

Summary of Blue-Green Algae monitoring in bathing waters and nearby sites

November 2023

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1 Background

This report provides a summary of all the blue-green algae water sample results taken to support management of risk to public health at identified and candidate bathing waters and related sites in 2023. Water samples were also taken within wider Lough Neagh catchment and these results are also presented in the document. The report provides a background to the monitoring approach, which will be reviewed following consultation with experts and stakeholders for 2024, and consideration of the findings from 2023. The results are presented by area (inland, wider Lough Neagh and coastal sites), and summary maps of the results are provided in Annex A, along with example photographs of blue-green algal scum at or near to bathing waters.

Bathing Waters Monitoring Programme

The Quality of Bathing Water Regulations (Northern Ireland) 2008 (<https://www.legislation.gov.uk/nisr/2008/231/contents/made>) sets quality standards for bathing water. Bathing water quality is monitored by DAERA Marine and Fisheries Division.

Identified bathing waters, whether inland or marine/coastal, are subject to two types of monitoring:

1. Sampling for faecal indicator bacteria
2. Visual assessment for possible pollution incidents, including presence of waste, proliferation of macroalgae (seaweed) and algal scums and blooms (including blue-green algae).

The bathing season runs from 1 June to 15 September each year, with monitoring (water sampling and visual assessments) carried out up to 20 times at each identified bathing water between June and September (pre-season testing is normally also carried out in May).

Northern Ireland has 26 identified bathing waters, all of which are coastal, and 7 candidate bathing waters (1 inland, 6 coastal). Bathing water monitoring takes place at both identified and candidate sites.

Within Lough Neagh and downstream from the River Bann to the north coast, in an impact zone of the river discharge, there are the following sites:

- Rea's Wood, Lough Neagh (inland candidate bathing water)
- Portstewart Strand (identified coastal bathing water)
- Castlerock beach (identified coastal bathing water)
- Downhill beach (identified coastal bathing water)
- Benone beach (identified coastal bathing water)
- Portstewart and Portrush harbours

Faecal indicator bacteria:

The methodology for determining levels of faecal indicator bacteria is specified within the Bathing Water Regulations. Weekly bathing water results for faecal indicator bacteria for all bathing waters during the bathing season are made available via [DAERA](#) and [NI Direct](#) websites. The higher the numbers of faecal indicator bacteria present in the water, the poorer the water quality and the greater the risk to human health. When faecal indicator bacteria levels reach a set threshold then a 'poor bathing quality – advice against bathing notice¹' is issued by the Bathing Water Operator. Water quality failures are notified to Bathing Water Operators whenever they occur.

Blue-green algae (cyanobacteria):

Unlike faecal indicator bacteria, there is not a specific methodology prescribed by the Bathing Water Regulations for assessing risk to public health from blue-green algae, beyond the visual assessment and the requirement to take action to minimise risk. Where there are concerns of risks to bathers' health from a visual assessment of blue-green algae, reference is made to guidelines provided by the World Health Organisation, which emphasises that if there is a dense scum visible, or risk of this developing (e.g. where scum is near the bathing site), advice against bathing should be issued. However, if scum is transient or less dense, but there is suspected presence of potentially toxic blue-green algae, further assessment is made by taking water samples to establish levels in relation to agreed health guidelines for safe bathing – known as "reactive sampling". Depending on visual assessments of algal scum, precautionary closures may be required until full water sample results become available.

¹ >1250 E. coli colony forming units/100ml for marine sites, >2250 E. coli colony forming units/100ml for inland sites e.g. Rea's Wood.

If levels of blue-green algae water sample results exceed the safe threshold ('guideline values for recreation') from WHO, DAERA notifies the Bathing Water Operator to issue 'advice against bathing' notices. The Bathing Water Operator is usually the local authority but in the case of Portstewart Strand, the National Trust carries out this role.

Wider reports of cyanobacteria have been encouraged by the public via the 'Bloomin' Algae app' and the Emergency Pollution Hotline. Records are then confirmed by Northern Ireland Environment Agency (NIEA) scientists.

2 Blue-green algae occurrences in bathing waters

In 2023, the first blue-green algal bloom impacting bathing waters in Northern Ireland occurred. This was unprecedented and required a new operational protocol to be developed at haste. The Department referred to a number of guidelines in use by other countries, including:

- Scottish Government's "Cyanobacteria (Blue-Green Algae) in Inland and Inshore Waters: Assessment and Minimisation of Risks to Public Health". 2012. Available at: <https://www.gov.scot/publications/cyanobacteria-blue-green-algae-inland-inshore-waters-assessment-minimisation-risks-public-health/>
- World Health Organisation (WHO)'s "Guidelines for safe recreational water environments. Volume 1: Coastal and fresh waters". 2003, Available at: <https://www.who.int/publications/i/item/9241545801>
- World Health Organisation (WHO)'s "Toxic cyanobacteria in water – Second edition: A guide to their public health consequences, monitoring and management". 2021. Available at: <https://www.who.int/publications/m/item/toxic-cyanobacteria-in-water---second-edition>

As detailed in the previous section, an approach based on the initial visual assessment was enacted, with water samples taken where levels of potentially toxic blue-green algae needed to be established in the absence of a dense blue-green algal scum.

Water sample analysis

A range of water sample analyses for blue-green algae are possible to support assessment of potential risk to health, including cell counts, biovolume analysis and cyanotoxin analysis, which can then be used to compare against established 'guideline values' for safe levels for recreation. Within Northern Ireland, the Department accessed cell counting via its science delivery partners the Agri-Food and Biosciences Institute. This was the only analysis available where turnaround could be within days from sample collection. However, the WHO 2021 guidelines recommend 'calibrating' cell counts (and biovolume analyses) with periodic cyanotoxin analyses, as blue-green algae may vary considerably in the levels of toxins produced throughout the bloom cycle, and from different strains of cyanobacteria.

The Department initiated price checks in August 2023 for cyanotoxin analysis, seeking a fully accredited laboratory to undertake such work. The only available laboratory was in England, which meant that results could take 1-2 weeks to be returned following sample collection. Analysis of samples for cyanotoxins was progressed to better understand the possible toxicity of the bloom in bathing waters and adjacent areas.

Results from inland sites

Background to data collection

The Northern Ireland Environment Agency (NIEA) undertakes a programme of water quality monitoring to report upon the ecological and chemical health of the water environment. This includes the monitoring of 450 rivers and 21 lakes on a scheduled basis with chemistry samples collected throughout the year and biological sampling carried out over a rolling 3-year period. NIEA respond to reports of pollution incidents taking samples were necessary to prove the polluting nature of the substance.

NIEA also respond to reports of suspected blue-green algae to confirm these, liaising with landowners to initiate actions as appropriate. There is, however, no formal long-term monitoring programme for blue-green algae; these are intermittent and are managed as pollution incidents. Reports are usually made via the Emergency Pollution Hotline², but

² Emergency Pollution Hotline: 0800 80 70 60, email: emergency-pollution@daera-ni.gov.uk

have also been encouraged via the 'Bloomin' Algae' app³ (created by the UK Centre for Hydrology and Ecology).

