2,274 days with illegal sewage discharges to 11 Welsh rivers from 2018 to 2023

Peter Hammond, Windrush Against Sewage Pollution (WASP), October 2023

This report analyses the performance of 11 sewage treatment works in Wales from 2018 to 2023.

Major findings

- 2,274 days with permit breaches involving discharges of untreated sewage
- 96.6% were “early” when the sewage works was not at capacity and 3.4% were in “dry” weather
- the following sites were exposed to untreated sewage pollution
  - 11 rivers and river catchments exposed in total for over 100,000 hours
  - 2 Special Areas of Conservation and 3 Sites of Special Scientific Interest
  - commercial mussel and cockle beds
  - important Salmon, Sea Trout, Lamprey, Brown Trout spawning grounds
  - one of only two UK sites with resident bottlenose dolphins
- at least 419 million litres of untreated sewage were discharged from 4 of the STWs
- more than 1,000 “early” spills at Cardigan STW alone because of seawater ingress over 6 years
- possible permit breaches for ammonia levels in treated sewage at Garnswllt STW

Recommendations

- open access to detailed sewage treatment & spill data to aid illegal spill detection
- increase funding for NRW to automate detection and recruit more specialist staff
- give more attention to cumulative effects of sewage exposure on river catchments
- record discharge volume at storm overflows and add it to spill reduction targets
- increase research on exposure of SACs and SSSIs to sewage pollution
- replace Operator Self Monitoring of STWs by an independent body

Permitted discharge of treated and untreated sewage

Sewage Treatment Works (STWs) operated by Dŵr Cymru Welsh Water (DCWW) discharge treated sewage 24/7 to rivers and coastal waters under permits issued by environmental regulators: Natural Resources Wales (NRW) in Wales and the Environment Agency (EA) in England. Some STWs in Wales are operated by Hafren Dyfrdwy, a subsidiary of Severn Trent Water, and some are regulated by the EA.

Both regulators also permit excess untreated sewage to be discharged, or "spilled", from "storm overflows" when the sewerage system (STWs, pumping stations and sewer network) is overloaded.

Water and sewerage companies (WaSCs) in England and Wales have been required to install Event Duration Monitors (EDMs) to record spills of untreated sewage and to report to the EA or NRW, each March, the number of spills and spilling hours for each storm overflow for the previous year.

Illegal discharge of untreated sewage arising from a permit breach

In 2012, the European Court of Justice[1] ruled that storm overflows should operate only in *exceptional circumstances*. However, for decades, in England and Wales, discharge of untreated sewage has been permitted provided it is "due to rainfall or snowmelt" - without qualification or reference to a rainfall threshold. A spill in breach of this permit condition is often called "dry".

Many discharge permits also specify a minimum capacity of sewage flow or treatment that should be achieved before, and maintained throughout, the use of a storm overflow. A spill in breach of this permit condition is often called "early".

Monitoring and recording spills by DCWW

DCWW has 833 STWs, largely in rural areas[2], serving about 3 million people, with a median population equivalent served of under 270[3]. DCWW has installed EDMs on 99.5% of its storm overflows but admits that some still have no permit to spill. In 2022, DCWW published EDM data for 1,943 storm overflows[4] located on the sewerage pipe network (58%), on sewage pumping stations (26%), on inlets (6%) or on storm tanks at STWs (10%).

Identification of permit breaches and illegal spills of untreated sewage

The 11 DCWW STWs considered in this report were selected because

- they offered the opportunity to estimate volumes of untreated sewage discharges, or
- they were frequent spillers likely to be discharging untreated sewage illegally, or
- concern had been expressed by local anglers, conservationists and Afonydd Cymru

Environment Information Regulation (EIR) requests were submitted to DCWW who usually provided 15-min sewage treatment data and individual spill start-stop times within 20 working days. Occasionally, data was withheld without comment. If no rainfall fell on the day, or day before, the spill occurred, it was called "dry". If a spill involved flow to full treatment below 92% of permitted capacity, it was called "early". The 92% accommodates 8% error allowed by NRW and the EA. Final effluent flow data only was provided for 2 STWs, for which the 92% threshold was replaced by a very conservative 50%.

