

Broomfield Park Water Quality and Pollution

Friends of Broomfield Park Lakes Team

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1. Background

Broomfield Park's water courses consist of 3 lakes, Wetland, and a wildlife pond that flows into Pymmes Brook. Historically the waters entering these watercourses flows from springs and small streams uphill. Before urban development of the Lakes Estate there was open land south of Fox Lane and a large lake in the north of Alderman's Hill. Water flowed southwards across Alderman's Hill into the park lakes and fishponds.

At this time a small canal called 'The Long Water' carried water southwards which entered the Upper Lake through a cascade on the northeast side.

The area to the north of the park was built up in the early 1900s and the lake there filled in. When the boating pond was constructed in the 1930s, water was pumped from the London Aquifer to the boating lake and released to the lakes. Water continued to flow underground through the park downhill from Alderman's Hill.

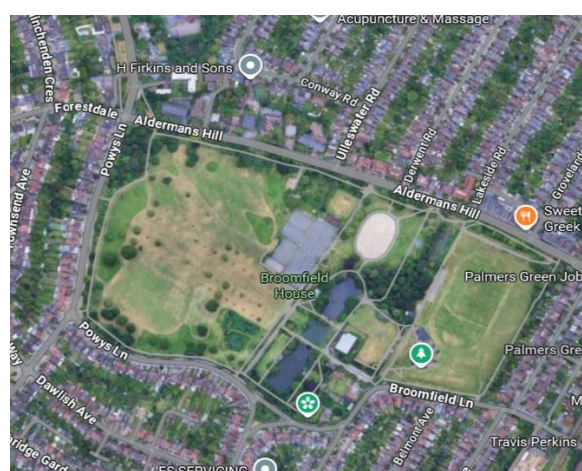
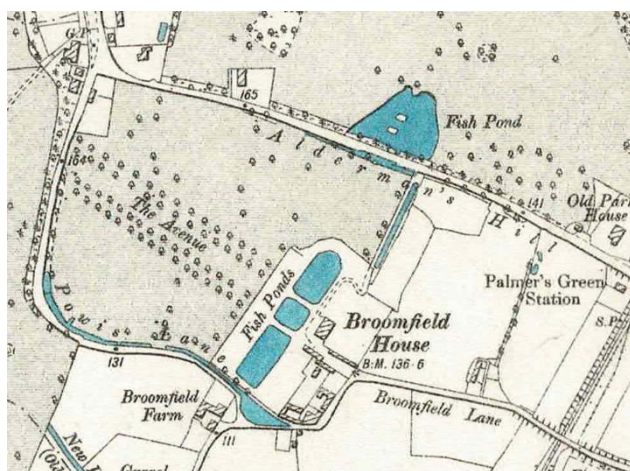
In 2019, when the Wetland was created, it was fed by land drains from across the open parkland to the northwest corner. In addition, an offshoot pipe was added from the main Thames Water pipe that runs North to South past the tennis courts. This was designed to increase water flow into the lakes, and a new pipe was added from the Middle Lake to the Wetland. Hence the water quality could be improved before it flows onto Pymmes Brook. The inlet pipe to the NW of Upper Lake comes in through an arched stone entrance. For some years, while the boating pond was empty; the main source of water for the lakes has been through the pipes and surface water drainage maintained by Thames Water.

An independent ecological survey was commissioned in 2024 by Friends of Broomfield Park (FoBP) and funded by the Environment Agency. While the Wetland ecological status was 'Good', the status of all the lakes was 'Poor', with few invertebrates and few plant species. This was thought likely to be due to high ammonia and phosphate levels in water, although these were not regularly tested. These can cause eutrophication, leading to excessive algae growth, oxygen depletion, and direct toxicity to aquatic organisms. This affects fish, amphibians, invertebrates and birds.

