



WATERSIDE ECOLOGY

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Viking Energy Wind Farm

Water Quality Monitoring Plan

Hydrochemical Quarterly report 20

Period covered: watercourses 17th February to 11th May 2025, lochs 3rd February to 26th April 2025

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| Status | Final | | |
| Issue date | 17/07/2025 | | |

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VIKING ENERGY WIND FARM:

QUARTERLY HYDROCHEMICAL MONITORING REPORT FOR MARCH TO MAY 2025

1. EXECUTIVE SUMMARY

Field observations and dip samples of water were collected from 22 routine watercourse sample locations on the 2nd, 8th, 9th and 30th of March, and on the 5th and 6th of April within the Viking Energy Wind Farm development. After consultation and agreement from the statutory consultees it was agreed that the number of routine sample locations could be reduced to 14 locations, and these were sampled on the 10th and 11th of May 2025. Additional *ad hoc* samples were taken from the following watercourses in each of the 3 months covered by this report:

- from a small watercourse (site TWE1) that drains eastwards from borrowpit KBP02 and turbine bass K51 into the Burn of Weisdale, just upstream of sample location WE4
- from the Burn of Weisdale (WE5) upstream of the confluence of the un-named watercourse (TWE) and the Burn of Weisdale
- from the Burn of Lunklet at LU2
- from the Red Burn at sample location RB2 in all 3 months

Field observations and dip samples of water were collected from 16 routine sample locations from 7 lochs within the Viking Energy Wind Farm development on the 26th and 27th of April 2025. Control samples were collected from 3 watercourses on the 2nd and 30th of March, 5th of April and the 11th of May, and from 3 lochs outside the development on the 26th and 27th of April.

The results of the analysis of 29 physico-chemical determinands showed that, for the vast majority of the parameters measured in the samples, values were within the range observed during the baseline monitoring period.

Trigger threshold values for watercourses are given in Tables 5 and 6 and those for lochs in Tables 7 and 8. It should be noted that many of the threshold values equate to baseline maxima, not to formal environmental standards (ES). Exceedances based on deviation from baseline do not necessarily indicate potentially damaging conditions. Exceedances of the 'good' ES values are highlighted in bold font.

1.1.1 Watercourses

- The baseline trigger threshold for TON concentration (200 µg N/L) was exceeded in the March sample taken from the Burn of Sandgarth, a control watercourse, by 31 µg N/L.
- The watercourse specific baseline trigger threshold of 6 mg/L for dissolved calcium was exceeded in the May samples taken from the Burn of Burrafirth at BF1 and the Burn of Lambawater (LM1) by 1.58 and 0.15 mg/L, respectively.
- The watercourse specific baseline trigger threshold of 10 mg/L for dissolved calcium was exceeded in the following samples:
 - a. the Burn of Flamister in April and May by 1.68 and 1.91 mg/L, respectively
 - b. the Burn of Lunklet at LU1 in April and May by 3.71 and 3.67 mg/L and at LU2 by 3.97 and 2.49 mg/L, respectively.
- **The 'good' ES standard for maximum allowable dissolved nickel concentration (34 µg/L) was exceeded in the samples taken from the Red Burn at RB2 in March and April by 15.1 and 7.0 µg/L, respectively.**

- The baseline trigger threshold of 15 µg/L for dissolved zinc was exceeded in the following samples:
 - a. The Burn of Lunklet at LU1 in March and April by 16.0 and 14.8 µg/L, respectively.
 - b. The Burn of Lunklet at LU2 in March and April by 18.6 and 22.4 µg/L, respectively.
 - c. The Red Burn at RB2 in March, April and May by 60.2, 52.6 and 0.5 µg/L, respectively.
 - d. The un-named tributary of the Burn of Weisdale at TWE1 in March by 1.9 µg/L.

None of the other watercourse samples exceeded the trigger threshold values for any of the other determinands in this round of sampling.

1.1.2 *Lochs*

- The loch specific baseline trigger threshold of 4.0 mg/L for dissolved calcium was exceeded in samples TR1L and TR2L taken from Truggles Water and sample GO2L taken from Gossa Water by 0.36, 0.10 and 0.27 mg/L, respectively.
- The loch specific baseline trigger threshold of 2.5 mg/L for dissolved calcium was exceeded in samples LB1L and LB2L from Lamba Water, and samples MAA1L and MAA2L taken from Maa Water by 2.30, 2.04, 1.27 and 1.37 mg/L, respectively.
- **The 'good' ES standard for maximum allowable dissolved cadmium concentration (0.45 µg/L) was exceeded by 0.03 µg/L in sample LB2L from Lamba Water and sample TR1L from Truggles Water.**

None of the other loch samples exceeded the trigger threshold values for any of the other determinands in this round of sampling.

2. BACKGROUND

As part of the Viking Energy Wind Farm development by SSE on Mainland Shetland, Scotland, a series of fishery and water quality monitoring programmes have been put in place. The identified sensitive ecological receptors within the drainage system are the fish and aquatic invertebrates in the watercourses and epilithic diatoms in the lochs which are reported on separately. The suite of physico-chemical variables or determinands that are monitored are those that could potentially be affected by the proposed development and that may have direct or indirect impacts on the sensitive ecological receptors within the rivers, streams and lochs within the development area of the Viking Energy Wind Farm. The suite of determinands and sampling locations were agreed by SEPA and other consultees on 4th February 2019, as part of the Water Quality Monitoring Plan (WQMP) (Viking Energy Wind Farm 2019).

The construction phase of the Viking Energy Wind Farm for the Kergord access route and converter station was started in June 2020. Consequently, the Water Quality Monitoring Plan (WQMP) was implemented for this part of the development during that month. When construction was started in August 2020 across the whole of the Viking Energy Wind Farm, the Water Quality Monitoring Plan (WQMP) was initiated for the remaining parts of the development area. This report describes the results of the monitoring of the determinands specified in the WQMP for the period 17th of February to 11th of May 2025 for the watercourses, and the 3rd of February to 27th of April 2025 for the lochs.

3. METHODS

3.1 Site Description

A full description of the Viking Energy Wind Farm development site including baseline conditions for sensitive ecological receptors and physico-chemical variables are given in the Water Quality Monitoring Plan (Viking Energy Wind Farm 2019).

3.2 Sampling

3.2.1 Routine sampling

The locations and the grid references where water samples were taken are given in the WQMP and a full description is given in the Baseline Hydrochemical Report (Headley 2020 and 2021). One litre whole water samples were taken from all of the routine watercourse sample locations within the development area and the three control sample locations as specified in the WQMP on the 2nd, 8th, 9th and 30th of March; 5th and 6th of April; and 10th and 11th of May 2025. Due to some samples being taken late in March after those taken on the 2nd and 8th of March additional samples were taken from two of the control watercourses, the Burn of Sandgarth and the Burn of Laxobigging, on the 30th of March.

After consultation with SEPA, Shetland Island Council agreed on the 6th of May 2025 that the number of watercourse sample locations and determinands could be reduced during the post construction monitoring period, as was requested in a letter on the 24th of September 2024. Consequently the following sample locations were not sampled on the 10th and 11th of May 2025:

- EF1, GI1, GO1, GR1, KI1, LA1, PW1, PW2 and SA1, the latter being a control watercourse

One litre whole water samples were taken from the 16 other routine watercourse sample locations and the 4 additional *ad hoc* sample locations within the development area as specified in the WQMP on the 11th of May 2025.

Similar 1 litre samples were collected from the lochs on the 27th of April 2025. When these routine watercourse and loch samples were collected field measurements were taken of the parameters specified in the WQMP. The acidity (pH), electrical conductivity (EC) and temperature were measured using a Hanna HI98194 multiparameter meter and HI7698194 probe. Due to difficulties in successfully calibrating the DO probes for the field meters, the field measurements of dissolved oxygen concentrations were stopped after the sampling in March. The turbidity of the water in the lochs and watercourses was measured with Hanna HI93703 portable microprocessor turbidity meter.

The 1 litre whole water samples (dip samples) were taken by immersing a one litre polypropylene bottle in the watercourse and filling to the rim after rinsing three times with water from the watercourse to be sampled. At the time dip samples were collected various observations were made:

- Flow (height/water-level at Weisdale Mill)
- Signs of suspended solids
- Signs of any oils
- Smell
- Colour

3.2.2 *Additional sampling*

Additional samples were collected from the following locations:

- LU2 on the Burn of Lunklet at grid reference HU 3769,5731
- RB2 on the Red Burn at grid reference HU 3809,5731
- WE5 on the Burn of Weisdale at grid reference HU 4047,5860
- TWE1 on the un-named watercourse that drains into the Burn of Weisdale at grid reference HU 4032,5795

These samples were analysed for the full suite of determinands except for SRP, TP, total calcium and aluminium in samples WE5 and TWE1.

3.3 **Laboratory Analyses**

The following physico-chemical variables or determinands were measured at the Environmental Research Institute (ERI) at the North Highland College of the University of the Highlands and Islands at Thurso for all the routine monthly samples.

- acidity (pH)
- electrical conductivity (EC)
- alkalinity by Gran titration
- dissolved organic carbon (DOC)
- total suspended solids (TSS)
- turbidity
- total ammoniacal-nitrogen (TAN)
- total oxidised inorganic nitrogen (TON)
- soluble reactive orthophosphate (SRP)
- total phosphorus (TP)
- dissolved sodium (Na)
- dissolved iron (Fe)
- dissolved manganese (Mn)
- dissolved and total calcium (Ca)
- dissolved and total aluminium (Al)
- dissolved zinc (Zn)

- dissolved arsenic (As)
- dissolved cadmium (Cd)
- dissolved chromium (Cr)
- dissolved copper (Cu)
- dissolved nickel (Ni)
- dissolved lead (Pb)

The analysis of total concentrations of arsenic, cadmium, chromium, copper, nickel, lead and zinc was stopped in January 2021, and these elements were analysed instead for dissolved concentrations so that bioavailable concentrations could be calculated. The analysis of dissolved potassium and magnesium was also stopped in January 2021. In association with the reduction in the number of watercourse sample locations analysis on the 6th of May 2025, it was agreed the following determinands could be stopped for all water samples:

- turbidity, SRP, TP, dissolved sodium and dissolved chromium

It was also agreed that the analysis of samples on the east side of Pettadale (CR1, FL1, LB1, QU1, SA1 and WF1) for the following determinands could be ceased:

- total aluminium, and dissolved arsenic, cadmium, copper, nickel, lead and zinc.

The pH, electrical conductivity, TSS, alkalinity and turbidity were measured on the whole water samples within one or two days of delivery to the laboratory. The whole water samples were filtered prior to analysis for DOC and those specified for dissolved concentrations. The methods used for carrying out the determinations are given in Headley (2020). Filtration and acidification of samples was carried out by ERI at the laboratory upon sample delivery.

3.4 Data analysis and Assessment

The results of the analyses of the water samples were evaluated against the baseline data and the revised trigger thresholds as presented in Headley (2020 and 2021). The concentrations of bioavailable manganese, copper, nickel, zinc and lead were calculated using the metal bioavailability assessment (m-BAT) tools¹.

3.1 Data presentation

In the tables, values outside the baseline range of values are highlighted as follows: yellow cells indicative the value is above the maximum recorded during the extended baseline monitoring period, while blue cells show the value is below the minimum recorded during the extended baseline monitoring period. Numbers in bold and red exceed the trigger threshold value for that determinand.

4. POLLUTION INCIDENTS AND POTENTIAL IMPACTS OF CONSTRUCTION WORKS

There were no reports of any pollution incidents that occurred over the period covered by this report.

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<https://www.wfduk.org/sites/default/files/Media/Environmental%20standards/MBAT%20UKTAG%20Method%20Statement.pdf>

5. FIELD SAMPLING AND OBSERVATIONS

5.1 Results and observations

5.1.1 Watercourses

The rainfall at Weisdale Mill for March, April and May 2025 was 141.8, 34.8 and 61.8 mm, respectively. March 2025 on Mainland Shetland was wet with 54.4 mm of rain being recorded above the long-term average rainfall 87.4 mm. In contrast April was a dry month with the rainfall at Weisdale Mill being 29.8 mm below the long-term average. Rainfall in May was close to the long-term average with it being only 4.8 mm above the long-term average for May.

The level of the Burn of Weisdale at Weisdale Mill taken from the SEPA gauge was at the higher end of the normal range when sampling was carried out in March with levels of between 0.41 to 0.59 metres recorded (Table 1). The water levels on the 5th and 6th of April were generally lower, at low to moderate as assessed by the samplers and 0.37 or 0.38 metres at Weisdale Mill. The level in the Burn of Weisdale was lower still at 0.34 metres on the 10th and 11th of May with the vast majority of watercourses being assessed as being low when they were sampled.

The temperature of the water in the watercourses ranged from 1.9 to 8.5 °C when they were sampled in March to between 3.2 and 11.5 °C in April, and between 11.7 and 19.7 °C in May (Table 1). Two of the routine sample locations (MA1 and WE3) had temperatures below their respective extended baseline minimum values in March, whilst 8 sample locations (BF1, BF2, LB1, LM1, LU1, MA1, QU1 and WE1) had temperatures above their respective extended baseline maximum values in May (Table 1).

The field pH values ranged from 5.6 to 8.0 across the 80 measurements that were taken this reporting period (Table 1). Two of the 80 field measurements of pH were above their extended baseline maximum values, the Burn of Weisdale at WE4 on the 9th of March and the Burn of Burrafirth at BF2 on the 11th of May. The Burn of Droswall on the 6th of May had a pH below its extended baseline minimum value (Table 1).

The EC values ranged from 103 to 425 µS/cm across all 80 field measurements (Table 1). Six of the EC values were above their respective extended baseline maximum values, and these were at DR1 (10th of May), LB1 (2nd of March), LU1 (8th of March, 5th of April and 11th of May) and WE1 (10th of May).

The relative dissolved oxygen levels (DO) at the 12 sample locations where measurements were taken were between 94 and 100% saturation on the 2nd of March (Table 1). All of these values were within their respective extended baseline ranges (Table 1).

Field turbidity values ranged from 0 to 14.49 FTUs across all 80 measurements that were taken (Table 1). One sample location (WE1) in March and two in May (BF1 and LU1) had turbidity values above their respective extended baseline maximum values (Table 1).

5.1.2 Lochs

The temperature in the lochs when the samples were taken ranged from 9.0 to 16.2 °C (Table 3). All of the lochs had temperatures within their respective extended baseline range of values (Table 3).

The pH of the lochs ranged from 5.8 to 7.7, with the highest pH values recorded at SA4 in Sand Water (Table 3). The pH at both sample locations in Loch of Benston were below its baseline minimum value, whilst the pH at sample location LB2L in Lamba Water and sample location MAA1L in Maa Water were above their respective baseline minimum values.

The electrical conductivity (EC) values ranged from 104 to 270 µS/cm (Table 3). All of the EC values were within their extended baseline range of values (Table 3).

The field turbidity values ranged from 0 FTUs in three lochs (Lamba Water, Maa Water and Sand Water) to 7.76 FTUs at sample location SA4L in Sand Water (Table 3). The turbidity at both sample locations in Lamba Water, Maa Water and Truggles Water and single sample locations in Petta Water and Gossa Water and two of the four sample locations in Sand Water were below their respective extended baseline minimum values for these lochs (Table 3). The turbidity at sample location SA4L in Sand Water had a turbidity value above the extended baseline maximum value for this loch.

5.2 Exceedances of Field Trigger Threshold Values

None of the field measurements in the watercourses or the lochs exceeded the relevant trigger threshold values.

6. LABORATORY RESULTS

6.1 pH, alkalinity and acid neutralising capacity (ANC)

6.1.1 Watercourses

The laboratory determinations of pH ranged from 5.0 in the Red Burn at RB2 in the March sample to 8.2 in the May sample collected from the Burn of Weisdale at WE2 (Table 2). The pH in the April and May samples from the Burn of Quoys and the May sample collected from the Burn of Weisdale at WE2 had pH values above their respective extended baseline maximum values.

The alkalinities of the samples ranged from below the limit of detection (0.1 mg CaCO₃/L) in the March sample taken from the Red Burn at RB2 to 80.5 mg CaCO₃/L in the May sample taken from the Wester Filla Burn (Table 2). One of the April routine samples (FL1) and five of the May samples (BF2, CR1, DR1, FL1 and QU1) had alkalinities above their respective extended baseline maximum values.

The ANC concentrations ranged from 8 µequivalents/L in the March sample from the Red Burn at RB2 to 1.636 mequivalents/L in the May sample taken from the Wester Filla Burn (Table 2). The April routine sample taken from the Burn of Flamister (FL1) and four of the May samples (BF2, CR1, DR1 and FL1) had ANC values above their respective extended baseline maximum values (Table 2).

6.1.2 Lochs

The pH in the loch samples ranged from 5.6 to 7.7 (Table 4). The only sample with a pH above its extended baseline maximum value was sample SA2L taken from Sand Water (Table 4).

The alkalinity values ranged from 1.2 mg CaCO₃/L in both samples from Lamba Water to 53.7 mg CaCO₃/L in sample BE1L from Loch of Benston (Table 3). Both samples from Smerla Water, a control loch, and one sample from Gossa Water (GO2L) had alkalinities that were above their respective extended baseline maximum values (Table 4).

The ANC values in all the loch samples were between 49 µequivalents/L in sample LB2L from Lamba Water to 1.1 mequivalents/L in sample BE1L from Loch of Benston (Table 4). One sample from Smerla Water (SM1L) and one from Gossa Water (GO2L) had ANC values that were above their respective extended baseline maximum values (Table 4).

6.2 Total suspended solids (TSS), turbidity, DOC and aluminium

6.2.1 Watercourses

The concentrations of TSS ranged from below the limit of detection (0.1 mg/L) in the April sample from the Easter Filla Burn to 142.0 mg/L in the sample taken from the Wester Filla Burn in April (Table 2). Two of the March routine samples, 12 of the April samples and 4 of the May samples had TSS concentrations below their respective extended baseline minimum values (Table 2). Only one sample, the Wester Filla Burn sample taken in April had a TSS concentration above its extended baseline maximum value (Table 2).

The laboratory determinations of turbidity ranged from 0.9 to 46.4 NTUs with the highest turbidity in the April sample taken from the Wester Filla Burn (Table 2). Only this latter sample had a turbidity above its extended baseline maximum value (Table 2).

DOC concentrations ranged from 1.8 mg/L in sample RB2 taken from the Red Burn in March to 17.2 mg/L in the April sample taken from the Burn of Grunnafirth (Table 2). The April sample taken from the Burn of Drowall was the only routine sample where the DOC concentration was below its extended baseline minimum value (Table 2).

The concentrations of dissolved aluminium ranged from 42.5 µg/L in the May sample taken from the Seggie Burn, a control watercourse, to 356.6 µg/L in the April sample taken from the Red Burn at RB2 (Table 2). All of the routine samples had dissolved aluminium concentrations within their respective extended baseline range of values (Table 2).

Total aluminium concentrations ranged from 57.1 µg/L in the April sample taken from the Easter Filla Burn to 982.0 µg/L in the sample taken from the Red Burn at RB2 in March (Table 2). The March and April samples from the Burn of Lunklet at LU1 and the April sample from the Wester Filla Burn had total aluminium concentrations above their respective extended baseline maximum values (Table 2).

