Annual Environmental Report

2019

Shannon Town

D0045-01

CONTENTS

1 EXECUTIVE SUMMARY AND INTRODUCTION TO THE 2019 AER

This Annual Environmental Report has been prepared for D0045-01, Shannon Town, in Clare in accordance with the requirements of the wastewater discharge licence for the agglomeration. Specified reports where relevant are included as an appendix to the AER.

1.1 ANNUAL STATEMENT OF MEASURES

A summary of any improvements undertaken is provided where applicable.

1.2 TREATMENT SUMMARY

The agglomeration is served by a wastewater treatment plant(s)

- Shannon Town WWTP with a Plant Capacity PE of 12500, the treatment type is 2 - Secondary treatment
    - The treatment process consists of two process streams: a domestic stream and an industrial stream. Since 21 December 2016, the domestic and industrial streams were combined into one stream at the new inlet works and are being balanced and combined before treatment.
    - Treated wastewater discharges to a large final effluent lagoon before discharge to the Shannon Estuary via an outfall pipe and diffuser.

1.3 ELV OVERVIEW

The overall compliance of the final effluent with the Emission Limit Values (ELVs) is shown below. More detailed information on the below ELV's can be found in Section 2.

Discharge Point Reference	Treatment Plant	Discharge Type	Compliance Status	Parameters failing if relevant
TPEFF0300D0045SW001	Shannon Town WWTP	Treated	Non-Compliant	BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l

1.4 LICENCE SPECIFIC REPORTING INCLUDED IN AER

Assessment / Report	Included in AER
There are no Licence Specific Reports included in the AER.	

2 TREATMENT PLANT PERFORMANCE AND IMPACT SUMMARY

2.1 SHANNON TOWN WWTP - TREATED DISCHARGE

2.1.1 INFLUENT MONITORING SUMMARY - SHANNON TOWN WWTP

A summary of influent monitoring for the treatment plant is presented below. This monitoring is primarily undertaken in order to determine the overall efficiency of the plant in removing pollutants from the raw wastewater.

Note the influent monitoring is

Parameters	Number of Samples	Annual Max	Annual Mean
BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l	24	1347	143
Suspended Solids mg/l	24	284	102
COD-Cr mg/l	24	554	246
Total Nitrogen mg/l	24	43	16
Total Phosphorus (as P) mg/l	24	6.44	3
Hydraulic Capacity	N/A	12070	6507

If other inputs in the form of sludge / leachate are added to the WWTP then these are included in Section 2.1.5 if applicable.

Significance of Results:

The annual mean hydraulic loading is less than the peak Treatment Plant Capacity. The annual maximum hydraulic loading is less than the peak Treatment Plant Capacity. Further details on the plant capacity and efficiency can be found under the sectional 'Operational Performance Summary'. The design of the wastewater treatment plant allows for peak values and therefore the peak loads have not impacted on compliance with Emission Limit Values.

2.1.2 EFFLUENT MONITORING SUMMARY - TPEFF0300D0045SW001

Parameter	WWDL ELV (Schedule A)	ELV with Condition 2 Interpretation included Note 1	Interim % reduction from influent concentration	Number of sample results	Number of exceedances	Number of with Condition 2 Interpretation included	Annual Mean	Overall Compliance (Pass/Fail)
COD-Cr mg/l	125	250	N/A	11	2	N/A	84.06	Pass
Ammonia-Total (as N) mg/l	35	42	N/A	11	N/A	N/A	18.21	Pass
Suspended Solids mg/l	35	87.5	N/A	11	2	N/A	27.63	Pass
BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l	25	50	N/A	11	5	1	26.19	Fail
Temperature °C	25	N/A	N/A	1	N/A	N/A	N/A	Pass
Total Oxidised Nitrogen (as N) mg/l	15	18	N/A	11	N/A	N/A	0.8	Pass
pH pH units	9	9	N/A	11	N/A	N/A	7.65	Pass

Notes:
1 – This represents the Emission Limit Values after the Interpretation provided for under Condition 2 of the licence is applied

