



# Drinking water 2019

## Summary of the Chief Inspector's report for drinking water in Wales



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# Contents

Executive Summary	5
Drinking water 2019 – Summary of the Chief Inspector's report for Wales	7
Drinking water quality testing	9
Compliance with standard	10
Compliance risk index	10
Learning from compliance failures	14
Microbiological parameters	14
Chemical and physical parameters	17
Consumer contacts and discolouration	21
Events	28
Prosecutions and Warnings	33
Audits	34
Recommendations	40
Enforcement	45
Regulatory strategies	47
Annex 1	

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## Executive Summary

*Drinking water 2019* is the 30<sup>th</sup> published by the Drinking Water Inspectorate (DWI). This report covers public water supplies managed by water companies operating wholly or mainly in Wales. A separate report is available for private supplies.

Safe, clean drinking water is vital to public health and the wellbeing of our society now and into the future. This is the central tenet of the vision and strategy of the Drinking Water Inspectorate published in April 2020. It is ever more important in the face of significant challenges to drinking water supplies from the impacts of climate change, and on the quality and availability of water resources, as well as more recently infectious disease such as CoViD-19.

The Inspectorate's work is wide-ranging, covering all aspects of the quality and sufficiency of public water supplies. *Drinking water 2019* provides a record of the work of the Inspectorate in checking that water companies and local authorities have taken the appropriate action to maintain confidence in drinking water quality and to safeguard public health.

The status of water quality in Wales is at a very high standard but work remains to improve planning for future generations:

It is difficult to escape the question of lead. Fifty years after the use of lead pipes were made illegal, the industry has not made significant progress largely because the ownership of supply pipes from the property curtilage remains with the householder. The most significant risk of lead dissolving into the water is from where it sits in the last few meters of piping waiting to be drawn from the tap. Consequently this will continue to be a potential risk to the mental and physical health of our future generations without the removal of lead from domestic plumbing.

Global challenges such as CoViD-19 coupled with current water resource demand and availability pose challenges for the maintenance of supply during these difficult times. Companies in Wales have identified "no supply" as being a key risk. Demand and resource all threaten water quality and sufficiency for which long term planning will be vital to maintain both our industry and our private supplies. We have clear evidence that water resource challenges result in water quality failings and the decision between sufficiency and quality is not a choice that can be or should have to be made.

In Wales discolouration remains the single biggest challenge with consumer contacts about the appearance of drinking water being almost three times as frequent in Wales than in the wider industry. Compliance failures and

unplanned events are dominated by iron from the ageing network. Inevitably, disturbance of iron (from corroding pipes) will cause discolouration which is alarming to see in drinking water and consumers will reject it.

The increasing use of nickel in the manufacture of taps, and their availability on the market as a cheap alternative, is of concern. Individuals sensitised to nickel, (estimated to be 15% of the population, EFSA 2018) can develop an itchy eczematous rash of the skin. Without some control, these increasingly popular fittings are likely to create a future legacy for an increasingly sensitive population. The Inspectorate has been in discussions with WRAS for fittings made of nickel to be identifiable.

Companies are required to provide risk assessments. In 2019, of approximately 80,000 hazards, analysis indicated 91.8% of the risks were being effectively mitigated which is 2% lower than the wider industry. Turbidity at works and 'no supply' are the top two identified risks.

The annual report provides a summary of 265,394 compliance results taken by the industry, and the associated investigations taken for 76 failures of regulatory standards in Wales. The continuing performance by the industry is measured by the Compliance Risk Index (CRI), designed to allocate a numerical value to risk. A lower value indicates a lower risk. For 2019 the CRI for Wales was 3.73 compared to the wider industry value of 2.87. Dŵr Cymru Welsh Water scored 4 of which three-quarters were due to aesthetic parameters, (Iron, Manganese, Taste, Odour). All failures were investigated and actions carried out to protect consumers. From 2020 companies have a target to achieve an individual CRI of 2 as a common performance commitment.

In 2019 there were 46 events in Wales, where an unexpected failure in the water supply or water quality may not have met the minimum standards expected. Any event which may pose a risk to consumers' water quality and supply is an unacceptable situation and each and every one are investigated based upon risk. The performance of the industry is measured by the Event Risk Index (ERI), which illustrates the risk arising from these events. A lower value indicates a lower risk. In 2019 the ERI for Wales was 27 which is a year on year improvement. The score for Dŵr Cymru Welsh Water was 26 whilst Hafren Dyfrdwy scored 48. A performance target of 30 would be considered acceptable.

# Drinking water 2019

## Summary of the Chief Inspector's report for Wales

*Drinking water 2019* is the annual publication of the Chief Inspector of Drinking Water for England and Wales. It is the 30<sup>th</sup> report of the work of the Inspectorate and presents the summary information about drinking water quality for the calendar year of 2019. It is published as a series of four quarterly reports which cover public water supplies and one report which covers private water supplies. This report is a summary of public water supplies for Wales.

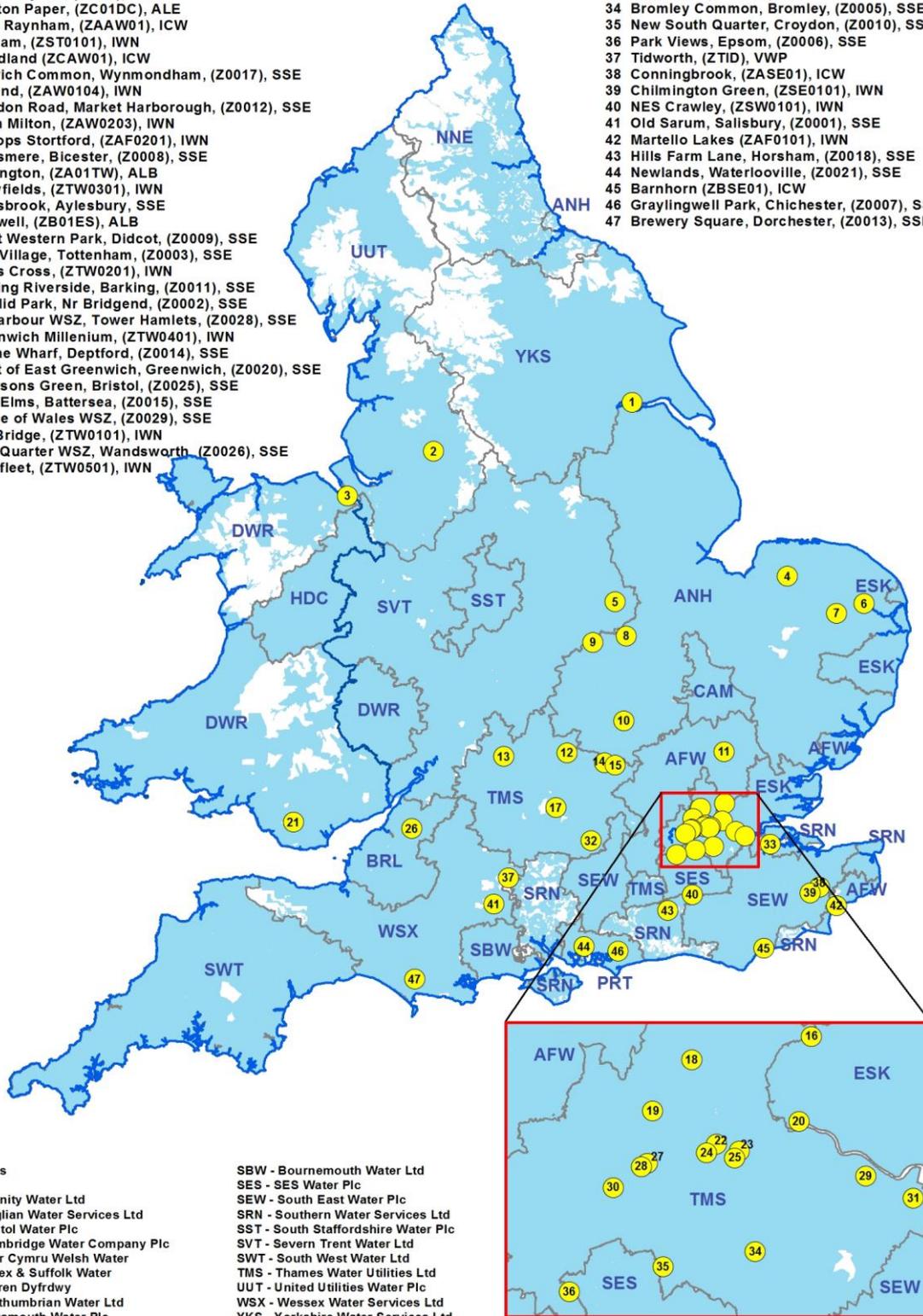
Set out in this report are the key facts about the quality of the public water supplies in Wales, which is served by four water companies delivering supplies to over three million consumers. The area served by each water company is shown in Figure 1.

Table 1: Key facts about public and private water supply arrangements in Wales

Public supplies		Private supplies	
Population supplied	3,116,180	Population supplied	71,238
Water supplied (l/day)	867 million	Water supplied (l/day)	11.4 million
Abstraction points	82	Approximate number of private water supplies*	13,880
Treatment works	66	Total number of local authorities	22
Service reservoirs	407	Number of local authorities with private supplies	22
Water supply zones	96	Water composition	
Length of mains pipe (km)	27,765	Surface influenced supplies	83.1%
		Groundwater sources	8.8%
Water composition		Mains water	7.1%
Surface sources	93%	Unknown	1%
Groundwater sources	6%		
Mixed sources	1%		
Area of supply Anglesey, Blaenau Gwent, Bridgend, Caerphilly, Cardiff, Cardiganshire, Carmarthenshire, Conwy, Denbighshire, Flintshire, Gwynedd, Merthyr Tydfil, Monmouthshire, Neath and Port Talbot, Newport, Pembrokeshire, Powys, Rhondda Cynon Taff, Swansea, Torfaen, Vale of Glamorgan, Wrexham County Borough.			
*Boundaries for public supplies regions are based on groupings of water company zones. Boundaries for private supplies figures are based on the closest approximation of the public supply zones. Where local authorities' boundaries cross regional boundaries, the whole local authority data has been attributed to the region in which the majority of its area lies.			

Figure 1: Companies supplying in England and Wales

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|---|---|
| <ol style="list-style-type: none"> <li>1 Brough, (ZYW0101), IWN</li> <li>2 Media City UK, (ZM01), PWN</li> <li>3 Shotton Paper, (ZC01DC), ALE</li> <li>4 West Raynham, (ZAAW01), ICW</li> <li>5 Oakham, (ZST0101), IWN</li> <li>6 Broadland (ZCAW01), ICW</li> <li>7 Norwich Common, Wynmondham, (Z0017), SSE</li> <li>8 Rutland, (ZAW0104), IWN</li> <li>9 Farndon Road, Market Harborough, (Z0012), SSE</li> <li>10 North Milton, (ZAW0203), IWN</li> <li>11 Bishops Stortford, (ZAF0201), IWN</li> <li>12 Kingsmere, Bicester, (Z0008), SSE</li> <li>13 Rissington, (ZA01TW), ALB</li> <li>14 Berryfields, (ZTW0301), IWN</li> <li>15 Kingsbrook, Aylesbury, SSE</li> <li>16 Chigwell, (ZB01ES), ALB</li> <li>17 Great Western Park, Didcot, (Z0009), SSE</li> <li>18 Hale Village, Tottenham, (Z0003), SSE</li> <li>19 Kings Cross, (ZTW0201), IWN</li> <li>20 Barking Riverside, Barking, (Z0011), SSE</li> <li>21 Llanilid Park, Nr Bridgend, (Z0002), SSE</li> <li>22 Millharbour WSZ, Tower Hamlets, (Z0028), SSE</li> <li>23 Greenwich Millenium, (ZTW0401), IWN</li> <li>24 Marine Wharf, Deptford, (Z0014), SSE</li> <li>25 Heart of East Greenwich, Greenwich, (Z0020), SSE</li> <li>26 Emersons Green, Bristol, (Z0025), SSE</li> <li>27 Nine Elms, Battersea, (Z0015), SSE</li> <li>28 Prince of Wales WSZ, (Z0029), SSE</li> <li>29 The Bridge, (ZTW0101), IWN</li> <li>30 Ram Quarter WSZ, Wandsworth (Z0026), SSE</li> <li>31 Ebbsfleet, (ZTW0501), IWN</li> </ol> | <ol style="list-style-type: none"> <li>32 Kennet Island, Reading, (Z0004), SSE</li> <li>33 Riverside, (ZBSR01), ICW</li> <li>34 Bromley Common, Bromley, (Z0005), SSE</li> <li>35 New South Quarter, Croydon, (Z0010), SSE</li> <li>36 Park Views, Epsom, (Z0006), SSE</li> <li>37 Tidworth, (ZTID), VWP</li> <li>38 Conningbrook, (ZASE01), ICW</li> <li>39 Chilmington Green, (ZSE0101), IWN</li> <li>40 NES Crawley, (ZSW0101), IWN</li> <li>41 Old Sarum, Salisbury, (Z0001), SSE</li> <li>42 Martello Lakes (ZAF0101), IWN</li> <li>43 Hills Farm Lane, Horsham, (Z0018), SSE</li> <li>44 Newlands, Waterlooville, (Z0021), SSE</li> <li>45 Barnhorn (ZBSE01), ICW</li> <li>46 Graylingwell Park, Chichester, (Z0007), SSE</li> <li>47 Brewery Square, Dorchester, (Z0013), SSE</li> </ol> |
|---|---|



- |   |  |
|---|--|
| <p><b>Companies</b></p> <p>AFW - Affinity Water Ltd<br/>         ANH - Anglian Water Services Ltd<br/>         BRL - Bristol Water Plc<br/>         CAM - Cambridge Water Company Plc<br/>         DWR - Dŵr Cymru Welsh Water<br/>         ESK - Essex &amp; Suffolk Water<br/>         HDC - Hafren Dyfrdwy<br/>         NNE - Northumbrian Water Ltd<br/>         PRT - Portsmouth Water Plc</p> | <p>SBW - Bournemouth Water Ltd<br/>         SES - SES Water Plc<br/>         SEW - South East Water Plc<br/>         SRN - Southern Water Services Ltd<br/>         SST - South Staffordshire Water Plc<br/>         SVT - Severn Trent Water Ltd<br/>         SWT - South West Water Ltd<br/>         TMS - Thames Water Utilities Ltd<br/>         UUT - United Utilities Water Plc<br/>         WSX - Wessex Water Services Ltd<br/>         YKS - Yorkshire Water Services Ltd</p> |
|---|--|

## Drinking water quality testing

Throughout 2019, water companies sampled drinking water across Wales to verify compliance with the drinking water regulations. Almost half of the tests were carried out on samples drawn from consumers' taps selected at random. For monitoring purposes, company water supply areas are divided into zones. Sampling in zones at consumers' taps is risk-based with the number of tests being higher in zones with a large population (maximum 100,000). Other sample locations are water treatment works and treated water (service) reservoirs. Collectively, the water companies carried out a total of 265,394 tests during 2019 and only 53 of these tests failed to meet one or more of the standards set down in the regulations or exceeded a screening value.

