

RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 2ND CYCLE CLASSIFICATION SUMMARY

2015-2021

Transitional Heavily Modified Water Body
– Lagan Estuary

31/05/2015

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	<p>Version Date: 22/12/09</p>
<p>MONITORING & ASSESSMENT TEAM</p>	

LAGAN ESTUARY (TRANSITIONAL WATER)

Water body Information

- River Basin District: North Eastern
- Water body type: Transitional Water 2 (TW2)
- Water body code: UKGBNI5NE100010
- Water body characteristics: Partly mixed/stratified, mesotidal, sand and mud, mesohaline
- Water body area: 0.33 km²
- Heavily Modified Water Body: Yes
- 2021 Classification Objective: Moderate Ecological Potential

2015 CLASSIFICATION	POOR ECOLOGICAL POTENTIAL	PASS/FAIL 2021 OBJECTIVE	FAIL
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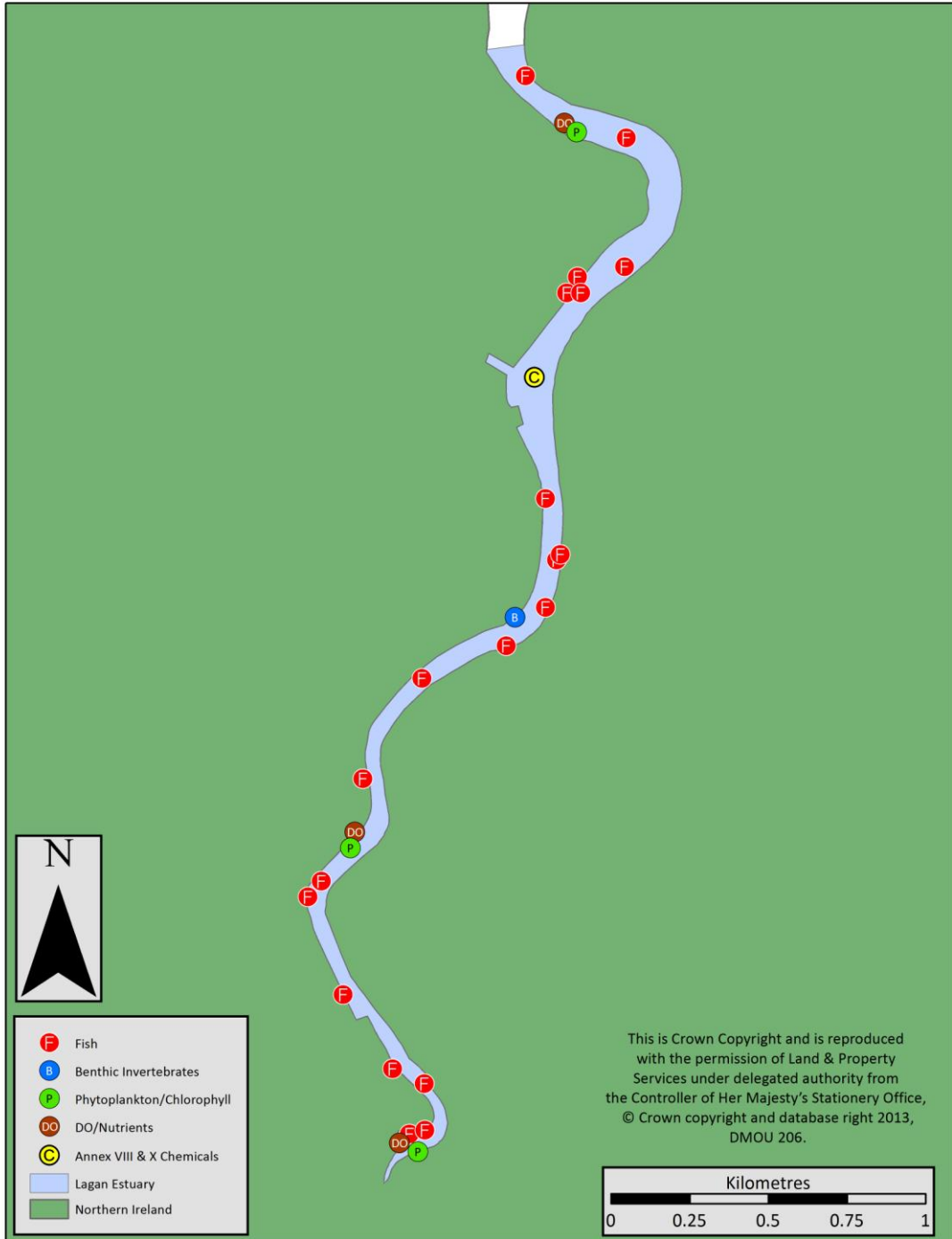


