. of Incidents in 2012					No.of	1
No of Incidents reported to the EPA via EDEN in 2012					No.of	1
Explanation of any discrepancies between the two numbers above					Comment	

Corrective Actions

The WWTP was designed for Secondary Treatment and not designed for Nutrient Removal. The WWTP was commissioned in 2004 and practically simultaneously the receiving water (Lough Mahon Estuary) was designated a Nutrient Sensitive Water. The WWDL licence granted in 2009 stipulated standards for Nutrient Removal albeit not as onerous as those for the UWWT Directive but still outside the limitations of the design of the plant.

The WWTP is being operated to deliver the best practical Total Phosphorus and Total Nitrogen outputs within the limits of the existing plant design. This resulted in reduction in load of 41.2% and 22.8% for Total Phosphorus and Total Nitrogen over the year 2012. (Refer to Table 2.3 Treatment Efficiency Report). In addition, while Total Nitrogen results consistently exceed all ELV Standards, Total Phosphorus has complied with Annual Mean for 2012, 5 of the 26 samples exceeded the ELV and only one sample of 26 exceeded the 120% ELV. These exceedences were earlier in the year 2012, i.e. all samples for Total Nitrogen since 1st May 2012 have been in compliance.

This ongoing incident is being reported by Cork City Council on a quarterly basis via the EPA Eden system.

See also Section 2.2. *Discharges from the Agglomeration.*

Plant Upgrade

Cork City Council has received approval from the Department of Environment, Communications and Local Government under the Water Services Infrastructure Programme to engage a consultant for the design of **Nutrient Removal /Tertiary Treatment** for Cork City (Carrigrennan) WWTP. This is to enable works to be carried out to ensure discharges comply with the WWDL and UWWT standards for Sensitive waters, i.e. reduction in emissions of Total N and Total P. The appointment process for the consultant is underway.

	2012 D0033-01 ELV Exceedences				
ELV	**10.0**	**2.5**			
120%ELV	**12.0**	**3.0**			
	(mg/l)	**(mg/l)**			
	Final Effluent				
Sample Date	**Total Nitrogen (mg/L)**	**Total Phosphorus (mg/L)**	**Method**	**Date Submitted to EPA**	**EPA Incident no.**
31/10/2011	32	1.8	Composite sample	21/02/2012	INCI000035
14/11/2011	23	2.1	Composite sample	21/02/2012	INCI000035
28/11/2011	19	2.0	Composite sample	21/02/2012	INCI000035
12/12/2011	20	1.9	Composite sample	21/02/2012	INCI000035
26/12/2011	23	1.8	Composite sample	21/02/2012	INCI000035
10/01/2012	24	2.1	Composite sample	02/04/2012	INCI000092
24/01/2012	29	2.8	Composite sample	02/04/2012	INCI000092
07/02/2012	36	2.6	Composite sample	02/04/2012	INCI000092
21/02/2012	30	2.4	Composite sample	02/04/2012	INCI000092
06/03/2012	31	2.6	Composite sample	02/04/2012	INCI000092
21/03/2012	34	3.0	Composite sample	10/07/2012	INCI000306
04/04/2012	33	1.4	Composite sample	10/07/2012	INCI000306
17/04/2012	31	**5.0**	Composite sample	10/07/2012	INCI000306
01/05/2012	28	2.3	Composite sample	10/07/2012	INCI000306
15/05/2012	27	2.4	Composite sample	10/07/2012	INCI000306
29/05/2012	23	2.1	Composite sample	10/07/2012	INCI000306
12/06/2012	21	1.7	Composite sample	10/07/2012	INCI000306
26/06/2012	21	1.9	Composite sample	10/07/2012	INCI000306
10/07/2012	18	1.9	Composite sample	21/09/2012	INCI000458
24/07/2012	12	1.1	Composite sample	21/09/2012	INCI000458
07/08/2012	24	1.4	Composite sample	21/09/2012	INCI000458
22/08/2012	16	1.2	Composite sample	21/09/2012	INCI000458
04/09/2012	19	1.8	Composite sample	21/09/2012	INCI000458
18/09/2012	20	2.5	Composite sample	21/09/2012	INCI000458
02/10/2012	21	2.1	Composite sample	04/01/2013	INCI000632
16/10/2012	19	2.2	Composite sample	04/01/2013	INCI000632
13/11/2012	24	2.2	Composite sample	04/01/2013	INCI000632
27/11/2012	15	1.3	Composite sample	04/01/2013	INCI000632
11/12/2012	26	2.4	Composite sample	04/01/2013	INCI000632
28/12/2012	18	1.8	Composite sample	04/01/2013	INCI000632
2012 Annual Mean	**24.0**	**2.2**			
Annual Mean	non compliant	compliant			
8 out of 10 samples < or =ELV	non compliant	compliant from 07/08/12			
sample < or =120% ELV	all non-compliant	one sample non-compliant			

4. Infrastructural Assessments and Programme of Improvements

4.1 Storm Water Overflow Identification and Inspection Report -Summary

Attached is the full listing of Storm Water Overflows for Cork City Council Drainage Network.

All these Storm water overflows were included in Schedule A4 of the WWDL.

All the CSO structures have been designed and built as part of various Drainage Schemes, from the earliest constructed in 1948 to the more recent constructed as part of Cork Main Drainage and completed in 2003. All the CSOs are identified and all bar one have construction detail drawings associated with them. There is an inspection regime in place to ensure the structure and/or outfall is inspected on a fortnightly basis. A dedicated drainage crew carries out the inspections and maintenance of the CSO structures to ensure that blockages and debris are removed as quickly as possible and to reduce unnecessary overflows.

As part of Cork Main Drainage assessments were carried out on a large number of CSOs and they were deemed compliant with DoEHLG Criteria. These assessments were based on theoretical information and Model calculation. However, based on observations and practical working knowledge it is believed that these assessments need to be re-visited in more detail. Previous assessments were also done on groups of CSOs and their impact on the major water body of the River Lee, which was deemed minimal and acceptable. While this may hold true, monitoring however indicates that there is a more severe impact from overflows on the quality of water in the smaller tributaries into the Lee.

The Catchment for each CSO has been identified and fuller assessment for each of the criteria in DoEHLG is being carried out.

In general Structure Design ensured that Visual/Aesthetics were catered for where diligent maintenance is carried out. Design was also based on Formula A or its approximation in most instances. Difficulty arises where additional inflows are identified over and above that which might reasonably have been included.

The significance of each overflow on Water Quality is being individually assessed to determine whether Low Medium or High with requirements for associated standards. This is where the larger catchments and the smaller river tributaries pose the greatest difficulties.

There are no bathing waters adjacent to the CSOs and this criterion does not apply. Given that Lower Lee Estuary was designated *Sensitive Waters* in recent years there is now a necessity to reduce overflows to 20% as a percentage of rainfall run off volumes. This criterion did not exist when these CSOs were first designed and poses the largest challenge for compliance.

Based on this criterion alone it is likely that it will be necessary to provide additional significant rainwater storage for a large number of the CSO structures in order to achieve compliance.

The **Storm Water Overflow Identification and Inspection Report**, conditioned under 4.13.1 and 4.13.2 of the WWDL, is outstanding from the second AER 2011.

It will be submitted later as **Appendix 3** for 2012.

CSO Structure location			CSO Cork City Co.Name	Storm Overflow /Outfall Location		EPA Storm Overflow Name	Receiving water/ Discharges to	Discharge Location
MANHOLE_	EASTING	NORTHING		EASTING	NORTHING			
Storm Overflow	164839	71605	01A Our lady's Hospital	165012	71470	S01	River Lee	River Lee d/s waterworks (in Tailrace)
Storm Overflow	165704	71740	02 Eikpa Lodge Sunday's Well	165720	71689	S02	River Lee North Channel	River Lee d/s Daly Bridge opp. Fitz. Pk.
Storm Overflow	165944	71810	03 Hazelhurst Sunday's Well	165987	71722	S03	River Lee North Channel	River Lee d/s Daly Bridge opp. Fitz. Pk/Boat Club.
Storm Overflow	166733	72110	04 Wyse's Hill	166770	72081	S04	River Lee North Channel	River lee above St Vincent's Pedstrian Bridge North Mall at Distillery access,
Storm Overflow	166947	72211	05 Rock Cottages North Mall	166968	72156	S05	River Lee North Channel	River lee North Mall Adjacent North Abbey Sq, low level
Storm Overflow	167051	72223	06 Shandon Street	167053	72191	S06	River Lee North Channel	River Lee Adjacent Griffith Bridge High level
Storm Overflow	167448	72175	07 John Redmond Street	167462	72137	S07	River Lee North Channel	River lee u/s Christy Ring Bridge
Storm Overflow	167387	72552	08 Upper John Street	167438	72568	S08	Kiln River Culvert (Bride/Glen)	Culvert in Murphys Brewery
Storm Overflow	167361	72652	09 Cathedral Walk					
Storm Overflow	167316	72902	10 Gerald Griffin Street	167401	72902	S09	Kiln River Culvert (Bride/Glen)	Culvert in Watercourse rd
Storm Overflow	167346	73060	11 great Wm O'Brien Street	167443	73019	S47	Kiln River Culvert (Bride/Glen)	Bride River Thu' firestation to Culvert in Watercourse rd
Storm Overflow	167400	73420	13 wherelands Lane	167409	73411	S10	River Bride	River Bride at Orchard Court Access Bridge
Storm Overflow	167428	73720	14 Pophams Road	167498	73710	S11	River Bride	River Bride at shopping centre
Storm Overflow	167504	73382	18 Thomas Davis Street	167458	73280	S13	River Bride	River Bride at Blackpool Church
Storm Overflow	167515	73172	19 Assumption road	167456	73163	S14	Kiln River Culvert (Bride/Glen)	River Bride at new Culvert (phase 5) Watercourse Rd
Storm Overflow	167425	72806	20 Popes Road	167418	72804	S15	Kiln River Culvert (Bride/Glen)	River Bride at old Culvert Watercourse Rd
Storm Overflow	167477	72639	21 Fever Hospital Steps	167446	72643	S16	Kiln River Culvert (Bride/Glen)	Back Watercourse, Brewery Corner
Storm Overflow	167612	72288	22 Hardwick Street	167558	72134	S17	River Lee North Channel	River Lee d/s Christy Ring Br.
Storm Overflow	167684	72191	23 Bridge Street	167666	72128	S18	River Lee North Channel	River Lee u/s Patricks Br.
Storm Overflow	167941	72200	24 York Street	168076	72050	S19	River Lee North Channel	River Lee Patricks Quay/Penrose Quay at Ship st opp. Jurys Inn
Storm Overflow	168036	72191	25 Summerhill North					
Storm Overflow	168198	72201	26 Lower Glanmire Road					

CSO Structure location			CSO Cork City Co.Name	Storm Overflow /Outfall Location		EPA Storm Overflow Name	Receiving water/ Discharges to	Discharge Location
MANHOLE_	EASTING	NORTHING		EASTING	NORTHING			
Storm Overflow	168757	72339	27 Grattan Hill	168779	72116	S20	River Lee	River Lee Horgan's Quay
Storm Overflow	169274	72348	28 Beales Hill	169332	72302	S21	River Lee	River Lee Lr Glamire Rd at Ferry boat
Storm Overflow	170426	72362	29 Trafalgar Hill	170473	72263	S22	River Lee	River Lee off Lr Glanmire Rd, Port of Cork Millenium Garden
Storm Overflow	170729	72520	30 Silversprings Lane	170700	72265	S23	River Lee	River Lee Lr Glamire Rd Tivoli Ind estate
Storm Overflow	170282	71575	33 Park Ave	170275	72110	S24	River Lee	River Lee opposite Atlantic Pond
Storm Overflow	168842	71357	34 Springville blackrock road	168322	71868	S25	River Lee South Channel	Storm pipe discharging to Kennedy Quay at Junction Victoria Rd
Storm Overflow	168796	71087	35 Boreenmanna Road, (Ashton)					
Storm Overflow	168018	71230	37 Victoria Hospital	167915	71717	S26	River Lee South Channel	River Lee, South Channel,u/s Parnell Bridge, South Bank
Storm Overflow	167994	71150	38 Southern Road					
Storm Overflow	167871	71152	39 High Street					
Storm Overflow	167828	71144	40 Summerhill South					
Storm Overflow	167488	71361	41 Mary Street	167535	71537	S27	River Lee South Channel	Georges Quay d/s of Parliament Br.
Storm Overflow	167402	71396	42 Travers Street	167470	71546	S28	River Lee South Channel	Sullivans Quay u/s of Parliament Br.
Storm Overflow	167257	71462	43 Barrack street	167261	71523	S29	River Lee South Channel	Frenchs Quay /Proby's quay u/s South Gate Bridge
Storm Overflow	167182	71430	44 Keyser's Hill	167183	71501	S30	River Lee South Channel	Proby's Quay /Frenchs Quay at Probys Bridge
Storm Overflow	167071	71421	45 St Finbarr's Place					
Storm Overflow	166928	71428	46 Bishop street					
Storm Overflow	166412	71468	47 O'Donovan Rossa Road	166415	71482	S31	River Lee South Channel	River Lee South Channel d/s Donovans Bridge
Storm Overflow	165976	71297	48 Gaol Walk	165980	71327	S32	River Lee South Channel	River Lee u/s Gaol Bridge
Storm Overflow	164303	69533	49 woodbrook Gurrane Lane	164346	69421	S33	Glasheen River	Glasheen d/s of Road Culvert, Stratton Pines
Storm Overflow	163531	70038	50 Rossa Ave PS	163233	69984	same location as SD04	Curragheen river	Near Elton lawn/ Pitch & Putt
Storm Overflow	171228	70750	51 Skehard Rd	171677	69812	S34	Douglas Estuary	Douglas Estuary at Mahon Golf Club