Since 2024 a Project Board has continued to meet to monitor and aim to improve water quality in Broomfield Park. Members include FoBP Lakes Team, Enfield Council, the Environment Agency, Thames Water and Thames 21. Thanks to equipment, training and support from Thames21, FoBP Lakes Team has been monitoring water quality regularly since 2025. They can now monitor ammonia, phosphate, oxygen saturation, total dissolved solids and other parameters.

In 2025 the FoBP Lakes Team reported two serious pollution incidents (with video evidence and testing data) that brought polluted water to the lakes. Thames Water and the Environment Agency were alerted and responded quickly.

Thames Water has been carrying out a project in 2026 to clean and repair pipes in Broomfield Park and to explore pollution sources. They assessed 332 properties upstream on the Lakes Estate. 72 properties were sources of pollution. 45 misconnections include basins, washing machines, toilets and showers. Householders have rectified 27 of these. A separate major problem is the Edwardian sewage system which lets foul water into the surface water pipes, especially if foul water pipes are blocked with wet wipes etc. The sewage caps, which should keep the systems separate unless there is a blockage, are missing in 73 properties. Thames Water has successfully sought legal clearance to offer a free service to householders to replace these caps. They can only do this if invited, as they are on private property.



Broomfield area in 1897 and present day

2. Research questions

1. What is the pollution status of Broomfield Park in comparison to surrounding water courses?
2. Does the Wetland in Broomfield Park improve water quality?
3. What does the evidence suggest should be the next steps to improve water quality?

3. Methodology

Samples have been collected from 22 locations in the park – between February 2025 and September 2026. Samples were collected regularly over the course of this investigation to detect seasonal variations, and data was recorded on the Water Rangers data [website](https://www.thames21.org.uk/water-rangers).

Sampling locations were chosen to be representative of the quality of the water across the park and to investigate the significance of flow under different conditions. The locations aim to explore the quality of water entering the park from the upstream surface water drainage network, how this changes through the lakes in the park, and to investigate the impact of the wetland on water quality.

At each of these locations, Hanna checkers were used to record Ammonia and Phosphate concentrations from the water in the lakes and wetlands. It should be noted that for sampling visits before August 2025, the Phosphate Hanna checker was only capable of reading up to 2.50mg/l. As such, Phosphate data in this report was selected to reflect the more accurate later readings. Now that a higher range Phosphate checker is in use, future reports are likely see an increase in average Phosphate concentrations in the lakes compared to a similar period earlier in 2025.

Recorded concentrations were compared against the Environment Agency's Water Framework Directive (WFD) classifications for Ammonia and Phosphate to give a qualitative interpretation of the quality of water in the park. The categories are 'Very Good' (near natural conditions), 'Good', 'Moderate', 'Poor' and 'Bad' (heavily polluted conditions).

Parameter	Ammoniacal Nitrogen /NH ₃ -N (mg/litre)	Phosphate / PO ₄ (mg/litre)	Electrical Conductivity (µS)	Turbidity (NTU)
Average Type	90th Percentile	Mean Concentration	Mean Concentration	90th Percentile
Standards based on	WFD	WFD	Thames21 Judgement	Thames21 Judgement
Very Good	<0.3	<0.15	<800	<18
Good	0.3 < 0.6	0.15 < 0.27	<800	18 < 26
Moderate	0.6 < 1.10	0.27 < 0.64	800 < 900	26 < 30
Poor	1.10 < 2.50	0.64 < 3.30	900 < 1000	30 < 40
Bad	≥ 2.50	≥ 3.30	≥ 1000	≥ 40

