



Further investigating metal pollution
in Corby's freshwater and soil



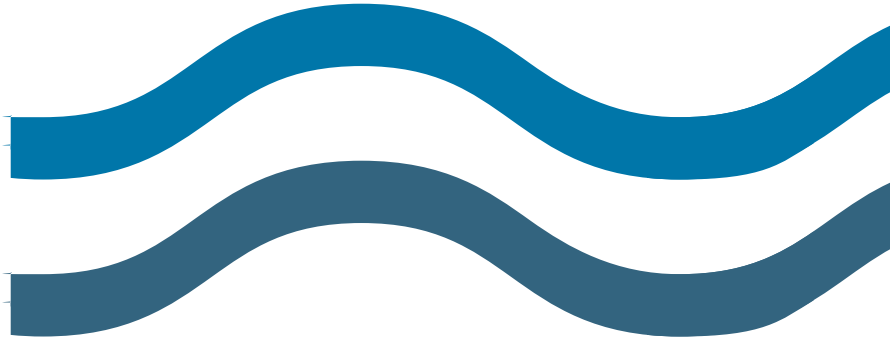
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Cover image: Corby steelworks and town, circa 1980 © North Northamptonshire Council

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Thank you to the community of Corby who made this report possible.

Introduction

Prior to its closure in 1980, 10,000 people worked at Corby's steelworks, and the unemployment rates resulting from its closure prompted the local council to launch a regeneration project. The British Steel Corporation demolished the works, and using government and European grants, the council began reclaiming the land. The project involved moving thousands of tonnes of contaminated waste to Deene Quarry, on the outskirts of the town.

Years later, concerns arose when mothers living near the reclamation site gave birth to children with upper limb differences, at rates three times higher than in the surrounding area. In a landmark case, a team of experts argued that the council's mismanagement of toxic waste had spread contaminated dust throughout the town. The heavy metal cadmium was identified on the former steel site, and a medical expert cited research linking it to birth defects in animals¹.

Today, the community are worried that metals are still present in the environment. In November 2025, Earthwatch Europe and Artemis Analytical supported the community to investigate metal contamination in Corby's waterways.

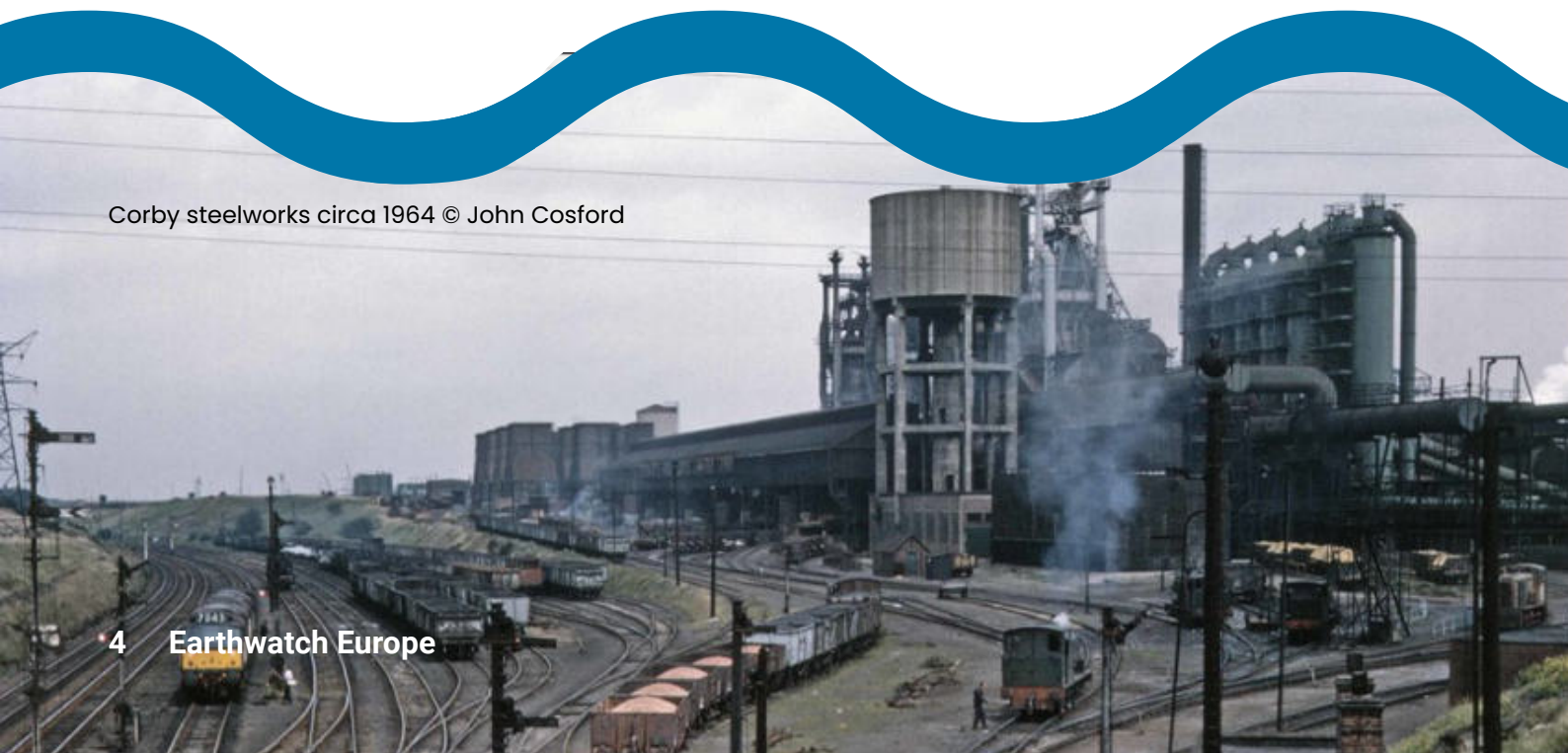
The results showed elevated concentrations in waterbodies located near two general areas: Deene Quarry and a slag heap in Weldon.