CSO Structure location			CSO Cork City Co.Name	Storm Overflow /Outfall Location		EPA Storm Overflow Name	Receiving water/ Discharges to	Discharge Location
MANHOLE_	EASTING	NORTHING		EASTING	NORTHING			
Storm Overflow	165353	70793	52 Glasheen Bridge	165283	71154	S35	Curragheen river	Curraheen at Orchard Court
Storm Overflow	165278	70820	53 Dennehy's Cross					
Storm Overflow	165679	70442	54 Flannery's Pub	165591	70436	S36	Glasheen River	Glasheen d/s Glasheen Bridge on Glasheen Rd.
Storm Overflow	165801	70408	55 Glendale	165647	70387	S37	Glasheen River	Glasheen d/s Glendale Road Culvert (u/s Flannerys Pub) on Glasheen Rd.
Storm Overflow	165715	69796	56 Deanrock, Summerston Lane	165705	69790	S38	Glasheen River	River Glasheen, at footbridge to Deanrock Ave
Storm Overflow	166202	69371	58 South Ring road, Tramore rd	166288	69283	S39	Tramore River	Tramore river at Greenwood Estate, sports field
Storm Overflow	168917	70016	59 Rosebank	168667	69892	S40	Trabeg River	Trabeg River rear of Greenhills estate /landfill site
Storm Overflow	170005	69675	60 Riverbank, Douglas	170018	69669	S41	Douglas Estuary	Douglas River Culvert under South Ring Road(N25) to rear of house An Bruaic,Riverbank douglas
Storm Overflow	169881	70078	61 Douglas Hall Lawn	170037	70060	S42	Douglas Estuary	Douglas esturay, East of Douglas Hall Lawn
Storm Overflow	168831	73266	62 Sunview Place East	168818	73442	S43	Glen River	Glen River at Glen River Park, upper pond
Storm Overflow	171654	71626	64 Convent Road	171626	71862	S44	River Lee	East end of Marina at Blackrock Harbour
Storm Overflow	171748	71663	65 Convent Ave					
Storm Overflow	171568	71688	66 Ursuline Convent					
Storm Overflow	168164	70647	67 St Finbarr's Hospital	168133	70154	S45	Trabeg River	Trabeg River culvert, north of Pitch & Putt, landfill
Storm Overflow	167815	70193	68 Turner's Cross					
Storm Overflow	170473	69691	70 Rear Tesco Douglas	170473	69690	S46	Douglas Estuary	Storm Pipe to Douglas estuary,rear Tesco Douglas shopping centre
Storm Overflow	176782	70677	71 Carrigrennan WWTP	176683	69726	S48S Same location as Primary	Lough Mahon	South of Carrigrennan WWTP, Little Island Co.Cork
				176746	69736			
Storm Overflow	170727	71897	Atlantic Pond PS-PS01	170768	72079	S49W	River Lee	from Quay wall on Marina,North of Atlantic Pond P.S. 100m into River
			Atlantic Pond PS-PS01	170863	72054	S49E		
Storm Overflow	166623	71482	Gillabbey Pump Station overflow	166628	71487	same location as SD03	River Lee South Channel	Lee South Channel,South bank, Near weir, Gillabbey
Storm Overflow	167236	72097	Coal Quay PS -PS20	167273	72119	same location as SD20	River Lee North Channel	East of Shandon Bridge, south bank
Storm Overflow	167394	71580	Grand Parade PS-PS21	167386	71575	same location as SD21	River Lee South Channel	East of Nano Nagle Bridge, north Bank

4.2 Report on Progress made and proposals being developed to meet the improvement requirements

	Specified Improvement Programmes (under Schedule A and C of WWDL)	Licence Schedule (A or C)	Licence Completion Date	Date Expired? (N/NA/Y)	Status of Works	Comments	Licensee Timeframe for Completing the work
	Discharge to be discontinued						
1	SD02, St Patrick's Bridge	**A.3**	22-Dec-15	**N**	Planning Stage, Culvert Survey to be carried out	as per 4 below	22-Dec-15
	Improvement Programme for Primary Discharge						
2	Infiltration and Inflow Programme	**C.1**	22-Dec-15	**N**	In-house review underway, & Programme being drawn up		22-Dec-15
3	Improvement in operation of and a reduction in frequency of discharge via, CSO71 (S48N and S48S)	**C.1**	To be Agreed	**N/A**	Planning Stage	Part of Brief for WWTP upgrade, see 6 below	22-Dec-15
	Improvement Programme for Secondary discharge						
4	Cessation of Discharge from SD02	**C.2**				As per 1 above	
	Improvement Programme for Storm Water Overflows						
5	Meet requirements of DoEHLG "Procedures and criterai in relation to storm water overflows" 1995	C.3	22-Dec-15		In-house review Partially Completed, & Programme being drawn up		22-Dec-15
	Non Specified Improvements						
6	Upgrade of Treatment Plant to comply with Nutrient Removal Licence & UWWT Directive		01-Jan-11	**Y**	Funding for Planning stage approved, Procurement for consultant in train		22-Dec-15
7	Assesment of impact on shellfish & implementation of recommendations from same		Jun-11	**Y**	Planning Stage	Part of Brief for WWTP upgrade, see 6 above	22-Dec-15
8	Cessation of Discharges to Kiln River Culvert		To be Agreed	**N/A**	Planning Stage, Culvert Survey undertaken	Submission to be made to EPA	22-Dec-15
9	Docklands Sewerage Scheme			**N/A**	Delayed due to WSIP or Funding		
10	Tramore River Valley Study			**N/A**	Delayed due to WSIP or Funding	Relevant to C.1 & C.3, prioritised Important	
11	Glanmire/Riverstown/Little Island, Stormwater seperation Study			**N/A**	Delayed due to WSIP or Funding	Relevant to C.1 & C.3, prioritised Important	

2013 Update on Progress for Upgrade of WWTP			
Milestone	**Process**	**Date**	**Comment**
	2nd Stage Procurement Process Consultant Appointment		
1	Closing date for Tender Submission	**20th August 2013**	
2	**Appointment of Consultant**	**End September 2013**	Tentative
3	**Provision of Preliminary Report**	**End March 2014**	Last week of March 2014
	(Preparation Duration 6 months)		
4	**Detailed Design Work Complete**	**End September 2014**	**Options**
	(Duration 3 to 6 months)		a) Modify existing plant
			b) Modify existing plant and add on new Nutrient removal works
			c) Full add on solution
5	**Construction Start**	**March 2015**	
			Options for contract
	Duration 3 to 6 months		a) Traditional Contract
			b) Design Build
			c) Change of existing DBO
6	**Construction Complete / commissioned**	**September 2015**	
	Note:		
	Duration of works depends on solutions selected and contract method.		

5 Environmental Liability and Financial Provisions

5.1 Annual Statement on prevention of environmental damage

The Cork City Waste Water Treatment plant at Carrigrennan is operated by Northumbrian Water Projects Ltd on behalf of Consort Joint Venture on a twenty year contract. Full Performance Management Systems, independently certified to ISO 9001 and ISO 14001, are in place, with appropriate controls and monitoring for the operation, and maintenance of the plant and equipment. Carrigrennan WWTP is operated to the highest standards for secondary treatment of effluent and all environmental monitoring required by the licence is undertaken. Process monitoring is also undertaken and alarm and call-out systems are in place to address any accidents/incidents should they arise.

Atlantic Pond Pump Station and the Ballinure Header Chamber are the key items of infrastructure on the system apart from the Treatment Plant. They are operated and maintained under separate contract, and are under constant surveillance.

The City Council P&M department carry out maintenance of the older pump stations (pre Cork Main Drainage). The department operates a callout system for fitters and electricians. This call out system has been further enhanced with the upgrade of all the control panels which now includes a text alert system which is activated by alarm set points. The alarm texts are now directly issued to the P&M foreman.

The remaining pump stations, constructed more recently within the Cork Main Drainage projects are inspected regularly, up to twice weekly, depending on risk level attached to the installation, by City Council technicians. A maintenance programme is in place and service and repairs are carried out as required by contractors.

Pump replacement and refurbishment is an ongoing feature of the preventive maintenance carried out under both systems. This results in any pump station failures being mitigated.

Cork City Council operates and maintains the Drainage Network within the City. Regular inspection, repair and maintenance are carried out by the Drainage maintenance staff, who responds to all complaints that are received concerning the network operation. A specialist crew inspects and cleans all Combined Sewer Overflows on a fortnightly basis. Cork City Council also operates a call-out /emergency response system for out- of- hour's problems that arise.

Cork County Council via their Area Network Maintenance Divisions, operate and maintain the County Council Drainage Network which discharges to Carrigrennan WWTP.

5.2 Environmental Liabilities Risk Assessment

An Environmental Liability Risk Assessment & Statement of Measures for Cork City Agglomeration was prepared and submitted as part of the second AER Report for 2011. The following is the update for Statement of Measures 2012.

Table 4 Statement of Measures						
Risk I.D.	**Risk Score**	**Mitigation measure to be taken**	**Outcome**	**Action**	**Date for completion**	**Owner/Contact Person**
		WWTP				
1	5	Network Review, Operation of main Pump Stations contributing to inflows.	Improved management of flows	Pump Station by Pump Station review, to study trigger issues	Dec 2013 Ongoing Project	SEE Drainage: Cork City Co.
1B	5	Network Review, Comparison of inflows Vs Design at key locations.	Improved knowledge of mechanisms of infiltration	Inspection /Maintenance of all outfalls & Non Return Valves at overflows. Study to Identify catchments with most infiltration	Dec 2013 Ongoing Project	Cork City Council, Cork County Council
2A	5	Increased policing /monitoring of discharges into network to be carried out by LAs in agglomeration. Industrial sources to be contacted /warned.	Reduced Risk of high loads to WWTP /Hazardous substance release	Portable automatic effluent samplers purchased to monitor network, in particular Local flows.	Purchased Dec 2011	Cork Co. Co.
2B	9	Ditto	Ditto	Ditto	Ditto	Ditto
2C	3	Ditto	Ditto	Ditto	Ditto	Ditto
3	5	Operation of WWTP is by Experienced and Qualified staff under contract to Cork City Council. Monitor weather reports and take action accordingly in advance. Plant operation /contingency plans for possible event.	Improved readiness of operation. Reduction in risk of effluent quality decrease	Demonstrate measures in place	Ongoing	Plant Operator under contract to Cork City Council
4	1	Chloride Inflow levels monitored daily, Regular inspection and maintenenance of pipework and equipment for build up of Struvite.	No Spillages /groundwater contamination. Equipment replaced before breakdown /blockages occurr	Operation of WWTP is by Experienced and Qualified staff under contract to Cork City Council. Process Management Systems are in place to control and monitor operation of plant on a 24-hour basis.	Ongoing	Plant Operator under contract to Cork City Council
5A	5	Upgrade of WWTP required to incorporate Nutrient Removal. Ref WSIP programme (Note:Estuary designation upgraded to Sensitive Waters immediately prior to WWTP commissioning)	Final discharges compliant, within Emission Limit Values (ELV's), in particular UWWT .	Progress appointment of consultants for WWTP upgrade under WSIP. Return of Tenders from consultants due 20th August 2013.	Aug 2013 Ongoing Project	Cork City Council (lead) / Cork County Council
5B	2	Ditto	Reduced risk of groundwater contamination	Ditto	Ditto	Ditto
5C	6	Ditto	Potential impact on SPA and SAC reduced	Ditto	Ditto	Ditto

