RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Transitional Heavily Modified Water Body – Foyle and Faughan

31/05/2015

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RIVER BASIN MANAGEMENT PLAN		
Department of the Environment www.doeni.gov.uk Marine Environment Division	WFD TRANSITIONAL WATER BODY CLASSIFICATION Foyle and Faughan	
	Version Date:	31/05/2015
	MONITORING & ASSESSMENT TEAM	

FOYLE AND FAUGHAN (TRANSITIONAL WATER)

Water body Information

- River Basin District: NE
- Water body type: Transitional Water 2 (TW2)
- Water body code: GBNIIE5NW250010
- Water body characteristics: Partly mixed/stratified, mesotidal, sand and mud, mesohaline
- Water body area: 34.29 km^2
- Heavily Modified Water Body: Yes
- 2015 Classification Objective: Moderate Ecological Potential

FINAL CLASSIFICATION	MODERATE ECOLOGICAL POTENTIAL	*PASS/FAIL 2015 OBJECTIVE*	PASS

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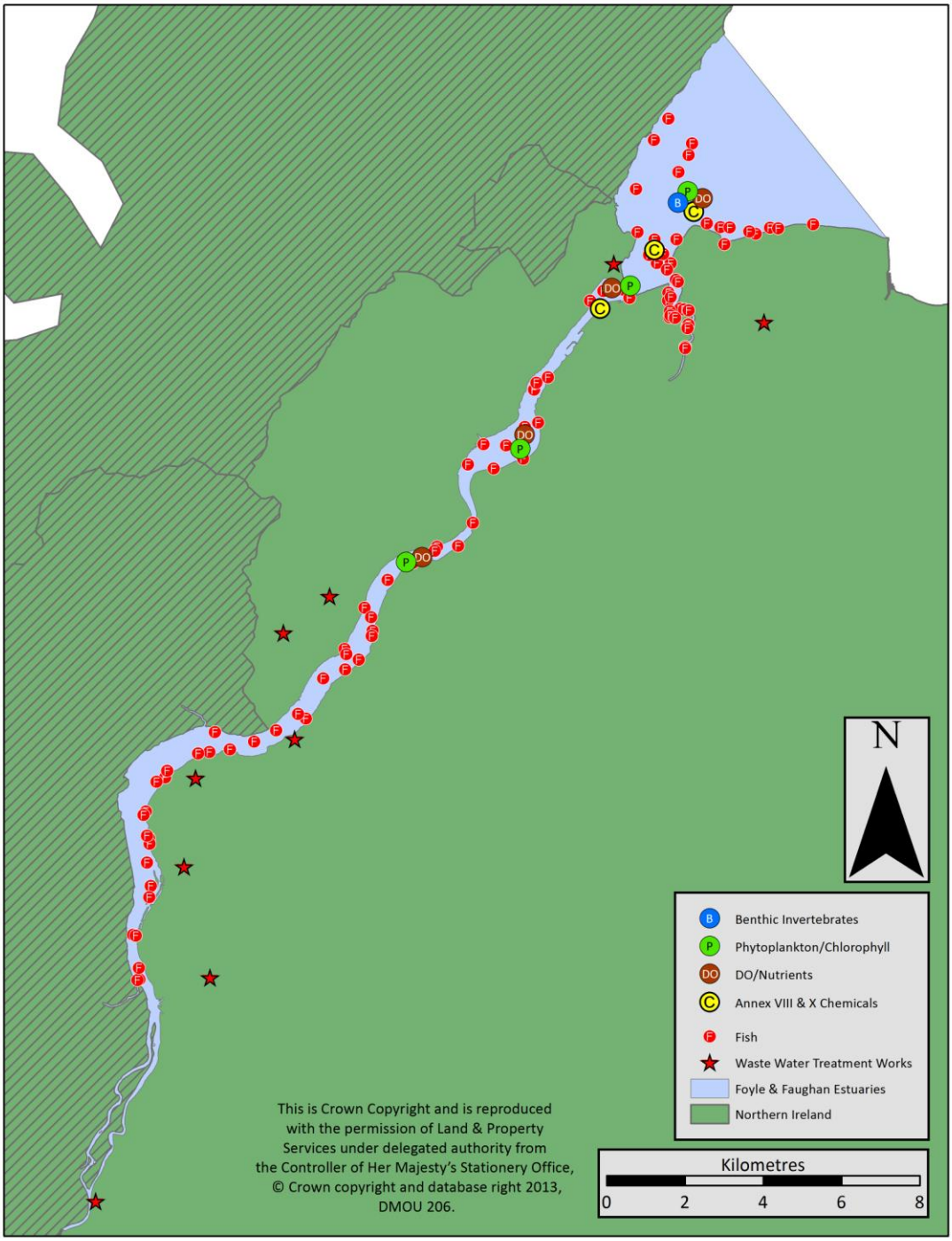

Figure 1: Waste water treatment pressures and monitoring points within Foyle and Faughan Estuary (Transitional Water).

