Panther Environmental Solutions Ltd
Units 3 & 4, Innovation Centre
Institute of Technology
Green Road, Carlow
Ireland
R93 W248

Telephone: 059-9134222
Email: info@pantherwms.com
Website: www.pantherwms.com

AQUATIC ASSESSMENT OF THE DERRY AND SLANEY RIVERS

2020

DUFFY MEATS T/A
KERRY FOODS
COOLATIN, SHILLELAGH
CO WICKLOW

EPA LICENCE NO. P0804-02

Date:	29th September 2020	**Prepared By:**	Martin O'Looney, BSc.
Report number:	RQA_20_9842	**Checked:**	Mike Fraher, BSc.

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EXECUTIVE SUMMARY

Panther Environmental Solutions Ltd (PES Ltd) was commissioned by Kerry Foods, Shillelagh to carry out an aquatic assessment of the Derry and Slaney Rivers. This assessment is required as the Kerry Foods site discharge treated effluent to the Derry River, under IED licence conditions, from its primary and biological effluent treatment plant.

Monitoring was conducted at eleven sampling stations, on Wednesday 9th September 2020, under low to normal flow conditions, nine of which are located on the Derry River and the remainder on the River Slaney. Monitoring was conducted by Martin O'Looney BSc of PES Ltd.

The weather during the summer of 2020 was generally wetter, with lower temperatures than average (https://www.met.ie/climate/past-weather-statements).

Due to river flow conditions, the river at station 9 (Balisland Bridge) was too deep to allow for safe access and monitoring. Water samples were taken for lab analysis and in-field measurements were recorded.

Dissolved oxygen, temperature and pH were all within expected levels and showed no indications of negative impact across all monitoring locations. BOD_5 results for the Derry and Slaney Rivers were classified as being of "*high status*" (<2.2 mg/l O_2 95 %ile) for all stations in 2020. Orthophosphate results for the Derry and Slaney Rivers were classified as being of "*high status*" (<0.035 mg/l PO_4-P 95 %ile) for all stations in 2020.

At Station 3 (Shillelagh Bridge) and Station 4 (25m d/s of the Kerry outfall), a biotic indices of Q3-4 was found, indicating "*moderate status*". BOD_5 and orthophosphate levels indicated "*high status*", this was similar to levels found along the full course of the River Derry.

The water quality at Station 4 (25m d/s of the Kerry outfall) appears to have improved slightly to Q3-4 "*moderate status*" in 2020 versus the Q3 "*poor status*" recorded in 2019.

A water quality status of Q3-4 "*moderate status*" was also found at Station 3 (Shillelagh Bridge), which is upstream of both the Kerry Foods and Shillelagh Municipal Treatment Plant discharges to the Derry River.

Therefore, the above information would indicate that the Kerry Foods facility is not having a significant negative impact on water quality in the Derry and Slaney Rivers.

1.0 INTRODUCTION AND SCOPE OF WORK

Duffy Meats Ltd. trading as Kerry Foods, Wicklow is located approximately 0.5 km south of Shillelagh Village in Co. Wicklow. The plant was established on a green field site in 1991 and production commenced there in 1994.

The site is licenced to carry out the following activity, under Industrial Emissions Licence No P0804-02;

7.8 Treatments or processes for the purposes of the production of food products from –
(a) animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day.

Panther Environmental Solutions Ltd (PES Ltd) was commissioned by Kerry Foods, Shillelagh to carry out an aquatic assessment of the Derry and Slaney Rivers. This assessment is required as the Kerry Foods site discharge treated effluent to the Derry River, under IED licence conditions, from its primary and biological effluent treatment plant.

This Aquatic Assessment was compiled as a requirement under the IED licence, as follows:

Schedule C.6 Ambient Monitoring

Receiving Water Monitoring

Location: To be agreed by the Agency

Parameter	**Monitoring Frequency** Note 1	**Analysis Method/Technique**
Biological Quality (Q) Rating/Q Index	Annually	To be agreed by the Agency

Note 1: Monitoring period - June to September.

2.0 DESCRIPTION OF THE DERRY AND SLANEY RIVERS

Hydrometric Area 12 contains the Slaney Catchment and Wexford Harbour (area 1,750 km^2). The River Slaney flows from its source in the Lugnaquilla Mountain south for a length of 117.5 km through Baltinglass, Rathvilly, Tullow, Bunclody, Enniscorthy and finally discharging into a narrow estuary in Wexford Town.

The River Slaney is classified as a Salmonid Water under the first Schedule of the European Communities (Quality of Salmonid Waters) Regulations, 1988 (SI 293 of 1988), site number IE_SE_12_924.

The Slaney River Valley is a Special Area of Conservation (IE0000781) with particular species of interest being the Freshwater Pearl Mussel (*Margaritifera margaritifera*), Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Alosa fallax*), Atlantic Salmon (*Salmo salar*) and Otter (*Lutra lutra*), as listed in Annex II of the EC Habitats Directive (92/43/EC). The Derry River is included in the Slaney River Valley SAC.

The Derry River [12D02] (catchment area 246 km^2) is a tributary of the River Slaney. The Derry River rises north of Tinahely and flows for a length of 33.8 km to its confluence with the River Slaney at Killdavin Village.

There are two municipal wastewater treatment plants discharging to the Derry River upstream of the Kerry Foods outfall at Tinahely and Shillelagh. The Shillelagh Wastewater Treatment Plant (SWTP) provides secondary treatment and is designed to cater for a PE of 800. The SWTP outfall is located 200 metres upstream of the Kerry Foods effluent discharge outfall.

The European Communities Environmental Objectives (Surface Waters) Regulations (S.I. 272 of 2009) provide for the classification of surface water bodies by the EPA for the purposes of the Water Framework Directive, and the establishment of legally binding quality objectives for all surface waters.

These regulations establish that those surface waters classified by the Agency as being of "*high*" or "*good*" status shall be maintained at their current level, and those surface waters which have been classified as less than "good" status shall be improved to at least good status by 2015.

EPA monitoring in 2019 (which was the last monitoring period) has classified the Derry River as good to high status (Q4-5) at Greenhall Bridge, good status (Q4) at Shillelagh Bridge and good status (Q4) at Balisland Bridge. This area covers monitoring stations 1-9.

EPA monitoring in 2019 has classified the River Slaney as moderate status located at the Kilcarry Bridge and the Slaney New Bridge was last monitored by the EPA in 1991 which had a classification status of moderate. This area covers monitoring locations 10-11.

3.0 DESCRIPTION OF MONITORING LOCATIONS

Eleven sampling stations were agreed previously between the client and Wicklow County Council, nine of which are located on the Derry River and the remainder on the Slaney as follows;

Table 3.1: Sampling Station Locations

Station	River	Location	County	Easting	Northing
1	Derry	Greenhall Bridge	Wicklow	302132	170693
2	Derry	Deegins Bridge	Wicklow	301053	168969
3	Derry	Shillelagh Bridge, 50m u/s SWWTP outfall	Wicklow	299101	168011
4	Derry	25m d/s Kerry Foods outfall in mixing zone	Wicklow	299072	167640
5	Derry	200m d/s Kerry Foods outfall	Wicklow	299027	167408
6	Derry	600m d/s Kerry Foods outfall	Wicklow	298850	167116
7	Derry	1 km d/s Kerry Foods outfall at a private bridge	Wicklow	298843	166766
8	Derry	2.5 km d/s Kerry Foods outfall	Wicklow	298730	165651
9	Derry	Balisland Bridge	Wicklow	297795	164487
10	Slaney	Kilcarry Bridge	Carlow	289263	162465
11	Slaney	New Bridge	Wexford	289902	159661

Appendix A contains Map P120, which gives an overview of monitoring locations along the course of the Derry and Slaney Rivers, and maps P121, P122, P123 and P124 detailing the locations of all monitoring stations.

Further details of monitoring location characteristics are presented within Table B3 in Appendix B.

Monitoring Point 1 is located approximately 5.16 kilometres upstream of the discharge point, downstream of Greenhall Bridge. This location was monitored by the EPA between 1987 and 2016 (Station No 12D02-0350). This monitoring point is located within the Tomnafinnoge Woods.

Figure 3.1: Monitoring Point 1 (Greenhall Bridge)

Monitoring Point 2 is located 3 kilometres upstream of the discharge point, downstream of Deegins Bridge. This location was monitored by the EPA between 1980 and 1991 (Station No 12D02-0400). This monitoring point is also located within the Tomnafinnoge Woods.

Figure 3.2: Monitoring Point 2 (Deegins Bridge)

Monitoring Point 3 is located 360 metres upstream of the discharge point and c. 50 metres upstream of the Shillelagh Municipal WWTP discharge, downstream of Shillelagh Bridge (also called the Bay Bridge). This location was monitored by the EPA between 1987 and 2016 (Station No 12D02-0500). The Shillelagh Stream meets with the Derry River approximately 50 metres upstream of this location.