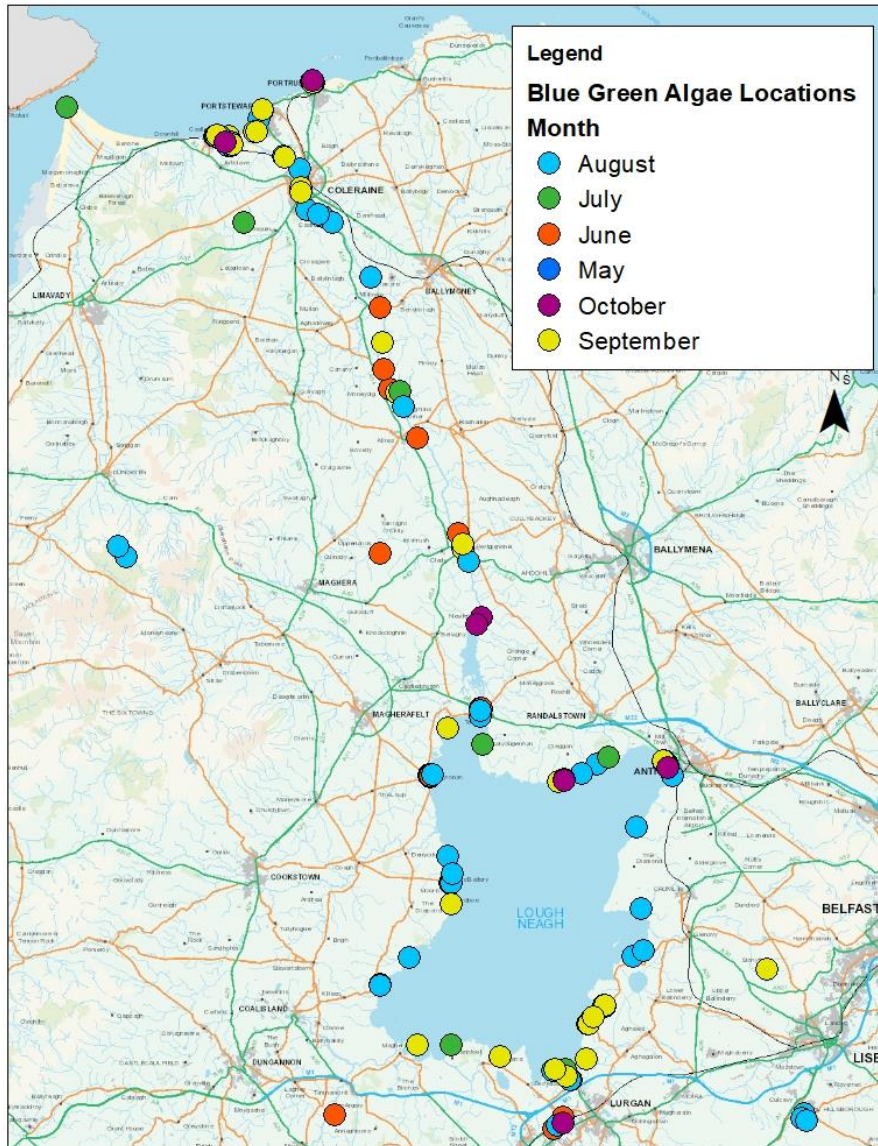
Historically, Northern Ireland has had no inland identified bathing waters. However, following the Bathing Waters Review in 2022-23⁴, one inland site has been progressed as a candidate bathing water: Rea's Wood in Lough Neagh. As such, there were no previous records of blue-green algae from the DAERA Marine and Fisheries Division bathing waters monitoring programme at this site.

Lough Neagh and downstream confirmed presence of blue-green algae

Throughout the summer into autumn, confirmed observations have been made of blue-green throughout Lough Neagh, and wider afield. Figure 1 presents all confirmed records in 2023 within Lough Neagh and downstream along the lower Bann river to the north coast.

³ <https://www.daera-ni.gov.uk/news/help-protect-public-health-risks-harmful-blue-green-algal-blooms-bloomin-algae-app>

⁴ Bathing Waters Review report available at: <https://www.daera-ni.gov.uk/publications/202223-bathing-water-review-report>



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Figure 1. Confirmed records of blue-green algae throughout 2023 in Lough Neagh, downstream in the lower Bann river and along the north coast.

Rea's Wood water sample results

NIEA started to receive reports of possible blue-green algae at Rea's Wood from May 2023. Blue-green algae was confirmed by sampling on 23rd May, which identified *Microcystis sp.* as the species of cyanobacteria present. No dense scum/bloom against the shoreline at Rea's Wood was present at that stage, however the first dense bloom at this site was reported to NIEA on 12th June 2023. This was confirmed, and the local Council was informed. A number of reports from the public were confirmed subsequently during the summer.

During the Bathing Waters monitoring programme, visual assessments had noted blue-green algae with a dense scum evident throughout mid-June to mid-July, and water sampling specifically for quantitative analysis of blue-green algae was initiated on 27th July. This is used when there is no dense scum to help determine whether levels are safe for bathing, as per WHO guidelines.

Multiple samples were taken between July and the end of the bathing season (15th September), and the decision was made to continue sampling due to public interest beyond the end of the bathing season. Table 1 gives the cell count results with two species of cyanobacteria identified: *Microcystis* sp. and *Anabaena* sp (*Microcystis* generally in much higher numbers than *Anabaena*). The WHO (2003) and Scottish Government guidelines (2012) use a guideline value of 20,000 cells/ml where below this level is considered safe for recreation. Rea's Wood exceeded this twice, with the highest recorded cell counts from samples taken on 24th August. During the month of September, the bloom was sufficiently visible and dense not to require water sampling to confirm risk to health, as per WHO guidelines, i.e. where there is a dense algal scum advice against bathing should be issued.

Sampling resumed as the bloom started to disperse and breakdown in early October, with all cell counts being below the WHO guideline value of 20,000 cells/ml.

Table 1. **Cyanobacteria cell count results** from Rea's Wood water samples. *cells lysing/breaking down and shrinking.

WHO guideline value (2003)	20,000 cells/ml	
Date	Microcystis cell count/ml	Anabaena cell count/ml
28/07/2023	low	0
31/07/2023	18,834	0
02/08/2023	39,126	225
08/08/2023	9,175	86
16/08/2023	2,122	0
18/08/2023	10,288	278
24/08/2023	124,639	0
11/10/2023	<20,000*	0

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18/10/2023	<20,000*	200
25/10/2023	<20,000*	0
31/10/2023	<20,000*	0
06/11/2023	<20,000*	0

The cyanotoxin results are presented in Table 2 below. Results are presented split between ‘intracellular’, i.e. toxins detected within blue-green algal cells, and ‘extracellular’, i.e. toxins found outside the cells within the water. The laboratory reported microcystin results with a measurement uncertainty envelope. The results presented in the table show the highest likely result from the measurement uncertainty envelope.

Table 2. **Cyanotoxin results** from Rea’s Wood water samples, where “<LOR” is below the limit of reporting (which is 1 µg/L), but where cyanotoxins were still present.