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

Ecological Quality Element			
Main Element	***Sub-Element***	***Applied***	***Comment***
Phytoplankton	**Chlorophyll Biomass Index**	✓	
	Elevated Taxa Count Index	✓	
Benthic Invertebrates	**Infaunal Quality Index**	☒	Tool Under Development: not signed off for transitional waters
Fish	**Estuarine Multimetric Fish Index**	✓	
Physico-Chemical	**General Conditions**		
	-*Dissolved Oxygen*	✓	
	-Nutrients	✓	
	Specific Pollutants (Annex VIII subs)	✓	
Hydromorphological Quality Elements	SEPA Rapid Designation	✓	
	TraC MIMAS	✓	
Chemical Status			
Priority Hazardous Substances (Annex X)	Annex X Substances	✓	

Table 2: Sampling frequency for each quality element.

Monitoring Level: *Surveillance*

Quality Elements		Data years contributing to classification	No. of sites/samples
Phytoplankton	Chlorophyll Biomass Index	2009-2013	3 sites 22 samples
	Elevated Taxa Count Index	2011-2014	3 sites 15 samples
Fish		2014	38 samples
Physio-chemical			
Nutrients		2007-2014	7 sites 41 samples
Dissolved Oxygen		2006-2008, 2010, 2012-2015	
Specific polluting substances (Annex VIII)		2010-2014	
Hydromorphology		2007	
Water chemistry (Annex X)			
Priority hazardous substances		2010-2014	

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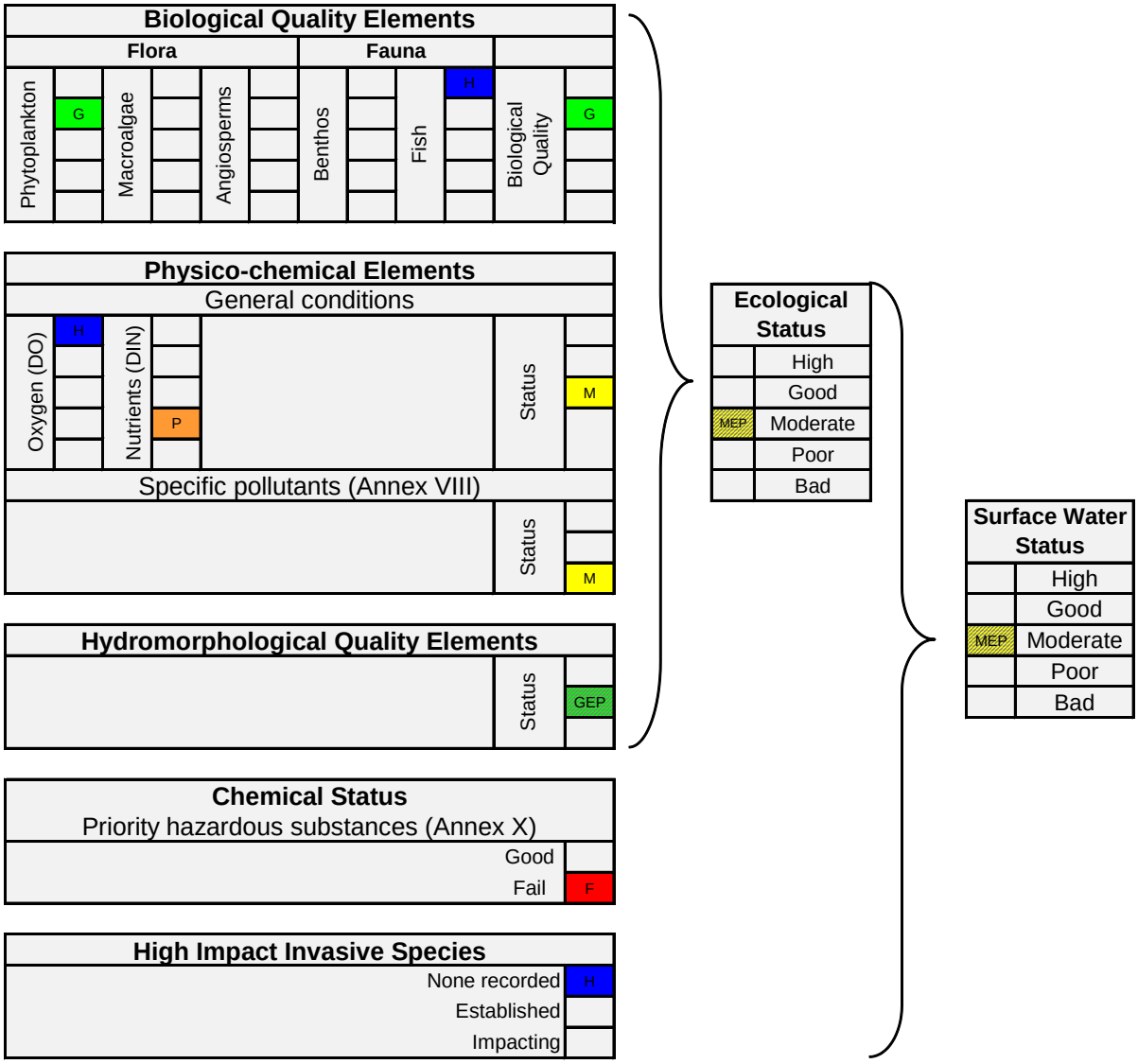