During a survey undertaken in April 2000, it was noted that a discharge from a wastewater treatment plant (WWTP) upstream of the Kerry Foods outfall may be having a negative impact on the river. Station 3 was relocated upstream of this discharge for subsequent surveys in order for the results to be compared with previous assessments.

Station 3 has remained upstream of the Shillelagh Municipal Treatment Plant effluent outflow for all assessments following the April 2000 Survey.

Figure 3.3: Monitoring Point 3 (Shillelagh Bridge)

Monitoring Point 4 is located approximately 25 metres downstream of the Kerry Foods outfall and c. 200 metres downstream of the Shillelagh Municipal WWTP discharge.

Figure 3.4: Monitoring Point 4 (25 m d/s discharge point)

Monitoring Point 5 is located approximately 200 metres downstream of the Kerry Foods outfall. This location is c. 50 metres downstream of an EPA monitoring point, which was monitored by the EPA between 1980 and 1987 (Station No 12D02-0600).

Figure 3.5: Monitoring Point 5 (200 m d/s discharge point)

Monitoring Point 6 is located approximately 600 metres downstream of the Kerry Foods outfall. This monitoring location is bounded by agricultural pastureland with willow in the riparian zone.

Figure 3.6: Monitoring Point 6 (600 m d/s discharge point)

Monitoring Point 7 is located 1 kilometre downstream of the discharge point, downstream of a private bridge to agricultural buildings ("Ballard House" on 25" OSI maps). This location was monitored by the EPA in 1987 and 1991 (Station No 12D02-0650).

Figure 3.7: Monitoring Point 7 (1 km d/s discharge point)

Monitoring Point 8 is located 2.5 kilometres downstream of the discharge point, downstream of a tributary flowing through Ballyknocker Woods. This monitoring location is bounded by agricultural pastureland with willow and holly in the riparian zone.

Figure 3.8: Monitoring Point 8 (2.5 km d/s discharge point)

Monitoring Point 9 is located 4 kilometres downstream of the discharge point, downstream of Balisland Bridge. This location was monitored by the EPA between 1976 and 2016 (Station No 12D02-0700). The Derry River meets with the River Slaney approximately 11 kilometres downstream of this location.

Figure 3.9: Monitoring Point 9 (Balisland Bridge)

Monitoring Point 10 is located at Kilcarry Bridge on the River Slaney, approximately 3 kilometres upstream of the confluence with the Derry River. This location was monitored by the EPA between 1984 and 2016 (Station No 12S02-1600).

Figure 3.10: Monitoring Point 10 (Kilcarry Bridge)

Monitoring Point 11 is located near Kildavin, at New Bridge on the River Slaney, approximately 150 metres downstream of the confluence with the Derry River. This location was monitored by the EPA between 1971 and 1991 (Station No 12S02-1700).

Figure 3.11: Monitoring Point 11 (New Bridge)

4.0 METHODOLOGY

Monitoring of the eleven sampling stations was conducted by Martin O'Looney BSc of PES Ltd on Wednesday 9th September 2020 under normal to high flow conditions. Weather conditions were warm with scattered showers.

The weather during the summer of 2020 was generally wetter, with lower temperatures than average (https://www.met.ie/climate/past-weather-statements).

Due to river flow conditions, the river at station 9 (Balisland Bridge) was too deep to allow for safe access and monitoring. Water samples were taken for lab analysis and in-field measurements were recorded.

4.1 PHYSICO-CHEMICAL SAMPLING

Water samples were collected at each of the eleven sampling stations for the analysis of BOD_5 and Orthophosphate. Samples were stored in a cooled container before delivery to T.E. Laboratories, Tullow, Co. Carlow.

Temperature, Dissolved Oxygen and pH were measured in the field at the time of sampling using a Wti Multi-meter with an inbuilt thermometer.

4.2 ECOLOGICAL SAMPLING

Ecological analysis was carried out in accordance with Standard Methods "*Benthic Macroinvertebrates*" Section 10500, Chapter 1, page 10-63 and Toner et al (2005). A single two-minute kick sample was collected at each monitoring station. Stone wash samples were also collected from two brick sized stones at all locations where this was possible.

Following collection, specimens were segregated and refrigerated below 4°C in specimen jars. Identification was carried out by means of a high-powered microscope and dichotomous keys, as per section 8.0 below.

Where possible, the following principles in the selecting of sampling locations and the conducting of sampling have been applied;

1. Collect samples in riffles (shallow areas where water breaks over rocks).
2. Sample where the stream flow velocity is at least 0.3 meters per second.
3. Sample substrate composed of course gravel to larger rubble (< 0.3 meters diameter).
4. Sample similar environments and standardize protocols (points 1 – 3) at all assessment sites if possible, particularly if comparisons are being made between or among sites, or at sites over time.

It should be noted that the available habitats of the following locations in this study differ significantly from the majority of the sampling locations, in particular;

Monitoring Location	Name	Description
MP4	25m d/s Kerry Foods outfall in mixing zone	Deep pool/glide section with little mixing, substrate consisting of silt/sand with isolated large stones and macrophytes
MP9	Balisland Bridge	Deep pool/glide section with little mixing, substrate consisting of mud with isolated large stones and macrophytes
MP10	Kilcarry Bridge	Deep pool/glide section with some mixing upstream, substrate consisting of predominantly large stones/boulders with very limited sections of fine gravel/sand
MP11	New Bridge	Shallow riffle area with good mixing, substrate consisting of predominantly large stones/boulders with very limited sections of fine gravel/sand

Therefore, direct comparisons between samples collected from different habitats may be unreliable.

It should also be noted that sampling occurs during the summer months of June to September, as is required by the sites IE licence, where the lowest flows and highest temperatures typically occur during the year. This period covers the time of year when any impact, both natural and anthropogenic, can have its maximum impact.

It should also be noted that, as the sampling occurs during the summer period, macroinvertebrate communities are in a state of transition between typical spring community associations and autumn community associations.

Although sampling design is intended to reduce the influence of extraneous variables, values of indices may differ during seasons and years because of variations in weather and hydrology.

EPA Q Rating Methodology

The methodology outlined in Toner et al (2005) was followed in order to determine the Biotic Quality Rating (Q) at each monitoring location. Macroinvertebrates were identified down to the lowest taxon as outlined in Appendix I of Toner et al (2005).

In the presence of pollution, characteristic and well-documented changes are induced in the flora and fauna of rivers and streams. The changes which occur are due to the varying sensitivities of the different components of the community to the stresses caused by pollution. It is, therefore, possible to relate certain faunal groupings or community types to particular levels of pollution. Biotic indices are a qualitative measure of the influence of pollution in that they give an indication of the presence and potentially the type (organic, eutrophication or toxicity) of an impact, however, a quantitative measure of the source of the impact is not defined.

Identified macroinvertebrates were grouped into categories based upon their relative sensitivities to pollution, from “Group A” being most sensitive to “Group E” being the most

tolerant of pollution. The relative abundances of each group were calculated and the Q-rating for each monitoring station was determined. The correlation between Q values and water quality can be seen in Table 4.1 below.

Table 4.1: Relationship between Q-value and Water Quality

Biotic Index	Water Quality	Condition	Status
Q5 or Q4-5	Good	Satisfactory (Pristine)	**High Status**
Q4	Fair	Satisfactory	**Good Status**
Q3-4	Transitional (Slight Pollution)	Unsatisfactory	**Moderate Status**
Q3, Q2-3, Q2	Moderately Polluted	Unsatisfactory	**Poor Status**
Q1	Seriously Polluted	Unsatisfactory	**Bad Status**

The intermediate ratings, Q1-2, Q2-3, Q3-4 and Q4-5, are used to denote transitional conditions, ratings within parenthesis, i.e. (Q4), indicate borderline values, and a rating including a zero i.e. Q3/0, indicate toxic effects rather than eutrophication.

Site characteristics for each station have also been included in order to allow a more complete assessment of the ecological make-up at each site. This included an examination of substrate characteristics, riparian vegetation and shade, macrophyte growth and percentage cover.

Site information is summarised in Table B3 of Appendix B.

5.0 RESULTS

The following tables detail the finding of this June 2018 aquatic assessment of the Derry and Slaney Rivers. Results of previous year's assessments have been included for BOD, Orthophosphate, Biotic Index (Q), BMWP Score and ASTP Score to allow for longitudinal analysis of trends.

