

Annual Environmental Report

2020



Lower Liffey Valley Regional Sewerage Scheme

D0004-02

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1 EXECUTIVE SUMMARY AND INTRODUCTION TO THE 2020 AER

This Annual Environmental Report has been prepared for D0004-02, Lower Liffey Valley Regional Sewerage Scheme, in Kildare 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.

The following capital works, significant changes or operational improvements were undertaken in 2020 or are planned for 2021:

- Biogas storage bell replaced in 2020.
- PLC upgrade in 2021.
- Automation of ferric sulphate dosing in 2021.

1.2 TREATMENT SUMMARY

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

- Lower Liffey Valley WWTP - 2020 with a Plant Capacity PE of 150000, the treatment type is 3NP - Tertiary N&P removal

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
TPEFF1400D0004SW001	Lower Liffey Valley WWTP - 2020	Treated	Compliant	N/A

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 LOWER LIFFEY VALLEY WWTP - 2020 - TREATED DISCHARGE

2.1.1 INFLUENT MONITORING SUMMARY - LOWER LIFFEY VALLEY WWTP - 2020

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.

Parameters	Number of Samples	Annual Max	Annual Mean
BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l	30	469.00	220.42
COD-Cr mg/l	30	692.00	362.68
Suspended Solids mg/l	30	382.00	184.52
Total Nitrogen mg/l	30	75.00	43.64
Total Phosphorus (as P) mg/l	30	6.99	3.60
Hydraulic Capacity	N/A	50837	35975

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 - TPEFF1400D0004SW001

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)
Fluoride mg/l	160	192	N/A	33	N/A	N/A	5.84	Pass
Chemical Oxygen Demand mg/l	125	250	N/A	33	N/A	N/A	15.76	Pass
Suspended Solids mg/l	35	87.5	N/A	33	N/A	N/A	3.14	Pass
pH pH units	6-9	6-9	N/A	30	N/A	N/A	6.59	Pass
BOD, 5 days with Inhibition (Carbonaceous) mg/l	4	8	N/A	33	N/A	N/A	1.00	Pass
Total Phosphorus mg/l	1	1.2	N/A	33	N/A	N/A	0.12	Pass
Ammonia-Total (as N) mg/l	0.5	1	N/A	33	1	N/A	0.16	Pass
ortho-Phosphate (as P) - unspecified mg/l	0.1	0.2	N/A	33	2	N/A	0.07	Pass
Chromium - unfiltered µg/l	N/A	N/A	N/A	4	N/A	N/A	1.00	

Parameter	WDDL 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)
Nitrate (as N) mg/l	N/A	N/A	N/A	33	N/A	N/A	18.23	
Nitrite (as N) mg/l	N/A	N/A	N/A	32	N/A	N/A	0.03	
Total Nitrogen mg/l	N/A	N/A	N/A	31	N/A	N/A	19.20	
Total Oxidised Nitrogen (as N) mg/l	N/A	N/A	N/A	29	N/A	N/A	19.20	
True Colour PtCo Units	N/A	N/A	N/A	31	N/A	N/A	21.06	

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):

Not applicable.

Significance of Results:

The WWTP is compliant with the ELV's set in the Wastewater Discharge Licence.

2.1.3 AMBIENT MONITORING SUMMARY FOR THE TREATMENT PLANT DISCHARGE TPEFF1400D0004SW001

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
Upstream	301516, 235804	RS09L011940	No	No	No	No	Unassigned
Downstream	302295, 235190	RS09L012040	No	No	No	No	Unassigned

The results for ambient results and / or additional monitoring data sets are included in the **Appendix 7.1 - Ambient monitoring summary**.

Significance of Results:

The WWTP discharge was compliant with the ELV's set in the wastewater discharge licence.

The ambient monitoring results does not meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.

Based on ambient monitoring results a deterioration in Ortho-P and Ammonia concentrations downstream of the effluent discharge is noted.

A deterioration in water quality has been identified, however it is not known if it or is not caused by the WWTP.

Other causes of deterioration in water quality in the area are unknown.

Based on effluent compliance, it is considered that the discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status. However, it should be noted that the WFD status u/s and d/s of the WWTP is currently Unassigned.

2.1.4 OPERATIONAL PERFORMANCE SUMMARY - LOWER LIFFEY VALLEY WWTP - 2020

2.1.4.1 Treatment Efficiency Report - Lower Liffey Valley WWTP - 2020

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	2918122	13032	100
COD	4801528	205389	96
SS	2442831	40881	98
TN	577789	253282	56
TP	47644	1592	97

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

2.1.4.2 Treatment Capacity Report Summary - Lower Liffey Valley WWTP - 2020

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.

