

Appendix 15.1

Baseline Water Quality

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Table 15.1: Surface water quality standards for physio-chemical parameters from relevant legislation

Parameter	Units	European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989*	European Communities Environmental Objectives (Surface Water) Regulations 2009	European Communities Drinking Water Regulations 2007	Salmonid Water Regulations 1988 (Mandatory Levels)
BOD	mg/l	5-A1 & A2 7-A3	<i>River Water body</i> High Status ≤ 1.3 (mean) or ≤ 2.2 (95%ile) Good Status ≤ 1.5 (mean) or ≤ 2.6 (95%ile) <i>Transitional Water body</i> ≤ 4 (95%ile)	N/A	≤ 5
Suspended Solids	mg/l	50	N/A	N/A	≤ 25
pH	-	5.5-8.5 – A1 5.5-9.0 – A2 & A3	<i>River Water body</i> 4.5-9.0 (Soft Water) 6.0-9.0 (Hard Water) <i>Transitional Water body</i> N/A	≤ 6.5 & ≤ 9.5	≤ 6.5 & ≤ 9.5
Conductivity	$\mu\text{s/cm}$	1,000	N/A	2,500	N/A

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Phosphates	mg/l P2O5	0.5 – A1 & A2 0.7 A3	N/A	N/A	N/A
Molybdate Reactive Phosphorus (MRP)	mg/l P	N/A	<p><i>River Water body</i> High Status ≤ 0.025 (mean) or ≤ 0.045 (95%ile)</p> <p>Good Status ≤ 0.035 (mean) or ≤ 0.075 (95%ile)</p> <p><i>Transitional Water body</i> (0-17 psu) ≤ 0.060 (median) (35 psu) ≤ 0.040 (median)</p>	N/A	N/A
Chloride	mg/l Cl	250	N/A	250	N/A
Ammonium	mg/l NH4	0.2 – A1 1.5 – A2 4 – A3	N/A	N/A	≤ 1.0
Total Ammonia	mg/l	N/A	<p><i>River Water body</i> High status ≤ 0.04 (mean) or ≤ 0.09 (95%ile)</p>	N/A	N/A

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			Good Status ≤ 0.14 (mean) or ≤ 0.065 (95%ile) <i>Transitional Water body</i> N/A		
Nitrate	mg/l NO ₃	50	N/A	50	N/A
Nitrite	mg/l NO ₂	N/A	N/A	0.5	≤ 0.05
Dissolved Oxygen	-	$\geq 60\%$ – A1 $\geq 50\%$ – A2 $\geq 30\%$ – A3	<i>River Water body</i> Lower limit: 95%ile > 80% saturation Upper Limit: 95%ile < 120% saturation <i>Transitional Water body (Summer)</i> (35 psu) Lower limit: 95%ile > 80% saturation Upper Limit: 95%ile < 120% saturation	N/A	50% ≥ 9 mg/l

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			(0 psu) Lower limit: 95%ile>70% saturation Upper Limit: 95%ile<130 %saturation		
Total Hardness	Mg/l CaCO ₃		N/A	N/A	N/A
Copper	mg/l Cu	0.05 – A1 0.1 – A2 1.0 – A3	<u>Inland Surface Waters</u> 5 – water hardness ≤100mg/l CaCO ₃ 30 – water hardness >100mg/l CaCO ₃ <u>Other Surface Waters</u> 5 – water hardness ≤100mg/l CaCO ₃	2.0	≤ 0.005 ≤ 0.022 ≤ 0.04 ≤ 0.112
Zinc	mg/l Zn	3-A1 5-A2&A3	<u>Inland Surface Waters</u> 0.008 – water hardness ≤100mg/l CaCO ₃ 0.05 – water hardness >10 ≤100mg/l CaCO ₃ 0.1 – water hardness >100mg/l CaCO ₃	N/A	≤ 0.03 ≤ 0.2 ≤ 0.3 ≤ 0.5

Parameter	Units	European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989*	European Communities Environmental Objectives (Surface Water) Regulations 2009	European Communities Drinking Water Regulations 2007	Salmonid Water Regulations 1988 (Mandatory Levels)
			<i>Other Surface Waters</i> 0.04 – water hardness		
Total coliforms	No/100 ml	5,000 – A1 25,000 – A2 100,000 – A3	N/A	N/A	N/A
Faecal coliforms	No/100 ml	1,000 – A1 5,000 – A2 40,000 – A3	N/A	0	N/A