5.1 FIELD MEASUREMENT RESULTS FOR THE DERRY AND SLANEY RIVERS

Table 5.1: Temperature, Dissolved Oxygen and pH Levels

Station	pH	DO (mg/l)	DO (%Sat)	Temperature (°C)
1	7.2	9.74	97.9%	15.1
2	7.3	9.33	90.0%	13.2
3	7.3	9.35	91.2%	13.7
4	7.4	9.57	92.1%	13.1
5	7.3	9.61	95.4%	14.5
6	7.2	9.57	96.6%	15.3
7	7.5	9.49	95.4%	15.1
8	7.4	9.42	95.3%	15.4
9	7.3	9.12	93.1%	15.8
10	8.2	9.35	95.8%	16.0
11	8.4	9.46	99.4%	17.2

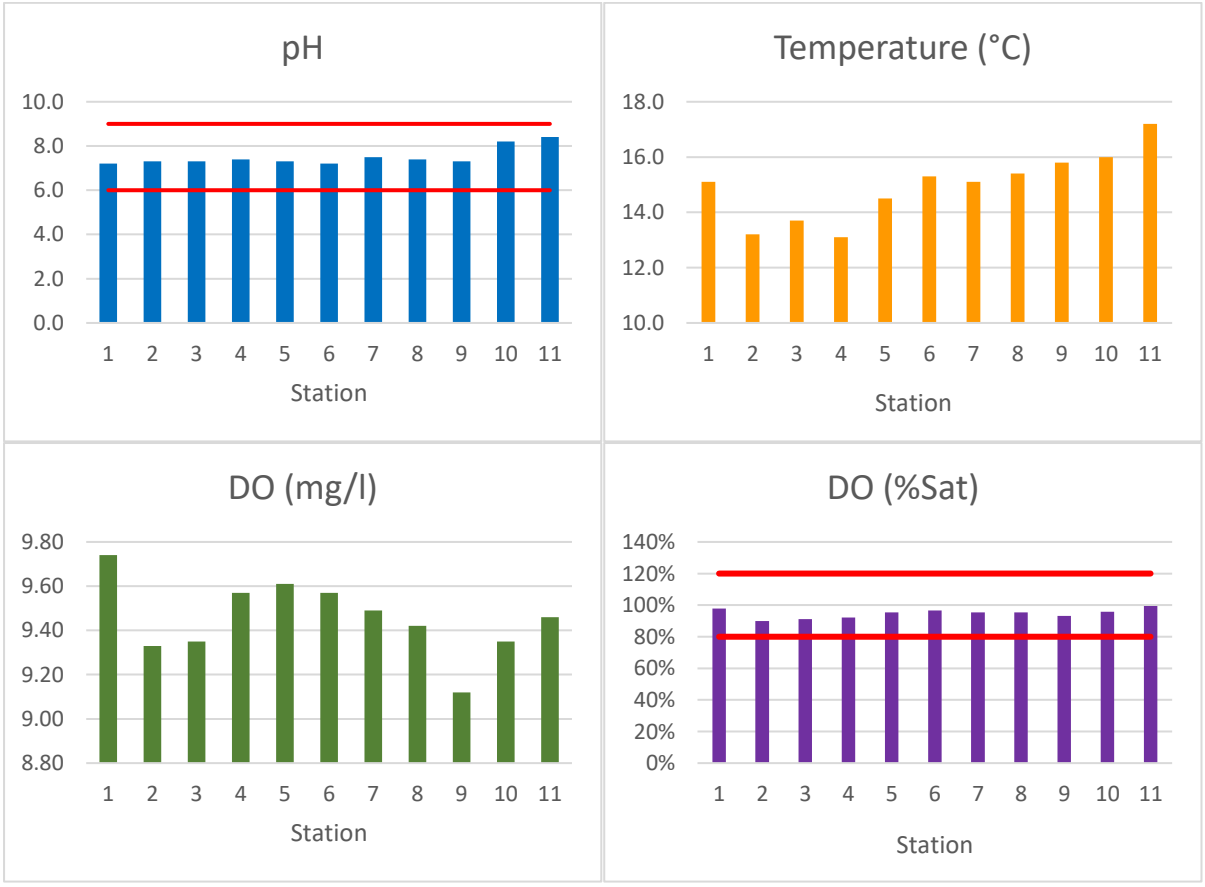


Figure 5.1: pH and Dissolved Oxygen Levels

5.2 CHEMICAL RESULTS FOR THE DERRY AND SLANEY RIVERS

Table 5.2: 2020 Survey BOD_5 Levels and Historical Levels

Station	1	2	3	4	5	6	7	8	9	10	11
					BOD_5 (mg/l O_2)						
2020	<2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2019	1.0	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	1.0	1.0
2018	3	4	5	4	4	4	4	4	4	4	4
2017	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2016	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2
2015	<5	<5	<5	<5	<3	<3	<3	<3	<3	<3	<3

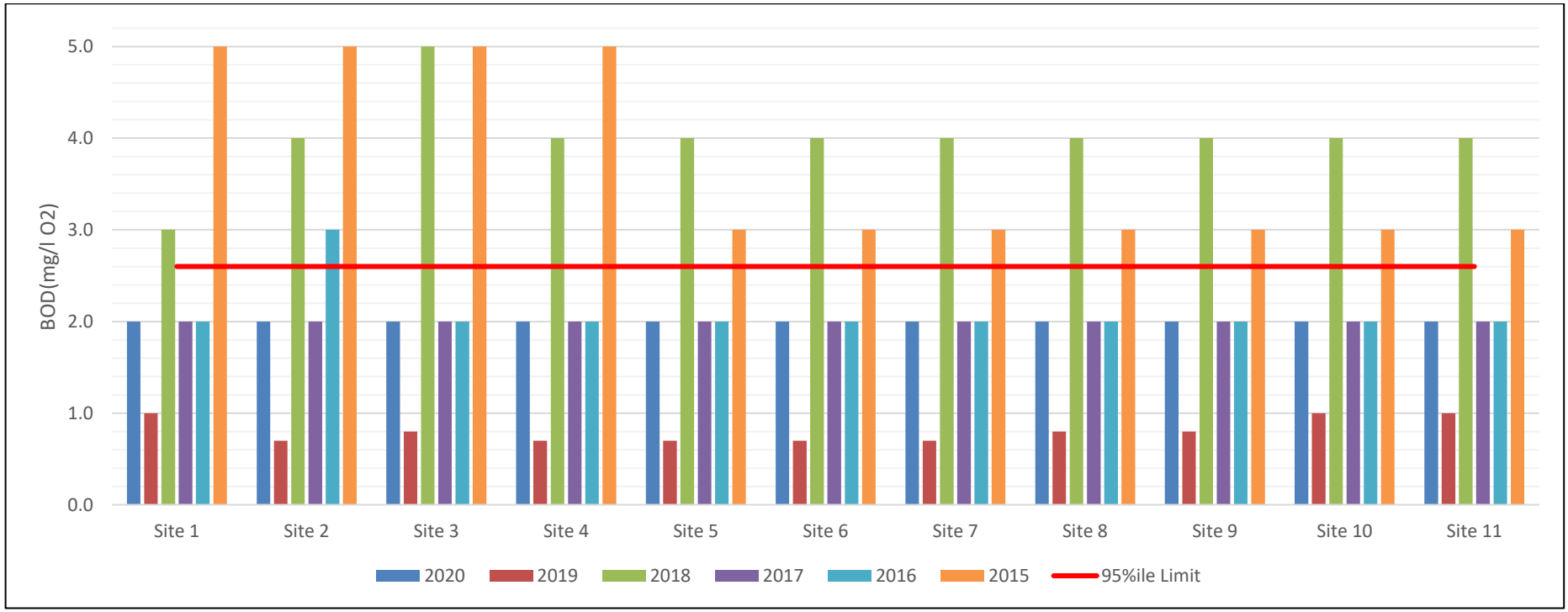


Figure 5.2: 2020-2015 Survey BOD_5 and annual 95 percentile "*Good Status*" limit

Table 5.3: 2020 Survey Orthophosphate Levels and Historical Levels

Station	1	2	3	4	5	6	7	8	9	10	11
Orthophosphate (mg/l as P)											
2020	0.02	0.02	0.02	0.03	0.02	0.01	0.03	0.03	0.03	0.03	0.03
2019	0.03	0.02	0.02	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03
2018	0.07	0.08	0.05	0.08	0.06	0.08	0.07	0.08	0.07	0.05	0.07
2017	0.06	0.09	0.03	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
2016	0.020	0.029	0.029	0.049	0.069	0.049	0.049	0.049	0.039	0.020	0.020
2015	0.039	0.036	0.026	0.065	0.042	0.042	0.082	0.059	0.065	0.065	0.065