Lower Liffey Valley WWTP - 2020	
Peak Hydraulic Capacity (m ³ /day) - As Constructed	65405
DWF to the Treatment Plant (m ³ /day)	48500
Current Hydraulic Loading - annual max (m ³ /day)	50837
Average Hydraulic loading to the Treatment Plant (m ³ /day)	35975
Organic Capacity (PE) - As Constructed	150000
Organic Capacity (PE) - Collected Load (peak week) ^{Note1}	138112
Organic Capacity (PE) - Remaining	11888
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 - LOWER LIFFEY VALLEY WWTP - 2020

'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)
Waterworks Sludge	475	Weight (Tonnes)	6	0	Yes	Yes	Yes
Domestic /Septic Tank Sludge	12490	Weight (Tonnes)	152	0.09	Yes	Yes	Yes
Industrial / Commercial Sludge	8026	Weight (Tonnes)	98	0.06	Yes	Yes	Yes
Landfill Leachate (delivered by tanker)	23513	Weight (Tonnes)	286	0.18	Yes	Yes	Yes

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
There were no relevant environmental complaints in 2020.			

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)
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	Yes
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	No

Incident Type	Cause	No. of incident occurrences	Recurring (Y/N)	Closed (Y/N)
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	Yes
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	Yes
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	Yes
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	Yes
Breach of ELV *	Other	1	No	Yes
Spillage	Blocked Sewer	1	No	Yes
Spillage	Broken Sewer Pipe	1	No	Yes
Spillage	Blocked Sewer	1	No	Yes
Spillage	Blocked Sewer	1	No	Yes
Uncontrolled release	EO caused by pump failure	1	No	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes
Uncontrolled release	Blocked Sewer	1	Yes	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes
Uncontrolled release	SWO exceptional rainfall and overflow expected	1	No	Yes

* Incident INCI019512, ELV breach, relates to a process sample.

3.2.2 SUMMARY OF OVERALL INCIDENTS

Question	Answer
Number of Incidents in 2020	19
Number of Incidents reported to the EPA via EDEN in 2020	19
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 2020 (No. of events)	Total volume discharged in 2020 (m ³)	Monitoring Status
SW002	301546 235839	Yes	Low	Meeting	Unknown	19426	Monitored
SW003	288868, 239585	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW004	294407, 238711	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW005	293552, 237349	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SW006	298236, 233802	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW007	297590, 233306	Yes	Low	Not 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 2020 (No. of events)	Total volume discharged in 2020 (m ³)	Monitoring Status
SW008	297584, 233306	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SW009	297379, 232919	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW010	298651, 233371	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW011	298651, 233385	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW012	296932, 232421	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW013	301155 235871	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SW014	292832, 229607	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SW015	300408, 235903	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SW016	30653 235836	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
TBC	297590, 233306	No	Unknown	Not yet Assessed	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 2020 (No. of events)	Total volume discharged in 2020 (m ³)	Monitoring Status
TBC	286684, 240780	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Monitored
TBC	298236, 233802	No	Unknown	Not yet Assessed	Unknown	Unknown	Not Monitored
TBC	288434, 238610	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	288177, 239026	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown

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 2020 (No. of events)	Total volume discharged in 2020 (m ³)	Monitoring Status
TBC	287770, 240274	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	299292, 234119	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	300469, 235248	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	293095, 238364	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	TBC, TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown

SWO Summary	
How much sewage was discharged via SWOs in the agglomeration in the year (m ³)?	Unknown
Is each SWO identified as not meeting DoEHLG Guidance included in the Programme of Improvements?	No
The SWO Assessment included the requirements of relevant of WWDL schedules?	Yes
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 WVDL)	Description	Licence Schedule	Licence Completion Date	Date Expired? (N/N/A/Y)	Status of Works	Timeframe for Completing the Work	Comments
D0004-SIP:01	Upgrading of Storm Water Overflows to comply with the criteria outlined in the DoECLG "Procedures and Criteria in relation to Storm Water Overflows, 1995".	C	31/12/2020	No	Work ongoing on-site	31/12/2021	
D0004-SIP:02	Waste Water capacity improvement works	C	08/05/2020	No	Works Completed		
D0004-SIP:03	Waste Water Treatment plant improvement and ancillary works to meet the requirements of Schedule A.1 and condition 3.4	C	31/12/2019	No	Works Completed		

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.