WHO 2021 guideline value for Microcystin-LR: 24 µg/L			
Date	Intracellular microcystin (µg/L)	Extracellular microcystin (µg/L)	Total microcystin (µg/L)
07/09/2023	<LOR	<LOR	<LOR
21/09/2023	5.5	<LOR	5.5
28/09/2023	<LOR	<LOR	<LOR
11/10/2023	<LOR	<LOR	<LOR
18/10/2023	<LOR	<LOR	<LOR
25/10/2023	<LOR	<LOR	<LOR
31/10/2023	<LOR	1.7	1.7
06/11/2023	<LOR	<LOR	<LOR

The WHO guideline values for cyanotoxins are provided in Table 3 and have been extracted from the 2021 guidelines.

Table 3. Guideline values for a range of cyanotoxins produced by cyanobacteria, in terms of risk to public health for recreational users – WHO guidelines, 2021.

<i>Toxin</i>	<i>Exposure</i>	<i>Value (µg/L)</i>	<i>Value type</i>
Microcystin-LR	Recreational	24	Provisional guideline value
Cylindrospermopsin	Recreational	6	Provisional guideline value
Anatoxin-a	Recreational	60	Health-based reference value
Saxitoxin	Recreational	30	Guideline value

The only cyanotoxins detected in Rea’s Wood were microcystins. Rea’s Wood samples’ results were below the WHO guideline value.

Wider Lough Neagh results

Observations noted that the blue-green algal bloom and its material varied notably with changes in weather and prevailing wind conditions. Given that material could be washed from one part of Lough Neagh to another, cyanotoxin analysis was conducted on a range of samples from across Lough Neagh, into Lough Beg and at the start of the Lower Bann river. Figure 2 shows the locations of the sampling sites.

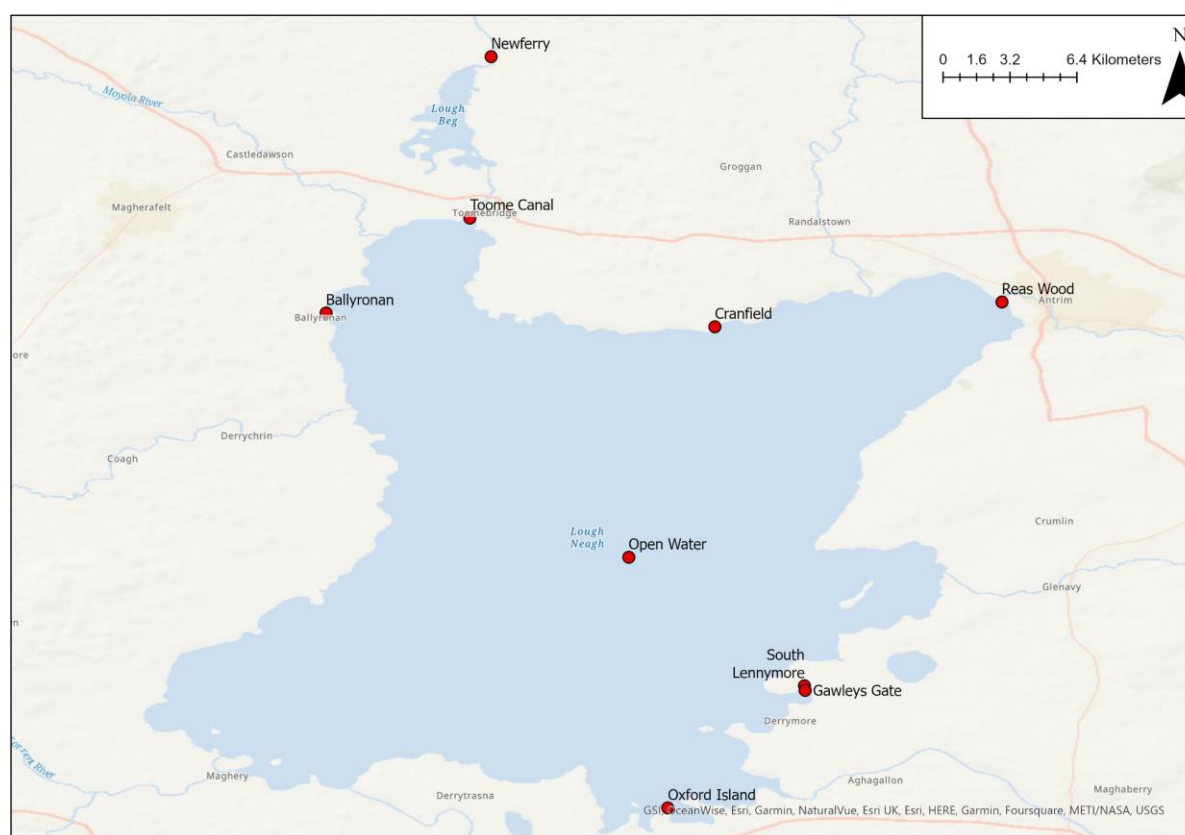


Figure 2. Lough Neagh wider sampling locations.

Sampling at wider Lough Neagh sites deliberately targeted the most visible/densest blue-green algal scum, or most discolouration, in order to provide possible ‘worst case’ results for cyanotoxins and cell numbers rather than ‘representative’ results of the wider area. This approach is common practice elsewhere.

Table 4 (below) provides the results of cell counts for a series of wider Lough Neagh samples, of which four sites exceeded the WHO (2003) guideline value for cell counts.

Table 4. **Cyanobacteria cell count results** from wider Lough Neagh water samples.

WHO guideline value (2003)	20,000 cells/ml	
Site	Date	Microcystis cell count/ml
Gawley's Gate control	31/10/2023	>20,000
South Lennymore Bay	31/10/2023	>20,000
Cranfield	31/10/2023	<20,000
Toome Canal	31/10/2023	>20,000
Newferry	31/10/2023	>20,000
Ballyronan	07/11/2023	<20,000
Lough Neagh Open Water	07/11/2023	<20,000

Table 5 provides the results for the only detected cyanotoxins – microcystins. At a number of sites in Lough Neagh cyanotoxin levels were very high, and the concentrations varied markedly.

Table 5. **Cyanotoxin results** from wider Lough Neagh water samples, where “<LOR” is below the limit of reporting (which is 1 µg/L).