Risk I.D.	Risk Score	Mitigation measure to be taken	Outcome	Action	Date for completion	Owner/Contact Person
6	10	Ultraviolet treatment may not be necessary. Refer to submission on Shellfish assessment. Prevent unnexessary untreated overflows to Lee/Lough Mahon Estuary	Prevent deterioration of Water Quality in Estuary / increased possibility of contamination of Shellfish	Study/Review to be carried out as part of Upgrade of WWTP re. Nutrient Removal /Licence conditions. Regular Inspection and maintenance regimes for CSOs and Pump Stations in addition to WWTP process systems & equipment in particular in winter months.	N/A at this time	Cork City Council, Cork County Council, Plant Operator
7A	1	Operation of WWTP is by Experienced and Qualified staff under contract to Cork City Council. Process Management Systems are in place to control and monitor operation of plant on a 24-hour basis. ISO9001:2008 and ISO14001:2004	Reduced risk of non compliant discharges	Regular Inspections /Preventative maintenance / Rapid response to faults Regular review meetings. Ensure Standards and procedures are maintained in accordance with best practice.	Ongoing	Plant Operator / Cork City Council
7B	2	Ditto	Reduced risk of groundwater contamination	Ditto	Ongoing	Ditto
7C	1	Ditto	Potential impact on SPA and SAC reduced	Ditto	Ongoing	Ditto
7D	3	Ditto	Reduced risk of groundwater contamination	Ditto	Ongoing	Plant Operator / Cork City Council
8	2	Back up power supply at WWTP. This generator is tested and used regularly to shed power/energy load	Reduced risk of non compliant discharges	Maintain existing system of regular use of Generator / Train for response to power failure	In place	Plant Operator under contract to Cork City Council
9	6	Operation of WWTP is by Experienced and Qualified staff under contract to Cork City Council. Process Management Systems are in place to control and monitor operation of plant on a 24-hour basis. ISO9001:2008 and ISO14001:2004	Reduced risk of groundwater contamination	Emergency Plan & procedures to be reviewed and updated annually. Regular Inspections /Preventative maintenance / Rapid response to faults Regular review meetings. Ensure Standards and procedures are maintained in accordance with best practice.	In place	Plant Operator under contract to Cork City Council
10	4	Ditto	Reduced risk of groundwater contamination	Ditto	In place	Plant Operator under contract to Cork City Council
11	5	Ditto	Reduced Risk of smells causing nuisance	All complaints investigated thoroughly. Review of all actions/processes to uncover system failures	In place	Plant Operator under contract to Cork City Council
		SEWER NETWORK				
12A	8	Experienced , Qualified & Trained Staff (Contractors) manage this site in conjunction with Atlantic Pond PS 7 days a week.	Reduced liklihood of Malfunction /reduced risk of uncontrolled discharge/pollution to River lee & Estuary	Regular inspection and maintenance of equipment and systems, Rapid response. Regular review meetings, Ensure Standards and procedures are maintained in accordance with best practice.	Ongoing	Cork City Council / Contractor
12B	8	Prompt Shutdown of inflows to Header Chamber. Experienced , qualified & Trained Staff (Contractors) manage this site in conjunction with Atlantic Pond PS 7 days a week.	Reduced risk of groundwater contamination	Emergency Plan & procedures to be reviewed and updated annually	Dec 2013 Ongoing Project	Cork City Council / Contractor

Risk I.D.	Risk Score	Mitigation measure to be taken	Outcome	Action	Date for completion	Owner/Contact Person
13A	6	Regular inspection and maintenance of equipment and systems, Rapid response. Experienced , qualified & Trained Staff (Contractors) manage this site in conjunction with Header Chamber 7 days a week.	Reduced Risk of Discharges	Emergency Plan & procedures to be reviewed and updated annually.	Dec 2013 Ongoing Project	Cork City Council / Contractor
13B	2	Monitor Weather & Tides as part of Flood precautions		Ditto	Ongoing	Cork City Council / Contractor
14A	5	Monitor Weather & Tides as part of Flood precautions. Identify measures to protect vulnerable installations & put in place an action plan for same	Reduced Risk of damage to installation & resultant discharges to river /estuary	Review locations and vulnerability of each pump station and controls	Dec 2013 Ongoing Project	SEE Drainage: Cork City Co.
14B	8	Monitor Weather & Tides as part of Flood precautions. Identify measures to protect vulnerable installations & put in place an action plan for same	Reduced Risk of damage to installation & resultant discharges to minor rivers	Review locations and vulnerability of each pump station and controls	Dec 2013 Ongoing Project	SEE Drainage: Cork City Co.
15A	3	Experienced , Qualified & Trained Staff (CCC P& M, Drainage Staff, & Contractors) oversee Pump Stations. Servicing and repair/replacement of pumps and equipment prioritised in funding.	Reduced Risk of Discharges	Extension of electronic alarm system to all pump stations: Regular inspection and maintenance of equipment and systems, Rapid response by Staff to Calls.	Dec 2013 / Ongoing	SEE Drainage, Cork City Co. Drainage & P&M Sections Cork City Council
15B	8	Electrical Control Equipment on P&M PumpStations has been renewed recently and other Pump Stations were built /renewed relatively recently under the CMD contracts	Reduced Risk of Discharges	Regular inspection and maintenance of equipment and systems, Rapid response by Staff to Calls. An electronic alarm /SMS sytem is in place.	Ongoing	Drainage & P&M Sections Cork City Council
16A	3	Draw up emergency plan for Pump Stations detailing sump capacity and decant frequency, power requirements and sources of generators.	Reduced Risk of Discharges	Draw down /overpump sumps to aleviate problematic discharge where possible	Dec 2013	SEE Drainage, Cork City Co. Drainage & P&M Sections Cork City Council
16B	8	Ditto	Reduced Risk of Discharges	Draw down /overpump sumps to aleviate problematic discharge where possible	Dec 2013	SEE Drainage, Cork City Co. Drainage & P&M Sections Cork City Council

Risk I.D.	Risk Score	Mitigation measure to be taken	Outcome	Action	Date for completion	Owner/Contact Person
17A	5	Regular Inspection and cleaning regime in place by Specialist Drainage Crew	Reduced Risk of Discharges	Review of CSO's operation to take place as part of WWDL to identify remediation measures	Dec 2013	SEE Drainage: Cork City Co.
17B	8	Regular Inspection and cleaning regime in place by Specialist Drainage Crew	Reduced Risk of Discharges	Review of CSO's operation to take place as part of WWDL to identify remediation measures	Dec 2013	SEE Drainage: Cork City Co.
18A	15	Diversion of foul flows from St Patrick Street Culvert	Elimination/reduction in discharges	Contract to be put in place to carry out work	Dec 2013	SEE Drainage: Cork City Co.
18B	10	Connection of drains to Sewer Network	Elimination of discharges	Contract to be put in place to carry out work	Dec 2013	SEE Drainage: Cork City Co.
18C	5	Complaints system and Call Out system in place: Response by Drainage Staff, Maintenace crews	Reduced Risk of Discharges	Rapid response & repair	Ongoing	Drainage Section Cork City Council
18D	5	Complaints system and Call Out system in place: Response by Drainage Staff, Maintenace crews	Reduced Risk of Discharges	Rapid response & repair	Ongoing	Drainage Section Cork City Council
18E	5	Sewer Surveys & Inspections of Sewers to located discharges.	Reduction in number of discharges	Investigate complaints with enforcement proceedings taken where necessary	Resouces limited, ongoing	Drainage & Enforcement Sections Cork City Council
		Statement				
		I confirm the above are the measures which will be taken by the Local Authority in 2013				
		Signed:				
		Name E. WALSH		Date 18-09-13		
		The appropriate Officer should sign the Programme of Measures				

5.3 Details of Financial Provision/Insurance

Cork City Council does not hold a specific Environmental Liability Insurance policy but the standard insurance policy held from Irish Public Bodies Mutual/ACE Europe includes cover where legal liability attaches to Cork City Council as follows:

Products Liability and Sudden/ Unforeseen Pollution as defined in policy -€13m any one event/any one period. Also increased to €25m any one event /any one period by way of excess layer.

The terms of the WWTP contract include provision of insurances, and, in addition, a Performance Bond of €3m for the satisfactory execution of duties under the contract. The insurance held by Northumbrian Water includes cover as follows

Products / Pollution Liability -€15m any one accident/ in the aggregate.

(Pollution is defined as sudden, accidental and unintended pollution)

Part copies of letters confirming insurance of Cork City Council and Northumbrian Water are attached. Both entities use Marsh as brokers.

MARSH

CONFIRMATION OF INSURANCE – CORK CITY COUNCIL

As requested by you, we are writing to confirm that we act as your Insurance Broker and that we have arranged insurances on your behalf as detailed below. A copy of this letter may be provided by you to third parties who have a legitimate need to receive confirmation of your insurance cover.

TYPE OF INSURANCE	Employers and Public Liability Insurance
INSURER:	Irish Public Bodies Mutual / ACE Europe
POLICY NUMBER:	*CBL 110*
PERIOD OF INSURANCE:	*1ST June 2011 – 31st May 2012*

MARSH

CONFIRMATION OF INSURANCE – Northumbrian Water Projects Limited
Carrigrennan Waste Water Treatment Plant

TYPE OF INSURANCE	Employers, Public and Products Liability Insurance
INSURER:	Chubb Insurance Company
POLICY NUMBER:	35911521
BUSINESS DESCRIPTION:	Operation and Maintenance of Waste Water Treatment Plant and Associated Treatment Plant/Pumping Stations/Sewers
PERIOD OF INSURANCE:	01 April 2011 – 31 March 2012

MARSH

6 Licence Specific Reports

6.1 Priority Substances Assessment

Screening of the WWTP primary discharge effluent for organic compounds and metals (Priority Substances) is conditioned to be carried out within twelve months of the date of grant of licence, i.e. by 17th Dec 2010.

The Environmental Protection Agency undertook an Effluent Characterisation with consultants Mott MacDonald Ireland Ltd, and 88 pollutants, (including all the priority substances) were monitored on a quarterly basis at 11 WWTPs around Ireland, including Cork City WWTP. This study's objective was to determine which pollutants are likely to be found in Irish WWTPs and also to refine the UWW Calculation Tool for PRTR reporting purposes.

It was agreed with the EPA that Cork City did not have to carry out further sample testing for the Priority Substances, i.e. Organic Compounds and Metals, as this testing was included in the Effluent Characterisation monitoring for Cork City WWTP.

The final report for this WWTP Characterisation was produced in July 2012.

A summary of the findings of the report with relevance to Carrigrennan WWTP is attached in this AER Report 2012 as **Appendix 1: Priority Substances**

6.2 Drinking water Abstraction Point Risk Assessment

This is not applicable to Cork City Council Agglomeration: D0033-01

6.3 Shellfish Impact Assessment

A submission has been made to the EPA with respect to compliance with this conditions 5.6 and 5.7 of the WWD licence, D0033-01.

This submission is attached as **Appendix 2: Shellfish Assessment**

6.4 Toxicity of Final Waste Water Effluent

A full Toxicity report was included as part of the second AER Report 2011

6.5 Toxicity of the Final Effluent Report

This is not applicable to Cork City Council Agglomeration: D0033-01

6.6 Pearl Mussel Measures Report

This is not applicable to Cork City Council Agglomeration: D0033-01

6.7 Habitats Impact Report

This is not applicable to Cork City Council Agglomeration: D0033-01

7. Certification and Sign off

Does the AER include an executive summary	YES
Does the AER include an assessment of the performance of the Waste Water Works (i.e. have the results of assessments been interpreted against WWDL requirements and/or Environmental Quality Standards)?	YES
Is there a need to advise the EPA for consideration of a technical amendment /review of the licence?	No
List reason e.g. additional SWO identified	
Is there a need to requst/ advise the EPA of any modifications to the existing WWDL?	YES
Refer to condition 1.7 (changes to works/discharges) & Condition 4 (Changes to monitoring requirements)	Condition 4: Request change of Monitoring Location
Have these processes commenced? (i.e. Request for Technical Amendment / Licence Review /Change request)	No
Are all outstanding reports and assessments from previous AERs included as an appendix to this AER?	No
List Outstanding reports	CSO Report

Approval

As per condition 6.12 of Discharge Licence D0033-01, I certify the above report is true and accurate.

Prepared by: Anne Hennessy
Senior Exec. Engineer
Water Services (Drainage)

Reviewed by: Eamonn Walsh
Senior Engineer
Water Services (Drainage)

Approved by: J O'Donovan
Director of Service

Appendix 1

Priority Substances Assessment

Cork City, D0033-01 WWD Licence Condition no.4.12

A representative sample of effluent from the primary discharge point shall be screened for the presence of organic compounds and metals within twelve months of the date of grant of this licence. The list of parameters for analysis shall include, as a minimum, those organic compounds and metals identified as relevant having regard to the Water Policy Regulations 2003 and amendments (S.I. No. 722 of 2003 and amendments) and any other relevant legislation. Such screening shall be repeated at intervals as requested by the Agency thereafter.

Effluent Characterisation Study

Background

The European Communities (European Pollutant Release and Transfer Register) Regulations 2007 came into operation on 22 March 2007 giving effect to Regulation (EC) No 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register (E-PRTR).

The E-PRTR is an inventory of pollutants of concern which are released from specified activities (through routine discharge, accidental, fugitive and non-routine discharges) to air, water and soil, and transferred offsite for treatment or disposal.

The EPA is the competent authority in Ireland for reporting PRTR data to Europe. The EPA is therefore responsible for gathering all PRTR data from the relevant EPA-licensed facilities and for carrying out a quality check of the reported data before it is submitted to Europe.

