RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Heavily Modified Water Body – Belfast Harbour

31/05/2015

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

BELFAST HARBOUR

Water body Information

- River Basin District: North Eastern
- Water body type: CW8
- Water Body Code: UKGBNI6NE100
- Water body characteristics: Euhaline, mesotidal, sheltered
- Water body area: 3.44 km^2
- Heavily Modified Water Body: Yes
- 2015 Classification Objective: Moderate Ecological Potential

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

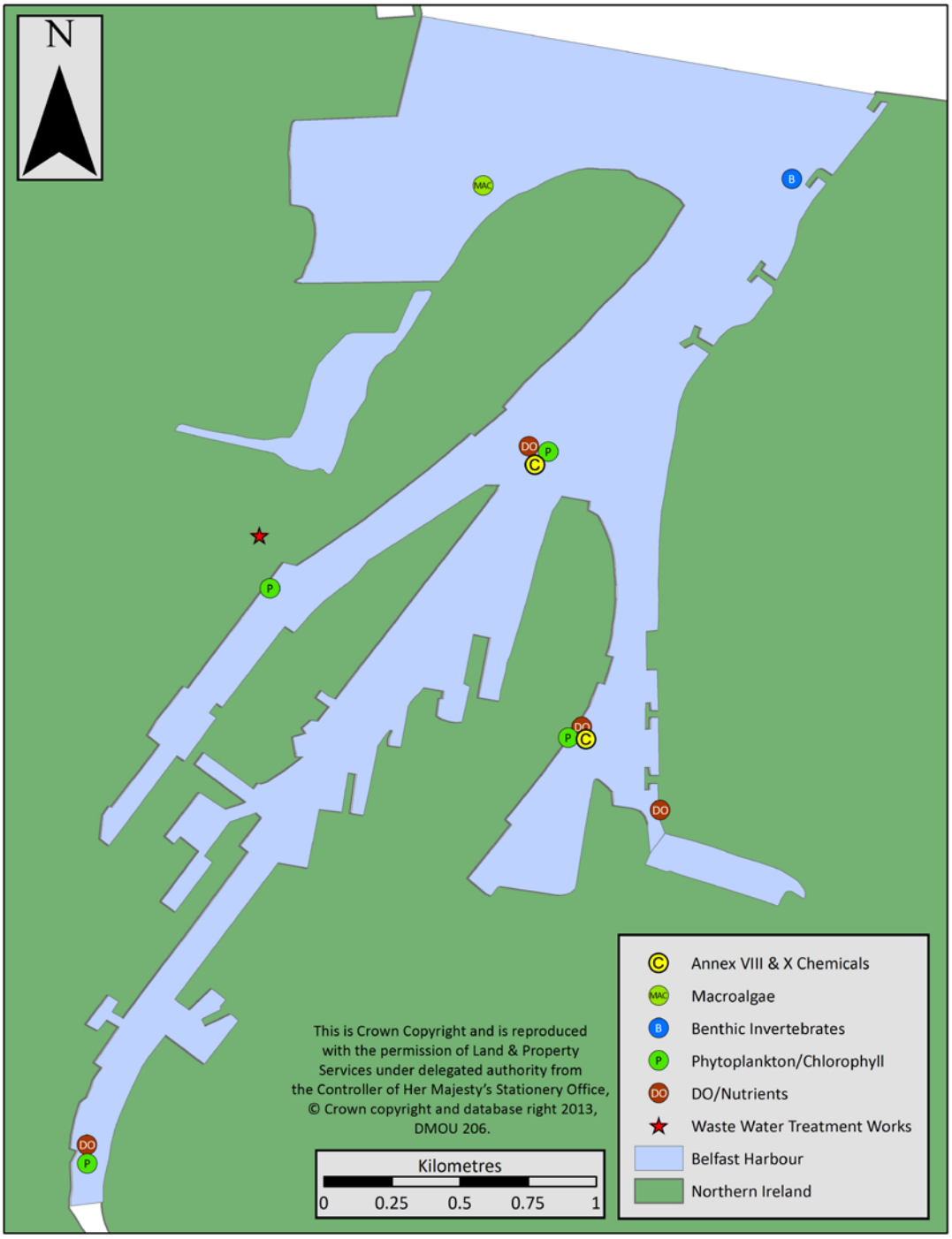

Figure 1: Waste water treatment pressures and monitoring points within Belfast Harbour (Coastal Water).

