

PERSONAL PERSPECTIVE

DRY WEATHER DISCHARGES OF UNTREATED SEWAGE ..., WHY?

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On the 14 June the BBC published its report on dry weather discharges of sewage by English water companies <https://www.bbc.co.uk/news/articles/c4nn46rjej6o>

It used a paradigm that identified dry weather at the point of discharge as being less than 0.25mm on the preceding four days and found that there were some 6000 such discharges recorded by water companies in 2022, which it characterised as illegal. The methodology was contested by the water companies (the formal definition is less than 0.25cm.. the use of 0.25mm was probably just a reporting error). Every year, England's water companies are required to submit an annual report to the Environment Agency EA summarising their discharges. This enables the EA to investigate potential cases of dry spills and to decide whether it will take any action. The BBC used data behind the 2022 report. In responding to its findings, the water companies argued that the datasets are unverified and contain errors.

Explanations offered were that monitors provided invalid data; that some outlets have large catchment areas and it can take a few days for any rainfall to drain through their systems, i.e. sewage detected on a dry day may be the remnants from an earlier rainy day. However, the BBC responded by saying that it accounted for drain-down time by only considering a discharge a potential dry spill when there had been four consecutive days in the surrounding area without rain (but this is not the formal definition of dry weather flow).

And that naturally occurring groundwater can enter sewers, often from private pipes and in dry weather, which can cause overflows (groundwater infiltration is already embedded in the definition of dry weather flow). No one cited discharges being due to emergency circumstances.

On June 14th Anglian Water's Head of Spill Reduction, Gail Pickles explained why a dry day spill, isn't always a dry day spill in a blog 'De-mystifying dry day spills' , which can be found on its website .The insight she provided included...

We are the only country in Europe to have installed monitors on all our storm overflows. Event duration monitors (EDMs) indicate the start and stop times of when a storm overflow may have been active – and I choose that word deliberately, for a good reason.

Getting accurate information about storm spills is not straightforward. In fact, the technology and EDM monitors we're using are still relatively new – less than five years old. They are placed in sewer pipes – which are fairly inhospitable environments and it's not uncommon for them to be 'activated' without a spill occurring.

Nearby activity such as high-speed trains, interruptions in network signal or even a very active spider web can trigger an activation. If we see a sensor has been activated when we wouldn't normally expect it, like in dry weather, we send our teams to check the site and use other telemetry, catchment and weather data to decide whether a spill is in fact genuine. It takes a great deal of time, data and expertise to make sure we're reporting the most accurate

information we can, all of which is shared with our regulator, the Environment Agency in an annual return. And we take a very cautious approach to what we include, if we can't find enough robust evidence to suggest a spill didn't happen, it goes in the return.

And as a comment my burglar went off falsely and we were informed that it was a spider activating the garage alarm..... keep it dusted ... , so the problems occur with other remote sensors !!

An article on this topic of dry weather flows has already been published by the Institute of Water in its Winter 2023 Magazine edition (How Wet is Dry ?) and this article seeks to update that and provide some clarification .It does not seek to defend or admonish the BBC , the water companies or the Environment Agency but seeks to set out as many relevant facts as accurately as possible, so that any debate can take place in a well informed framework .It is essential that any conclusions from that debate do not divert investment or ascribe blame unreasonably. The article does not seek to offer practical or regulatory solutions to the problems .. which is another article for another day!

The diversity of reasons for dry weather discharges can be summarised as follows

- Excessive localised cloud bursts of rainwater in a catchment, but overflowing elsewhere from a sewer at a point where the weather is not wet; the delay can be hours, even days, in big drainage areas,
- And to elaborate this point, if the overflow is due to rising groundwater levels above the sewer level or private drains and sewers , this could cause an overflow well after the rainfall event and last for a long time .Of course the reverse might happen with leaky sewers during dry weather and that is equally undesirable ,which might eventually collapse with blockages and emergency overflows .Sewers may deteriorate by fracturing due to soil movement for a variety of meteorological reasons .So climate change affects groundwater as well . The nature of this problem is highlighted in the discussion after the BBC report and needs particular attention... for example by Wessex Water in its infiltration reduction plan <https://corporate.wessexwater.co.uk/media/mftgfnpv/wessex-water-regional-infiltration-reduction-plan-summary-report.pdf>
- Excessive localised cloud bursts of rainwater in a catchment, but overflowing elsewhere from a sewer at a point where the weather is not wet; the delay can be hours, even days, in big drainage areas,
- Connections of domestic sewage on an incremental basis under S106 of the 1991 Water Industry Act with a slow upward creep of base flow , so a sewer can overflow in drier conditions. This may be evident during a daily period when flows fluctuate. This can be more of a challenge for management of sewer assets than treatment works, but it is still a risk for works. There needs to be greater clarity in the relationship between individual connections providing a very small increment of financial contribution and the major provision of additional assets as individual connections increase.
- Big swings in flow over 24 hours particularly in small sewer catchments and works ,
- Blockages of sewers due to irresponsible disposal of unflushable materials such as sanitary items and cooking wastes such as fat being emptied into sewers ... it is still

allowable to install domestic sink disposal units for food wastes even though this causes problems with blockages!,

- Changes in trade effluent discharges .. likely to become greater as the UK economy promotes more ‘on shoring’,
- Emergencies which are a fact of life in sewers and treatment works such as power outages or third party damage to sewers,
- Irresponsible management and lack of investment

This does not take account of false alarms and how these can be minimised and understood in the matrix of compliance data.