EPA-licenced facilities are required to submit an Annual Environmental Report (AER) each year which must set out the environmental performance of the activity. This must include PRTR emission data. The monitoring of PRTR pollutants may not be prescribed as a licence condition and measured data may therefore not be available in all cases. In such circumstances either a *Calculated* or an *Estimated* emission value must be reported.

Emission values may be *Calculated* using national or international emission models which have been approved for use by the EPA. In order to assist in deriving an *Estimated* emission value, the EPA developed sector-specific excel-based Estimation tools. The Estimation tools provide facility operators with a means of estimating releases of PRTR substances to air, water and land using best available scientific knowledge and expertise.

Mott MacDonald Ireland Ltd. was appointed by the EPA in May 2011 to assess the WWTP specific excel-based Estimation tool, Version 4.0, and to broaden its applicability to a wider mix of treatment plant agglomerations. Version 4.0 was based on emission coefficients developed using two sets of analytical data, both relating to characterisation of effluents from Dublin City Council's Ringsend WWTP. Mass loads were calculated from the data generated in these studies and annual concentrations were estimated using flow weighted averaging. This version of the model was considered to be an adequate starting point for AER/PRTR reporting purposes however the EPA decided to carry out a further effluent characterization exercise at additional UWWTPs to broaden the applicability of the model and in particular address a wider combination of urban and industrial pressures than the current version of the tool.

The main objective of the effluent Characterisation study was to redefine the model by capturing data from 11 UWWTPs of varying agglomeration capacities and with different domestic and industrial inputs than the Version 4.0 toolset. The revised PRTR Estimation model would provide a more representative estimation of PRTR pollutants and priority substances for reporting purposes.

The EPA identified eleven waste water treatment plants which were be targeted for quarterly sampling, i.e. 4 rounds of sampling was carried out. Cork City, WWTP at Carrigrennan, was included in the study.

Priority Substance Assessment

The results of sampling from this study form the basis of the Priority Substances Assessment as required for Cork City, D0033-01 WWD Licence Condition no.4.12

A representative sample of effluent from the primary discharge point shall be screened for the presence of organic compounds and metals within twelve months of the date of grant of this licence. The list of parameters for analysis shall include, as a minimum, those organic compounds and metals identified as relevant having regard to the Water Policy Regulations 2003 and amendments (S.I. No. 722 of 2003 and amendments) and any other relevant legislation. Such screening shall be repeated at intervals as requested by the Agency thereafter.

The relevant details for the Cork City Agglomeration, informing the Priority Substances Assessment under the Effluent Characterization Study are as follows:

2011 Population Equivalent:	302,842 PE i.e. >100,000 PE
Domestic/ Non Domestic contribution	47% / 53%
Type of Collection system:	37% combined, 31% Foul, 30% Storm & 2% Rising mains
Level & Type of Treatment:	Secondary Treatment only
Location:	Catchment, Coastal

The presence of PRTR substances in an effluent discharge from a waste water treatment plant was found to be broadly dependant on these factors as follows:

1. **Activities in the Catchment**

_ Population Equivalent (PE) – PE is a representation of the total load to the waste water treatment based on BOD loading. The pollution load to the treatment plant is influenced by the population living in the catchment and the level of commercial and industrial activity in the catchment. A greater prevalence and diversity of PRTR pollutants would be expected in urban catchments as they are more densely populated and generally contain a larger number and greater variety of industrial and commercial activities.
_ Domestic / Non-Domestic Contribution – Plants with a greater non domestic contribution are expected to have a broader range of PRTR substances in their effluent than those with lower numbers of commercial and industrial activities in their catchment.
_ Water Supply – The constituents of a water supply are source specific where PRTR substances are present these may be measured in the waste water treatment plant serving the catchment.

2. **Type of collection system** feeding the treatment works (i.e. combined or separate foul). Storm water runoff can contain higher levels of certain PRTR substances but can also have the effect of diluting the concentration of other substances.

3. **Level and type of treatment** at the plant will influence the removal efficiencies within the plant and therefore the final effluent constituents.

4. Whether the treatment plant is **located coastally or inland** can influence the concentration of certain parameters. Coastally located plants subject to saline intrusion will have higher concentrations of parameters that are found in sea water

Activities in the Catchment

Population Equivalent (PE) Of the waste water treatment plants included in this study, only four had a PE of greater than 50,000 including *Carrigrennan.*

Direct inputs of PRTR substances to a waste water treatment facility occur from three principal sources from within the catchment: domestic discharges, commercial discharges, and industrial discharges.

Major **domestic sources** of PRTR pollutants include faeces (which contain metals and pharmaceutical residues), sanitation waste water (which include chemicals in body care and makeup products, chemicals in cleaning products and detergents and also the chemicals which are inherent to the water supply). Other domestic sources include the release of liquid wastes into the drain which may include paints, gardening products etc. The plumbing system will also influence certain metal concentrations in the waste water and is influenced by water hardness.

Commercial sources include discharges from small businesses which may include dry cleaners, dentists,petrol stations, hairdressers, hospitals, bus/train stations, golf courses, and education facilities e.g.universities. The majority of these commercial activities are sub-threshold to the First Schedule of the Protection of the Environment Act, 2003 and therefore do not require an IPPC licence. These facilities should however be licenced under Section 16 of the Local Government (Water Pollution) Act, 1977 where they are discharging a trade effluent to sewer.

Many **industrial activities** use PRTR substances as part of their production activities. The PRTR
contribution to a waste water treatment plant is catchment specific as it is dependant on the type of industrial activities (amongst others) within the catchment. Industrial activities are licensable by IPPC and Waste licence. Some PRTR substances are common to many different types of industry and it is difficult therefore to attribute the presence of a substance to a particular industry.

It cannot however be concluded with certainty that where a substance is not seen in the effluent at a treatment plant that it is not being produced in the catchment, as the type and level of treatment at a treatment plant will influence PRTR substances in the effluent. Regard must therefore also be had to the influent monitoring carried out under this study to reaffirm or otherwise any correlation identified between population equivalent and concentration in the effluent.

Summary of Results of Effluent Characterisation Study

(Carrigrennan Priority Substances Assessment)

General Parameters

(Table of results for Carrigrennan attached)

The General Parameters (with the exception of cyanide) are ubiquitous in Irish wastewaters and in almost all cases were measured above the LOD.

Cyanide was detected in the effluent of Carrigrennan WWTP in Round 1 and 3. **Cyanides** were detected in the effluent of the Carrigrennan and a small number of other WWTP only.

Total Nitrogen concentrations in the influent of samples taken in Round 1 were generally higher than those for Rounds 2, 3 and 4. Influent concentrations for **Total Phosphorus** were low at a number of plants. Total Nitrogen and Total Phosphorus concentrations in the effluents were lower in the WWTPs that had nutrient reduction as part of the treatment process. Carrigrennan does not have nutrient removal and exceeds the licence limits for Total Nitrogen, while complying with annual mean ELV Licence limits for total Phosphorus.
No direct correlation between PE and the occurrance and concentration of **nutrients** in the effluent could be determined with the exception of **Total Phosphorus** which was slightly higher in the effluent of plants with >50,000 PE. Influent concentrations were not however higher in these plants. The plants with >50,000PE do not provide phosphorus removal and it is therefore more likely a feature of the level of treatment rather than PE.

There was significant variation in influent **TOC** concentrations between sampling rounds, most plants had lowest TOC concentrations in Round 2, and this may be as a result of rainfall prior to sampling. However effluent TOC concentrations were less variable over the rounds, which indicate good consistent TOC removal rates at the WWTPs. Carrigrennan exhibited approx 75% removal rates on the samples taken.

Chlorides and **conductivity** were detected in higher concentrations in influent and effluent samples from coastal WWTPs including Carrigrennan, which was expected due to location and saline intrusion. These Plants are coincidentally those with a PE of >50,000.

Fluorides mostly exist in wastewater samples due to the fluoridation of water supplies and are a function also of catchment activities. Fluoridation of public water supplies is a regulatory requirement, under the Fluoridation of Water Supplies Regulations, 2007 and the amount of fluoride which may be added to the public water supplies shall be such that the water, after the addition of fluoride, the minimum concentration of fluoride is 0.6 mg/l with a maximum concentration of 0.8 mg/l. Generally, slightly higher concentrations were recorded in the influent and effluent of treatment plants >50,000 PE. The average effluent concentration in plants >50,000 PE was 0.55mg/l as opposed to 0.19 mg/l for plants less than 50,000 PE. Carrigrennan concentrations varied from 0.41 to

0.6 mg/l. The fluoride concentrations in the influent to the treatment plants will be influenced by the extent of leakage of mains water to the sewer. Note that interference by carbonate ions in the analysis, due to saline intrusion in the catchment, was considered and expected not to be the cause of higher fluoride concentrations as the samples are buffered using a reagent to compensate for interference.

Total Hardness is normally a function of the geology of the area and hence reflected in the water composition. Carrigrennan reported the highest Total Hardness over the 4 rounds of testing, although lower concentrations were detected in Round 4. High Total Hardness may be linked to specific industries with water softeners e.g. Commercial Laundries, Pharmaceuticals etc. It is likely that the concentrations detected are related to the saline intrusion in the catchment (total hardness of seawater is in the region of 6630mg/l CaCO3).

The **pH** ranges at the WWTPs are typical of that necessary to support the aerobic biological treatment processes employed at the WWTPs.

Metals

Arsenic & Boron concentrations were highest in effluent from Carrigrennan compared to other WWTPs in the study. There were no other notable differences in Metal concentrations between Carrigrennan and the other WWTPs.

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Boron is likely to be ubiquitous in wastewater due to its use in soaps and detergents. The European Communities (Drinking Water) Regulations, 2000 set a concentration of 1mg/l for Boron, all samples are below this concentration. Boron is present in seawater at concentrations of 5mg/l which is reflected in higher influent and effluent samples from the 4 coastal WWTPs which coincidentally also happen to be the WWTP with PE>50,000, including Carrigrennan. Boron Levels at Carrigrennan were in the order of 0.4 to 0.8 mg/l.

Arsenic was generally more prevalent in the effluent of waste water treatment plants >50,000PE.
Concentrations were also generally higher in both the influent and effluent. An average effluent
concentration of 0.002mg/l was recorded at plants >50,000PE whereas an average concentration of 0.0003mg/l and 0.0005mg/l was recorded at 10,000 to 50,000 PE and 2,000 to 10,000 PE plants respectively. Carrigrennan recorded concentration of 0.007mg/l in round 1. The higher concentrations in the influent of plants >50,000PE may be a function of industrial activity. It is of note however that the larger plants are located coastally. Arsenic in sea water is typically in the range of 0.001mg/l to 0.005mg/l. The average influent concentration of plants >50,000PE was 0.002mg/l. It is likely that the higher concentrations are due to saline intrusion in the catchment.

Zinc and Barium had the highest number of detections, measured in all influent and effluent samples (Rounds 1 to 4) above the LOD. Zinc levels for Carrigrennan were

comparable to other WWTPs with influent concentration levels considerably less than Portarlington and Mitchelstown.
Barium was ubiquitous to all effluent discharges. Lower concentrations were noted in plants within the 2,000 to 10,000 PE band, with an average concentration of 12.47µg/l as opposed to an average of 22.98 µg/l for plants >50,000 PE. Carrigrennan had levels of 17 to 28 µg/l in effluent.
Vanadium was also detected in a high number of samples, detected in 30 of 44 influent samples and 32 of 44 effluent samples, including Carrigrennan.
Nickel was detected above the LOD in 37 of 44 influent samples and 30 of 44 effluent samples including Carrigrennan in both cases.

Copper was detected in 34 of 44 influent samples and 24 of 44 effluent samples. **Copper, nickel, zinc, vanadium** were recorded across all PE bands. No obvious correlation to the PE bands was discernible.
Molybdenum was recorded above the LOD in the effluent of >50,000 PE plants only. Influent samples showed the same general trend. Metal analysis for Round 3 provided a number of questionable results; most notably Molybdenum was detected at very high concentrations in all effluent and influent samples including Carrigrennan, where it was found to be 48 µg/l vs other highest level of 3 µg/l. The decision was taken to exclude all Round 3 metal results from the study for the purpose of developing the Tool.
Lead was detected in 32 of 44 influent samples and 26 of 44 effluent samples with much less detection above the LOD in Round 2 and Round 3. **Lead** was more prevalent in the effluent of plants 2,000 to 10,000 PE however average concentrations were only slightly higher at 4.69µg/l as opposed to an average of 2.02µg/l and 2.73µg/l for plants 2,000 to 10,000 PE, and >50,000 PE respectively. Carrigrennan concentrations in effluent were recorded as <5 µg/l
Selenium, Antimony and Cobalt, were detected in fewer influent and effluent samples, no trend was noted with regard to seasonal variation. **Selenium** was only found in the effluent of treatment plants of >50,000 PE. **Tin** was present in higher concentrations in the effluent of treatment plants >50,000PE.
Chromium, cobalt, tin and antimony were recorded above the LOD at only a small number of samples but were ubiquitous to all PE bands. No obvious correlation to the PE bands was discernible.
Mercury was detected above the LOD in 10 influent samples, again no seasonal trend was identified. **Mercury** was not measured above in the LOD in any effluent sample.
Cadmium was found in the effluent of treatment plants across all PE bands but was recorded at slightly higher concentrations in plants in the 2,000 to 10,000 PE band. Carrigrennan recorded low concentrations.