Figure 2: Overall classification of Foyle Harbour and Faughan (Transitional Water)

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+data confidence):	GOOD (47.7 %)	

Classification metrics:

1. Chlorophyll biomass index (Transitional Waters)
2. Elevated taxa count index:

1. Chlorophyll Biomass Index

Data store (classification): M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\NEW WAtERBODIES\FAUGHAN AND HARBOUR).xls

M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\NEW WAtERBODIES\FAUGHAN AND HARBOUR ELEVATED.XLS
Data Availability (spot & continuous samples): Spot samples –2009, - 2014 NIEA/MD

Thresholds:

				EA Proposed Transitional Boundaries		
		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:

EQR	Status	Data Years	No. of Sites	No. of Samples	Data Confidence
1.0	HIGH	2009-2013	3	22	42.1 %

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

Data Confidence for High status 42.1% but 42.2% for Good. The calculation of EQR is based on one salinity band only due to the removal of previous sites included in this new waterbody.

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:

Class	% Exceedance	EQR
High	0-15	0.67-1.0
Good	15-30	0.33-0.67
Moderate	30-40	0.28-0.33
Poor	40-50	0.20-0.33
Bad	>50	0-0.20

Results (% Exceedence):

I_1	I_2	EQR	Status	Data Years	No. of Julian months	No. of phytoplankton samples	Data confidence
26.7%	20.0%	0.567	Moderate	2011-2014	14	15	66.4%

3. **Combined Chlorophyll and Elevated Count Tool for Waterbody**

Good (47.7%)

4. Presence of High impact Species: *None*

QE: Macroalgae – tool not applicable

QE Angiosperms – tool not applicable

QE: Benthic Invertebrates – Foyle and Faughan (HMWB)

QE benthic invertebrate assessment (+ Data confidence):	MODERATE TUD (LOW)	

Classification tools: 1. Infaunal Quality Index (IQI)

1. IQI (UKTAG v01 20140228)

Water body IQI assessment: **Moderate TUD (Low*)***

WFD surveillance monitoring:

- **Data store:** ..\Foyle and faughan water body (HMWB)\Foyle and faughen water body 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 sites, 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-CSEG	Kild (3),	3	0.50	0.01	Moderate
2011	MM-CSEG	Kild (5)	5	0.65	0.04	Good
2012	MM-CSEG	Kild (5)	5	0.74	0.03	Good
2013	MM-CSEG	Kild (5)	5	0.49	0.13	Moderate
2014	MM-CSEG	Kild (5)	-	-	-	-
2015	MM-CSEG	Kild (5)	-	-	-	-
Overall 6 year waterbody means			**4.7**	**0.60 (0.54*)**	**0.06**	**Moderate (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)