6.2.2 Lochs

The TSS concentrations ranged from 0.5 mg/L in sample MAA2L from Maa Water to 28.0 mg/L in sample SA4L from Sand Water (Table 4). One sample from Petta Water (PE1L) and one from Sand Water (SA4L) had TSS concentrations above their respective loch extended baseline maximum values, whilst both samples from Laxo Water, a control loch, had TSS concentrations below its extended baseline minimum value (Table 4).

The turbidity levels in the lochs ranged from 0.93 to 18.20 NTUs (Table 4). The turbidity at SA4L in Sand Water was above its extended baseline maximum value, whilst the turbidity at both sample locations in Laxo Water were below its extended baseline minimum value (Table 4).

DOC concentrations ranged from 5.3 to 12.1 mg/L across all 22 loch samples (Table 4). All of the samples taken from Lamba Water and Truggles Water had DOC concentrations below their respective extended baseline minimum values, whilst sample BE2L from Loch of Benston had a DOC concentration above its extended baseline maximum value (Table 4).

Dissolved aluminium concentrations ranged from 12.8 to 111.1 µg/L with the highest concentration in sample MAA2L from Maa Water (Table 4). Both samples from Maa Water had dissolved aluminium concentrations above this loch's extended baseline maximum value (Table 4). Total aluminium concentrations ranged from 16.8 to 255.0 µg/L with the highest concentration in sample SA4L from Sand Water (Table 4). Both samples from Loch of Skellister had total aluminium concentrations below this loch's extended baseline minimum value (Table 4).

6.3 Sodium, calcium and electrical conductivity (EC)

6.3.1 Watercourses

The concentrations of dissolved sodium ranged from 6.59 to 35.15 mg/L in the 60 samples analysed for this determinand (Table 2). Only one sample, the March sample taken from the Burn of Burrafirth at BF1, had a dissolved sodium concentration below its extended baseline minimum value (Table 2).

The concentrations of dissolved calcium ranged from 1.37 to 28.46 mg/L with the highest concentration in the May sample taken from the Wester Filla Burn (Table 2). One of the March samples (LU1), six of the April samples (DR1, FL1 LM1, LU1, WE1 and WE2) and ten of the May samples (BF1, BF2, CR1, DR1, FL1, LM1, LU1, QU1, WE1 and WE2) had dissolved calcium concentrations above their respective extended baseline maximum values (Table 2).

The total calcium concentrations ranged from 1.92 to 30.49 mg/L, with the May sample taken from the Wester Filla Burn in May having the highest total calcium concentration (Table 2). One of the March samples (LU1), four of the April samples (DR1, FL1 LM1 and LU1) and 12 of the May samples (BF1, BF2, CR1, DR1, FL1, LM1, LU1, MA1, QU1, WE1, WE2 and WF1) had total calcium concentrations above their respective extended baseline maximum values (Table 2).

EC values ranged from 106 to 330 $\mu\text{S}/\text{cm}$, with the highest EC value in the sample taken from the Burn of Sandgarth, a control watercourse, in April (Table 2). Both the April and May samples taken from the Burn of Lunklet at LU1 had EC values above their extended baseline maximum value, whilst the sample taken from the Burn of Pettawater at PW2 in March had an EC value below its extended baseline minimum value (Table 2).

6.3.2 Lochs

The concentrations of dissolved sodium ranged from 15.25 to 25.10 mg/L (Table 4). The dissolved sodium concentrations in all of the samples taken from Maa Water, Loch of Skellister and Loch of Benston were below their respective extended baseline minimum values (Table 4).

The concentrations of dissolved calcium ranged from 1.54 to 19.85 mg/L and the total calcium concentrations in the same loch samples were only very slightly higher at 1.68 to 20.97 mg/L (Table 4). All of the samples from Lamba Water, Maa Water and Truggles Water and sample GO2L had dissolved and total calcium concentrations above their respective extended baseline maximum values (Table 4). Sample SM2L from Smerla Water had only a dissolved calcium concentration above its extended baseline maximum value (Table 4).

Laboratory EC values ranged from 108 to 251 $\mu\text{S}/\text{cm}$ (Table 4). All of the samples from Loch of Skellister, Smerla Water and Laxo Water had EC values below their respective extended baseline minimum values (Table 4).

6.4 Nutrients (ammonium, oxidised nitrogen, orthophosphate and total phosphorus)

6.4.1 Watercourses

The concentrations of total ammoniacal-nitrogen (TAN) ranged from below the limits of detection (5 to 9 $\mu\text{g N/L}$) in 52 of the 72 samples analysed for this determinand to a maximum of 76 $\mu\text{g N/L}$ in the April sample taken from the Wester Filla Burn at WF1 (Table 2). One of the March routine samples (LU1), three of the April samples (LU1, WE3 and WF1) and one of the May samples (CR1) had TAN concentrations above their respective extended baseline maximum values (Table 2).

The concentrations of total oxidised inorganic nitrogen (TON), principally nitrate, ranged from below the limits of detection (3 to 11 $\mu\text{g N/L}$) in 22 samples to a maximum of 231 $\mu\text{g N/L}$ in the sample taken

from the Burn of Sandgarth in April (Table 2). Five of the March samples (BF1, EF1, LB1, LU1 and WE1) and four of the April samples (BF1, BF2, EF1 and SA1) had TON concentrations above their respective extended baseline maximum values (Table 2).

The concentrations of SRP were below the limits of detection (1.2 to 1.4 µg P/L) in 30 of the 60 samples analysed for this determinand, to a maximum of 6 µg P/L in the March sample taken from the Burn of Sandgarth (Table 2).

The concentrations of TP ranged from below the limits of detection (6 µg P/L) in 39 of the 60 samples analysed for this determinand to a maximum of 28 µg P/L in the April sample taken from the Wester Filla Burn (Table 2).

All of the routine samples had SRP and TP concentrations within their respective extended baseline range of values.

6.4.2 Lochs

The concentrations of total ammoniacal-nitrogen (TAN) ranged from below the limit of detection (3 µg N/L) in 18 samples to a maximum of 6 µg N/L in both samples Loch of Benston (Table 4).

TON concentrations ranged from below the limit of detection (5 µg N/L) in 7 samples to a maximum of 132 µg N/L in sample MAA2L taken from Maa Water (Table 4).

SRP concentrations were below the limits of detection (1.4 µg P/L) in all but 5 of the 22 loch samples (Table 4). The 5 samples with detectable SRP had concentrations of 2 or 3 µg P/L.

TP concentrations ranged from below the limit of detection (3 µg P/L) in 6 samples to a maximum concentration of 26 µg P/L in sample SA4L taken from Sand Water (Table 4).

All samples had TAN, TON, SRP and TP concentrations within their respective extended baseline range of values (Table 4).

6.5 Heavy Metals (iron, manganese, arsenic, cadmium, chromium, copper, lead, nickel and zinc)

6.5.1 Watercourses

The concentrations of dissolved iron ranged from 0.16 mg/L in sample BF1 taken from the Burn of Burrafirth in March to 3.53 mg/L in the sample taken from the Burn of Quoys in May (Table 2). The March, April and May samples taken from the Burn of Lambawater (LM1) and the March sample taken at BF1 from the Burn of Burrafirth had dissolved iron concentrations below their extended baseline minimum values (Table 2).

The concentrations of dissolved manganese ranged from 13.0 µg/L in the sample taken from the Burn of Pettawater at PW2 in March to 1.066 mg/L in the sample taken from the Red Burn at RB2 in April (Table 2). Two of the March samples (LM1 and LU1), three of the April samples (BF1, LM1 and LU1) and four of the May samples (BF1, LU1, QU1 and WF1) had dissolved manganese concentrations above their respective extended baseline maximum values (Table 2). The bioavailable manganese concentrations were in the range of 6.3 to 155.5 µg/L, with the highest concentration in the April sample taken from the Red Burn at RB2 (Table 2). Single samples taken in April (FL1) and May (LM1) had bioavailable manganese concentrations below their respective extended baseline minimum values (Table 2).

Dissolved arsenic concentrations ranged from below the limits of detection (2.3 to 12.8 µg/L) in 68 samples to a maximum of 9.3 µg/L in the sample taken in March from the Burn of Weisdale at WE4 (Table 2).

Dissolved cadmium concentrations ranged from below the limits of detection (0.49 to 0.99 µg/L) in all but one of the 74 samples analysed for this determinand (Table 2). The only sample with a detectable dissolved cadmium concentration was taken from the Burn of Marrofield in May and it had a concentration of 0.51 µg/L (Table 2).

The concentrations of dissolved chromium ranged from below the limits of detection (0.5 to 0.6 µg/L) in 52 of the 60 samples analysed for this determinand to a maximum of 0.9 µg/L in the sample taken from the Burn of Gossawater in March (Table 2).

The concentrations of dissolved copper ranged from below the limits of detection (0.7 to 0.8 µg/L) in 40 of the 74 samples analysed for this determinand to a maximum of 3.2 µg/L in the sample taken from the Red Burn at RB2 in March (Table 2). The concentrations of bioavailable copper ranged from less than 0.02 µg/L to a maximum of 1.38 µg/L in the sample taken from the Red Burn at RB2 in March (Table 2).

The concentrations of dissolved nickel ranged from below the limits of detection (0.2 to 1.9 µg/L) in 36 of the 74 samples analysed for this determinand to a maximum of 51.0 µg/L in the sample taken from the Red Burn at RB6 in April (Table 2). The concentrations of bioavailable nickel ranged from 0.1 µg/L to a maximum of 12.2 µg/L in the March sample taken from the Red Burn at RB2 (Table 2).

The concentrations of dissolved lead ranged from below the limits of detection (2.9 to 6.1 µg/L) in 64 of the 74 samples analysed for this determinand to a maximum of 9.0 µg/L in the sample taken from the Burn of Grunnafirth in April (Table 2). The concentrations of available lead ranged from less than 0.2 µg/L to a maximum of 1.4 µg/L in the April sample taken from the Red Burn at RB2 (Table 2).

The concentrations of dissolved zinc ranged from below the limit of detection (1.1 µg/L) in 4 samples to a maximum of 75.2 µg/L in the March sample taken from the Red Burn at RB2 (Table 2). Both the March and April samples taken from the Burn of Lunklet at LU1 had dissolved zinc concentrations that were above its extended baseline maximum value (Table 2). Bioavailable zinc concentrations ranged from less than 0.1 µg/L to 58.3 µg/L, with the highest concentration in the sample taken from the Red Burn at RB2 in March (Table 2).

6.5.2 *Lochs*

Dissolved iron concentrations ranged from 0.03 to 0.43 mg/L (Table 4). All of the samples from Lamba Water, Maa Water and Truggles Water, and one each from Petta Water (PE2L) and Laxo Water (LA2L) had dissolved iron concentrations below their respective extended baseline minimum values (Table 4).

Dissolved manganese concentrations ranged from 0.8 to 96.9 µg/L, with the highest concentration in sample SA4L from Sand Water (Table 4). A sample from Lamba Water (LA1L) and one from Sand Water (SA4L) had dissolved manganese concentrations above their respective extended baseline maximum values (Table 4). A single sample from each of Truggles Water (TR2L), Petta Water (PE2L) and Sand Water (SA3L) had dissolved manganese concentrations below their respective extended baseline minimum values (Table 4). Bioavailable manganese concentrations ranged from 0.3 to 23.8 µg/L (Table 4). Both samples from Truggles Water and one each from Petta Water (PE2L) and Sand Water (SA3L) had bioavailable manganese concentrations below their respective extended baseline minimum values (Table 4). A single sample from each of Water (SA4L) and Loch of Benston (BE1L) had bioavailable manganese concentrations above their respective extended baseline maximum values (Table 4).

The only loch sample with a dissolved arsenic concentration above the limit of detection (2.7 µg/L) was sample PE2L taken from Petta Water where the concentration was 4.1 µg/L (Table 4).

Three samples had dissolved cadmium concentrations above the limit of detection (0.35 µg/L) and those three had concentrations of 0.43 or 0.48 µg/L and were from Lamba Water, Maa Water and Truggles Water (Table 4).

All 22 of the loch samples had dissolved chromium concentrations below the detection limit of 0.9 µg/L (Table 4).

Seventeen of the 22 loch samples had dissolved copper concentration below the detection limit (2.0 µg/L), with the other 5 samples having dissolved copper concentrations ranging from 2.2 to 2.6 µg/L (Table 4). The concentrations of bioavailable copper ranged from 0.07 µg/L to a maximum of 0.34 µg/L in both samples from Lamba Water (Table 4).

Dissolved nickel concentrations ranged from below the limit of detection of 0.4 µg/L in 3 samples to a maximum of 5.6 µg/L in sample LB1L from Lamba Water (Table 4). Bioavailable nickel concentrations ranged from less than 0.1 µg/L to a maximum of 1.3 µg/L in sample LB1L from Lamba Water (Table 4).

Dissolved lead concentrations were below the limit of detection (3.3 µg/L) in all 22 of the loch samples (Table 4). The calculated available lead concentrations were all less than 0.7 µg/L (Table 4).

Dissolved zinc concentrations ranged from below the limit of detection (1.1 µg/L) in 5 samples to a maximum of 12.7 µg/L in sample LA1L from Lamba Water (Table 4). Bioavailable zinc concentrations ranged from less than 0.4 µg/L to a maximum of 7.4 µg/L, with the highest concentration being in sample LA1L from Lamba Water (Table 4).

6.6 Exceedances of Trigger Threshold Values

It should be noted that many of the threshold values equate to baseline maxima, not to formal environmental standards (ES) given in The Scotland River Basin District (Standards) Direction 2014 and amended in 2015. Exceedances based on deviation from baseline do not necessarily indicate potentially damaging conditions. Exceedances of the 'good' ES value are highlighted in bold. Trigger threshold values for watercourses and lochs are given in Tables 5, 6, 7 and 8. Individual samples are only compared to trigger thresholds or 'good' ES values for maximum allowable concentrations.

6.6.1 Watercourses

- The baseline trigger threshold for TON concentration (200 µg N/L) was exceeded in the March sample taken from the Burn of Sandgarth, a control watercourse, by 31 µg N/L.
- The watercourse specific baseline trigger threshold of 6 mg/L for dissolved calcium was exceeded in the May samples taken from the Burn of Burrafirth at BF1 and the Burn of Lambawater (LM1) by 1.58 and 0.15 mg/L, respectively.
- The watercourse specific baseline trigger threshold of 10 mg/L for dissolved calcium was exceeded in the following samples:
 - c. the Burn of Flamister in April and May by 1.68 and 1.91 mg/L, respectively
 - d. the Burn of Lunklet at LU1 in April and May by 3.71 and 3.67 mg/L and at LU2 by 3.97 and 2.49 mg/L, respectively.
- **The 'good' ES standard for maximum allowable dissolved nickel concentration (34 µg/L) was exceeded in the samples taken from the Red Burn at RB2 in March and April by 15.1 and 7.0 µg/L, respectively.**
- The baseline trigger threshold of 15 µg/L for dissolved zinc was exceeded in the following samples:

- e. The Burn of Lunklet at LU1 in March and April by 16.0 and 14.8 µg/L, respectively.
- f. The Burn of Lunklet at LU2 in March and April by 18.6 and 22.4 µg/L, respectively.
- g. The Red Burn at RB2 in March, April and May by 60.2, 52.6 and 0.5 µg/L, respectively.
- h. The un-named tributary of the Burn of Weisdale at TWE1 in March by 1.9 µg/L.

None of the other watercourse samples exceeded the trigger threshold values for any of the other determinands in this round of sampling.

6.6.2 Lochs

- The loch specific baseline trigger threshold of 4.0 mg/L for dissolved calcium was exceeded in samples TR1L and TR2L taken from Truggles Water and sample GO2L taken from Gossa Water by 0.36, 0.10 and 0.27 mg/L, respectively.
- The loch specific baseline trigger threshold of 2.5 mg/L for dissolved calcium was exceeded in samples LB1L and LB2L from Lamba Water, and samples MAA1L and MAA2L taken from Maa Water by 2.30, 2.04, 1.27 and 1.37 mg/L, respectively.
- **The 'good' ES standard for maximum allowable dissolved cadmium concentration (0.45 µg/L) was exceeded by 0.03 µg/L in sample LB2L from Lamba Water and sample TR1L from Truggles Water.**

None of the other loch samples exceeded the trigger threshold values for any of the other determinands in this round of sampling.

7. INTERPRETATION

7.1 pH

After a reduction in pH in March in the Burn of Lunklet, Red Burn and Burn of Weisdale the pH in these watercourses have returned to near neutral values (Figure 2). The pH typically falls in most watercourses through autumn and winter months due to increased rainfall washing out humic acids from the surface of the surrounding peatlands. The source of acidic waters coming from T026 has a very little water coming from it and the natural outcrop of metamorphosed limestone a short way upstream of sample location TWE1 means that it has little impact on the pH of the Burn of Weisdale (Figure 2). This contrasts with the acidic waters entering the Red Burn and subsequently the Burn of Lunklet where it has a larger discharge and there are no outcrops of limestone within its catchment (Figure 1). As a result, the pH in the Red Burn and consequently the Burn of Lunklet show much wider fluctuations in pH (Figure 2).

7.2 Calcium

The explanations for the concentrations of dissolved calcium being above the baseline trigger threshold in the Burn of Lunklet and Burn of Flamister given in the previous two quarterly reports still apply to the exceedances seen in this reporting period. These exceedances are due to the use of crushed shells to treat the acidity in the upper reaches of the Red Burn in the case of the Burn of Lunklet. For the Burn of Flamister there are extensive exposures of rock at the former borrowpit NBPO3 which is currently being restored and revegetated, and these exposures will be a source of various cations, including calcium, that are weathered from the freshly exposed rock (Figure 1). Similarly, the rock used in the track network and hard standings will also be an increased source of

minerals, especially base cations, and is therefore the most likely explanation of the dissolved calcium concentrations in Lamba Water and Maa Water being above their baseline trigger threshold.

7.3 Nitrate

The concentrations of TON, principally nitrate, in the Burn of Sandgarth is almost certainly related to the catchment of this watercourse being intensively used by a farmer/crofter. The application of significant quantities of manure and/or fertilisers as well as large quantities of dung being deposited the fields by their livestock means that there can be elevated concentrations of nitrate in the water. It is for this reason that this 'control' watercourse is no longer being used. The Seggie Burn is being used as a more effective control for those watercourses within the Viking Energy Wind Farm as it does not have any improved pastures within its catchment.

7.4 Cadmium

The occurrence of dissolved cadmium concentrations above the maximum threshold of 0.45 µg/L has happened previously, for example in November 2024, and this included all three of the control watercourses, and those away from the Scallafield Scord area (Headley 2024). As mentioned previously the most likely explanation is that there is a background level of atmospheric pollution, including the presence of cadmium, that may be contributing to the presence of cadmium (Baker 2001, Vincent & Passant 2006). Also, the historical legacy of air pollution at the peak of the industrial revolution in the nineteenth century means that the peat across Mainland Shetland is likely to have a background level of heavy metals, including cadmium within it (Ballabio *et al.* 2004, Livett *et al.* 1979). Therefore, the erosion of any peat on Mainland Shetland is likely to re-mobilise these metals present in the surface layers of peat. Thus, a combination of past and present atmospheric pollution and peat erosion may well be giving rise to the occasional small peaks above background levels of dissolved cadmium and other heavy metals.