Licence Specific Report	Required by licence	Year included in AER	Included in this AER	Reference to relevant section of AER
Priority Substances Assessment	Yes	2014	No	
Toxicity/Leachate Management	Yes	2014	No	

5.1 PRIORITY SUBSTANCES ASSESSMENT

The Priority Substances Assessment Report has been included in the AER 2014.

5.2 TOXICITY/LEACHATE MANAGEMENT

The Toxicity/Leachate Management Report has been included in the AER 2014.

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?	No
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	No
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	N/A

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

Date: 12/03/2021

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

Lower Liffey Valley Sewerage Scheme 2020 Ambient Monitoring Summary

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Irish National Grid Reference (Easting, Northing)	EPA Feature Coding Tool code	Receiving Waters Designation (Yes/No)			
			Bathing Water	Drinking Water	FWPM	Shellfish
Upstream Monitoring Point	301516, 235804	RS09L011940	No	No	No	No
Downstream Monitoring Point	302295, 235190	RS09L012040	No	No	No	No

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Current WFD Status	cBOD (Mean mg/l)	o-Phosphate (as P) (Mean mg/l)	Ammonia (as N) (mean mg/l)
Upstream Monitoring Point	Unassigned	1.000	0.077	0.168
Downstream Monitoring Point	Unassigned	1.000	0.082	0.181
<i>Difference</i>		<i>0.000</i>	<i>0.005</i>	<i>0.013</i>
EQS		1.500	0.035	0.065
% of EQS		0.000%	14.286%	20.000%