Cause of Exceedance(s):

Inadequate infrastructure

Significance of Results:

WWTP is in compliance with cBOD since Sept 2019. Upgrade works have now commenced at the WWTP

2.1.3 AMBIENT MONITORING SUMMARY FOR THE TREATMENT PLANT DISCHARGE TPEFF0300D0045SW001

A summary of monitoring from ambient monitoring points associated with the wastewater discharge is provided in the sections below. For discharges to rivers upstream (U/S) and downstream (D/S) location data is provided. For other ambient points in lakes, coastal or transitional waters, monitoring data from the most appropriate monitoring station is selected.

The table below provides details of ambient monitoring locations and details of any designations as sensitive areas.

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Irish Grid Reference	River Station Code	Bathing Water	Drinking Water	FWPM	Shellfish	WFD Status
There is no Ambient data available for Shannon Estuary for 2019. The latest data pertaining to the period 2007 – 2013 is included in Appendix 7.1 - Ambient monitoring summary							

Significance of Results:

The WWTP discharge was not compliant with the ELV's set in the wastewater discharge licence.

The ambient monitoring results meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.

The discharge from the wastewater treatment plant does not have an observable impact on the water quality.

The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status.

2.1.4 OPERATIONAL PERFORMANCE SUMMARY - SHANNON TOWN WWTP

2.1.4.1 Treatment Efficiency Report - Shannon Town WWTP

Treatment efficiency is based on the removal of key pollutants from the influent wastewater by the treatment plant. In essence the calculation is based on the balance of load coming into the plant versus the load leaving the plant. The efficiency is presented as a percentage removal rate.

A summary presentation of the efficiency of the treatment process including information for all the parameters specified in the licence is included below:

Parameter	Influent mass loading (kg/year)	Effluent mass emission (kg/year)	Efficiency (% reduction of influent load)
cBOD (kg/yr)	398,518	74,499	81%
COD (kg/yr)	733,103	213,315	71%
SS (kg/yr)	419,192	133,692	68%
Total P (kg/yr)	9,633	5,892	39%
Total N (kg/yr)	57,013	45,838	20%

Note: The above data is based on sample results for the number of dates reported

2.1.4.2 Treatment Capacity Report Summary - Shannon Town WWTP

Treatment capacity is an assessment of the hydraulic (flow) and organic (the amount of pollutants) load a treatment plant is designed to treat versus the current loading of that plant.

Shannon Town WWTP	
Peak Hydraulic Capacity (m³/day) - As Constructed	13686
DWF to the Treatment Plant (m³/day)	6312

Shannon Town WWTP	
Current Hydraulic Loading - annual max (m^3/day)	12070
Average Hydraulic loading to the Treatment Plant (m^3/day)	6509
Organic Capacity (PE) - As Constructed	12500
Organic Capacity (PE) - Collected Load (peak week)[Note1]	18661
Organic Capacity (PE) – Remaining	0
Will the capacity be exceeded in the next three years? (Yes/No)	No

Nominal design capacities can be based on conservative design principles. In some cases assessment of existing plants has shown organic capacities significantly higher than the nominal design capacity. Accordingly plants that appear to be overloaded when comparing a collected peak load with the nominal design capacity can be fully compliant due to the safety factors in the original design.

2.1.5 SLUDGE / OTHER INPUTS - SHANNON TOWN WWTP

'Other inputs' to the waste water treatment plant are summarised in table below

Input type	Quantity	Unit	P.E.	% of load to WWTP	Included in Influent Monitoring (Y/N)?	Is there a leachate/sludge acceptance procedure for the WWTP?	Is there a dedicated leachate/sludge acceptance facility for the WWTP? (Y/N)
There is no Sludge and Other Input data for the Treatment Plant included in the AER. **There is no measured volume of leachate to the plant as there is currently no flow meter in place**							

3 COMPLAINTS AND INCIDENTS

3.1 COMPLAINTS SUMMARY

A summary of complaints of an environmental nature is included below.