The exceedance is only in the order of 30 ng/L, i.e. 3 parts in every 100,000,000 parts of water. This deviation is so small and close to the limits of detection that it means that some doubt has to be cast on its significance. Also, it is highly unlikely that it will have any detectable ecological impact.

7.5 Nickel and Zinc

The dissolved and bioavailable zinc and nickel concentrations have exceeded the relevant maximum allowable 'good' ES or baseline trigger thresholds on fewer occasions, at fewer locations, and the exceedances have not been as large in this reporting period, compared to the previous two (Headley 2024 and 2025). The maximum allowable concentrations for nickel are now only exceeded only in the Red Burn and not in the Burn of Lunklet (see above). Similarly, the baseline trigger threshold for dissolved zinc did not occur in May in the Burn of Lunklet, whereas in the previous 6 months it was exceeded in every month, i.e. between September and February (Figures 5 and 6).

This may be a result of the treatment systems starting to remove a greater proportion of the zinc and nickel coming from the capped borrowpit or it may be a result of the drier conditions that occurred through April and May.

8. REFERENCES

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9. TABLES

Table 1. Results of field measurements taken from the routine watercourse sample locations on the 2nd, 8th, 9th and 30th of March; 5th and 6th of April; and 11th of May 2025. Concentrations of a determinand that are below the minimum recorded during the extended baseline monitoring period they are highlighted in blue and those above the maximum for the same baseline data are highlighted in yellow. Abbreviations: W.M. level = height of the Burn of Weisdale (m) at Weisdale Mill; JC = J. Clarkson; RF = Rob Fray; LJ = Logan Johnson; EC = electrical conductivity ($\mu\text{S cm}^{-1}$); Temp = temperature ($^{\circ}\text{C}$); DO = dissolved oxygen (% saturation); Turb. = turbidity (NTU); nd = readings were not determined due to the meter being repaired or producing doubtful results.

| Watercourse | sample code | easting | northing | date sampled | time | sampler | flow | W.M. level | sample location | pH | EC | Temp | DO | Turb. | odour | suspended solids | signs of oil | colour/notes |
|--------------------------|-------------|---------|------------|--------------|-------|---------------|---------------|------------|-----------------|-----|-----|------|------|-------|-------|------------------|--------------|------------------------------------|
| South Burn of Burrafirth | BF1 | 436686 | 1157506 | 08/03/2025 | 9.30 | JC | moderate/high | 0.50 | right bank | 7.0 | 150 | 6.4 | - | 1.68 | None | None | None | |
| | BF2 | 436709 | 1156888 | 30/03/2025 | 13.44 | JC | high | 0.56 | midstream | 7.0 | 110 | 8.0 | - | 1.76 | None | None | None | |
| Burn of Crookadale | CR1 | 443382 | 1153916 | 02/03/2025 | 09:10 | RF | moderate | 0.42 | midstream | 6.4 | 178 | 6.2 | 95 | 3.90 | None | None | None | |
| Burn of Droswall | DR1 | 439970 | 1155000 | 30/03/2025 | 12.15 | JC | moderate/high | 0.56 | midstream | 6.8 | 150 | 8.0 | - | 2.08 | None | None | None | |
| Easter Filla Burn | EF1 | 442424 | 1162325 | 02/03/2025 | 12:10 | RF | moderate | 0.42 | midstream | 7.0 | 149 | 6.5 | 96 | 0.79 | None | None | None | |
| Burn of Flamister | FL1 | 443790 | 1155040 | 02/03/2025 | 09:45 | RF | moderate | 0.42 | midstream | 6.5 | 144 | 6.2 | 94 | 1.46 | None | None | None | |
| Gill Burn | GI1 | 443591 | 1154693 | 02/03/2025 | 10:35 | RF | moderate | 0.42 | midstream | 6.9 | 140 | 6.5 | 99 | 1.36 | None | None | None | |
| Burn of Gossawater | GO1 | 443712 | 1162524 | 02/03/2025 | 12:30 | RF | moderate | 0.42 | midstream | 6.9 | 112 | 6.7 | 98 | 2.36 | None | None | None | |
| Burn of Grunnafirth | GR1 | 445705 | 1158859 | 02/03/2025 | 11:20 | RF | moderate | 0.42 | midstream | 6.8 | 134 | 6.6 | 99 | 0.00 | None | None | None | |
| Burn of Kirkhouse | KI1 | 439784 | 1161796 | 30/03/2025 | 14.35 | JC | John | 0.56 | midstream | 7.1 | 110 | 8.5 | - | 1.37 | None | None | None | |
| Laxo Burn | LA1 | 443854 | 1162861 | 02/03/2025 | 14:05 | RF | moderate | 0.42 | midstream | 6.9 | 135 | 7.1 | 99 | 0.92 | None | None | None | |
| Burn of Laxobigging | LB1 | 441717 | 1172666 | 02/03/2025 | 15:05 | RF | moderate | 0.42 | midstream | 7.1 | 425 | 6.9 | 97 | 0.81 | None | None | None | |
| | LB1 | 441712 | 1172682 | 30/03/2025 | 15.50 | JC | high | 0.56 | midstream | 6.6 | 110 | 7.5 | - | 0.74 | None | None | None | submerged macrophytes |
| Burn of Lambawater | LM1 | 437444 | 1137103 | 30/03/2025 | 13.20 | JC | high | 0.56 | midstream | 5.6 | 130 | 7.5 | - | 1.55 | None | few | None | submerged macrophytes |
| Burn of Lunklet | LU1 | 437378 | 1157306 | 08/03/2025 | 11.04 | JC | moderate | 0.50 | midstream | 6.4 | 210 | 6.3 | | 5.08 | None | None | None | |
| | LU2 | 437692 | 1157515 | 08/03/2025 | 10.50 | JC | moderate/high | 0.50 | midstream | 6.0 | 210 | 6.3 | | 7.26 | None | None | None | emergent macrophytes |
| Red Burn | RB2 | 438096 | 1157299 | 08/03/2025 | 10.29 | JC | moderate | 0.50 | midstream | 6.9 | 290 | 5.8 | | 8.87 | None | None | None | |
| Burn of Marrofield Water | MA1 | 437332 | 1157322 | 08/03/2025 | 11.36 | JC | John | 0.50 | midstream | 7.1 | 150 | 2.0 | | | None | None | None | |
| Burn of Quoys | QU1 | 441593 | 1155536 | 09/03/2025 | 12.38 | JC | moderate/high | 0.59 | midstream | 6.6 | 130 | 7.3 | | 1.49 | None | Yes | None | submerged and emergent macrophytes |
| Burn of Sandgarth | SA1 | 441720 | 1157147 | 30/03/2025 | 17.08 | JC | moderate/high | 0.56 | midstream | 6.7 | 130 | 8.0 | | 1.84 | None | Yes | None | submerged macrophytes |
| | SA1 | 444728 | 1155349 | 02/03/2025 | 10:05 | RF | moderate | 0.42 | midstream | 6.6 | 131 | 6.2 | 94 | 4.92 | None | None | None | |
| Seggie Burn | SE1 | 440769 | 1168016 | 02/03/2025 | 14:35 | RF | moderate | 0.41 | midstream | 6.9 | 249 | 6.9 | 99 | 0.00 | None | None | None | |
| Burn of Pettawater | PW1 | 440786 | 1168062 | 30/03/2025 | 16.40 | JC | moderate/high | 0.56 | midstream | 7.0 | 240 | 8.5 | | 1.75 | None | few | None | Few macrophytes |
| | PW2 | 443947 | 1163764 | 02/03/2025 | 13:10 | RF | moderate | 0.56 | midstream | 6.9 | 135 | 6.9 | 100 | 0.00 | None | None | None | |
| Burn of Weisdale | WE1 | 440152 | 1154376 | 08/03/2025 | 12.10 | JC | moderate/high | 0.50 | right bank | 6.7 | 230 | 6.0 | | 7.78 | None | None | None | submerged and emergent macrophytes |
| | WE2 | 440222 | 1155258 | 09/03/2025 | 12.15 | JC | high | 0.59 | left bank | 6.7 | 150 | 7.0 | | 1.81 | None | few | None | submerged macrophytes |
| | WE3 | 440502 | 1156741 | 09/03/2025 | 11.56 | JC | high | 0.59 | midstream | 6.2 | 130 | 1.9 | | 6.90 | None | Yes | None | |
| | WE4 | 440524 | 1157802 | 09/03/2025 | 11.32 | JC | moderate/high | 0.59 | midstream | 7.6 | 110 | 6.7 | | 1.44 | None | Yes | None | |
| | WE5 | 440474 | 1158600 | 30/03/2025 | 11.07 | JC | moderate | 0.56 | midstream | 6.5 | 120 | 7.0 | | 1.25 | None | None | None | emergent macrophytes |
| TWE1 | 440436 | 1157936 | 09/03/2025 | 11.15 | JC | moderate/high | 0.59 | midstream | 6.2 | 140 | 6.8 | | 1.83 | None | None | None | | |
| Wester Filla Burn | WF1 | 441528 | 1162320 | 02/03/2025 | 12:55 | RF | moderate | 0.42 | midstream | 6.9 | 192 | 6.7 | 97 | 0.33 | None | None | None | |

| Watercourse | sample code | easting | northing | date sampled | time | sampler | flow | W.M. level | sample location | pH | EC | Temp | DO | Turb. | odour | suspended solids | signs of oil | colour/notes |
|--------------------------|-------------|---------|----------|--------------|-------|---------|--------------|------------|-----------------|-----|-----|------|----|-------|-------|------------------|--------------|----------------------------------|
| South Burn of Burrafirth | BF1 | 436686 | 1157506 | 05/04/2025 | 12.40 | JC | Low-moderate | 0.38 | right bank | 6.9 | 150 | 9.5 | | 1.76 | None | None | None | |
| | BF2 | 436709 | 1156888 | 05/04/2025 | 12.18 | JC | moderate | 0.38 | midstream | 6.7 | 140 | 9.3 | | 1.58 | None | None | None | filamentous algae 20% |
| Burn of Crookadale | CR1 | 443382 | 1153916 | 05/04/2025 | 11:25 | LJ | Moderate | 0.38 | midstream | 7.0 | 175 | 7.1 | | 2.89 | None | None | None | |
| Burn of Droswall | DR1 | 439987 | 1154926 | 06/04/2025 | 10.59 | JC | low | 0.38 | midstream | 6.4 | 230 | 7.8 | | 4.86 | None | None | None | |
| Easter Filla Burn | EF1 | 442424 | 1162325 | 05/04/2025 | 14:30 | LJ | Moderate | 0.38 | midstream | 6.6 | 192 | 10.1 | | 2.34 | None | None | None | |
| Burn of Flamister | FL1 | 443790 | 1155040 | 05/04/2025 | 10:40 | LJ | Moderate | 0.38 | midstream | 6.7 | 166 | 7.1 | | 1.70 | None | None | None | |
| Gill Burn | GI1 | 443591 | 1154693 | 05/04/2025 | 11:00 | LJ | Moderate | 0.38 | midstream | 6.3 | 161 | 7.0 | | 1.77 | None | None | None | |
| Burn of Gossawater | GO1 | 443712 | 1162524 | 05/04/2025 | 14:15 | LJ | Moderate | 0.38 | midstream | 5.9 | 103 | 10.1 | | 0.08 | None | None | None | |
| Burn of Grunnafirth | GR1 | 445705 | 1158859 | 05/04/2025 | 15:10 | LJ | Moderate | 0.38 | midstream | 6.5 | 149 | 10.8 | | 1.44 | None | None | None | |
| Burn of Kirkhouse | KI1 | 439784 | 1161796 | 05/04/2025 | 13.43 | JC | Low-moderate | 0.38 | midstream | 6.9 | 200 | 10 | | 3.91 | None | None | None | |
| Laxo Burn | LA1 | 443854 | 1162861 | 05/04/2025 | 14:00 | LJ | Moderate | 0.38 | midstream | 6.4 | 138 | 10.2 | | 8.40 | None | None | None | |
| Burn of Laxobigging | LB1 | 441717 | 1172666 | 05/04/2025 | 16:40 | LJ | Moderate | 0.37 | midstream | 7.2 | 149 | 10.2 | | 0.00 | None | None | None | |
| Burn of Lambawater | LM1 | 437444 | 1137103 | 05/04/2025 | 11.50 | JC | moderate | 0.38 | midstream | 6.6 | 150 | 7.7 | | 1.07 | None | None | None | submerged & emergent macrophytes |
| Burn of Lunklet | LU1 | 437378 | 1157306 | 05/04/2025 | 11.35 | JC | moderate | 0.38 | midstream | 6.5 | 250 | 7.5 | | 5.48 | None | None | None | filamentous algae 30% |
| | LU2 | 437692 | 1157515 | 05/04/2025 | 11.15 | JC | moderate | 0.38 | midstream | 6.3 | 250 | 7.1 | | 5.64 | None | None | None | emergent macrophytes |
| Red Burn | RB2 | 438096 | 1157299 | 06/04/2025 | 10.48 | JC | Low-moderate | 0.38 | midstream | 6.3 | 340 | 5.8 | | 7.77 | None | None | None | filamentous algae <10% |
| Burn of Marrofield Water | MA1 | 437332 | 1157322 | 05/04/2025 | 11.40 | JC | low | 0.38 | midstream | 6.7 | 150 | 7.3 | | 1.64 | None | None | None | |
| Burn of Pettawater | PW1 | 441593 | 1155536 | 06/04/2025 | 15.00 | JC | moderate | 0.38 | midstream | 7.3 | 250 | 9.3 | | 1.17 | None | None | None | submerged & emergent macrophytes |
| | PW2 | 441720 | 1157147 | 06/04/2025 | 14.25 | JC | Low-moderate | 0.37 | midstream | 7.0 | 210 | 9.5 | | 1.32 | None | None | None | submerged & emergent macrophytes |
| Burn of Quoys | QU1 | 444728 | 1155349 | 05/04/2025 | 12:25 | LJ | Moderate | 0.38 | midstream | 6.8 | 133 | 6.4 | | 3.14 | None | Some | None | |
| Burn of Sandgarth | SA1 | 440769 | 1168016 | 05/04/2025 | 16:00 | LJ | Moderate | 0.38 | midstream | 6.7 | 285 | 10.0 | | 3.62 | None | None | None | |
| Seggie Burn | SE1 | 443947 | 1163764 | 05/04/2025 | 13:00 | LJ | Moderate | 0.38 | midstream | 6.7 | 142 | 10.2 | | 1.47 | None | None | None | |
| Burn of Weisdale | WE1 | 440152 | 1154376 | 05/04/2025 | 15.30 | JC | low | 0.38 | midstream | 7.4 | 260 | 11 | | 4.38 | None | None | None | submerged & emergent macrophytes |
| | WE2 | 440222 | 1155258 | 06/04/2025 | 14.00 | JC | moderate | 0.37 | left bank | 7.7 | 260 | 11.5 | | 4.63 | None | None | None | submerged macrophytes |
| | WE3 | 440502 | 1156741 | 06/04/2025 | 13.33 | JC | moderate | 0.37 | midstream | 7.0 | 210 | 10 | | 5.53 | None | None | None | |
| | WE4 | 440524 | 1157802 | 06/04/2025 | 13.06 | JC | moderate | 0.37 | midstream | 6.9 | 180 | 9 | | 5.66 | None | None | None | |
| | WE5 | 440474 | 1158600 | 06/04/2025 | 12.21 | JC | low | 0.37 | midstream | 6.6 | 180 | 7.7 | | 6.89 | None | None | None | emergent macrophytes, fish |
| | TWE1 | 440436 | 1157936 | 06/04/2025 | 12.47 | JC | moderate | 0.37 | midstream | 7.0 | 190 | 3.2 | | 5.31 | None | None | None | |
| Wester Filla Burn | WF1 | 441528 | 1162320 | 05/04/2025 | 13:25 | LJ | Moderate | 0.38 | midstream | 7.0 | 172 | 10.1 | | 6.89 | None | None | None | |
| South Burn of Burrafirth | BF1 | 436686 | 1157506 | 11/05/2025 | 13:15 | RF | low | 0.34 | right bank | 7.2 | 154 | 17.4 | | 4.21 | None | None | None | |
| | BF2 | 436709 | 1156888 | 11/05/2025 | 15:30 | RF | low | 0.34 | midstream | 7.2 | 143 | 19.7 | | 0.83 | None | None | None | |
| Burn of Crookadale | CR1 | 443382 | 1153916 | 11/05/2025 | 09:45 | RF | low | 0.34 | midstream | 7.0 | 236 | 11.8 | | 3.69 | None | None | None | |
| Burn of Droswall | DR1 | 439987 | 1154926 | 10/05/2025 | 11.42 | JC | low | 0.34 | midstream | 6.8 | 250 | 14.2 | | 6.31 | None | None | None | fish, fine sediment/algae |
| Burn of Flamister | FL1 | 443790 | 1155040 | 11/05/2025 | 10:35 | RF | low | 0.34 | midstream | 6.6 | 171 | 11.7 | | 0.77 | None | None | None | |
| Burn of | LB1 | 441717 | 1172666 | 11/05/2025 | 16:45 | RF | low | 0.34 | midstream | 6.9 | 157 | 17.6 | | 0.48 | None | None | None | |

| Watercourse | sample code | easting | northing | date sampled | time | sampler | flow | W.M. level | sample location | pH | EC | Temp | DO | Turb. | odour | suspended solids | signs of oil | colour/notes |
|--------------------------|-------------|---------|----------|--------------|-------|---------|----------|------------|-----------------|-----|-----|------|----|-------|-------|------------------|--------------|--|
| Laxobigging | | | | | | | | | | | | | | | | | | |
| Burn of Lambawater | LM1 | 437444 | 1157103 | 11/05/2025 | 15:00 | RF | low | 0.34 | midstream | 6.3 | 138 | 16.9 | | 1.64 | None | None | None | |
| Burn of Lunklet | LU1 | 437378 | 1157306 | 11/05/2025 | 13:50 | RF | low | 0.34 | midstream | 6.3 | 198 | 16.5 | | 13.46 | None | None | None | |
| | LU2 | 437692 | 1157515 | 11/05/2025 | 14:15 | RF | low | 0.34 | midstream | 6.8 | 192 | 17.0 | | 12.16 | None | None | None | |
| Red Burn | RB2 | 438096 | 1157299 | 11/05/2025 | 14:30 | RF | low | 0.34 | midstream | 6.9 | 240 | 16.6 | | 14.49 | None | None | None | |
| Burn of Marrofield Water | MA1 | 437332 | 1157322 | 11/05/2025 | 13:45 | RF | low | 0.34 | midstream | 6.8 | 150 | 17.0 | | 2.36 | None | None | None | |
| Burn of Quoys | QU1 | 444728 | 1155349 | 11/05/2025 | 11:10 | RF | low | 0.34 | midstream | 6.6 | 172 | 14.3 | | 4.42 | None | None | None | |
| Seggie Burn | SE1 | 443947 | 1163764 | 11/05/2025 | 12:30 | RF | low | 0.34 | midstream | 7.6 | 238 | 16.7 | | 0.00 | None | None | None | |
| Burn of Weisdale | WE1 | 440152 | 1154376 | 10/05/2025 | 14.55 | JC | low | 0.34 | left bank | 7.8 | 280 | 17.5 | | 4.42 | None | None | None | submerged and emergent macrophytes, 5% filamentous algae |
| | WE2 | 440222 | 1155258 | 10/05/2025 | 14.30 | JC | moderate | 0.34 | left bank | 8.0 | 260 | 17.5 | | 4.78 | None | yes | None | submerged & emergent macrophytes, 80% filamentous algae |
| | WE3 | 440502 | 1156741 | 10/05/2025 | 13.59 | JC | moderate | 0.34 | midstream | 7.3 | 230 | 13.4 | | 5.76 | None | yes | None | 10% filamentous algae |
| | WE4 | 440524 | 1157802 | 10/05/2025 | 13.30 | JC | moderate | 0.34 | midstream | 7.2 | 210 | 13.4 | | 6.65 | None | None | None | emergent macrophytes, fish present |
| | WE5 | 440474 | 1158600 | 10/05/2025 | 12.52 | JC | low | 0.34 | midstream | 7.0 | 230 | 12.4 | | 8.44 | None | yes | None | emergent macrophytes, cloudy |
| | TWE1 | 440436 | 1157936 | 10/05/2025 | 13.14 | JC | moderate | 0.34 | midstream | 7.6 | 270 | 13.6 | | 8.84 | None | None | None | cloudy, light sediment/algae |
| Wester Filla Burn | WF1 | 441528 | 1162320 | 11/05/2025 | 12:15 | RF | low | 0.34 | midstream | 6.5 | 269 | 13.1 | | 1.81 | None | None | None | |