[1] **https://curia.europa.eu/juris/document/document.jsf?docid=128650&doclang=EN**
[2] **https://corporate.dwrcymru.com/en/community/education/teaching-resources/primary-resources/waste-water**
[3] **https://waterprojectsonline.com/custom_case_study/wastewater-treatment-works-rationalisation/**
[4] **https://corporate.dwrcymru.com/en/community/environment/combined-storm-overflows**

Summary of spilling hours & analysis of DCWW data obtained by FOI

Annual spilling hours							crl+click for	Days with Illegal spills						
'18	'19	'20	'21	'22	'23^	TOTAL	STW report	TOTAL	'18	'19	'20	'21	'22	'23
4,378	1,455	4,288	3,429	4,299	1,444	**19,293**	Abererch	**374**	48	72	29	42	127	56
1,445	3,012	2,099	1,391	451	?	**8,398**	Brecon	**52**	1	40	10	1	?	?
1,728	***1,680***	1,483	1,181	370	?	**4,714**	Builth Wells	**99**	10	15	48	21	5	?
?	?	337	331	1,497	694	**2,859**	Caernarfon	**14**	?	?	?	?	1	13
?	7,225	2,018	2,098	2,801	1,116	**15,258**	Cardigan	**1,146**	50	276	228	257	258	77
2,640	***2,856***	***3,048***	***2,184***	***984***	?	**11,712**	Garnswllt*	**9**	2	?	?	7	?	?
?	?	2,138	1,471	637	398	**4,644**	Llanfarian	**88**	?	?	41	22	21	4
2,500	***3,189***	3,339	2,445	2,391	?	**13,864**	Llannon	**275**	18	14	120	99	24	?
?	?	2,069	1,304	894	220	**4,487**	Llanrwst	**82**	?	?	47	21	10	4
655	1,709	2,579	1,808	698	447	**7,896**	Ruthin	**106**	3	24	63	16	0	0
3,360	3,168	3,677	3,231	2,851	1,948	**18,235**	Trebanos	**29**	1	2	7	13	4	2
14,978	**24,294**	**27,075**	**20,873**	**17,873**	**6,267**	**111,360**		**2,274**	**133**	**443**	**593**	**499**	**451**	**156**

* WASP believes Garnswllt STW spilled less often in 2020-2022 than DCWW's data suggests.
All spill and sewage treatment data were from public sources or provided by DCWW in response to EIR/FOI requests
? = insufficient or no data available for analysis; ***italics*** used for total hours estimated by WASP
^2023 data is incomplete

The 11 STWs analysed vary considerably in the size of the population equivalent (PE) they serve – from 836 to 30,617. The rivers to which they discharge also vary considerably in size.

	Abererch	Brecon	Builth Wells	Caernarfon	Cardigan	Garnswllt	Llanfarian	Llannon	Llanrwst	Ruthin	Trebanos
PE	1,782	9,977	3,444	13,844	7,159	30,617	1,541	836	3,128	6,433	16,867

Annual spilling hours for these 11 STWs reduced over the past 3 EDM reporting years in line with national trends of 14%-25% reductions in England and Wales. However, in 2023, the EA said[5]:

The 2022 EDM data shows a decrease in spills, which reflects last year's drier than average weather. Despite claims by some water companies, there is no evidence to show it is because of water company action.

The number of days with illegal spills at the 11 STWs reduced each year by 10% to 20% with the exception of Abererch STW where it increased in 2022 and Cardigan STW where it is still excessive. Of the 2,274 days with evidence for permit breaches, WASP believes 77 (3.4%) were dry only, i.e. no rain on the day or day before the spill with treatment flow above capacity, and the remainder, 2197 (96.6%), were early, i.e. treatment flow was below capacity at some point during the spill.