Table 2: Number of tests carried out by companies in Wales

Company	Place of sampling			Number of tests per company	Target number of tests
	Water treatment works	Service reservoirs	Consumer taps (zones)		
Albion Eco	0 (0)	0 (0)	248 (1)	<b>248</b>	<b>248</b>
Dŵr Cymru Welsh Water	63,010 (60)	80,036 (325)	84,070 (76)	<b>227,116</b>	<b>227,178</b>
Hafren Dyfrdwy	5,734 (6)	20,966 (82)	11,126 (18)	<b>37,826</b>	<b>37,941</b>
SSE Water	0 (0)	0 (0)	204 (1)	<b>204</b>	<b>204</b>
<b>Wales overall</b>	<b>68,744 (66)</b>	<b>101,002 (407)</b>	<b>95,648 (96)</b>	<b>265,394</b>	<b>265,571</b>
Numbers in brackets reflect the number of works, reservoirs or zones operated by that company in Wales in 2019. Some companies are permitted to carry out some tests on samples taken from supply points rather than from consumers' taps.					

# Compliance with standards

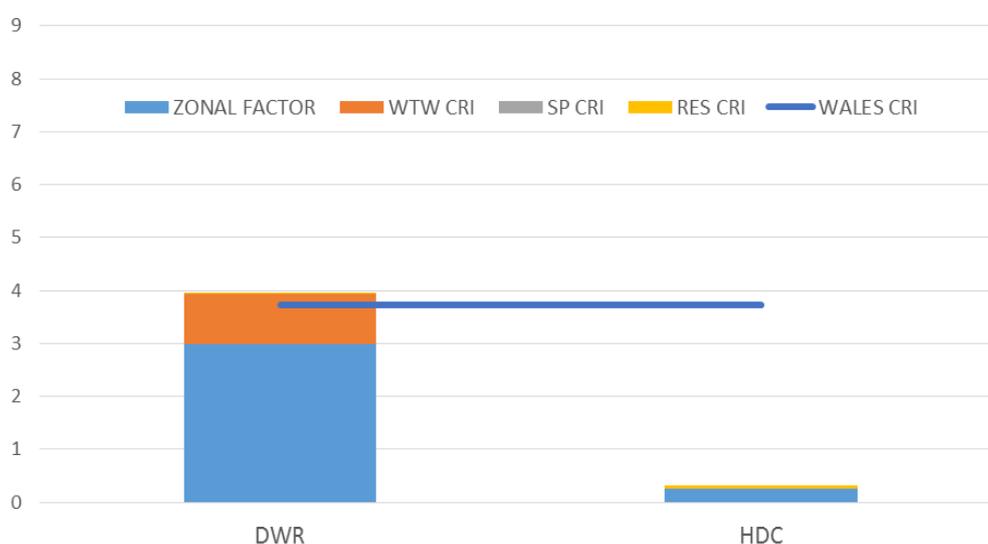
## Compliance Risk Index

The Compliance Risk Index is a performance measure designed to illustrate the risk arising from failures to meet the drinking water standard for the parameters specified within the regulations. It aligns with the Drinking Water Inspectorate’s (DWI) risk-based approach to water supply regulation. The Index assigns a value to the significance of the failing parameter, the proportion of consumers potentially affected and an assessment of the company’s response. The measure illustrates the performance of the industry as a whole, based on the companies and their four elements of a supply system: treatment works; supply points; service reservoirs and consumer’s taps.

In 2019, the CRI for companies wholly or mainly in Wales was 3.73. This is an improvement in performance from the figure of 4.14 in 2018 but in the context of the last four years, this does not represent an overall improving trend. For the industry as a whole, CRI was 2.85, improved from 3.87 in 2018 and consequentially Wales remains above the industry CRI as the wider industry has improved comparatively by a greater margin.

The overall CRI figure is comprised of figures representing performance at different parts of the water supply chain (treatment works, supply points, service reservoirs and zones). In Wales, the improvement from 2018 to 2019 is largely attributable to improvement by both companies to the zonal element of the measure

Figure 2: Company CRI and Industry CRI 2019 for Wales

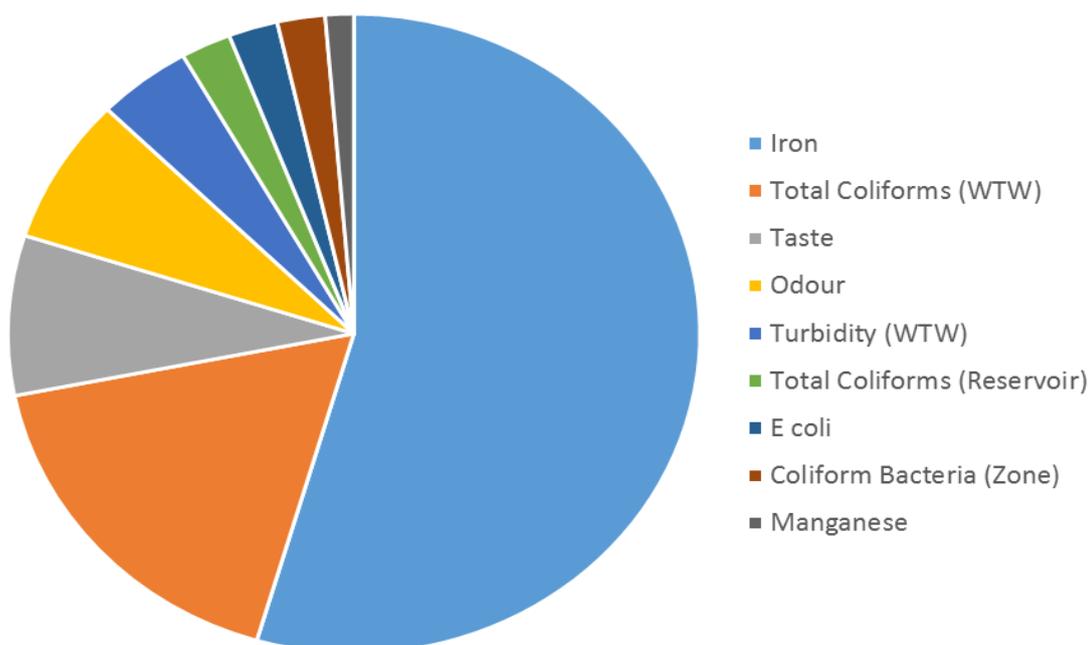


From 2020, companies have an individual outcome CRI of 2 as a common performance commitment agreed with the economic regulator Ofwat. This value was based upon an estimated median companies should reasonably achieve by 2020. The median is a more representative number for a variable and skewed dataset where data is not normally distributed. It weights equally to a middle value and is not influenced by individual underperformance presenting a suitable target for companies to achieve. The actual median value for the industry in 2019 is 1.73 and this has been relatively stable over the last three years. Over half of companies nationally are now meeting this outcome, however, Dŵr Cymru Welsh Water has some way to go. It is not unreasonable to achieve this given that in a number of instances failure to meet this CRI has been entirely within the control of the company as explained in this section below.

Considering individual company performance; there was improvement in the scores of both companies, Dŵr Cymru Welsh Water and Hafren Dyfrdwy. However, Dŵr Cymru Welsh Water not only contributed to the majority of the CRI figure, the company also exceed the Welsh national CRI.

CRI permits the unpacking of the key contributors to each element within the score to understand where the risks are arising and these can be seen in the pie chart below. The data includes all failures of EU, National Standards and Indicator parameters taken at treatment works, service reservoirs and consumer taps and used for the CRI calculation.

Figure 3: CRI Profile for the industry in Wales



In Wales, collectively iron failures are the largest contributor to CRI (see Figure 3) and this parameter remains consistently the main contributor to CRI since this metric was introduced. When considering iron, Dŵr Cymru Welsh Water had 15 failures, eight of which are covered by Legal Instruments. There are 38 zones in Wales subject to undertakings to reduce iron and manganese with the majority set for completion by 2027. See the section on 'Consumer contacts and discolouration' for further discussion.

In addition to iron failures, coliform breaches are indicative of unmitigated risks. For the Wales as a whole, the single largest contribution to CRI was the detection of a coliform at a treatment works, reflecting widespread risk to consumers where there are large populations supplied by the works.

In Wales, there were 11 compliance failures in 2019, which attracted a CRI score in excess of 0.1. It is worth considering why these failures attracted the highest scores; with an aim to encourage companies to do better in future to prevent failures occurring and improved mitigation for those that do.

Out of the 11 compliance breaches above a CRI value of 0.1, two of them occurred at treatment works, a coliform detection and a turbidity failure, and two, whilst taken in zones related to a taste and an odour as a result of works or a catchment related cause. The remaining seven were iron failures in zones, (DWR 6, HDD 1). The Inspectorate encourages companies to focus on treatment performance as this has significance in terms of the potential widespread risk to the community. Treatment works with microbiological failures present a risk to public health and this is particularly pertinent in Wales as the highest single CRI score related to a works with structural problems in contact tanks.

In Wales, the coliform failure which registered as 0.75 in the CRI scale in October occurred at Felindre works, one of Dŵr Cymru's largest works. Following the observation of ingress it was identified the tank had been ineffectively repaired externally. Capital work is required to enable the contact tank compartments to be removed from supply. The Inspectorate is engaging with the company to determine an appropriate timescale to complete this work.

The turbidity failure at Broomy Hill works, Herefordshire in February is operated by Dŵr Cymru Welsh Water, (and included as a company who mainly operates in Wales). This failure was classified as an event as the final water turbidity automated shutdown was deliberately disabled during the re-commissioning of Compartment 2 of the contact tank. Recommendations were made to prevent a recurrence, however, this was a completely unnecessary contribution to the company CRI score.

The taste failure in the Merthyr / Abercynon zone and the odour failure in the Abergele / Rhyl zone both in July were caused by products of algae such as 2-Methylisoborneol (MIB) or geosmin are both subject to a Legal Instrument and again should have been entirely preventable.

The recurring theme in these four significant failures is their detection at treatment works and the fact that these are assets completely in the control of the company. In this perspective, all were entirely avoidable. Companies are advised to review their works and put in place appropriate short term and medium term steps to address the risks. It is also advisable to present clear plans of how and when the issues identified shall be addressed.

Of the remaining six failures within the highest 10 scoring CRI for Dŵr Cymru Welsh Water, all of which were iron failures, four were from Newport, Newport West or Abergavenny / Cwmtillery zone (2). Abergavenny / Cwmtillery has failed six times since 2014, Newport West has failed four times since 2015 and Newport twice since 2017 before the failures in 2019. All are subject to Legal Instruments and therefore all were predictable.

It could be argued therefore that all significant contributing scores by Dŵr Cymru Welsh Water were entirely avoidable and if this were the case, they would not be so adrift of the wider industry CRI.

Further information of the specific failures can be found in the *Learning from compliance failures* section below.

## Learning from compliance failures

The key water quality results for Wales are presented in the following tables showing the results for microbiological parameters (Table 3) and chemical and physical parameters (Table 4). A summary of the results of testing for all parameters and tables that contribute to the drinking water quality performance indices for each company can be found on the DWI website (<http://www.dwi.gov.uk>).

### Microbiological parameters

Table 3: Microbiological tests - The number of tests performed and the number of tests not meeting the standard

Parameter	Current standard	Total number of tests	Number of tests not meeting the standard	Additional information
<b>Water leaving water treatment works</b>				
<i>E.coli</i>	0/100ml	11,343	0	
Coliform bacteria	0/100ml	11,343	1	DWR (1)
<i>Clostridium perfringens</i>	0/100ml	751	1	HDC (1)
Turbidity <sup>1</sup>	1NTU	11,340	0	
<b>Water leaving service reservoirs</b>				
<i>E.coli</i>	0/100ml	20,193	2	DWR (1), HDC (1)
Coliform bacteria	0/100ml in 95% of tests at each reservoir	20,193	8	DWR (4), HDC (4) The following reservoir in the region did not meet the 95% compliance rule:  HDC Higher Wilford DSR (out of service).
<b>Water sampled at consumers' taps</b>				
<i>E.coli</i>	0/100ml	8,240	2	DWR (1), HDC (1)
Enterococci	0/100ml	735	0	
<sup>1</sup> Turbidity is a critical control parameter for water treatment and disinfection.				

All compliance failures are significant and are required to be investigated by the company and the company's findings are in turn assessed by the Inspectorate. All failures contribute to the Compliance Risk Index and the significance, impact and actions taken by the company or required by the Inspectorate influence the score for each failure and guide the Inspectorate in identifying those requiring closer examination.

### ***E.coli* at Works and service reservoirs**

There were no *E.coli* failures in Wales in 2019 at works. However, both Dŵr Cymru Welsh Water and Hafren Dyfrdwy reported a detection of *E.coli* at service reservoirs (Hengaer and High Wilford respectively). This is the first occurrence of an *E.coli* detection at a works or reservoir in Wales since 2013.

Following the failure in August at Hengaer service reservoir (DWR), the company removed both compartments from service for inspection and cleaning before being returned to service in October. This early action by the company is prudent to secure public health. The inspection found no issues with the reservoir or the supplying works. However, the company identified the sample line had been connected onto a 2 inch main feeding a local property and an animal trough, instead of being connected directly onto the outlet main from the reservoir. The company have now directly connected the sample line to the service reservoir outlet. Whilst it is not possible to definitively determine the root cause, follow up sampling have not identified any further *E.coli* failures with the new installation.

The incorrect installation of the sample tap should have been the outcome of a water quality risk assessment, if one been completed. The subsequent inconvenience, cost and increased risk to network resilience whilst keeping the reservoir out of supply for a month could have consequently been avoided. In addition, an exemplary record in this area has been lost.

