

Drinking water 2020

Quarter 2

April - June 2020

A report by the Chief Inspector of Drinking Water



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Drinking water 2020
Public water supplies for
England and Wales

Quarter 2
April – June 2020

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Foreword

Drinking Water 2020 is the publication of the Chief Inspector of Drinking Water for England and Wales. This second report of 2020 covers public water supplies and is intended to provide learning as soon as available and prior to the final 2020 report.

This year has been exceptional for the water industry with the emergence of CoViD-19. It is without doubt that there have been real challenges to maintain a wholesome and continuous water supply. This is not least because of the change in usage from commercial to a more domestic use as the population remained at home, and equally the challenge of water resources more widely. Operationally water companies have had to ensure sufficient staff were available to continue water treatment and maintain serviceability of their distribution network including, for instance, repair to burst mains. More specifically to water quality, the assurance that the water supply remained wholesome, and therefore companies maintained the confidence in our supply; which required sampling, inspections and the associated meeting the public. This public interface presented unique challenges to avoid cross-infection both by staff and the public. Consequentially, companies found it difficult to enter domestic households as more consumers refused company samplers and workers entry.

The outcome of these difficulties resulted in less samples being taken at consumers taps as companies sought to assure supplies at their assets. Consequentially there were fewer coliform detections, a reduction in failures for the taste and odour parameters; and a reduction in failures for lead at the point of compliance, which is the tap. The impact of these numbers is described in this quarter for wider learning.

Conversely, increased sampling at upstream assets for parameters not normally taken at these points identified shortcomings in the maintenance of assets and their sampling points. For instance, metal failures at service reservoirs have highlighted missed or delayed cleaning of the interior where sediment has been allowed to build up on the floor or in the pipelines. Companies are therefore being encouraged to take advantage of this new information to update their risk assessments and to take necessary action.

In this quarter, we describe the first burst main where alternative supplies were required. New plans under the CoViD-19 restrictions were largely untested, where alternative supplies needed to be delivered to shielding consumers who could not go to bottled water collection points. Access to the register was somewhat problematical and the company needed to adapt to acquiring this information with input from their local resilience forum. Whilst this was more difficult than necessary, the company adapted well, something other companies should be prepared for.

In the midst of a viral pandemic, the maintenance of disinfection is central to the safe delivery of wholesome water where reliance upon critical operating practices assure water treatment rather than sampling at the endpoint. This is water safety planning in action. This quarter my team carried out a desktop audit on this very critical question. The audits identified some significant findings, raising 127 recommendations on operational issues; policies; verification of disinfection, including calibration; training; and competence. These findings are detailed for wider learning.

In amongst all these challenges, the routine work of my team has been ongoing and to whom I am grateful for a consistent output at a challenging time. This report describes the detail of the continuing enforcement necessary to drive a secure and safe water supply. In total, my team realised 19 new legal instruments, 16 closure reports and 128 recommendations for companies to improve their performance. In addition, my team has worked with the industry on pragmatically dealing with sampling, to assure supply through notices, which detailed an agreed strategy. Companies remain accountable and appropriate responses to poor performance and events remains central. South West Water's Lowermoor works, which was the subject of a long investigation, is reported in the context of regulatory action to hold companies to account.

Finally, and on a positive note, I am able to report the improved performance of Severn Trent Water who have moved into the expected performance range through hard work by putting water quality first. Such improvement is an excellent example of how better regulation with the use of a transformation programme can reduce regulatory risk improving supplies to their consumers.

Water quality compliance monitoring

In the second quarter of 2020, companies reported a total of 122 compliance breaches which required the Inspectorate's assessment and a further 329 samples where the fluoride concentration did not meet the specification required by Public Health England in fluoridated water supply zones. This represents a decrease of 157 compliance breaches on the same period last year and is largely due to: fewer coliform detections at consumers taps; a decrease of gross alpha results above the trigger value; a reduction in failures for the taste and odour; and a reduction in failures for lead. Many of these changes are due to the revised sampling programmes adopted by companies in response to the CoViD-19 pandemic which is discussed below.

The significant increase in fluoride out of range samples is largely due to a single company, Northumbrian, Essex and Suffolk Water (NES), reporting results for a site where the fluoride dosing equipment was out of service. The root cause for the lack of service was due to a serious failure of a fluoride storage tank in January 2019 and resulted in extensive damage at the works. The site is currently undergoing refurbishment which is due to be completed by February 2021. The Inspectorate had given the company a dispensation not to report these results for the zones supplied but a change in sampling, due to CoViD-19, meant results were reported unnecessarily. The reporting anomaly has now been corrected.

Inspectors made 10 recommendations from compliance assessments and most of these related to inadequate investigations and deficiencies in risk assessment.

The restrictions of social distancing relating to the CoViD-19 pandemic had a substantial impact on the collection of samples from consumers properties for the second quarter of 2020. The DWI recognised the potential challenges companies would face and issued several Information letters on various aspect relating to CoViD-19 including 1/2020 and 4/2020 which both included advice on sampling.

Each company adopted its own approach to monitoring, primarily consisting of sampling from properties within zones such as public buildings and staff properties or upstream assets owned by the company or a combination of the two. Where upstream assets were used companies were advised to report the results against the zones supplied. The net effect is that the number of results reported for zones to the Inspectorate in the second quarter of 2020 was 447,929, significantly higher than in same period of 2019 which was 375,135.

Despite the overall increase in sample results reported there remained significant shortfalls for individual parameters and across companies. For the first half of 2020, there was a shortfall of 80,661 sample results for

zones. Thames Water had the greatest shortfall at 28,222, followed by Anglian Water (13,544) Severn Trent Water (8,085) Affinity (5,370), Welsh Water (4,865), Northumbrian Essex and Suffolk (4,751), South West and Bournemouth (3,480) and Portsmouth Water (3,285). Other companies had shortfalls of less than 3,000 sample results. It is noted that Cambridge Water had no shortfall in its zonal sampling in the first half of 2020 and the company is commended for this performance.

The shortfalls extended across the full range of parameters normally sampled in zones but were highest for *E. coli*, coliforms, distribution metals (iron, manganese and aluminium) and plumbing metals (lead, nickel and copper). The shortfalls explain the reduction in failures for lead and coliforms mentioned above.

The Inspectorate recognises the unusual and challenging circumstances of the pandemic and will bear this in mind when assessing the shortfalls at year end. The Inspectorate also considers there is no benefit to public health in attempting to catch up the shortfalls that have already occurred. However, now that the national lockdown has eased companies are expected to have plans in place for local restrictions. The Inspectorate expects all companies to meet the pro rata frequency for the final quarter of 2020 and that all samples should be taken in zones rather from upstream assets.