Recommendations in more detail

Open access to detailed sewage treatment & spill data to aid illegal spill detection

The summary data on sewage treatment (daily volumes) and untreated sewage spills (annual frequency and hours) submitted routinely to the EA and NRW is insufficient to detect permit breaches. For example, the equivalent would be for the police to detect individual speed limit breaches for a driver from the number and total time of journeys undertaken and the number of miles driven in a year. The EA has said that it only asks for the detailed data if suspicion is aroused.

If sewage treatment at 15-min frequency and individual spill start-stop times had been openly available, local people in Cardigan could have detected and brought pressure to cut short the years of illegal spilling at Cardigan STW. A similar case can be made for the multiple permit breaches at Abererch STW and Llannon STW.

[5] https://environmentagency.blog.gov.uk/2023/03/31/storm-overflow-spill-data-shows-performance-is-totally-unacceptable/

Increased funding for NRW to automate detection and recruit more specialist staff

The methods employed in the detailed analyses here of the 11 STWs are not sophisticated and could easily be embodied in software. An analysis pipeline could draw on detailed sewage treatment, individual spill start-stop times and rainfall data and automatically flag likely “dry” and “early” breaches of permit conditions for closer inspection.

NRW started applying similar methods to check permit compliance in 2021 - see example at Ruthin STW[6]. With some initial investment of software development, semi-automated compliance checking could be extremely efficient and subsequently cost effective at monitoring the performance of STWs and detecting those involving illegal discharges of untreated sewage.

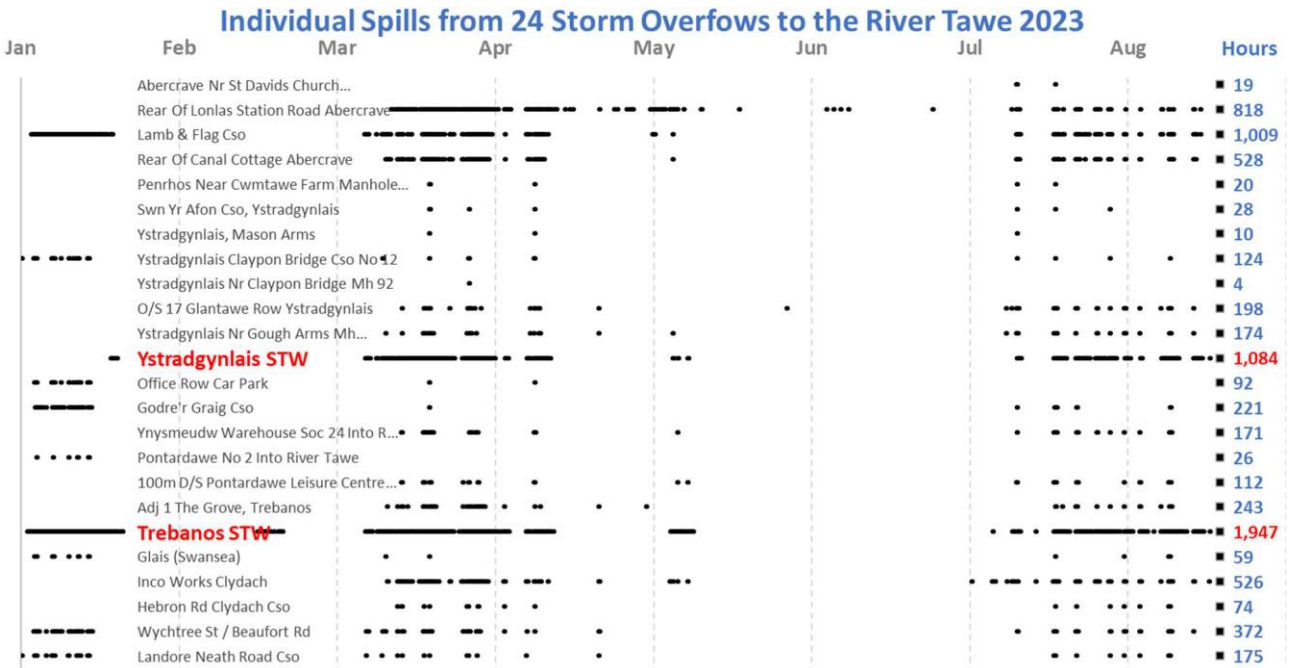
NRW are significantly in advance of the EA in providing open access via an effective online Public Register to discharge permits and also to reports of their inspections of sewage treatment works.