Metal detection above the LOD in Round 2 was significantly lower than for the other rounds of sampling. It is considered that the low concentrations may be attributable to the storm conditions experienced immediately before and during the sampling.

Pesticides

The use of many pesticides in Europe has been banned progressively since the 1980's. The effects of the ban are evident in the results of sample analysis at the eleven waste

water treatment plants. The following parameters, for which a ban exists, were not detected above the LOD in any influent or effluent sample: Alachlor, Aldrin, Endrin, Heptachlor, Chlordane, Isodrin, DDT, Trifluralin, Hexachlorobenzene (HCB),Chlorfenvinphos, Chlordecone, Hexachlorobutadiene (HCBD). A ban on the use of Dieldrin, Mirex and Endosulphan also exists, however these parameters were recorded at low concentrations in a very small number of influent samples. They are persistent in nature and may therefore exist in the environment long beyond the cessation of their use.
None of these pesticides were detected above the LOD in any influent or effluent sample at Carrigrennan.

Triazine Herbicides, Substituted Ureas, Organotin Compounds and Acid Herbicides

Restrictions for the protection of the environment are in place across Europe regarding the application of certain herbicides. The effects of the restrictions on use can be seen in the analytical results. The use of **Atrazine** and **Simazine** is restricted in Ireland. They were detected in only a small number of samples. Their usage is seasonal and associated with agricultural / horticultural activities. They were also used historically for the maintenance of road verges.
Substituted Ureas usage is restricted in Ireland**. Linuron** was not detected in any influent or effluent sample with **Isoproturon** only detected in one effluent sample in Round 3 (Dundalk). **Diuron** was only detected in the Newcastle West treatment plant (in Round 2 and Round 4). No correlation with PE band could be established.
Organotins were not recorded above the LOD in any of the influent or effluent samples. This is reflective of the restriction on their use in Ireland.

Acid herbicides are used widely throughout Ireland in agricultural and grassland maintenance in both rural and urban environments. Their presence is across all PE bands. Herbicide concentration recorded at Newcastle West in Round 4 was high. This may be attributed to runoff from the catchment due to the heavy rainfall experienced in the area on the day of sampling.
Concentrations of **Glyphosate** were highest in Round 1. This is as expected due to seasonal usage. Note that the LOD (i.e. 5 ug/l) for the effluent samples was raised in Round 3 due to chromatographic interference; it is not therefore possible to draw any conclusions from Round 3 results as all were below the LOD. Slightly higher concentration were detected in the influent of WWTPS >50,000PE which may be reflective of its use for the maintenance of roadside vegetation. Carrigrennan had concentration levels of 11.5 ug/l, above the LOD, in the influent for Round 1 but corresponding effluent concentration was 1.05 ug/l.
Mecoprop appears to have widespread usage throughout the year, with samples measured above the LOD in 10 of the 11 WWTPs sampled over Rounds 1 to 4, including Carrigrennan. Highest concentrations were detected in Rounds 2 and 4 at Newcastle West and Ballinalsoe.
MCPA and **2,4-D** were also detected in a number of WWTPs including Carrigrennan in both instances. MCPA was not detected in Round 2 effluent samples and at only 1 WWTP in Round 3. MCPA and 2,4-D are typically applied in Spring/Summer between May and June. This correlates with the higher concentrations recorded in Rounds 1 and 4.

PAHs

Polycyclic aromatic hydrocarbons (PAHs) arise from incomplete combustion or pyrolysis of organic substances such as wood, carbon or mineral, they may also be utilised in the manufacture of pharmaceuticals, pesticides and dyes, and as such are likely to be present in wastewaters. Note that influent monitoring was undertaken in Round 1 and 2 only.
Results of PAH analysis show that there is a higher frequency of occurrence and a higher concentration of PAHs in the influent samples taken from the larger waste water treatment plants i.e. those with a >50,000 PE. PAHs are associated with industrial activity and road runoff which tend to be more intense in urban settings. There are high removal efficiencies for PAHs using activated sludge as can be seen by the low effluent concentrations.

All PAHs tested were measured above the LOD in at least one influent sample in Round 1, with **Total PAH, Anthracene, Naphthalene** and **Fluoranthene** the only PAHs detected above the LOD in influent samples in Round 2. The effluent samples had fewer numbers of parameters and samples detected above the LOD. **Total PAH** in Carrigrennan influent was above LOD at 0.21 ug/l for round 1 and <0.10 ug/l for round 2 whereas **Naphthalene** was recorded at 0.149 in Carrigrennan influent Round 1 and <0.10 ug/l for round 2.
Parameters such as Total PAHs, Indeno[1,2,3-c-d]pyrene, Benzo[g,h,i]perylene, Anthracene, Naphthalene and Fluoranthene have reported high removal rates (70-90%) in activated sludge plants, which may account for fewer measured samples above the LOD in the effluent. This would explain why levels of both parameters in effluent at Carrigrennan were below the reporting limits, 0.01 ug/l. The maximum effluent concentration of 0.113 µg/l was recorded in the Athlone WWTP in Round 4.

PCBs- Pesticides and Others

PCBs were not measured above the LOD in any samples; this may be as they have been withdrawn from use.
Tetrachloromethane was not detected. Tetrachloromethane was commonly used as a dry-cleaning agent, a degreasing agent, a fire extinguishant and a pesticide, these uses are now banned. Tetrachloromethane is from industrial spillages and from landfill sites where waste containing TCM has been buried. Releases of TCM rapidly evaporate into the air. While Tetrachloromethane may be present in landfill leachate, it was not measured at any of the WWTPs which receive landfill leachate, including Carrigrennan.

Tetrachloroethylene and **Dichloromethane** were measured above the LOD in a small number of samples both in the influent and effluent (Rounds 2 and 3).
Dichloromethane was measured above the LOD at only two WWTPs, namely Carrigrennan and Waterford WWTP in Rounds 2 and 3, with a maximum concentration of 14.7µg/l (Round 3 influent Carrigrennan). The main uses of dichloromethane are in paint removers, aerosol solvents, in the manufacture of certain pharmaceuticals, and as a degreasing agent in the electronics industries. The corresponding effluent concentration in Carrigrennan in Round 3 was 2 µg/l. This may be associated with industrial discharges in these catchments.
Trichloroethylene, Vinyl Chloride and **1,2-dichloroethane** were not measured above the LOD in any samples, they may be utilised in the production of solvents, degreasers,

plastics, however they appear not be present in Irish wastewaters at levels currently measurable.

SVOCs

The parameters which were detected above the LOD in the influent samples (Rounds 1 and 2) included:

_ **Benzene**
_ **Toluene**
_ **Xylene**
_ **Ethyl benzene**
_ **Di(2-ethylhexyl)phthalate**

Many of these parameters were not measured above the LOD with the same frequency in effluent samples, this may be due to high volatility and high removal rates in WWTPs of these parameters. There was a greater frequency of detection in Round 3. **Benzene, Ethyl benzene** and **toluene** were present in the influent, highest concentrations recorded at Dundalk and Blarney, but were also recorded above LOD at Carrigrennan .

2,6-Dichlorobenzamide was not measured in the influent samples above the LOD, although was detected in the effluent of 3 WWTPs in Round 3 and 10 WWTPs in Round 4 with a maximum concentration of 0.25 µg/l at Dundalk and 0.14 µg/l at Carrigrennan. **Dichlobenil** of which 2,6-Dichlorobenzamide is a metabolite was detected in the majority of WWTPs, however the LODs achievable for Dichlobenil (<0.002 µg/l) are significantly lower than those achievable for 2,6-Dichlorobenzamide (<0.06 µg/l). Whilst there is a difference in the achievable LODs, it may be deduced that the metabolite of Dichlobenil is likely to be present in effluents from Irish WWTPs.

Di(2-ethylhexyl)phthalate (DEHP) was measured in almost all (21 of 22) influent samples. This was anticipated due to its use as an additive to plastics. The LOD for the effluent was raised in Round 1 (<1.0 µg/l), with only one sample above the LOD, i.e. 1.2 µg/l (at Mitchelstown),. the required LOD was achieved in Rounds 2, 3, and 4 which reported all samples above the LOD in the range of 0.07 to 3 µg/l. Carrigrennan was at a level of 1.11 µg/l in Round 3 effluent. In most cases effluent concentrations Round 3 and 4 were higher than those in Round 2.

Toluene was measured in the influent ranging from 0.17 to 270 µg/l with highest concentrations recorded in Carrigrennan. High removal efficiencies are however achieved for SVOCs and these high concentrations are not reflected in the effluent sampling.

The following parameters were not detected above the LOD in any effluent sample: **Trichlorobenzenes (TCBs)** (all isomers), **Pentachlorophenol (PCP), Pentachlorobenzene, Hexabromocyclododecane (HBCD), Toxaphene, Hexabromobiphenyl**. SVOCs were detected across all PE bands.

Phenols, Organic Fluorochemicals, and Polybrominated diphenylethers.

Total Phenols (sum of phenol and 8 simple substituted phenols) were measured above the LOD in most influents; highest frequency of detection was reported in Round 1. Total Phenols concentrations in the influent were generally highest in Round 1, where concentrations ranged from 2.288 to 212.695 µg/l (as C), the highest concentration was reported in Carrigrennan, which also reported higher than average influent concentrations in Rounds 2 and 3. Only nine effluent samples were recorded a concentration above the

LOD. Concentrations in the influent of the Carrigrennan treatment plant were several orders of magnitude higher than that recorded in the other plants in Rounds 1 and 3 and are understood to be associated with local industry.

Nonylphenol and Nonylphenol ethoxylates (NPEs) were measured above the LOD in Carrigrennan influent and effluent at 9.8 and 3.65µg/l, respectively in Round 2. However, the LODs for NPEs were raised in Round 3 due to matrix interferences.

Polybrominated diphenylethers were not observed above the LOD in the influent or effluent samples of any of the eleven treatment plants.

Conclusions

Sampling results for Priority Substances confirm the influence of the factors outlined above on the influent from the Agglomeration and the effluent from the WWTP.

Coastal location and seawater infiltration into the network, as exhibited by increased hydraulic loadings above design levels, and as shown by the levels of chlorides in samples, also explains elevated levels of Boron, Total Hardness and Arsenic found in the wastewater.

The level of fluoride in the water is related to the fluoridation of water and is generally higher where there is a higher **population equivalent**. Fluoride concentrations in the influent to the treatment plants will also be influenced by the extent of leakage of mains water to the sewer, reflected in an older urban agglomeration. Both of these are relevant to Cork City.

Industrial discharges and local industries, including pharmaceuticals, influence and are possible causes for high levels of Arsenic and Dichloromethane, and, in addition SVOCs, in particular Toluene and DEHP, as well as Phenols in the wastewater.

Secondary / Activated Sludge treatment of the effluent contributes to the elimination of PAHs and SVOCs in the effluent. Carrigrennan does not have nutrient removal treatment, hence explaining the levels of Total Phosphorus & Total Nitrogen in particular in the effluent.

Legislation banning the use of certain substances appears to have had a major influence on their occurrence / non occurrence, indicating substantial compliance with the legislation.