Companies are advised that there will also be an impact from the change and variation in sampling regimes on the zonal CRI scores. The Inspectorate is considering the impact on the CRI calculation as a reduced number of failures in zones may result in a changed outcome for the zonal calculation of CRI. As this metric is part of the agreed financial performance commitments by companies, Ofwat has been informed.

Water quality at treatment works

Microbiological failures at treatment works

Table 1: Q2 2020 – Microbiological tests

Parameter	Total Number of tests	Number of tests not meeting the standard
Water leaving water treatment works		
<i>E. coli</i>	45,999	0
Coliform bacteria	45,999	14

Whilst there were no *E. coli* failures at treatment works in quarter two, there were 14 coliform breaches which is over twice the number of the same period in 2019 (SVT 4, SRN 2, TMS 2, AFW 1, DWR 1, Isles of Scilly 1, NES 1, PRT 1 and SST 1). One of the coliform failures at works (SRN) was covered by legal improvement notices and for a further six (AFW, DWR, NES, SST, SVT 2) Inspectors judged that the company failed to determine a cause despite a satisfactory investigation.

Three (ISC and SVT 2) were judged unlikely to recur because of remedial action taken by the companies. The two Severn Trent Water failures were in consecutive weeks at Markham Clinton works and the company has replaced the roof membrane on both compartments of the outlet balance tank. On the Isles of Scilly the parent company, South West and Bournemouth Water, conducted maintenance on the UV system and issued a boil water advisory notice to consumers while the work was in progress.

The failure at Portsmouth Water's Walderton works was additionally reported as an event with the most likely cause being environmental contamination within the laboratory. Several coliform detections from separate unrelated assets were identified between 18-22 May and the same coliform species identified as were found in the plates exposed to the laboratory atmosphere. Good laboratory practice remains essential to avoid laboratory derived contamination. Laminar flow cabinets have been now installed in the laboratory to prevent recurrence. Samples taken from the reservoirs and zone supplied by the treatment works gave satisfactory results with no detection of any coliforms as part of the investigation or subsequently.

At Thames Water's Westerham works no definitive cause could be found for a coliform failure. The company is continuing to investigate the risk from potential stagnation and has submitted a revised risk assessment report to reflect this. Deficiencies were found in the company's records of chlorine residual and a recommendation was made for the company to review this. Companies are reminded of the crucial role such data plays in the verification of the disinfection process.

At Southern Water's Wingham works a flood of the surge vessel sump was identified as a potential route of ingress for contamination and a likely root cause for the coliform exceedance. The sump contained a main used as the source of motive water for the orthophosphate dosing. The sump has been drained and its inspection will be included in routine checks. A suggestion was made to review the overflow arrangement at the site. Companies are reminded of the need to keep chambers and sumps free from standing water where it may pose a risk of ingress to treated water systems.

Turbidity failures at treatment works

There was a single failure to meet the turbidity specification at a treatment works in the second quarter of 2020. At South East Water's Barcombe Mills works the start-up of the final water pumps at the works was considered to cause a temporary disturbance in the main at the time of sampling. The site is subject to a legal instrument against which the company is reviewing the setting of the variable speed drive to avoid a recurrence.

Water quality at service reservoirs and in distribution

There were no *E. coli* failures at service reservoirs in quarter two of 2020. However, there were 28 coliform detections, an increase of 12 when compared to the same period in 2019 (SWB 4, YKS 4, PRT 3, ANH 2, BRL 2, NES 2, SEW 2, SVT 2, AFW 1, DWR 1, HDC 1, SRN 1, TMS 1, UUT 1 and WSX 1). The three detections at Portsmouth Water were most likely to have been caused by the laboratory contamination event described above for Walderton works.

Two detections resulted in recommendations being made. At Anglian Water's Old Leake Tower a coliform detection was initially thought to be due to ingress into the tower through defects in the roof identified during an inundation test. Subsequently it became clear that in 2018 the sample point had been incorrectly attached to the inlet leg of the common inlet/outlet main after it splits from the outlet leg. The effect of this is that the sampling conducted at the site has not been representative of the water in the reservoir since 2018 when the sample line was tapped to the wrong main. Had it not been for the coliform detection in the incoming water, the defects in the roof and the incorrect sampling may have remained undetected until the next internal inspection. The company has committed to undertake a full review of all ten storage points that were upgraded as part of this programme to ensure that they are representative. At the time of writing seven of these have been assessed and no issues have been identified.

Old Leake Tower itself remains out of service until the defects have been repaired and the sample line relocated. The company is inspecting air valves upstream of Old Leake Tower for signs of possible ingress.

Recommendations were made to ensure the company checks all affected sample taps and provide details of this review and that the company installs a pH monitor upstream of the contact tank at West Pinchbeck works (the works supplying Old Leake Tower). This episode serves as a reminder to all companies of the importance of ensuring sample points are representative. Guidance on taking representative samples at service reservoirs is included in part 5 of the Inspectorate's guidance document.

At Lyth Hill service reservoir (Severn Trent Water) a single coliform led to the inspection of the West compartment of the reservoir and the identification of ingress around the hatches. The company removed the West side compartment from service, and it will remain so until remedial work is complete and satisfactory samples obtained. The Inspector was unable to rule out the possibility that the East compartment may also be affected by ingress and recommended the company conducts enhanced monitoring, and develop a plan for inspection and, if necessary, remediation of the East compartment.

Suggestions were made in respect of two coliform detections at service reservoirs. Drawback reservoir (NES) is supplied from Whittle Dene works via Wylam booster pumping station. The booster pumps also supply the distribution system downstream of Drawback. During a high demand period the supply arrangement effectively resulted in a low turnover in the reservoir, with the demand being met directly via the Wylam pumps. The company developed a proposal to resolve the issue and a suggestion was made to accelerate a key part of that programme.

At Southern Water’s Sidown Hill 2 reservoir, in response to the coliform detection the company inspected the reservoir and completed some remedial actions. A dead leg was identified during the site visit, although this was located downstream of the final sample point. A suggestion was made that the Company assess the risk of the dead leg to water quality and consider removing it.

For ten of these coliform detections it was the assessing Inspectors opinion that satisfactory investigations had found no cause. A further nine were considered unlikely to recur following actions taken by the company, and one detection was covered by a legal notice. One remains under assessment (Monkwood no.2 – Yorkshire Water).

Table 2: Q2 2020 – Microbiological tests

Parameter	Total Number of tests	Number of tests not meeting the standard
Water leaving service reservoirs		
<i>E.coli</i>	51,464	0
Coliform bacteria	51,463	28

Water quality at consumers' taps

E. coli

In the second quarter of the year, there were no *E. coli* detections at consumers' taps. This compares with seven failures in the corresponding period for 2019. Such an apparent improvement is more likely a reflection of the reduction in sampling from consumers taps as a result of the CoViD pandemic. The number of sample results assigned to company zones was 32,002 in Q2 2020 down from 37,165 in Q2 2019. In addition, many of the results that were reported were zonal surrogate samples taken from upstream assets where the company will have complete control of the water quality and are not influenced by the domestic distribution system.