4. Analysis & results



Figure 1. Broomfield Park lakes' ammonia and phosphate levels

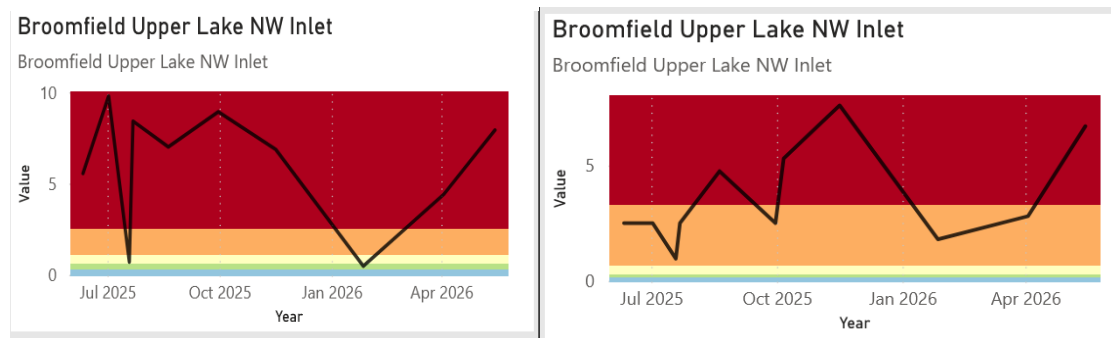
What does the data show?

The Upper Lake has average ammonia levels of almost 10 mg/l near the inlet. The average phosphate level is also bad. The average for phosphate includes a period when equipment available was limited to a maximum of 2.5 mg/l which draws the average down.

The comparative data shows Broomfield Park lakes' levels of ammonia and phosphate are among the worst in the catchment. The Water Framework Directive categorises ammonia levels above 2.50mg/l as 'Bad' and phosphate levels above 3.30mg/l as 'Bad'.

Ammonia and phosphate levels are higher in the Upper Lake than in the Middle and Lower Lakes.

The levels vary seasonally. Annex A gives a more detailed picture of variations in pollution levels for each watercourse.