Higher Wilford (Hafren Dyfrdwy) is a small service reservoir supplying 20 properties and the failure of the *E.coli* standard was not insubstantial at 20/100ml. There had been a previous coliform detection at this site in September 2018. The company were not able to establish a cause for the failure but observed that chlorine concentrations were approximately half the concentration expected. This logic, which connects a low chlorine residual to a failure, does not account for the certainty that the detection of *E.coli* defines the presence of a faecal contaminant, which must have originated from an external source. In addition, a high chlorine may only inhibit the detection as viable but non-culturable. The reservoir is a small single cell type, and was last inspected and flood tested in September 2018, which was satisfactory. At that time the sample line was upgraded. In the absence of a root cause, the company again prudently removed the site

from supply and have abandoned it recognising that the site poses an unknown risk. The company have put into place new pumping arrangements at Frondeg booster station to augment the supply provision thereby securing a quality supply for those 20 properties for the future.

### **Coliforms at works and service reservoirs**

In October Dŵr Cymru Welsh Water detected a coliform at Felindre works. In response the company carried out a wide scoping investigation which included resamples from downstream assets and properties as well as a check on the operation of the works. Whilst the exact reason for the failure remains indeterminate, ingress was identified on the hatches of one of the contact tanks compartments. In this instance, since the contact tank is an integral part of the treatment process, it could not be removed from service. However, the company put into place short term repairs to secure the integrity before planning for engineering works to enable the tanks to be bypassed thereby securing a longer term objective to protect water quality.

Additionally there were eight detections of coliforms at service reservoirs (DWR 4, HDC 4). Dŵr Cymru Welsh Water experienced two failures at Narbeth Road and Coed Y Garth reservoirs which were considered unlikely to recur following a satisfactory investigation. In August a failure at Hengaer reservoir described in the previous section, and finally in October at Wda (Million Gallon) reservoir. This last failure had previously failed in 2016 after which ingress was found following an internal investigation in tank 1. Again, the company removed it from supply, and also removed redundant gauges as part of other remedial work. Clearly for this company, whilst the number of failures remain very low for coliforms, but not zero as a minimum standard, reservoirs which have previously failed for ingress should always be considered higher risk.

In addition to the Higher Wilford failure mention in the previous section, the three failures for Hafren Dyfrdwy occurred at Penymynydd Combined Outlet, Pennant and Church Hill reservoirs in August, September and October respectively. Penymynydd Combined Outlet had previously identified ingress in 2013 and considered a moderate risk. Following the failure an internal inspection identified various ingress points through the roof wall joint and access hatches. The reservoir will remain out of service until the roof membrane and all remedial work has been completed and it has undergone a further satisfactory flood test and recommissioning samples. This is an excellent example of robust action in response to a coliform failure securing future compliance.

The company followed similar actions having identified a coliform failure at Pennant reservoir. However, a coliform failure at Church Hill was detected

after the internal liner had been changed just 12 months previously. On site inspections and re-samples did confirm an immediate risk and the reservoir is scheduled to be cleaned and inspected in 2020.

## Chemical and physical parameters

Table 4: Chemical and physical parameters - The number of tests performed and the number of tests not meeting the standard

Parameter	Current standard or specified concentration <sup>1</sup>	Total number of tests	Number of tests not meeting the standard	Additional information
Aesthetic parameters – odour	No abnormal change	3,068	10	DWR (9), HDC (1)
– taste		3,060	10	DWR (9), HDC (1)
Fluoride	1.5mg/l	698	0	
Iron	200µg/l	3,034	15	DWR (14), HDC (1)
Lead	10µg/l	704	1	HDC (1)
Manganese	50µg/l	3,031	1	DWR (1)
Nickel	20µg/l	705	2	DWR (2)
Nitrate	50mg/l	748	0	
Nitrite	0.5mg/l	748	0	
Pesticides – total	0.5µg/l	909	0	
Pesticide – individual <sup>3</sup>	0.1µg/l	6,854	0	
Radioactivity				
Gross alpha	0.1Bq/l	55	0	
Gross beta	1.0Bq/l	55	0	
Radon	100Bq/l	15	0	
Total indicative dose	0.1mSv/year	0	0	
Tritium	100Bq/l	9	0	
Notes:				
<sup>1</sup> For comparison, 1mg/l is one part in a million, 1µg/l is one part in a thousand million.				
<sup>2</sup> The value of 2mg/l at the consumer's tap is a screening value set by the Inspectorate.				
<sup>3</sup> A further 3,012 tests were done for aldrin, dieldrin, heptachlor, heptachlor epoxide, all of which met the relevant standard of 0.03µg/l.				
<sup>4</sup> These are screening values to trigger action. The standard is 'Total Indicative Dose'.				

Table 4 sets out the results for those chemical and physical parameters where there has been a failure to meet a Prescribed Standard (mandatory quality standard) and any other parameter of interest.

The main chemical contributors to the CRI index in Wales were iron, taste and odour. A single lead failure was reported but due to the circumstances of the failure these did not contribute to the index. The reason for this is that lead failures are attributed to a very small proportion of the population, often the population of a single household. Nonetheless, the circumstances of these failures are reported due to the importance of this parameter for public health.

## Iron

There were 15 failures recorded in 2019, 14 of which were in zones supplied by Dŵr Cymru Welsh Water in Wales and one in a zone supplied by Hafren Dyfrdwy.

Detections of iron remained the same in 2019 as the previous year and similar to those failures over the years without any real visible improvement. In most cases the situation was short-lived and appropriately remedied by the company concerned. There were various causes described by the company such as changes in flow, flushing, network re-sedimentation and build up of iron in supply pipes because of property locations, such as at the end of a cul-de-sac. One zone which failed in July for iron, Abergale / Rhyle, was also associated with a manganese failure. It is apparent that risk of discolouration from sediment present within the network remains significant in Wales.

When observing this year's data for parameters not meeting the standard, it is evident that a consumer who resides in Newport or Newport West or Abergavenny / Cwmtillery zone is more likely to have received water, which contains elevated iron than any other parameter. One zone, Abergavenny / Cwmtillery had two failures during the year and has failed six times since 2014. This zone, together with a further seven zones are covered by legal instruments for discolouration to identify and prioritise zones for further work to remediate issues.

None of the remaining failures resulted in recommendations from DWI as they were either unlikely to recur or a satisfactory investigation did not identify a cause.

## Odour and Taste

There were ten detections of odours and tastes in Wales, (DWR 9, HDC 1). Only three of which were joint detections of taste and odour in the same sample. There were two distinct causes which in the majority of cases

were identified as fittings related, where for instance there existed no backflow prevention between taps used for drinking and washing machines. In the remainder, a minority of about a third of cases, these were earthy or a musty type taste and odours. Such taints are caused by the degradation products of algae such as 2-Methylisoborneol (MIB) or geosmin. For Dŵr Cymru Welsh Water one of the odour failures (Abergele / Rhyl zone) is subject to a Legal Instrument, as is the taste failure in Merthyr / Abercynon zone.

Water samples from the Preseli zone failed in March for Odour, September for Taste and November for both, reflecting the raw water quality as this zone has recorded a number of failures in recent years where low levels of geosmin and MIB are detected. Preseli works employs Powdered Activated Carbon for treatment; however, the Taste detection in September was as a direct result of an algal challenge at the works and was classified as an event, reported in more detail in the Events section. Subsequently, an audit was carried out at the works which is further reported upon in the Audits section. The company are required to submit a report detailing the findings of the catchment investigation outlining their future action plan to prevent a recurrence.

The taste and odour detections for Hafren Dyfrdwy (Glyndwr South zone) were due to poor turnover within a property which was unoccupied. All other exceedances were unlikely to recur.

## Nickel

The usual cause of nickel failures is domestic fittings but despite this, companies are still expected to carry out relevant fittings inspections and provide appropriate advice to consumers. Absorption of nickel from drinking water on an empty stomach is 10 to 40-fold higher than absorption from food and may lead to eczematous flare-up reactions in the skin in sensitized individuals.

Nickel remains a rising concern due to the availability and relative cheap cost of fittings with exposed nickel. The sensitivity of some individuals is becoming more apparent and not to tackle this problem as it is emerging risks a future legacy. The Inspectorate has been in discussions with WRAS to work with the industry to ensure that fittings made of nickel are clearly identifiable so that consumers, plumbers and house builders can avoid products at the root of this emerging issue.

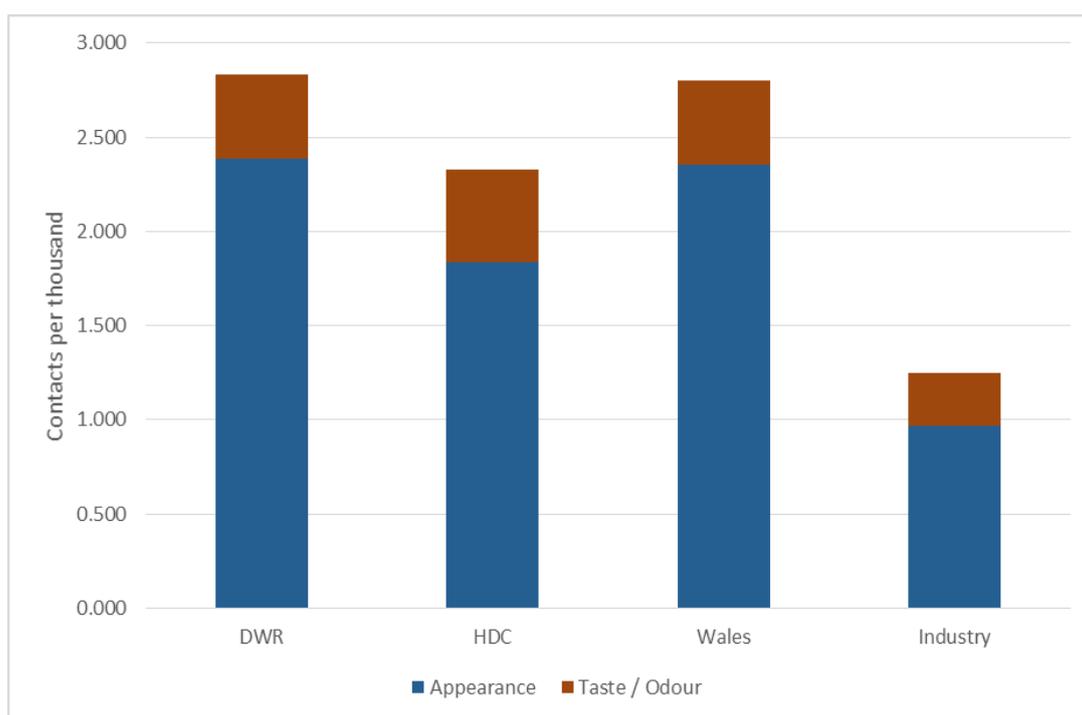
Companies are required to provide appropriate advice on flushing including flushing particularly after periods of non-use, such as first thing in the morning. Advice is a requirement of regulation 18(6) and applies to any breach where the cause is due to the domestic distribution system.

Whilst there were only 2 nickel failures reported in Wales (DWR), the level reported for one of them in the Elan zone was 130ug/l which exceeds the health based suggested no adverse response level SNARL of 70ug/l. As a result, Do Not Drink advice was issued to the customer at the property as a precautionary measure and bottled water subsequently delivered. Resamples were taken from the original failing property utility tap (flushed and unflushed) and also the kitchen tap, which were all satisfactory. The Do Not Drink advice was lifted and customer advised to use the kitchen tap for cooking/drinking in the future. A water fittings inspection was carried out which determined that the tap is WRAS approved (WRAS approval number 1404143), this was not immediately identifiable and difficult for appropriate choices to be made by consumers and plumbers alike.

## Consumer contacts and discolouration

In 2019, Dŵr Cymru Welsh Water continues to receive the highest number of customer contacts per 1,000 population despite an overall improvement since 2018.

Figure 4: 2019 Total contacts /1,000 population – Wales

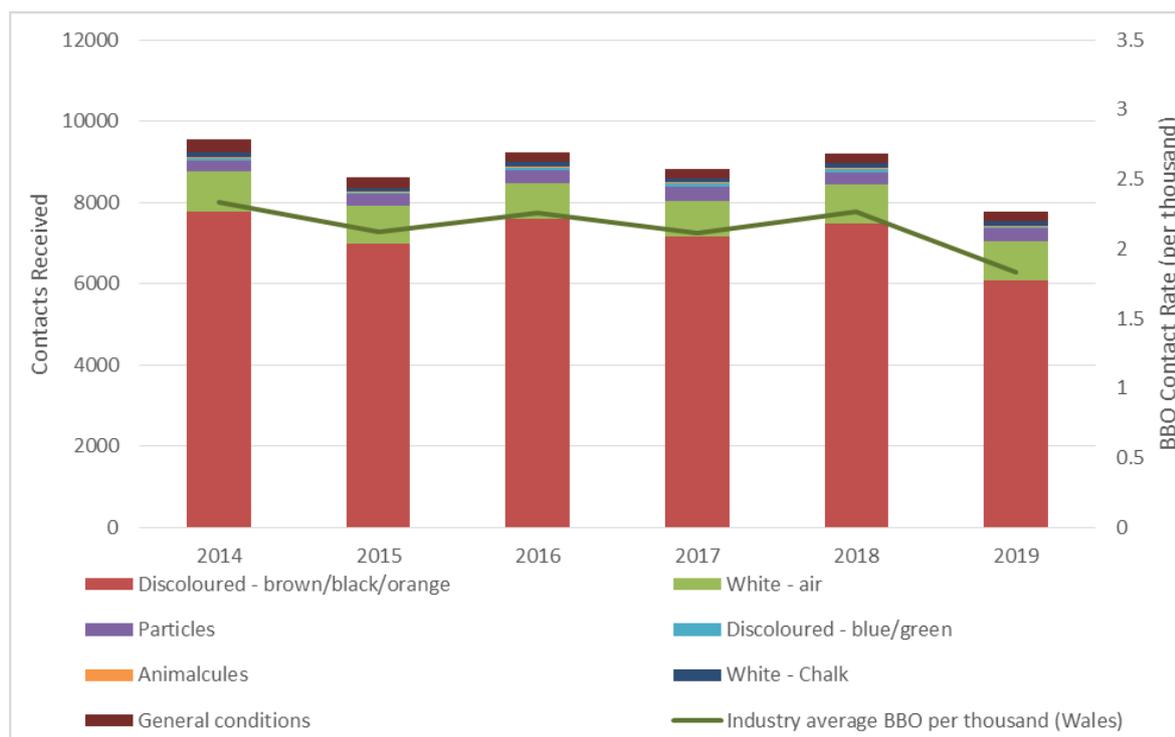


Discolouration remains the most common reason that consumers will contact their water company to report an issue with water quality. Discolouration may arise from the disturbance of historic mains settlement in the distribution system, typically due to an increase in velocities in the pipe, for example following a burst main or network operation.