QE: Transitional Fish

QE: Transitional fish assessment (+ data confidence):	HIGH (85%)	

Classification tools: Transitional Fish Classification Index (TFCI)

Data store:

- **Fish**: ..\..\..\FISH\DATA\WFDClassification\TFCI\TFCI 2014\TFCI 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	<0.2	≥0.2; < 0.4	≥0.4; <0.6	≥0.6; < 0.8	≥0.8

Results:
Transitional Fish Classification Index (TFCI) – 2014 data

Metric Number	Metric	Score
1	Species composition	4
2	Presence of Indicator species	3
3	Species relative abundance	4
4	No. of taxa making up 90% of the abundance	4
5	No. of estuarine resident taxa	5
6	No. of estuarine-dependent marine taxa	5
7	Functional guild composition	5
8	No. of benthic invertebrate feeding taxa	5
9	No. of piscivorous taxa	5
10	Feeding guild composition	4
	TFCI	44
	EQR	0.85

Fish cont'd

Percent Confidence of Class (bias corrected bootstrap method)

Bad	Poor	Moderate	Good	High
0.0	0.0	0.0	15.3	84.7

Data confidence: High

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

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

QE: Dissolved Oxygen

QE Dissolved oxygen (+ data confidence):	HIGH (M)	

Classification tools: Comparison of 5% ile against reference standards.

- **Data Store:** ..\..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.lnk
- **Data Availability:** 2006-2008, 2010, 2012-15.
- **Data Source (spot & continuous samples):** Spot

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*)
6.39	High	2006-08, 2010, 2012-15	**		

* Proportion of possible months for which data are available

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QE: Nutrients – N regulation

QE N regulation (+ Data confidence):	POOR (57%)	

- **Data store:** ..\Transitional DIN 2015-2021.xls
- **Data Availability:** 2007 to 2014
  DIN & salinity (Nov to Feb)
- **Data Availability (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
65.07*		41	7	2007 to 2014	Database not yet QA'd	**POOR**

*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	

Classification tools: Comparison with EQS levels.

Data assessed for 2013 Update:

Specific Pollutants:

Suite	Parameter	Data Availability
Trace Metals	Chromium	CSEG 2012
Trace Metals	Iron	CSEG 2012
Trace Metals	Copper	CSEG 2012
Trace Metals	Zinc	CSEG 2012
Trace Metals	Arsenic	CSEG 2012
Trace Organics (OPONS)	Dimethoate	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Diazinon	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Fenitrothion	DEC 2010 – JUN 2011
Urea Herbicides	Linuron	AUG 2011 – JUN 2012
Nutrients (Winter Nutrients)	Unionised Ammonia (at pH8)	WIN NUTS 2012-2013
Candidate Specific pollutant	Glyphosate	JAN 2013

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

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	CSEG 2012
Trace Organics (OPONS)	Mevinphos	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Triazaphos*	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Dichlorvos	DEC 2010 – JUN 2011

Triazaphos* LOD above the EQS.

*Further data is available but cannot be used for classification until assessment of 2011 Culmore and Strabane WWTW trace organics monitoring data is completed.

Link to Data, Assessment and EQSs:

G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFCATION UPDATE 2013\Chemistry

Data assessed for 2014 Update:

Suite	Parameter	Data Availability
Trace Metals	Chromium	CSEG 2013
Trace Metals	Iron	CSEG 2013
Trace Metals	Copper	CSEG 2013
Trace Metals	Zinc	CSEG 2013
Trace Metals	Arsenic	CSEG 2013

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

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	CSEG 2013
Trace Metals (DSD list 2)	Boron	CSEG 2013

No EQS failures

Link to Data, Assessment and EQSs:

..\..\Data

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
Trace Metals	Chromium	Sept 2014 – Dec 2014
Trace Metals	Iron	Sept 2014 – Dec 2014
Trace Metals	Copper	Sept 2014 – Dec 2014
Trace Metals	Zinc	Sept 2014 – Dec 2014
Trace Metals	Arsenic	Sept 2014 – Dec 2014

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

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	Sept 2014 – Dec 2014

EQS failures:

Cypermethrin

Link to Data, Assessment and EQSs:

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ANNEX D: Hydromorphological quality elements

Overall hydromorphology assessment	**HMWB-GEP**	

Classification tools:

1. TRaC Hydromorphology metrics
2. MIMAS

Alternative approach assessment (CIS guidance 2006): Good Ecological Potential

ANNEX E: Chemical Status

Priority hazardous substances (+data confidence)	FAIL	

Classification tools: Comparison with EQS levels.