Figure 1: Waste water treatment pressures and monitoring points within Lagan Estuary (Transitional Water).

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Table 1: Parameters for which classification systems are available and have been used in the previous round of classification. Some biological assessment tools are not suitable for all water bodies due to habitat type.

Ecological Quality Element			
<i>Main Element</i>	<i>Sub-Element</i>	<i>Applied</i>	<i>Comment</i>
Phytoplankton	Chlorophyll Biomass Index	✓	
	Elevated Taxa Count Index	✓	
Benthic Invertebrates	Infaunal Quality Index	☒	Tool under development; not signed off for transitional waters
Fish	Estuarine Multi-metric Fish Index	✓	
Physico-Chemical (water)	General Conditions		
	-Dissolved Oxygen	✓	
	-Nutrients	✓	
	Specific Pollutant (Annex VIII subs)	✓	
Hydromorphological Quality Elements	SEPA Rapid Designation	✓	
	TraC MIMAS	✓	
Chemical Status			
Priority Hazardous Substances (Annex X)	Annex X Substances	✓	


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Table 2: Sampling frequency for each quality element.

Monitoring Level: Surveillance

Ecological		Data years contributing to classification	No. of sites/samples
Phytoplankton - 90 %ile		2004-8	5 sites 78 samples
Benthic Invertebrates	Infaunal Quality Index	2010-2013	1 site 18 samples
Fish	Estuarine Multimetric Fish Index	2014	20 samples
Physio-chemical			
Nutrients		2010-2014	4 sites 56 samples
Dissolved Oxygen		2006-2008, 2010-2015	
Specific pollutants (Annex VIII)		2013-2014	
Hydromorphology		2007	
Water chemistry (Annex X)			
Priority hazardous substances		2013-2014	

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Biological Quality Elements									
Flora					Fauna				Biological Quality
Phytoplankton					Benthos	Fish	M	Biological Quality	P
	P	P							
	Macroalgae			Angiosperms					
Physico-chemical Elements									
General conditions									
Oxygen (DO)								Status	M
	M								
		Nutrients (DIN)							
		B							
Specific pollutants (Annex VIII)									
								Status	M
Hydromorphological Quality Elements									
								Status	GEP
Chemical Status									
Priority hazardous substances (Annex X)									
								Good	
								Fail	F
High Impact Invasive Species									
								None recorded	H
								Established	
								Impacting	

Ecological Status	
	High
	Good
	Moderate
PEP	Poor
	Bad

Surface Water Status	
	High
	Good
	Moderate
PEP	Poor
	Bad

Figure 2: Overall classification of Lagan Estuary (Transitional Water)

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+data confidence):	Poor (98.7%)	
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Classification metrics:

1. Chlorophyll biomass index (90%ile)
2. Elevated taxa count index:

1. Chlorophyll Biomass Index

Data store (classification): [M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update \(08-13 data\)\Transitionals\LAGAN 2015y.XLS](M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update (08-13 data)\Transitionals\LAGAN 2015y.XLS)
<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\transitional data\TRANSITIONAL CHLOROPHYLL LAGAN.xls>

Data Availability (spot & continuous samples): Spot samples –NIEA/MD 2009-2014

Thresholds:

		<i>EA Proposed Transitional Boundaries</i>				
		High	Good	Moderate	Poor	Bad
10 (5 submetrics for each zone) (2 salinity zones present) 1-25psu & >25-35psu	Face Value (passes)	9	7	5	3	<3
	EQR	0.9	0.7	0.5	0.3	0
5 (only 1salinity zone present)	Face Value (passes)	4	3	2	1	0
	EQR	0.8	0.6	0.4	0.2	0