*S.U. No. 294/1989 is superseded by S.I. No 272 of 2009. If a particular parameter is not found in SI 272 of 2009 then the 1989 value applies

Surface water is classified in accordance with the quality standards specified in Part II of the Schedule into three categories, A1, A2, A3, which correspond to the standard methods of treatment specified in Part I of the Schedule. Definition of the standard methods of treatment for transforming surface water of categories A1, A2 and A3 into drinking water is as follows:

Category A1 - Simple physical treatment and disinfection, e.g. rapid filtration and disinfection

Category A2 - Normal physical treatment, chemical treatment and disinfection, e.g. prechlorination, coagulation, flocculation, decantation, filtration, disinfection (final chlorination)

Category A3 - Intensive physical and chemical treatment, extended treatment and disinfection, e.g. chlorination to break-point, coagulation, flocculation, decantation, filtration, adsorption (activated carbon), disinfection (ozone, final chlorination).

Table 15.2 Q value classification

Q Value	WFD Status	Pollution Status	Condition (re beneficial uses)
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Source: EPA website (<http://www.epa.ie/QValue/webusers/>)

Table 15.3 Coastal Water Biological Quality Elements

Biological quality element	Classification system	Ecological quality ratio		High-good boundary	Good-moderate boundary
		High - good	Good - moderate	Chlorophyll ($\mu\text{g/l}$)	
Phytoplankton	Phytoplankton Biomass (Chlorophyll)	0.66	0.33	2.5 (median value) and 5.0 (90 percentile value)	5.0 (median value) and 10.0 (90 percentile value)
				5.0 (median value) and 10.0 (90 percentile value)	10.0 (median value) and 20 (90 percentile value)
	Phytoplankton composition	0.84	0.43	Percentage of single taxa counts above thresholds	
				20	39

Source: European Union Environmental Objectives (Surface Water) Regulations (S.I No. 386 of 2015)

Table 15.4 Coastal and Transitional Water Biological Quality Elements

Biological quality element	Classification system	Ecological quality ratio	
		High - good boundary	Good - moderate boundary
Macroalgae	Rocky shore reduced species list multimeric system	0.80	0.60
	Opportunistic macroalgae multimeric system	0.80	0.60

Source: European Union Environmental Objectives (Surface Water) Regulations (S.I No. 386 of 2015)

Table 15.5 River Avoca Biological Quality Rating (Q value)

Station	Station No.	1981	1986	1990	1994	1997	2000	2003	2006	2009	2012	2015
Avoca Br	RS10A0307 00	1	1	1	1	-	1	-	4	2	3	3
AVOCA - At Shelton Abbey (u/s I.F.I.)	RS10A0310 00	-	2	-	-	-	-	-	-	-	-	-
AVOCA - Arklow Br	RS10A0312 00	-	1	1	-	-	-	-	-	-	-	-

Table 15.6 EPA Physico-chemical data from EPA sampling point - AV010

EPA Physico- chemical Data – River Avoca 2017				
Station No: AV010 Station name: Arklow Bridge (main Arch)				
Parameter	Unit	Min	Mean	Max
Salinity	ppt	1.035	1.496	2.275
BOD 5 days with Inhibition (Carbonaceous BOD)	mg/l	2.4	4.35	6.3
ortho-Phosphate (as P) - unspecified	mg/l	16	23.33	28
Ammonia-Total (as N)	mg/l	0.005	0.185	0.42
Total Oxidised Nitrogen (as N)	mg/l	0.79	1	1.4
Turbidity	NTU	0	2.53	7.2
Chlorophyll	Volts	0.0119	0.02045	0.0263
Specific Conductivity @20°C	µS/cm	2.794	3.66	5.106
Dissolved Oxygen	% Saturation	84.3	91.06	95.1
Dissolved Oxygen	mg/l	8.39	8.753	9.27
pH	pH units	6.99	7.63	8.18
Temperature	°C	15.19	16.715	18.85