DCWW has so far provided very limited access to its data without EIR (FOI) request, only providing online access to the summary spill data it submits to the EA. Sewage treatment and individual spill start-stop times need to be made more available in a timely manner.

Give more attention to cumulative effects of sewage exposure on river catchments

Reporting the total hours of untreated sewage discharge for a year for a single storm overflow fails to reveal the lengths of individual spills and the activity of each overflow in relation to others that may be simultaneously spilling both upstream and downstream of its location.

For example, in 2023 (up to August), Trebanos STW has spilled for 1,947 hours to the River Tawe. This is a considerable total for just 8 months. The individual spills in the wider Tawe catchment are revealed from headwaters to coast for 24 storm overflows as in the chart below for 2023, clearly showing the potential for cumulative untreated sewage pollution exposure.



[6] https://publicregister.naturalresources.wales/Search/Download?RecordId=47451

The detailed reports accompanying this overview show similar cumulative potential by charting spills for multiple storm overflows in the River Conwy catchment (Llanrwst STW report) and the River Seiont catchment (Caernarfon STW report).

Record discharge volume at storm overflows and add it to spill reduction targets

It is well known that WaSCs in England use tankers to transfer untreated sewage from smaller STWs that are under pressure or performing badly to STWs already spilling or with headroom. Thus, spills can be avoided by judicious use of (carbon intensive) sewage transfer. Hence, a simple count of spills per overflow, especially for STWs, is not a robust target metric for judging reductions in storm overflow spilling. Afonydd Cymru is aware of and has reported this practice in Wales.

Four of the STWs considered in this report have two storm overflows, one at the inlet and another on the storm tank. This has allowed estimates to be made of volumes of untreated sewage discharges from the storm tanks when both overflows were in operation. It doesn't take into account the volume spilled at the inlet overflow or from the storm tank when it is operating in isolation. So lower bounds for spill volumes were calculable for Caernarfon, Llanfarian, Llanrwst and Ruthin STWs – over 400 million litres in all.

Scottish Water (also a not-for-profit WaSC) reported volumes of untreated sewage discharges in 2023 at more than 20 of its storm overflows at STWs. Thames Water publishes volume spill data for just one STW, Mogden in West London. So, claims by WaSCs that metering spill volume is technically challenging look hollow.

Increase research on exposure of SACs and SSSIs to sewage pollution

Several of the STWs considered here (Brecon, Builth Wells, Cardigan, Llanrwst) discharge treated and untreated sewage to rivers that are either designated SAC or SSSI in their own right or are part of a catchment that includes such a designated area.

For example, Cardigan STW discharges into the Teifi estuary just before it joins Cardigan Bay, a designated SAC with a rich diversity of marine mammals such as grey seals, porpoises and resident bottlenose dolphins.

There are concerns about the standards of treated effluent and existing bathing water quality standards for protecting human health being applied to marine wildlife, especially dolphins and other cetaceans[7,8].

Research by Professor Jamie Woodward at the University of Manchester has demonstrated a direct link between poor wastewater management and high levels of microplastic pollution in the beds of UK rivers[9] which are washed out to sea by enhanced river flow during severe storms. Research

[7] https://www.abdn.ac.uk/sbs/documents/MPB_2007.pdf
[8] The Conservation of British Cetaceans: A Review of the Threats and Protection Afforded to Whales, Dolphins, and Porpoises in UK Waters, Part 1. https://docs.wind-watch.org/parsons2010a.pdf
[9] https://blog.policy.manchester.ac.uk/posts/2021/05/microplastic-contamination-of-uk-rivers-caused-by-poor-wastewater-management/