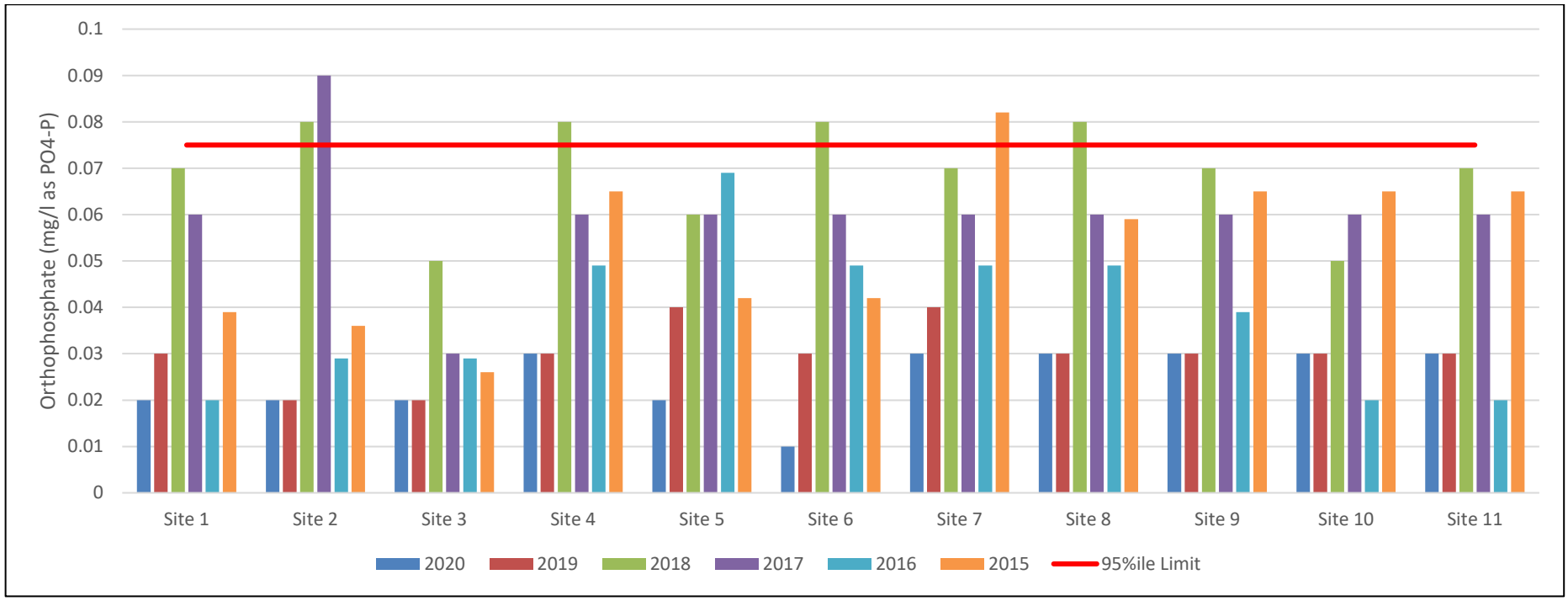


Figure 5.3: 2020-2015 Survey Orthophosphate and annual 95 percentile "*Good Status*" limit

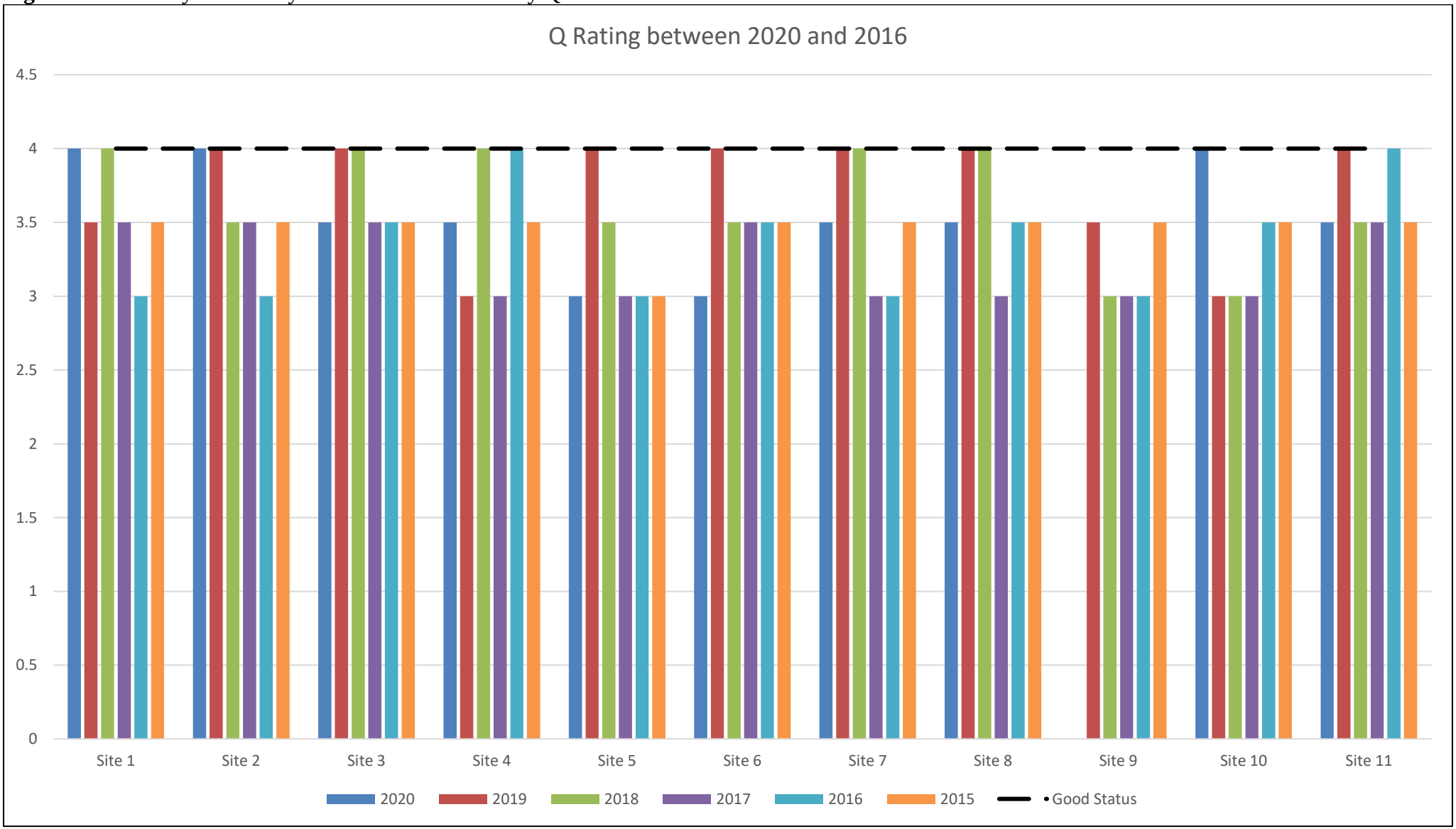
5.3 ECOLOGICAL RESULTS FOR THE DERRY AND SLANEY RIVERS

Appendix B, Chart B1 contains further details of species abundance and biotic indices for this 2018 assessment of the Derry and Slaney Rivers.

Table 5.4: Derry and Slaney Rivers 2020 Survey and Historical Q-values

Year	Q-values										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2020	4	4	3-4	3-4	3	3	3-4	3-4	No sample	4	3-4
2019	3-4	4	4	3	4	4	4	4	3-4	3	4
2018	4	3-4	4	4	3-4	3-4	4	4	3	3	3-4
2017	3-4	3-4	3-4	3	3	3-4	3	3	3	3	3-4
2016	3	3	3-4	4	3	3-4	3	3-4	3	3-4	4
2015	3-4	3-4	3-4	3-4	3	3-4	3-4	3-4	3-4	3-4	3-4
2014	3-4	3-4	3	3-4	3-4	3	3-4	3	3	3-4	4
2013	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3	3-4	3-4
2012	4	4	4	4	4	4	4	3-4	3-4	4	4
2011	3-4	3-4	3-4	4	4	4	4	4	3-4	3-4	4
2010	4-5	4-5	3-4	3-4	4	4	4	4	4	3-4	4
2009	3-4	4	3-4	3-4	3-4	3-4	4	3-4	4	4	4
2008	4-5	4-5	3-4	3-4	3-4	3-4	4	4	3-4	3-4	4
2007	4-5	4-5	3-4	3-4	3-4	3-4	4	4	3-4	3-4	4
2006	4-5	4-5	3-4	4	3-4	3-4	4	4	3-4	3-4	3-4
2005	4-5	4-5	3-4	3-4	3-4	3-4	4	4	4	4	3-4
2004	(3-4)4	(3-4)4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	4	4
2003	4-5	4-5	4	4	4	4(4-5)	4	4	4(3-4)	4	4
2001	4(4-5)	4-5	4-5	4	4	4(4-5)	4(3-4)	4(4-5)	4	4	4
2000	4-5	4(4-5)	4(4-5)	4(4-5)	4(4-5)	4-5	4-5	4-5	4-5	4(4-5)	4(4-5)

Figure 5.4: Derry and Slaney Rivers 2020-2015 Survey Q-values



*In 2020, flow conditions at Site 9 were too deep to allow for ecological sampling to take place.