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	✓	
Macroalgae (seaweed)	Reduced Species List	✓	
Angiosperms	Seagrass	☒	Tool Not Applicable
Benthic Invertebrates	Infaunal Quality Index	✓	
	Imposex	☒	No suitable sites
Physico-chemical (water)	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	2009-2014	6 sites 88 samples
	Elevated Taxa Count Index	2009-2014	6 sites 63 samples
Benthic Invertebrates	Infaunal Quality Index	2011-2013	6 sites 20 samples
Physico-chemical			
Nutrients		2007-2008, 2010-2015	5 sites 58 samples
Dissolved Oxygen (DO)		2007-2015	
Other polluting substances (Annex VIII)		2010-2014	1 site
Hydromorphology		2007	
(Annex X)		2010-2014	1 site

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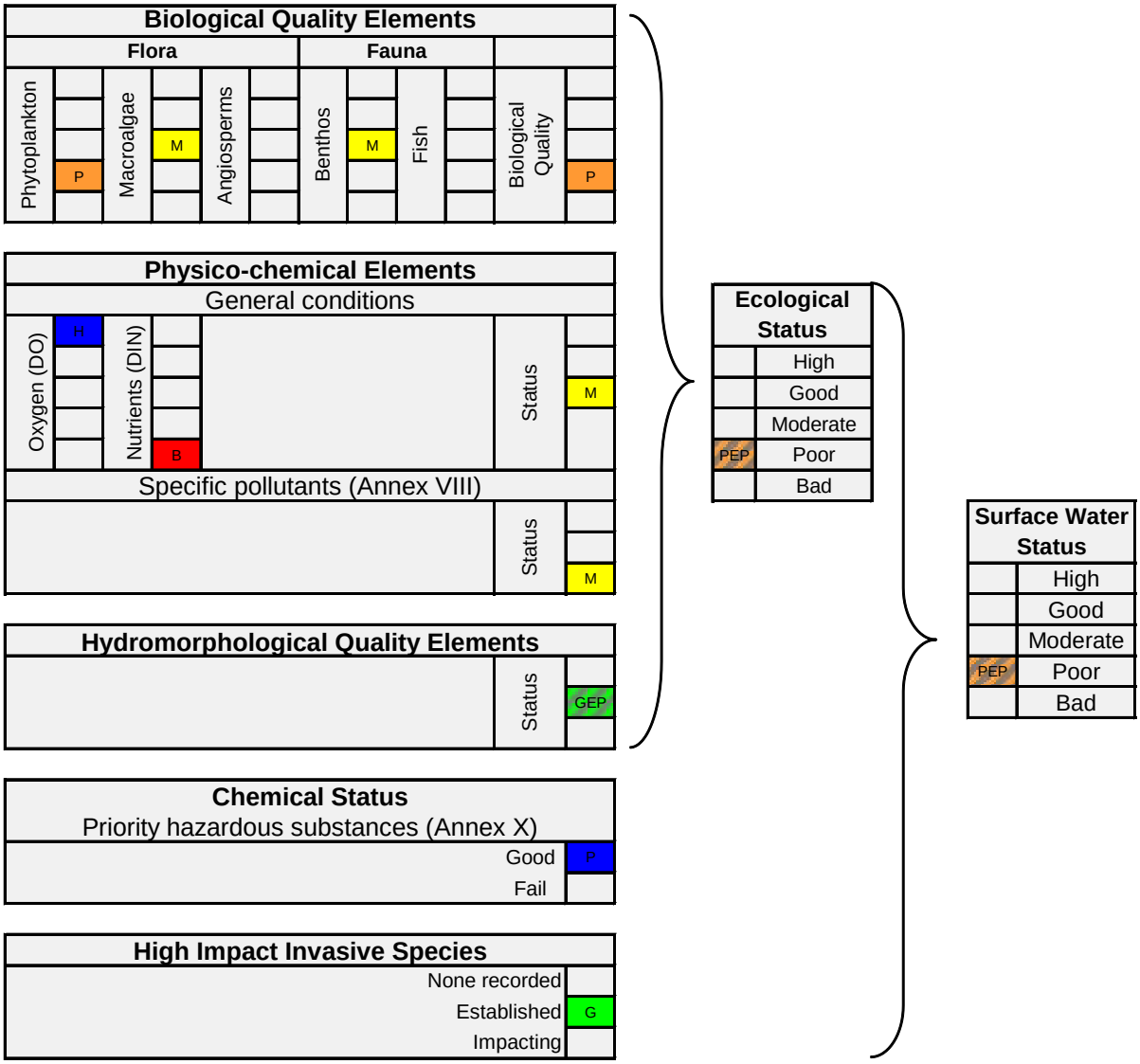

Figure 2: Overall classification of Belfast Harbour (Coastal Water).

ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE phytoplankton assessment (+ Data confidence):	POOR (80%)	

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

Data store (classification): ..\..\..\..\Projects 12\Phycology 2012\Chlorophyll a\WFD Updates\Phytoplankton Updates 2012 data sheets\Belfast Harbour 90th Percentile.xls
M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\Coastal data\BELFAST HARBOUR 2015.XLS

Data Availability (spot & continuous samples):
Phytoplankton=NA
Chl = spot (*2009-2014) NIEA*

1. Chlorophyll Biomass Index - 90%ile (Chl μg l^{-1})
(Growing Season 1st Mar – 31st Oct)

Waterbody Chl. biomass assessment **Bad *(58.8%)***

- **Thresholds:**

Water Ref. Area		Status				
		High	Good	Moderate	Poor	Bad
North/Irish Sea	Chl μg l^{-1}	<5	5-10	10-15	15-20	>20
	EQR	0 -1.0	1.0-0.8	0.8-0.6	0.6-0.4	0.4-0.2

Results:

90%ile	Status	Data Years	No. of Sites	No. of Samples	Data Confidence
22.62	BAD	2009-2014	6	88	58.8%

Data confidence: 58.8%

Data analysed using M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015CW_Phytoplankton_CoC_tool_v10 7_UKTAG.xls

2. *Elevated Taxa Count Index*

Waterbody Elevated Taxa Assessment

Thresholds:

Tool	Thresholds	
	North/Irish Sea	Atlantic
I_1 - Individual Species Count (excl. Phaeocystis) (%)	500,000 (cells l^{-1})	
I_2 – Total Taxa Count (%)	10^7 (cells l^{-1})	
I_3– Elevated Biomass Count (%)	>10 (µg l^{-1})	>5 (µg 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	I_3	Elevated Count Mean	Status	Data Years	No. of phytoplankton samples	Data confidence
34.8%	6.1%	30.3%	0.56	Moderate	2009-2014	63	93.7%

Data confidence: 93.7%

Data analysed using M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015CW_Phytoplankton_CoC_tool_v10 7_UKTAG.xls

Prescence of alien/ nuisance species: *none*

Overall Waterbody Status

Poor (80%)

QE: Macroalgae

QE Macroalgae assessment (+ data confidence):	MODERATE (93.1%)	

Classification tools:

1. Reduced species list (RSL).
2. Macroalgal Blooming Tool (MBT) – not applicable
3. Angiosperms – not applicable

- **WFD surveillance monitoring**: 2010,2014
- **Data Availability (classification)**: 2010, 2014 2 sites
- **Data Store**: **..\..\..\..\Projects 14\Phycology 2014\MM14-12 Intertidal Rocky Shore\FSL-RSL Classification update 2015 (09-14)Datasheet.xls**

1. Reduced Species List

Boundaries:

Parameter	Quality Status / Sub-metric quality status	Bad 0.0 – 0.2	Poor 0.21 – 0.4	Moderate 0.41 – 0.6	Good 0.61 – 0.8	High 0.81 – 1.0
Species richness (adj. for shore)		0 – 3	3 – 10	10 – 20	20 – 34	34 – 68
Proportion of Chlorophyta (% G)		80 – 100	45 – 80	30 – 45	20 – 30	0 – 20
Proportion of Rhodophyta (% R)		0 – 10	10 – 25	25 – 35	35 – 45	45 – 100
Ecological Status Group ratio (ESG)		0.0 – 0.2	0.2 – 0.4	0.4 – 0.6	0.6 – 0.8	0.8 – 1.2
Proportion of opportunists (% opp)		50 – 100	35 – 50	25 – 35	15 – 25	0 – 15

Results:

Shore	Sub-Metric EQR							RSL EQR	Status
	Shore	Sp. richness	Adj. Sp. Richness	% G	% R	ESG	% Opp		
Edgewater 10	10	19	25.84	26.32	47.37	0.46	31.58	0.59	MOD
Edgewater 14	10	41	21.76	31.25	37.50	0.33	31.25	0.53	MOD
Clare house 14	9	16	23.04	25.00	25.00	0.45	37.50	0.50	MOD
Mean								0.54 +/- 0.05	MOD

Confidence of classification: Moderate (93.1%)

- Data analysed for Confidence of Class using M:\Projects 14\Phycology 2014\MM14-12 Intertidal Rocky Shore\PIRATES_v04 - Class update 2015 (09-14) for UKTAG.xls
- Standard Deviation (±) included with the mean EQR.
- Data QA (expert team)
- FSL not yet carried out.
- Good spatial coverage low temporal coverage.

Alien taxa: *None present*

QE: Angiosperms –Tool not applicable

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QE: Benthic Invertebrates

QE Benthic invertebrate assessment (+ Data confidence):	MODERATE (L)	

Classification tools:

1. Infaunal Quality Index (IQI)
2. Imposex tool (VDSI) – ND

1. IQI (UKTAG v01 20140228)

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

WFD surveillance monitoring:

- **Data store:** ..\Belfast Harbour (HMWB)\Belfast Harbour (HMWB) 08-13 1mm fauna data.xlsx
- **Benthic invertebrates** UNICORN (NMMT) Database
- **Supporting Parameters** Water Quality Data Set
- **Digital images** AMAP Project folder
- **Data Availability (classification):** 6 sites, 5 & 1 reps, 3 years, Day Grab, 1 mm sieve, n= 20.

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	-	-	-	-	-	-
2011	MM-Benthos	BLH18	5	0.65	0.03	Good
2012	MM-Benthos, BParker12	BLH18, P18-P22	10	0.59	0.10	Moderate
2013	MM-Benthos	BLH18	5	0.71	0.04	Good
2014	MM-Benthos	BLH18	-	-	-	-
2015	MM-Benthos	BLH18	-	-	-	-
Overall 6 year waterbody means			**6.7**	**0.65(*0.59)**	**0.06**	**Moderate**

* 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 with additional spatial coverage in 2012 with 5 sites)

Alien taxa present: *Crepidula fornicata* (Slipper limpet)

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

QE: Dissolved Oxygen

Dissolved oxygen (+ data confidence):	HIGH (89%)	

Classification tools: Comparison of 5% ile against reference standards

- Data Availability: 2010 -2015 ..\..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.lnk

- Data Availability (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*)
5.77	HIGH	2010 - 2015	**		

***** Proportion of possible months for which data are available

QE: Nutrients – N regulation

QE N regulation (+ Data confidence):	BAD (66%)	

- **Data store:** ..\CofCDINth 2015-2021.xlsx
- **Data Availability:** 2010-2015 DIN & salinity (November to February)
- **Data Availability (spot & continuous samples):** spot

N regulation thresholds:

Area	Salinity range	DIN (uM) Winter mean H/G	DIN (uM) Winter mean G/M	DIN (uM) Winter mean M/P	DIN (uM) Winter mean P/B
Coastal (at salinity 32)	30-34.5	12-18	18-30	30-40.5	>40.5

Results:

Mean Winter DIN (uM) (Avg DIN)*	Winter DIN Daily average (n)	No. of samples (n)	No. of sites	Data Years	Data Quality	Status
60.95	0	52	5	2010-15	Database not yet QA'd	BAD

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

Confidence of data source: ..\CofCDINth.xlsx

ANNEX C: Classification of physico-chemical quality elements: Specific Pollutants (Annex VIII)

Specific pollutants assessment (+data confidence)	MODERATE (L)	

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
Trace Metals	Chromium	Sept 2014 – Dec 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

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

The hydromorphological assessment for the water body is that it could meet Good Ecological Potential (GEP) due to management and mitigation measures undertaken within the harbour.

ANNEX E: Chemical Status – Annex X Chemicals

Hazardous substances assessment (+data confidence)	GOOD (L)	

Classification tools: Comparison with EQS levels.