In July 2026 the community repeated this testing, again with the support of Earthwatch Europe and Artemis Analytical. The focus was to answer two questions that emerged from the first analysis.

Firstly, were the high concentrations of metals detected near Deene Quarry and the slag heap in Weldon due to heavy rainfall washing these pollutants into Corby's rivers, or were they more likely due to landfill leachate?

Secondly, are these metals also present in Corby's soils?

Corby steelworks circa 1964 © John Cosford



Key findings



In July 2026, 30 citizen scientists collected 52 water samples and 28 soil samples from sites across Corby for the analysis of 33 elements



At every freshwater site across Corby, at least one metal or metalloid was present at concentrations which exceed their predicted no effect concentration (PNEC), the concentration below which no adverse ecological effects are expected.



Nickel was detected in 28 freshwater samples at concentrations higher than its PNEC, and cadmium was detected at elevated concentrations in six freshwater samples.



In soil samples, cadmium was detected at concentrations higher than its Soil Guideline Value (SGV) in 2 sites, and arsenic at 6 sites; meaning that long-term exposure could pose risk to human health.



Elevated concentrations of cadmium and nickel in freshwater, and cadmium and arsenic in soil were largely confined to Deene Quarry and a former slag heap in Weldon.



The findings from the water samples – determined during the driest summer on record - are comparable to the results of winter sampling, indicating a relatively constant source of pollution; likely groundwater and landfill leachate rather than urban runoff.

Environmental toxicity of metals in water

The water that we drink is drawn from rivers, groundwater and reservoirs, filtered and disinfected at water treatment works to meet drinking-water standards, then delivered to homes through the mains network. The quality of tap water is regulated by the Drinking Water Inspectorate, with strict limits (see Table 1). Potable (drinking) water is not abstracted from freshwater in Corby.

After we discharge water (through sinks, showers and toilets), it enters the sewer system, where it is treated at sewage treatment works before being released back into rivers or the sea. The Environment Agency is the main body in England responsible for regulating Operators against discharges permits and abstractions licences in the water environment

Metals are typically hard, shiny elements which conduct heat and electricity. Heavy metals are generally referred to as those metals which possess a specific density of greater than 5g/cm^3 and can adversely affect the environment and living organisms. The most common heavy metals in wastewater include arsenic, cadmium, chromium, copper, lead, nickel, and zinc, all of which cause risks for the environment².

The limits for metal concentrations in the environment, called the Environmental Quality Standards, are a little more complicated than the limits for metal concentrations in tap water. These standards are based on the bioavailable fraction of the metal. Factors like pH and dissolved organic carbon influence a metal's bioavailability and are used to determine site-specific limits.