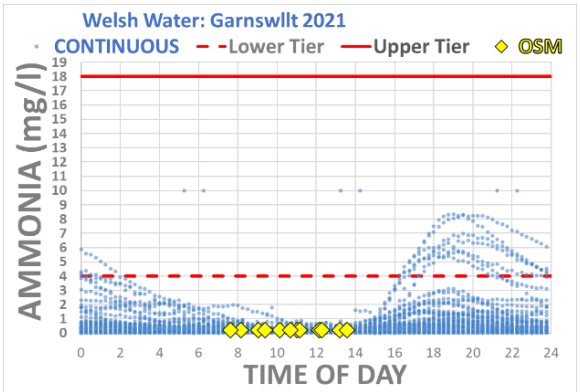
published in 2021[10] showed that the intestinal contents of over 90% of Western Mediterranean striped dolphins frequently included polyacrylamide, a constituent of synthetic clothing.

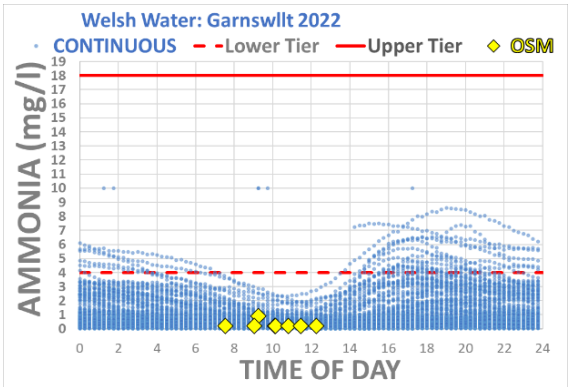
Polychlorinated biphenyls (PCBs)[11] and microplastics[12] are documented threats to male fertility and marine wildlife with growing evidence of feminisation of male fish, reduction of sperm counts and testes size in dolphins, and size of the baculum (penis bone) in otters.

Replace Operator Self Monitoring of STWs by an independent body

Operator Self Monitoring (OSM) of treated sewage at STWs was introduced in 2009/10. OSM allows WaSCs to sample treated sewage at STWs, typically once each month, at a time of their choosing and submit the results of laboratory testing of the samples to an environmental regulator.

In February 2023[13], WASP revealed a major flaw in OSM whereby WaSCs typically restrict their sampling between 7 am and 2 pm so that most treated sewage is never monitored for treatment quality. For example, DCWW undertook its statutory/reportable OSM sampling at Garnswllt STW in 2021 and 2022 between 7:30 am and 12:30 pm (see figure blow). Non-statutory/non-reportable continuous monitoring of treated effluent was undertaken separately by DCWW as it is by most WaSCs. The OSM sampling data easily satisfies the lower tier permit threshold for Ammoniacal Nitrogen. In contrast, the continuous monitoring data suggests that the lower permit level may have been exceeded multiple times in 2021 and 2022 - certainly more often than the two exceedances allowed annually before it is considered a permit breach.





An independent testing body could genuinely test at random times without warning and provide thorough, and more reliable, permit compliance checking.

A study by the University of Oxford[14], reported in 2023, has shown that treated sewage effluent has a significant impact on water quality and the animal and plant life living on riverbeds, regardless of surrounding land use. Another 2023 report by the same group has developed an early detection method for potentially harmful sewage fungus outbreaks in rivers associated with treated sewage discharged from STWs. These two studies demonstrate the importance of maintaining vigilant monitoring of the quality of sewage treatment as well as the current focus on untreated sewage spills.

[10] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7474812/pdf/main.pdf
[11] https://pubmed.ncbi.nlm.nih.gov/33454091/
[12] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7967748/
[13] Feb 2023 **The failure of Operator Self-Monitoring** https://drive.google.com/file/d/1Xsr67YGjw9tr4IalBzq8GNe2q3kT2PcT/view
[14] https://onlinelibrary.wiley.com/doi/10.1111/gcb.16934