Number of Complaints	Nature of Complaint	Number Open Complaints	Number Closed Complaints
87	Blocked Sewer	0	87

3.2 REPORTED INCIDENTS SUMMARY

Environmental incidents that arise in an agglomeration are reported on an on-going basis in accordance with our waste water discharge licences. Where an incident occurs and it is reportable under the licence, it is reported to the Environmental Protection Agency through their Environmental Data Exchange Network, or in some instances by telephone. Some incidents which arise in the agglomeration are recorded by Irish Water but may not be reportable under our licence for example where the incident does not have an impact on environmental performance.

A summary of reported incidents is included below.

3.2.1 SUMMARY OF INCIDENTS

Incident Type	Cause	No. of incident occurrences	Recurring (Y/N)	Closed (Y/N)
Uncontrolled release	Broken Sewer Pipe	1	No	Yes
Uncontrolled release	Network Infrastructure	1	No	Yes
Uncontrolled release	Broken Sewer Pipe	1	No	Yes

Uncontrolled release	Broken Sewer Pipe	1	No	Yes
Uncontrolled release	Broken Sewer Pipe	1	No	Yes
Uncontrolled release	Broken Sewer Pipe	1	No	Yes
Breach of ELV	Inadequate Infrastructure	1	Yes	No

3.2.2 SUMMARY OF OVERALL INCIDENTS

Question	Answer
Number of Incidents in 2019	7
Number of Incidents reported to the EPA via EDEN in 2019	7
Explanation of any discrepancies between the two numbers above	N/A

4 INFRASTRUCTURAL ASSESSMENTS AND PROGRAMME OF IMPROVEMENTS

4.1 STORM WATER OVERFLOW IDENTIFICATION AND INSPECTION REPORT

A summary of the operation of the storm water overflows and their significance where known is included below:

4.1.1 SWO IDENTIFICATION

WWDL Name / Code for Storm Water Overflow	Irish Grid Ref.	Included in Schedule A4 of the WWDL	Significance of the overflow(High / Medium / Low)	Assessed against DoEHLG Criteria	No. of times activated in 2019 (No. of events)	Total volume discharged in 2019 (m3)	Monitoring Status
SW2	143381, 159426	Yes	Low	Not yet Assessed	Unknown	Unknown	Unknown
TBC	TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
SW3	TBC	Yes	Low	Not yet Assessed	Unknown	Unknown	Not Monitored
SW4	139480, 161672	Yes	Unknown	Meeting	Unknown	Unknown	Not Monitored
SW5	141671, 163372	Yes	Unknown	Meeting	Unknown	Unknown	Not Monitored

WWDL Name / Code for Storm Water Overflow	Irish Grid Ref.	Included in Schedule A4 of the WWDL	Significance of the overflow(High / Medium / Low)	Assessed against DoEHLG Criteria	No. of times activated in 2019 (No. of events)	Total volume discharged in 2019 (m3)	Monitoring Status
TBC	TBC	No	Low	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC	No	Low	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored

SWO Summary	
How much sewage was discharged via SWOs in the agglomeration in the year (m3)?	Unknown
Is each SWO identified as not meeting DoEHLG Guidance included in the Programme of Improvements?	N/A
The SWO Assessment included the requirements of relevant of WWDL schedules?	No
Have the EPA been advised of any additional SWOs / changes to Schedule C3 and A4 under Condition 1.7?	N/A

4.2 REPORT ON PROGRESS MADE AND PROPOSALS BEING DEVELOPED TO MEET THE IMPROVEMENT PROGRAMME REQUIREMENTS.

4.2.1 SPECIFIED IMPROVEMENT PROGRAMME SUMMARY

A wastewater discharge licence may require a number of reports on specific subject areas to be prepared for the agglomeration in question. These reports are submitted to the EPA as part of the Annual Environmental Report. This section provides list of the various reports required for this agglomeration and a brief summary of their recommendations.