This study focuses on metal pollution in freshwater environments only, and not in drinking water. For the sake of simplicity, we have indicated the Predicted No Effect Concentration (PNEC) of these metals for freshwater habitats (see Table 1). The PNEC is the estimated concentration of a substance below which adverse effects on ecosystems are unlikely to occur. Metals at a concentration higher than their PNEC value could pose risk to aquatic life.

What is PNEC?

A Predicted No Effect Concentration, or PNEC, is the level of a substance - such as a metal - below which it is not expected to harm plants, animals, or ecosystems, even if exposure continues over a long time. It relates specifically to environmental health and does not describe effects on human health.

Element (symbol)	Type	DWI limit (ug/l) ³	PNEC freshwater (ug/l) ⁴
Aluminium (Al)	Post-transition metal	200	-
Arsenic (As)	Metalloid	10	0.5
Boron (B)	Metalloid	1000	2000
Barium (Ba)	Alkaline earth metal	Not monitored	19
Beryllium (Be)	Alkaline earth metal	Not monitored	-
Bismuth (Bi)	Post-transition metal	Not monitored	-
Cadmium (Cd)	Transition metal	5	0.25
Caesium (Cs)	Alkali metal	Not monitored	-
Calcium (Ca)	Alkaline earth metal	Not monitored	-
Chromium (Cr)	Transition metal	50	3.4
Cobalt (Co)	Transition metal	Not monitored	0.28
Copper (Cu)	Transition metal	2000	1.0
Gallium (Ga)	Post-transition metal	Not monitored	-
Indium (In)	Post-transition metal	Not monitored	-
Iron (Fe)	Transition metal	200	1000
Lead (Pb)	Post-transition metal	10	1.2
Lithium (Li)	Alkali metal	Not monitored	-
Manganese (Mn)	Transition metal	50	123
Magnesium (Mg)	Alkaline earth metal	Not monitored	-
Nickel (Ni)	Transition metal	20	2
Phosphorous (P)	Reactive non-metal	Not monitored	-
Potassium (K)	Alkali metal	Not monitored	-
Rubidium (Rb)	Alkali metal	Not monitored	-
Selenium (Se)	Reactive non-metal	10	0.1
Silicon (si)	Metalloid	Not monitored	-
Silver (Ag)	Transition metal	No limit	-
Sodium (Na)	Alkali metal	200,000	-
Strontium (Sr)	Alkaline earth metal	Not monitored	-
Sulphur (S)	Reactive non-metal	Not monitored	-
Tellurium (Te)	Reactive non-metal	Not monitored	-
Thallium (Tl)	Post-transition metal	Not monitored	0.013
Vanadium (V)	Transition metal	Not monitored	4.1
Zinc (Zn)	Transition metal	None specified	7.8

Table 1. Elements analysed, their type as defined in the periodic table, their limit as regulated by the DWI, and their PNEC for freshwater habitats. Not monitored indicates the DWI does not test for this metal. None specified indicates the DWI has not specified the limit. The (-) symbol indicates where there is no PNEC record in the NORMAN toxicology database.

Environmental toxicity of metals in soil

We are dependent on healthy soils. Our soils are not only valuable for growing the food we eat; soil quality can be an important factor in flood management and the quality of our water.

The accumulation of metals in soil may result in a drop-in soil quality, and a decrease in soil fertility and agricultural productivity. The concentrations of metals in soils are increased by human activities such as mining, burning fossil fuels for energy, the application of some fertilisers and pesticides, as well as sewage and industrial discharge.

As well as altering soil structure and harming microorganisms (bacteria and fungi), elevated concentrations of heavy metals can accumulate in plants, making them unsuitable for consumption.

The Environment Agency publishes Soil Guideline Values using the Contaminated Land Exposure Assessment (CLEA) model, which takes soil type into account, as characteristics such as pH and organic matter affects how easily metal binds to soil.

What is SGV?

Soil Guideline Values are concentrations of contaminants in soil below which long-term exposure poses minimal risk to human health

Contaminant	Residential (mg/kg)	Allotments (mg/kg)	Commercial (mg/kg)
Arsenic	32	43	640
Cadmium	10	1.8	230
Nickel	130	230	1,800
Selenium	350	120	13,000

Table 2. The Environment Agency published SGVs for a small set of contaminants in mg/kg of dry soil⁵⁻⁸. These SGVs are based on soils with pH 6. UK Soil Observatory data for Corby indicates that the Weldon area has a pH of 6⁹

Distribution of metals across Corby

Fifty-two freshwater samples and twenty-eight soil samples from across Corby were tested for the presence of thirty-three elements; twenty-nine metals and metalloids, and four reactive non-metals.