In 2019, consumer contacts about the appearance of drinking water continue to be almost three times as frequent in Wales than in the industry as a whole and this is likely to reflect the network risk of iron and manganese identified through CRI. This remains a significant concern for Wales.

Progress in reducing levels of these contacts in Wales has started to show a slight but not in any way significant improvement in recent years (see Figure 5).

Figure 5: 2014-2019 Appearance contacts /1,000 population – Wales

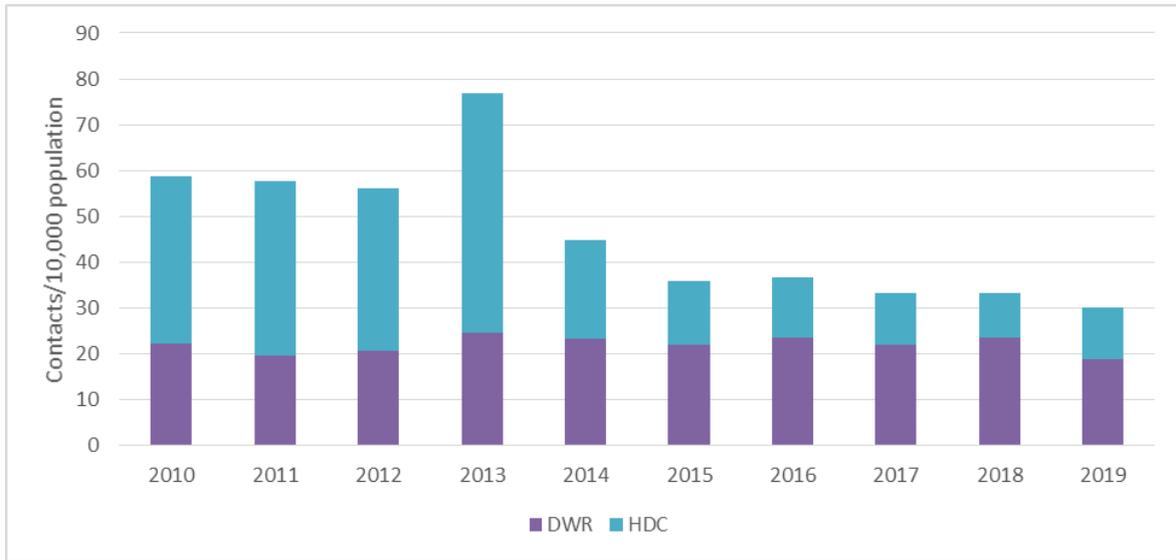


Any contact by a consumer to a company about discoloured water is unacceptable not just to the consumer but for the company, where there is a duty to supply wholesome and sufficient water all of the time. This is the minimum standard. The number of appearance contacts in Wales stands at a little under 8,000 contacts. In the context of overall unwanted contacts to companies which stand at 117,570 for Wales (DWR, HDD) as reported by CCW in their 18/19 report, water quality contacts remain relatively small but nevertheless critically important. This is shown in Figure 5 together with the proportion of discolouration contacts and the average industry Brown, Black or Orange (BBO) contact rate (per thousand population).

Consumer contacts, compliance failures for iron, together with manganese, CRI, events and ERI, are inextricably linked. This is because ultimately, they all have the same root cause in Wales and they all represent a predictable risk. The situation is particularly demonstrated by Dŵr Cymru Welsh Water who in 2019 registered 19 failures for iron and one for manganese and where iron makes up 53% of their CRI score.

Figure 6 illustrates that while Hafren Dyfrdwy (now operating zones formerly under the control of Dee Valley Water) has shown improvements since 2013, Dŵr Cymru Welsh Water is not showing any significant progress in reducing the number of contacts.

Figure 6: 2010–2019 Black/brown/orange contacts/10,000 population – Wales



For events in 2019, of the 46 events notified in Wales, 15 (33%) were associated with the supply of discoloured water, to 200,942 consumers. These events have exposed up to 6% of the population to discoloration at one point in the year. The number of discoloration related events and the corresponding ERI score which has been attributed to these events by company is shown below.

Figure 7: Discolouration events and ERI score

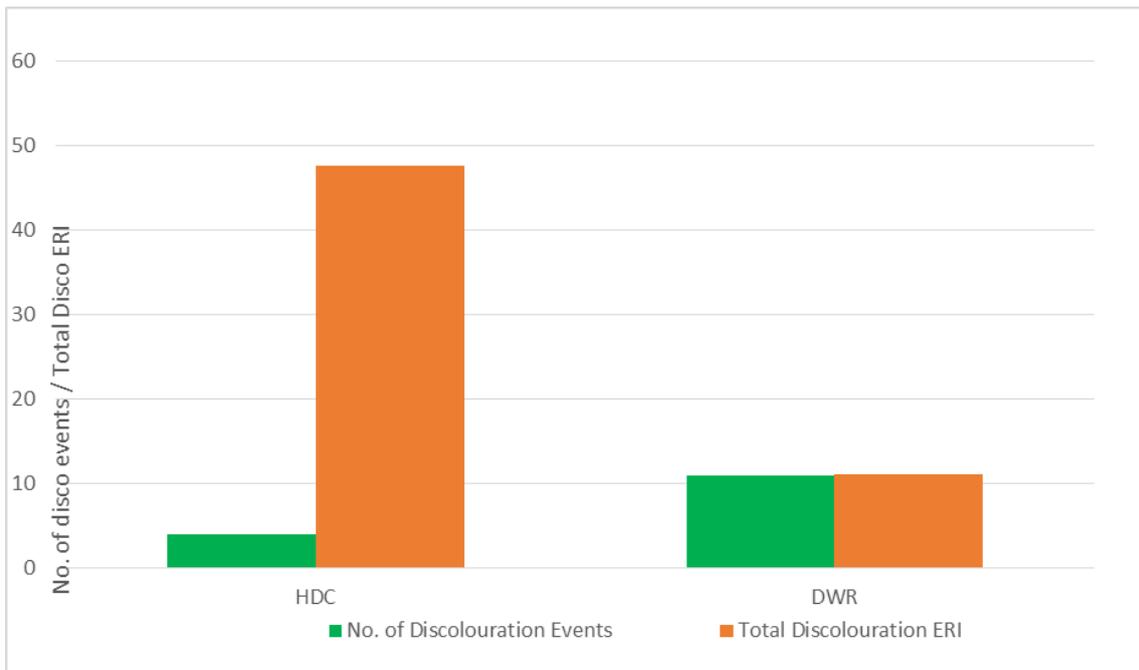
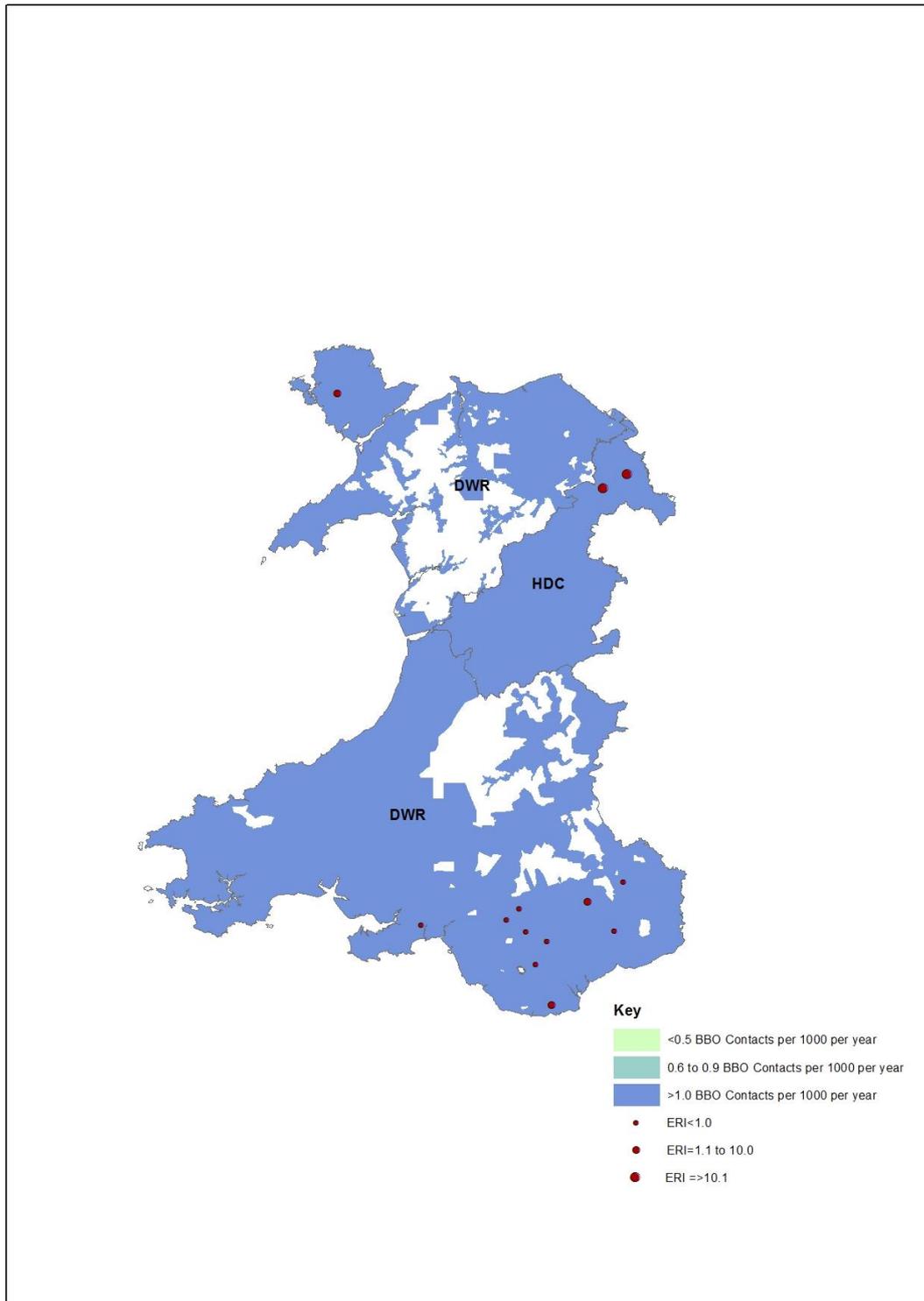


Figure 7 shows that, in 2019, consumers supplied by Hafren Dyfrdwy were relatively at greater risk of experiencing discoloured drinking water following a water supply event impacting on the distribution network. This is despite Hafren Dyfrdwy having fewer total number of discolouration events (see Events section for further discussion).

Figure 8: Map of discolouration events 2019



The above map shows the distribution of discolouration events for 2019. Company boundaries (except inset appointments) are shown on the map, and the background colour represents the company's number of consumer contacts about discolouration (BBO per 1,000 consumers) received during the year. The map identifies where discolouration hotspots exist. In 2019, South Wales stands out as an area with a higher frequency of discolouration events and higher than average rates of discolouration contacts.

In 2019 Dŵr Cymru Welsh Water demonstrated a significant reduction in the ERI related to discolouration, showing that they have learned lessons around managing events in the network to reduce the population affected and the duration. In 2018, Dŵr Cymru Welsh Water reported 12 discolouration events with a combined ERI score of 34 however, in 2019 this had improved to 11 events with a combined ERI score of 11. In contrast Hafren Dyfrdwy reported four events in 2019 with a combined ERI score of 48, however in 2018 reported zero discolouration events.

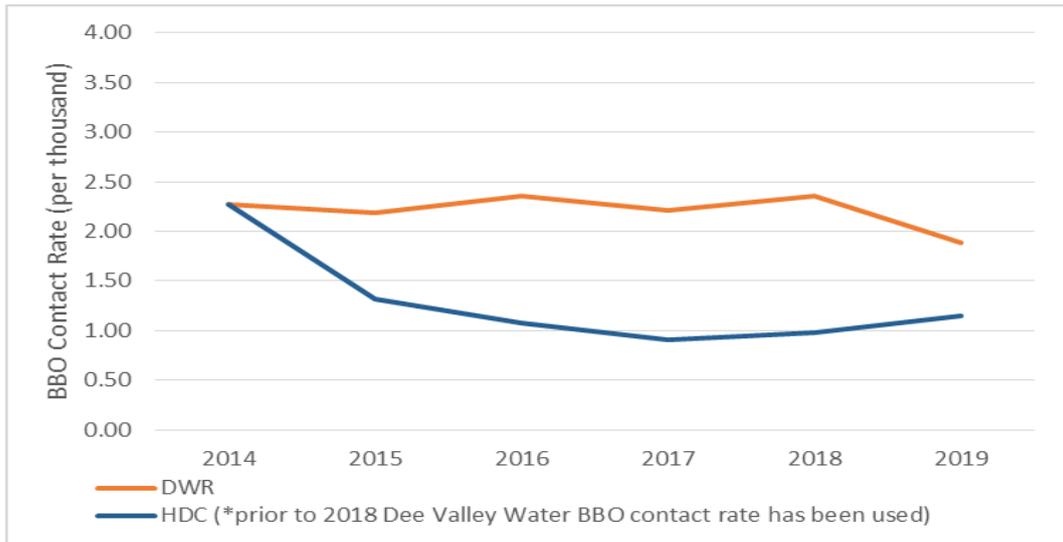
The Inspectorate welcomes the developments in network management, such as software aids and improved training for operators to provide "calm networks", and encourages their continued use as operational tools. The Inspectorate also encourages the use of real-time monitors for routine operational monitoring as investigative tools in providing improved responsiveness to interruptions. All of these have been important in reducing the number and severity of discolouration events.

In recognition of the importance of the appearance of water to consumers, the Inspectorate identified in 2015 a number of water companies which had areas of persistent discolouration. Network assets are completely in the control of a company, which clearly should be compliant with the minimum regulatory standards. The Inspectorate examined water company strategies for tackling discolouration over the forthcoming AMP6 period and evaluated whether any further enforcement action would be needed to reduce the risk of consumers being supplied with discoloured water

The exercise resulted in the Inspectorate issuing 30 improvement notices to Dŵr Cymru Welsh Water. The notices formalised the measures set out in company discolouration strategies which included the completion of Distribution Zonal Studies, installation of additional treatment for manganese removal, cleaning of supplying service reservoirs, mains cleaning (including flushing), mains rehabilitation, mains abandonment and pressure management.