Table 2. The results of all the laboratory analysis of the water samples collected on the 2nd, 8th and 30th of March; 5th and 6th of April; and 11th of May 2025 from the routine watercourse sample locations within the Viking Energy Wind Farm. Control sites are highlighted in lilac. Concentrations of a determinand that are below the minimum recorded during the extended baseline monitoring period they are highlighted in blue and those above the maximum for the same baseline data are highlighted in yellow. Numbers in bold and red indicate they exceed the appropriate trigger threshold values. Abbreviations: EC = electrical conductivity; DOC = dissolved organic carbon; ANC = acid neutralising capacity; TSS = total suspended solids; Turb. = turbidity; TAN = total ammoniacal-nitrogen; TON = total oxidised inorganic nitrogen (nitrate); SRP = soluble reactive orthophosphate; TP = total phosphorus; Diss. = dissolved; Na = sodium; Ca = calcium; Diss. = dissolved; Tot. = total; n/a = not applicable.

| Date sampled | Date received | Report due | Sample code | Acidity | EC | Gran Alkalinity | | DOC | ANC | TSS | Turb. | TAN | TON | SRP | TP | Diss. Na | Diss. Ca | Tot. Ca |
|--------------|---------------|------------|-------------|---------|---------|-----------------|---------------------------|--------|---------|--------|-------|-----------|-----------|--------|--------|----------|----------|---------|
| | | | | pH | (µS/cm) | (µeq/L) | (mg CaCO ₃ /L) | (mg/L) | (µeq/L) | (mg/L) | NTU | (µg N /L) | (µg P /L) | (mg/L) | (mg/L) | (mg/L) | | |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | BF1 | 6.1 | 155 | 45.9 | 2.3 | 7.2 | 82 | 2.7 | 3.0 | <LOD | 53 | <LOD | <LOD | 6.59 | 1.37 | 4.54 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | BF2 | 5.7 | 108 | 26.9 | 1.3 | 10.6 | 80 | 2.1 | 3.2 | <LOD | 34 | <LOD | <LOD | 14.49 | 2.59 | 2.63 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | CR1 | 6.6 | 213 | 339 | 16.9 | 11.3 | 395 | 1.2 | 3.9 | 10 | 59 | <LOD | <LOD | 24.73 | 8.76 | 9.02 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | DR1 | 7.0 | 136 | 285 | 14.3 | 11.6 | 343 | 2.0 | 4.0 | <LOD | 16 | <LOD | <LOD | 15.67 | 7.35 | 7.43 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | EF1 | 6.8 | 195 | 467 | 23.4 | 10.5 | 520 | <LOD | 2.1 | <LOD | 82 | 2 | <LOD | 19.07 | 8.43 | 8.79 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | FL1 | 6.6 | 177 | 301 | 15.0 | 11.2 | 357 | 0.2 | 3.1 | <LOD | 76 | 2 | 7 | 18.85 | 7.20 | 7.34 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | GI1 | 6.8 | 173 | 272 | 13.6 | 11.2 | 328 | 0.6 | 2.3 | <LOD | 69 | 1 | <LOD | 19.44 | 6.61 | 6.66 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | GO1 | 6.4 | 144 | 115 | 5.8 | 9.8 | 165 | 2.5 | 2.9 | <LOD | 59 | 2 | <LOD | 17.05 | 2.94 | 3.03 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | GR1 | 6.8 | 165 | 291 | 14.6 | 9.8 | 340 | 0.4 | 2.5 | <LOD | 57 | <LOD | <LOD | 18.41 | 6.06 | 6.22 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | KI1 | 6.8 | 106 | 183 | 9.2 | 11.5 | 241 | 0.8 | 2.2 | <LOD | <LOD | <LOD | 7 | 14.39 | 4.15 | 4.27 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | LA1 | 6.8 | 165 | 251 | 12.5 | 10.3 | 302 | 1.6 | 2.7 | <LOD | 56 | <LOD | <LOD | 19.36 | 5.30 | 5.38 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | LB1 | 6.6 | 158 | 178 | 8.9 | 9.6 | 226 | 0.8 | 1.4 | <LOD | 31 | 2 | 8 | 19.24 | 3.26 | 3.20 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | LB1 | 6.3 | 109 | 70 | 3.5 | 12.2 | 131 | 0.4 | 0.9 | <LOD | <LOD | 5 | 9 | 16.35 | 1.86 | 1.92 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | LM1 | 5.6 | 127 | 22 | 1.1 | 7.5 | 59 | 1.6 | 2.2 | <LOD | 20 | <LOD | <LOD | 15.40 | 4.21 | 4.28 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | LU1 | 5.9 | 205 | 38 | 1.9 | 4.8 | 61 | 5.5 | 6.4 | 34 | 38 | <LOD | <LOD | 18.17 | 8.14 | 8.19 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | LU2 | 5.5 | - | 19 | 0.9 | 4.6 | 42 | 6.4 | - | - | - | - | - | 18.02 | 8.26 | 8.57 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | RB2 | 5.0 | - | 0 | <LOD | 1.8 | 8 | 10.2 | - | - | - | - | - | 18.82 | 16.44 | 16.36 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | MA1 | 5.4 | 108 | 18 | 0.9 | 9.6 | 62 | 2.5 | 3.6 | <LOD | <LOD | <LOD | 6 | 14.73 | 2.11 | 2.20 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | PW1 | 6.5 | 152 | 175 | 8.8 | 9.3 | 222 | 2.1 | 2.1 | <LOD | 20 | <LOD | <LOD | 18.20 | 4.55 | 4.57 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | PW2 | 6.6 | 122 | 160 | 8.0 | 11.2 | 216 | 3.3 | 3.7 | <LOD | 15 | <LOD | <LOD | 17.24 | 4.19 | 4.20 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | QU1 | 6.5 | 158 | 164 | 8.2 | 11.0 | 219 | 1.5 | 3.1 | 11 | 38 | <LOD | 7 | 19.60 | 4.08 | 4.21 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | SA1 | 7.3 | 296 | 785 | 39.3 | 5.1 | 811 | 1.0 | 3.5 | <LOD | 131 | <LOD | <LOD | 33.43 | 16.34 | 16.65 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | SA1 | 7.2 | 204 | 603 | 30.2 | 8.6 | 646 | 1.1 | 3.2 | <LOD | 157 | 6 | <LOD | 26.42 | 12.32 | 12.39 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | SE1 | 6.8 | 165 | 308 | 15.4 | 11.3 | 364 | 0.6 | 1.1 | <LOD | 31 | <LOD | 11 | 18.71 | 6.04 | 6.15 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | WE1 | 7.1 | 219 | 705 | 35.3 | 7.2 | 741 | 6.9 | 9.8 | <LOD | 108 | 4 | 17 | 18.75 | 16.29 | 16.42 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | WE2 | 6.9 | 167 | 320 | 16.0 | 7.9 | 359 | 1.4 | 1.9 | <LOD | 58 | 2 | <LOD | 16.04 | 8.95 | 9.15 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | WE3 | 6.4 | 149 | 166 | 8.3 | 8.5 | 209 | 6.0 | 3.3 | <LOD | <LOD | <LOD | 8 | 15.40 | 4.94 | 5.10 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | WE4 | 6.2 | 139 | 94 | 4.7 | 9.0 | 139 | 1.4 | 1.8 | <LOD | <LOD | <LOD | <LOD | 15.18 | 3.32 | 3.47 |
| 30/03/2025 | 03/04/2025 | 17/04/2025 | WE5 | 6.4 | 107 | 110 | 5.5 | 10.1 | 160 | 0.9 | 1.6 | - | - | - | - | 14.22 | 3.50 | 3.64 |
| 08/03/2025 | 13/03/2025 | 28/03/2025 | TWE1 | 6.2 | - | 65 | 3.3 | 6.6 | 98 | 1.5 | - | - | - | - | - | 15.56 | 4.91 | 4.95 |
| 02/03/2025 | 07/03/2025 | 24/03/2024 | WF1 | 7.1 | 234 | 579 | 29.0 | 11.2 | 635 | 1.1 | 1.9 | <LOD | 68 | <LOD | 11 | 24.92 | 12.42 | 12.48 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | BF1 | 6.7 | 149 | 131 | 6.6 | 8.6 | 174 | 0.9 | 1.9 | <LOD | 39 | <LOD | <LOD | 16.88 | 5.18 | 5.27 |

| Date sampled | Date received | Report due | Sample code | Acidity | EC | Gran Alkalinity | | DOC | ANC | TSS | Turb. | TAN | TON | SRP | TP | Diss. Na | Diss. Ca | Tot. Ca |
|--------------|---------------|------------|-------------|---------|---------|-----------------|---------------------------|--------|---------|--------|-------|-----------|-----------|--------|--------|----------|----------|---------|
| | | | | pH | (µS/cm) | (µeq/L) | (mg CaCO ₃ /L) | (mg/L) | (µeq/L) | (mg/L) | NTU | (µg N /L) | (µg P /L) | (mg/L) | (mg/L) | (mg/L) | | |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | BF2 | 6.5 | 128 | 100 | 5.0 | 8.1 | 141 | 0.9 | 2.0 | <LOD | 69 | <LOD | 6 | 16.62 | 3.78 | 3.92 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | CR1 | 6.6 | 179 | 264 | 13.2 | 14.4 | 336 | 1.3 | 4.1 | 39 | <LOD | <LOD | <LOD | 25.33 | 6.93 | 7.33 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | DR1 | 7.2 | 199 | 815 | 40.8 | 4.6 | 838 | 0.4 | 5.6 | 13 | 43 | 2 | <LOD | 18.81 | 16.76 | 16.74 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | EF1 | 7.3 | 211 | 1038 | 52.0 | 7.9 | 1078 | <LOD | 2.4 | <LOD | 67 | <LOD | <LOD | 20.16 | 15.57 | 15.86 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | FL1 | 7.2 | 184 | 669 | 33.5 | 9.2 | 715 | 0.3 | 2.2 | <LOD | 83 | 5 | <LOD | 18.74 | 11.68 | 11.93 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | GI1 | 7.1 | 179 | 602 | 30.1 | 8.5 | 644 | 0.2 | 2.0 | <LOD | 60 | 2 | <LOD | 19.73 | 10.86 | 11.14 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | GO1 | 6.7 | 119 | 155 | 7.8 | 12.0 | 215 | 1.2 | 2.4 | <LOD | <LOD | <LOD | <LOD | 15.44 | 3.07 | 3.35 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | GR1 | 7.1 | 165 | 558 | 27.9 | 17.2 | 644 | 0.5 | 1.8 | <LOD | 40 | 2 | <LOD | 18.93 | 8.78 | 9.09 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | KI1 | 7.1 | 183 | 854 | 42.8 | 9.0 | 899 | 0.7 | 4.5 | 35 | 31 | 4 | <LOD | 18.08 | 14.30 | 14.73 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | LA1 | 7.0 | 155 | 449 | 22.5 | 11.0 | 505 | 1.0 | 1.8 | <LOD | 22 | <LOD | <LOD | 18.00 | 7.42 | 7.71 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | LB1 | 7.0 | 155 | 365 | 18.2 | 8.2 | 405 | 0.3 | 1.5 | <LOD | <LOD | 3 | <LOD | 20.08 | 4.57 | 4.81 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | LM1 | 6.4 | 158 | 95 | 4.8 | 7.6 | 133 | 1.2 | 1.3 | <LOD | <LOD | <LOD | <LOD | 16.38 | 5.04 | 5.19 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | LU1 | 6.5 | 240 | 159 | 7.9 | 6.1 | 189 | 2.3 | 6.3 | 43 | 28 | <LOD | <LOD | 18.83 | 13.71 | 14.14 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | LU2 | 6.2 | - | 92 | 4.6 | 5.7 | 120 | 2.5 | - | - | - | - | - | 18.67 | 13.97 | 14.20 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | RB2 | 6.4 | - | 80 | 4.0 | 3.6 | 98 | 1.9 | - | - | - | - | - | 19.51 | 23.12 | 23.41 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | MA1 | 6.6 | 156 | 176 | 8.8 | 8.8 | 220 | 0.9 | 2.0 | <LOD | <LOD | 2 | <LOD | 17.85 | 4.09 | 4.16 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | PW1 | 7.2 | 251 | 845 | 42.3 | 9.0 | 890 | 0.6 | 1.8 | 18 | 77 | 2 | <LOD | 23.48 | 17.02 | 17.24 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | PW2 | 7.0 | 222 | 683 | 34.2 | 9.3 | 729 | 0.9 | 1.6 | 36 | 57 | <LOD | <LOD | 20.81 | 13.21 | 13.35 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | QU1 | 6.9 | 162 | 330 | 16.5 | 11.8 | 389 | 1.8 | 4.6 | 11 | 21 | <LOD | <LOD | 18.70 | 5.79 | 6.03 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | SA1 | 7.5 | 330 | 1206 | 60.3 | 5.8 | 1235 | 2.8 | 4.3 | 8 | 231 | <LOD | <LOD | 35.15 | 23.93 | 24.06 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | SE1 | 7.3 | 169 | 523 | 26.2 | 11.8 | 582 | 0.9 | 1.7 | <LOD | 16 | 2 | <LOD | 18.14 | 8.55 | 8.75 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | WE1 | 7.2 | 262 | 1061 | 53.1 | 7.9 | 1100 | 0.3 | 5.1 | <LOD | 32 | 5 | <LOD | 20.33 | 23.16 | 23.31 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | WE2 | 7.9 | 253 | 1064 | 53.2 | 7.6 | 1102 | 0.5 | 5.7 | <LOD | 40 | 5 | 9 | 19.35 | 22.85 | 23.03 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | WE3 | 7.1 | 210 | 759 | 38.0 | 8.3 | 800 | 0.6 | 6.4 | 24 | 20 | 3 | <LOD | 18.27 | 14.51 | 14.51 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | WE4 | 6.9 | 185 | 554 | 27.7 | 6.9 | 589 | 1.0 | 6.9 | 29 | 24 | 3 | <LOD | 17.45 | 10.14 | 10.22 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | WE5 | 6.8 | - | 562 | 28.1 | 7.4 | 599 | 1.4 | - | - | - | - | - | 17.32 | 9.87 | 9.97 |
| 06/04/2025 | 10/04/2025 | 29/04/2025 | TWE1 | 7.1 | - | 504 | 25.2 | 7.8 | 543 | 0.4 | - | - | - | - | - | 17.10 | 11.56 | 12.02 |
| 05/04/2025 | 10/04/2025 | 29/04/2025 | WF1 | 6.3 | 209 | 247 | 12.4 | 7.7 | 252 | 142.0 | 46.4 | 76 | <LOD | <LOD | 28 | 27.13 | 4.89 | 5.32 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | BF1 | 7.0 | 181 | 322 | 16.1 | 9.6 | 370 | 1.1 | - | <LOD | <LOD | - | - | - | 7.58 | 7.94 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | BF2 | 6.7 | 168 | 298 | 14.9 | 7.2 | 334 | 0.9 | - | <LOD | <LOD | - | - | - | 5.78 | 5.79 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | CR1 | 7.0 | 278 | 992 | 49.7 | 7.0 | 1027 | 0.8 | - | 55 | 41 | - | - | - | 16.71 | 17.97 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | DR1 | 7.4 | 230 | 1064 | 53.2 | 5.7 | 1092 | 0.7 | - | 16 | 36 | - | - | - | 20.74 | 21.90 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | FL1 | 7.1 | 189 | 738 | 36.9 | 12.0 | 797 | 0.7 | - | <LOD | <LOD | - | - | - | 11.91 | 12.81 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | LB1 | 7.2 | 178 | 538 | 26.9 | 9.5 | 586 | 0.6 | - | <LOD | <LOD | - | - | - | 6.66 | 6.82 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | LM1 | 6.5 | 157 | 171 | 8.6 | 6.0 | 201 | 1.3 | - | <LOD | <LOD | - | - | - | 6.15 | 6.20 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | LU1 | 6.6 | 214 | 342 | 17.1 | 10.6 | 395 | 3.1 | - | <LOD | <LOD | - | - | - | 13.67 | 14.00 |

| Date sampled | Date received | Report due | Sample code | Acidity | EC | Gran Alkalinity | | DOC | ANC | TSS | Turb. | TAN | TON | SRP | TP | Diss. Na | Diss. Ca | Tot. Ca |
|------------------|---------------|------------|-------------|------------|---------|-----------------|---------------------------|--------|---------|--------|-------|-----------|-----------|--------|--------|----------|----------|---------|
| | | | | pH | (µS/cm) | (µeq/L) | (mg CaCO ₃ /L) | (mg/L) | (µeq/L) | (mg/L) | NTU | (µg N /L) | (µg P /L) | (mg/L) | (mg/L) | (mg/L) | | |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | LU2 | 6.7 | 232 | 215 | 10.8 | 7.5 | 253 | 2.4 | - | <LOD | 5 | - | - | - | 12.49 | 13.49 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | RB2 | 6.9 | 293 | 239 | 12.0 | 8.4 | 281 | 1.5 | - | 62 | 24 | - | - | - | 19.19 | 19.99 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | MA1 | 6.8 | 167 | 355 | 17.8 | 8.5 | 397 | 0.8 | - | <LOD | <LOD | - | - | - | 6.25 | 6.69 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | QU1 | 7.0 | 185 | 917 | 45.9 | 9.2 | 963 | 0.8 | - | 16 | 38 | - | - | - | 11.66 | 12.29 |
| 11/05/2025 | 15/05/2025 | 30/05/2025 | SE1 | 7.8 | 248 | 1574 | 78.8 | 6.6 | 1607 | 0.2 | - | <LOD | <LOD | - | - | - | 23.42 | 24.92 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WE1 | 7.6 | 254 | 1225 | 61.3 | 7.9 | 1265 | 0.9 | - | <LOD | <LOD | - | - | - | 25.15 | 26.41 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WE2 | 8.2 | 249 | 1127 | 56.4 | 8.2 | 1168 | 0.9 | - | <LOD | <LOD | - | - | - | 23.51 | 24.44 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WE3 | 7.2 | 214 | 992 | 49.6 | 6.3 | 1023 | 1.1 | - | <LOD | 5 | - | - | - | 17.09 | 18.13 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WE4 | 6.9 | 186 | 763 | 38.2 | 9.5 | 811 | 1.3 | - | <LOD | 15 | - | - | - | 13.21 | 13.38 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WE5 | 6.8 | 208 | 800 | 40.0 | 7.0 | 835 | 3.0 | - | 23 | 13 | - | - | - | 13.13 | 13.50 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | TWE1 | 7.2 | 209 | 702 | 35.1 | 10.4 | 754 | 1.3 | - | 28 | <LOD | - | - | - | 13.74 | 14.20 |
| 10/05/2025 | 15/05/2025 | 30/05/2025 | WF1 | 7.3 | 284 | 1609 | 80.5 | 5.5 | 1636 | 0.7 | - | <LOD | 67 | - | - | - | 28.46 | 30.49 |
| | | | | | | | | | | | | | | | | | | |
| Detection limits | | | | March 2025 | n/a | 1.0 | 0.1 | 0.4 | 0.1 | 0.1 | 9 | 9 | 1.2 | 6 | 0.003 | 0.04 | 0.1 | |
| | | | | April 2025 | n/a | 1.0 | 0.1 | 0.2 | 0.1 | 0.1 | 5 | 11 | 1.4 | 6 | 0.007 | 0.2 | 0.1 | |
| | | | | May 2025 | n/a | 1.0 | 0.1 | 0.4 | 0.1 | 0.1 | 8 | 3 | | | | 0.1 | 0.3 | |
| Accuracy | | | | 0.01 | 1.0 | 0.1 | | | | | | | | | | | | |