Results:

NORM EQR	Status	Data Years	No. of Sites	No. of Samples	Data Confidence
0.13	BAD	2009-2014	6	184	91.5%

Data confidence:

Data analysed for Confidence of Class using CUTLASS

<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015TW Phytoplankton CofC tool CUTLASS v1.8 UKTAG.xls>

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2. Elevated Taxa Count Index

Waterbody Elevated Taxa Assessment

Thresholds:

Tool	Thresholds	
	North/Irish Sea	Atlantic
I ₁ - Individual Species Count%	500,000 (cells l ⁻¹)	
I ₂ - Total Taxa Count%	10 ⁶ (cells l ⁻¹)	

EQR Boundaries:

% exceedances (Face value range)	Metric range (0-1)	Class
0 - <10	≥0.8 - 1.0	High
≥10 - < 20	≥0.6 - < 0.8	Good
≥20 - < 40	≥0.4 - < 0.6	Moderate
≥40 - <60	≥0.2 - < 0.4	Poor
≥60 - 100	≥0 - < 0.2	Bad

Results (% Exceedence):

I ₁	I ₂	EQR	Status	Data Years	No. of Julian months	No. of phytoplankton samples	Data confidence
41.5%	36.6%	0.41	MODERATE	2009 - 2014	29	82	60.3%

3. Combined Chlorophyll and Elevated Count Tool for Waterbody

POOR (98.7%)

QE: Macroalgae – tool not applicable

QE Angiosperms – tool not applicable

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QE: Benthic Invertebrates – tool under development for transitional waters

Overall benthic invertebrate assessment (+ data confidence):	POOR TUD (L)	
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Classification tools:

1. Infaunal Quality Index (IQI)
2. Imposex tool (VDSI) – N/A

1. IQI (UKTAG v01 20140228)

Water body IQI assessment:

Poor TUD (Low)

WFD surveillance monitoring:

- **Data store:** [..\Lagan\Lagan river waterbody 08-13 fauna data 0 5mm.xlsx](#)
- **Benthic invertebrates** UNICORN (NMMT) Database
- **Supporting Parameters** Water Quality Data Set
- **Digital images** AMAP Project folder
- **Data Availability (classification):** 1 site, 3&5 reps, 4 years, Day Grab, 0.5 mm sieve, n=18.

Boundaries (Intercalibrated NEAGIG):

Class	Bad	Poor	Moderate	Good	High
IQI	>0.0 ≤0.24	≥0.24 <0.44	≥0.44 <0.64	≥0.64 <0.75	≥0.75

Results:

Year	Survey	Station	n	Annual Mean	Annual ± S.D	Status
2010	MM-Benthos	ORB (5)	3	0.45	0.02	Moderate
2011	MM-Benthos	ORB (5)	5	0.44	0.03	Moderate
2012	MM-Benthos	ORB (5)	5	0.45	0.11	Moderate
2013	MM-Benthos	ORB (5)	5	0.45	0.02	Moderate
2014	MM-Benthos	ORB (5)	-	-	-	-
2015	MM-Benthos	ORB (5)	-	-	-	-
Overall 6 year waterbody means			4.5	0.45 (0.40*)	0.05	Poor (TUD)

TUD – Tool Under development: IQI not signed off for transitional waters

* IQI derived from data averaged minus Standard Deviation (see issues with tools paper).

This figure is used for classification

Data confidence:

Low

- Sample analysis QA'd through NMBAQC (Good)
- Database QA'd (Good)
- No specific WFD data (single point with reps)

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QE: Transitional Fish

QE transitional fish assessment (+ Data confidence):	MODERATE (100%)	
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Classification tools: Estuarine Multi-metric Fish Index (EMFI)

Data store:

- **Fish:** ..\\..\\..\\FISH\\DATA\\WFD\\Classification\\EMFI\\class\\EMFIii2014\\THEMFI_2014_Analysis.xlsx
- **Supporting Parameters:** [Chemistry](#)

Data Availability:

- WFD surveillance monitoring 2005-2014; one survey in 2005, two surveys per annum from 2006 to 2011, one (autumn) survey in 2012, 2013 and 2014. Sampling methods include seine net, fyke net, and beam trawl.