At the heart of this is the concept of dry weather flow and its measurement .The monitoring of the duration of overflows is different to that of dry weather flow per se .Both are easiest at treatment plants and most difficult on sewers in remote areas .The discussion on the BBC report does not offer any distinction. In the cases of permits for effluent discharges , the permissible dry weather flow itself is limited and overflow discharges restricted as multiples of that. If the DWF is exceeded, that is a breach in itself, and the overflow impact may be controlled by lowering the multiple for the overflow .. but that may be difficult . In the cases of sewer overflows the DWF is a design feature with overflows at defined multiples , but there is no DWF permit limit per se ..And monitoring dry weather flow may be difficult and insights into the DWF may be gained by the actual versus the design frequencies of overflows in prescribed weather conditions .. that is the heart of the BBC issues .Whatever ,it is clear from the dialogue after the BBC report, that the location of the places in which rainfall is measured, ie where it is dry needs to be more clearly defined , understood and agreed .

DWF has been defined for permits for many years as the average daily sewage flow entering a treatment works over 7 days with rainfall which did not exceed 25mm on any one day (excluding local or Bank holidays etc) following a period of 7 days, in which rainfall did not exceed 25 mm on any day. Daily total flows are measured on flow meters certified on the EAs Monitoring Certification Scheme (MCERTS). But this is quite challenging, particularly during our recent wet weather.

So the EA offers the alternative measurement of Nonparametric 80% exceeded flow (Q80).The nonparametric 20-percentile value of a time series of measured total daily volume (TDV) data provides a good estimate of DWF ;this value is that exceeded 80% of the recorded daily values. If there are 365 measured values of TDV in a year ranked from the lowest to the highest, the Q80 is the 73rd value.

However, compliance is also assessed with the 90 percentile flow Q90 ,which is the flow equalled or exceeded for 10% of the specified term – a high flow parameter which, when compared with the Q 95 flow provides a measure of the variability, or ‘flashiness’, of the flow regime.

<https://www.gov.uk/government/publications/calculating-dry-weather-flow-dwf-at-waste-water-treatment-works/calculating-dry-weather-flow-dwf-at-waste-water-treatment-works#calculate-dwf-for-new-discharges>

This arcane explanation is simplified in the 2010 EA guidance

http://www.fwr.org/WQreg/Appendices/Assessing_compliance_with_effluent_flow_conditions_472_10.pdf Where the measured DWF (90%- exceeded daily flow) is greater than the

permitted DWF (planned 80%- exceeded daily flow) then the company is required to investigate the cause and take appropriate action to minimise the risk of further non-compliance. This is applied to the largest treatment works.

As far as the design DWF be it for sewers or sewage treatment works , the EA provides guidance on the contemporary use of a long established formula which takes account of design population , per capita water consumption , infiltration and trade effluent discharges . So the current drive for water use efficiency will have the long term benefit of a smaller DWF (but which will be of more concentrated quality)

The issues arising from the BBC report are in many ways all part of the debate about Operator Self Monitoring of discharges .It has elements of self monitoring , self reporting and action taken when non conformity is identified .It is clear that monitor failure cannot be tolerated ,but from the debate there has to be clarity about monitor settings .Many of the reasons given are apocryphal and need more evidence .

From 2025, all water companies have committed to publishing near real-time sewage maps for the public to increase transparency. They will use the data from these monitors to create the maps. And there is no doubt that these will be studied intently by interest groups , regulators , politicians and the media .So it seem reasonable that the reasons for any overspill are given, even if it is the best guess is the best that can be offered .Further- more the measurement or assessment of DWF, by whatever means, needs to be better communicated and understood .Failure to comply does not mean necessarily making an illegal discharge and compliance with the DWF does not necessarily avoid making an illegal discharge

The article in the Institute of Water Magazine Winter of 2023 suggested that this whole topic could be included a future effluent quality assurance approach .That was taken further by the Worshipful Company of Water Conservators in making proposals for a Effluent Quality Assurance approach overseen by a manager akin to role to that of a Health and Safety Manager and that is elaborated further in the Institute of Water Summer 2024 edition (How Can We Be Assured on the Quality of Treated Sewage Effluents ?)

The whole report by the BBC strengthens that position. The execution of a rigorous programme of monitoring ,the maintenance off equipment ,the reporting and explanation of non- compliance as part of EQA is the way forward .And that whole tranche of information must then feed into investment plans.