Specified Improvement Programmes (under Schedule A and C of WWDL)	Description	Licence Schedule	Licence Completion Date	Date Expired? (N/NA/Y)	Status of Works	Timeframe for Completing the Work	Comments
D0045-SIP:01	Refurbish the existing WWTP and upgrade it, resulting in a capacity to treat a population equivalent of 35,000.	C	31/12/2015	Yes	Works going	31/12/2020	

A summary of the status of any improvements identified by under Condition 5.2 is included below.

4.2.2 IMPROVEMENT PROGRAMME SUMMARY

Improvement Identifier	Improvement Description / or any Operational Improvements	Improvement Source	Expected Completion Date	Comments
There are no Improvements Programme for this Agglomeration.				

4.2.3 SEWER INTEGRITY RISK ASSESSMENT

The utilisation of multiple capital maintenance programmes and the outputs of the workshops with the Local Authority Operations Staff held under the programme can be used to satisfy the requirements of Condition 5 regarding network integrity. Improvement works identified by way of these programmes and workshops will be included in the Improvements Summary Table.

5 LICENCE SPECIFIC REPORTS

A wastewater discharge licence may require a number of reports on specific subject areas to be prepared for the agglomeration in question. These reports are submitted to the EPA as part of the Annual Environmental Report. This section provides list of the various reports required for this agglomeration and a brief summary of their recommendations.

5.a Licence Specific Reports Summary Table

Licence Specific Report	Required by licence	Year included in AER	Included in this AER	Reference to relevant section of AER
There is no Licence Specific Report Required in this AER Annual Review.				

6 CERTIFICATION AND SIGN OFF

6.1 SUMMARY OF AER CONTENTS

Parameter	Answer
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?	N/A
List reason e.g. additional SWO identified	N/A
Is there a need to request/advise the EPA of any modification to the existing WWDL with respect to condition 4 changes to monitoring location, frequency etc	N/A
List reason e.g. changes to monitoring requirements	N/A
Have these processes commenced?	N/A
Are all outstanding reports and assessments from previous AERs included as an appendix to this AER	No

I certify that the information given in this Annual Environmental Report is truthful, accurate and complete:

Signed: Date: 05/03/2020

This AER has been produced by Irish Water's Environmental Information System (EIMS) and has been electronically signed off in that system for and on behalf of ,

Katherine Walshe

Acting Head of Environmental Regulation.

7 APPENDIX

Appendix
Appendix 7.1 - Ambient monitoring summary

Appendix 7.2 Ambient Monitoring Summary

Ambient monitoring data for Shannon WWTP (D0045-01) 2018 AER (Source: EPA – Coastal & Estuarine Monitoring 2007-2013)