EQR boundaries:

	Bad	Poor	Moderate	Good	High
EQR	<0.10	≥0.10; < 0.35	≥0.35; <0.65	≥0.66; < 0.92	≥0.92

Results:

Estuarine Multi-metric Fish Index (EMFI) – 2014 data

Metric Number	Metric	Score
1	Species richness	3
2	Number of introduced species	5
3	Species composition	4
4	Species abundance	3
5	Dominance	4
6	Number of diadromous species	2
7	Estuarine species richness	4
8	Marine migrant species richness	2
9	Estuarine species abundance	4
10	Marine migrant species abundance	3
11	Zoobenthivore species richness	3
12	Piscivore species richness	1
13	Zoobenthivore abundance	3
14	Piscivore abundance	1
	EMFI	42
	EQR	0.50

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Fish cont'd

Percent Confidence of Class (bias corrected bootstrap method)

Bad	Poor	Moderate	Good	High
0.0	0.0	100.0	0.0	0.0

Data confidence: High

- Survey methodologies and protocols (High)
- Realistic type-specific reference conditions (High)
- Data QA (High)
- Statistical testing and intercalibration (High)

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ANNEX B: Classification of physico-chemical Quality Elements: General

QE: Dissolved Oxygen

QE Dissolved oxygen assessment (+ data confidence):	MODERATE (M)	
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Classification tools: Comparison of 5% ile against reference standards

- **Data Store:** [..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.lnk](#)
- **Data Availability:** 2006-08 + 2010-15
- **Data Availability (spot & continuous samples):** Spot & Continuous

Thresholds:

WFD Status	Marine 5%ile	Objectives
HIGH	≥5.7 mg/L	All life stages of salmonids and transitional fish
GOOD	≥4.0 <5.7 mg/L	Presence of salmonids and transitional fish
MODERATE	≥2.4 <4.0 mg/L	Most life stages of non-salmonid adults
POOR	≥1.6 <2.4 mg/L	Presence of non-salmonids, poor survival of salmonids
BAD	<1.6 mg/L	No salmonids present, marginal survival of resident species

Results:

5% ile DO (mg/L)	Status	Data years	Data Quality	No. of daily averages	Data Coverage (proportion of possible months with data*)
3.97	Moderate	2006-08 2010-15	**		

* Proportion of possible months for which data are available

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QE: Nutrients – N regulation

QE N regulation assessment (+ Data confidence):	BAD (100%)	
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- Data store: [..\Transitional DIN 2015-2021.xls](#)
- Data Availability: 2010-2014
DIN & salinity (Nov to Feb)
- Data Source (spot & continuous samples): spot

Thresholds:

Area	Salinity range	DIN (uM) Winter mean H/G	DIN (uM) Winter mean G/M	DIN (uM) Winter mean M/P
Transitional (at salinity 25)	5-25	20-30	30-45	45-67.5

Results:

Mean Winter DIN (uM) (normalised to salinity 25)	Winter DIN Daily average (n)	No. of samples (n)	No. of sites	Data Years	Data Quality	Status
142.02*		56	4	2010-2014	Database not yet QA'd	BAD

*Average DIN used as r^2 value of regression model is less than 0.75

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ANNEX C: Classification of physico-chemical quality elements: Other Specific Pollutants

Specific pollutants assessment (+data confidence)	MODERATE	
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Classification tools: Comparison with EQS levels.

Data assessed for 2015 Update:

Suite	Parameter	Data Availability
Trace Organics	Permethrin	June 2013 – June 2014
Trace Organics	Cypermethrin	June 2013 – June 2014
Trace Organics	Toluene	Nov 2013 – Sept 2014
Trace Organics	Xylene	Nov 2013 – Sept 2014

Other Pollutants – DSD list 2 (with existing EQS):

Suite	Parameter	Data Availability

EQS failures:


Cypermethrin

Link to Data, Assessment and EQSs:

[G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets](#)

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ANNEX D: Hydromorphological quality elements

Overall hydromorphology assessment	HMWB-GEP	
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Classification tools:

1. TRaC Hydromorphology metrics
2. MIMAS

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ANNEX E: Chemical Status

Priority hazardous substances (+data confidence)	FAIL	
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Classification tools: Comparison with EQS levels.