Table 5.5: EPA Recording Stations – Q-values

River	Derry River (12D02)				River Slaney (12S02)
Station Code	**0350**	**0500**	**0700**	**1000**	**1600**
Location	**Greenhall Br**	**Shillelagh Br**	**Balisland Br**	**U/s Derry-Slaney confluence**	**Kilcarry Br**
Station (Kerry Survey)	**1**	**3**	**9**	**N/A**	**10**
2019	4-5	4	4	4-5	3-4
2016	3-4*	3-4	3-4	4	3-4
2013	3-4	3-4	3-4	3-4	3-4
2010	3-4	4	3-4	4	4
2004	4-5	3-4	4	4	3-4
2001	4-5	4	3-4	4	3-4
1998	4-5	4-5	4-5	4-5	4-5
1995	4	4	3-4/0	4-5	3-4
1991	4-5	3-4	4	4	3-4
1987	3-4	4	4	4	3-4
1984	-	-	4	4	3-4
1980	-	-	4	4	-
1976	-	-	4	-	-

*Instream repair works ongoing at Greenhall Br during the time of the 2016 assessment causing significant siltation.

6.0 DISCUSSION

6.1 DISCUSSION OF CHEMICAL RESULTS

Field Measurements

pH values recorded in the Derry River were slightly alkaline, with higher pH values being recorded in the River Slaney. This is consistent with the results of previous surveys. All pH measurements were within the 6-9 pH range as specified in the Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009).

Dissolved oxygen levels for the Derry and Slaney Rivers are within the normal range and show no evidence of excessive deoxygenating from organic pollution or enhanced plant growth. All monitoring locations were measured to have dissolved oxygen concentrations in compliance with the 9 mg/l O_2 limit, as per the Salmonid Waters Regulations (S.I. No. 293 of 1988) (Revoked). DO saturation remained within the 80 to 120% saturation range as specified in the Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009).

BOD_5 & Orthophosphate

The following table outlines the BOD_5 and orthophosphate parameters which are taken into account by the EPA, along with biological elements, when calculating ecological status, as per Schedule 5, European Communities Environmental Objectives (Surface Waters) Regulations (S.I. 272 of 2009).

Table 6.1: Criteria for Calculating Surface Water Ecological Status

Parameter	Mean (Annual Monitoring)		95%ile (Annual Monitoring)	
	High status	Good status	High status	Good status
BOD (mg/l O_2)	≤1.3	≤1.5	≤2.2	≤2.6
Ortho-phosphate (mg/l P)	≤0.025	≤0.035	≤0.045	≤0.075

The above criteria are intended to apply to the results of continuous or regular monitoring and therefore are not directly comparable with the results of this assessment. However, as this monitoring survey consists of individual grab samples, the criteria for 95% flow may be more appropriate for comparison.

As can be seen in Table 5.2 above, BOD_5 results for all locations are compliant with the "*high status*" 95%ile limit. BOD_5 results at MP4 (downstream of Kerry Foods) do not indicate that the discharge from the Kerry Foods facility is having a significant influence upon the Derry River.

BOD levels appear to be elevated above the levels found in 2019, which ranged from 0.7 to 1.0 mg/l O_2. However, this is due to the 2.0 mg/l O_2 limit of detection for the test in 2020.

The orthophosphate levels at all monitoring locations remained within the "*high status*" quality level in 2020, with values ranging from 0.01 to 0.03 mg/l PO_4-P. Ortho-phosphate results at MP4 (downstream of Kerry Foods) do not indicate that the discharge from the Kerry Foods facility is having a significant influence upon the Derry River.

Overall, the physico-chemical quality of the Derry and Slaney Rivers in 2020 appears to have improved from those recorded in 2018.

6.2 DISCUSSION OF ECOLOGICAL RESULTS

The following table outlines the relationship between the EPA Biotic Index (Q) and the corresponding water quality.

Table 6.2: EPA scheme of Biotic Indices (Q) and its Corresponding Quality Status

Biotic Index	Condition	Status
Q5 or Q4-5	Satisfactory (Pristine)	**High Status**
Q4	Satisfactory	**Good Status**
Q3-4	Unsatisfactory	**Moderate Status**
Q3, Q2-3, Q2	Unsatisfactory	**Poor Status**
Q1	Unsatisfactory	**Bad Status**

Monitoring stations 1, 2 and 10 were classified as achieving Q4 "*good status*" due to presence of Group A organisms in "*at least fair numbers*" (> 10% abundance). The Group A stonefly species *Isoperla grammatica* were found at stations 1, 2 and 10 and mayfly *Heptagenia sulphurea* were found at stations 1 and 2. The group A mayfly *Ephemera danica* was also found at stations 2 and 10.

Monitoring stations 3, 4, 7, 8 and 11 were classified as achieving Q3-4 "*moderate status*" due to presence of Group A organisms in "*at least small numbers*" (1 to 5% abundance). The Group A stonefly species *Isoperla grammatica* was found at stations 3, 4, 7, 8 and 11. The Group A mayfly *Ephemera danica* was also found at station 3 and 8.

Due to the absence of Group A taxa at stations 5 and 6, these monitoring stations were classified as Q3 "*poor status*".

It is noted that due to river flow conditions at the time of sampling, the river at station 9 (Balisland Bridge) was too deep to allow for safe access and monitoring. Therefore, no in-stream sampling for ecology was carried out at this station in 2020.

Therefore, the results of this ecological assessment in summary are;

- Station 1 (Derry River, Greenhall Bridge) Q4 – Good Status,
- Station 2 (Derry River, Deegins Bridge) Q4 – Good Status,
- Station 3 (Derry River, Shillelagh Bridge) Q3-4 – Moderate Status,
- Station 4 (Derry River, 25m d/s Kerry outfall) Q3-4 – Moderate Status,
- Station 5 (Derry River, 200m d/s Kerry outfall) Q3 – Poor Status,
- Station 6 (Derry River, 600m d/s Kerry outfall) Q3 – Poor Status,
- Station 7 (Derry River, 1km d/s Kerry outfall) Q3-4 – Moderate Status,
- Station 8 (Derry River, 2.5km d/s Kerry outfall) Q3-4 – Moderate Status,
- Station 9 (Derry River, Balisland Bridge) Not monitored in 2020,
- Station 10 (Slaney River, Kilcarry Bridge) Q4 – Good Status,
- Station 11 (Slaney River, New Bridge) Q3-4 – Moderate Status.

The water quality at Station 4 (25m d/s of the Kerry outfall) appears to have improved slightly to Q3-4 "*moderate status*" in 2020 versus the Q3 "*poor status*" recorded in 2019. A water quality status of Q3-4 "*moderate status*" was also found at Station 3 (Shillelagh Bridge), which is upstream of both the Kerry Foods and Shillelagh Municipal Treatment Plant discharges to the Derry River.

Therefore, there is no evidence that the Kerry Foods discharge is having a significant impact upon the quality of the Derry River in the vicinity of the outfall in 2020.

However, it is noted that the water quality status at Station 5 (200m d/s Kerry outfall) and Station 6 (600m d/s Kerry outfall) have reduced in quality from Q4 "*good status*" in 2019 to Q3 "*poor status*" in 2020. As the water quality immediately downstream of the Kerry outfall has improved, it is unclear if this reduction at these more distant monitoring stations is due to local impacts (e.g. adjacent farmland).

7.0 CONCLUSIONS

- pH, dissolved oxygen and temperature were all within expected levels and showed no indications of negative impact across all monitoring locations.

- BOD_5 results for the Derry and Slaney Rivers were classified as being of "*high status*" (<2.2 mg/l O_2 95 %ile) for all stations in 2020.

- The orthophosphate results for the Derry and Slaney Rivers were classified as being of "*high status*" (<0.035 mg/l PO_4-P 95 %ile) for all stations in 2020.

- In 2020, the water quality status of the Derry and Slaney Rivers was found to be;
  - Station 1 (Derry River, Greenhall Bridge) Q4 – Good Status,
  - Station 2 (Derry River, Deegins Bridge) Q4 – Good Status,
  - Station 3 (Derry River, Shillelagh Bridge) Q3-4 – Moderate Status,
  - Station 4 (Derry River, 25m d/s Kerry outfall) Q3-4 – Moderate Status,
  - Station 5 (Derry River, 200m d/s Kerry outfall) Q3 – Poor Status,
  - Station 6 (Derry River, 600m d/s Kerry outfall) Q3 – Poor Status,
  - Station 7 (Derry River, 1km d/s Kerry outfall) Q3-4 – Moderate Status,
  - Station 8 (Derry River, 2.5km d/s Kerry outfall) Q3-4 – Moderate Status,
  - Station 9 (Derry River, Balisland Bridge) Not monitored in 2020,
  - Station 10 (Slaney River, Kilcarry Bridge) Q4 – Good Status,
  - Station 11 (Slaney River, New Bridge) Q3-4 – Moderate Status.