The benefit of company's discolouration strategies can be seen in Figure 9, which shows the companies average BBO consumer contact rate over the AMP6 period:

Figure 9: Improvements in company AMP6 BBO contact rate



Dŵr Cymru Welsh Water have seen a 14% decrease in the overall company BBO contact rate. Dŵr Cymru Welsh Water are undertaking Distribution Zonal Studies to better identify what the appropriate remedial measures are to mitigate against the discolouration risk within supply zones. The Inspectorate issued notices to the company, some of which stretch over the forthcoming period between 2020 and 2025, requiring the company to deliver the identified measures in the high risk zones (such as mains rehabilitation, mains replacement, mains abandonment and mains flushing). The company has seen a recent improvement in the consumer contact rate as they deliver the outcomes of the Distribution Zonal Studies.

Figure 10: Discolouration contacts with the rate per 1,000

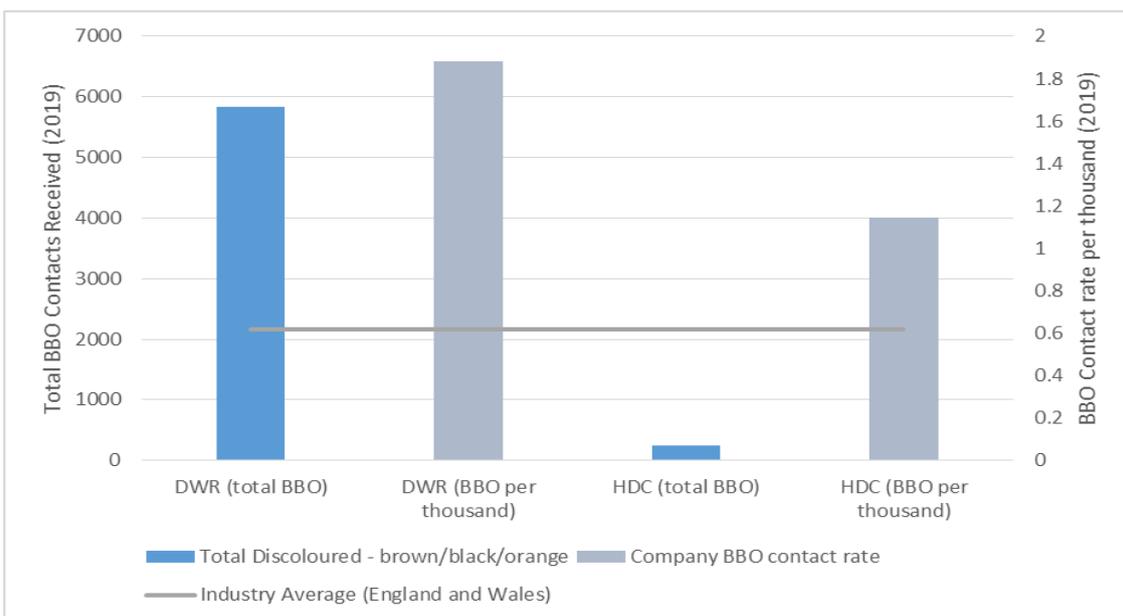


Figure 10 identifies the number of discolouration contacts and the corresponding company discolouration rate (per thousand) received across Wales during 2019. The relative performance of companies normalised by contact rate together with the industry average identifies those companies, which are relatively poor performing. Hafren Dyfrdwy received a relatively low number of total contacts for discolouration in 2019, the small population supplied has resulted in a higher consumer contact rate per thousand consumers. The company has an enforcement notice in place, which covers the Legacy and Rhos zones and includes steps to clean the supplying trunk main, with a completion date of April 2021. The Inspectorate will be liaising with the company to determine whether any further enforcement action is needed in any other high discolouration risk zones.

Dŵr Cymru Welsh Water is the worst performing company for discolouration when comparing the contact rate per thousand consumers supplied. The company has 17 improvement notices in place for the company's highest risk zones and the Inspectorate will be working with the company during the delivery of the schemes to ensure that progress is made to reduce the discolouration risk to an acceptable level.

The Inspectorate has issued regulation 28(4) notices requiring companies to take steps to reduce the risks associated with discolouration in higher risk areas, and we will continue to monitor companies' progress to ensure that providing safe, wholesome water to consumers that is of acceptable aesthetic quality remains at the heart of strategic drinking water quality planning. Along with targeted maintenance and strategic renewal of distribution assets, where there is evidence that iron and manganese is not effectively removed at the treatment works, companies should investigate options to improve treatment to reduce the load in distribution and reduce risks associated with discolouration.

During 2020 the Inspectorate will be undertaking a review of company performance across the whole of the industry to identify any zones which have unacceptable discolouration risk and, if necessary, initiate enforcement to ensure that these companies have suitable discolouration strategies in place to reduce consumer contacts. Ultimately, the only acceptable level should be zero contacts.

## Events

The Event Risk Index is a measure designed to illustrate the risk arising from treated water incidents and it aligns with the current risk-based approach to regulation of water supplies used by the Drinking Water Inspectorate (DWI). Like CRI, it assigns a value to the significance of the event, the proportion of consumers potentially affected and an assessment of the company response.

A summary of the nature, cause and duration of the 50 events with the highest ERI scores, along with details of the Inspectorate's findings, are set out on the Inspectorate's website. A listing of other events is also published. Most events notified to the Inspectorate in 2019 were of relatively short duration and the company took appropriate action to inform and safeguard consumers and liaised with other stakeholders.

For the benefit of the industry, the Inspectorate published information on events that are of wider significance, to illustrate issues that the water industry can learn from.

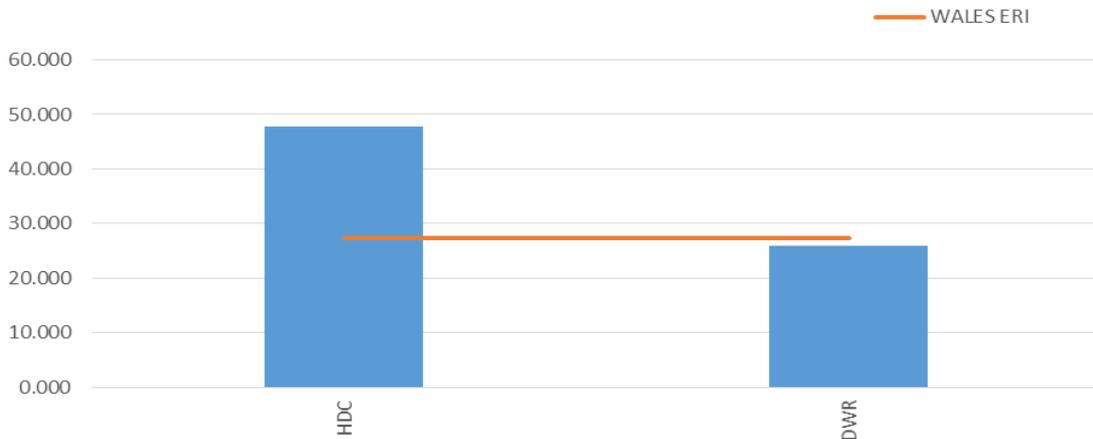
In 2019 the ERI for Wales was 27, indicating an improving performance from 32 in 2018 and 55 in 2017. Out of the 50 events with the highest ERI scores, the number of events in 2019 in Wales was three. Whilst companies should work towards no events which affect consumers and hence an ERI of zero, the ERI value in Wales indicates events have a relatively smaller impact with an improved response over the last three years.

The national ERI calculates the total value of all events of companies wholly or mainly in Wales and calculates an index as if it were a single company. Those companies who exceed this value represent either a greater number of events, events which affect more people, are longer, have a higher risk category, are responded to relatively poorly or are a combination of some or all of these factors. Hafren Dyfrdwy recorded an ERI above the Welsh ERI due to the two single largest events in Wales in 2019.

ERI is derived from a variable and skewed dataset and is easily influenced by outliers. It is therefore appropriate to examine performance using the median value as a helpful measure of the centre point. The median value in the wider industry for 2019 is 12.5 and has reduced three years in a row from 30.7 in 2017. This indicates a continuing improving picture for this dataset only offset by a few companies elevating the National ERI. It would not be unrealistic as a future expectation for all companies to perform better than the 2017 median value. The performance of Wales already exceeds the 2017 value largely due to the individual performance of Dŵr Cymru Welsh

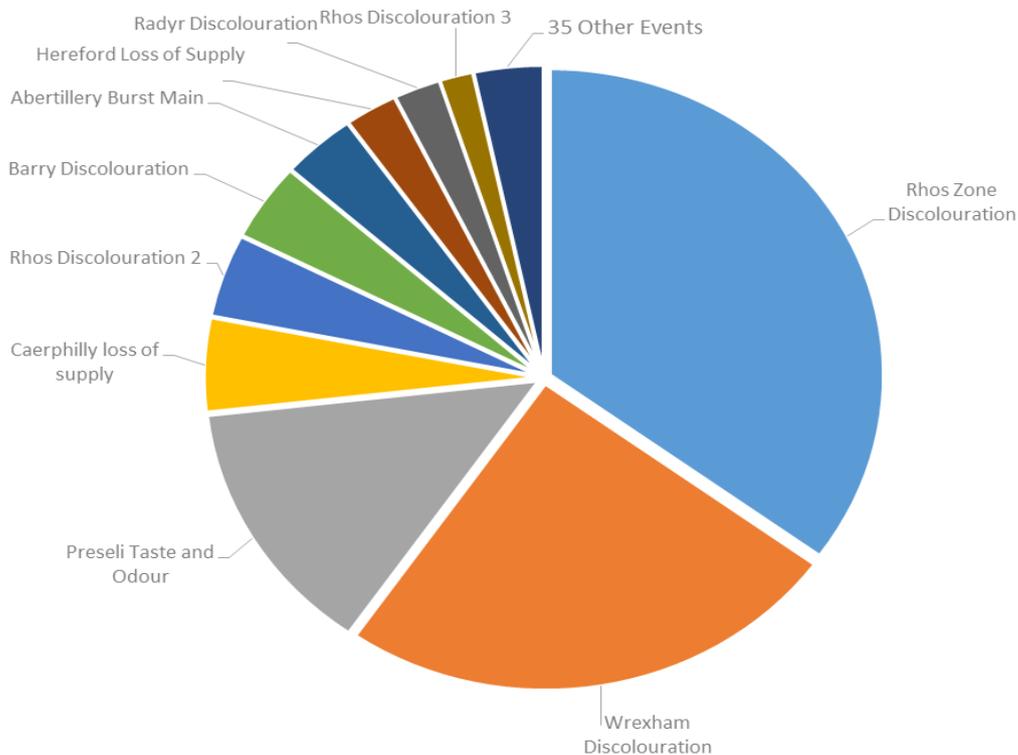
Water. This should be commended as demonstrates the focus by the company on reducing the impact of events.

Figure 11: ERI score 2019 for Wales



ERI permits the understanding of the main contributors to risk, which can be seen in Figure 12. The largest single contributor to the Events Risk Index, was an event comprising discolouration in Rhosllanerchrugog followed by discolouration in Wrexham. The circumstances are described below along with descriptions of the other main events contributing to ERI.

Figure 12: Main events contributing to ERI in Wales



## Rhos zone, discolouration (Hafren Dyfrdwy)

Hafren Dyfrdwy had the highest ERI score for Wales, with an ERI of 25 for this discolouration event which lasted for several days. Rhosllanerchrugog, located near Wrexham, has been an area of water main refurbishment work using a technique referred to as ice pigging. The operation involves the planned shut and isolation of a specific section of water main whilst an ice slush is injected into the main. The slush possesses abrasive but non-destructive properties, which enables the removal of accumulated historical corrosion deposits without damaging the main itself. The ice slush collects and pushes the debris along the main, until it is removed at the end of the shut section. The main is then further flushed with water to ensure the supply is wholesome and compliant with the water quality regulations.

The inspectorate had previously visited the area in 2013, when the company was Dee Valley Water, to witness the innovative ice pigging process. However, there have since been a number of events across the Industry associated with this process. As the Inspectorate has determined, the process is only as good as the management and planning associated with it.

The company was issued a regulation 28 notice in early 2019 which transferred the previous responsibilities from Dee Valley Water to Hafren Dyfrdwy, for risks associated with manganese, to complete mains rehabilitation work in this area. The original legal instrument was first issued in 2015, with consumers continued to be exposed to intermittent water quality issues since then. During 2018 manganese breaches were attributed to mains deposits. During 2019 there were three events reported to the Inspectorate within the zone. These events highlight the poor condition of the water mains and the importance of the completion of maintenance.

Date	Event Name	ERI score
12 Sept 2019	Rhos Zone Discolouration	25
06 Aug 2019	Rhos Discolouration 2	3
30 Jul 2019	Rhos Discolouration	1

On 30 July 2019 planned works involved the isolation of a 10 inch main so that a new valve could be installed. Such operations are routine for the Industry with no adverse impact on the water quality of the supply. However, on this occasion the valve operations caused a discolouration of the supply. The company failed to model the flow rates for this operation due to staff shortages and the work relied upon a previous risk assessment

undertaken. Since this event the company has been receiving support from Severn Trent Water, who are the parent company, to provide modelling resources to plan work to be undertaken.

On 6 August 2019, during planned work to enable future mains cleaning, a corroded fire hydrant failed. The increase in flow caused a discolouration to water supplies affecting 11,000 consumers. The event was a highly unusual occurrence. The risk of the hydrant had been identified and was in the process of being excavated when it failed. The team on site managed to control the loss of water following the burst and began flushing but not before the sudden increase in flow rates had caused discolouration.

On 10 September 2019 the company had been undertaking ice pigging overnight, which is standard practice as there is reduced demand on the network. The reduced demand is important as the isolation of a section of main can change the hydraulics in local mains, but with less demand, the status quo of the mains is maintained. There had previously been two ice pigging operations on these sections of main with no issues occurring and no consumer contacts being received.

Unbeknown to the company, that same night the local fire service carried out a drill and accessed a fire hydrant. The opening of the hydrant significantly increased the flow in the local mains. This unexpected increase in flow would have been sufficient to mobilise historical deposits in sections of main which had not yet been through the ice pigging cleaning process and caused discolouration to the supply. There was a PCV failure for coliforms and complaints of taste & odour were also received. Owing to the repeat nature of this event the ERI score was higher than the previous two.

Over the years this zone has been a hotspot for discolouration, hence the legal instrument. Whenever intrusive operations are undertaken on the distribution network there exists an element of risk. The company experienced three separate events within three months all of which had the unfortunate consequence of causing discolouration and disruption to consumers. The discolouration was as a result of historical accumulation of corrosion deposits. Poor network maintenance results in discoloured supplies whenever an adverse operation to the distribution system occurs. The cleaning activities are now complete, and the Inspectorate is awaiting the final report from the company, along with the sampling evidence to show that the improvement scheme has brought about an improvement in water quality.