Enterococci

There was a single Enterococci failure on a sample taken by Anglian Water in Wellingborough supply zone. Resamples taken from the kitchen tap, and upstream assets were reported as satisfactory. However, the company did not take samples from neighbouring properties nor carry out a fitting's inspection citing CoViD-19 restrictions. Nevertheless, the company asked the consumer several fitting's related questions to determine if any infringements existed and found none. The company have committed to revisiting the property for a full inspection when restrictions are lifted.

Coliforms

There were 12 coliform detections assigned to zones: seven were taken from properties within the zones, usually employees' houses; and five from upstream assets, such as reservoirs. In comparison there were 67 coliform detections in zones in Q2 2019. Again, the reduced number of failures when compared to the same period in 2019 is likely to reflect the reduction in sampling from consumers taps as a result of the CoViD pandemic. The number of samples results assigned to company zones was 31,987 in Q2 2020 down from 37,165 in Q2 2019. In addition, many of the results that were reported were zonal surrogate samples taken from upstream assets where the company will have complete control of the water quality and are not influenced by the domestic distribution system.

It was the assessing Inspectors' opinion that satisfactory investigations had found no cause for four of these detections. A further four were considered unlikely to recur following actions taken by the company, one was covered by a legal notice, one was considered trivial and for one a suggestion was made. The remaining detection was a failure in Watford zone (Affinity Water) and the company concluded that the sampler may not have followed the correct procedure. A review of previous failures indicated that since April

2019 there had been eight compliance breaches that the company have attributed to sampling error. Accordingly, a recommendation was made for the company to consider additional proactive actions to improve sampler training.

Lead

There were no lead failures during this quarter, which compares with 17 failures in the corresponding period for 2019. Again, the change reflects the reduction in sampling from consumers taps as a result of the CoViD pandemic. The number of samples results assigned to company zones was 694 in Q2 2020 down from 3,052 in Q2 2019. Lead mainly arises from the consumers pipework and companies taking samples from upstream assets due to the CoViD pandemic may not have monitored for plumbing metals and any that did were unlikely to find lead.

Taste and Odour

During the quarter there were nine taste failures (UUT 4, SVT 3, SRN 1, and SWB 1), and twelve odour failures (UUT 4, SVT 3, SST 2, AFW 1, SEW 1 and SRN 1).

Five of the odour failures (SEW, SVT 2 and UUT 2) were judged unlikely to recur. For a further two odour failures (AFW and SRN) the company's conducted a satisfactory investigation and no cause was found.

Recommendations were made in respect of two failures (UUT). At United Utilities an earthy/musty odour was detected in samples from Hartshorn reservoir supplying Ashton under Lyne. The company was unable to identify a definitive cause, stating raw water geosmin concentrations in May and June reached a maximum concentration of 3 ng/l, below the company assessment requiring GAC dosing. However, elevated algal levels were identified at the works supplying the reservoir. Consequently, a recommendation was made for the company to review their algal management plans.

Enforcement action at South Staffs Water was required for two failures. Musty odours were detected in water leaving West Bromwich Booster station on 4 May and again on 29 May. This was due to elevated levels (7 ng/l) of the algal metabolite geosmin, in treated water leaving Hampton Loade works. There was a further odour detection at the works from a sample taken on 5 May, but not reported until 17 May, containing 4.7 ng/L geosmin. Both results exceeded the company's trigger criterion (4 ng/l) for the dosing of powdered activated carbon (PAC), but this mitigating treatment process was not commenced until 14 days after the first failure. Recommendations were made to ensure a faster analytical turnaround time on samples taken for geosmin, enabling a quicker operational response to elevated geosmin

levels. In addition, the company were recommended to review their dosing trigger levels to ensure consumer acceptability for taste and odour.

Of greater concern, however, was the fact that the second odour detection on 29 May occurred after the company had ceased PAC dosing in order to maintain supply from the works at its full output to meet a high demand. This action was taken even though the final water geosmin levels were still above the trigger criterion, but at full output the PAC was blinding the rapid gravity filters. Clearly, the company had failed to design and operate a suitable treatment stage to mitigate against taste and odour as it was required to do by a regulation 28(4) notice. To design and implement a PAC dosing system which takes account of the full range of deployable output from the works is a fundamental asset management requirement. The Inspectorate therefore initiated enforcement action in the form of a Warning Letter as well as serving a replacement regulation 28(4) Notice to address the shortcomings of the company. If the company fails to mitigate the risks and a repeat of the breaches occur, the Inspectorate will consider the Warning Letter and recommendations made when deciding what further actions would need to be taken.

The situation at Hampton Loade works also affected the bulk supply to Severn Trent Water. A musty odour was detected by Severn Trent in water leaving Sedgeley reservoir supplying Wolverhampton. A suggestion was made for the company to consider effective ways to prevent a recurrence and further action was not ruled out.

Taste detections often occur at the same time as odours. Four of the taste detections were considered unlikely to recur (SVT 2, UUT 2) and a further two the assessing Inspector judged that despite a satisfactory investigation no cause could be found (SRN, UUT). One was coincident with the odour detection at Wolverhampton and a further one with the odour detected in Ashton under Lyne which are both described above.

The remaining taste failure was at Littlehempston works (SWB), which was also due to elevated geosmin levels leaving the works. In this case the company did increase the PAC promptly after the taste failure. The site is covered by a legal instrument, but the Inspectorate has concerns about the effectiveness of the PAC dosing and enforcement action is being considered to secure a more detailed notice.

The presence of geosmin or methyl isoborneol are well established causes of taste and odours in drinking water. Companies should have robust operational monitoring strategies in place for these substances at high risk sites and should respond promptly to their presence in excess of company trigger levels and where companies have assessed taste and odour detections in compliance samples are likely.

Iron

Of the 19 iron failures (UUT 6, DWR 4, SRN 3 YKS 2, AFW 1, ANH 1 NES 1, SWB 1) 11 were either trivial, unlikely to recur or there were legal instruments in place to address the risk of recurrence. For two failures, the assessing Inspector considered a satisfactory investigation had been conducted and no cause could be found. Two other failures resulted in a suggestion and three remain under assessment. In the remaining case enforcement was considered for Southern Water.

Fifteen of the 19 failures were taken at service reservoirs due to CoViD -19 restrictions and these failures highlighted two issues.

First, four failures (NES 1, SRN 2 and UUT 1) were attributed to iron sediment in the sample line. This is an issue that can usually be resolved by flushing the sample line and it is disappointing that adequate flushing was not conducted. Three of the four failures (NES 1 and SRN 2) were associated with new sample points and in the fourth case, Rosehill reservoir (UUT), a recommendation was made to improve the sample point. Whilst service reservoirs do not require compliance monitoring for metals under the regulations, these issues could have been picked up sooner through routine operational monitoring for metals.