WHO 2021 guideline value for Microcystin-LR: 24 µg/L				
Date	Site	Intracellular microcystin (µg/L)	Extracellular microcystin (µg/L)	Total microcystin (µg/L)
11/10/2023	Cranfield Slipway	<LOR	<LOR	<LOR
31/10/2023	Cranfield Slipway	<LOR	<LOR	<LOR
11/10/2023	Gawleys Gate	<LOR	<LOR	<LOR
31/10/2023	Gawleys Gate rep 1	<LOR	<LOR	<LOR
31/10/2023	Gawleys Gate rep 2	<LOR	<LOR	<LOR
31/10/2023	Gawleys Gate control	9,951.10	<LOR	9,951.10
11/10/2023	Lough Neagh Open Water	<LOR	<LOR	<LOR
07/11/2023	Lough Neagh Open Water	<LOR	<LOR	<LOR

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11/10/2023	Newferry Quay Lough Beg	19.38	<LOR	19.38
31/10/2023	Newferry Quay Lough Beg	4,090.00	<LOR	4,090.00
30/10/2023	Oxford Island	<LOR	<LOR	<LOR
11/10/2023	South Lennymore Bay	47,426.16	<LOR	47,426.16
31/10/2023	South Lennymore Bay	53,494.40	100.30	53,594.70
11/10/2023	Toome Canal	29.73	<LOR	29.73
31/10/2023	Toome Canal	1,405.30	<LOR	1,405.30
07/11/2023	Ballyronan	<LOR	<LOR	<LOR

Coastal sites

Lough Neagh drains via the floodgates at Toome (which help control water levels of Lough Neagh), into Lough Beg, past Newferry and into the River Bann (known as the 'lower Bann'). The Bann estuary is located between the north coast beaches of Portstewart Strand and Castlerock, which lie immediately adjacent to the Bann, with sand dune systems and sea walls separating the main bathing waters from the river. The adjacent beach shorelines and their bathing waters may be affected by the river water from the Bann, depending on wind and tidal conditions affecting mixing and flow.

Observations of blue-green algae scum were first confirmed in early July at locations along the lower Bann, including Barmouth. The first observations of blue-green algae scum on the beach shorelines, in very small amounts, were noted on Castlerock and Portstewart Strand on 5th July 2023, with further small amounts confirmed on the westward adjoining beach of Downhill on 9th July. Reactive water sampling was initiated, with Table 6 presenting the cell count results for these bathing waters. Samples were also collected within the River Bann and Seaton's Marina (which is 5.7 km from the coast on the river Bann), to assist in identifying flow/risk of blue-green algae from Lough Neagh to the north coast. As the bloom in Lough Neagh progressed into September, and cyanotoxin analysis options became available, cyanotoxin concentrations were assessed from water samples at coastal locations to support provision of advice at bathing waters, with results provided in Table 7.

The results of the water samples showed that only Seaton's Marina (which is not an identified or candidate bathing water itself) exceeded the WHO guidelines for cell counts (on two occasions – 28th July and 21st September) and cyanotoxins (on one occasion –

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10th October). In addition, Portrush Harbour exceeded the guideline value for microcystin twice, on 21st September and 9th October. Although this site is not an identified bathing water, the location includes a recreation zone (for swimmers) and due to the level of public interest, monitoring continued following visual observation of blue-green algae. Results for all the identified bathing waters at Portstewart Strand, Castlerock, Downhill and Benone have been well below WHO guideline values.

Table 6. **Cyanobacteria cell count results** from coastal and riverine water samples, by site.

*cells lysing/breaking down and shrinking. Due to analyst availability, semi-quantitative results were sometimes presented (e.g. 'very high numbers', 'moderate numbers'), but expert judgement applied regarding whether above or below the 20,000 cells/ml WHO guideline value.

WHO guideline value (2003)	20,000 cells/ml	
Site	Date	Microcystis cell count/ml
River Bann	09/07/2023	18,823
Seaton's Marina, nr Coleraine	28/07/2023	"very high numbers"
Seaton's Marina, nr Coleraine	31/07/2023	56
Seaton's Marina, nr Coleraine	21/09/2023	43,719
Seaton's Marina, nr Coleraine	10/10/2023	<20,000*
Seaton's Marina, nr Coleraine	19/10/2023	<20,000*
Seaton's Marina, nr Coleraine	25/10/2023	<20,000*
Seaton's Marina, nr Coleraine	30/10/2023	<20,000*
Seaton's Marina, nr Coleraine	06/11/2023	<20,000*
Portstewart Strand	09/07/2023	0
Portstewart Strand	18/08/2023	4
Portstewart Strand	20/09/2023	50
Portstewart Strand	23/09/2023	200
Portstewart Strand	10/10/2023	<20,000*
Portstewart Strand	12/10/2023	<20,000*
Portstewart Strand	19/10/2023	<20,000*
Portstewart Strand	25/10/2023	<20,000*
Portstewart Strand	30/10/2023	<20,000*
Portstewart Strand	06/11/2023	<20,000*
Portstewart Harbour	28/07/2023	"moderate amount"
Portstewart Harbour	31/07/2023	15,795
Portstewart Harbour	21/09/2023	145
Portstewart Harbour	12/10/2023	<20,000*
Portrush Harbour	28/07/2023	"low numbers"
Portrush Harbour	28/07/2023	"moderate amount"
Portrush Harbour	31/07/2023	5,268
Portrush Harbour	31/07/2023	7,875
Portrush Harbour	15/08/2023	Present

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Portrush Harbour	09/10/2023	<20,000*
Portrush Harbour	25/10/2023	<20,000*
Portrush Harbour	25/10/2023	<20,000*
Portrush Harbour	30/10/2023	<20,000*
Portrush Harbour	06/11/2023	<20,000*
Portrush 'little harbour'	06/11/2023	<20,000*
Castlerock	05/07/2023	Present
Castlerock	09/07/2023	Present
Castlerock	16/08/2023	9,325
Castlerock	18/08/2023	56
Castlerock	19/09/2023	1250
Castlerock	10/10/2023	<20,000*
Castlerock	19/10/2023	<20,000*
Castlerock	25/10/2023	<20,000*
Castlerock	30/10/2023	<20,000*
Castlerock	06/11/2023	<20,000*
Downhill	09/07/2023	present, very low numbers
Downhill	18/08/2023	214
Downhill	07/09/2023	present, very low numbers
Downhill	20/09/2023	present, very low numbers
Benone	07/09/2023	Absent
Benone	11/09/2023	Absent
Benone	12/09/2023	Absent

Table 7. **Cyanotoxin results** from coastal and riverine water samples, where “<LOR” is below the limit of reporting (which is 1 µg/L).

WHO 2021 guideline value for Microcystin-LR: 24 µg/L				
Date	Site	Intracellular microcystin (µg/L)	Extracellular microcystin (µg/L)	Total microcystin (µg/L)
07/09/2023	Benone	<LOR	<LOR	<LOR
07/09/2023	Castlerock	<LOR	<LOR	<LOR
07/09/2023	Castlerock repeat	<LOR	<LOR	<LOR
07/09/2023	Downhill	<LOR	<LOR	<LOR
07/09/2023	Portstewart Strand	<LOR	<LOR	<LOR
07/09/2023	Portstewart Strand Post 4	<LOR	<LOR	<LOR
07/09/2023	Portstewart Strand Post 6	<LOR	<LOR	<LOR
07/09/2023	Seaton's Marina	<LOR	0.7	0.7
20/09/2023	Castlerock	<LOR	<LOR	<LOR
20/09/2023	Downhill	<LOR	<LOR	<LOR
20/09/2023	Portstewart Strand	<LOR	<LOR	<LOR
21/09/2023	Portrush Harbour	53.4	1.3	54.7
21/09/2023	Portstewart Harbour	<LOR	<LOR	<LOR
21/09/2023	Seaton's Marina	<LOR	<LOR	<LOR