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

Data Assessed for 2015 Update:

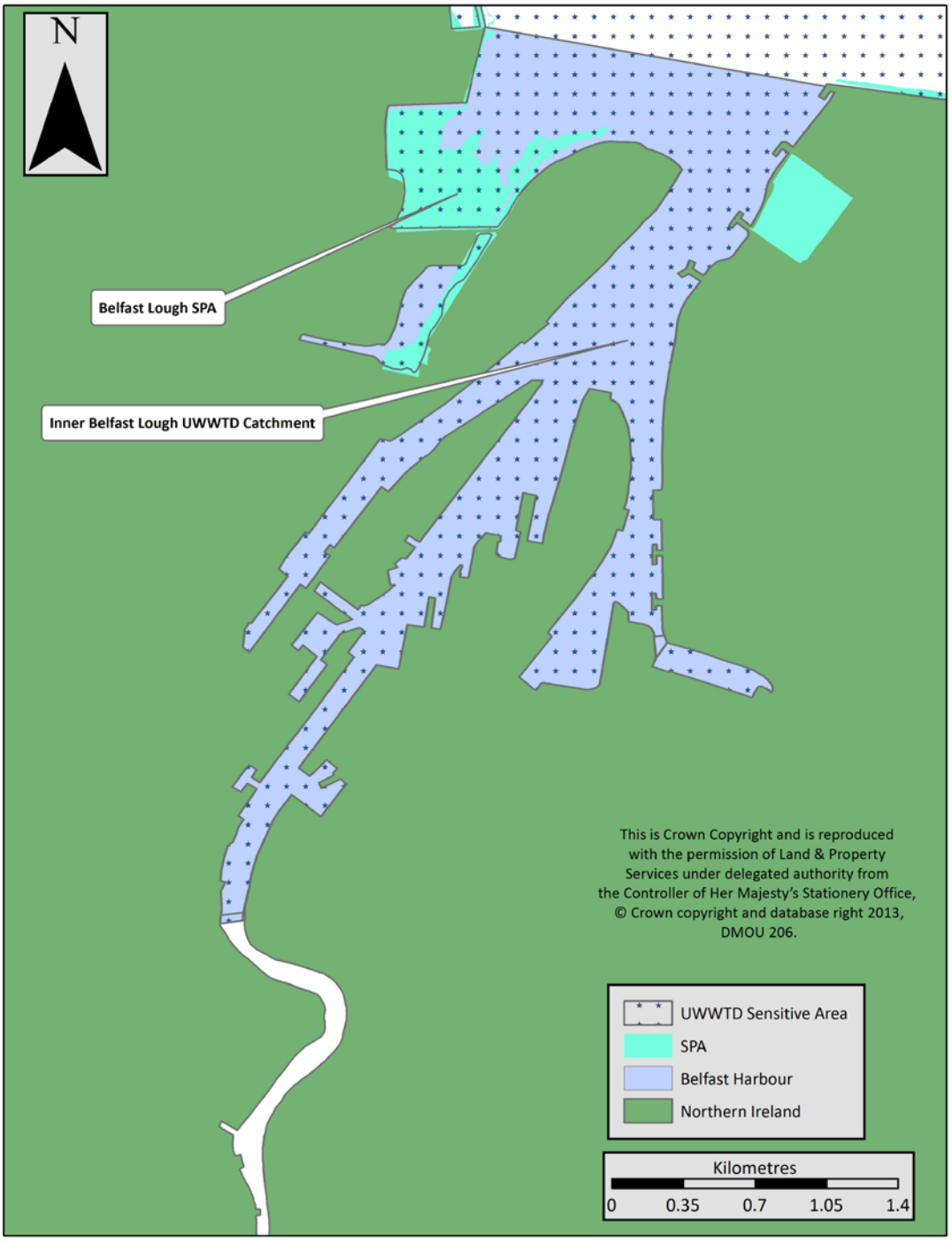
Suite	Parameter	Data Availability
Trace Organics	Benzene	Nov 2013 – Sept 2014
Trace Organics	Nonylphenol	April 2014 – Dec 2014
Trace Organics	Octylphenol	April 2014 – Dec 2014

No EQS failures

Link to Data, Assessment and EQSs:

G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets

ANNEX F: Protected Areas



Protected areas within Belfast Harbour (Coastal Water).

The following Protected Areas are situated either wholly or partly within the Belfast Harbour 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
Belfast Lough SPA	Unfavourable	Redshank	Redshank	Non marine water quality related

Nitrates Directive/ Urban Waste Water Treatment Directive Sensitive Areas:

- Inner Belfast Lough UWWTD Sensitive Area

ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment		GOOD

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*		Y		W
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 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
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