Secondly in the case of eight failures, sediment was observed or believed to be present on the reservoir floor, and for four of these the high demand for water in June was thought to have played a role. Three successive failures at Weobley reservoir (DWR) were attributed to high demand causing disturbance of sediment in the unlined inlet main resulting in iron deposits on the floor of the reservoir. The reservoir has now been cleaned and the company is investigating a resolution to the issue of the inlet main. These three failures remain under assessment pending the outcome from the company's investigation. At Heswall SR (UUT) high demand in June caused disturbance of sediment in the reservoir or associated pipework. The zone is covered by a legal instrument as is the reservoir and the company has reported work at the reservoir will be completed by March 2021.

In April at South West Water's Beaulieu reservoir, a failure led to an inspection that found sediment on the floor of the reservoir. The tank was cleaned and returned to service making the failure unlikely to recur.

At Hollins Hill SR (UUT) two failures, one in April and one in May, led to an inspection of the reservoir using a remotely operated vehicle. Sediment was observed on the reservoir floor for which the site is covered by an all reservoirs generic legal instrument. Consequently, a recommendation was made for the company to give a firm timetable for inspection and cleaning.

Finally, Southern Water's Cocking High service reservoir is a site with an acknowledged problem of sediment, arising from the upstream booster station, that can be disturbed if operated at low capacity. The reservoir failed for iron in June. The reservoir has not been inspected since 2012.

Given these circumstances enforcement was considered to secure a notice to resolve this issue. In addition, a recommendation was made for the company to review the minimum operating level for the reservoir.

Companies are reminded that regular inspection and operational monitoring will help reduce the risk of metal sediment accumulating in reservoirs. The Inspectorate expects such good practice to be routinely followed.

Southern Water Event - Loss of Supply affecting consumers in Hastings

On 9 April 2020 the Inspectorate issued Information Letter 03/2020 to provide water suppliers with guidance on dealing with drinking water quality or sufficiency events during the CoViD-19 outbreak. This Information Letter included the requirement that water suppliers should "... be able to demonstrate that they have sought to identify CoViD-19 specific vulnerable groups and to direct specific guidance to them where appropriate."

The Information Letter recognised exceptional circumstances and difficulties especially with access to the alternative supplies, such as those who are self-isolating or are vulnerable consumers. However, the expectation is that public health should not be compromised. Companies are expected to ensure they are aware of these consumers through their own vulnerable consumer registers and that of the current centralised registration database. It was further recognised that the delivery of drinking water in bottles to doorsteps by companies would be a significant and additional logistic challenge. Companies were asked to consider their response, where these requirements cannot be practicably met and to justify any deviations from this requirement. In effect, companies needed to amend their plans proactively for dealing with water supply emergencies to ensure that consumers who were shielding could be identified and, if necessary, be provided with home-deliveries of bottled water or other alternative water supplies and services as necessary.

In April one such event occurred where there was a loss of supply at the height of the CoViD-19 restrictions, when an estimated 1.4 million people in England were shielding in accordance with Government advice for the clinically vulnerable. As expected, these people were unable to leave their homes during this time.

Although representations were made by Water UK and the Drinking Water Inspectorate, water suppliers in England were not able to access details held by the Department of Health of consumers who were identified as shielding, because of data protection requirements. Defra subsequently wrote to all water suppliers in England on 22 May 2020 to confirm that they would be unable to share details of shielding consumers with water companies or any other utility for business as usual planning and preparation for incidents. Defra did commit, however, to continue to work with Government to provide clear guidance to local resilience forums (LRFs) and local authorities about sharing this information during an incident.

To overcome this additional difficulty, most water suppliers have proactively tried to increase awareness of their priority services registers to encourage shielding consumers to register, so that if a water supply emergency

developed, these consumers would automatically receive home deliveries of bottled water. This action is a commendable solution by the water industry.

For wider learning of the industry in response to CoViD specific circumstances, the sequence of events and the action taken by the company is described below. This event demonstrates the quick action taken by the company to identify vulnerable consumers and priority premises such as care homes which remained operable and should always be considered proactively at such a challenging time.

On 26 April 2020, the raw water main that supplies Southern Water's Beauport treatment works burst, and the treatment works had to be shut down. Beauport works is an important treatment works that supplies around 112,000 consumers in and around Hastings. Treated water from Beauport works is stored in Baldslow service reservoir (SR) before onward supply to consumers and other parts of the supply system.

The volume of water stored in Baldslow SR began to reduce, and the water company used water supply tankers to replenish the reservoir and to inject treated water directly into the network. This maintained supplies to most consumers in the affected area. Bottled water was delivered to consumers on the company's priority services register. The company established contact with the Sussex Local Resilience Forum (LRF) and it was estimated from the official list of local residents who were shielding that some 12,000 consumers in the affected area were on the list.

The company used social media, its website and local media to encourage consumers to register for priority services if they needed bottled water to be delivered. Four drive-through bottled water stations were established, which were ultimately not needed. Tankers were despatched to five critical premises (a police headquarters, a fire station, an ambulance station, an NHS Hospital and a private hospital) to enable continuous supplies to be maintained to these premises, but these were also not needed.

The first consumer contacting the company reporting a loss of supply was received at 13:00 hours on 27 April. The operation to repair to the raw water main commenced on 26 April, but the work was complicated and difficult due to access restrictions and some equipment malfunction. By 13:00 on 27 April the repair had been completed and the main was being slowly recharged so as not to cause any additional bursts. The supply from the works was restored at 21:30 that evening and supplies from Baldslow SR recommenced at 02:00 on 28 April. As the distribution network had been drained there were several airlocks within the system which meant that consumers on higher ground did not receive a water supply until the company carried out valving operations to remove the airlocks.

Figure 1. Leaking raw water main and the repair operation

(Photographs provided by Southern Water)



Supplies to all consumers were restored by 14:30 on 28 April. Of 475 consumers who contacted the company in connection with the event, 10 reported discolouration of their water supply. Most of the consumer contacts were reports of no water or poor pressure, with some consumers reporting aeration. In total some 12,300 consumers in the affected area lost their water supply, and some consumers received discoloured water.

The occurrence of this event during the CoViD lockdown period presented additional challenges to Southern Water. The company operates a priority services register whereby consumers can contact the company to be included on a list of vulnerable residents. At the outset of this event this list consisted of 335 consumers. A further 260 consumers registered during the event. 41 care homes and 128 consumers from a list provided by Rother Council were provided with bottled water in addition to the 595 consumers on the register.