EPA Effluent Characterisation Study June 2011 to September 2012

*Round 1 sampling: 19th – 21st July 2011
*Round 2 sampling: 24th October - 2nd November 2011
*Round 3 sampling: 23rd – 25th January 2012
*Round 4 sampling: 16th – 19th April 2012

					>100,000 pe Secondary							
					Carrigrennan Inlet				Carrigrennan Outlet			
Parameter No	Determinands	Group	Proposed LOD (source: EPA)	Reporting Limit (source: STL)	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
1	Total nitrogen (as N)	General Parameters	0.9 mg/l	0.9 mg/l	28	16.8	16.1	24.3	17.5	17	12.8	20.8
2	Total phosphorus (as P)	General Parameters	0.02 mg/l	0.019 mg/l	3.6	4.2	3.04	3.9	2.21	1.58	2.64	4.4
3	Total organic carbon	General Parameters	0.7 mg/l	0.7 mg/l	40.4	13.5	51	70.7	9.1	7.59	8.8	12.3
4	Chlorides (as total Cl)	General Parameters	0.9 mg/l	0.9 mg/l	2680	2350	2430	1340	2660	1710	2040	1610
5	Cyanides (as total CN)	General Parameters	0.01 mg/l	0.009 mg/l	<0.009	<0.009	<0.009	<0.009	0.022	<0.009	0.016	<0.009
6	Fluorides (as total F)	General Parameters	0.2 mg/l	0.2 mg/l	0.6	0.4	0.5	0.5	0.6	0.41	0.5	0.6
7	Conductivity (uS/cm)	General Parameters	30 uS/cm	30 uS/cm	7730	6970	7350	4220	7790	5300	6320	5000
8	Total Hardness (mg/l CaCO3)	General Parameters	2.0 mg/l	2.0 mg/l	944	868	886	515	984	638	776	559
9	pH	General Parameters	na	na	7.1	7.1	7.2	7.1	7.6	7.4	7.6	7.6
10	Arsenic and compounds (as As)	Metals	0.001 mg/l	0.0014 mg/l	0.007	<0.0014	<0.0014	0.00008	0.0069	<0.0014	<0.0014	0.00008
11	Cadmium and compounds (as Cd)	Metals	0.6 µg/l	0.6 µg/l	<0.6	0.8	<0.6	0.21	<0.6	<0.6	<0.6	0.06
12	Chromium and compounds (as Cr)	Metals	0.7 µg/l	0.7 µg/l	1.5	<2	1.9	3.2	<0.7	<2	1.2	0.5
13	Copper and compounds (as Cu)	Metals	1.0 µg/l	1.0 µg/l	20	<1	40	33.1	9	<1	8	69.2
14	Mercury and compounds (as Hg)	Metals	0.1 µg/l	0.1 µg/l	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1
15	Nickel and compounds (as Ni)	Metals	2.0 µg/l	2.0 µg/l	10	<2	6	5.9	4	<2	4	4.7
16	Lead and compounds (as Pb)	Metals	5.0 µg/l	5.0 µg/l	6.8	10.2	<5.0	17.6	<5.0	<5.0	<5.0	1
17	Zinc and compounds (as Zn)	Metals	3.0 µg/l	3.0 µg/l	73	159	120	80.7	34	32	39	45.5
18	Selenium	Metals	1.6 µg/l	1.6 µg/l	28.4	2	<1.6	<1.6	28.3	2	<1.6	<1.6
19	Antimony	Metals	1.6 µg/l	1.6 µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
20	Molybdenum	Metals	2.0 µg/l	2.0 µg/l	<2	3	48	<3.00	<2	<2	44	<3.00
21	Tin	Metals	5.0 µg/l	5.0 µg/l	6	<5	<5	2	<5	<5	<5	0.6
22	Barium	Metals	0.6 µg/l	0.6 µg/l	31	40.3	26	27	28	19.9	22.8	16.8
23	Boron	Metals	120 µg/l	120 µg/l	770	604	849	433	795	392	725	479
24	Cobalt	Metals	0.6 µg/l	0.6 µg/l	<0.6	<0.6	<0.6	<2.00	<0.6	<0.6	<0.6	<2.00
25	Vanadium	Metals	2.0 µg/l	2.0 µg/l	4	6	6	<4.00	3	4	5	<4.00
26	Chloroalkanes (C10-C13)	not tested										
27	Alachlor	Pesticides	0.004 µg/l	0.04 µg/l	<0.020	<0.040	N/S	N/S	<0.020	<0.020	<0.040	<0.020
28	Aldrin	Pesticides	0.004 µg/l	0.004 µg/l	<0.004	<0.008	N/S	N/S	<0.004	<0.004	<0.008	<0.004
29	Dieldrin	Pesticides	0.004µg/l	0.004 µg/l	<0.004	<0.008	N/S	N/S	<0.004	<0.004	<0.008	<0.004
30	Endrin	Pesticides	0.004 µg/l	0.004 µg/l	<0.004	<0.008	N/S	N/S	<0.004	<0.004	<0.008	<0.004
31	Heptachlor	Pesticides	0.001 µg/l	0.001 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002

					>100,000 pe							
					Secondary							
					Carrigrennan Inlet				Carrigrennan Outlet			
Parameter No	Determinands	Group	Proposed LOD (source: EPA)	Reporting Limit (source: STL)	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
32	Chlordane	Pesticides	0.003 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
33	Chlordecone	Pesticides	0.003 µg/l	**1 µg/l**	<1000	< 1000	N/S	N/S	<1000	< 1000	<8000	<1000
34	Mirex	Pesticides	0.004 ug/	4 ng/l	<20	< 4	N/S	N/S	<20	< 4	<10	<4
35	Endosulphan	Pesticides	0.004 µg/l	0.004 µg/l	<0.004	<0.008	N/S	N/S	<0.004	<0.004	<0.008	<0.004
36	Dichlorobenil	Pesticides	0.002 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
37	Lindane (1,2,3,4,5, 6 - hexachlorocyclohexane)	Pesticides	0.003 µg/l	0.003 µg/l	<0.003	<0.006	N/S	N/S	<0.003	<0.003	<0.006	<0.003
38	Isodrin	Pesticides	0.004 µg/l	0.004 µg/l	<0.004	<0.008	N/S	N/S	<0.004	<0.004	<0.008	<0.004
39	DDT - sum of all isomers	Pesticides	0.002 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
40	Trifluralin	Pesticides	0.03 µg/l	0.03 µg/l	<0.030	<0.060	N/S	N/S	<0.030	<0.030	<0.060	<0.030
41	Hexachlorobenzene (HCB)	Pesticides	0.002 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
42	Hexachlorobutadiene (HCBD)	Pesticides	0.007 µg/l	0.007 µg/l	<0.007	<0.014	N/S	N/S	<0.007	<0.007	<0.014	<0.007
43	Chlorfenvinphos	Pesticides	0.002 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
44	Chlorpyrifos	Pesticides	0.002 µg/l	0.002 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
45	Atrazine	Triazine Herbicides	0.04 µg/l	0.04 µg/l	<0.020	<0.040	N/S	N/S	<0.020	<0.020	<0.040	<0.020
46	Simazine	Triazine Herbicides	0.04 µg/l	0.04 µg/l	<0.020	<0.040	N/S	N/S	<0.020	<0.020	<0.040	<0.020
47	Diuron	Subsitituted Ureas	0.05 µg/l	Best attainable	<1.00	<0.50	N/S	N/S	<0.30	<0.15	<0.05	<0.15
48	Linuron	Subsitituted Ureas	0.05 µg/l	Best attainable	<0.20	<0.50	N/S	N/S	<0.05	<0.05	<0.05	<0.05
49	Isoproturon	Subsitituted Ureas	0.05 µg/l	Best attainable	<7.50	<2.50	N/S	N/S	<1.00	<0.75	<0.50	<0.05
50	Triphenyltin	Organotin compounds (as total	0.020 µg/l	Best attainable	<0.06	<0.20	<0.20	<0.10	<0.20	<0.06	<0.06	<0.02
51	Organotin	Organotin compounds (as total	0.020 µg/l	Best attainable	<0.06	<0.20	<0.20	<0.10	<0.20	<0.06	<0.06	<0.02
52	Tributyltin	Organotin compounds (as total	0.020 µg/l	Best attainable	<0.06	<0.20	<0.20	<0.10	<0.20	<0.06	<0.06	<0.02
53	Mecoprop	Acid Herbicides	0.04 µg/l	Best attainable	0.14	<0.16	N/S	N/S	0.2	<0.04	<0.04	0.07
54	2,4-D	Acid Herbicides	0.05 µg/l	Best attainable	0.16	<0.20	N/S	N/S	0.36	<0.05	<0.05	0.29
55	MCPA	Acid Herbicides	0.05 µg/l	Best attainable	0.14	<0.20	N/S	N/S	0.22	<0.05	<0.05	<0.05
56	Glyphosate	Acid Herbicides	0.08 µg/l	Best attainable	11.5	0.37	N/S	N/S	1.05	0.70	<1.00	0.88
57	PAH, Total	PAHs	0.001 µg/l	0.01 µg/l	0.21	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
58	Benzo[a]pyrene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
	Benzo[b]fluoranthene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
	Benzo[ghi]perylene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<1.0	<1.0
	Benzo[k]fluoranthene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
	Indeno[1,2,3-c,d]pyrene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
59	Anthracene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
60	Naphthalene	PAHs	0.001 µg/l	0.01 µg/l	0.149	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
61	Flouranthene	PAHs	0.001 µg/l	0.01 µg/l	<0.01	<0.10	N/S	N/S	<0.01	<0.01	<0.01	<0.01
62	Polychlorinated biphenyls (PCBs) - sum of 11 congenors	PCBs- Pesticides and others	0.004 µg/l	0.004 µg/l	<0.002	<0.004	<0.008	<0.004	<0.002	<0.002	<0.004	<0.002
63	Halogenated organic compounds (as AOX)	not tested										

					>100,000 pe							
					Secondary							
					Carrigrennan Inlet				Carrigrennan Outlet			
Parameter No	Determinands	Group	Proposed LOD (source: EPA)	Reporting Limit (source: STL)	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
64	Tetrachloroethylene (PER)	PCBs- Pesticides and others	0.01 µg/l	1 µg/l	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
65	Tetrachloromethane (TCM)	PCBs- Pesticides and others	0.01 µg/l	1 µg/l	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
66	Trichloroethylene	PCBs- Pesticides and others	0.01 µg/l	1 µg/l	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
67	Vinyl chloride	PCBs- Pesticides and others	0.01 µg/l	0.5 µg/l	<1.0	<0.5	<1.0	N/S	<1.0	<0.5	<0.5	<0.5
68	1,2-dichloroethane (EDC)	PCBs- Pesticides and others	0.01 µg/l	1 µg/l	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
69	Dichloromethane (DCM)	PCBs- Pesticides and others	0.01 µg/l	1 µg/l	<2.0	1.2	14.7	N/S	<2.0	<1.0	2	<1.0
70	Carbon tetrachloride	PCBs- Pesticides and others	0.01 µg/l	See Tetrachloromethane (Nr. 65)	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
71	Phenols (as total C)	Phenols	0.5 µg/l	0.5 µg/l	1580	357	1240	104	<0.50	<0.50	<0.50	0.98
72	Octylphenols and Octylphenol Ethoxylates	Phenols	1.0 µg/l	0.5 µg/l	<4	<2.8	<5	N/S	<1	<0.5	<5	<1
73	Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	Phenols	1.0 µg/l	1 µg/l	<4	9.8	<5	N/S	<1	3.65	<5	<1
74	Trichlorobenzenes (TCBs) (all isomers)	SVOCs	1.0 µg/l	Best attainable	<2.0	<1.0	<2.0	N/S	<2.0	<1.0	<1.0	<1.0
75	Pentachlorophenol (PCP)	SVOCs	1.0 µg/l	Best attainable	<10.0	<5.0	N/S	N/S	<1.0	<5.0	<5.0	<1.0
76	Pentachlorobenzene	SVOCs	0.003 µg/l	0.004 µg/l	<0.002	<0.004	N/S	N/S	<0.002	<0.002	<0.004	<0.002
77	2,6-Dichlorobenzamide	SVOCs	0.06 µg/l		<0.10	< 0.06	N/S	N/S	<0.10	< 0.06	<0.06	0.14
78	Benzene as BTEX	SVOCs	1.0 µg/l	0.1 µg/l	0.21	0.16	N/S	N/S	<0.10	<0.10	<0.10	<0.10
79	Toluene as BTEX	SVOCs	1.0 µg/l	0.1 µg/l	270	116	N/S	N/S	1.13	0.2	0.35	0.24
80	Xylenes (total mass of ortho, para and meta-xylene)BTEX	SVOCs	1.0 µg/l	0.2 µg/l	0.71	0.44	N/S	N/S	<0.20	<0.20	<0.20	<0.20
81	Ethyl benzene (BTEX)	SVOCs	3.0 µg/l	0.1 µg/l	0.14	<0.10	N/S	N/S	<0.10	<0.10	<0.10	<0.10
82	Di(2-ethylhexyl)phthalate	SVOCs	0.05 µg/l	0.1 µg/l	5.66	3.34	N/S	N/S	<1.00	0.23	1.11	0.8
83	Dicofol	not tested										
84	Hexabromocyclododecane (HBCD)	SVOCs	0.01 mg/l	20µg/l	<20.00	< 20.00	N/S	N/S	<20.00	< 20.00	<20.00	<20.00
85	Toxaphene	SVOCs	1.0 µg/l	Best attainable	<50.00	< 1.00	N/S	N/S	<10.00	< 1.00	<1.00	<1.00
86	Hexabromobiphenyl	SVOCs	1.0 µg/l	10 µg/l	<0.002	<0.004	<0.008	<0.004	<0.002	<0.002	<0.004	<0.002
87	PFOS	Organic Fluorochemicals	25 ng/l	0.005 µg/l		<0.005	N/S	N/S		<0.005	<0.005	<0.005
	Tetrabromodiphenylether	Polybrominated diphenylethers	0.01 mg/l	10 µg/l	<10.00	< 10.00	N/S	N/S	<10.00	< 10.00	See A/C	<10.00
	Hexabromodiphenylether	Polybrominated diphenylethers	0.01 mg/l	10 µg/l	<10.00	< 10.00	N/S	N/S	<10.00	< 10.00	See A/C	<10.00
	Pentabromodiphenylether	Polybrominated diphenylethers	0.01 mg/l	10 µg/l	<10.00	< 10.00	N/S	N/S	<10.00	< 10.00	See A/C	<10.00
	Heptabromodiphenylether	Polybrominated diphenylethers	0.01 mg/l	10 µg/l	<10.00	< 10.00	N/S	N/S	<10.00	< 10.00	See A/C	<10.00
88	Decabromodiphenyl ether	Polybrominated diphenylethers		0.1µg/l				N/S				<0.10
	Octabromodiphenyl ether	Polybrominated diphenylethers		0.1µg/l				N/S				<0.10
	Nonabromodiphenyl ether	Polybrominated diphenylethers		0.1µg/l				N/S				<0.10

Appendix 2

Review for Shellfish Assessment

Cork City, D0033-01 WWD License Condition 5.6

The licensee shall carry out an assessment of the impact of the discharges from the waste water works on the microbiological quality (including viruses) of the shellfish in the adjacent designated shellfish waters in consultation with the DoEHLG, Sea Fisheries Protection Authority, the Marine Institute and An Bord Iascaigh Mhara.