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23/09/2023	Portstewart Strand	<LOR	<LOR	<LOR
27/09/2023	Downhill	<LOR	<LOR	<LOR
27/09/2023	Seaton's Marina	<LOR	<LOR	<LOR
28/09/2023	Castlerock	<LOR	<LOR	<LOR
01/10/2023	Portrush Harbour	<LOR	<LOR	<LOR
01/10/2023	Portstewart Strand	<LOR	<LOR	<LOR
09/10/2023	Portrush Harbour	59.88	23.25	83.13
10/10/2023	Castlerock	<LOR	<LOR	<LOR
10/10/2023	Portstewart Strand	<LOR	<LOR	<LOR
10/10/2023	Seaton's Marina	64.89	<LOR	64.89
12/10/2023	Portstewart Harbour	<LOR	<LOR	<LOR
19/10/2023	Castlerock	<LOR	<LOR	<LOR
19/10/2023	Portstewart Strand	<LOR	<LOR	<LOR
19/10/2023	Seaton's Marina	<LOR	<LOR	<LOR
25/10/2023	Castlerock	<LOR	<LOR	<LOR
25/10/2023	Portrush Harbour	<LOR	<LOR	<LOR
25/10/2023	Portrush 'little harbour'	<LOR	<LOR	<LOR
25/10/2023	Portstewart Strand	<LOR	<LOR	<LOR
25/10/2023	Seaton's Marina	<LOR	<LOR	<LOR
30/10/2023	Castlerock	<LOR	<LOR	<LOR
30/10/2023	Portrush Main Harbour	<LOR	<LOR	<LOR
30/10/2023	Portstewart Strand	<LOR	<LOR	<LOR
30/10/2023	Seaton's Marina	<LOR	<LOR	<LOR
06/11/2023	Castlerock	<LOR	<LOR	<LOR
06/11/2023	Portrush Main Harbour	<LOR	<LOR	<LOR
06/11/2023	P Portrush 'little harbour'	<LOR	<LOR	<LOR
06/11/2023	Portstewart Strand	<LOR	<LOR	<LOR
06/11/2023	Seaton's Marina	<LOR	<LOR	<LOR

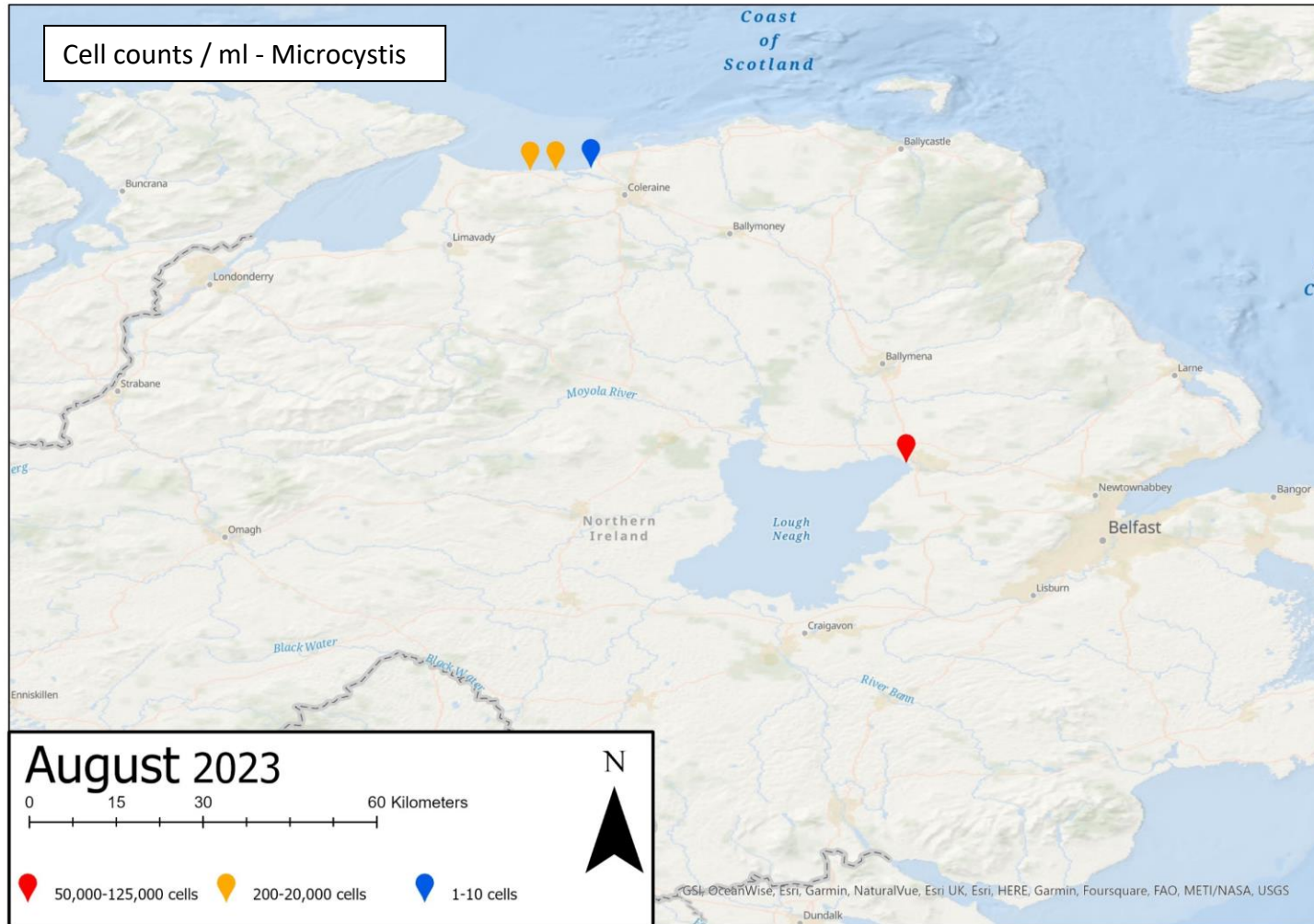
The results from cell counting and cyanotoxin analysis of water samples are presented spatially by month on the maps in Annex A. For context, supporting photographs of the visual presence of blue-green algae at sites which were then sampled are provided in Annex B.