Table 2. continued. Abbreviations: Fe = iron; Mn = manganese; Al = aluminium; As = arsenic; Cd = cadmium; Cr = chromium; Cu = copper; Ni = nickel; Pb = lead; Zn = zinc; Bioa. = bioavailable; PNEC = probable no-effect concentration.

| Sample code | Sample Date | Diss. Fe | Diss. Mn | Diss. Al | Tot. Al | Diss. As | Diss. Cd | Diss. Cr | Diss. Cu | Diss. Ni | Diss. Pb | Diss. Zn | Bio. Mn | Bioa. Cu | Bioa. Ni | Bioa. Zn | PNEC Pb | Av. Pb |
|-------------|-------------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|----------|---------|----------|----------|----------|---------|--------|
| | | (mg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) |
| BF1 | 08/03/2025 | 0.16 | 31.8 | 53.0 | 163.7 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 2.8 | 31.8 | <0.08 | <0.5 | 1.3 | 8.7 | <0.9 |
| BF2 | 30/03/2025 | 0.33 | 32.8 | 99.1 | 114.7 | <LOD | <LOD | <LOD | 1.6 | <LOD | <LOD | 5.4 | 32.8 | 0.10 | <0.4 | 1.8 | 12.7 | <0.6 |
| CR1 | 02/03/2025 | 0.68 | 111.2 | 74.7 | 99.8 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 2.1 | 36.1 | <0.03 | <0.4 | 0.6 | 13.5 | <0.6 |
| DR1 | 30/03/2025 | 0.51 | 91.4 | 149.8 | 185.7 | <LOD | <LOD | 0.8 | 1.8 | 2.5 | <LOD | 6.6 | 33.0 | 0.04 | 0.4 | 1.6 | 14.0 | <0.6 |
| EF1 | 02/03/2025 | 0.48 | 97.6 | 68.9 | 77.1 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 2.3 | 31.2 | <0.03 | <0.4 | 0.7 | 12.6 | <0.6 |
| FL1 | 02/03/2025 | 0.62 | 61.0 | 101.9 | 112.3 | <LOD | <LOD | <LOD | 0.8 | <LOD | <LOD | 3.2 | 23.3 | 0.03 | <0.4 | 0.9 | 13.4 | <0.6 |
| GI1 | 02/03/2025 | 0.43 | 47.4 | 103.1 | 110.3 | <LOD | <LOD | 0.6 | <LOD | <LOD | <LOD | 2.0 | 18.9 | <0.02 | <0.3 | 0.5 | 13.4 | <0.6 |
| GO1 | 02/03/2025 | 0.29 | 18.9 | 66.0 | 81.4 | <LOD | <LOD | 0.9 | <LOD | <LOD | <LOD | 1.9 | 18.6 | <0.04 | <0.4 | 0.6 | 11.8 | <0.7 |
| GR1 | 02/03/2025 | 0.61 | 66.5 | 82.9 | 109.3 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 3.5 | 27.0 | <0.03 | <0.4 | 1.0 | 11.7 | <0.7 |
| KI1 | 30/03/2025 | 0.54 | 62.0 | 101.0 | 105.6 | <LOD | <LOD | <LOD | 0.8 | <LOD | <LOD | 2.3 | 37.8 | 0.02 | <0.3 | 0.6 | 13.8 | <0.6 |
| LA1 | 02/03/2025 | 0.36 | 48.8 | 65.8 | 75.9 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 2.3 | 21.4 | <0.03 | <0.4 | 0.6 | 12.4 | <0.6 |
| LB1 | 02/03/2025 | 0.38 | 53.7 | 86.6 | 93.4 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 3.4 | 42.4 | <0.03 | <0.4 | 1.0 | 11.5 | <0.7 |
| LB1 | 30/03/2025 | 0.33 | 45.3 | 96.6 | 100.8 | <LOD | <LOD | <LOD | 1.4 | <LOD | <LOD | 3.2 | 45.3 | 0.06 | <0.4 | 0.8 | 14.6 | <0.5 |
| LM1 | 30/03/2025 | 0.30 | 52.5 | 106.9 | 121.9 | <LOD | <LOD | <LOD | 1.0 | 4.5 | <LOD | 9.7 | 31.5 | 0.10 | 1.0 | 4.5 | 9.0 | <0.9 |
| LU1 | 08/03/2025 | 0.46 | 373.8 | 207.5 | 438.4 | <LOD | <LOD | <LOD | <LOD | 18.4 | <LOD | 31.0 | 109.5 | <0.13 | 4.5 | 19.4 | 5.7 | <1.3 |
| LU2 | 08/03/2025 | 0.38 | 414.3 | 211.6 | 508.3 | <LOD | <LOD | <LOD | 1.3 | 20.7 | <LOD | 33.6 | 122.5 | 0.22 | 5.1 | 21.4 | 5.5 | <1.4 |
| RB2 | 08/03/2025 | 0.39 | 839.8 | 309.2 | 982.0 | 3.6 | <LOD | <LOD | 3.2 | 49.1 | <LOD | 75.2 | 146.6 | 1.38 | 12.2 | 58.3 | 2.2 | <3.4 |
| MA1 | 30/03/2025 | 0.35 | 62.0 | 124.0 | 140.9 | <LOD | <LOD | <LOD | 0.9 | 3.1 | <LOD | 8.4 | 62.0 | 0.06 | 0.6 | 3.1 | 11.5 | <0.7 |
| PW1 | 08/03/2025 | 0.30 | 17.8 | 112.5 | 127.6 | <LOD | <LOD | 0.8 | <LOD | <LOD | <LOD | 2.2 | 9.1 | <0.04 | <0.4 | 0.7 | 11.1 | <0.7 |
| PW2 | 30/03/2025 | 0.24 | 13.0 | 117.2 | 145.7 | <LOD | <LOD | <LOD | 1.4 | <LOD | <LOD | 2.0 | 8.0 | 0.05 | <0.3 | 0.5 | 13.4 | <0.6 |
| QU1 | 02/03/2025 | 0.75 | 78.7 | 71.5 | 76.1 | <LOD | <LOD | 0.6 | <LOD | <LOD | <LOD | 2.5 | 50.7 | <0.03 | <0.4 | 0.7 | 13.1 | <0.6 |
| SA1 | 02/03/2025 | 0.50 | 73.1 | 63.2 | 94.6 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 2.0 | 20.0 | <0.04 | <0.7 | 0.9 | 6.1 | <1.3 |
| SA1 | 30/03/2025 | 0.39 | 46.4 | 88.5 | 131.6 | <LOD | <LOD | <LOD | 1.7 | <LOD | <LOD | 2.3 | 10.6 | 0.04 | <0.4 | 0.7 | 10.4 | <0.8 |
| SE1 | 02/03/2025 | 0.41 | 70.8 | 72.4 | 80.9 | 2.9 | <LOD | <LOD | 1.4 | <LOD | <LOD | 2.2 | 30.5 | 0.04 | <0.3 | 0.5 | 13.6 | <0.6 |
| WE1 | 08/03/2025 | 0.55 | 77.6 | 99.1 | 339.4 | 2.3 | <LOD | <LOD | <LOD | <LOD | <LOD | 2.4 | 14.5 | <0.03 | <0.5 | 0.9 | 8.6 | <0.9 |
| WE2 | 08/03/2025 | 0.46 | 45.0 | 127.1 | 148.8 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 4.0 | 12.8 | <0.03 | <0.4 | 1.4 | 9.5 | <0.8 |
| WE3 | 08/03/2025 | 0.48 | 52.2 | 143.3 | 192.8 | 4.3 | <LOD | 0.8 | <LOD | <LOD | <LOD | 5.0 | 23.7 | <0.05 | <0.4 | 1.8 | 10.2 | <0.8 |
| WE4 | 08/03/2025 | 0.46 | 58.0 | 145.9 | 158.6 | 9.3 | <LOD | <LOD | 1.4 | <LOD | <LOD | 6.0 | 46.8 | 0.11 | <0.4 | 2.2 | 10.8 | <0.7 |
| WE5 | 30/03/2025 | 0.44 | 52.9 | 104.3 | 109.6 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 4.3 | 40.7 | <0.04 | <0.4 | 1.3 | 12.1 | <0.7 |
| TWE1 | 08/03/2025 | 0.55 | 138.2 | 273.1 | 304.0 | <LOD | <LOD | <LOD | <LOD | 9.8 | <LOD | 16.9 | 59.5 | <0.08 | 2.2 | 8.1 | 8.0 | <1.0 |
| WF1 | 02/03/2025 | 0.62 | 52.9 | 91.5 | 102.2 | 5.0 | <LOD | <LOD | 1.2 | <LOD | <LOD | 2.9 | 12.6 | 0.03 | <0.4 | 0.7 | 13.5 | <0.6 |
| BF1 | 05/04/2025 | 0.48 | 70.6 | 118.3 | 146.1 | <LOD | <LOD | <LOD | <LOD | 3.8 | <LOD | 5.9 | 29.6 | <0.03 | 0.7 | 2.0 | 10.3 | <0.4 |
| BF2 | 05/04/2025 | 0.43 | 22.4 | 99.8 | 107.8 | <LOD | <LOD | <LOD | <LOD | 1.7 | 4.1 | 2.1 | 13.5 | <0.05 | 0.4 | 0.8 | 9.7 | 0.5 |
| CR1 | 05/04/2025 | 1.12 | 141.5 | 61.2 | 68.7 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 5.0 | 63.2 | <0.02 | <0.2 | 1.1 | 17.3 | <0.2 |

| Sample code | Sample Date | Diss. Fe | Diss. Mn | Diss. Al | Tot. Al | Diss. As | Diss. Cd | Diss. Cr | Diss. Cu | Diss. Ni | Diss. Pb | Diss. Zn | Bio. Mn | Bioa. Cu | Bioa. Ni | Bioa. Zn | PNEC Pb | Av. Pb |
|-------------|-------------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|----------|---------|----------|----------|----------|---------|--------|
| | | (mg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) |
| DR1 | 06/04/2025 | 0.72 | 213.4 | 84.7 | 112.9 | <LOD | <LOD | <LOD | <LOD | 1.7 | 3.0 | 2.8 | 41.6 | <0.04 | 0.5 | 1.3 | 5.5 | 0.7 |
| EF1 | 05/04/2025 | 0.60 | 112.6 | 53.5 | 57.1 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 28.8 | <0.03 | <0.3 | <0.1 | 9.5 | <0.4 |
| FL1 | 05/04/2025 | 0.93 | 53.3 | 101.5 | 106.7 | <LOD | <LOD | <LOD | 1.4 | <LOD | <LOD | 2.3 | 12.8 | 0.04 | <0.3 | 0.6 | 11.1 | <0.4 |
| GI1 | 05/04/2025 | 0.55 | 55.4 | 81.5 | 87.3 | <LOD | <LOD | <LOD | <LOD | 0.5 | <LOD | 11.8 | 13.8 | <0.03 | 0.1 | 3.7 | 10.2 | <0.4 |
| GO1 | 05/04/2025 | 0.23 | 22.1 | 63.3 | 75.5 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 1.3 | 22.1 | <0.03 | <0.2 | 0.3 | 14.4 | <0.3 |
| GR1 | 05/04/2025 | 0.84 | 64.4 | 69.5 | 79.2 | <LOD | <LOD | <LOD | 1.5 | <LOD | 9.0 | 2.5 | 23.3 | 0.03 | <0.2 | 0.4 | 20.6 | 0.5 |
| KI1 | 05/04/2025 | 1.12 | 190.7 | 75.8 | 93.5 | <LOD | <LOD | <LOD | 1.0 | <LOD | <LOD | <LOD | 39.8 | 0.03 | <0.3 | <0.1 | 10.8 | <0.4 |
| LA1 | 05/04/2025 | 0.39 | 52.8 | 59.3 | 68.7 | <LOD | <LOD | <LOD | <LOD | <LOD | 3.6 | 1.7 | 18.6 | <0.02 | <0.2 | 0.4 | 13.2 | 0.3 |
| LB1 | 05/04/2025 | 0.44 | 40.7 | 67.5 | 78.4 | <LOD | <LOD | <LOD | 2.2 | <LOD | <LOD | 1.8 | 18.6 | 0.07 | <0.3 | 0.6 | 9.8 | <0.4 |
| LM1 | 05/04/2025 | 0.27 | 38.0 | 95.5 | 116.2 | <LOD | <LOD | <LOD | 2.0 | 4.0 | <LOD | 8.2 | 16.3 | 0.13 | 0.9 | 3.3 | 9.1 | <0.4 |
| LU1 | 05/04/2025 | 0.67 | 533.8 | 252.7 | 447.3 | <LOD | <LOD | <LOD | 1.3 | 22.3 | <LOD | 29.8 | 111.4 | 0.10 | 5.0 | 14.1 | 7.3 | <0.5 |
| LU2 | 05/04/2025 | 0.50 | 622.9 | 269.7 | 541.4 | <LOD | <LOD | <LOD | 2.5 | 25.5 | <LOD | 37.4 | 128.7 | 0.30 | 5.8 | 19.6 | 6.8 | <0.5 |
| RB2 | 05/04/2025 | 0.47 | 1065.9 | 356.6 | 839.1 | <LOD | <LOD | <LOD | 2.9 | 51.0 | 5.1 | 67.6 | 155.5 | 0.45 | 11.0 | 40.5 | 4.3 | 1.4 |
| MA1 | 05/04/2025 | 0.65 | 55.3 | 105.3 | 119.9 | <LOD | <LOD | <LOD | <LOD | 2.8 | 6.6 | 3.5 | 30.7 | <0.04 | 0.5 | 1.2 | 10.5 | 0.8 |
| PW1 | 05/04/2025 | 0.51 | 30.1 | 83.2 | 94.4 | <LOD | <LOD | <LOD | 1.3 | <LOD | <LOD | 1.5 | 6.4 | 0.03 | <0.3 | 0.4 | 10.7 | <0.4 |
| PW2 | 05/04/2025 | 0.34 | 44.8 | 88.9 | 98.9 | <LOD | <LOD | <LOD | 2.3 | <LOD | 4.0 | 1.6 | 10.0 | 0.06 | <0.3 | 0.5 | 11.1 | 0.4 |
| QU1 | 05/04/2025 | 1.40 | 146.9 | 76.6 | 90.5 | <LOD | <LOD | <LOD | 1.8 | 0.8 | 3.0 | 2.6 | 60.7 | 0.04 | 0.1 | 0.6 | 14.1 | 0.3 |
| SA1 | 05/04/2025 | 0.62 | 67.1 | 56.2 | 80.2 | <LOD | <LOD | <LOD | 2.4 | 0.7 | <LOD | <LOD | 26.0 | 0.09 | 0.2 | <0.1 | 7.0 | <0.5 |
| SE1 | 05/04/2025 | 0.46 | 25.2 | 57.1 | 63.3 | <LOD | <LOD | <LOD | 1.1 | <LOD | <LOD | <LOD | 7.9 | 0.02 | <0.2 | <0.1 | 14.2 | <0.3 |
| WE1 | 05/04/2025 | 0.97 | 72.4 | 100.6 | 117.9 | <LOD | <LOD | <LOD | 1.5 | 1.3 | <LOD | 2.1 | 15.7 | 0.04 | 0.3 | 0.7 | 9.4 | <0.4 |
| WE2 | 06/04/2025 | 0.93 | 46.0 | 114.9 | 128.8 | <LOD | <LOD | 0.6 | 1.5 | 1.1 | <LOD | 1.7 | 38.3 | 0.05 | 0.3 | 0.5 | 9.1 | <0.4 |
| WE3 | 06/04/2025 | 1.12 | 134.6 | 111.4 | 126.6 | <LOD | <LOD | <LOD | 2.1 | 1.2 | <LOD | 3.1 | 27.5 | 0.06 | 0.3 | 1.0 | 9.9 | <0.4 |
| WE4 | 06/04/2025 | 1.10 | 146.1 | 126.8 | 143.3 | <LOD | <LOD | <LOD | 2.7 | 1.8 | <LOD | 4.5 | 37.1 | 0.11 | 0.4 | 1.8 | 8.2 | <0.5 |
| WE5 | 06/04/2025 | 0.92 | 169.6 | 99.5 | 115.7 | <LOD | <LOD | 0.6 | <LOD | <LOD | <LOD | 2.9 | 44.7 | <0.03 | <0.3 | 1.1 | 8.9 | <0.4 |
| TWE1 | 06/04/2025 | 1.16 | 213.4 | 162.4 | 204.4 | <LOD | <LOD | <LOD | 1.3 | 5.9 | 3.2 | 10.0 | 50.1 | 0.04 | 1.3 | 3.3 | 9.3 | 0.4 |
| WF1 | 05/04/2025 | 0.32 | 14.8 | 98.2 | 759.8 | <LOD | <LOD | <LOD | 2.8 | 0.6 | <LOD | 3.9 | 7.6 | 0.26 | 0.1 | 1.8 | 9.3 | <0.4 |
| BF1 | 11/05/2025 | 1.08 | 52.8 | 77.4 | 90.9 | <LOD | <LOD | - | <LOD | 2.8 | <LOD | 3.2 | 17.6 | <0.06 | 0.5 | 0.9 | 11.5 | <0.3 |
| BF2 | 11/05/2025 | 0.94 | 17.4 | 56.4 | 61.1 | <LOD | <LOD | - | <LOD | 1.4 | <LOD | 3.5 | 6.3 | <0.09 | 0.3 | 1.4 | 8.6 | <0.4 |
| CR1 | 11/05/2025 | 1.42 | 286.1 | 65.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DR1 | 10/05/2025 | 1.37 | 263.4 | 89.6 | 108.5 | <LOD | <LOD | - | <LOD | 3.4 | <LOD | 2.9 | 85.9 | <0.08 | 1.1 | 1.1 | 6.8 | <0.6 |
| FL1 | 11/05/2025 | 1.10 | 78.2 | 88.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LB1 | 11/05/2025 | 0.53 | 21.4 | 61.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LM1 | 11/05/2025 | 0.23 | 23.1 | 58.7 | 77.2 | <LOD | <LOD | - | <LOD | 2.5 | <LOD | 5.1 | 8.3 | <0.16 | 0.6 | 2.5 | 7.2 | <0.5 |
| LU1 | 11/05/2025 | 1.63 | 341.1 | 131.6 | 183.9 | <LOD | <LOD | - | 2.5 | 9.1 | <LOD | 8.7 | 78.2 | 0.10 | 1.6 | 2.7 | 12.7 | <0.3 |
| LU2 | 11/05/2025 | 0.98 | 393.2 | 109.4 | 197.4 | <LOD | <LOD | - | <LOD | 10.5 | <LOD | 9.6 | 89.1 | <0.10 | 2.3 | 3.7 | 9.0 | <0.4 |
| RB2 | 11/05/2025 | 1.42 | 624.9 | 146.9 | 253.6 | <LOD | <LOD | - | <LOD | 21.1 | <LOD | 15.5 | 108.2 | <0.07 | 4.5 | 5.3 | 10.1 | <0.4 |