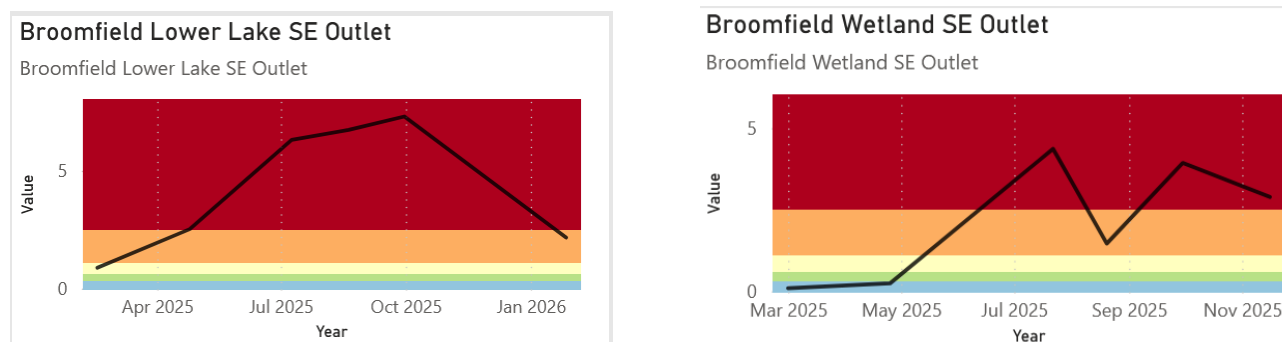


Ammonia 2025-6

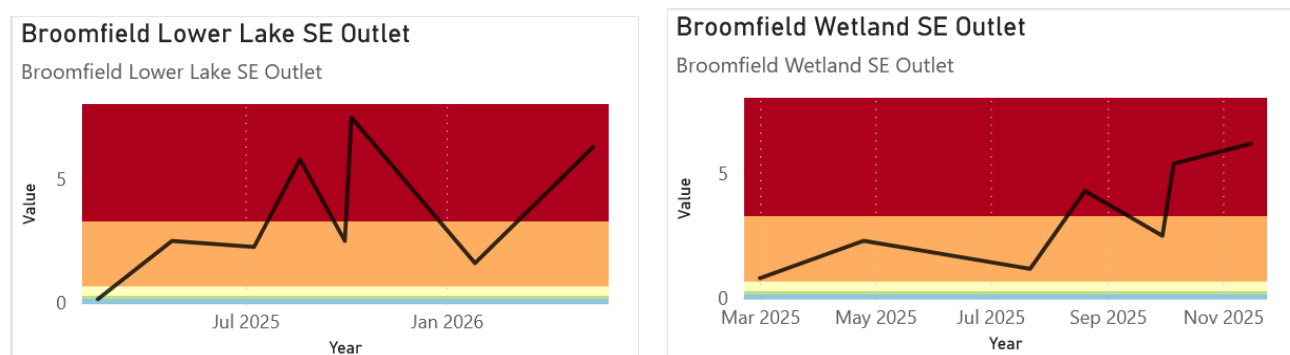
Phosphate 2025-6

Water leaving the park exits towards Pymmes Brook, either from the Wetland or from the Lower Lake outlets. The charts below compare the water quality from each route.

Dashboard: thames21.org.uk/citizen-science-dashboard



Ammonia



Phosphates

An ecological assessment of the watercourses by MKA Associates was conducted in 2023 through a PSYM (Predictive System for Multimetrics) survey commissioned by Friends of Broomfield Park (funded by the Environment Agency). This found a lack of species diversity with few invertebrates and plant species in the Upper Lake, contributing to its very poor status as a waterbody. The Middle and Lower Lakes had a slightly greater species diversity and a higher “poor” status. The Wetland had a greater diversity of species and a moderate PSYM status. The Wildlife Pond had a good status.

Table 3: Combined data results for ponds at Broomfield Park, Enfield

Pond name	Upper Lake	Middle Lake	Lower Lake	Wildlife Pond	Wetland
Index of Biotic Integrity (%)	22	33	28	78	50
PSYM Status*	Very Poor	Poor	Poor	Good	Moderate
Priority pond?	No	No	No	Yes	No

Stored pollution, including phosphates and metals, can be bound in the deep silt. Johnson et al 2025 used a statistical model that shuffles combinations of variables to see which elements have most impact on biodiversity. This used 30 years data from 1457 sites in England. It showed that Zinc and Copper have the greatest relative importance for macroinvertebrates’ richness and biodiversity.

Silt surveys of the Broomfield lakes were conducted by TWS in January 2018 and by Miles Water Engineering in September 2025. These have both shown Zinc, Lead, Aluminium, Iron, Nickel and Copper to be present in the silt. Particularly high levels of Zinc were found in the Upper Lake (1200 mg/kg in 2012, 149-1137 mg/kg in 2025) and Middle Lake (1100 mg/kg in 2012, 70-101 mg/kg 2025). This needs to be removed and is planned as part of the Unblocking Broomfield programme currently under consideration for a National Heritage Lottery Fund grant. The levels of metals in the silt of the Lower Lake are dramatically lower.

5. Discussion

Readings near the Upper Lake inlet are consistently higher than in the other lakes downstream, suggesting that some of the incoming pollution maybe be deposited in the lakes or may bind to the excessive amount of silt present. There are also extreme variations seasonally, particularly as winter and summer months are influenced by the lack of water flow during hotter months, including the 2026 drought.

Water leaves Broomfield Park to reach Pymmes Brook from the Wetland and from the Lower Lake. Data shows the Wetland is very successful in reducing ammonia levels. For example, in May 2025, levels of ammonia fell by 77% (5.67 to 4.36) between the inlet and outlet of the Wetland. It is slightly less effective but still valuable in reducing phosphates by 47% (2.5 to 1.17). It is understood that reeds are most effective at drawing in phosphate in their early growth.

There is an imperative need to intervene to tackle pollution that is already present in the Broomfield Park lakes and to reduce further pollution from entering them. This will require action from different organisations working together. Some of this is already planned or underway.