At every freshwater site, at least one metal or metalloid was detected at concentrations higher than its PNEC, meaning that it could pose risk to aquatic life. Note that metals such as arsenic, cobalt, copper, nickel, manganese, lead, and zinc are known to be elevated in Northampton Sand Ironstone¹⁰.

The distribution of metals across Corby's freshwaters was not uniform, with different sites polluted by a variety of different metals.

The number of times individual metals were detected at a higher concentration than known freshwater PNECs is listed in Table 3. The percentage of sites with metals at concentrations higher than their PNEC did not decrease between November's testing during wet weather, and July's testing during a period of drought. This suggests a relatively constant source of contamination (groundwater) rather than urban runoff which is highly variable in relation to rain events.

Element (symbol)	PNEC freshwater (ug/l) ⁴	Number of sites detected (above LoQ)	Number of sites higher than PNEC	% of sites higher than PNEC	% of sites higher than PNEC November
Arsenic (As)	0.5	51	45	87	98
Boron (B)	2000	52	0	0	0
Barium (Ba)	19	52	34	65	63
Cadmium (Cd)	0.25	25	0	0	0
Chromium (Cr)	3.4	52	0	0	0
Cobalt (Co)	0.28	47	38	73	56
Copper	1.0	47	19	37	100
Iron (Fe)	1000	52	0	0	0
Lead (Pb)	1.2	45	30	58	2
Manganese (Mn)	123	45	1	1	2
Nickel (Ni)	2	52	28	54	51
Selenium (Se)	0.1	9	8	15	37
Thallium (Tl)	0.013	0	0	0	0
Vanadium (V)	4.1	50	5	10	3
Zinc (Zn)	7.8	43	26	50	47

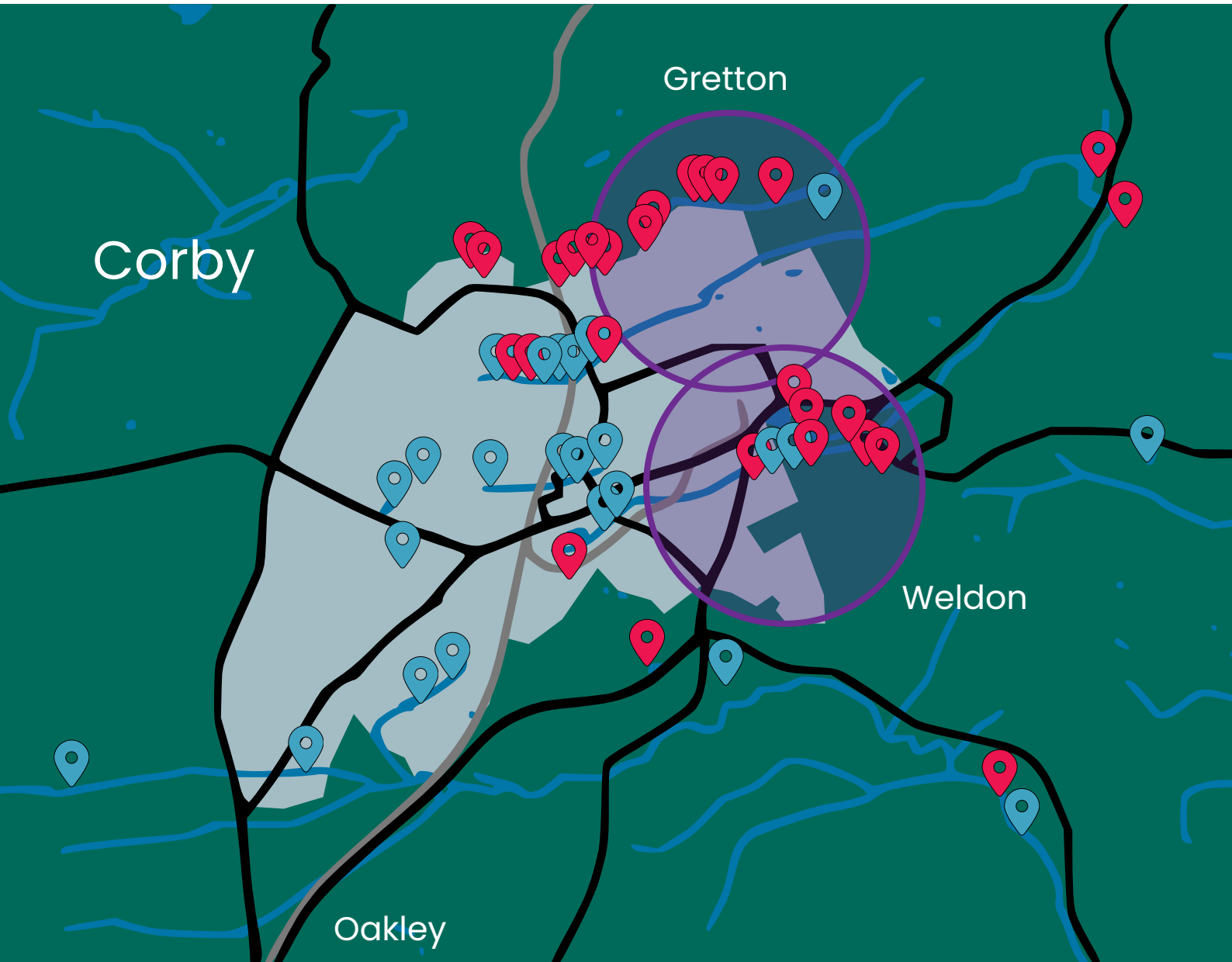
Table 3. Number of sites where metals with known PNECs were detected: at their Limit of Quantitation (LoQ) - the lowest concentration of a substance an analytical method can measure with acceptable accuracy and precision - and at concentrations higher than the PNEC.