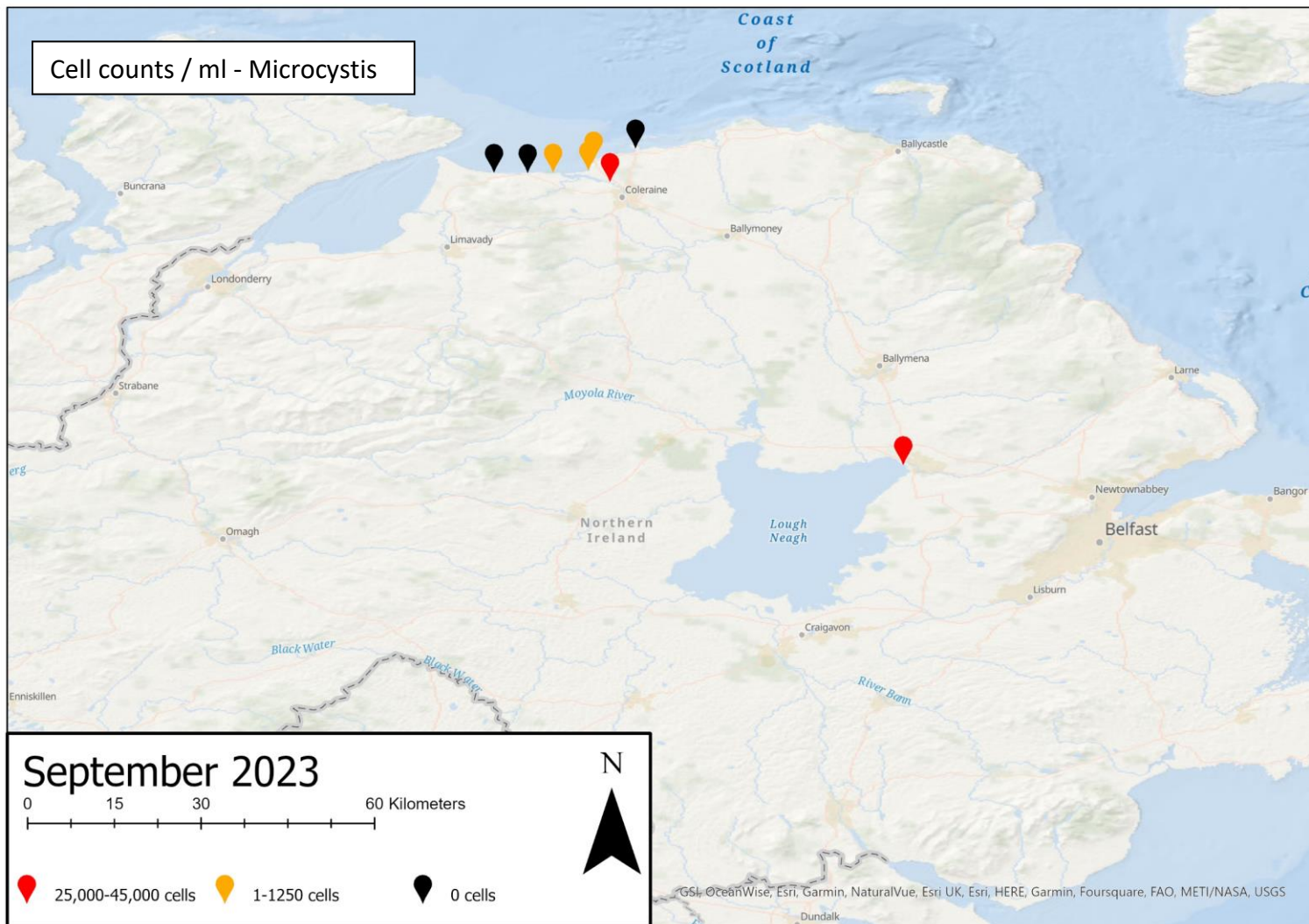
Next Steps

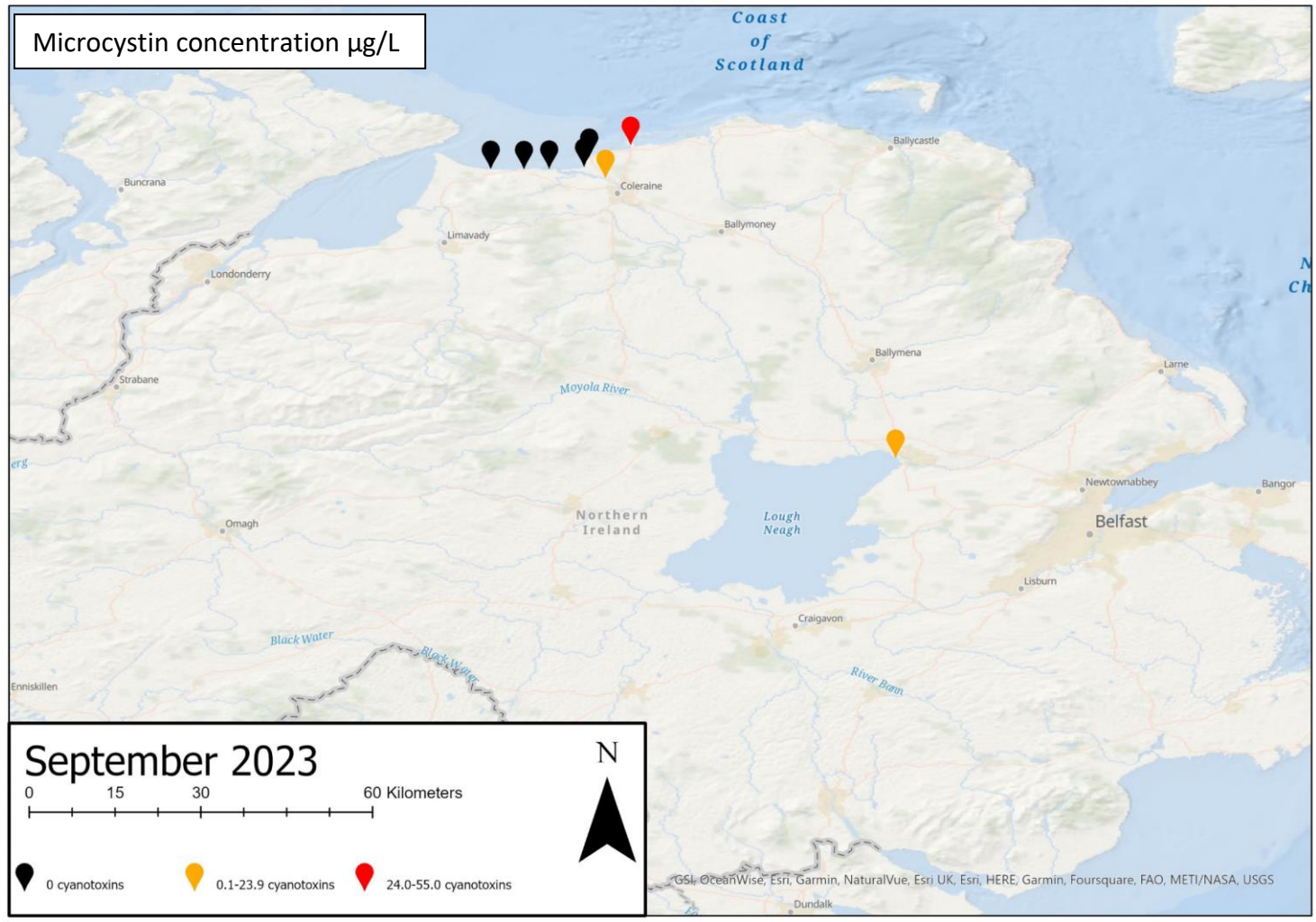
As this phase of monitoring, which has been linked to the 2023 bathing season, closes, the Department is scoping out an additional monitoring programme to consider the winter dormancy and early spring period for blue-green algae and associated cyanotoxins. The objectives of this study are to understand the die-back phase of a blue-green algae bloom and any related baseline cyanotoxin levels, and to better understand the ecology surrounding blue-green algae and wider fate of cyanotoxins. This study will also assist in developing a bathing waters-related risk profile for future years.