Annex X: Overall Compliance	Fail
Annex X: Pass/Fail	Fail

Data Assessed for 2015 Update:

Suite	Parameter	Data Availability
Trace Organics	Benzene	Nov 2013 – Sept 2014
Pesticides	Pentachlorobenzene	April 2014 – Dec 2014
Pesticides	Trifluralin	April 2014 – Dec 2014
Pesticides	HCH	April 2014 – Dec 2014
Pesticides	Hexachlorobenzene	April 2014 – Dec 2014
Pesticides	Alachlor	April 2014 – Dec 2014
Pesticides	Cyclodienes	April 2014 – Dec 2014
Pesticides	Endosulphan	April 2014 – Dec 2014
Pesticides	DDT	April 2014 – Dec 2014
Pesticides	pp DDT	April 2014 – Dec 2014

EQS Failures:

HCH
Endosulphans

Link to Data, Assessment and EQSs:

[G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets](#)

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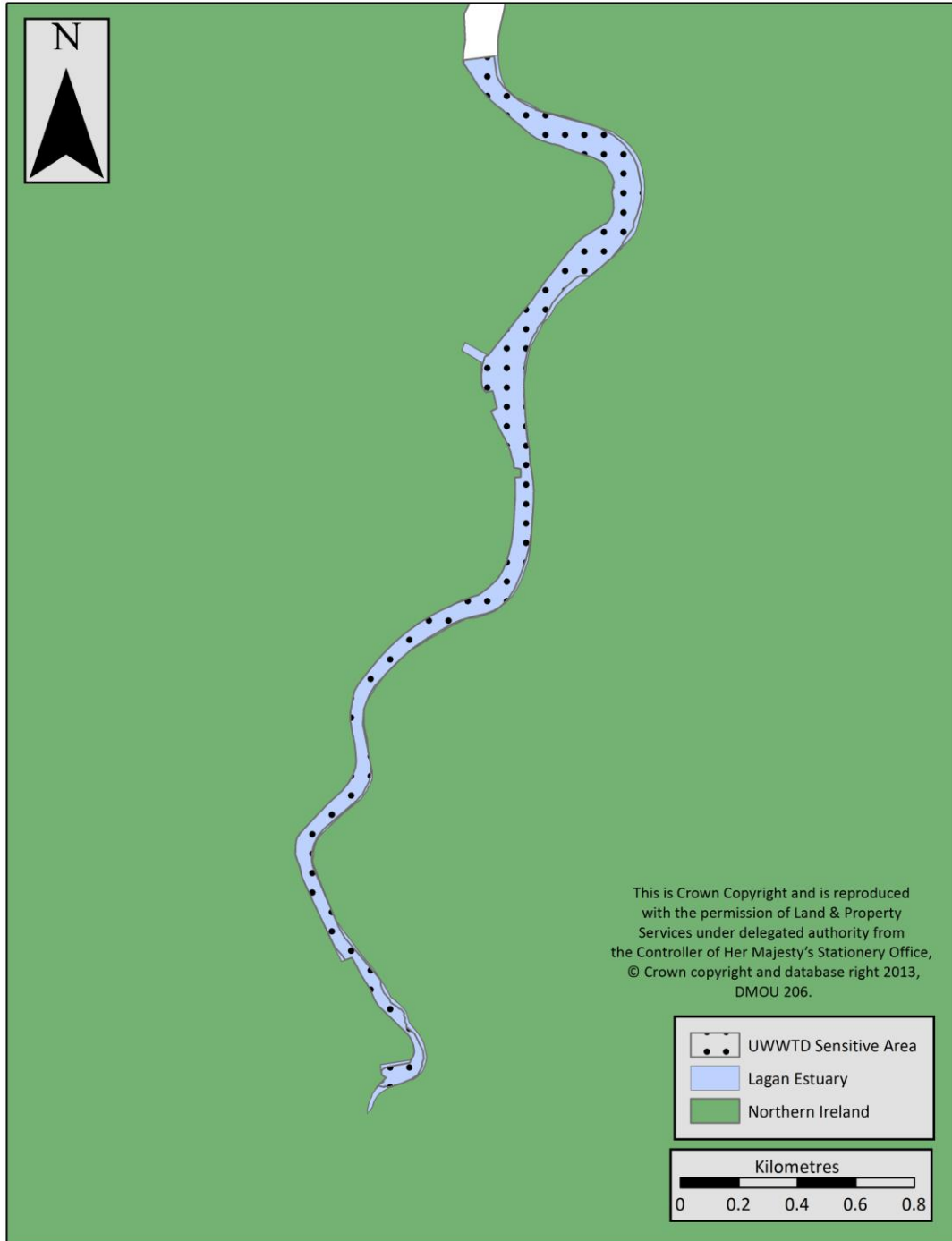
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ANNEX F: Protected Areas