The report on the assessment should include a review of hydrodynamic and modeling assessments completed for the purposes of the discharge specified in this license and relevant assessments of other discharges to Cork Harbour. The report shall be submitted to the Agency within eighteen months of the date of grant of the license.

In accordance with the guidelines issued on *Conducting an Assessment of the impact of discharges from a Waste Water Works on the Microbiological Quality of Shellfish in adjacent Shellfish Waters*, a review of documentation was carried out and contact was made with the referenced Consultees with a view to drawing up a Monitoring Programme. (Documentation review is attached as Appendix 1.)

Contact was made with Mr. Brian Nolan of Sea Fisheries Protection Authority
Dr Bill Dore of Marine Institute
And
Dr Terence O'Carroll of Bord Iascaigh Mhara

The following points were made between parties during discussions:

- Shellfish monitoring has been carried out by the Marine Institute on behalf of SFPA, extensively in Lough Mahon and Cork Harbour over the past 10 years.
- Shellfish are contaminated to greater or lesser degrees within Cork Harbour
- There are a number of possible sources of contamination within the Estuary and Harbour.
- Two detailed Scientific Reports have been recently published on the subject of Norovirus that are particularly relevant

Modeling the Norovirus Contamination of an Oyster Farm in Cork Harbour
Final Report November 2007
Prof. J.P.J. O 'Kane PhD, CEng
Kevin Barry BE, MEngSc

CONCENTRATION OF NOROVIRUS DURING WASTEWATER TREATMENT AND THE IMPACT ON OYSTER CONTAMINATION (October 2012)
John Flannery, Sinéad Keaveney, Paulina Rajko-Nenow, Vincent O'Flaherty* and William Doré *Marine Institute, Rinville, Oranmore, Co. Galway, Ireland. *Microbial Ecology Laboratory, Microbiology, School of Natural Sciences, National University of Ireland, Galway, Ireland*

The views as informed from Dr Bill Dore with respect to conducting a monitoring programme for Cork City Agglomeration D0033-01 are attached as per the email correspondence received. (See Appendix 2).

Given the views expressed by Dr Bill Dore, and as further discussed with Mr. Brian Nolan and Dr Terence O Connell, it was concluded that further shellfish monitoring in the Lough Mahon, North Channel or Cork Harbour would not be productive. Dr Terence O'Connell expressed the view that other methods of treatment other than Ultraviolet Disinfection should be considered, for example, use of wet lands.

The 2nd report above indicates the effectiveness of similar treatment processes at a WWTP to that at Carrigrennan, i.e. this eliminates the need to carry out the second stage of the monitoring assessment requirement, assessing the effectiveness of the waste water treatment process.

As outlined in both Prof. O 'Kane report and Dr. Bill Dore's review of the location and discharges, it is not possible to rule out the impact of the effluent from the Waste Water Treatment Plant on Microbiological Quality of shellfish in the area.

License condition 5.7 *Where the assessment indicates that discharges from the waste water works are having a deleterious microbiological (including viruses) effect on the quality of shellfish in adjacent designated shellfish waters, the licensee shall implement the recommendations of the report including the installation of a disinfection system or other appropriate measure as required*

Identification of requirement for Ultraviolet or any other appropriate disinfection

Cork City Council has received approval from the Department of Environment, Communications and Local Government under the Water Services Infrastructure Programme to procure a consultant to prepare a preliminary report for the design of Nutrient Removal /Tertiary Treatment for Cork City (Carrigrennan) WWTP. This is to enable discharges to comply with UWWT standards for Sensitive waters.

Implementation of conditions 5.6 and 5.7 of the WWD license, D0033-01, are included as part of the brief to the consultant with a view to including any additional treatment necessary under this license condition as part of the WWTP upgrade.

Expressions of Interest were received from Consultants and opened on 19th April 2013. The next stage in the Consultant procurement process will be the selection of qualified candidates from the submitted expressions and the tendering by these for appointment.

Extract from Draft Brief for Appointment of Consultant:

Carrigrennan Wastewater Treatment Plant Upgrade

Treated wastewater from the plant is discharged through a 500m long outfall pipe to Cork Harbour at Lough Mahon.

The design of the existing plant did not include for nutrient removal or disinfection.

Since the plant was commissioned the upper harbour, was designated a sensitive area under the Urban Wastewater Treatment (Amendment) Regulations 2004 (SI 440/2004). Current discharges from the plant do not comply with these regulations.

Furthermore, there are several shellfish waters designated within Cork Harbour. It is alleged that discharges from Carrigrennan WWTP result in some of these waters not meeting the required standards.

Cork City Council now requires a consultant to identify what works are necessary to ensure that discharges from Carrigrennan WWTP comply with:

- ***SI 440/2004 and***
- ***SI 268/2006 European Communities (Quality of Shellfish Waters) Regulations 2006***
- ***Its Wastewater Discharge Licence (D0033-01).***

Compliance, Approval Required

Approval is now sought from the Environmental Protection Agency to proceed on the basis as outlined above with respect to achieving compliance with conditions 5.6 & 5.7 of the WWD licence for Cork City, D0033-01.

Procurement of consultants is in train and issuing of their review as per the brief would be the next stages in the Shellfish Assessment required, i.e. the report as required by EPA condition 5.6. A timeframe for installation of an appropriate disinfection system will also issue from this process.

When available this report will be submitted to the consultees for comment. Any comments and recommendations received from the consultees will be addressed and incorporated into the final report.

Anne Hennessy

Anne Hennessy
Senior Executive Engineer
Water Services (Drainage)
Environment,
Cork City Council

Appendix 1

Document review

D0033-01 Licence Conditions: 17th December 2009

5.6 The licensee shall carry out an assessment of the impact of the discharges from the waste water works on the microbiological quality (including viruses) of the shellfish in the adjacent designated shellfish waters in consultation with the DoEHLG, Sea Fisheries Protection Authority, the Marine Institute and An Bord Iascaigh Mhara.
The report on the assessment should include a review of hydrodynamic and modelling assessments completed for the purposes of the discharge specified in this licence and relevant assessments of other discharges to Cork Harbour. The report shall be submitted to the Agency within eighteen months of the date of grant of the licence.

5.7 Where the report specified in Condition 5.6 indicates that the discharges are having a deleterious microbiological (including viruses) effect on the quality of shellfish in the adjacent designated shellfish waters, the licensee shall implement the recommendations of the report including the installation of a disinfection system or other appropriate measure, as required.

Reason:

To provide for the improvement of the waste water works on a planned basis having regard to the need for ongoing assessment, recording and reporting of matters affecting the receiving water environment.

Inspectors Report On Licence application 26th November 2009

Shellfish Designation

The primary discharge is located near Marino Point in Lough Mahon which is not a designated shellfish water. However the discharge is approximately 6km from an area in the North Channel which is designated as an area to which the EC (Quality of Shellfish Waters) Regulations 2006 & 2009 apply.

Since November 2008 the responsibility for the Shellfish Waters Directive (2006/113/EC) transferred to the Department of Environment Heritage and Local Government (DoEH1,G). The regulations implementing the directive outline that the Minister has the responsibility to ensure that the waters comply with the standards set out in Schedule 2 to the Regulation including the sampling regime to be undertaken. The Marine Institute will carry out monitoring for the relevant parameters. No results from the monitoring in the North Channel are available as yet. In addition, it is the responsibility of the Minister, in consultation with prescribed public bodies, to establish a programme to provide that the waters comply with the Regulations. The Pollution Reduction Plans are currently being drafted by the DEHLG for consultation but are not yet available for the Cork Harbour area.

The Sea Fisheries Protection Authority is the competent authority (CA} for the classification of live bivalve mollusc production areas. The Food Safety Authority is the CA for the coordination of food legislation and as such it co-ordinates the monitoring and enforcement of shellfish production areas for the presence of bio-toxins. The North Channel is currently closed for mussel production due to bio-toxins and it is classified as a Class B area for oyster production (purification required before sale) based on bacteriological quality.

A report in the EIS submitted with the application outlined the modelling that was undertaken and the impact of the discharge of total coliforms on the North Channel which at that time was a proposed designated area. On the basis of the decay rate of the coliforms and water movement to the channel from Lough Mahon it concluded that the discharge would have no impact on background levels to the east of Weir Island in the North Channel.

A more recent report in the Midleton application (D0056-01) by UCC commissioned for Cork County Council (2006) details the relative impact of the discharges in Cork Harbour on the water quality in the North Channel with particular reference to the Noravirus (Winter vomiting bug). It outlines that there is movement of water between Lough Mahon and the North Channel through the Belvelly Channel. The report concludes that in certain weather conditions, particularly when the wind is from the west; that the impact of the Carrigrennan discharge, relative to the other discharges in the harbour, is in the range 13-15%. The model indicates however that this is a significant improvement on the scenario prior to 2003 when the discharges from Cork City were untreated. The relative impacts will also alter when the Ringaskiddy discharge is treated and proposed improvements to stormwater ovcrflows is undertaken.

Some parameters have specified limits in the Shellfish Regulations in relation to the impact of a discharge, i.e., suspended solids, coloration and salinity. No specific assessment was carried out in relation to the impact of the discharge from Carrigrennan (WWTP1) on the North Channel. The RL does not specify emission limit values for the parameters specified in the Shellfish Waters Regulations due to the distance to the shellfish waters {-- 6km and 13Km) however Condition 4.17 in the RL does require a report on the chemical and ecological status of the receiving water having regard to the Shellfish Waters Regulations and the impact of the discharge on it.

The Foreshore Licence granted to Cork City Council in 2005 states that '*The Licensee shall agree to the future installation of ultra violet treatment should such treatment become necessary and shall make provision for such treatment.'*
The RL (Condition 5.6 and 5.7) requires the licensee to carry out a review of the assessments of the impact of discharges in the Lough Mahon Cork Harbour area on the shellfish in the designated areas in consultation with the relevant authorities and the implementation of any recommendations regarding the provision of further treatment of the discharge that may be specified in the report. This may mean that disinfection will be required in future.

Published Reports

Modelling the Norovirus Contamination of an Oyster Farm in Cork Harbour
Final Report November 2007
Prof. J.P.J. O'Kane PhD, CEng
Kevin Barry BE, MEngSc

This report and model, as referred to in the Inspectors report above, comes to a number of conclusions with respect to the contribution of various sources and dispersion of Norovirus throughout the Harbour. It makes detailed recommendations including establishment of early alert systems, and integration of WWTP scada systems, in addition to recommendations for further research, study and engineering works.

An EPA STRIVE funded project being carried out by the Marine Institute on Norovirus, has been completed.

EPA STRIVE Project ***Assessing the Impact of Waste Water Treatment Plant Effluent on Norovirus contamination in shellfisheries***

Funding Programme: EPA STRIVE 2007-2013 Environment and Human Health

Start date: 1st October 2008 Duration: 3 years

<u>Project objectives and targets</u>

The overall aim of the project was to provide a robust data set on the survival of NoVs during sewage treatment and in the marine environment in the Irish setting. This will allow regulatory authorities and planners to make informed decisions on the level of sewage treatment required and the location of sewage outfalls to prevent or reduce NoV contamination in shellfisheries and other sensitive marine environments. Protection of shellfisheries will increase public health protection. Specific objectives were to;

1. Quantify the level of norovirus found in sewage influent, intermediate stages and effluent in a secondary treatment WWTP and identify the extent of norovirus removal during sewage treatment.

2. Determine the relative contribution of storm overflow discharges and continuous treated sewage inputs to norovirus contamination in shellfisheries.

3. Establish the time required to reduce 90% of norovirus (T90 values) in seawater under typical winter and summer conditions.