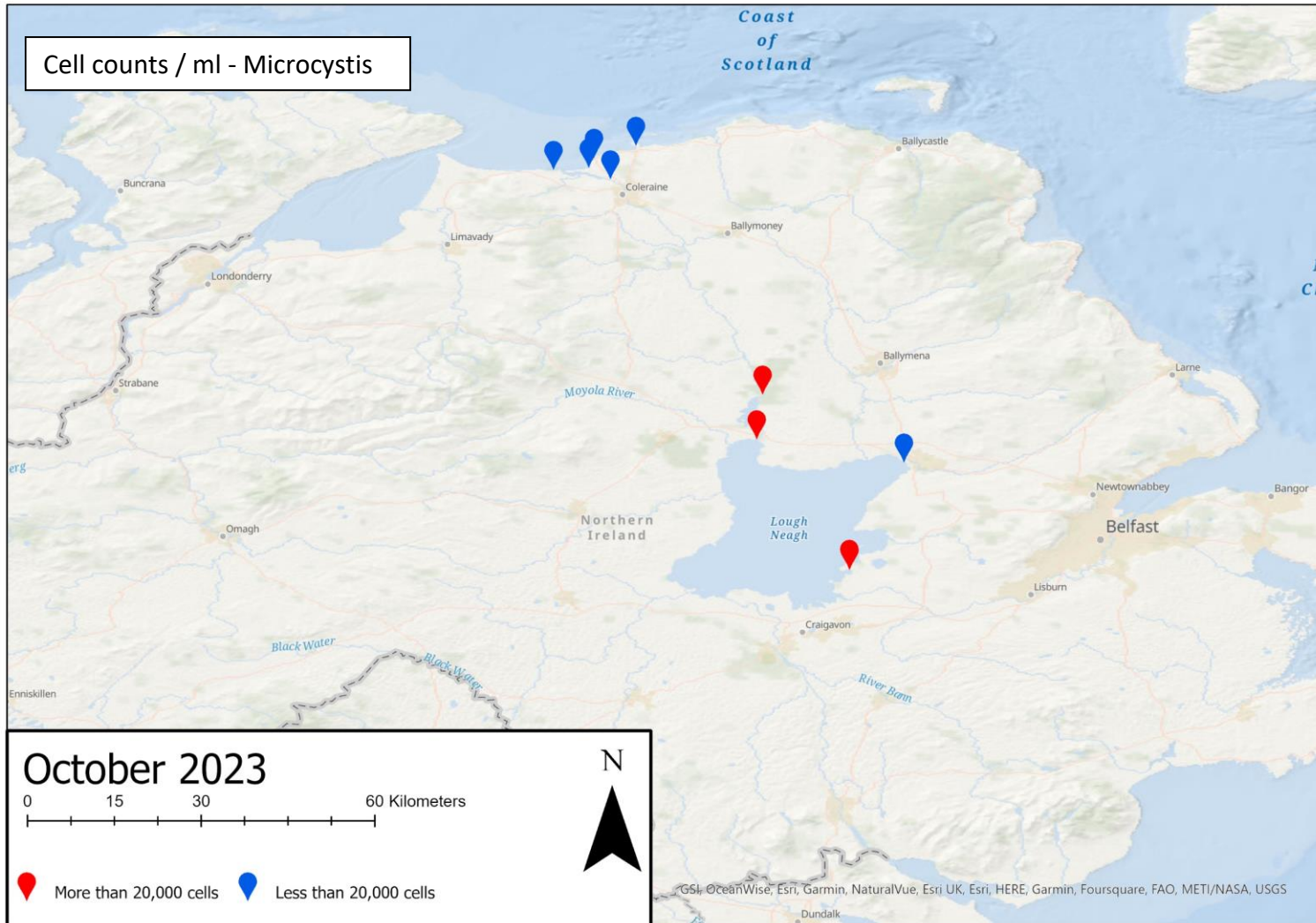
Blue-green algae sampling is undertaken in an ongoing capacity as part of the Water Framework Regulations monitoring suite for freshwater, with counts forming part of the phytoplankton monitoring used within the lakes classification tool. Additional sampling for blue-green algae is undertaken by AFBI on behalf of NIEA as part of the Long Term Ecological Research programme, which monitors Lough Neagh for nutrients and phytoplankton in Lough Neagh fortnightly, weather permitting.

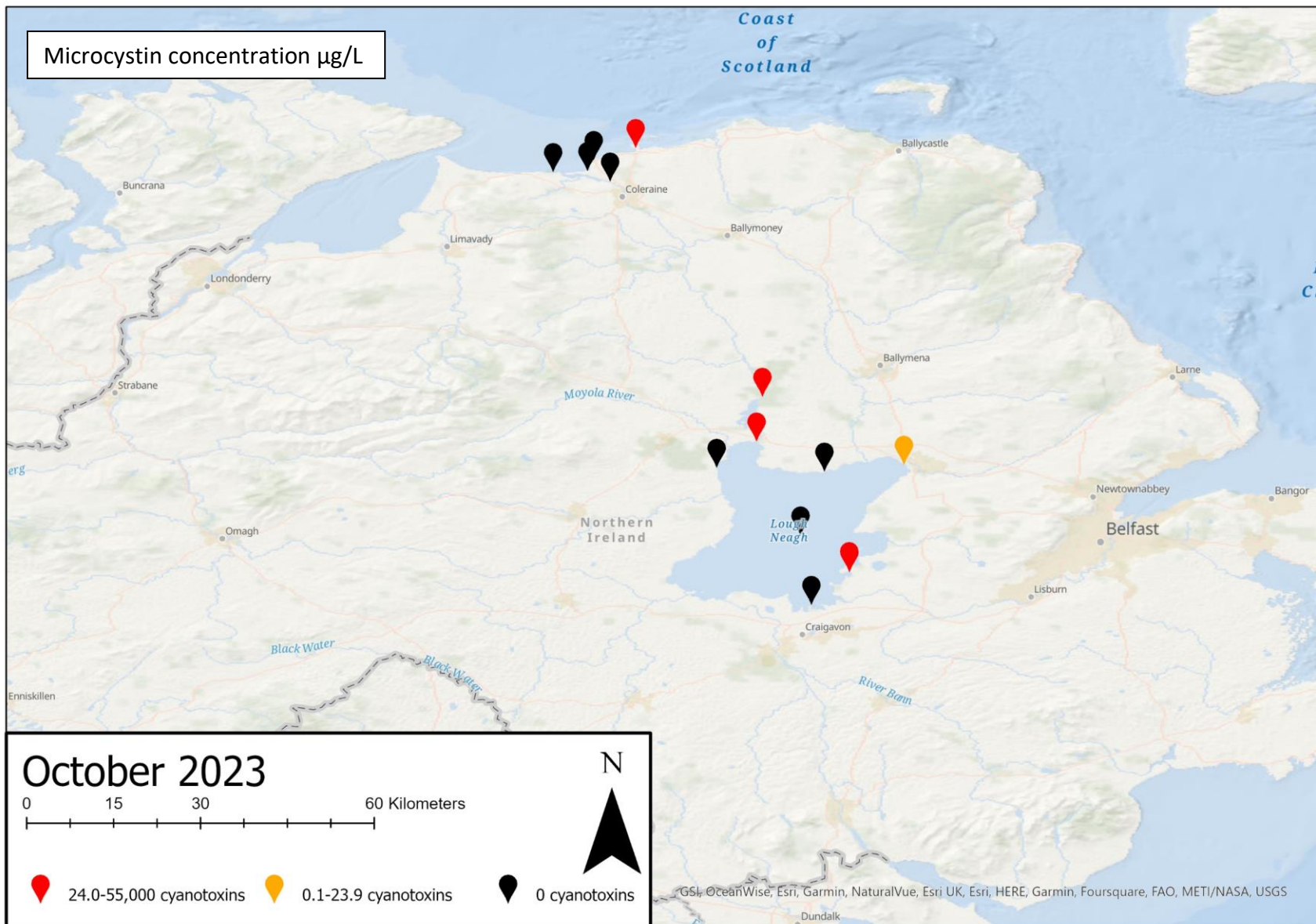
Annex A – Maps of blue-green algae results