Bottled water was delivered by company volunteers wearing appropriate PPE who were directed to place the plastic wrapped bottles on the doorstep, ring the doorbell or knock, and then step back two metres. If no-one answered the door, the bottles were left on the step, out of direct sunlight. If a customer requested assistance in moving the bottles into their home, they were asked to stay two metres away or, ideally, in a different room to allow the company volunteer to safely enter.

The company commenced an investigational sampling survey after supplies were restored, but because of the restrictions in place, sampling personnel were unable to enter premises to take samples. The company collected

samples from service reservoirs and used standpipes connected to boundary boxes within the distribution network. Two standpipe samples contained confirmed coliform bacteria (*Buttiauxella*), one of which had turbidity above 4 NTU. Resamples were taken from the original locations and from the boundary box of one downstream property and all results were satisfactory.

On 27 April, the company requested access to the list of shielding members of the community from the LRF. The LRF provided a list that contained some 12,500 entries, equivalent to around 25% of the population of the affected area. The list was more than a list of shielding individuals and included anyone residing in the area who might require additional support. Southern Water was unable to sort or filter the information to identify consumers who would benefit from a home-delivery of bottled water, and therefore its usefulness was limited.

The company also engaged with the following stakeholders during the event: National Incident Management (NIM); Defra; the Environment Agency and the Water UK Covid-19 Platinum Group. The Covid-19 Platinum Group is a Water UK-led incident response structure established to help support the industry effort in managing the impacts of the Covid-19 pandemic. Water UK worked with the Government to try and facilitate the release of the CoViD-19 shielding list to water suppliers in a useful and timely manner, and the difficulties faced by Southern Water were consistent with other companies' experiences at this time.

Southern Water is to be commended for the relatively short duration of the loss of supplies that occurred as a consequence of the burst raw water main at Beauport works, which is a strategic asset and the sole source of supply to several thousand consumers. The consequences could have been more serious if the repair had taken longer, with a larger population suffering a loss of supply and greater risks to water quality. The CoViD-19 restrictions in place presented additional challenges which would have increased the inconvenience for consumers, with potentially serious difficulties for shielding consumers.

This serious event highlights the risks associated with single points of failure, where the event was caused by the failure of a critical asset without the ability to supply raw water to Beauport works by another means. Southern Water should use this event to update its risk assessment for Beauport works and consider addressing this risk in its future investment plans.

The Inspectorate was critical that Southern Water did not notify the Inspectorate and Defra until Monday 27 April, approximately 28 hours after the burst raw water main occurred. Had the notification been made sooner using appropriate out of hours contacts then access to the shielding list may potentially have been obtained sooner and issues identified earlier. The Inspectorate suggested that the company should review the timeliness of

notification so that potentially major events which may lead to involvement with Defra and the Local Resilience Forum are notified at the earliest opportunity by telephone contact, in accordance with the Inspectorate's published guidance on the Notification of Events.

Disinfection and Unmitigated Risk - Desktop Audit Programme

The emergence of CoViD-19 and the resultant national restrictions on people's engagement meant that in the early stages of the pandemic site-based audits were replaced with a series of 16 desktop audits. The two main objectives of the programme were to confirm treatment and disinfection has continuously met the required standards during restrictions and to explore companies progress with addressing longstanding unmitigated risks. The maintenance of disinfection is central to the safe delivery of wholesome water, none more so than during a viral pandemic where reliance upon critical operating practices assure water treatment rather than sampling at the endpoint. This is water safety planning in action.

The audits identified some significant findings and areas for further action. In response, the Inspectorate raised 127 recommendations; assessed two of the audits for potential prosecution; and commenced further enforcement action in one case.

Two cases of disinfection failures were identified which had gone unreported. Additionally, significant gaps were found in many disinfection policies and a recurring theme of a failure to verify disinfection and various calibration issues were also identified. Given the poor performance across many companies the Inspectorate is likely to revisit these issues on future audits, when it is expected that companies will have reflected upon their own experience and those within the following summary of poor practices to improve their performance in these critical areas.

Operational Changes due to CoViD-19

The Inspectorate assessed company plans for addressing staffing issues at sites during the first wave of the coronavirus pandemic and in general terms all companies had considered operational staff levels and developed plans to sustain works operation. There were opportunities for improvement in some companies, including assessing the risk to water quality from reduced staffing, with a consequence that some activities were not completed. However, overall companies' operations were considered satisfactory.

Disinfection Issues

At Sutton and East Surrey Water's Cheam works, on 13 April, there was a power failure. The company confirmed that the inlet and outlet valves to the contact tank do not fail shut as is normal practice for such a site permitting

unchlorinated water to enter the tank due to forward pressure. The company were not aware that this was the case and had failed to appropriately investigate the risks associated with a power failure at this site. There was a short-lived restart of the works for approximately 15 minutes, that the company assume to have occurred when the power was restored, although no records of this restart were made. Data, which was available during this restart, recorded an excessive chlorine residual at the inlet to the contact tank. Subsequently, an hour after the pumps were without power, the chlorine residual at the outlet of the contact tank was recorded as being above the alarm level, indicating that water had left the contact tank past the open outlet valve. There was no evidence of an appropriate review of the process trends before the restart in the company's records. Company staff also failed to gain authorisation for the restart according to SES Water's own procedures before the phased restart of the works some two hours later.

The findings highlight a poor risk assessment of contact tank operation associated with a power failure; a failure to understand fully the operation of the works; and a failure to follow procedures designed to ensure water quality is safeguarded. However, there was little evidence of improperly disinfected water leaving the works on this occasion and recommendations were made for Sutton and East Surrey Water to review their risk assessment and operating practices. All companies should consider whether the operation of their works is understood and properly risk assessed under a wide range of scenarios. Companies are also encouraged to review recent shutdowns at their works and consider whether the human factors observed here should drive additional training.

On the evening of 10 May, SCADA information at Thames Water's Coppermills works did not report the required information to verify the disinfection process for a three-hour period in the east contact tank. Disinfection was solely ascertained by two manual tests. In response, the company drained the contact tank. Due to an operational pump failure, the contact tank could not be drained completely, and some water remained in the tank. To return a critical site to supply, the company re-filled the tank on top of the remaining water and super chlorinated the total volume before the works was eventually returned to supply on 15 May. The company failed to notify this as an event under the requirements of the Water Industry (Suppliers Information) Direction. Recommendations were made to resolve the faulty pump; recalibrate a faulty flow meter; update the site operating manual in use, which was out of date; and to carry out further training of operational managers to ensure disinfection processes are clearly understood and that all manual tests are recorded.

The audit at Hinxton Grange works (Cambridge Water) identified that technicians did not always complete the required restart forms due to technical issues with iPads. Consequently, the company was unable to prove that disinfection was always achieved. The company are working to improve

the technology, but in the interim will use hard copy records to demonstrate compliance.