Lower Liffey Valley Sewerage Scheme 2020 Ambient Monitoring Data

Monitoring Result Source	Sampling Method	Sample Date	Temperature °C	pH pH units	BOD mg/l	COD mg/l	Suspended solids mg/l	Total Nitrogen mg/l	Total Phosphorus mg/l	Ammonia mg/l	Ortho-Phosphate mg/l	Nitrite mg/l	Nitrate mg/l	Visual	DO mg/l	DO % sat	Coloration	Total Oxidised Nitrogen N	Fluoride
Upstream	Grab	08/01/2020	8.7	7.99	1	17	6	3	0.14	0.31	0.06	0.02	2.4	89	10.6	90.5	89	2.4	0.25
Upstream	Grab	15/01/2020	6.8	7.99	1	17	7	4	0.13	0.21	0.1	0.02	3.7	95	10.8	89.4	95	3.7	0.21
Upstream	Grab	23/01/2020	8.5	7.96	1	12	3	2	0.1	0.28	0.07	0.01	1.8	49	10.7	88.9	49	1.8	0.13
Upstream	Grab	30/01/2020	6.9	8.09	1	13	1	3.8	0.21	0.09	0.18	0.01	3.6	33	10.8	89.4	33	3.6	0.25
Upstream	Grab	12/02/2020	5.7	8.01	1	13	6	3.5	0.13	0.29	0.12	0.04	3.2	104	11.5	91.9	104	3.3	0.37
Upstream	Grab	26/02/2020	6.4	7.94	1	20	4	4	0.1	0.21	0.16	0.01	3.3	102	10.9	89.3	102	3.3	0.37
Upstream	Grab	04/03/2020			1	20	4	4	0.1	0.21	0.06	0.01	3.3						0.37
Upstream	Grab	18/03/2020			1	3	3	3	0.12	0.1	0.07	0.02	2.6						0.03
Upstream	Grab	06/05/2020		8.4	1	9	1	3	0.07		0.05	0.01	2.4	32	12.3	120	32	2.4	0.13
Upstream	Grab	14/05/2020	14	8.2	1	10	1	3	0.04	0.02	0.02	0.03	2.3	23	11.8	113.1	23	2.3	0.12
Upstream	Grab	28/05/2020	18.9	8.1	1	27	1	5	0.11	0.09	0.1	0.04	2	8.2	10.8	114	8.2	2.1	0.1
Upstream	Grab	04/06/2020	17.9	7.85	1	5	2	4	0.07	0.18	0.06	0.03	2	36	8.1	85.7	36	2.2	0.09
Upstream	Grab	12/06/2020	16.3	7.83	1	12	2	3	0.16	0.27	0.14	0.03	2.4	38	9.6	92.4	38	2.5	0.1
Upstream	Grab	18/06/2020	17.1	7.77	1	25	4	3	0.11	0.16	0.11	0.02	2.5	43	8.6	88.7	43	2.7	0.22
Upstream	Grab	24/06/2020	17.3	7.93	1	6	2	3	0.13	0.08	0.14	0.02	2.2	33	9.2	95.3	33	2.3	0.2
Upstream	Grab	02/07/2020	17.1	7.9	1	17	2	2	0.12	0.14	0.05	0.03	1.6	41	8.9	92	41	1.6	0.08
Upstream	Grab	09/07/2020	16.5	7.62	1	10	5	1	0.11	0.01	0.11	0.01	1.6	18	8.8	90.6	18	1.6	0.1
Upstream	Grab	15/07/2020	17.7	7.98	1	6	4	3	0.12	0.01	0.1	0.01	2.7	36	9.6	100.2	36	2.7	0.12
Upstream	Grab	12/08/2020	18.7	7.65	1	13	1	2.7	0.04	0.14	0.04	0.01	2.3	27	9.34	99.7	27	2.3	0.08
Upstream	Grab	27/08/2020	15.2	7.92	1	12	5	4.1	0.16	0.19	0.08	0.02	3.5	64	9.6	96.9	64	3.6	0.14
Upstream	Grab	02/09/2020	16.4	7.61	1	20	7	3	0.08	0.19	0.06	0.02	1.9	96	9.72	99.6	96	2	0.06
Upstream	Grab	16/09/2020	17.8	7.8	1	15	1	3	0.05	0.07	0.03		2.6	41	9.4	97.1	41	2.6	0.14
Upstream	Grab	30/09/2020	12.7	8.04	1	10	9	2.5	0.11	0.19	0.07	0.02	2.4	39	9.4	102.8	39	2.5	0.1
Upstream	Grab	07/10/2020	11.9	7.71	1	29	5	3	0.13	0.25	0.07	0.02	2.8	91	10.2	94.2	91	2.9	0.18
Upstream	Grab	21/10/2020	12.5	7.6	1	10	6	2.6	0.11	0.21	0.02	0.02	1.5	92	9.88	94.7	92	2.6	0.17
Upstream	Grab	04/11/2020	9.6	7.68	1	29	4	3	0.08	0.18	0.01	0.01	2.8	98	10.9	93.6	98	2.8	0.16
Upstream	Grab	18/11/2020	9.7	7.82	1	17	6	3.4	0.08	0.15	0.03	0.02	2.8	73	9.7	93	73	2.9	0.12
Upstream	Grab	25/11/2020	9.5	7.76	1	17	8	3.5	0.08	0.18	0.06	0.05	2.3	109	11.3	99.5	109	2.4	0.11
Upstream	Grab	02/12/2020	9.7	7.76	1	28	4	3	0.16	0.27	0.09	0.04	2.3	96	11.03	96.4	96	2.4	0.09
Upstream	Grab	16/12/2020	7.8	7.8	1	20	4	3	0.11	0.18	0.06	0.03	2.6	85	11.4	97.2	85	2.7	0.14
		Mean	12.86	7.88	1.00	15.40	3.93	3.14	0.11	0.168	0.077	0.022	2.513	60.400	10.174	96.289	60.400	2.579	0.158