| Sample code | Sample Date | Diss. Fe | Diss. Mn | Diss. Al | Tot. Al | Diss. As | Diss. Cd | Diss. Cr | Diss. Cu | Diss. Ni | Diss. Pb | Diss. Zn | Bio. Mn | Bioa. Cu | Bioa. Ni | Bioa. Zn | PNEC Pb | Av. Pb |
|------------------|-------------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|----------|---------|----------|----------|----------|---------|--------|
| | | (mg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) |
| MA1 | 11/05/2025 | 0.97 | 21.0 | 68.1 | 86.1 | <LOD | 0.51 | - | <LOD | 2.3 | <LOD | 2.9 | 8.0 | <0.08 | 0.5 | 1.0 | 10.2 | <0.4 |
| QU1 | 11/05/2025 | 3.53 | 431.8 | 79.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SE1 | 11/05/2025 | 0.66 | 34.9 | 42.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| WE1 | 10/05/2025 | 1.44 | 48.7 | 90.4 | 91.8 | <LOD | <LOD | - | <LOD | 2.5 | <LOD | 2.9 | 23.6 | <0.06 | 0.7 | 0.8 | 9.5 | <0.4 |
| WE2 | 10/05/2025 | 0.93 | 21.8 | 93.1 | 108.1 | <LOD | <LOD | - | <LOD | 1.9 | <LOD | 1.3 | 21.8 | <0.09 | 0.7 | 0.4 | 9.9 | <0.4 |
| WE3 | 10/05/2025 | 1.19 | 133.9 | 88.9 | 119.8 | <LOD | <LOD | - | <LOD | 1.7 | <LOD | 1.8 | 29.4 | <0.08 | 0.5 | 0.7 | 7.6 | <0.5 |
| WE4 | 10/05/2025 | 1.22 | 159.1 | 108.3 | 140.5 | <LOD | <LOD | - | <LOD | 2.0 | 4.2 | 3.6 | 35.7 | <0.06 | 0.4 | 1.1 | 11.4 | <0.5 |
| WE5 | 10/05/2025 | 0.92 | 198.2 | 86.9 | 132.7 | <LOD | <LOD | - | <LOD | 1.9 | <LOD | 2.4 | 42.7 | <0.09 | 0.4 | 0.9 | 8.4 | <0.5 |
| TWE1 | 10/05/2025 | 1.97 | 244.4 | 156.8 | 199.3 | <LOD | <LOD | - | <LOD | 6.4 | <LOD | 5.4 | 53.6 | <0.05 | 1.2 | 1.4 | 12.5 | <0.3 |
| WF1 | 10/05/2025 | 1.25 | 83.8 | 73.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | | | | | | | | | | | | | | | | |
| Detection limits | March 2025 | 0.004 | 0.3 | 0.8 | 0.2 | 2.3 | 0.66 | 0.5 | 0.7 | 1.9 | 6.2 | 0.7 | | | | | | |
| | April 2025 | 0.001 | 0.2 | 2.3 | 2.6 | 7.1 | 0.99 | 0.6 | 0.8 | 0.5 | 2.9 | 1.1 | | | | | | |
| | May 2025 | 0.002 | 0.2 | 4.8 | 3.7 | 12.8 | 0.49 | | 2.0 | 0.2 | 2.9 | 0.5 | | | | | | |

Table 3. Results of field measurements taken from the routine loch sample locations on the 26th and 27th of April 2025. Abbreviations are the same as those used in Table 1. Control lochs are highlighted in lilac. Concentrations of a determinand that are below the minimum recorded during the extended baseline monitoring period they are highlighted in blue and those above the maximum for the same baseline data are highlighted in yellow. nd = not determined

| Water-body | Site code | easting | northing | Date sampled | Time | sampler | level | wind direction | waves | Sample location | pH | EC | Temp | Turb | odour | Suspended solids | Signs of oil | notes |
|---------------------|-----------|---------|----------|--------------|-------|---------|----------|----------------|-------|-----------------------|-----|-----|------|------|-------|------------------|--------------|---------------------------------------|
| Lamba Water | LB1L | 438199 | 1155683 | 27/04/2025 | 11:30 | RF | Low | SW | No | SW bank | 6.4 | 127 | 10.7 | 0.00 | None | None | None | |
| | LB2L | 437888 | 1156055 | 27/04/2025 | 11:45 | RF | Low | SW | No | NW corner outflow | 6.6 | 124 | 10.6 | 0.00 | None | None | None | |
| Maa Water | MAA1L | 437997 | 1154961 | 27/04/2025 | 12:45 | RF | Low | SW | No | SE corner inflow | 6.5 | 115 | 12.3 | 0.00 | None | None | None | |
| | MAA2L | 437441 | 1155090 | 27/04/2025 | 14:05 | RF | Low | SW | No | SW corner outflow | 6.3 | 114 | 10.7 | 0.00 | None | None | None | |
| Truggles Water | TR1L | 437191 | 1154457 | 27/04/2025 | 13:30 | RF | Low | SW | Yes | SE corner inflow | 5.8 | 120 | 11.2 | 0.47 | None | None | None | Waves breaking. Foam on shoreline |
| | TR2L | 437053 | 1154430 | 27/04/2025 | 13:15 | RF | Low | SW | No | SW corner outflow | 6.6 | 121 | 12.9 | 0.02 | None | None | None | |
| Petta Water | PE1L | 441574 | 1159374 | 26/04/2025 | 15:30 | JC | moderate | S | Yes | Inflow area | 7.0 | 180 | 9.5 | 1.83 | none | none | none | Medium waves |
| | PE2L | 441608 | 1158847 | 26/04/2025 | 15:06 | JC | moderate | S | Yes | Outflow area | 6.9 | 160 | 9.5 | 0.80 | none | none | none | calm |
| Sand Water | SA1L | 441249 | 1154978 | 27/04/2025 | 14:55 | RF | Low | SW | Yes | NW inflow | 6.9 | 200 | 16.2 | 0.00 | None | None | None | Waves not breaking |
| | SA2L | 441478 | 1155153 | 27/04/2025 | 15:10 | RF | Low | SW | Yes | N shore inflow | 6.6 | 221 | 14.3 | 0.00 | None | None | None | Waves not breaking. Foam on shoreline |
| | SA3L | 441556 | 1155108 | 27/04/2025 | 15:25 | RF | Low | SW | Yes | NE shore minor inflow | 6.9 | 201 | 13.1 | 2.55 | None | None | None | Waves breaking. Foam on shoreline |
| | SA4L | 441652 | 1154540 | 27/04/2025 | 16:05 | RF | Low | SW | No | Longa Ness | 7.7 | 131 | 15.0 | 7.76 | None | None | None | |
| Loch of Skell-ister | SK1L | 445816 | 1156440 | 27/04/2025 | 11:20 | JC | moderate | SW | Yes | Inflow area | 6.4 | 140 | 11.0 | 0.97 | none | yes | none | Small waves, otter spraint |
| | SK2L | 446198 | 1155995 | 27/04/2025 | 11:51 | JC | moderate | SW | Yes | Outflow area | 6.7 | 130 | 10.5 | 0.92 | none | yes | none | Small waves |
| Gossa Water | GO1L | 443534 | 1160432 | 27/04/2025 | 10:10 | RF | Low | SW | Yes | SW corner inflow | 6.5 | 114 | 10.0 | 0.86 | None | None | None | Waves not breaking |
| | GO2L | 443451 | 1160888 | 27/04/2025 | 09:45 | RF | Low | SW | Yes | NW corner outflow | 6.9 | 104 | 10.3 | 1.74 | None | None | None | Waves not breaking |
| Loch of Benston | BE1L | 445737 | 1153373 | 27/04/2025 | 12:32 | JC | moderate | SW | calm | Inflow area | 6.8 | 270 | 11.0 | 1.19 | none | none | none | |
| | BE2L | 446632 | 1153710 | 27/04/2025 | 12:55 | JC | moderate | SW | Yes | Outflow area | 6.7 | 260 | 12.0 | 1.43 | none | yes | none | Medium waves |
| Smerla Water | SM1L | 438199 | 1160459 | 26/04/2025 | 10:55 | JC | moderate | s | calm | Inflow area | 6.1 | 130 | 9.0 | 0.85 | none | none | none | |
| | SM2L | 430866 | 1160563 | 26/04/2025 | 11:17 | JC | moderate | S | calm | Outflow area | 6.3 | 110 | 9.0 | 0.60 | none | none | none | |
| Laxo Water | LA1L | 444181 | 1165208 | 26/04/2025 | 13:29 | JC | moderate | s | calm | Inflow area | 6.6 | 120 | 10.0 | 0.99 | none | none | none | |
| | LA2L | 444379 | 1164654 | 26/04/2025 | 13:57 | JC | moderate | S | calm | Outflow area | 6.7 | 120 | 10.0 | 1.03 | none | none | none | |

Table 4. The results of all the laboratory analysis of the water samples collected on the 26th and 27th of April 2025 from the routine loch sample locations within the Viking Energy Wind Farm and the control lochs. Concentrations that exceed the appropriate trigger threshold values are in bold red. Control sites are highlighted in pink. Concentrations of determinands outside the range of values recorded during the baseline monitoring period are highlighted in various colours. Cells highlighted in blue are below the minimum whilst cells highlighted in yellow are above the maximum. Abbreviations are the same as those used in Table 2.

| Date sampled | Date received | Report due | Loch | Sample code | Acidity | EC | Gran Alkalinity | | DOC | ANC | TSS | Turb. | TAN | TON | SRP | TP | Diss. Na | Diss. Ca | Tot. Ca |
|--------------|---------------|------------|--------------------|-------------|---------|---------|-----------------|---------------------------|--------|---------|--------|-------|----------|----------|--------|--------|----------|----------|---------|
| | | | | | pH | (µS/cm) | (µeq/L) | (mg CaCO ₃ /L) | (mg/L) | (µeq/L) | (mg/L) | NTU | (µg N/L) | (µg P/L) | (mg/L) | (mg/L) | (mg/L) | | |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Lamba Water | LB1L | 5.6 | 138 | 24 | 1.2 | 5.6 | 52 | 1.3 | 1.9 | 4 | 30 | <LOD | 3 | 15.88 | 4.80 | 4.79 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | LB2L | 5.6 | 129 | 23 | 1.2 | 5.3 | 49 | 1.2 | 1.7 | <LOD | 27 | <LOD | 10 | 15.83 | 4.54 | 4.68 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Maa Water | MAA1L | 5.9 | 119 | 40 | 2.0 | 6.3 | 71 | 1.6 | 1.9 | <LOD | 126 | <LOD | <LOD | 15.25 | 3.77 | 4.03 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | MAA2L | 5.9 | 119 | 36 | 1.8 | 5.9 | 66 | 0.5 | 1.3 | <LOD | 132 | <LOD | <LOD | 15.25 | 3.87 | 4.02 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Truggles Water | TR1L | 6.1 | 146 | 72 | 3.6 | 6.3 | 104 | 12.1 | 6.0 | <LOD | 6 | <LOD | <LOD | 15.94 | 4.36 | 4.41 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | TR2L | 6.2 | 130 | 64 | 3.2 | 6.4 | 96 | 4.4 | 3.5 | <LOD | <LOD | <LOD | <LOD | 15.98 | 4.10 | 4.51 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | Petta Water | PE1L | 6.7 | 158 | 327 | 16.3 | 7.0 | 361 | 10.3 | 2.9 | <LOD | <LOD | <LOD | 13 | 19.99 | 6.81 | 7.36 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | | PE2L | 6.8 | 148 | 288 | 14.4 | 6.9 | 323 | 1.0 | 1.0 | <LOD | <LOD | <LOD | <LOD | 19.47 | 6.35 | 6.83 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Sand Water | SA1L | 7.2 | 198 | 733 | 36.7 | 7.0 | 768 | 1.6 | 2.2 | <LOD | <LOD | <LOD | 4 | 22.14 | 15.27 | 16.32 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | SA2L | 7.6 | 241 | 930 | 46.5 | 6.6 | 963 | 2.6 | 2.6 | <LOD | 9 | <LOD | 4 | 23.65 | 19.31 | 20.86 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | SA3L | 7.3 | 216 | 782 | 39.1 | 7.3 | 819 | 6.9 | 3.6 | <LOD | <LOD | <LOD | 5 | 22.31 | 15.86 | 17.24 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | SA4L | 7.2 | 219 | 840 | 42.1 | 9.7 | 889 | 28.0 | 18.2 | 4 | <LOD | <LOD | 26 | 22.40 | 16.14 | 17.87 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Loch of Skellister | SK1L | 6.5 | 124 | 86 | 4.3 | 10.4 | 138 | 1.0 | 1.4 | <LOD | 17 | 2 | 9 | 17.67 | 2.37 | 2.45 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | SK2L | 6.4 | 125 | 86 | 4.3 | 12.1 | 147 | 1.2 | 1.5 | <LOD | 31 | 2 | 11 | 17.69 | 2.47 | 2.68 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Gossa Water | GO1L | 6.7 | 116 | 176 | 8.8 | 9.3 | 223 | 1.8 | 2.1 | <LOD | <LOD | <LOD | 6 | 15.73 | 2.92 | 3.10 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | GO2L | 6.8 | 131 | 281 | 14.0 | 10.2 | 331 | 2.3 | 2.5 | <LOD | 20 | 3 | 12 | 16.59 | 4.27 | 4.47 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | Loch of Benston | BE1L | 7.6 | 251 | 1073 | 53.7 | 5.5 | 1100 | 0.8 | 1.6 | 6 | 5 | <LOD | 6 | 25.10 | 19.85 | 20.97 |
| 27/04/2025 | 01/05/2025 | 16/05/2025 | | BE2L | 7.7 | 245 | 1003 | 50.2 | 7.6 | 1041 | 3.6 | 3.0 | 6 | 7 | <LOD | 11 | 24.78 | 18.42 | 19.96 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | Smerla Water | SM1L | 5.9 | 111 | 45 | 2.3 | 7.5 | 83 | 0.6 | 0.9 | <LOD | 53 | <LOD | 6 | 15.40 | 1.54 | 1.72 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | | SM2L | 6.0 | 108 | 39 | 2.0 | 6.7 | 73 | 0.7 | 1.0 | <LOD | 57 | <LOD | 7 | 15.30 | 1.75 | 1.68 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | Laxo Water | LA1L | 6.6 | 120 | 116 | 5.8 | 10.0 | 166 | 1.0 | 1.7 | <LOD | 21 | 2 | <LOD | 16.46 | 2.83 | 2.91 |
| 26/04/2025 | 01/05/2025 | 16/05/2025 | | LA2L | 6.6 | 118 | 99 | 5.0 | 10.6 | 152 | 0.8 | 1.6 | <LOD | 25 | 2 | 6 | 16.42 | 2.66 | 3.02 |
| | | | Detection limits | | n/a | 1.0 | | 0.1 | 0.7 | | 0.1 | 0.1 | 3 | 5 | 1.4 | 3 | 0.004 | 0.03 | 0.2 |
| | | | Accuracy | | 0.01 | 1.0 | 2 | 0.1 | | 2 | | | | | | | | | |

Table 4. continued.