Protected areas within Lagan Estuary (Transitional Water).

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The following Protected Areas are situated either wholly or partly within the Lagan Estuary water body:

Nitrates Directive/ Urban Waste Water Treatment Directive Sensitive Areas:

- Tidal Lagan UWWTD Sensitive Area

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ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment	HIGH
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Ecoregion 17 Marine High Impact Invasive Species List

Phylum	Species	P	E	I	Record
<i>Chordata</i>	<i>Didemnum spp.</i>				
<i>Chordata</i>	<i>Styela clava</i>				
<i>Crustacea</i>	<i>Eriocheir sinensis</i>				
<i>Mollusca</i>	<i>Crassostrea gigas</i>				
<i>Mollusca</i>	<i>Crepidula fornicata</i>				
<i>Phaeophyceae</i>	<i>Sargassum muticum</i>				
<i>Angiosperms</i>	<i>Spartina anglica</i>				

P= Present; E= Established; I= Impacting

NB Established populations of high impact species automatically downgrade overall surface water classification from 'high' to 'good'.

Record should be inputted as follows. PO= personal observation outside of surveys; W= WFD survey; M= museum / institute records.

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GLOSSARY

AFBI	Agri-Food and Biosciences Institute (under contract to NIEA)
AMBI	AZTI Marine Biotic Index
Annex X	Annex 10 Priority Hazardous Substances
Annex VIII	Annex 8 Specific Pollutants
Article 5	Characterisation, typology, pressures and impacts analysis
ASSI	Area of Special Scientific Interest
DIN	Dissolved Inorganic Nitrogen
DO	Dissolved Oxygen
EQR	Ecological Quality Ratio
EQS	Ecological Quality Status
EUNIS	European Nature Information System
FSL	Full Species List
GEP	Good Ecological Potential
gH	Good/High
H/G/M/P/B	High/Good/Moderate/Poor/Bad (Classification Status)
H/M/L	High/Medium/Low (Confidence)
HMWB	Heavily Modified Water Body
IQI	Infaunal Quality Index
IRBD	International River Basin District
LOD	Limit of Detection
MBT	Macroalgal Blooming Tool
MEP	Moderate Ecological Potential
NB	Neagh Bann
ND	No data
NE	North Eastern
NEAGIG	North Eastern Atlantic Geographical Intercalibration Group
NIEA	Northern Ireland Environment Agency
N-regs	Nitrogen Regulation
NVZ	Nitrate Vulnerable Zone
NW	North Western
Physico-chem	Physical and chemical monitoring
RSL	Reduced Species List
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SPA	Special Protected Area
TNA	Tool Not Applicable
TraC MImAS	Transitional and Coastal Morphology Impact Assessment System
TUD	Tool Under Development
UKAS	United Kingdom Accreditation Service
UKTAG	United Kingdom Technical Advisory Group for Water Framework Directive
UNICORN	Database for marine organisms.
UWWTD	Urban Waste Water Treatment Directive (91/271/EEC)
VDSI	Vas Deferens Sequence Index
WFD	Water Framework Directive