### **Wrexham zone, discolouration (Hafren Dyfrdwy)**

A further discolouration event for Hafren Dyfrdwy, with an ERI of 18. On 27 February, the company received reports from consumers of discoloured

water within Wrexham district metered area affecting approximately 4,115 consumers.

The discolouration had been as a result of planned work to redirect water flows within the district metered area. The work caused two pressure drops which disturbed sediment within the mains, resulting in discolouration of the supply. There were 53 consumer contacts made to the company.

Hydraulic risk modelling had been completed prior to the completion of the planned work, however it failed to highlight the risk from discolouration that was observed during the event. Additionally, the company failed to complete a risk assessment or method statement prior to undertaking the planned work. The company reviewed their procedures to ensure planned works would go through the appropriate governance processes.

The Inspectorate considers that this event may have been wholly unavoidable had the company completed an adequate risk assessment of the planned works.

### **Preseli, Taste and Odour (Dŵr Cymru Welsh Water)**

Dŵr Cymru Welsh Water only had one event of any significance relating to ERI, with a score of 10. During two weeks in September, Dŵr Cymru received 114 consumer contacts from across the Pembrokeshire region. Of these calls 88 were reported as musty or earth taste and odour to the water supply. A further 14 reported gastric illness, whilst the remainder reported other tastes and odours. Following investigations it was identified that Rosebush reservoir had elevated levels of 2-methyl isoborneol (MIB). MIB is a compound widely associated with causing musty/earthy tastes and odours, as reported by the consumers.

Rosebush reservoir is the main source of raw water for Preseli Water Treatment Works. Historically there had not been any detections of elevated taste and odour causing compounds within Rosebush reservoir. As a consequence, there was no risk driver to install a treatment process at Preseli to remove any such compounds.

The company quickly initiated Powdered Activated Carbon (PAC) dosing at Preseli works using a mobile dosing rig. The raw water received at the works was also blended with another source to dilute the levels of MIB in the final water. Nearly 8,000 properties were rezoned to reduce the number of consumers directly supplied from Preseli, and tankers were provided to blend the distribution supply.

The reservoir has since been added to the companies “at risk” site list for taste and odour causing compounds. Enhanced sampling has been initiated during peak periods of MIB formation as well as further sampling at various

depths of the impounding reservoir to inform draw off management. A catchment investigation will be submitted to the Inspectorate during June 2020.

The inspectorate carried out a technical audit of the site in November in response to this event, which is further reported upon in the Audit section below. The company were commended for their approach to their risk assessment records providing the inspectorate with relevant and up to date comments on any changes made. They also acted promptly to implement suitable mitigation following the first cluster of consumer complaints to reduce the possible duration of the event.

## Cautions and prosecutions

There were no formal cautions or prosecutions for companies in Wales for 2019.

## Audits

In 2019, the Inspectorate carried out audits of four treatment works in Wales. Three inspections were carried out in April - at Talybont works, near Brecon; Lower Carno works close to Ebbw Vale; and at New Pendinas works near Wrexham. Preseli works, near Fishguard was visited in November.

### Talybont

The Inspectorate visited Talybont works, primarily to assess Dŵr Cymru Welsh Water's planned investment to make the works more robust and to safeguard the quality of water supplied to consumers. At the time of the audit, the company were planning to install a new 'run to waste' system at the treated water stage to ensure that water that did not meet the required standard could be removed from the process. This improvement was on track for delivery by April 2020, but has been deferred until early 2022.

Another measure to safeguard supplies is the use of an emergency shutdown valve to prevent improperly treated water from being provided to consumers. However, this valve had seized in July 2018 and was no longer operable. A new valve had been purchased and the company installed this in September 2019.

Figure 13: New emergency shutdown valve for Talybont works



In the meantime, the company were able to use an alternative control valve to safeguard supplies.

A forward look showed that the company plan to invest in new manganese removal and pH correction schemes by 2025 and an upgrade to the works SCADA control system, all of which will help to improve the quality of the water produced by the works.

Dŵr Cymru Welsh Water had also identified a number of risks that needed addressing at the works including repairs to the pressure filters and a top up of the filter media. The company has adopted a phased approach to the improvements, which to date have seen no negative impact to the operation of the works. The raw water main was in poor condition but had recently been replaced.

Figure 14: Compound for new raw water main to Talybont works



The Inspectorate highlighted potential risks to the disinfection process associated with variable water level in the contact tank, which the company also use as a storage tank. Recommendations were made to identify the contact tank level as a critical parameter, which the company addressed and also to assess disinfection risks related to low contact tank level. Following this review, the company amended its disinfection criteria to make

a disinfection failure less likely, but the potential risk has not been fully addressed.

The Inspectorate guidance on contact tanks and their use as storage tanks is comprehensive. Chlorine contact time should be provided in a purpose-built, baffled tank that is designed to provide plug-flow conditions, with water-level control, to enable residence time to be controlled to achieve a minimum target contact time (Ct). If a contact tank is used to provide storage, the flow out of the tank will vary depending on demand in the network, and it is not possible to control chlorine contact time in these circumstances. Regulation 26 requires that water suppliers must be able to verify the effectiveness of the disinfection process. If the contact tank is being used for storage, companies will not always be able to verify disinfection and therefore are at risk of non-compliance with regulation 26. Additionally, good practice would ensure contact tanks and storage tanks are compartmentalised, so that sections can be removed from supply for maintenance. The Inspectorate will be monitoring this aspect in future.

Lime dosing for pH correction occurs before the disinfection system at Talybont and excessive dosing could negatively impact on disinfection. The company's worst case calculations had not taken into account the highest pH that the works can operate at and as such the Inspectorate recommended that these calculations were revised. The review identified a disinfection risk when the works is operating at high pH levels. The company improved this situation by giving a greater margin of safety before triggering an emergency shutdown.

A number of small contact tank contamination risks were addressed by the company shortly after the audit and the company planned to improve drainage alongside the tank to prevent runoff from an adjacent farmer's field providing a potential source of contamination. The company also provided a report confirming that they had addressed 14 water fittings infringements identified in 2017. Sadly, the report was undated and does not provide evidence that the required action was taken promptly, soon after the Inspectorate raised the issue with the company.

## Lower Carno

Lower Carno works is normally used only at times of peak demand, such as in the summer, and is used to supplement supplies to Ebbw Vale. Dŵr Cymru Welsh Water had a well-developed procedure for works start-up and sufficient flexibility in the operation of the works to run the process water to waste at each stage.

The company provided evidence that the contact tank had been cleaned immediately prior to the operation of the site in July 2018. The Inspectorate

identified that there was no indication of whether the works was running into supply, or to waste and the company committed to installing a flow meter on the run to waste main to record this.

Figure 15: Lower Carno works



## **New Pendas**

The focus of the audit at Hafren Dyfrdwy's New Pendas works was on the company's risk assessment. The company had provided the Inspectorate with a report identifying a number of apparently uncontrolled risks at the works. When questioned, the company reported this to be an artefact of the company's formation and a merger of the risk assessment system with Severn Trent Water. The Inspectorate recommended that the company reassess these risks to comply with its statutory requirements.

The company completes weekly 'health checks' of the plant, which is a good way of capturing operational and process issues that need resolving. However many of the issues identified did not have time bound plans for resolution. The company subsequently updated the process to ensure action was taken in defined timescales. The Inspectorate welcomed the company's use of an 'application' to capture issues identified on site audits. The issues could then be linked to GIS and raise actions by connecting to other apps directly.

The audit team identified that two of the chemical delivery points were not appropriately bunded. For aluminium sulphate, the company subsequently confirmed plans to divert any chemical spillage to a blind tank. In addition, the site drainage would be used to capture phosphoric acid spills to the same blind tank.

Figure 16: Unbunded Aluminium Sulphate delivery point at New Pendinas works



## Preseli

The Inspectorate assessed Preseli works in November. Dŵr Cymru Welsh Water had received over 100 consumer complaints related to an earthy/musty taste and odour to the water in September and this was followed up during the site visit. Since the event the company had taken steps to prevent objectionable tastes and odours causing concern to consumers. A powdered activated carbon plant had been installed permanently at the works and the company have increased monitoring for geosmin and 2methyl-isoborneol, which cause such issues. The company have also committed to some catchment management initiatives for the next AMP period.

A faulty turbidity monitor had gone unrepaired for an unspecified period prior to the audit. Two turbidimeters were purchased as critical spares to be held centrally to address faults in future. The company failed to amend its

*Cryptosporidium* risk assessment following media loss in one of its filters above its internal trigger level.

The disinfection policy for the site was found to be flawed with the calculation not taking into account the worst operating scenarios and the absence of a turbidity monitor at the contact tank to confirm the effectiveness of the disinfection process. The company subsequently made amendments to the calculations and ordered a new turbidimeter.

Dwr Cymru Welsh Water were unable to demonstrate traceability of Carbon Dioxide and Sulphur Dioxide deliveries. No details of the conformance to the British Standard could be checked but the deliveries were accepted in any case. After recommendations from the Inspectorate, the company took action to improve the chemical acceptance process and provide further training and support to front line staff.

Dwr Cymru Welsh Water had identified 14 water quality risks at Preseli works where further mitigation was needed. The Inspectorate welcomed that not only had the risks been identified but the mitigation had been identified and the company were able to demonstrate appropriate timescales to implement these solutions, including dedicated run to waste schemes and a new pumping station.

A review of the compliance data identified a significant shortfall in nitrite analysis. This had been ongoing for a number of years and prompted a wider investigation showing that only 26 of 65 treatment works had supplied any nitrite results for 2019, at the time of the investigation.

The company belatedly scheduled nitrite samples across the remainder of the year to meet regulatory requirements. This led inevitably to issues of regularity and a recommendation to correct this going forward.

A recommendation was made for the company to review the steps it has in place to ensure that every parameter is sampled at the appropriate frequency for each sampling location. The company reported among other activities that it has a project plan and project team in place to ensure the correct frequencies and that this is signed off by relevant managers. It is the company's view that this error was the result of a long-standing misinterpretation of the requirements of the Regulations. It was only the Inspectorate's flagging of the issue that prompted resolution.

All companies are reminded of their responsibility to ensure that the regulatory sampling programmes are accurate and compliant with the requirements of the regulations. Companies should not be reliant on the Inspectorate's shortfall reporting to provide a checking and verification service for the sampling programme.

## Recommendations

During 2019, the Inspectorate issued 577 formal recommendations to water companies in Wales and the wider industry, in response to an actual breach, or a risk of a breaching, the regulations. 33 of these were made to companies operating wholly or mostly in Wales. This was an increase for the second successive year and sees the number return to almost the level of 2015 (see figure 17).