Chlorine monitoring of Bray contact tank (South East Water) was noted also to be downstream of the sulphur dioxide dosing, which is a chemical used to dechlorinate water to a set point before supply. The consequence of such an arrangement is that the contact time for disinfection (Ct) cannot be derived as the chlorine concentration at the end of the contact tank is required for the calculation. A recommendation was made to improve the suboptimal sulphur dioxide dosing and install chlorine monitors between the contact tank outlet and the sulphur dioxide dosing point.

The audit of Hardham works (Southern Water) identified triple validation chlorine monitors, used to assure the chlorine concentration was not subject to significant drift. This is when the measured reading moves away from the actual concentration and is a feature of electronic meters to a lesser or greater extent. Monitors must be adjusted regularly between calibrations to verify the data being produced. The Inspectorate recommended the company investigates the accuracy of the monitors and remediates as necessary.

Elevated turbidity seen on the start-up of Hardham works had been attributed to deposits in the sample line, but this had not been substantiated. The Inspectorate recommended an investigation into the maintenance of the sample lines to ensure samples were always representative. Hardham is subject to power fluctuations on the incoming supply. This is a critical works to ensure the sufficiency of supply and the Inspectorate required the company to implement a plan to address the power supply issues.

At Yorkshire Water's Embsay works, the monitor readings remained unchanged over extended periods. Whilst this may be an artefact of a very stable disinfection process, it is statistically improbable, and a recommendation was made to investigate the causes.

Single validation monitoring of the chlorination process at Barsham works (Northumbrian, Essex and Suffolk Water) presented a risk of supplying improperly disinfected water whenever the monitor is faulty, drifting or during shutdown tests where disinfection cannot be verified. Good practice would be to use triple validation to avoid such unmitigated failures. The company have committed to reviewing the use of single validation monitors. In addition, the disinfection chlorine residual is only monitored after the first of two contact tanks at Barsham works with an assumed chlorine demand on the second contact tank, which the company were unable to evidence. Consequently, the disinfection process cannot be verified and chlorine monitoring post the second contact tank is required.

Bristol Water has reduced the level of ozonation at Littleton works since the introduction of UV. The outcome of which is biofilm growth after the UV reactor. The company failed to consider the biocidal action of ozonation as part of this dose reduction which the company is investigating and now

having to take short term steps to mitigate. A recommendation was also made to address excessive icing on the liquid oxygen tanks which require overhaul or replacement. In conjunction with these issues and the limited chlorination onsite, the Inspectorate is considering enforcement action at this site to ensure the requirements of regulation 26 are met.

Disinfection Policies

The site-specific disinfection policy (SSDP) for Sutton and East Surrey Water's Cheam works contains the caveat "Where practical to do so" before citing measures to prevent improperly disinfected water from entering supply. This implies that the company may supply water from this works which is improperly disinfected if the practicalities do not allow its removal. The policy is silent on the additional safeguards the company would need to put in place under these circumstances to protect public health and comply with the regulations. SES Water also consider short term overdosing of sulphur dioxide to be acceptable practice post contact tank provided disinfection in the tank has been satisfactory. The Inspectorate considered that this approach amounts to an acceptance of the deficiencies in the chemical dosing control systems in place at the works. Companies should seek to understand the causes for the variation in dosing control and take action to improve it. Neither the disinfection policy nor the risk assessments for SES Water consider disinfection by-products associated with UV and a recommendation was made to correct this. In addition, the tracer test carried out at Cheam works in 2010 was flawed in that it assumed that the water remained at a fixed height in the contact tank. There is no water level monitoring in the contact tank, so a key parameter for demonstrating disinfection has been effective was missing from the process.

Bristol Water's disinfection policy was ambiguous and did not accurately reflect the need to use UV and chlorination together to address all disinfection risks, including viruses. It was also not clear that effective contact time was achieved in the contact main between the works and the first consumers.

At Portsmouth Water, the disinfection policy was in draft form and the Inspectorate recommended that the final version was issued as soon as is practicable. However, the company are unable to complete this task before the end of 2020 and so the Inspectorate will follow up on this situation next year.

Affinity Water do not have in place SSDPs and instead have an overarching disinfection policy with site specific alarm set points. The Inspectorate believe this position to be insufficient to demonstrate how disinfection is achieved at each site. The company made only limited changes in response to this recommendation and consequently it is considered that the company would still need to demonstrate how appropriate the situation is, especially

when compared to the standard of most companies' disinfection policies. This situation will be subject to further scrutiny.

There is no guidance on the appropriate actions to take in the event of low chlorine at Severn Trent Water's Bamford works, within its SSDP. The site is also at risk of supplying improperly disinfected water as the company have no failsafe shutdowns in place, a situation which will be further assessed. The emergency dosing system is also not described within the SSDP or the overarching company disinfection policy.

The SSDP for South West and Bournemouth Water's Knapp Mill works had no specific requirement for pH and a recommendation to revise the policy was made.

The contact tank retention time calculations at Anglian Water's Pitsford works were flawed and required correction. There was no pH monitoring upstream of the contact tank at Pitsford works or Barsham works (NES), both companies committed to install new monitors in a timely manner.

There were no auto shutdowns in place at United Utilities Oswestry works, which presents a disinfection risk. Additionally, the UV disinfection process is not considered as part of the SSDP for this site. The company were recommended to address the findings.

The disinfection policy for Cambridge Water's Hinxton Grange works required updates to reflect the maximum flow to be treated. The company subsequently updated other SSDPs following the Inspectorate's recommendation. The company were unable to demonstrate how the UV transmittance of 40 mJ/cm² is achieved under all flow and UVI conditions and consequently have been unable to demonstrate that disinfection requirements can always be met. The Inspectorate's investigation is continuing. The company were also unable to demonstrate that risks from viruses had been risk assessed or were mitigated using UV and marginal chlorination. The Inspectorate recommended defining marginal chlorination within disinfection policies.

South East Water's UV disinfection policy also shows some ambiguity relating to UV disinfection around UV dose and transmittance requirements. The policy document did not reference scientific peer reviewed reference documents. The company has subsequently updated the policy.

Southern Water's SSDP for Hardham works reports that the shutdown alarms for turbidity and pH are awaiting set up. The Inspectorate recommended these controls were implemented in a timely manner. A bulk import from Portsmouth Water to the contact tank is not considered as part of the SSDP, although there is a clear impact on disinfection, particularly contact time and the SSDP should be revised.

The SSDP for Essex and Suffolk Water's Barsham works defines a requirement of 4-log removal of pathogens, which is not met by the treatment process. The company are reviewing the required treatment process as part of a wider reassessment of its disinfection policy.

Disinfection monitoring and verification

Full Loop Calibrations

The Inspectorate examined whether monitors were calibrated appropriately to traceable national standards and whether full loop calibrations were undertaken, to ensure the monitor readings were accurately reflected on SCADA systems and in remote telemetered control rooms. Several deficiencies were found.