- At Station 3 (Shillelagh Bridge) and Station 4 (25m d/s of the Kerry outfall), a biotic indices of Q3-4 was found, indicating "*moderate status*". BOD_5 and orthophosphate levels indicated "*high status*", this was similar to levels found along the full course of the River Derry.

- Therefore, the above information would indicate that the Kerry Foods facility is not having a significant negative impact on water quality in the Derry and Slaney Rivers.

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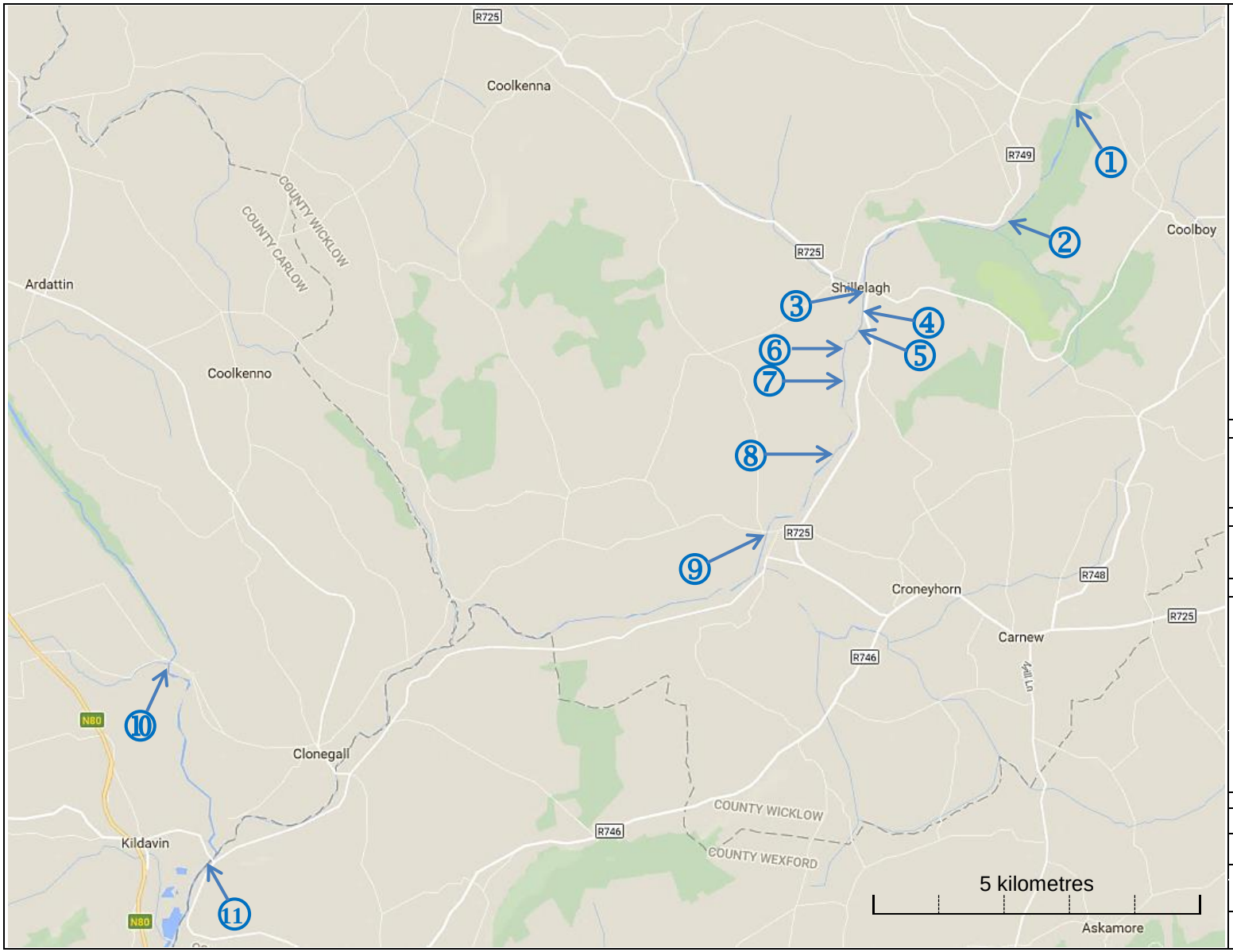
APPENDIX A

RIVER COURSE MAPS AND MONITORING LOCATIONS



NOTES:

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DUFFY MEATS T/A, KERRY FOODS, COOLATIN, SHILLELAGH, CO. WICKLOW

ECOLOGY MONITORING LOCATIONS

PANTHER ENVIRONMENTAL SOLUTIONS LTD

UNITS 3&4
INNOVATION CENTRE
GREEN ROAD
CARLOW
R93 W248

TELEPHONE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

File location:		scale: NTS	A4
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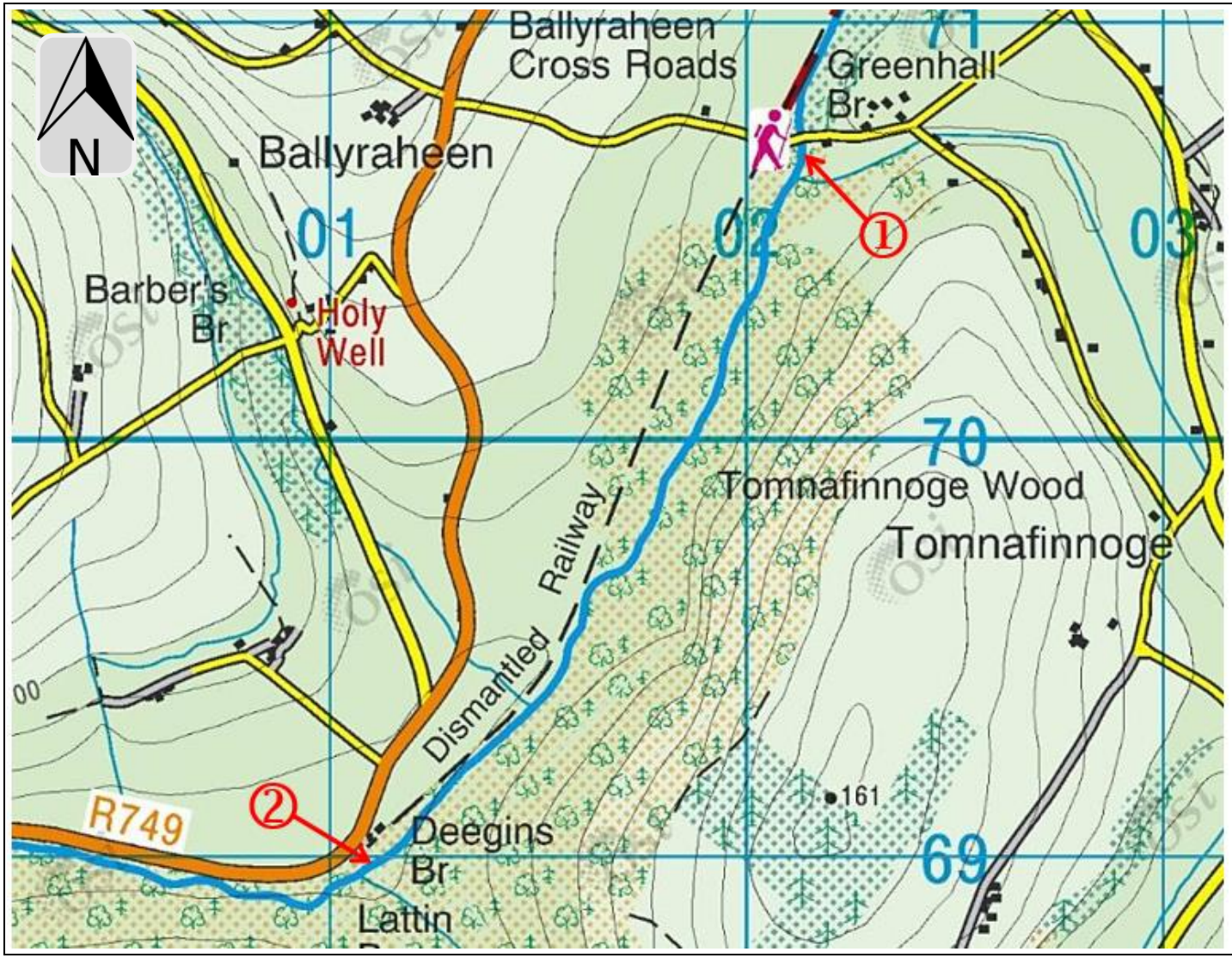