The median number of metals higher than their PNEC was five. Focusing on sites with five or more elements present at concentrations higher than their PNEC showed the same pollution hotspots which were identified in the first round of testing: one in Gretton and one in Weldon (Figure 1).

Due to the historic mismanagement of contaminated waste, the community were particularly concerned about the presence of cadmium, chromium and nickel in Corby's freshwaters.

Chromium was not detected at elevated concentrations, or above its PNEC in any sample; while nickel was detected at 28 sites at concentrations higher than its PNEC.

Cadmium was not detected at concentrations higher than its PNEC. However, it was detected at 6 sites at elevated concentrations compared to baseline values we measured in the Corby area on the day of testing, suggesting potential pollution sources (Figure 2).

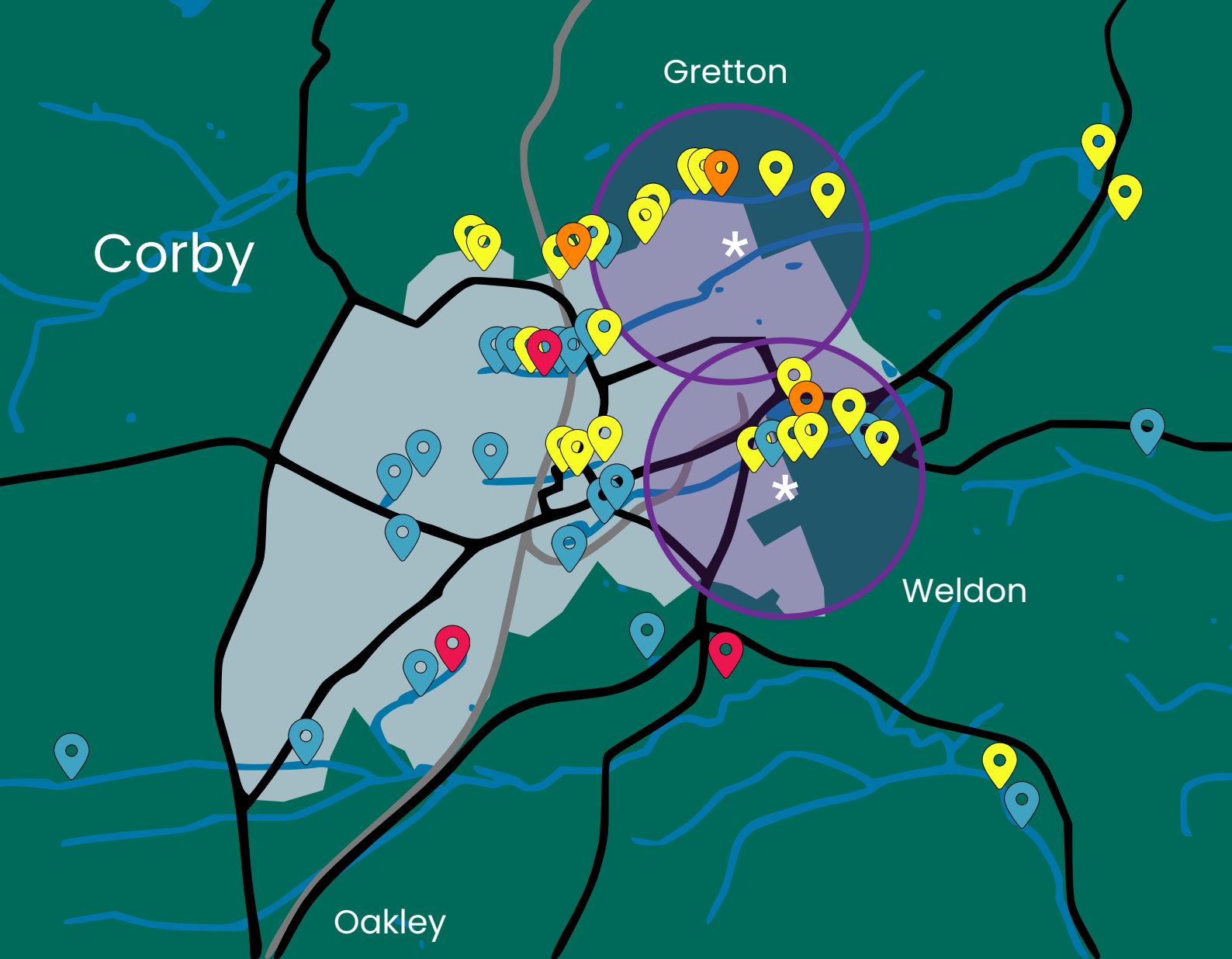


Water sample with five or more metals or metalloids over PNEC level



Water samples with fewer than five metals or metalloids over PNEC level

Figure 1. Location of samples with five or more metals or metalloids above their PNEC. Pollution hotspots highlighted in purple.



- | | |
|---|--|
|  Cadmium elevated above baseline |  Nickel over PNEC |
|  Cadmium elevated and nickel over PNEC |  Cadmium not elevated and nickel below PNEC |

Figure 2. Sites where cadmium was elevated and nickel was detected at concentrations higher than its PNEC. Pollution hotspots highlighted in purple. Deene Quarry and the former slag heap in Weldon are indicated by the * *