| Loch | Sample code | Diss. Fe | Diss. Mn | Diss. Al | Tot. Al | Diss. As | Diss. Cd | Diss. Cr | Diss. Cu | Diss. Ni | Diss. Pb | Diss. Zn | Bioav. Mn | Bioav. Cu | Bioav. Ni | Bioav. Zn | Avail. Pb |
|--------------------|-------------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|
| | | (mg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) | (µg/L) |
| Lamba Water | LB1L | 0.27 | 52.8 | 104.3 | 120.0 | <LOD | <LOD | <LOD | 2.4 | 5.6 | <LOD | 12.7 | 23.8 | 0.34 | 1.3 | 7.4 | 6.8 |
| | LB2L | 0.24 | 43.2 | 97.9 | 115.9 | <LOD | 0.48 | <LOD | 2.3 | 4.4 | <LOD | 9.6 | 20.1 | 0.34 | 1.1 | 5.9 | 6.3 |
| Maa Water | MAA1L | 0.21 | 29.7 | 109.2 | 129.1 | <LOD | 0.43 | <LOD | <LOD | 4.0 | <LOD | 5.0 | 17.5 | <0.3 | 0.9 | 2.7 | 7.6 |
| | MAA2L | 0.20 | 22.2 | 111.1 | 127.5 | <LOD | <LOD | <LOD | <LOD | 3.7 | <LOD | 4.6 | 12.3 | <0.3 | 0.9 | 2.6 | 7.1 |
| Truggles Water | TR1L | 0.24 | 17.1 | 68.8 | 132.6 | <LOD | 0.48 | <LOD | <LOD | 1.8 | <LOD | 3.1 | 8.3 | <0.3 | 0.4 | 1.6 | 7.6 |
| | TR2L | 0.24 | 14.6 | 68.6 | 94.5 | <LOD | <LOD | <LOD | <LOD | 2.6 | <LOD | 3.0 | 7.5 | <0.3 | 0.6 | 1.5 | 7.7 |
| Petta Water | PE1L | 0.17 | 6.7 | 45.9 | 69.3 | <LOD | <LOD | <LOD | <LOD | 0.5 | <LOD | <LOD | 2.3 | <0.1 | 0.1 | <0.5 | 8.4 |
| | PE2L | 0.11 | 0.8 | 49.9 | 57.1 | 4.1 | <LOD | <LOD | <LOD | 0.9 | <LOD | 1.7 | 0.3 | <0.1 | 0.2 | 0.7 | 8.3 |
| Sand Water | SA1L | 0.29 | 9.4 | 48.5 | 62.7 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 1.8 | 2.0 | <0.1 | <0.2 | 0.6 | 8.4 |
| | SA2L | 0.34 | 10.6 | 60.4 | 76.4 | <LOD | <LOD | <LOD | <LOD | 0.6 | <LOD | 1.4 | 4.9 | <0.1 | 0.2 | 0.5 | 7.9 |
| | SA3L | 0.29 | 1.5 | 44.9 | 75.1 | <LOD | 0.36 | <LOD | 2.2 | 1.0 | <LOD | <LOD | 0.3 | 0.07 | 0.2 | <0.4 | 8.8 |
| | SA4L | 0.42 | 96.9 | 33.7 | 255.0 | <LOD | <LOD | <LOD | <LOD | 0.6 | <LOD | <LOD | 21.8 | <0.1 | 0.1 | <0.4 | 11.7 |
| Loch of Skellister | SK1L | 0.34 | 17.2 | 90.4 | 94.7 | <LOD | <LOD | <LOD | <LOD | 0.7 | <LOD | 2.8 | 17.2 | <0.1 | 0.1 | 0.8 | 12.5 |
| | SK2L | 0.33 | 14.5 | 91.5 | 94.4 | <LOD | <LOD | <LOD | <LOD | 1.0 | <LOD | 3.1 | 14.5 | <0.1 | 0.2 | 0.8 | 14.5 |
| Gossa Water | GO1L | 0.24 | 5.3 | 55.2 | 65.3 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 1.7 | 4.7 | <0.1 | <0.1 | 0.5 | 11.2 |
| | GO2L | 0.43 | 31.8 | 60.4 | 68.3 | <LOD | <LOD | <LOD | <LOD | 1.1 | <LOD | 2.0 | 17.6 | <0.1 | 0.2 | 0.6 | 12.2 |
| Loch of Benston | BE1L | 0.03 | 2.5 | 15.6 | 16.8 | <LOD | <LOD | <LOD | 2.3 | 1.2 | <LOD | <LOD | 1.1 | 0.10 | 0.4 | <0.5 | 6.6 |
| | BE2L | 0.03 | 1.2 | 12.8 | 45.1 | <LOD | <LOD | <LOD | 2.6 | 0.5 | <LOD | <LOD | 0.7 | 0.09 | 0.1 | <0.4 | 9.1 |
| Smerla Water | SM1L | 0.36 | 12.4 | 82.0 | 88.4 | <LOD | <LOD | <LOD | <LOD | <LOD | <LOD | 1.9 | 12.4 | <0.2 | <0.1 | 0.9 | 9.0 |
| | SM2L | 0.23 | 7.2 | 70.9 | 74.2 | <LOD | <LOD | <LOD | <LOD | 1.1 | <LOD | 2.3 | 7.2 | <0.3 | 0.2 | 1.1 | 8.0 |
| Laxo Water | LWL1 | 0.25 | 8.0 | 58.4 | 59.8 | <LOD | <LOD | <LOD | <LOD | 0.8 | <LOD | 2.8 | 8.0 | <0.1 | 0.1 | 0.8 | 12.0 |
| | LWL2 | 0.21 | 7.5 | 56.5 | 63.1 | <LOD | <LOD | <LOD | <LOD | 1.0 | <LOD | 1.5 | 7.5 | <0.1 | 0.2 | 0.4 | 12.8 |
| Detection limits | | 0.0005 | 0.1 | 3.3 | 1.9 | 2.7 | 0.3 | 0.9 | 2.0 | 0.4 | 3.3 | 1.1 | | | | | |

Table 5. Trigger threshold values for physico-chemical variables measured a) in the field, and b) in the laboratory for all watercourses and therefore apply to all sample locations. The criteria for which threshold values were determined are based on The Scotland River Basin District (Standards) Directions 2014 and the full suite of data obtained between April 2019 and March 2020.

a)

| Determinand | units | statistic | trigger threshold | Criteria for threshold |
|-------------------------|---------------------|------------------------|-------------------|---|
| Temperature | °C | 98 th %tile | >20 | 'high' ES threshold for salmonid rivers |
| Dissolved Oxygen | % sat. | any single sample | <65 | 'moderate' ES threshold for salmonid rivers |
| | | 10 th %tile | ≤75 | 'good' ES threshold for salmonid rivers |
| Electrical Conductivity | μS cm ⁻¹ | any sample | >1,000 | level that indicates saline influence |
| Turbidity | NTU | any sample | >68 | Equivalent to a TSS of 80 mg L ⁻¹ |
| acidity | pH | any sample | <4.6 or >8.5 | Values just outside the range (4.8 to 8.0) observed across all the baseline samples |

b)

| Determinand | units | statistic | trigger threshold | Criteria for threshold |
|----------------------------|------------------------|------------------------|--------------------------|---|
| EC | $\mu\text{S cm}^{-1}$ | annual mean | >400 | Just above the baseline maximum |
| Total Suspended Solids | mg L^{-1} | any sample | >100 | Just above the baseline maximum |
| Dissolved Organic Carbon | mg L^{-1} | any sample | >40 | Just above the baseline maximum |
| Acidity | pH | annual mean | humic <4.6 clear <6.0 | 'good' EQS threshold for salmonid rivers |
| Acid Neutralising Capacity | $\mu\text{eq. L}^{-1}$ | annual mean | humic <50 clear <40 | 'good' EQS threshold for salmonid rivers |
| ammonium-nitrogen (total) | $\mu\text{g N L}^{-1}$ | any sample | >700 | The 'good' EQS thresholds for river types 1, 2, 4 and 6 |
| | | 90 th %tile | >300 | |
| Total Oxidised Nitrogen | $\mu\text{g N L}^{-1}$ | any sample | >200 | Above the baseline maximum |
| bioavailable manganese | $\mu\text{g L}^{-1}$ | any sample | >500 | Above the baseline maximum |
| | | annual mean | >123* | 'good' EQS threshold |
| dissolved arsenic | $\mu\text{g L}^{-1}$ | annual mean | >50 | 'good' EQS threshold |
| dissolved cadmium | $\mu\text{g L}^{-1}$ | any sample | >0.45 | The 'good' EQS thresholds for hardness Class 1 (<40 $\text{mg CaCO}_3/\text{L}$) |
| | | annual mean | >0.08 | |
| dissolved chromium | $\mu\text{g L}^{-1}$ | annual mean | >4.7 | 'good' EQS threshold |
| bioavailable copper | $\mu\text{g L}^{-1}$ | annual mean | >1 | 'good' EQS threshold |
| dissolved nickel | $\mu\text{g L}^{-1}$ | any sample | >34 | 'good' EQS threshold |
| bioavailable nickel | | annual mean | >4 | 'good' EQS threshold |
| available lead | $\mu\text{g L}^{-1}$ | any sample | >14 | Just above the baseline maximum |
| | | annual mean | >1.2 | 'good' EQS threshold |
| dissolved zinc | $\mu\text{g L}^{-1}$ | any sample | >15 | Just above the baseline maximum |
| bioavailable zinc | | annual mean | >10.9 | 'good' ES threshold |

Table 6. The sample location specific trigger threshold values for particular determinands for each of the various watercourses/sample locations.

| determinand | Alkalinity | ANC | SRP | TP | diss. Na | diss. Ca | diss. Fe | diss. Al |
|-----------------|------------------------|------------------------|------------------------|------------|--------------------|--------------------|--------------------|----------------------|
| Units | $\mu\text{eq. L}^{-1}$ | $\mu\text{eq. L}^{-1}$ | $\mu\text{g P L}^{-1}$ | | mg L^{-1} | mg L^{-1} | mg L^{-1} | $\mu\text{g L}^{-1}$ |
| statistic | any sample | | mean | any sample | | | | |
| BF1 & BF2 | - | <1 | >13 | >50 | >25 | >6 | >2.0 | >250 |
| CR1 | <1 | <10 | >19 | >30 | >35 | >18 | >2.6 | >300 |
| DR1 | <10 | <100 | >19 | >50 | >25 | >25 | >2.6 | >350 |
| EF1 | - | <10 | >19 | >50 | >28 | >25 | >1.0 | >350 |
| FL1 | - | <1 | >14 | >50 | >28 | >10 | >1.5 | >400 |
| GI1 | - | <1 | >18 | >50 | >28 | >15 | >1.2 | >300 |
| GO1 | <1 | <10 | >13 | >75 | >25 | >6 | >0.8 | >250 |
| GR1 | <1 | <10 | >17 | >30 | >25 | >15 | >2.2 | >300 |
| KI1 | <10 | <10 | >19 | >100 | >25 | >25 | >2.6 | >300 |
| LA1 | <1 | <10 | >17 | >50 | >28 | >15 | >1.0 | >200 |
| LM1 | - | <10 | >13 | >50 | >25 | >6 | >1.6 | >200 |
| LU1 | - | <10 | >13 | >50 | >25 | >10 | >3.5 | >350 |
| MA1 | - | <10 | >13 | >50 | >28 | >10 | >2.0 | >300 |
| PW1 & PW2 | <10 | <100 | >20 | >40 | >28 | >30 | >1.0 | >300 |
| QU1 | <1 | <10 | >15 | >30 | >30 | >12 | >4.0 | >300 |
| WE1, WE2, W3 | <10 | <100 | >24 | >50 | >25 | >30 | >4.0 | >400 |
| WE4 | <10 | <10 | >16 | >30 | >25 | >25 | >4.0 | >400 |
| WF1 | <10 | <10 | >21 | >50 | >35 | >35 | >2.0 | >350 |

Table 7. Trigger threshold values for the physico-chemical variables measured (a) in the field, and (b) in the laboratory for all lochs. The criteria for which threshold values were determined are based on The Scotland River Basin District (Standards) Directions 2014 and the full suite of data obtained between the 17th May 2019 and 25th February 2021.

(a)

| Determinand | units | statistic | trigger threshold | Criteria for threshold |
|-------------------------|---------------------|---------------|-------------------|--|
| Dissolved Oxygen | mg L ⁻¹ | July & August | <7 | 'moderate' ES threshold for salmonid lochs |
| Electrical Conductivity | µS cm ⁻¹ | any sample | >1,000 | level that indicates saline influence |
| Turbidity | NTU | any sample | >68 | Equivalent to an estimated TSS of 80 mg/L |
| Acidity | pH | any sample | <4.5 | Below the minima for Lamba Water, Loch of Skellister, Maa Water and Truggles Water |
| | | | <5.0 | Below the baseline minimum for Petta Water and Gossa Water |
| | | | <5.5 | Below the baseline minimum for Sand Water |

(b)

| Determinand | units | statistic | trigger threshold | Criteria for threshold |
|----------------------------|------------------------|------------------------|-------------------|--|
| EC | $\mu\text{S cm}^{-1}$ | annual mean | >500 | Just above the baseline maximum |
| Total Suspended Solids | mg L^{-1} | any sample | >100 | Just above the baseline maximum |
| Dissolved Organic Carbon | mg L^{-1} | any sample | >40 | Just above the baseline maximum |
| Alkalinity | $\mu\text{eq. L}^{-1}$ | any sample | <0 | Just below the baseline minimum |
| Acid Neutralising Capacity | $\mu\text{eq. L}^{-1}$ | annual mean | <20 | 'good' EQS threshold for salmonid lochs |
| ammonium-Nitrogen (total) | $\mu\text{g N L}^{-1}$ | any sample | >700 | The same standard as that used for watercourses |
| | | 90 th %tile | >300 | The 'good' ES for low alkalinity lochs |
| Total Oxidised Nitrogen | $\mu\text{g N L}^{-1}$ | any sample | >200 | Just above the baseline maximum |
| Soluble Reactive Phosphate | $\mu\text{g P L}^{-1}$ | any sample | >25 | Just above the baseline maximum |
| dissolved iron | mg L^{-1} | any sample | >2.0 | Just above the baseline maximum |
| | | annual mean | >1.0 | 'good' ES threshold for lochs |
| bioavailable manganese | $\mu\text{g L}^{-1}$ | annual mean | >123 | 'good' ES threshold for lochs |
| dissolved aluminium | $\mu\text{g L}^{-1}$ | any sample | >400 | Just above the baseline maximum |
| dissolved arsenic | $\mu\text{g L}^{-1}$ | annual mean | >50 | 'good' ES threshold for lochs |
| dissolved cadmium | $\mu\text{g L}^{-1}$ | any sample | >0.45 | 'good' ES threshold for hardness class 1 (<40 mg CaCO ₃ /L) |
| | | annual mean | >0.08 | |
| dissolved chromium | $\mu\text{g L}^{-1}$ | annual mean | >4.7 | 'good' ES threshold for lochs |
| bioavailable copper | $\mu\text{g L}^{-1}$ | annual mean | >1 | 'good' ES threshold for lochs |
| bioavailable nickel | $\mu\text{g L}^{-1}$ | annual mean | >20 | 'good' ES threshold for lochs |
| bioavailable lead | $\mu\text{g L}^{-1}$ | any sample | >14 | 'good' ES threshold for lochs |
| | | annual mean | >1.2 | |
| bioavailable zinc | $\mu\text{g L}^{-1}$ | annual mean | >10.9 | 'good' ES threshold for lochs |

Table 8. The sample location specific trigger threshold values for particular determinands for each of the lochs. The criteria for which threshold values were determined are based on a full suite of data obtained between May 2019 and January 2021, and The Scotland River Basin District (Standards) Directions 2014.

| determinand | Acidity | Total Phosphorus | dissolved sodium | dissolved calcium |
|--------------------|-------------|----------------------|--------------------|--------------------|
| Units | pH (lab) | µg P L ⁻¹ | mg L ⁻¹ | mg L ⁻¹ |
| statistic | annual mean | | any sample | |
| Gossa Water | <5.9 | >13 | >25 | >4.0 |
| Lamba Water | <5.3 | >7 | >25 | >2.5 |
| Loch of Skellister | <6.0 | >13 | >30 | >4.0 |
| Maa Water | <5.4 | >9 | >25 | >2.5 |
| Petta Water | <6.2 | >17 | >30 | >20.0 |
| Sand Water | <6.4 | >20 | >35 | >35.0 |
| Truggles Water | <5.7 | >10 | >25 | >4.0 |

10. FIGURES

Figure 2. The changes in the laboratory determinations of pH (proton concentration) at the various routine watercourse sample locations draining the Scallafield Scord area and one control (LB1) since January 2024.

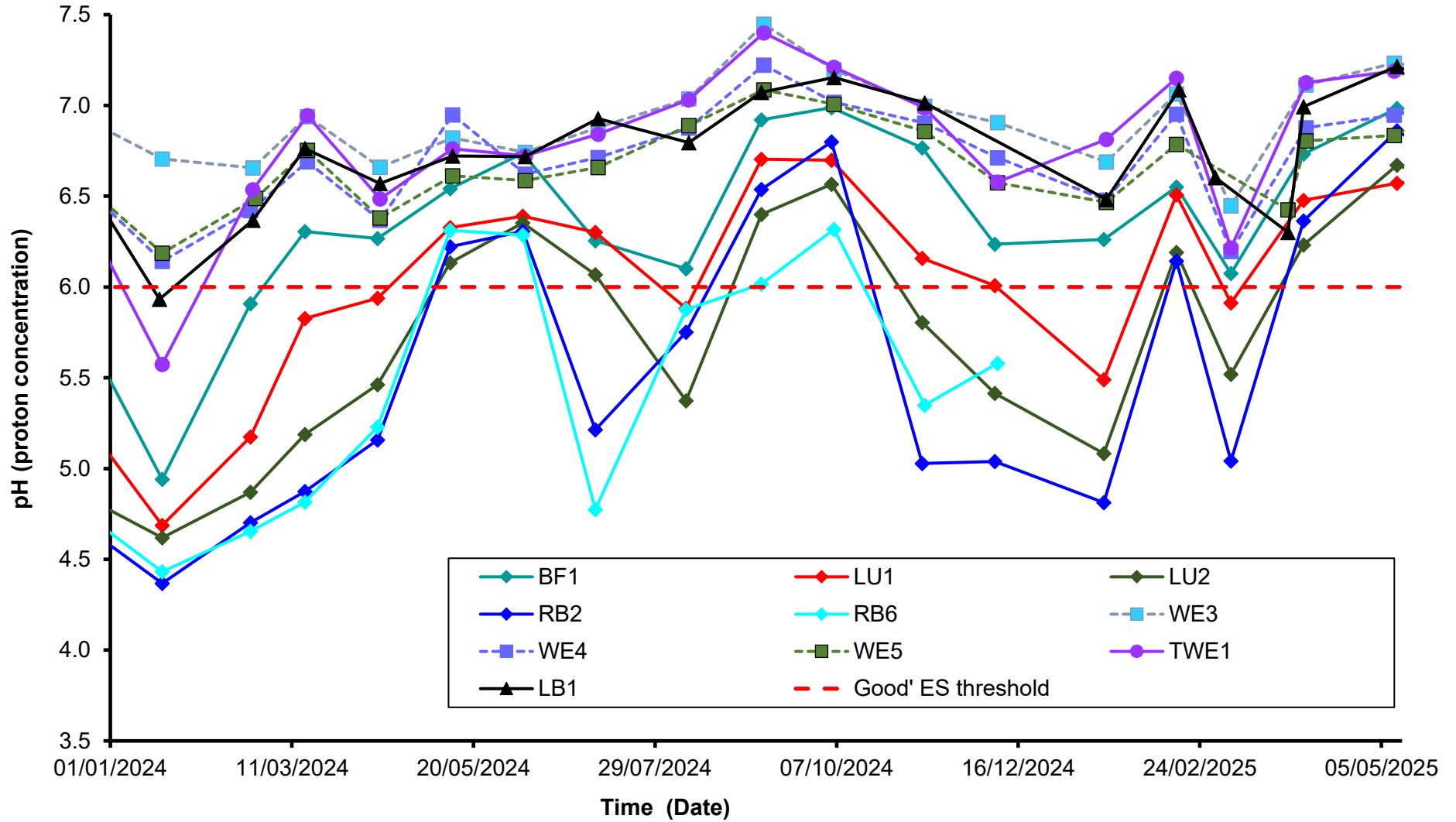


Figure 3. The changes in TON (nitrate + nitrite) concentrations in Maa Water (MAA1L and MAA2L), Truggles Water (TR1L and TR2L) and the Burn of Burrarfirth at sample locations BF1 and BF2 since January 2022.