Water pollution from pesticides and heavy metals poses a severe threat to water birds. These cause illnesses and deaths in birds and can endanger entire species. Water pollution reduces oxygen levels in the water, leading to fish kills and disrupting the natural balance of the ecosystem. Eutrophication, caused by excessive nutrients such as phosphates, can also lead to the dominance of species such as cyanobacteria which can be

toxic to fish and birds. Chronic ingestion of small amounts of heavy metals can lead to neurologic deficits, weight loss and other health issues. Bird eggs are particularly affected by pollutants and, along with feathers, are commonly used to monitor pollutants. High silt levels can also greatly increase the risk of avian botulism, caused by bacteria ingested in feeding. This has caused the death of many birds because of the 2026 drought (27 water birds, including the swan family, dying in Pymmes Park alone).

The bioaccumulation of pollutants can disrupt the endocrine system as reproductive, immune and other metabolic hormones are impaired. Failed eggs can serve as a record of pollutants circulating through the environment. A failed egg becomes a snapshot of what the mother has absorbed from her surroundings. Low levels do not mean harmless levels, causing harm below lethal levels, thinning eggshells or harming the development of the embryo inside.

The pattern of reproduction of the swan pair in Broomfield Park suggests pollution may be a factor in the drop of reproduction from 8 live cygnets in 2024, to one in 2025, to no live hatchings in 2026. This is despite 8 eggs being laid each year. Swans, as they feed in the silt, are more likely to absorb the pollutants in the Middle Lake silt than are other species. In 2024, when 8 young swans and their parents all fed throughout the year from the silt, it was stirred up and the water was cloudy all year. One young swan died from unknown causes. Two were found to be very undeveloped and taken to the Swan Sanctuary for treatment. The following year with 1 live birth, marked a substantial reduction in reproductive success for this young swan couple.

The Wetland offers a healthier environment for wildlife in Broomfield Park. The impact that the Wetland water filtration has on water quality is shown in the graphs in section 3. Ammonia leaving the Wetland is reduced by 31% compared to the water leaving the Lower Lake and phosphates by 47%. Wetland maintenance is principally carried out by Friends of Broomfield Park. Thames 21 is a valuable partner delivering corporate volunteering days and advice. More regular maintenance is planned, which will increase fresh reed growth, encouraging a greater uptake of phosphates.

Thames Water is actively carrying out a programme to identify misconnections and missing surface water caps. They are then contacting householders to alert them to the need to correct these. Enfield Council has the responsibility to take enforcement action if persuasion does not work. Friends of Broomfield Park is contacting local residents to let them know about the link between surface water drainage and the water reaching the Broomfield lakes. Pollution levels were high during the drought. Testing in September reveals this has remained the case. FoBP reported their tests to Thames Water and investigations reveal that blocked sewage pipes in 5 properties are the source of the problem.

A programme of work is underway in 2026 shared by Enfield's Blue and Green team and Friends of Broomfield Park. This aims to implement the recommendations of the Broomfield Ecological Enhancement Strategy commissioned by FoBP. The focus in 2026/7 is on the Lower Lake with funding from the Environment Agency.

A significant option for improving the water quality includes creating a new Wetland area to clean water entering the lakes. This would be likely to be in the North of the park, close to where historically the Long Water carried water into the lakes. This change could have the added value of increasing biodiversity in the North of the park, improving the flow of water and reducing flooding risk in an area where cellars, gardens and some areas of the park are often water sodden during rainy periods.

Finally consideration should be given to providing a more regular flow of water from the boating pond to the lakes during periods of dry weather, to reduce the concentration of pollution found when water levels fall.

6. Next steps & advocacy

The FoBP Lakes Team will share this report with Thames Water, the Environment Agency, Thames21, local press and interested community groups, Enfield Council including councillors and the local MP.