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

Data Assessed for 2013 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	CSEG 2012
Trace Metals	Cadmium	CSEG 2012
Trace Metals	Lead	CSEG 2012
Trace Metals	Mercury	CSEG 2012
Trace Organics (OPONS	Atrazine	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Chlorfenvinphos	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Chlorpyrifos	DEC 2010 – JUN 2011
Trace Organics (OPONS)	Simazine	DEC 2010 – JUN 2011
Urea Herbicides	Isoproturon	AUG 11 – JUN 12
Urea Herbicides	Diuron	AUG 11 – JUN 12
PAH	Anthracene	DEC 2010 – JUN 2011
PAH	Fluoranthene	DEC 2010 – JUN 2011
PAH	Naphthalene	DEC 2010 – JUN 2011
PAH	Benzo (a) pyrene	DEC 2010 – JUN 2011
PAH	*Benzo(b)fluoranthene	DEC 2010 – JUN 2011
PAH	*Benzo(k)fluoranthene	DEC 2010 – JUN 2011
PAH	*Benzo(g,h,i)perylene	DEC 2010 – JUN 2011
PAH	*Indeno(1,2,3 cd) pyrene	DEC 2010 – JUN 2011

*AA - EQS = Sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene = 0.03ug/l (No Marine MAC – EQS)

*AA - EQS = Sum of Benzo(g,h,i)perylene and Indeno(1,2,3 cd) pyrene = 0.002ug/l (No Marine MAC – EQS)

EQS Failures:

AA – EQS failure for the sum of Benzo(g,h,i)perylene and Indeno(1,2,3 cd) pyrene.
Calculated mean = 0.0023 ug/l

There is low confidence as the EQS is an annual average and the mean is calculated with only 3 months of monitoring data (Dec 10, Jan 11 and Jun 11).

There is no marine maximum allowable concentration (MAC) for comparison.

Link to Data, Assessment and EQSs

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Data Assessed for 2014 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	CSEG 2013
Trace Metals	Cadmium	CSEG 2013
Trace Metals	Lead	CSEG 2013
Trace Metals	Mercury	CSEG 2013

No EQS failures

Link to Data, Assessment and EQSs

..\..\Data

Data Assessed for 2015 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	Sep 2014 – Dec 2014
Trace Metals	Cadmium	Sep 2014 – Dec 2014
Trace Metals	Lead	Sep 2014 – Dec 2014
Trace Metals	Mercury	Sep 2014 – Dec 2014
Trace Organics	Benzene	Nov 2013 – Sept 2014
Trace Organics	Nonylphenol	April 2014 – Dec 2014
Trace Organics	Octylphenol	April 2014 – Dec 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	Endosuphan	April 2014 – Dec 2014
Pesticides	DDT	April 2014 – Dec 2014
Pesticides	pp DDT	April 2014 – Dec 2014

MARINE PAH INVESTIGATIVE MONITORING 2014

Suite	Parameter	Data Availability
PAH	Naphthalene	1 sample
PAH	Anthracene	NR
PAH	Fluoranthene	NR
PAH	Benzo(b)fluoranthene	1 sample
PAH	Benzo(k)fluoranthene	1 sample
PAH	Benzo (a) pyrene	1 sample
PAH	Indeno(1,2,3 cd) pyrene	1 sample
PAH	Benzo(g,h,i)perylene	1 sample

EQS failures:

HCH

Link to Data, Assessment and EQSs

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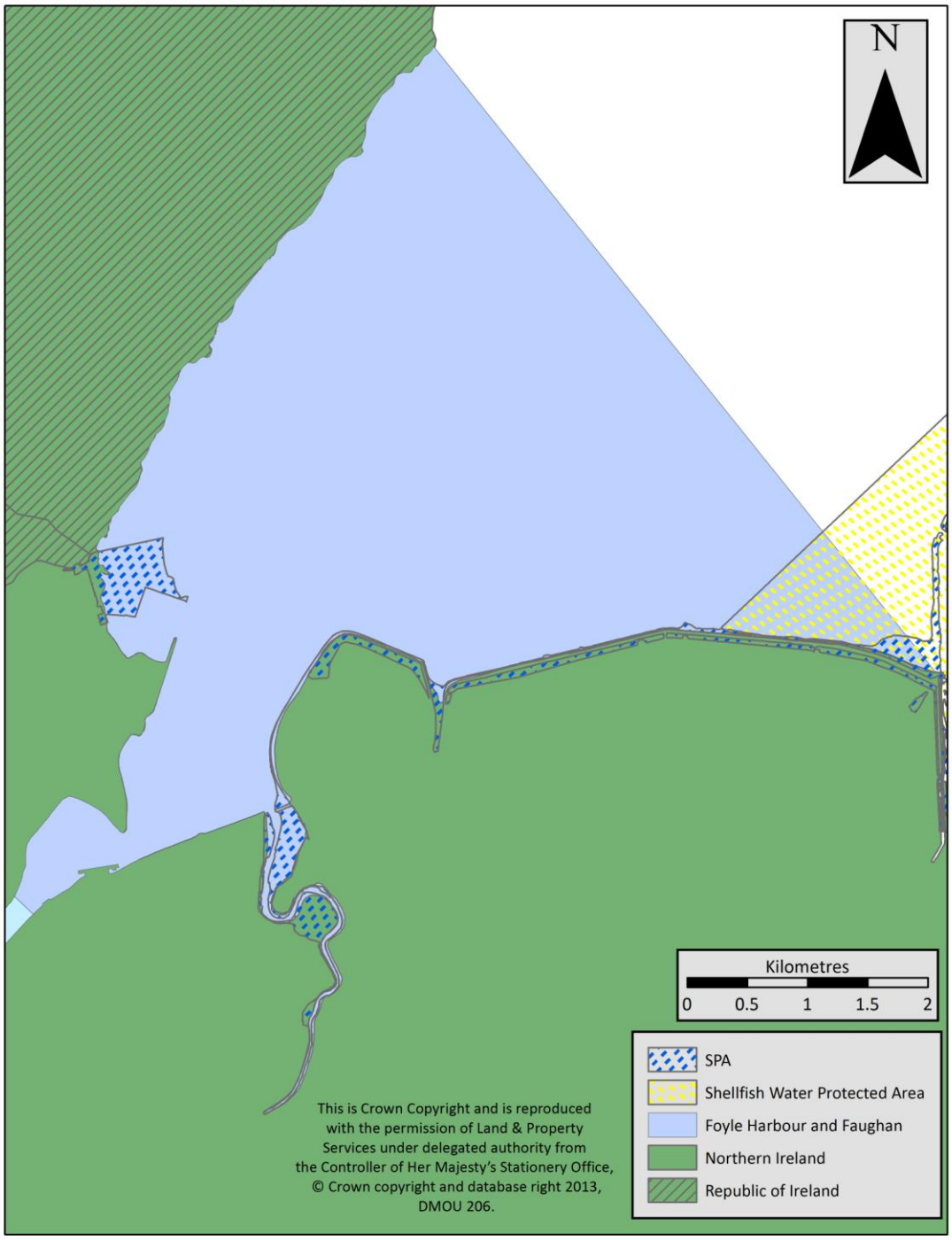
ANNEX F: Protected Areas



Protected areas within Foyle Harbour and Faughan Estuary (Transitional Water).

The following Protected Areas are situated either wholly or partly within the Foyle and Faughan water body:

Natura 2000 sites (Habitats Directive and Birds Directive):

Site Name	2014 Condition Status	Designated Water Dependant habitat/species	Feature(s) not meeting objective	Reason for not meeting objective
Lough Foyle SPA	Favourable	Bar tailed godwit; Whooper swan; Light bellied brent goose; water bird assemblage		

Shellfish Water Protected Areas:

Shellfish Water Protected Area	Met Guideline Microbiological Standard* in 2014
Longfield Bank	No (n=22)

*75% of samples contain ≤230 *E. coli* /100ml of shellfish flesh and intervalvular liquid

ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment		HIGH

Ecoregion 17 Marine High Impact Invasive Species List

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

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.

Glossary

AFBI	Agri-Food and Biosciences Institute (under contract to NIEA)
AMBI	AZTI Marine Biotic Index
Annex 10	Annex 10 Priority Hazardous Substances
Annex 8	Annex 8 Specific Pollutants
Article 5	Characterisation, typology, pressures and impacts analysis
ASSI	Area of Special Scientific Interest
CIS	Common Implementation Strategy
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
$_{G}$H	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