		95%ile	18.46	8.17	1.00	28.55	7.55	4.06	0.16	0.286	0.151	0.040	3.555	103.300	11.695	113.685	103.300	3.600	0.370
Downstream	Grab	08/01/2020	9.6	8.02	1	24	3	3	0.11	0.26	0.07	0.02	2.6	101	10.6	91.9	101	2.6	0.06
Downstream	Grab	15/01/2020	6.5	8.04	1	15	7	5	0.17	0.21	0.1	0.04	4.4	102	10.9	89.9	102	4.4	0.21
Downstream	Grab	23/01/2020	9.5	8.09	1	18	5	2	0.12	0.21	0.09	0.01	1.8	58	10.4	89.1	58	1.9	0.25
Downstream	Grab	30/01/2020	8.3	8.12	1	19	1	4	0.13	0.06	0.11	0.02	4.1	36	10.5	89.8	36	4.1	0.48
Downstream	Grab	12/02/2020	5.5	109	1	3	4	3.5	0.14	0.3	0.12	0.05	3.4	109	11.5	91.2	109	3.4	0.36
Downstream	Grab	26/02/2020	6.2	101	1	11	6	4	0.11	0.3	0.06	0.01	3.3	101	11.2	90.4	101	3.3	0.26
Downstream	Grab	04/03/2020			1	29	3	3	0.1	0.3	0.06	0.01	2.9						0.32
Downstream	Grab	18/03/2020			1	6	6	4	0.1	0.14	0.06	0.02	2.6						0.12
Downstream	Grab	06/05/2020	19	8.01	1	10	3	4	0.11	0.09	0.09	0.01	3.5	32	9.3	98.5	32	3.6	0.28
Downstream	Grab	14/05/2020	12.9	8.2	1	34	1	4	0.02	0.02		0.13	3.5	19	11.05	103	19	3.6	0.27
Downstream	Grab	28/05/2020	19	8.04	1	2	1	4	0.09	0.01	0.04	0.04	3.5	23	9.3	99	23	3.6	0.28
Downstream	Grab	04/06/2020	17.2	7.77	1	22	2	5	0.07	0.17	0.06	0.02	3.9	33	8.4	88	33	4	0.3
Downstream	Grab	12/06/2020	15.8	7.71	1	7	1	5	0.16	0.26	0.14	0.01	4.9	30	8.8	88.6	30	5.3	0.3
Downstream	Grab	18/06/2020	19	7.68	1	22	16	3	0.12	0.19	0.12	0.02	2.7	42	8.4	90.6	42	3	0.33
Downstream	Grab	24/06/2020	17.3	7.63	1	18	2	3	0.13	0.2	0.1	0.02	2.8	29	9.3	96.4	29	3	0.31
Downstream	Grab	02/07/2020	17.3	8.16	1	8	3	3	0.11	0.2	0.11	0.03	2.6	22	9.14	95.1	22	2.7	0.31
Downstream	Grab	09/07/2020	17.1	7.85	1	12	2	1	0.13	0.1	0.12	0.01	2.6	18	8.9	92	18	2.6	0.2
Downstream	Grab	15/07/2020	18.4	8.13	1	14	3	3	0.11	0.14	0.08	0.01	3	130	8.72	91.6	130	3	0.11
Downstream	Grab	12/08/2020	18.8	7.83	1	14	1	4.7	0.05	0.1	0.04	0.02	4.4	49	8.9	94.6	49	4.4	0.29
Downstream	Grab	27/08/2020	16.5	7.67	1	14	4	4.6	0.16	0.09	0.09	0.02	4.3	48	9.2	94.7	48	4.3	0.3
Downstream	Grab	02/09/2020		7.72	1	27	6	3	0.11	0.23	0.09	0.02	2.8	93	9.33	98.3	93	2.8	0.08
Downstream	Grab	30/09/2020	15.3	7.96	1	26	49	6	0.19	0.22	0.08	0.02	5.9	94	9.4	95.5	94	6	0.38
Downstream	Grab	07/10/2020	12.9	7.74	1	22	5	3	0.16	0.19	0.14	0.03	3.1	92	9.94	94.2	92	3.1	0.15
Downstream	Grab	21/10/2020	12.5	7.78	1	12	6	2.5	0.08	0.2	0.02	0.02	1.8		10.01	95.8		2.5	0.13
Downstream	Grab	04/11/2020	9.1	7.83	1	4	4	3	0.1	0.21	0.07	0.1	2.9	88	11.2	94.9	88	2.9	0.28
Downstream	Grab	18/11/2020	12.7	7.8	1	22	7	3.6	0.09	0.21	0.03	0.03	2.5	98	10.1	95.6	98	2.5	0.03
Downstream	Grab	25/11/2020	8.8	7.86	1	22	4	3.8	0.08	0.11	0.03	0.05	2.5	98	11.4	98	98	2.6	0.03
Downstream	Grab	02/12/2020	9.3	7.9	1	27	1	3	0.18	0.34	0.11	0.05	2.7	108	11.2	97.1	108	2.8	0.1
Downstream	Grab	16/12/2020	8.3	7.7	1	20	4	3	0.11	0.18	0.06	0.03	2.6	87	11.03	96.5	87	2.7	0.14
		Mean	13.18	15.08	1.00	16.59	5.52	3.58	0.12	0.181	0.082	0.030	3.228	66.923	9.930	94.085	66.923	3.359	0.230
		95%ile	19.00	73.16	1.00	28.20	12.40	5.00	0.18	0.300	0.133	0.080	4.700	108.750	11.340	98.850	108.750	5.030	0.372

Note: Where the concentration in the result is less than the limit of detection (LOD), a value of LOD/sqrt(2) was used in calculating the mean and 95%ile concentrations.