The sites where cadmium was elevated and nickel was at high concentrations were largely found in two general areas: Deene Quarry and a former slag heap in Weldon. The first of these sites was where thousands of tonnes of contaminated waste were dumped in the 1980s and 90s. The second is not a confirmed landfill site for the contaminated waste, but one which the community have long-suspected.

The freshwater data across the two studies – in November 2025 and July 2026 – are further supported by the results of our soil analysis. Detected metals with known SGVs are listed in Table 4

Due to the limited number of SGVs available, we plotted all eight sites with higher than SGV levels of arsenic or cadmium. Most of these sites are clustered in the same two pollution hotspots (Figure 3).



-  Soil sample with a metal or metalloid over SGV
-  Soil sample with no metals or metalloids over SGV

Figure 3. Pollution hotspots (purple circles). Sites which had no metal or metalloids over SGV are in blue. Sites which had an element at concentrations higher than their SGV are in red.

Element	SGV Residential (mg/kg)	SGV Allotments (mg/kg)	Number of sites detected (above LoQ)	Number of sites higher than SGV	% of sites higher than SGV
Arsenic	32	43	28	6	21
Cadmium	10	1.8	3	2	7
Nickel	130	230	28	0	0
Selenium	350	120	0	0	0

Table 4. Number of soil sites where elements with known SGVs were detected

Cadmium and arsenic being present at concentrations higher than their SGV in these pollution hotspots suggests long-term exposure to soil in these areas could pose a risk to human health.

How do these results compare?