Sample_ ID	Station_ No	Date_Surveyed	Time	Depth_ Bed	Depth_ Sample	Salinity	Temp	pH	Secchi	DO_ saturation	DO_mgL	BOD	TON	NH3	PO4	chl_a	DIN	Season
116932	SN330	27/11/2013	11:42:00	8.1	0.0	9.68	8.04	8.1	0.8	97.0	10.8	0.5	0.51	0.06	30	1.0	0.57	Winter
116933	SN330	27/11/2013	11:42:00	8.1	8.0	17.18	8.67	8.0	0.8	95.1	9.9	0.5	0.38	0.06	30	1.0	0.44	Winter
117054	SN310	27/11/2013	11:59:00	6.5	0.0	3.28	7.89	8.2	0.8	96.9	11.3		0.60	0.06	30	1.0	0.66	Winter
117055	SN310	27/11/2013	11:59:00	6.5	6.4	9.84	8.08	8.1	0.8	94.6	10.5		0.50	0.08	30	1.0	0.58	Winter
117744	SN330	26/08/2013	13:55:00	6.3	0.0	20.04	17.68	7.9	0.5	84.9	7.2		0.57	0.08	50	4.0	0.65	Summer
117897	SN310	26/08/2013	14:21:00	5.1	4.8	15.39	17.62	8.0	0.3	81.8	7.1	0.5	0.82	0.10	70	4.0	0.92	Summer
117736	SN330	26/08/2013	13:53:00	6.3	6.1	24.32	17.51	7.9	0.5	86.9	7.2		0.52	0.07	40	5.0	0.59	Summer
117884	SN310	26/08/2013	14:19:00	5.1	0.0	11.05	17.78	8.0	0.3	81.9	7.3		0.86	0.09	50	6.0	0.95	Summer
118141	SN330	15/07/2013	15:05:00	6.0	5.8	23.92	20.79	8.0	0.9	96.1	7.5		0.27	0.01	40	6.0	0.28	Summer
118154	SN330	15/07/2013	15:07:00	6.0	0.3	21.74	21.29	8.0	0.9	96.8	7.6		0.28	0.01	40	6.0	0.285	Summer
118277	SN310	15/07/2013	15:35:00	4.8	2.3	13.75	22.26	8.0	0.5	94.3	7.6		0.47	0.01	50	6.0	0.475	Summer
118269	SN310	15/07/2013	15:33:00	4.8	4.6	16.72	21.97	8.0	0.5	91.7	7.3	0.8	0.40	0.01	40	7.0	0.405	Summer
118512	SN310	27/05/2013	18:17:00	6.5	0.3	10.38	13.68	8.1	0.3	96.3	9.4		0.65	0.08	90	2.0	0.73	Summer
118506	SN330	27/05/2013	17:52:00	8.5	8.0	18.77	12.95	8.0	0.3	99.4	9.3		0.47	0.05	80	3.0	0.52	Summer
118511	SN310	27/05/2013	18:15:00	6.5	6.0	11.79	13.56	8.0	0.3	95.6	9.2	0.8	0.62	0.06	50	4.0	0.68	Summer
118508	SN330	27/05/2013	17:54:00	8.5	0.3	18.42	13.00	8.0	0.3	98.4	9.2		0.49	0.05	70	8.0	0.54	Summer
109898	SN310	30/08/2012	14:08:00	4.1	0.0	0.35	16.79	8.5	0.1	92.7	9.0		1.32	0.06	50	4.0	1.38	Summer
109898	SN310	30/08/2012	14:08:00	4.1	3.9	0.35	16.76	8.5	0.1	92.3	8.9		1.32	0.06	50	4.0	1.38	Summer
109897	SN330	30/08/2012	13:56:00	6.6	0.0	5.80	16.35	8.2	0.1	93.9	8.9		1.07	0.06	60	6.0	1.13	Summer
109897	SN330	30/08/2012	13:56:00	6.6	6.5	5.65	16.35	8.2	0.1	93.6	8.9		1.07	0.06	60	6.0	1.13	Summer
109577	SN330	16/07/2012	13:20:00	5.5	0.0	4.96	16.27	8.1	0.3	95.7	9.1	0.7	0.65	0.07	40	3.0	0.72	Summer
109577	SN330	16/07/2012	13:20:00	5.5	5.3	12.12	15.94	8.1	1.3	92.1	8.4	0.7	0.65	0.07	40	3.0	0.72	Summer
109578	SN310	16/07/2012	13:52:00	5.8	0.0	0.91	16.52	8.4	0.3	94.9	9.2		0.81	0.04	30	3.0	0.85	Summer
109578	SN310	16/07/2012	13:52:00	5.8	3.5	1.41	16.44	8.4	0.3	94.7	9.2		0.81	0.04	30	3.0	0.85	Summer