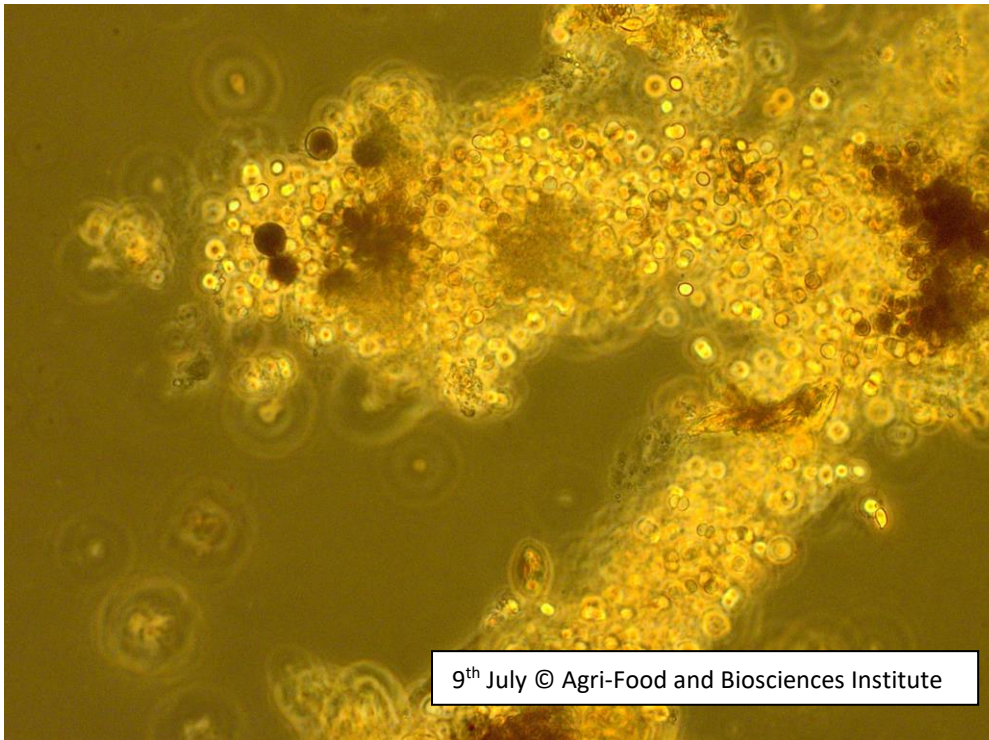






Annex B – Example pictures of blue-green algae near or at bathing waters in 2023

Microscopic image of *Microcystis sp.* from water sample taken in the lower river Bann



Rea's Wood



Seaton's Marina





10th October



10th October

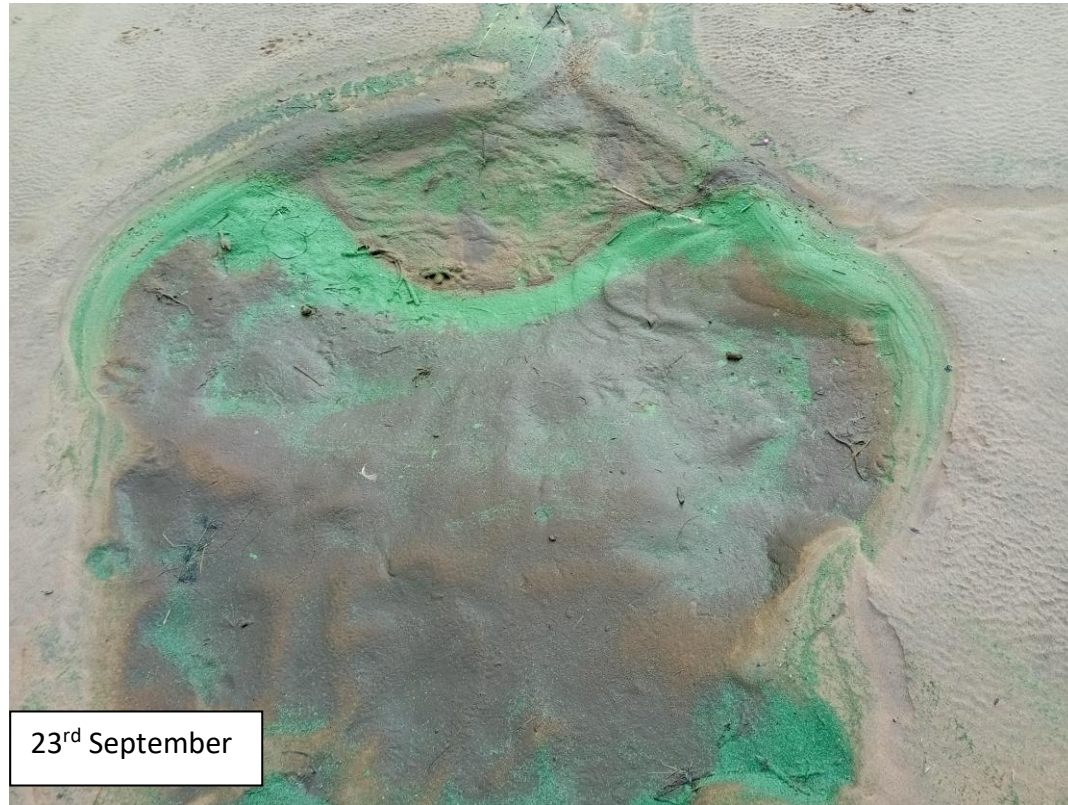
Barmouth



Castlerock Beach



Portstewart Strand



Portrush Harbour