Comparison of citizen-generated data and Environment Agency data

A river basin is the area of land around a river from which all water is drained. A river basin district includes one or more river basins, and each district has a river basin management plan that outlines the objectives, standards, and measures for managing water.

Corby is located in the Anglian River Basin District and in the Willow Brook operational catchment of the River Nene. There are three waterbodies in this operational catchment: Northern Stream, Southern Stream and Willow Brook. The Environment Agency has classified all three waterbodies as having moderate ecological status based on multiple samples per year¹¹. Data from 2019 and 2022 indicates that all three waterbodies had high status of copper, iron, manganese and zinc, and are considered “Good” in terms of their cadmium and nickel levels, based on Environmental Quality Standards rather than PNEC.

In terms of soil health, the Environment Agency have noted that “Data on soil health are held piecemeal by different institutions and businesses” and that “it is not easy to access or use these data.”

“The most recent national data sets were collected as part of the Countryside Survey in 2007, 1998 and 1978, and the National Soil Inventory, which took samples in the 1990s and 1980s. The numbers of samples in these national studies have been small compared to the sampling intensity achieved for air and water quality monitoring.”¹²



Discussion

This study provides valuable information that complements official monitoring efforts and helps to ensure transparency and accountability from polluters. The data presented in this report are indicative of three things.

Firstly, as this investigation was conducted during a period of drought, it has helped us to better understand the potential sources of pollution in relation to the measurements made in November 2025.

As we noted in our January report, “a decrease [in metal pollution] in dry weather would suggest a rain driven surface runoff source, whereas higher concentrations during periods of low river discharge would indicate a more constant source, such as groundwater.”

The July 2026 waterbody measurements did not show a decrease in metal concentrations, suggesting a more constant source, such as groundwater and landfill leachate.

Secondly cadmium – a heavy metal implicated in the Corby toxic waste case – is present in freshwater sites surrounding Deene Quarry and slag heap in Weldon at elevated concentrations; meaning it could pose risk to aquatic life.

And finally, that cadmium and arsenic are present in the soil surrounding these sites at concentrations higher than their SGVs, meaning that long-term exposure to this soil could cause a risk to human health.

More testing is required to further investigate the potential sources of pollution and their long-term impacts.

Earthwatch Europe champions citizen science, the active involvement of non-scientists in the scientific research process.

We are proud to have supported the residents of Corby to gather accurate and timely information on their local water quality and soil health, and we will continue to support them to fight for the health of their local environment.

Thank you to the community of Corby who made this report possible.



Methods

On Saturday July 11th, between 11.30am and 2pm, 30 trained citizen scientists collected 52 samples of freshwater and 28 samples of soil from sites across Corby.

Citizen scientists were recruited through Corby community leaders and trained by Earthwatch prior to testing.

All 59 freshwater sites from the first round of testing were visited. Due to drought conditions, 7 had no water at or near the site so samples were not collected. A further 7 had no water at the site, but did have water at nearby locations.

Weldon sites

- ///complains.goats.swim > ///slick.plays.banana
- ///menu.suffice.logo > ///smiled.text.wished

Gretton sites

- ///secure.intention.loads > ///financial.wharfs.minimums
- ///tools.worthy.loosed > ///regulator.gazette.cutlets

Harpers Brook sites

- ///perfect.belts.pairings > ///ounce.speared.shimmered
- ///shop.grants.script > ///beast.broker.insect

Pen Green sites

- ///thudding.broth.share > ///regulates.giggled.dwelled

Soil samples were collected from topsoil at a randomised subset of locations.

Water and soil samples were analysed by Artemis Analytical using Inductively Coupled Plasma Mass Spectrometry (ICP-MS/MS) analysis.

The water samples were split: one fraction was used to measure pH and total dissolved solids (TDS) and the second fraction used to measure element concentrations. This second fraction was diluted tenfold (x10) in 2% nitric acid and filtered (0.45 micron) prior to ICP-MS/MS analysis. Field blanks and external standards were acidified to the same concentration, ensuring all samples were matrix matched.

Soil samples were first dried in an oven, then powdered and homogenised using a pestle and mortar. Around 0.1 g of each sample was placed into a microwave-assisted concentrated nitric acid leach using quartz vessels to ensure low background. This method was not designed to fully digest all silicate matter, but instead only extracts the biologically available metals that animals or plant life would be able to extract. This digestate was then diluted gravimetrically and filtered through 0.45 micron filters prior to ICP-MS/MS analysis.