Notes

Project Title:

Ecology Monitoring Locations

Client Name:

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SHILLELAGH,
CO. WICKLOW**

PANTHER ENVIRONMENTAL SOLUTIONS LTD

UNITS 3 & 4
INNOVATION CENTRE
GREEN ROAD
CARLOW
R93 W248

TELE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

Drawing Status:	**Scale:**	NTS	A4
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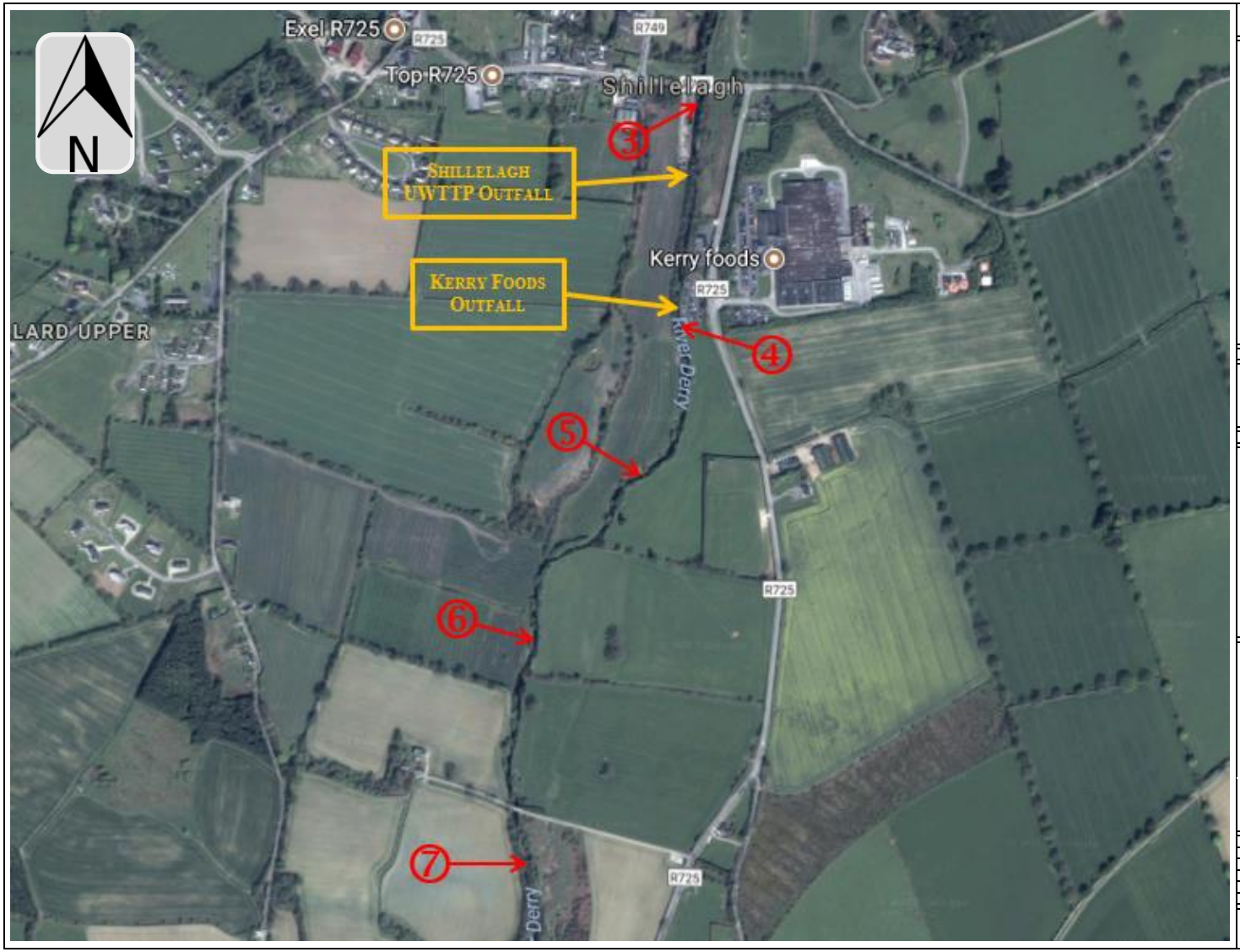

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**UNITS 3 & 4
INNOVATION CENTRE
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CARLOW
R93 W248**

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Report	**Datum:**		Bing
Drawing Number:	**Drawn:**		NR
	Checked:		MF
Revision:	**Approved:**		
R1	**Date:**		11/06/2018

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Ecology Monitoring Locations

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SHILLELAGH,
CO. WICKLOW**

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**UNITS 3 & 4
INNOVATION CENTRE
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R93 W248**

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EMAIL: info@pantherwms.com
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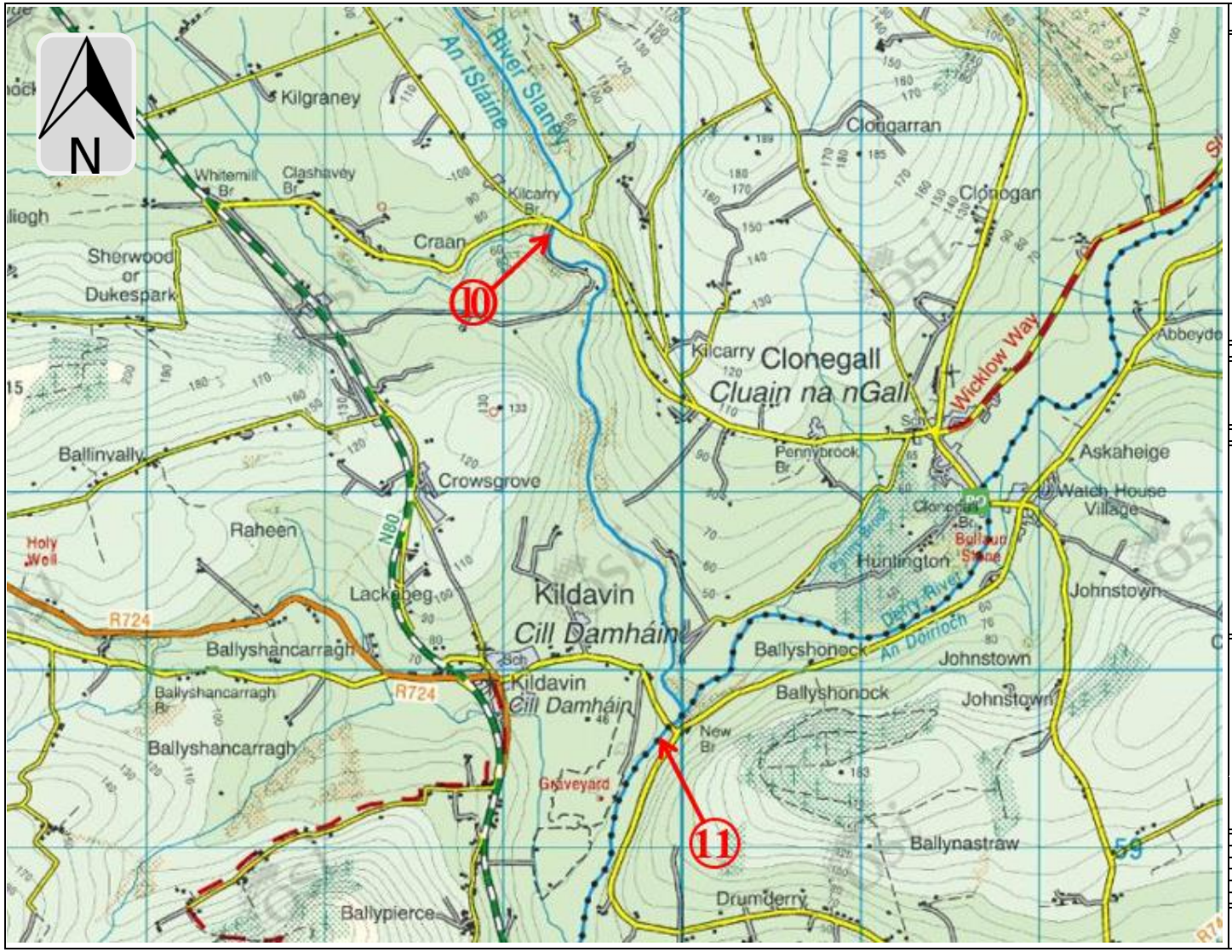

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UNITS 3 & 4
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Drawing Status:	**Scale:**	NTS	A4
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R1	**Date:**		05/09/2017