Table 15.7 EPA Physico-chemical data from EPA sampling point – AV020

EPA Physico- chemical Data – River Avoca 2017				
Station No: AV020 Station name: Harbour Office				
Parameter	Unit	Min	Mean	Max
Salinity	ppt	0.19	1.421	2.39
BOD 5 days with Inhibition (Carbonaceous BOD)	mg/l	0.5	0.8	1.1
ortho-Phosphate (as P) - unspecified	mg/l	16	10.7	28
Ammonia-Total (as N)	mg/l	0.059	0.1082	0.18
Total Oxidised Nitrogen (as N)	mg/l	0.77	1.046	1.4
Turbidity	NTU	0	0.1	0.7
Chlorophyll	Volts	0.0142	0.021	0.0323
Specific Conductivity @20°C	µS/cm	0.387	3.302	5.302
Dissolved Oxygen	% Saturation	91.5	99.0125	111.5
Dissolved Oxygen	mg/l	9.08	10.106	11.84
pH	pH units	6.95	7.54	8.02
Temperature	°C	6.48	14.31	19.3

Table 15.8 EPA Physico-chemical data from EPA sampling point – AV040

EPA Physico- chemical Data – River Avoca 2017				
Station No: AV040 Station name: Inner Harbour Mouth				
Parameter	Unit	Min	Mean	Max
Salinity	ppt	0.67	1.749	2.487
BOD 5 days with Inhibition (Carbonaceous BOD)	mg/l	0.5	2	2.8
ortho-Phosphate (as P) - unspecified	mg/l	10	18.5	32
Ammonia-Total (as N)	mg/l	0.045	0.12	0.18
Total Oxidised Nitrogen (as N)	mg/l	0.8	1.0625	1.4
Turbidity	NTU	0	0	0
Chlorophyll	Volts	0.0111	0.0178	0.0226
Specific Conductivity @20°C	µS/cm	1.262	3.911	5.493
Dissolved Oxygen	% Saturation	87.7	92.95	97.7
Dissolved Oxygen	mg/l	8.53	9.547	11.96
pH	pH units	6.78	7.683	8.67
Temperature	°C	6.57	14.21	19

Table 15.9 EPA Physico-chemical data from EPA sampling point – RS10A031140

EPA Physico- chemical Data – River Avoca 2013-2015				
Station No: 10A03-1140 Station name: 0.5km d/s Honeywell (Pearse Park)				
Parameter	Unit	Min	Mean	Max
Alkalinity-total (as CaCO ₃)	mg/l	12	16.29	29
Ammonia-Total (as N)	mg/l	0.035	0.08944	0.178
BOD 5 days with Inhibition (Carbonaceous BOD)	mg/l	0.3	1.2789	5.5
Chloride*	mg/l	-	-	-
Conductivity @20°C	µS/cm	52	90.17	151
Dissolved Oxygen	% Saturation	96.37	87.4	103.4
Dissolved Oxygen	mg/l	8.4	10.89	12.2
Nitrite (as N)	mg/l	0.001	0.0067	0.021
ortho-Phosphate (as P) - unspecified	mg/l	0.004	0.01	0.027
pH*	pH units	5.53	6.065	6.82
Temperature*	°C	5.4	9.92	17.9
Total Hardness (as CaCO ₃)	mg/l	13	26.1875	43
Total Oxidised Nitrogen (as N)	mg/l	0.33	1.212	1.78
True Colour*	Hazen	34	63.18	109

Note: Limits for values are given in Table 15.1, Parameters that are above the standards are highlighted in bold

Table 15.10 EPA Physico-chemical data from EPA sampling point - RS10A031050

EPA Physico- chemical Data – River Avoca 2013-2015				
Station No: 10A03-1050 Station name: Avoca-0.75km u/s Br on M11				
Parameter	Unit	Min	Mean	Max
Alkalinity-total (as CaCO ₃)	mg/l	5	14.083	72
Ammonia-Total (as N)	mg/l	0.01	0.048	0.2
BOD 5 days with Inhibition (Carbonaceous BOD)	mg/l	0.5	0.857	0.3
Chloride*	mg/l	8	10.737	13
Conductivity @20°C	µS/cm	66.93	96.33	133
Dissolved Oxygen	% Saturation	80.4	97.62	106
Dissolved Oxygen	mg/l	8.3	10.74	12.7
Nitrite (as N)	mg/l	-	-	-
ortho-Phosphate (as P) - unspecified	mg/l	0.005	0.0062	0.015
pH*	pH units	-	-	-
Temperature*	°C	-	-	-
Total Hardness (as CaCO ₃)	mg/l	17	28	48
Total Oxidised Nitrogen (as N)	mg/l	0.24	1.503	4.2
True Colour*	Hazen	-	-	-

Note: Limits for values are given in Table 15.1, Parameters that are above the standards are highlighted in bold