The Limit of Detection (LoD) and Limit of Quantitation (LoQ) for the water samples were previously calculated using the signal intercept (i.e. the signal when the intended concentration is 0, a blank) and the gradient of the line for each element. The LoD is defined as 3x the intercept (background level), and the LoQ is 10x the background level, serving as a conservative background screening limit.

In the case of the soil, statistical method LoQs were found using the standard deviation of procedural laboratory blanks (10 x Blank SD). These were then scaled using the batch minimum sample mass and the batch maximum dilution volume. This provided a 'worst-case' LoQ that could be compared to the final corrected soil concentrations. The average blank concentrations were subtracted from the sample concentrations for both water and soil.

The LoD and LoQ are indicated in the full dataset, which can be accessed here: [LINK](#)

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Earthwatch Europe is an environmental charity that champions citizen science to help people understand and protect the natural world. We believe that when communities are equipped with the right tools, they can play a vital role in monitoring the environment and gathering the data needed to drive change.

By training individuals—from local residents to school groups—to collect high-quality scientific data, we create evidence-based insights into the health of our cities, soils, and waterways. Our work focuses on practical, community-led projects like creating urban greenspace through our Nature in Cities programme or monitoring freshwater quality through the FreshWater Watch programme.

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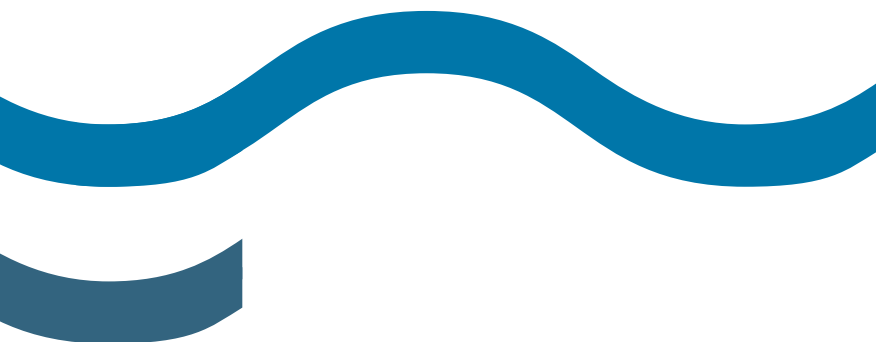
Artemis Analytical was founded in 2016 by Professor Kieran Flanagan to develop a breakthrough scientific instrument with unmatched sensitivity and selectivity.

By combining mass spectrometry with collinear resonance ionisation spectroscopy, we created a system capable of detecting difficult isotopes such as strontium-90 and carbon-14—well beyond the limits of conventional technology.

In 2019, Chris Yates and Giles Edwards joined the company, and Artemis earned a competitive place on the CERN Business Incubation Centre programme, helping accelerate our development and impact.

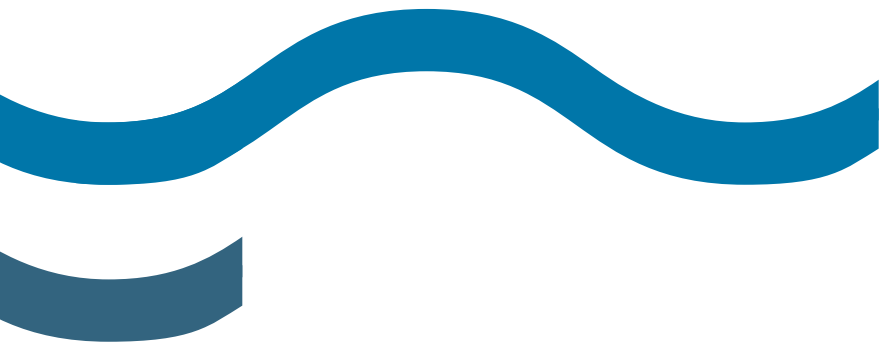
We've since expanded our mission. In 2020, we launched The Water Professor to provide accessible water testing services to the public, followed by Artemis Labs, a specialist contract laboratory offering advanced analytical services. Today, Artemis is united by a single goal: to deliver cutting-edge science that meets real-world analytical challenges.

artemis-analytical.com





Weldon Woodlands Park © Maggie Mahon





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