APPENDIX B

ECOLOGICAL MONITORING RESULTS

Table B1: List of Species Identified for the Derry and Slaney Rivers

EPHEMEROPTERA - MAYFLIES	**COLEOPTERA – BEETLES**
Baëtis rhodani	*Elmis aenea* (adult & larva)
Baetis scambus	*Esolus parallelepipedus* (adult & larva)
Baëtis muticus	*Limnius volckmari* (adult & larva)
Caenis spp.	*Oulimnius tuberculatus* (adult & larva)
Caenis rivulorum	*Gyrinus* spp. (adult)
Ephemera danica	Dytiscidae (adult)
Heptagenia sulphurea	*Nebrioporus elegans*
Rhithrogena semicolorata	**CRUSTACEA - CRUSTACEANS**
Ecdyonurus spp.	*Gammarus pulex* (freshwater shrimp)
Ephemerella ignita	*Gammarus dubenii* (freshwater shrimp)
Seratella ignita	*Asellus* spp. (hog-lice)
PLECOPTERA - STONEFLIES	**DIPTERA - TRUE FLIES**
Leuctra hippopus	Simuliidae (black-flies)
Leuctra inermis	Chironomidae (non-biting midges)
Isoperla grammatica	Tipulidae (Crane Flies)
Amphinamura sucicolis	Ptychopteridae (Phantom Crane Flies)
Chloroperla torrentium	Muscidae (house flies)
TRICHOPTERA – CADDISFLIES	**MOLLUSCA – MOLLUSCS**
Rhyacophila dorsalis	*Potamopyrgus jenkensii* (Spire Snail)
Hydropsyche spp.	*Potamopyrgus antipodarum* (Spire Snail)
Hydropsyche siltalai	*Ancylus* spp. (limpet)
Polycentropus flavomaculatus	*Ancylus fluviatilis* (limpet)
Sericostoma personatum	Planorbidae (ramshorn snail)
Lepidostoma hirtum	*Planorbis carinatus*
Limnephilis spp.	*Lymnaea* (Pond Snails)
Odontocerum albicorne	*Radix balthica* (Pond Snail)
Silo Pallipes	*Pisidium* (Pea Mussel)
Leptoceridae	**HEMIPTERA**
Glossosomatidae	*Aphelocheirus aestivalis*
Glossosoma boltoni	Coroxinae
Hydroptilidae	**HYDRACARINA – WATERMITES**
TRICLADIDA - FLATWORMS	Hydracarina
Polycelis sp.	**HIRUDINEA - LEECHES**
Dugesia sp.	Glossiphonidae
OLIGOCHAETE - WORMS	Piscicolidae
Lumbricidae (Freshwater Worms)	Erpobdellidae
Eiseniella tetraedra (Freshwater Worm)	*Erpobdella octoculata*
Tubificidae (Naididae)	

Table B2: Abundances of Species Identified for the Derry and Slaney Rivers

Benthic Macroinvertebrate Survey Results											
Station	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
EPHEMEROPTERA											
Baëtidae									-		
Baëtis rhodani	21	17	6	18	27	40	46	5	-	7	
Caenidae									-		
Ephemerellidae	1	1				2		1	-	1	
Ephemeridae		1	2						-		
Heptageniidae	6	9							-		
PLECOPTERA											
Leuctridae		3		2					-	1	
Perlodidae	2	8	3	6			3	4	-	5	3
Chloroperlidae									-		
Nemouridae									-		
Taeniopterygidae									-		
TRICOPTERA											
Rhyacophilidae	2	4		1					-		
Hydropsychidae	14	30	2	26	25	22	14	50	-	2	2
Polycentropidae						3			-		
Hydroptilidae									-		
Sericostomatidae	3	6	3	3	7			3	-		
Lepidostomatidae									-		
Limnephilidae									-		1
Leptoceridae									-		
Glossosomatidae									-		
Goeridae	2		1						-		
Beraeidae									-		
CRUSTACEA											
Gammarus sp.	50	15	26	17	28	20	10	30	-	11	3
Asellus sp.	5	4		3					-		1
COLEROPTERA											
Elminthidae	20	24	34	25	13	17	18	12	-	6	1
Gyrinidae									-		
Dytiscidae									-		

Benthic Macroinvertebrate Survey Results											
Station	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
HEMIPTERA											
Aphelocheirus sp.									-	7	1
Coroxinae									-	38	16
PLANARIIDAE											
Polycelis sp.	3		3			1	1	3	-		1
Dugesia sp.									-		
HIRUDINEA											
Glossiphonidae									-		1
Piscicolidae	2	4					1	1	-	1	
Erpobdellidae									-		
HYDRACARNIA											
Hydracarina	2		1	2	1	2			-	2	1
DIPTERA											
Simuliidae		6	1	8	50	60	50	50	-		1
Chironomous sp.		1						1	-		
Chironomidae				4					-		1
Ptychopteridae									-	1	1
Muscidae									-		
Tipulidae		3	6				3		-		
MOLLUSCA											
Ancylidae	3	1						1	-	2	4
Planorbidae									-		
Lymnaea			1	2	2				-	7	18
Hydrobiidae		5	50	50	50	60	50	50	-	15	30
OLIGOCHAETE	10	1	1	9			2	3	-		1
Tubificidae		3	9	5		1	2	4	-		
Station	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Total Abundance	146	146	149	181	203	228	201	219	-	106	87
Taxon Richness	16	20	16	16	9	11	13	16	-	15	18
Q-Rating	4	4	3.5	3.5	3	3	3.5	3.5	-	4	3.5

Table B3: Monitoring Station Characteristics for the Derry and Slaney Rivers

STN	WIDTH (m)	DEPTH (cm)	CURRENT	SUBSTRATE	COMMENT
1	4	20	Moderate - fast	Sand & gravel with sections of larger stones	%S* = 40% Primarily alder and some ferns. Opposite bank dominated by *Gunnera* sp (non-native). Clear. Macrophyte/ bryophyte cover 25% with water crowfoot (*Ranunuculus* sp.) dominant species. Gravels with no sewage fungus, slime or excessive macrophyte development noted. Slight siltation noted.
2	8	30	Fast	Gravel, large stones with sections of sand	%S = 70% . Instream island developing and overgrown with *Ranunculus*. Increased siltation. Bank dominated by colonising *Gunnera* sp (non-native). No sewage fungus or slime noted. Macrophyte growth is enhanced but not luxuriant.
3	6	35	Fast	Mixed sand and gravel with sections of larger stones	%S = 40% primarily alder, willow, sycamore and riparian herbaceous vegetation e.g. bramble, nettle, hogweed etc. Macrophyte/ bryophyte cover primarily *Ranunculus* and *Fontinalis* sp. Increased siltation. No sewage fungus, slime or excessive macrophyte development noted.
4	7.5	40	Slow	Sand/fine gravel with isolated larger stones	%S = 15% primarily alder, willow on opposing bank. Car park has been created adjacent to the outflow point. Macrophyte/ bryophyte cover 20% with *Ranunculus* sp. dominant. No sewage fungus, slime or excessive macrophyte development noted. Moderate siltation is evident at this location.
5	7.5	35	Slow - moderate	Fine gravel/ sand with few larger stones	. %S = 15% with willow on opposing bank. Also hogweed and grasses such as Reed Sweet-Grass (*Glyceria maxima*) and *Carex* sp. Macrophyte/ bryophyte cover 50% with *Ranunculus* sp. dominant. No sewage fungus, slime or excessive macrophyte development noted. Increased siltation.
6	9	35	Fast	Fine sand/gravel with some larger stones	%S = 10% with hogweed and large grasses such as Reed Sweet-Grass (*Glyceria maxima*) nettle, bramble etc. Macrophyte/ bryophyte cover 40% with *Ranunculus* sp the main species. No sewage fungus, slime or excessive macrophyte development noted. Significant siltation.
7	7	35	Fast	Sand overlaid with cobbles, gravel & larger stones	%S = 10% with main species willow. No sewage fungus or slime growths noted. Increased siltation and macrophyte growth.
8	10	40	Moderate	Large stones with some gravel & sand	%S = 15% with main species holly, bramble, willow and ivy. Macrophyte/bryophyte consisting of *Fontinalis* sp. and water crowfoot. No sewage fungus, slime growths or excessive macrophyte development noted.
9	8	40	Slow	Predominantly mud and silt with isolated larger stones	%S = 15% with main species willow, reed grass, grasses and sedges. Macrophyte/ bryophyte cover 10% with *Ranunculus* sp main species. No sewage fungus, slime or excessive macrophyte development noted.
10	10	50	Moderate	Large stones with some limited areas of gravel	%S = 40% mainly due to proximity of bridge. No sewage fungus, slime or excessive macrophyte development noted.
11	45	50	Moderate	Cobbles & sand	%S = 5% with mature trees e.g. ash. No sewage fungus, slime or excessive algal development noted. Sample taken in turbulent water at natural weir.