Sample_ ID	Station_ No	Date_Surveyed	Time	Depth_ Bed	Depth_ Sample	Salinity	Temp	pH	Secchi	DO_ saturation	DO_mgL	BOD	TON	NH3	PO4	chl_a	DIN	Season
109338	SN330	13/06/2012	13:31:00	10.1	0.0	8.34	15.63	8.1	0.5	94.1	8.9		0.59	0.08	30	1.0	0.67	Summer
109338	SN330	13/06/2012	13:31:00	10.1	10.0	19.07	14.81	8.1	0.5	88.8	8.0		0.59	0.08	30	1.0	0.67	Summer
109340	SN310	13/06/2012	13:52:00	6.4	6.3	10.64	14.97	8.1	0.6	88.0	8.3		0.68	0.11	50	8.0	0.79	Summer
109339	SN310	13/06/2012	13:52:00	6.4	0.0	1.35	16.54	8.5	0.6	97.4	9.4		0.87	0.06	30	9.0	0.93	Summer
108998	SN310	06/03/2012	14:27:00	6.1	0.0	3.77	8.27	8.2	0.3	99.9	11.5		0.94	0.05	80	2.0	0.99	Winter
108998	SN310	06/03/2012	14:27:00	6.1	6.0	6.06	8.35	8.2	0.3	98.9	11.2		0.94	0.05	80	2.0	0.99	Winter
108997	SN330	06/03/2012	14:11:00	8.2	0.0	12.02	8.51	8.1	0.3	99.4	10.7		0.74	0.04	90	4.0	0.78	Winter
108997	SN330	06/03/2012	14:11:00	8.2	8.1	13.63	8.57	8.1	0.3	98.3	10.5		0.74	0.04	90	4.0	0.78	Winter
108576	SN330	24/08/2011	13:19:00	8.0	0.0	19.92	16.65	8.1	1.2	105.8	9.1		0.23	0.02	12	1.8	0.245	Summer
108579	SN310	24/08/2011	13:36:00	8.0	7.0	21.83	16.68	8.0	0.5	90.9	7.7	1.0	0.27	0.04	19	4.1	0.311	Summer
108577	SN330	24/08/2011	13:19:00	8.0	7.0	24.94	16.58	8.0	1.2	94.5	7.9		0.22	0.02	17	4.8	0.244	Summer
108578	SN310	24/08/2011	13:36:00	8.0	0.0	11.42	16.58	8.1	0.5	100.4	9.1	2.0	0.48	0.06	16	5.8	0.535	Summer
108377	SN310	25/07/2011	14:07:00	11.5	11.0	19.28	16.53	8.1	0.6	91.6	7.9		0.33	0.04	23	5.4	0.368	Summer
108374	SN330	25/07/2011	13:49:00	8.5	0.0	19.14	17.02	8.1	0.7	100.8	8.7	1.0	0.31	0.01	20	8.6	0.324	Summer
108375	SN330	25/07/2011	13:49:00	8.5	8.0	24.15	16.29	8.1	0.7	95.2	8.1		0.21	0.02	18	9.1	0.23	Summer
108376	SN310	25/07/2011	14:07:00	11.5	0.0	14.78	17.11	8.1	0.6	99.2	8.7		0.44	0.03	23	10.1	0.469	Summer
107954	SN330	01/03/2011	13:45:00	5.0	0.0	5.63	7.95	8.1	0.5	96.6	11.0		1.10	0.06	21	1.9	1.156	Winter
107956	SN310	01/03/2011	14:20:00	6.8	0.0	0.70	7.23	8.2	0.5	96.0	11.5	1.0	1.25	0.04	17	2.1	1.289	Winter
107955	SN330	01/03/2011	13:45:00	5.0	4.0	11.91	7.70	8.0	0.5	94.7	10.4		0.90	0.05	26	2.8	0.948	Winter
107957	SN310	01/03/2011	14:20:00	6.8	6.0	1.16	7.19	8.1	0.5	95.6	11.5	1.0	1.21	0.04	19	4.4	1.254	Winter
92728	SN330	16/07/2009	10:44:00	5.2	0.0	12.80	17.62	8.1	0.6	95.9	8.5	1.0	0.40	0.04	33	8.0	0.44	Summer
92755	SN310	16/07/2009	10:23:00	6.5	0.0	7.90	17.67	8.1	0.6	91.7	8.3		0.50	0.05	29	9.4	0.55	Summer
92665	SN330	16/07/2009	10:44:00	5.2	5.2	20.50	17.58	8.1	0.6	94.4	8.0	1.0	0.20	0.04	33	9.5	0.24	Summer
92729	SN310	16/07/2009	10:23:00	6.5	6.2	13.42	17.77	8.1	0.6	90.3	7.9		0.40	0.06	38	11.6	0.46	Summer
92817	SN330	21/05/2009	14:11:00	8.0	0.0	7.79	13.38	8.2	0.2	98.9	9.8		0.80	0.05	26	4.7	0.85	Summer
92775	SN330	21/05/2009	14:11:00	8.0	7.8	14.34	12.62	8.1	0.2	96.5	9.4		0.60	0.04	32	5.3	0.64	Summer
92833	SN310	21/05/2009	14:44:00	12.0	0.0	2.48	13.13	8.2	0.2	96.9	10.0	1.0	0.90	0.06	31	12.2	0.96	Summer
92833	SN310	21/05/2009	14:44:00	12.0	10.9	4.08	12.78	8.2	0.2	95.3	9.8	1.0	0.90	0.06	31	12.2	0.96	Summer
92834	SN330	05/02/2009	12:20:00	8.0	0.0	10.85	4.70	8.0	0.8	98.6	11.8	1.0	0.90	0.04	26	0.8	0.94	Winter