Portsmouth Water confirmed the company does not carry out full loop calibrations at all but aims to implement them within the next 12 months, consequently the company were unable to verify their disinfection process. The Inspectorate is considering this situation. The company confirmed that all shutdown alarms are driven by hardwired signals from the instruments themselves. Whilst this may work provided the instruments are appropriately calibrated, it fails to consider the risk associated with hardwired alarms, which experience would indicate do not always operate effectively.

South West and Bournemouth Water were able to demonstrate full loop calibration for the turbidity monitor but did not provide evidence of validation of the turbidity, UVT or chlorine measurements in line with their own procedures.

South East Water and Sutton and East Surrey Water were unable to demonstrate full loop calibrations or provide appropriate calibration records. Recommendations were made to introduce summary records to demonstrate when satisfactory calibration was completed, and signal management to demonstrate the telemetered data can be verified. For SEW it was further identified that the turbidity meter on the inlet to Bray contact tank showed repeated 'true zero' values. Following a recommendation by the Inspectorate the company identified a scaling fault on the instrument that they are looking to rectify. For SES a recommendation was made to ensure technicians carrying out calibrations and operators verifying instrument readings are suitably trained and competent. A recommendation to extend the training and competence of samplers to include competence in pH and turbidity analysis was also made.

Cambridge Water were also unable to demonstrate full loop calibrations were being completed effectively and shall be re-briefing staff and improving documentation to achieve this.

Essex and Suffolk Water confirmed signal calibration between chlorine monitors and SCADA readings are not carried out, and full loop calibrations are not regularly carried out on water quality monitoring instruments.

Calibration

Calibration standards are traceable to national standards and independent verification of the calibration should be carried out periodically between calibrations to give confidence to the monitor results. Recommendations were made for Portsmouth Water to introduce summary records to demonstrate when satisfactory calibration was completed. Cambridge Water were required to demonstrate calibration standards are traceable to national standards and to provide evidence to demonstrate that the monitor readings can be appropriately verified between calibrations.

There were inconsistencies in the calibration and shutdown test frequencies at Hardham works that the Inspectorate recommended the company review. Additionally, calibration records for pH could not be demonstrated to national standards. Recommendations were made for Southern Water to introduce summary records to demonstrate when satisfactory calibration was completed; and signal management to demonstrate the telemetered data can be verified.

Yorkshire Water were unable to demonstrate the water quality monitors had been calibrated every four weeks in accordance with the company procedure and did not keep records to demonstrate that the online monitor readings matched the SCADA readings. In April, the company calibrated the benchtop chlorine meter with a standard that had recently expired. The pH meter was calibrated with a single standard (two are required) to demonstrate the monitor was measuring accurately across the range of interest. Recommendations were made accordingly.

Expired calibration standards were also found as part of the Coppermills audit of Thames Water. There was also a failure to carry out verification checks in line with company policy and the turbidity standard in use, 10 NTU, was significantly higher than the 1NTU level required for disinfection.

Unauthorised log sheets and calibration standards above the range of interest were observed at Wessex Water's Corfe Mullen works. The company ensured that the correct log sheet was used and briefed Production Managers accordingly.

Severn Trent Water did not provide evidence of calibration checks on the instruments used to verify the online monitor readings were appropriate.

Whilst checks on the accuracy of handheld chlorine monitors are carried out at Affinity Water's Chertsey works, this was not the case for turbidity or pH. Traceability of handheld monitor calibration could not be demonstrated as

there was no traceable way of determining the instrument used. The records have now been updated to include the instrument serial number. The handheld pH monitor was calibrated over the range 4-7, whereas the expected pH of the water at Chertsey works is between 7.5 and 8. Therefore the results of this testing are unreliable. The company are changing their calibration range to between pH 7 and 10 to correct this. The portable turbidimeter was calibrated with three standards 20 NTU, 100 NTU and 800 NTU, which are significantly above the range of interest. The company are to purchase a calibration check standard between 0.1 and 1.0 NTU to demonstrate the accuracy of this instrument going forward. Several calibration checks of the pre-disinfection turbidity monitor were cancelled at Chertsey works and the Inspectorate conclude the company are not carrying out verification of the disinfection process in line with its own policies.

Other monitoring

Portsmouth Water do not currently monitor turbidity post ultrafiltration, the point at which disinfection is calculated from, but are now planning to do so by the end of 2020. A recommendation was made for Dŵr Cymru Welsh Water to repair the post GAC iron monitor at Court Farm works as soon as possible. The repairs took over a month as spares were not held. The company relied on post RGF and Final Water monitors for iron in the meantime.

The investigation into the disinfection issues at Thames Water's Coppermills work in May also identified discrepancies in the Ct calculator and tracer tests that needed correcting.

Training / Competence

There were three Process Engineers who operated Yorkshire Water's Embsay works in April. An examination of their training records showed that they were not up to date, as with findings at a previous audit of the company in 2019.

The poor level of completion of the chlorine monitor calibration paperwork at Hinxton Grange works called into question the training and competence of the technicians completing this activity. The company are now developing a new work instruction to ensure this activity is completed to the standards required. Similarly, Southern Water could not provide evidence of training records for staff verifying the online water quality monitors at Hardham works.

Limited evidence of the competence of operators to carry out verification checks was provided by Severn Trent Water and it was recommended that annual audit was undertaken to ensure that operators were completing this task appropriate.

Unmitigated Risks

Whilst preparing for the Clough Bottom works audit, United Utilities observed that it was developing a programme of work to mitigate disinfection issues, but its risk assessment report did not reflect the appropriate risk category and corrected this for the Inspectorate. The Inspectorate recommended that the company reviews its governance processes for risk reporting.

The Inspectorate called into question the suitability of South East Water's risk categorisation process. For example, the chlorate risk at Bray works was categorised as 'C', additional control measures are being delivered, yet the company are still investigating the risk and consequently category 'E' may be more appropriate. The company subsequently reviewed their processes to take this into account.

At Essex and Suffolk Water's Barsham works refurbishment of the primary filters had commenced, yet the risk assessment report still considered the solution to iron breakthrough problems was under investigation.

Recommendations were made for Cambridge Water to review their risks for radon and nitrate, which the company addressed. An inconsistency in turbidity alarm level set points has identified a gap in the company's alarm change process. The company commenced a review of its critical control setpoints and are improving the change control and governance process.

Similarly, at Yorkshire Water's Embsay works the SCADA alarm set point for post filter chlorine was set at 0.3 mg/l rather than 0.8 mg/l as set in the company's control centre. A recommendation was made for the company to check all of its critical alarm setpoints, but it calls into question whether this alarm limit was set in error as a result of incompetence or whether it was a deliberate act to avoid alarms under certain conditions.