Figure 17: Total recommendations annually

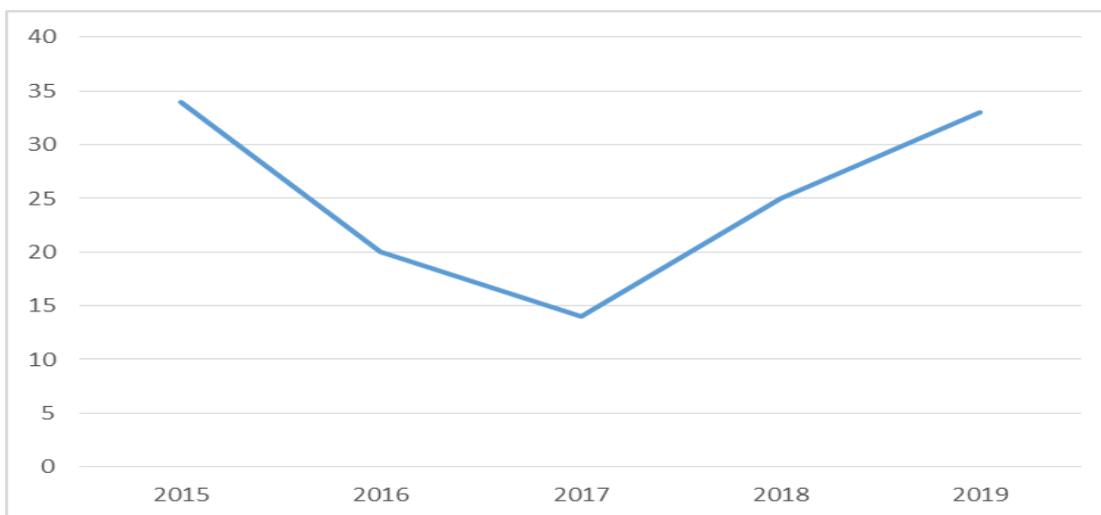


Figure 18: Recommendations by Company in 2019

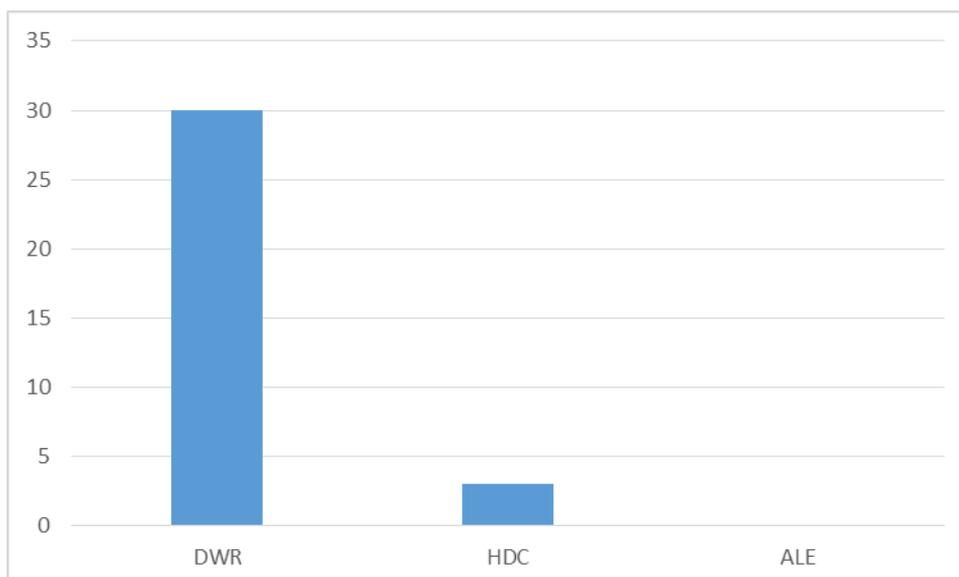
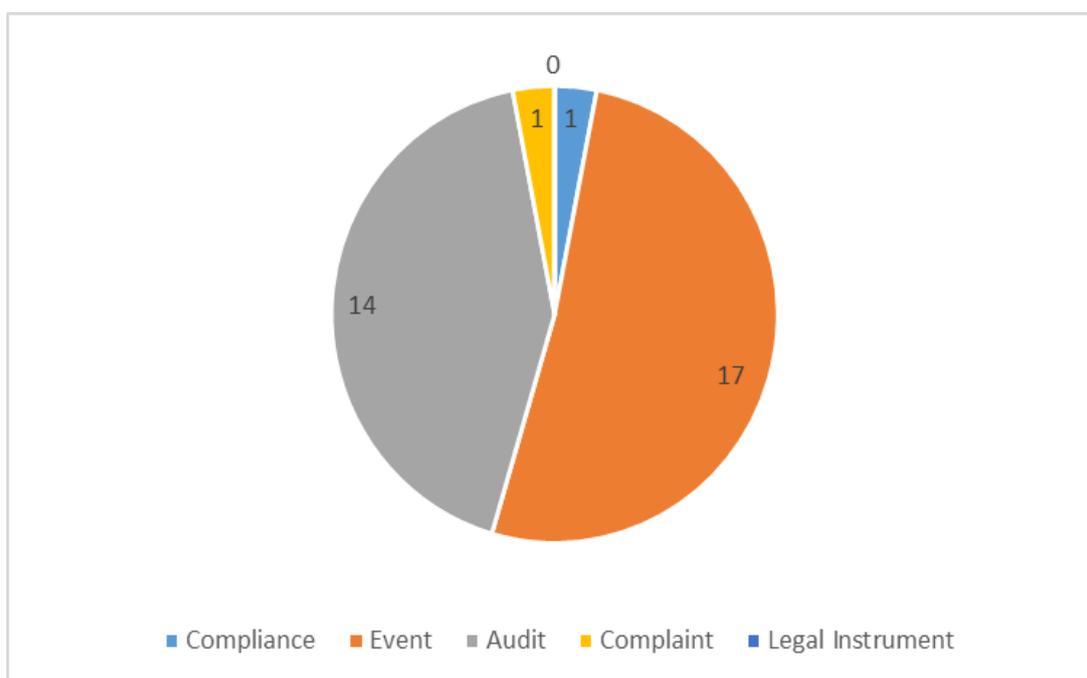


Figure 18 shows the number of recommendations made to each company in Wales in 2019 from the highest to the lowest numbers issued.

Recommendations in Wales were made from the Inspectorate's work on consumer complaints (1), compliance breach assessments (1), technical audits (14) and drinking water quality event assessments (17). The sources of recommendations made, as shown in figure 19, show that events account for the highest number of recommendations made, followed by audits.

Figure 19: Source of Recommendations in 2019



Recommendations can be made for a wide variety of deficiencies and these are summarised into categories. Figure 20 below shows the contribution of each recommendation type to the overall number of recommendations.

Management continues to be the biggest contributory area to recommendations across the industry. This category is made up of areas including risk assessment, policy/procedure, operation, maintenance, staff issues and investigation. Of these, the consistently largest contributor is poor risk assessment. Figure 21 shows the breakdown of recommendations within the management category.

Figure 20: Contribution of recommendations types in 2019

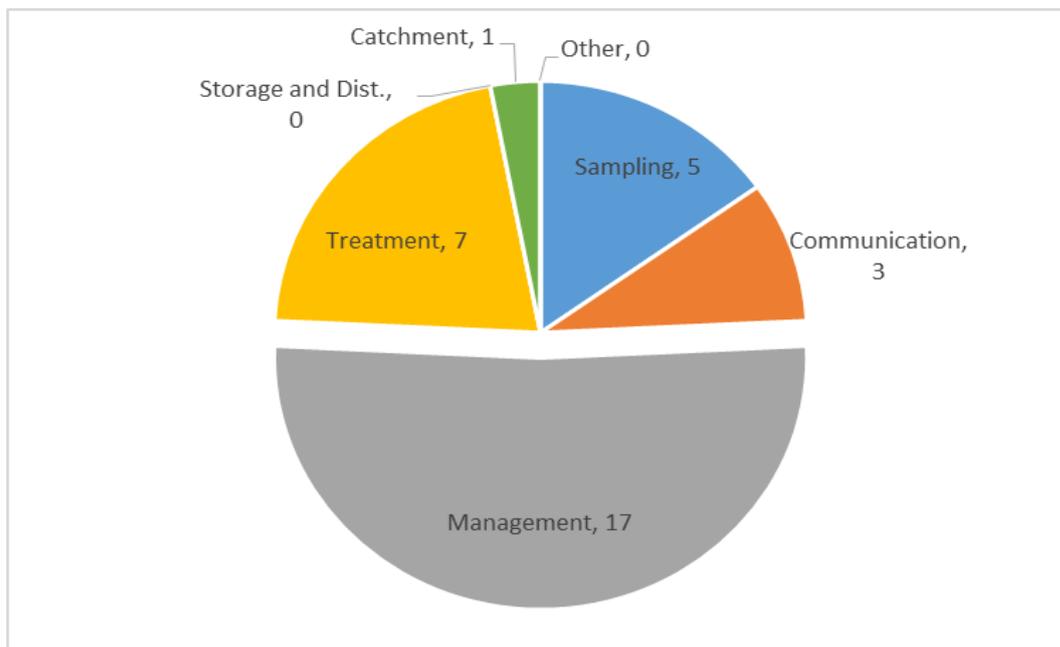
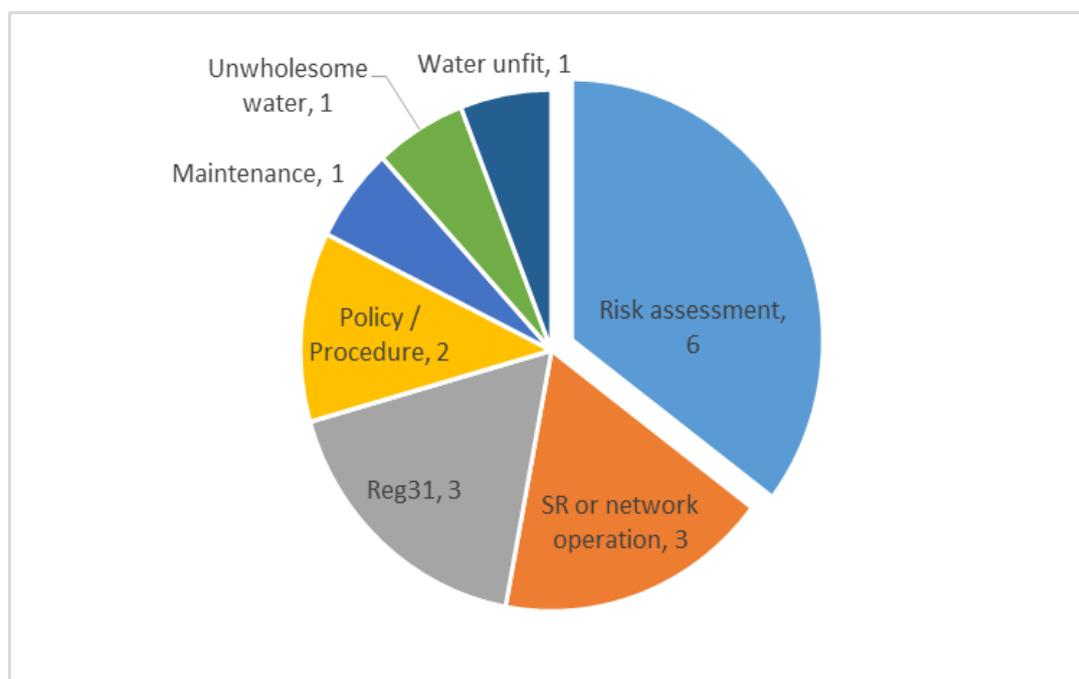


Figure 21: Contribution of Management sub-categories



Risk assessment deficiencies remain a perennial issue, as are recommendations linked to disinfection. Both of these areas are core to producing safe water and must be right first time in the assurance of water arriving at the tap. Drinking water cannot be recalled and so assessment,

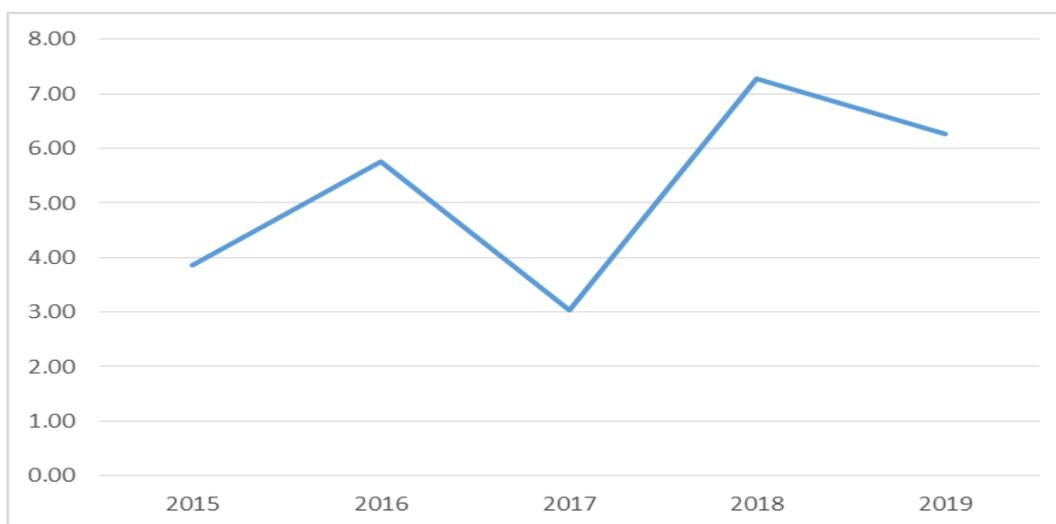
mitigation and control has to prevent failure before it happens. Equally disinfection is the last barrier and cannot be compromised ever.

Management is completely within the control of the company together with treatment, storage, sampling and communication among others and companies should work towards reducing recommendations in key areas.

As a further observation, training extends beyond front line operators as the second quarter audits identified the need for appropriate and relevant training of operational managers for whom the skill sets required are often very different to the skills acquired in earlier roles.

Recommendations are scored when made, depending on the level of risk that the Inspector believes is present and scored again when the Company provides a formal response. This provides tangible insight into how serious the recommendations are and how the company reacts to regulatory intervention. Figure 22 shows that the mean recommendation score for the companies in Wales decreased slightly, following the sharp rise observed in 2018. A decline in this value, with a stable total number of recommendations, would reflect an overall improved quality in the responses provided to recommendations and a reduction in the severity of the risk observed when the recommendations are made. The Inspectorate will continue to monitor this trend, with the expectation that it will improve in the future.

Figure 22: Mean Recommendation Scores by Year



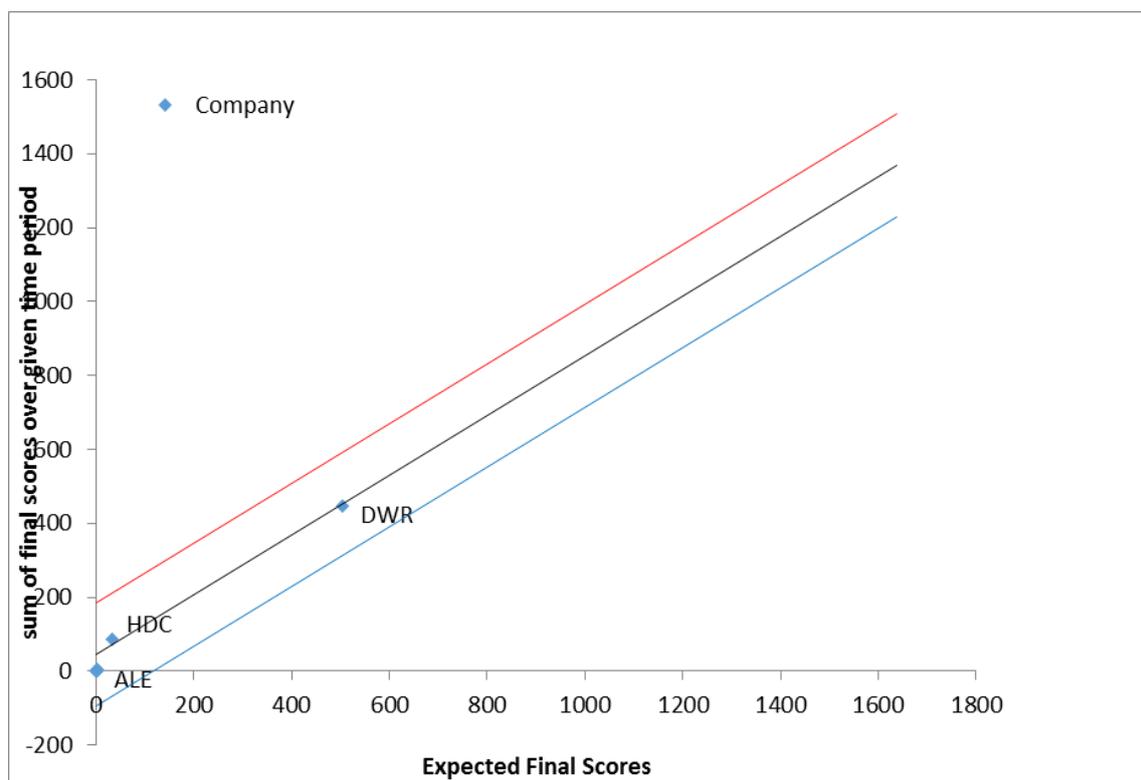
These scores are factored alongside the number of recommendations to give an overall recommendation score for each Company over time. Using data from the industry as a whole, the Inspectorate can estimate the expected recommendation scores of each Company based upon population size and an assumption of equity between companies. Whilst there would be

a natural error in such an assumption because of asset numbers and size, population density and even a dependency upon regulatory focus, this remains the simplest and fairest estimation.

Figure 23 shows this analysis. The central black line is the expected recommendation scores, with upper and lower 95% confidence lines shown in red and blue respectively. The individual company positions are shown with the blue diamonds. Where a Company is above the red line, they are accumulating a higher recommendation score than would be predicted and consequently have a greater than expected level of regulatory intervention. The Inspectorate will focus its investigations and audits on the reasons for these high scores in order to establish if corrective measures need to be implemented to reduce the level of regulatory risk.