Sample_ ID	Station_ No	Date_Surveyed	Time	Depth_ Bed	Depth_ Sample	Salinity	Temp	pH	Secchi	DO_ saturation	DO_mgL	BOD	TON	NH3	PO4	chl_a	DIN	Season
92800	SN330	05/02/2009	12:20:00	8.0	7.5	15.10	5.40	8.0		98.2	11.2	1.0	0.70	0.03	26	1.0	0.73	Winter
92876	SN310	05/02/2009	11:44:00	7.0	6.5	6.50	4.53	8.1		98.5	12.2		1.10	0.05	24	1.5	1.15	Winter
92894	SN310	05/02/2009	11:44:00	7.0	0.0	0.54	3.83	8.2	1.1	97.7	12.8	1.0	1.20	0.05	16	2.7	1.25	Winter
94362	SN310	26/08/2008	12:10:00	6.5	5.5	0.88	16.24	8.4	0.6	95.5	9.3	1.0	0.80	0.02	14	2.9	0.82	Summer
94362	SN310	26/08/2008	12:10:00	6.5	0.0	0.44	16.27	8.4	0.6	94.4	9.2	1.0	0.80	0.02	14	2.9	0.82	Summer
94045	SN330	10/07/2008	13:11:00	8.6	0.0	13.77	16.00	8.0	0.5	95.6		1.0	0.30	0.03	22	0.2	0.33	Summer
94159	SN310	10/07/2008	13:48:00	7.0	6.0	14.30	16.12	8.1	0.3	92.5	8.3		0.40	0.04	12	0.2	0.44	Summer
94226	SN330	10/07/2008	13:11:00	8.6	8.0	13.77	16.18	8.0	0.5			1.0	0.20	0.03	11	0.2	0.23	Summer
94266	SN310	10/07/2008	13:48:00	7.0	0.0	9.53	16.34	8.1	0.3	94.8	8.8	1.0	0.50	0.04	17	0.6	0.54	Summer
94194	SN330	29/05/2008	12:39:00	5.7	0.0	24.29	14.43	8.1	0.5	98.5	8.7	1.0	0.30	0.03	19	0.2	0.33	Summer
94114	SN330	29/05/2008	13:29:00	5.7	4.0	25.88	13.97	8.1	0.5	97.3	8.5	1.0	0.40	0.04	17	0.5	0.44	Summer
94169	SN310	29/05/2008	13:15:00	6.7	6.0	21.41	14.37	8.1	0.5	98.6	8.8		0.50	0.03	22	0.5	0.53	Summer
94275	SN310	29/05/2008	13:15:00	6.7	0.0	19.88	14.66	8.1	0.5	99.7	9.0		0.60	0.02	16	1.1	0.62	Summer
94271	SN310	28/02/2008	12:18:00	7.0	0.0	0.43	7.09	8.2	0.3	86.9	10.5	1.0	1.55	0.03	7.9	0.2	1.58	Winter
94334	SN310	28/02/2008	12:18:00	7.0	6.5	10.16	7.44	8.1	0.3	91.7	10.3	1.0	1.31	0.04	25	0.2	1.35	Winter
93946	SN310	27/02/2008	13:17:00	5.8	4.9	3.02	7.06	8.2	0.1	91.7	10.9	1.0	1.18	0.03	26		1.21	Winter
93946	SN310	27/02/2008	13:17:00	5.8	0.0	0.79	7.23	8.2	0.1	87.3	10.5	1.0	1.18	0.03	26		1.21	Winter