4. Determine the extent of the reduction of NoV levels using UV treatment.

The Report on the above project was published in October 2012

CONCENTRATION OF NOROVIRUS DURING WASTEWATER TREATMENT AND THE IMPACT ON OYSTER CONTAMINATION

John Flannery, Sinéad Keaveney, Paulina Rajko-Nenow, Vincent O'Flaherty* and William Doré
*Marine Institute, Rinville, Oranmore, Co. Galway, Ireland. *Microbial Ecology Laboratory, Microbiology, School of Natural Sciences, National University of Ireland, Galway, Ireland*

Extracts from Report

There is likely to be a greater chance of NoV being present in wastewater from WWTPs serving large populations considering that only a relatively small percentage of the population may be shedding NoV during non-epidemic periods. …..

Monthly sampling of the oysters in this study would have showed compliance with a category B *harvesting area (<4600 MPN E. coli 100 g^{-1} in 90% of samples) meaning that the oysters could be sold for consumption following minimal treatment such as depuration (29). Given the minimal reduction of NoV provided by the WWTP, elevated concentrations of NoV were detected in oysters harvested adjacent to the outfall throughout the year. These concentrations would be consistent with those that have caused illness in consumers (15) and* ***demonstrates the inadequacy of E. coli to assess the NoV risk associated with oysters****. As alternatives to E. coli, FRNA bacteriophage have been proposed as a viral surrogate to indicate the presence of NoV in oysters previously (16, 18) and thus were included in this study. However,* ***no seasonal trend was observed during our study*** *as has been observed by others (34) and oysters were contaminated to consistent concentrations year round and did not demonstrate an increased risk of higher concentrations of NoV being present during the winter months. This questions their suitability of use as an indicator of NoV in oysters. However, it has been proposed that* ***FRNA bacteriophage*** *may provide useful information on the viral contamination of shellfish in areas that are infrequently impacted by sewage rather than in areas undergoing continuous wastewater inputs as studied here (18).*

This study provides a comprehensive dataset concerning the concentrations of NoV GI and GII in a WWTP providing secondary treatment and the effect of effluent on NoV concentrations in shellfish. As wastewater treatment is considered an important control in reducing the microbial contamination of aquatic environments to acceptable concentrations, the actual reduction provided by treatment processes has implications for plant operators and water management agencies. The data from this and other studies (25, 36) demonstrates ***that conventional wastewater treatment processes cannot be relied upon in isolation to prevent the contamination of the marine environment*** *and thus oysters with NoV as determined using real-time PCR. As yet,* ***methods are not available to differentiate infectious from non-infectious NoV and the detection of NoV in oysters using current procedures may overestimate the infectious risk****. It is probable that low concentrations of NoV, as determined using real-time PCR, may not have an impact on consumer health. Therefore,* ***results from widespread general monitoring of oysters need to be placed in context and should be considered to be one element of a more comprehensive risk-based approach to managing NoV contamination in shellfisheries****. A more useful approach may be to* ***target at risk harvest areas identified through the use of sanitary surveys and areas known to be at risk of contamination by municipal wastewater*** *to mitigate the risk of NoV contamination from oysters.*

Legislation

Shellfish

The Shellfish Directive (2006/113/EC) is enacted in Ireland under S.I. 268 EC (Quality of Shellfish Waters) regulations 2006 and as amended by S.I. 55 0f 2009 and S.I 464 0f 2009. Shellfish Waters Mandatory and Guide values for parameters are listed in schedules 2 and 4 respectively of SI 268 of 2006.

Distance from Primary discharge

There are 4 designated Shellfish areas in Cork Harbour. The nearest shellfish area to the WWTP discharge location is Cork Great Island North Channel. The shortest pathway to this from the Primary Discharge outfall, via the Belvelly Channel, a narrow tidal passage, measures a distance of 4.7 km to the Shellfish Great Island North Channel designated site. The alternative pathway to this Shellfish water is via Marloag Point and the main Ballynacorra River Channel, a distance of 16.8 km. There are also three designated shellfish areas in the adjacent tidal waters at Rostellan, namely Rostellan North, Rostellan South, and Rostellan West, These are 13.3 km, 13.27 km and 12.2 km, respectively, distant from the Cork City Primary discharge.

Shellfish Quality

Cork Harbour is currently Classified "B" for Oysters in the Shellfish classification based on E.Coli Monitoring,(<4,600 *E.coli* MPN $100g^{-1}$ shellfish flesh), i.e. Must be depurated, heat treated or relayed to meet class A requirements.

The Guide value under S.I.268 of 2006 for Faecal Coliforms is 300 MPN 100g-1 Shellfish flesh.

There is no mandatory value given for Faecal Coliforms.

A Prohibition was issued on the Harvesting of Oysters in the North Channel of Cork Harbour effective from 15 Oct 2002, by the Dept of Communications, Marine, and Natural Resources before the commissioning of the WWTP at Carrigrennan. This is due to viral contamination of the oysters. Effectively this prohibition has not been withdrawn to date. Ref :Details of prohibition below:

http://www.irisoifigiuil.ie/archive/2002/october/2002%2010%2018%20IO%20Issue.PDF

E.Coli monitoring has been carried out by the Marine Institute on behalf of SFPA from 2003 to date on shellfish in Great Island North Channel and at Rostellan.

Norovirus /Winter vomiting bug can be found in the Marine Environment downstream from any waste water treatment plant. Shellfish as filter feeders have the potential to accumulate viruses and bacteria that are present in the growing waters.

A review of monitoring data of Norovirus has also been carried out by the Marine Institute on behalf of SFPA at Great Island Channel since the start of 2009. This shows that periods exist where the virus is not detected or low, notably the summer months. It further shows that there are increases in values peaking in winter.

Shellfish Pollution Reduction Programmes

The competent authority, The Department of the Environment, Heritage and Local Government, prepared Pollution Reduction Programmes, (PRPs) and their associated documents, for the designated shellfish waters in accordance with legislation on 19th January 2010.

Key pressures identified under the Final Report for Great Island North Channel PRP were urban waste water systems and on-site waste water treatment systems. Cork City (Carrigrennan) is one of three Urban Waste water systems listed in proximity to the Shellfish area, others being Midleton and Carrigtwohill. As stated previously this listing causes the agglomeration to default to the Highest Enforcement Category, A1.

Urban waste water systems and on-site waste water treatment systems were also identified in the PRPs for the Rostellan North, South & West PRPs as key pressures, and Cork City (Carrigrennan) was listed in each as one of the *adjacent agglomerations, with potential tidal influence,- for details see Cork Great Island North Channel Pollution Reduction Programme.*

Under the PRP Action Programme-Measures, for Great Island North Channel, with respect to Cork City (Carrigrennan), which had submitted an application for a WWD licence at the time of the PRP's establishment, it was stated that *any licence that might issue for Cork City (Carrigrennan) will take account of the requirements of the Shellfish Regulations.* The same measure was included under Adjacent Agglomerations-potential tidal influence, in the Rostellan PRPs.

The WWDL for Cork City D0033-01 was issued on 17th December 2009, almost contemporaneous to the establishment of the PRPs. Conditions 5.6 & 5.7 of the WWD licence are as follows:

> *The Licencee shall carry out an assessment of the impact of discharges from the waste water works on the microbiological quality (including viruses) of the Shellfish in the adjacent designated shellfish waters in consultation with the DoEHLG, Sea Fisheries Protection Authority, The Marine Institute and An Bord Iascaigh Mhara:*
>
> *The report on the assessment should include a review of hydrodynamic and modelling assessments completed for the purposes of the discharge specified in this licence and relevant assessments of other discharges to Cork Harbour. The report shall be submitted to the Agency within eighteen months of the date of grant of the licence.*
>
> *Where the report specified in Condition 5.6 indicates that the discharges are having a deleterious microbiological (including viruses) effect on the quality of shellfish in the adjacent designated shellfish waters, the licensee shall implement the recommendations of the report including the installation of a disinfection system or other appropriate measure, as required.*

The National Toolkit Measures, identified in the PRPs and that are applicable to Cork City (Carrigrennan), are WW7 to WW10, Waste Water Treatment Plants, as follows:

WW7: Apply a higher standard of treatment (stricter emission controls) where necessary.

WW8: Upgrade the plant to remove specific substances known to impact on water quality status

WW9: Install ultra-violet or similar type treatment.

WW10: Relocate the point of discharge.

It is noted that the Associated Mitigation Measures include the need to carry out a Habitats Directive Assessment.

Appendix 2

Correspondence with Dr Bill Dore, Marine Institute

&

Anne Hennessy, Cork City Council

Query

From: Anne Hennessy **Sent:** 18 January 2013 11:57
To: Bill Dore
Subject: CorkCity WWDL D0033-01 Shellfish Assessment

Dear Dr Dore,

Thank you for taking the time to talk to me yesterday. As discussed in our conversation there is a requirement in the Waste Water Discharge Licence for Cork City D0033-01 to carry out a "shellfish impact assessment"

The Guidance document issued by the EPA on carrying out Shellfish Assessments listed yourself as contact person for the Marine Institute

http://www.epa.ie/downloads/advice/waste%20water/name,31472,en.html

The relevant **licence conditions for Cork city D0033-01** are as follows:

5.6 The Licensee shall carry out an assessment of the impact of the discharges from the waste water works on the microbiological quality (including viruses) of the shellfish in the adjacent designated shellfish waters in consultation with the DoEHLG, Sea Fissheries Protection Authority, The Marine Institute and An Bord Iascaigh Mhara. The report on the assessment should include a review of Hydrodynamic and moddelling assessments completed for the purposes of the discharge specified in this licence and relevant assessments of other discharges to Cork Harbour. The report shall be submitted to the Agency within 18 months of the date of grant of this licence.

5.7 Where the report specified in condition 5.6 indicates that the discharges are having a deleterious microbiological (including viruses) effect on the quality of shellfish in the adjacent designated shellfish waters, the licensee shall implement the recommendations of the report including the installation of a disinfection system or other appropriate measure, as required.

The **inspectors report on the WWD Licence application** for Cork City, including comments on Shellfish Designation on page 6 is available at the following location:

http://www.epa.ie/licences/lic_eDMS/090151b28031134e.pdf

*The **2011 AER for Cork City** D0033-01, includes information on influent and effluent flows & loads etc. Shellfish are discussed briefly under Ambient monitoring and Environmental Liability Risk assessment, human health*

http://www.epa.ie/terminalfour/wwda/wwda-view-filter.jsp?regno=D0033-01&filter=f&docfilter=go

I have attached 2 drawings of the Cork city agglomeration and the outfall location in the harbour.

I would welcome your comments and direction. I would be particularly interested in your views from a Norovirus perspective or other on the report on *Modelling Norovirus contamination of an oyster farm in Cork Harbour* by Prof O'Kane. As I said, I am meeting Brian Nolan, SFPA, next Thursday and hope to move on our overdue assessment in the near future. It would be our hope that we could do this in conjunction with Cork County Council with whom we are in discussion, given the similar requirements on other licences in the Harbour.

Regards,

Anne

Anne Hennessy
Senior Executive Engineer
Water Services (Drainage)
Environment,
Cork City Council

Reply

(Date 1st February 2013)

Dear Anne

Thank you for the information which I have now had a chance to review.

As I explained during our telephone conversation assessing the impact of a single input on a shellfishery in not a straight forward issue.

From monitoring data it is clear that there is norovirus contamination of oysters in the North Channel of Cork Harbour occurs. At times this contamination is significant. The real time PCR method used to detect norovirus does not distinguish between infectious and non infectious virus particles. Therefore it can be

difficult to directly relate concentrations of norovirus detected with health risk. However, at times, concentrations observed in North Channel oysters are significantly greater than concentrations observed in oysters which have been definitively responsible for causing outbreaks of illness previously (~2,000 genome copies g^{-1}). Therefore I would conclude that, at times, these oysters are contaminated with norovirus to concentrations that would cause illness if consumed.

1. There are a number of inputs into Cork Harbour that could potentially impact on the microbiological quality of the oysters in the North Channel. From the pollution reduction plan prepared for the shellfish waters directive the principle key pressures include;
    a. WWTPs -Cork City (Carrigrenan), Middleton and Carrigtwohill
    b. Adjacent Agglomerations (with potential tidal influence)-Passage West, Cobh, Monkstown, Ringaskiddy, Crosshaven and Carrigaline.
    c. On site wastewater treatment systems (~150 dwelling some discharging directly to the foreshore)

2. It is not possible to be certain about the relative contribution (if any) each of the above pollution source to the overall contamination of the oysters in the North Chanel. However a model has been developed by UCC to determine the relative impact of these inputs on the concentrations of norovirus in oysters in the North Channel. This indicates that under certain conditions that the discharge from the Carrigrenan outfall will impact on norovirus concentrations in the oysters.

3. In conclusion I would suggest that, given the size of the Carrigrenan outfall and it's relatively close proximity (~6km to from the designate shellfish water) that it is likely to have a deleterious effect on the shellfish. This conclusion is far from certain but is supported by the UCC model.

4. Additional norovirus monitoring of the designated shellfishery or the discharge will not provide any further useful information for determining the impact of the Carrigrenan discharge on oysters.

I hope this helps but please do not hesitate to contact me if you wish to discuss further

Regards Bill

Bill Dore
Team Leader Shellfish Microbiology
Marine Institute