Companies that are below the blue line are receiving less recommendations than predicted. Initially, this will drive the Inspectorate to consider whether it is giving those companies sufficient scrutiny. However, it is entirely possible that these companies may be out performing and thus carrying a lower risk, in relation to the rest of the industry.

Figure 23: Observed vs Expected recommendations score



The analysis shows that companies operating in Wales are within the statistically expected range for recommendation scores, when compared to the whole of England and Wales.

## Enforcement

### New Legal Instruments Issued

In Wales, 12 notices under regulation 28(4) were served during 2019.

Table 5: New legal instruments in 2019

Instrument type	Number served	Company distribution
Regulation 28(4) Notices	12	8 DWR, 4 HDC

As the start of the new investment period begins, the planning stages of the AMP7 programmes should be well underway and the Inspectorate looks forward to receiving and reviewing the associated milestone reports.

Six notices were served on Dŵr Cymru Welsh Water to replace six existing notices for discolouration improvements. The Inspectorate notes that the company have completed a significant amount of work to understand their discolouration risks and to produce an action plan to address these. The six new notices are targeted to deliver significant improvements for consumers over the next few years. An additional notice was served on the Company for discolouration risks associated with a service reservoir.

Four notices were transferred to Hafren Dyfrdwy following the cessation of Dee Valley Water. These notices marked the conclusion of work to transfer all the Dee Valley Water legal instruments to the new company.

### Closures

The Inspectorate received 21 completion reports during 2019; 9 DVW, 11 DWR, 1 HDC.

### Change Applications

One Application to change a legal instruments was received from HDC for a former DVW scheme.

## **Milestones**

Companies in Wales submitted 45 milestone reports, independent of closure reports and annual progress reports, to the Inspectorate during 2019: 35 HDC (former DVW notices) and 10 DWR.

## **Annual Progress Reports**

Companies are required to submit an annual progress report for all improvement schemes, by the 31 January each year to reflect upon progress in the previous year. During October 2019, the Inspectorate wrote to all water companies to detail amended reporting requirements. Companies were requested to send a single summary report to outline the overall status of their legal instruments. The exceptions for this were those schemes which were delayed and those where the Inspectorate specifically requested further details. This was a better regulation initiative to reduce the burden on the industry in preparing annual reports, with the Inspectorate placing emphasis on the milestone reporting instead, which is more concurrent.

The Inspectorate shall issue further guidance in due course on the annual reporting requirements for legal instruments.

## **Regulation 14 – Sampling: New Sources**

No applications to use new sources under regulation 14 were received during 2019.

## **Radioactivity waivers**

During 2019, the Inspectorate received 1 application, from HDC, to cease regulatory monitoring for radioactivity parameters under regulation 6. This administrative adjustment represented the completion of work to move former DVW legal instruments to HDC.

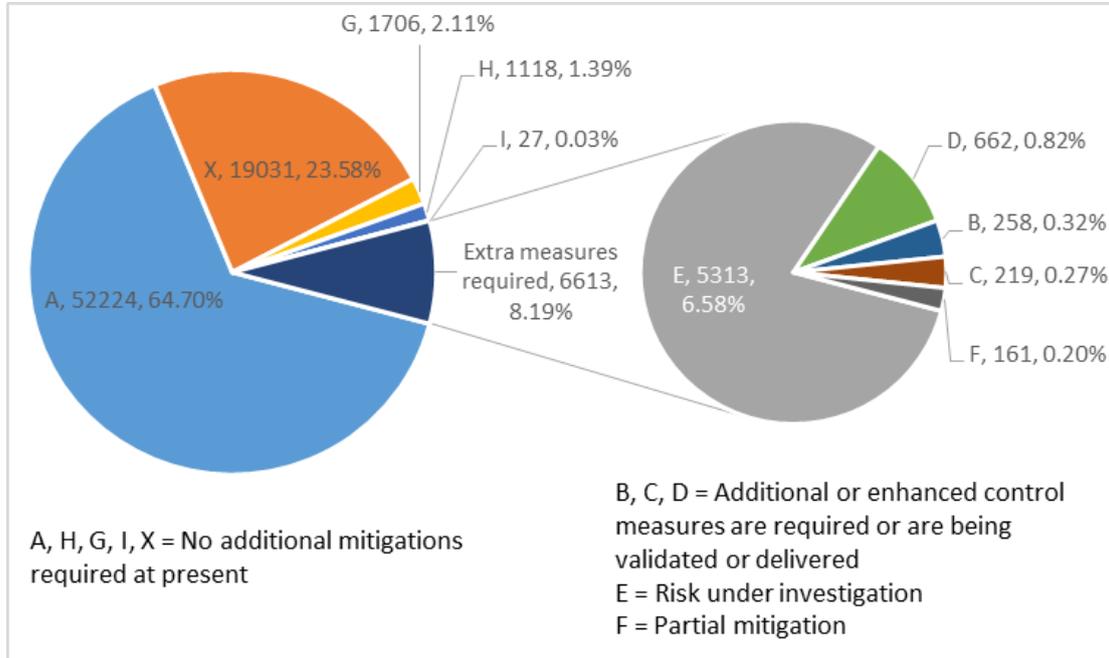
The Inspectorate reminds companies that the majority of Regulation 6 Notices were issued during 2016, on the coming into force of the 2016 amendments to the 2010 Regulations in Wales, with a 5 year expiry date. Companies should be continuing operational monitoring and the review of risk assessments in preparation for the submission of new applications for Regulation 6 Notices in 2021.

## Regulatory strategies

Under regulation 27 and regulation 28 water companies are required to carry out adequate risk assessments of each supply system and submit this data to the DWI. In April 2019 the DWI published Information Letter 02/2019 and its associated Annex A. The letter set out new requirements on the reporting of drinking water safety plan information in fulfilment of regulation 28, following a period of consultation with the industry. The Industry were required to meet the new requirements by 21 October 2019. The majority of companies met this deadline and the Inspectorate welcomes the efforts made to make this happen.

The Inspectorate received over 1.6 million lines of regulation 28 data, of which approximately 80,000 were attributed to Wales. The majority of this data for Wales (91.8%) indicates that risks are either being effectively mitigated, or fall into categories that indicate mitigations are not required.

Figure 24: Breakdown of regulation 28 data for Wales by DWI risk category



[Number of records and percentage of the total numbers are displayed]

## Risk Assessment Risk Index

Following these submissions, the Inspectorate entered a period of checking and analysing the data. The new requirements have facilitated this and allowed the development of a Risk Assessment Risk Index (RARI). The risk index uses similar principles to the Compliance Risk Index and Events Risk Index, adapted for regulation 28 data. The following elements are used:

- the severity of the hazard
- the status of the control measures (i.e. the DWI risk category)
- how long new control measures have been required for (where applicable)
- the site volume supplied or site population (whichever is applicable) as a proportion of the overall company volume supplied or population

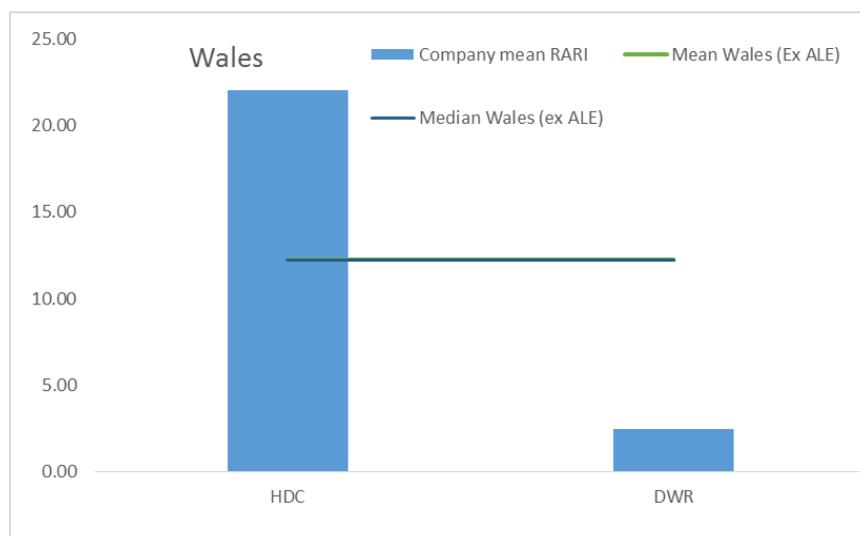
A number of other rules have been applied to allow a better comparison between companies. However, there remain differences in the way companies carry out drinking water safety plans and interpret Annex A of IL 02/2019, as well as errors in some of the data, and these will need to be worked through to provide a better comparison between companies.

## Company RARI scores

Albion Eco (ALE) had a score of 194.9, which is due to the small size of the company and the fact that any risks present affect most of the population supplied. There are mitigations being delivered at Shotton Paper Mill to control potential backflow due to modification of plumbing systems.

Hafren Dyfrdwy had the highest overall RARI score. Approximately 30% of the company's records are 'under investigation' (DWI risk category E) following the creation of this new company. This is reflected in the score because this risk category has a proportionally large effect.

Figure 25: Company Risk Assessment Risk Index (RARI) scores for 2019



Dŵr Cymru Welsh Water had a number of high scoring lead risks relating to potential unavailability of orthophosphoric acid for plumbosolvency control, which are under investigation. There were also no supply risks at several large works relating to potential lack of chemical availability or failure of assets on site. A number of works also had *Cryptosporidium* risks associated with lack of, or failure of, run to waste facilities. Lack of such facilities has been a contributory factor in previous water quality events reported to the Inspectorate and the company should take steps to minimise these risks. There were also a range of high scoring risks associated with treatment processes at a number of works.

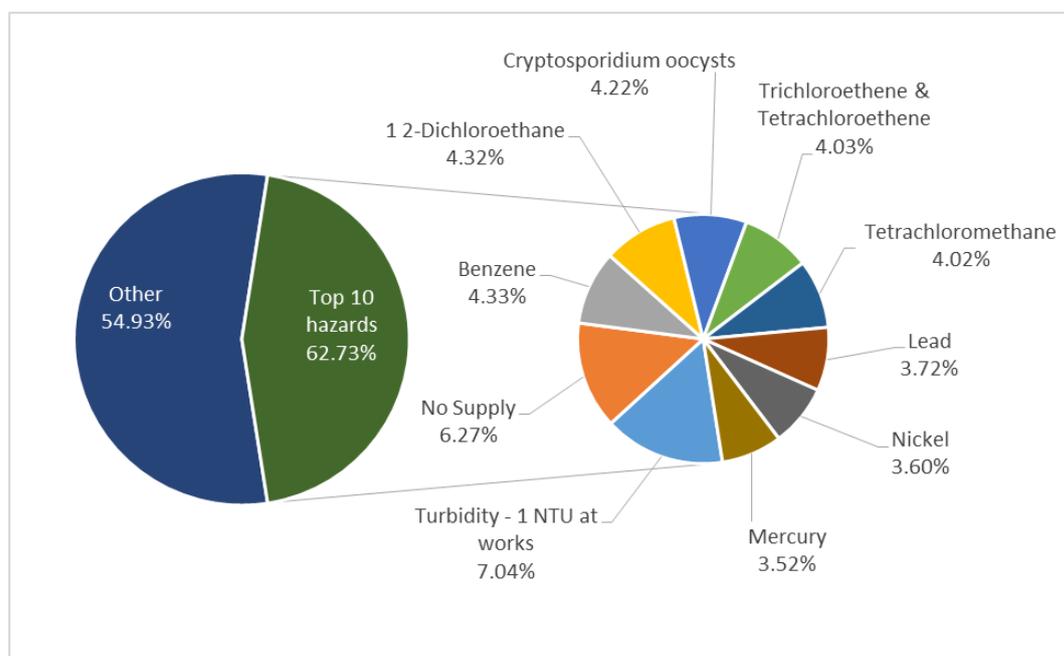
The Inspectorate plans to work with companies over the coming year to understand and improve the dataset. The new scoring mechanism will be used to prioritise and sense check issues that may need further review and companies should expect an increase in investigations into these issues throughout the remainder of 2020 and 2021.

### Industry top hazards

The highest scoring hazard across Wales was turbidity at treatment works. This was largely due to the investigations being undertaken by Hafren Dyfrdwy at a number of treatment works following the creation of this new company. There were also notable high turbidity scores for Dŵr Cymru Welsh Water at Broomy Hill, Cwmtillery, Bryn Cowlyd, Preseli and Dunfield works where turbidity had been detected above 0.5 NTU presenting a potential risk to water quality. Mitigations for these risks ranged from ‘under investigation (risk category E)’ to ‘control measures being validated (risk

category B)', indicating that the company has made some progress towards reducing these risks. Expediting these mitigations would reduce the company's score and risk to consumers.

Figure 26: Wales top ten hazards based on RARI score.



[Note: Albion Eco have been excluded from this graph due to the disproportionate effect of the small population on the scores.]

The second highest scoring risk across Wales was 'no supply'. This hazard attracts a high multiplier because of the potential contamination associated with depressurisation and because of the effect on vulnerable consumers, services and businesses. Furthermore, any schemes relating to resilience and security of supply are likely to become more critical. Companies should review their control measures associated with no supply and ensure they remain on track and are delivered more expeditiously where possible.

A number of risks (mercury, nickel, benzene, tetrachloromethane, 1 2-dichloroethane, trichloroethene and tetrachloroethene) are present in the top 10 hazards for Wales because Hafren Dyfrdwy have taken the approach of setting the DWI risk category for a number of risks to 'under investigation' (category E) following the creation of this new company. It does not necessarily reflect an immediate risk to consumers. The company should complete these investigations as soon as reasonably practical to determine whether any further mitigations are required. Lead and *Cryptosporidium* are also in the top ten list because of the above-mentioned issues at Welsh Water.

## Annex 1

**Table 6: Detection of *E.coli* and Enterococci at treatment works, service reservoirs and consumers' taps**

<b>Company</b>	<b><i>E.coli</i> in water leaving treatment works</b>	<b><i>E.coli</i> in water leaving service reservoirs</b>	<b><i>E.coli</i> at consumers' taps</b>	<b>Enterococci at consumers' taps</b>
Albion Eco	0 – 0	0 – 0	0 – 12	0 – 4
Dŵr Cymru Welsh Water	0 – 10,394	1 – 15,996	1 – 7,592	0 – 616
Hafren Dyfrdwy	0 – 949	1 – 4,197	1 – 624	0 – 111
SSE Water	0 – 0	0 – 0	0 – 12	0 – 4
<b>Wales overall</b>	<b>0 – 11,343</b>	<b>2 – 20,193</b>	<b>2 – 8,240</b>	<b>0 – 735</b>
Note: Results are shown as the number of positive tests – the total number of tests.				