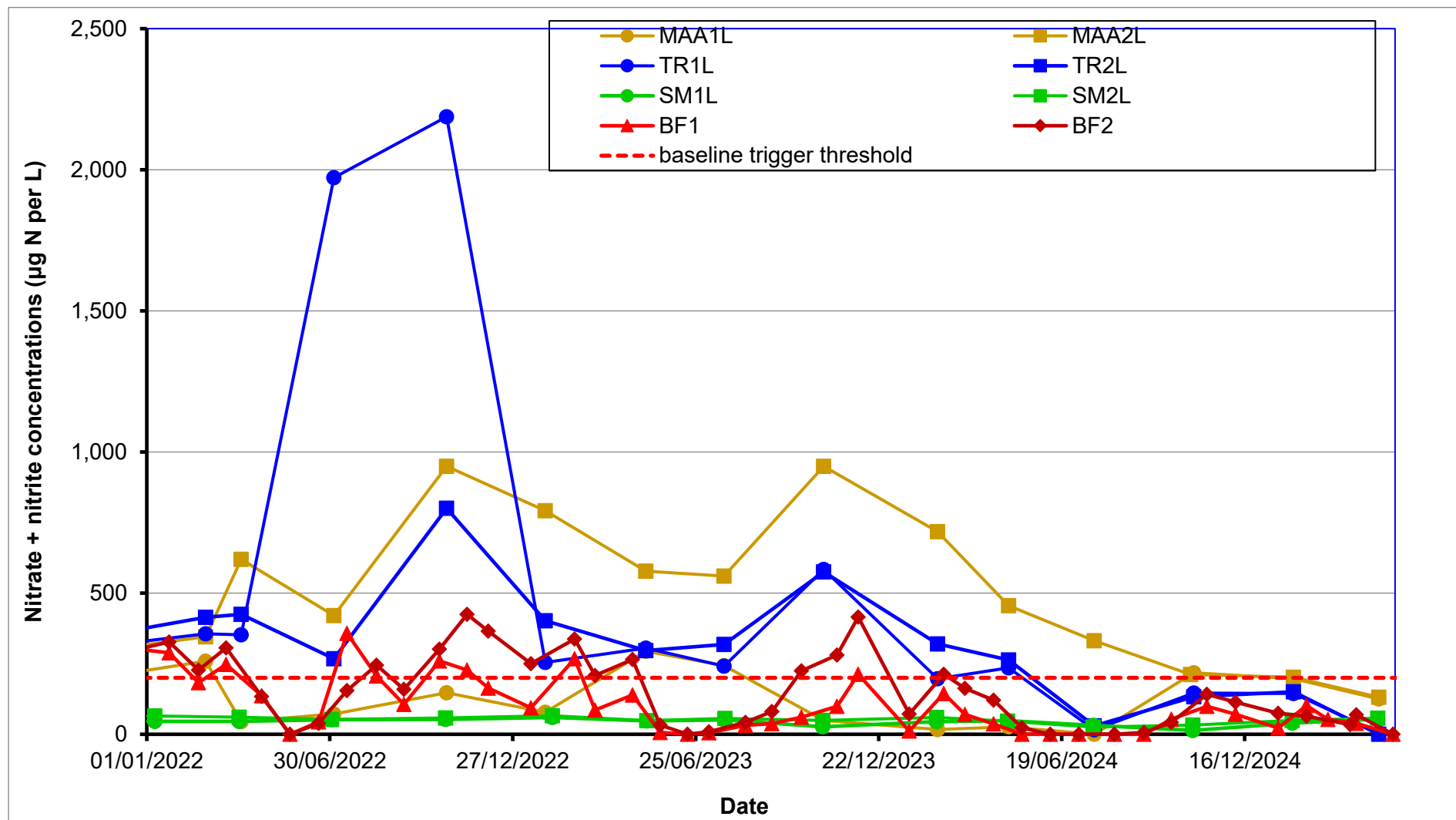


Figure 4. The changes in the concentration of bioavailable manganese in the watercourses draining the Scallafield Scord area and one control (LB1) since March 2023.

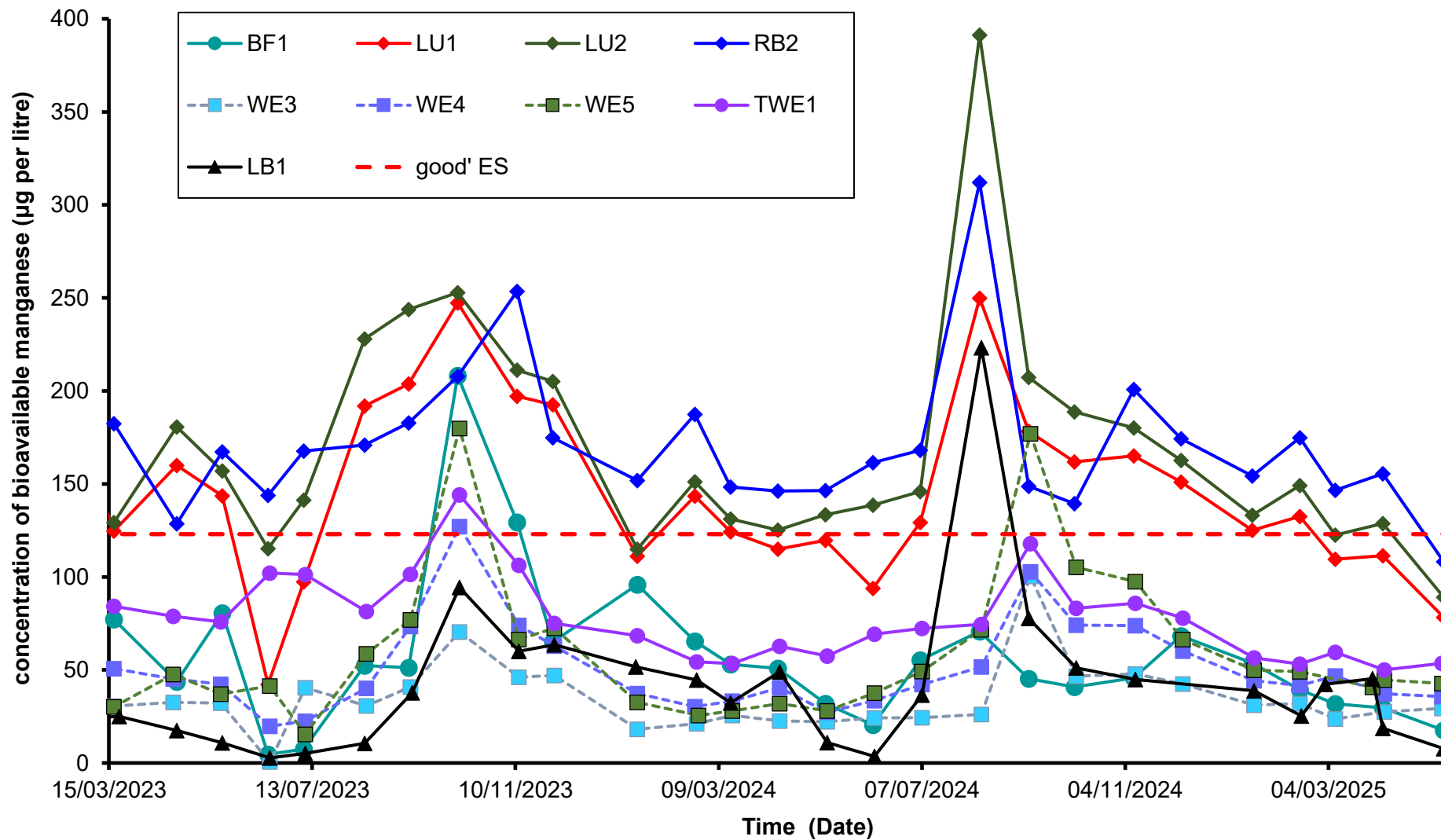
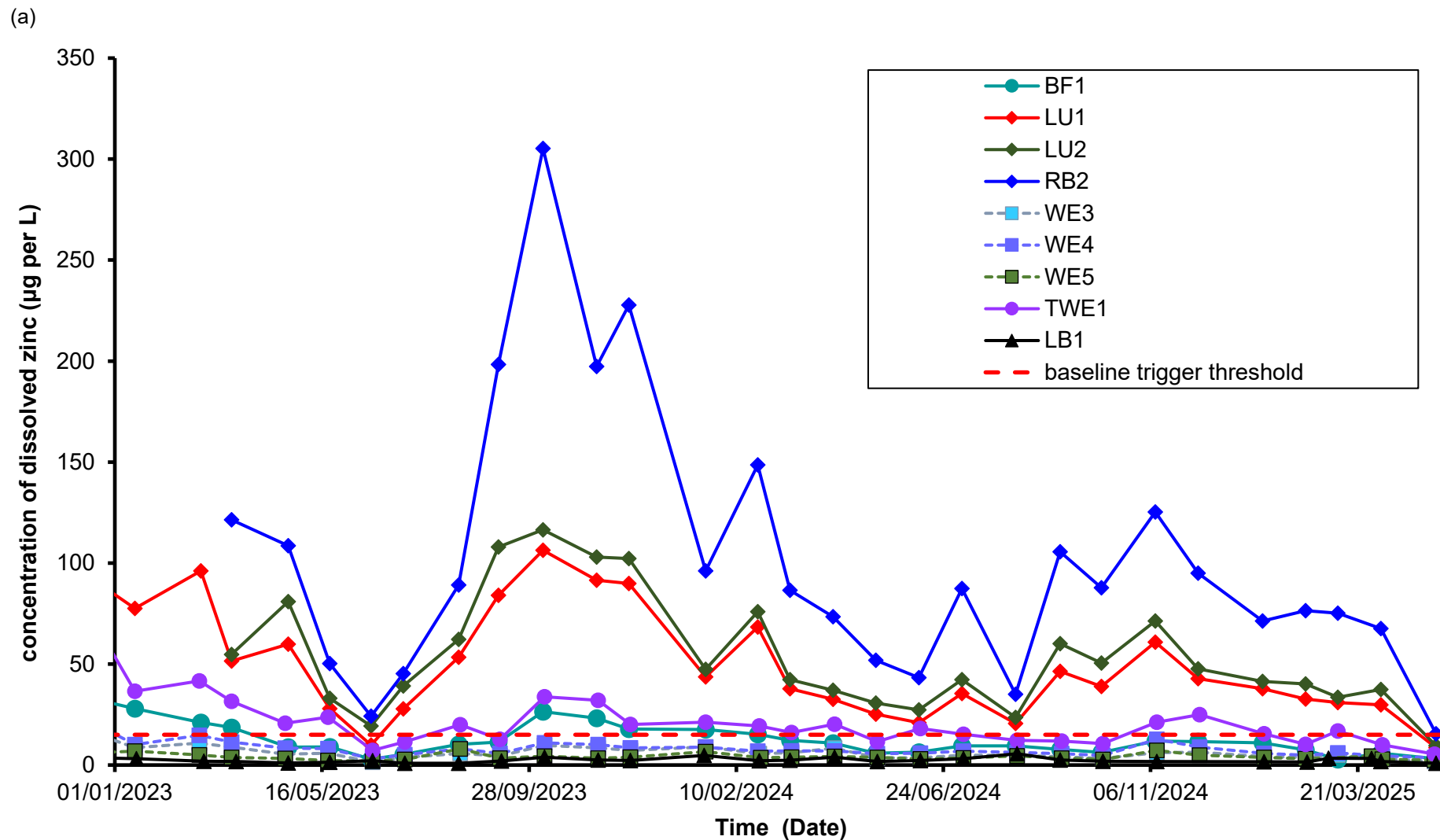


Figure 5. The changes in concentration of (a), dissolved and (b), bioavailable zinc (μg per litre) of the various 'impacted' watercourses draining the Scallfield Scord area and one control (LB1) since January 2023.



(b)

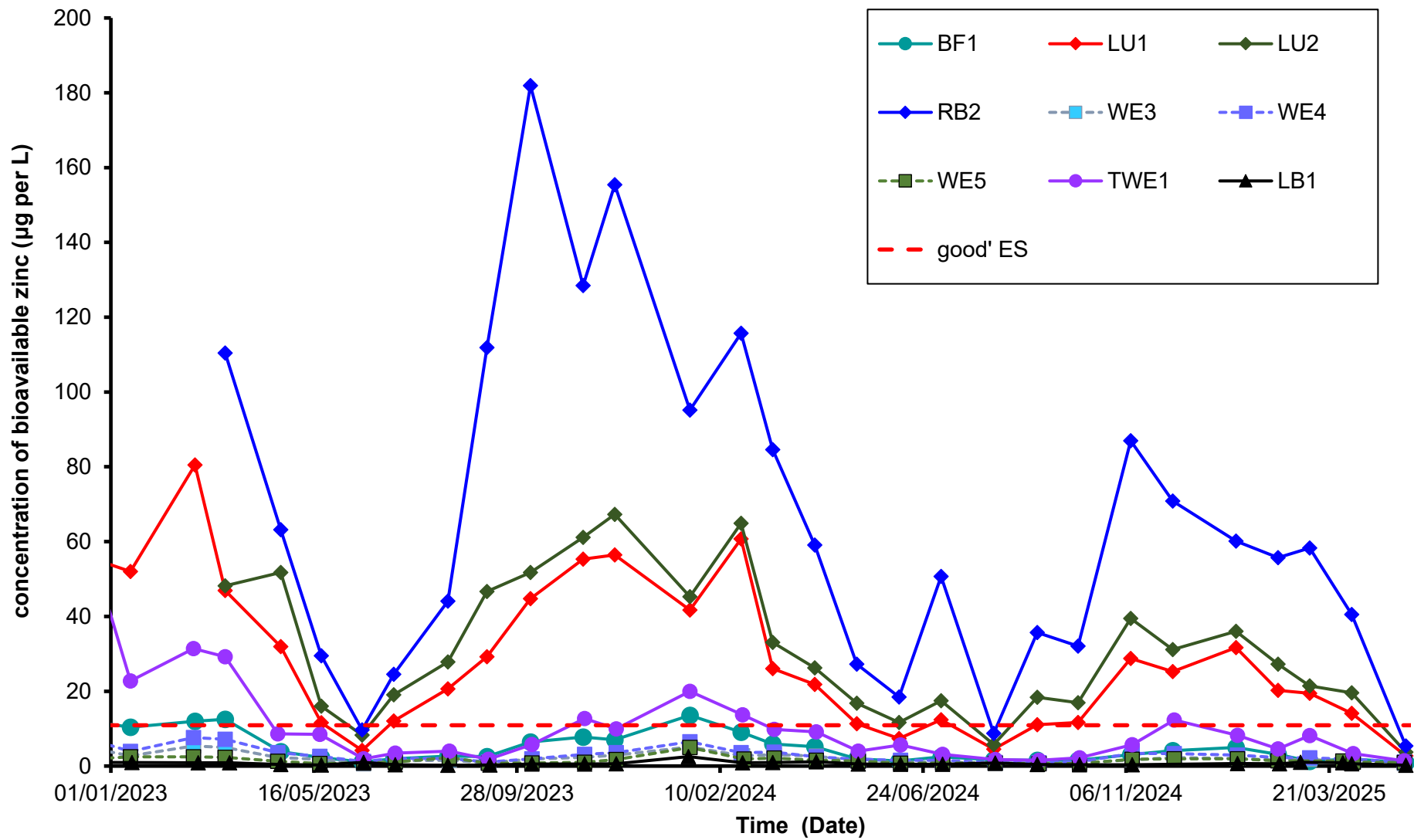
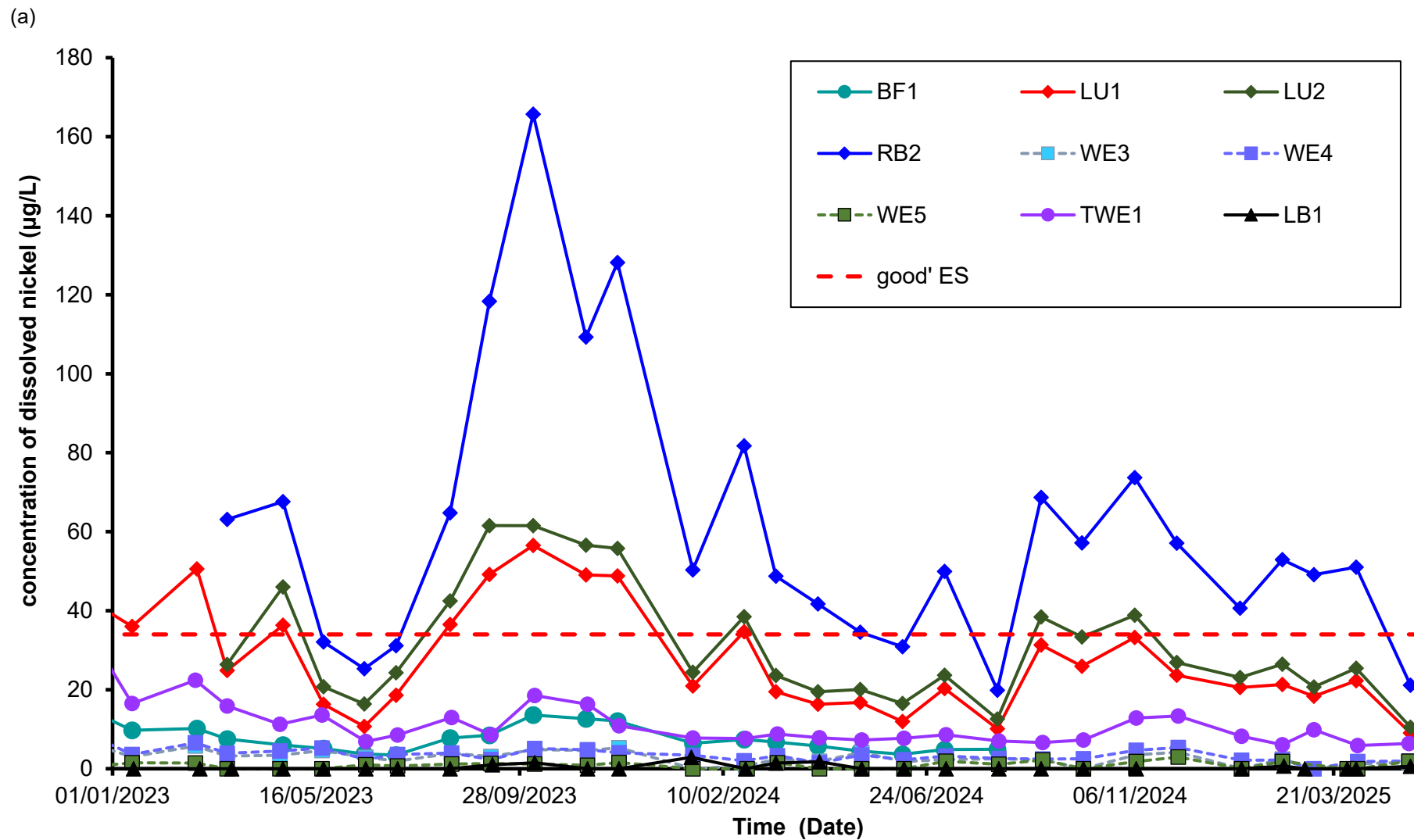


Figure 6. The changes in concentration of (a), dissolved and (b), bioavailable nickel (μg per litre) of the various 'impacted' watercourses draining the Scallafeld Scord area and one control (LB1) since January 2023.



(b)