We will

- Continue to advocate for attention and investment to water quality as part of the Unlocking Broomfield Project to be funded by the National Lottery Heritage Fund. At the end of this project in 2028 we would want to see a very significant improvement in the water quality of the lakes.
- Continue work with Enfield Blue and Green team, funded by the EA, to improve water quality
- Monitor changes to water quality in response to Thames Water's pollution management programme upstream
- Advocate to the public on how to reduce pollution from problem area
- Continue to monitor the impact of the Wetland on water quality
- Seek funding to monitor the impact of pollution through bioindicators such as eDNA

7. Relevance to Future Development

There is an urgent need to address the levels of pollution in the waters in the Broomfield Park lakes. The current Wetland shows one example of the potential value of a Wetland approach in reducing certain pollutants. The proposed desilting as part of the Unlocking Broomfield proposals, currently awaiting a decision by the Heritage Lottery Fund, will help with the long-term accumulation of metals.

Enfield's Blue and Green Team have been working on options to improve water quality as it enters the park. This is, to an extent, a substitute for the Long Water that historically drew water from the lake to the North of Alderman's Hill into the lakes via a cascade. The precise design and location of this feature is yet to be decided. Wherever it is placed the lakes and their wildlife are desperately in need of its impact on their health.

ANNEX A: Ammonia and Phosphate levels in Broomfield Watercourses

Upper Lake

The Upper Lake has been tested most regularly of all the watercourses to assess levels of pollutants in water entering the lake through the inlet pipe, in the lake itself below this point and, less regularly, levels in water exiting to the Middle Lake. Only in January 2026 was ammonia level good (0.48). In January and April phosphate levels were poor (1.8 and 2.8). All other sampling by the FoBP testers showed bad levels of ammonia and phosphates. Thames Water has also been testing water from the inlet pipe and in the lake to assess changes as households start to put right the misconnections in the catchment that have been identified. On some occasions they have found higher pollution rates in the lake than in water entering the lake. On other occasions FoBP testers have found higher rates in water entering from the pipe than in the lake. This shows the importance of testing water from both sources and in different weather conditions.

In July 2025 we tested water arising through the ground from a broken pipe after heavy rainfall and found this reduced the level of ammonia (by 34%) and phosphate (by 7%). During the summer drought in August 2026 ammonia levels at 9.99 were beyond the testing maximum of the equipment. Phosphate was at 5.9. In September, despite hopes that rectified misconnections in 15 properties would result in lower levels, ammonia and phosphate levels were equal (ammonia) or higher (phosphates) as a result of 5 properties with blockages in their sewage pipes.

Middle Lake

The Middle Lake has not been tested as regularly. In general the levels of pollutants have been similar but slightly lower than the Upper Lake, which is its sole source of water.

Lower Lake

The Lower Lake has been tested to assess the water quality leaving the park to join the Pymmes Brook. Tests show the difference between water exiting the Lower Lake without intervention and water leaving through the Wetland. Ammonia levels at the outlet are generally bad, apart from January and May 2026 which were slightly better (at poor 2.16 and 1.91). Phosphates are generally at bad levels except for January 2026 which was only poor (1.6).

Wetland

Testing has compared water quality leaving the park to join Pymmes Brook from the Wetland and Lower Lake. In August 2025 levels of ammonia were 78% lower leaving the Wetland than the Lower Lake (1.46 compared to 6.73) and phosphates 46% lower (3.93 compared to 7.3). In September 2025 the reductions were 46% ammonia and 29% phosphates.

In November 2025, comparing the water entering the Wetland with that leaving showed a 50% reduction in ammonia but a 8.7% increase in phosphates. An unexpected result in June showed pollutants at a higher level leaving the Wetland than entering (Ammonia 2.26 compared to 1.11: Phosphates 3.5 compared to 1.8). The hypothesis is that a recent downpour had brought cleaner water to enter the Wetland whilst stagnant water, as a result of a prolonged heatwave, was still making its way slowly through to the outlet.

Wildlife Pond

The Wildlife Pond was tested in March 2025. Its ammonia and phosphate levels and turbidity were all at good or moderate levels. In view of time constraints it has not been included in regular testing.