94136	SN330	27/02/2008	12:55:00	12.0	9.2	13.77	7.57	8.1	0.1	89.7	9.8		0.97	0.03	16		1	Winter
94136	SN330	27/02/2008	12:55:00	12.0	0.0	4.30	7.46	8.1	0.1	87.2	10.2		0.97	0.03	16		1	Winter
91052	SN330	06/09/2007	12:29:00	8.0	0.0	12.08	17.50	8.1	0.4	88.2	7.8	1.0	0.15	0.01	63	2.3	0.16	Summer
91054	SN310	06/09/2007	13:07:00	6.5	0.0	10.14	17.58	8.2	0.3	87.2	7.8		0.18	0.01	90	4.7	0.19	Summer
91055	SN310	06/09/2007		6.5	6.0	18.31	17.10	8.0	0.3	90.3	7.8		0.45	0.01	100	5.6	0.46	Summer
91053	SN330	06/09/2007		8.0	7.5	22.85	16.80	8.0	0.4	91.5	7.7	1.0	0.17	0.01	48	6.9	0.18	Summer
90979	SN310	25/07/2007	12:11:00	6.0	0.0	5.77	17.60	8.2	0.9	94.7	8.7		0.85	0.05	40	0.4	0.9	Summer
90978	SN330	25/07/2007		9.0	8.0	21.49	16.03	8.1		95.7	8.3	1.0	0.44	0.07	42	1.3	0.51	Summer
90980	SN310	25/07/2007		6.0	5.5	14.54	17.27	8.1	0.9	89.2	7.8		0.56	0.08	36	1.4	0.64	Summer
90977	SN330	25/07/2007	11:36:00	9.0	0.0	8.49	17.14	8.2		96.7	8.8	1.0	0.23	0.04	25	2.3	0.27	Summer
90541	SN330	27/06/2007	10:35:00	0.8	0.0	8.50	14.66	8.2	0.3	82.9	8.0		3.79	0.03	110	1.2	3.82	Summer
90542	SN310	27/06/2007	11:06:00	3.5	0.0	2.17	15.66	8.2	0.3	88.5	8.7	1.0	4.44	0.02	49	3.6	4.46	Summer

Sample_ ID	Station_ No	Date_Surveyed	Time	Depth_ Bed	Depth_ Sample	Salinity	Temp	pH	Secchi	DO_ saturation	DO_mgL	BOD	TON	NH3	PO4	chl_a	DIN	Season
90542	SN310	27/06/2007	11:06:00	3.5	3.3	4.35	15.68	8.2	0.3	87.2	8.4	1.0	4.44	0.02	49	3.6	4.46	Summer
90945	SN310	14/03/2007	13:58:00	7.5	0.0	0.59	8.15	8.0	1.3	80.9	9.5		2.36	0.01	35	0.2	2.37	Winter
90944	SN330	14/03/2007		8.2	8.0	14.92	8.03	8.3	0.8	81.7	8.8	1.0	0.45	0.02	36	0.8	0.47	Winter
90946	SN310	14/03/2007		7.5	7.0	10.45	7.87	8.3	1.3	79.6	8.8		1.56	0.02	45	0.8	1.58	Winter
90943	SN330	14/03/2007	13:25:00	8.2	0.0	1.71	8.38	7.9	0.8	84.5	9.8	1.0	1.24	0.01	24	1.6	1.25	Winter