Taste and odour risks associated with Sutton and East Surrey Water's Clifton's Lane works were reportedly submitted to the Inspectorate in error in that there has never been a material risk and the company corrected its submission. However, a recommendation was made for the company to review its processes and ensure risks are verified before board level sign off and submission to the Inspectorate.

The raw water risks associated with Wessex Water's Corfe Mullen works did not demonstrate that the groundwater sources had been considered in their entirety. Similarly, the risks associated with supernatant recovery from the process water system had not been evaluated. Recommendations were made.

South West and Bournemouth Water's risk assessment records for Knapp Mill works, were out of date and did not reflect the Notice in place to address cryptosporidium, dissolved organic carbon, colour and turbidity risks.

Unreliable chlorine monitoring at Thames Water's Shalford works had not been addressed and is now to form part of a longer-term programme of work on the disinfection system. The company is unable to say how long it shall take to upgrade the equipment as a study into the solution shall not be completed before March 2021. The risk remains unresolved in the meantime.

Legal Instruments

During the second quarter of 2020, activity was directed at sampling requirements during the CoViD-19 outbreak, with ongoing maintenance of regulation 7 notices. The completion of work to accept the revised metaldehyde undertakings also dominated the workload during the quarter. In addition, two new types of notice which have not previously been used by the Inspectorate were employed. These are described in detail below.

New Legal Instruments Issued

The Inspectorate put in to place 19 new legal instruments (Table 3).

Table 3: Legal instruments issued during Q2, 2020

Type of legal instrument	Number	Companies
Regulation 9(4) Notice	1	NES
Regulation 17(3) Notice	1	NES
Regulation 27(4) Notice	1	SEW
Regulation 28(4) Notice	4	BRL, NES, SRN, TMS
Section 19 Undertaking	12	AFW 2, ANH 2, SVT 2, ICW 1, IWN 1, NES 1, SEW 1, SST 1, TMS 1

The twelve section 19 undertakings were for metaldehyde, with all but one of the replacement undertakings for AMP7 in place by the end of the quarter. These include the bulk supply undertakings for companies receiving water from a supply system which itself has a metaldehyde undertaking in place.

Northumbrian, Essex and Suffolk Water (NES) were issued four legal instruments (including the Undertaking) during the period. Regulation 9 defines the monitoring frequencies required for compliance samples. Regulation 9(4) makes provision for the Inspectorate, on behalf of the Secretary of State or Welsh Ministers, to issue a notice to a company to vary the parameters to be monitored or the frequency of monitoring. It is this regulation under which companies may apply for monitoring variations. However, the Inspectorate may also issue a monitoring variation notice without application by a company, if the circumstances require.

Following detection of cyanide in the treated water supplied from Lartington treatment works (NES), the Inspectorate considered it necessary to issue a monitoring variation notice. The notice required the company to increase the cyanide sampling frequency to 52 samples a year from the Mickelton & Bowes treatment works compliance points. In addition, the company were required to report the results to the inspectorate, to be assessed as

compliance parameters, in a deviation from the Regulations which state the point of compliance for cyanide is ordinarily at the Consumers tap.

Regulation 17 sets the monitoring frequencies for surface water abstraction points. Regulation 17(3) require abstraction point monitoring for specific properties, organisms or substances at a specific frequency. The third instrument issued to Northumbrian, Essex and Suffolk Water also followed the Lartington cyanide event. The notice required the company to undertake an increase to the annual sampling frequency for UV254, colour (Hazen) and dissolved oxygen (DO₂), from the raw water monitoring point at Lartington works to 52 samples per year. These parameters were identified as being potential sources of the precursors for cyanide formation.

Whittle Dene treatment works (Northumbrian, Essex and Suffolk Water) had four positive detections of *Cryptosporidium* in the final water, on different days in October 2019. These detections were unusual occurrences for this treatment works, which indicated a change in raw water quality and represented an increased risk of supplying unwholesome water to consumers. The detections coincided with a period of heavy rainfall in the catchment. This event was reported upon in the 2019 annual Chief Inspectors Report. In May 2020 the fourth legal instrument, a regulation 28(4) notice, was served on Northumbrian, Essex and Suffolk Water requiring the company to make improvements at Whittle Dene treatment works in relation to the risks associated with *Cryptosporidium*. The Notice required improved catchment management measures to reduce contamination risks and a revision of procedures for abstraction and reservoir management. There was also a requirement that the company complete a gap analysis of clarification and rapid gravity filtration performance and compliance with Badenoch and Bouchier recommendations. Gaps identified at Whittle Dene treatment works will be addressed, with solutions and remedial work delivered by December 2021.

The notice also included water quality training modules for all production operators including treatment process scientists and water supply managers. Due to the contamination presented from the event the notice additionally requires the company to complete a tank inspection and cleaning of the contact and storage tanks associated with the works. This regulation 28(4) notice addresses the deficiencies in investment and maintenance at the Whittle Dene treatment works that were responsible for the event in October 2019. Once completed, the required improvements will increase site resilience and the ability to meet future water quality challenges.

A Notice served on Bristol Water was for an AMP7 scheme to mitigate the risk from Lead in zones supplied by Alderley treatment works for the installation of phosphate dosing. The Notice also requires the company to complete opportunistic communications pipe replacements where identified.

South East Water reported an event in October 2019 involving consumer taste and odour complaints. The Inspectorate's assessment of the event has subsequently identified the company's risk assessment reports for taste, odour, geosmin and Methyl-Isoborneol (MIB) for Hazard Green treatment works, Darwell reservoir and its abstraction source, were not adequate. Consequently, a regulation 27(4) notice was issued to the company to review the risk assessments and improve them.

A replacement AMP 7 nitrate notice was served on Southern Water in response to a change application by the company to merge three existing Thanet nitrate notices into a single, Thanet-wide notice. The company undertook a revision of the locations and scope of the schemes following the options phase of Southern Water's Risk & Value process. The review identified potential rationalization opportunities by addressing the nitrate problem holistically across the whole of the Thanet Water Supply Zone.

A notice was served on Thames Water in response to repeat coliform detections in both compartments of Chessington SR between June 2014 and November 2019. Investigations into each breach did not determine a specific cause. It was, however established that the chlorine residual in both compartments of the reservoir were low. Increased turnover did not improve the situation. The company Regulation 28 reports identified the unmitigated risks of chlorine and biological hazards associated with inadequate turnover and failure of structural embankments or walls. As further breaches were possible enforcement was initiated.

Closure Reports

The Inspectorate received 16 closure reports (AFW 2, ANH 1, DWR 1, HDC 1, NES 1, PRT 1, SRN 5, SVT 2, TMS 1 and WSX 1), which was almost half the number received during the first quarter of 2020. AMP6 scheme closures continue to contribute most closure reports submitted in 2020 so far.

Change Applications

Seven applications to change legal instruments were received by the Inspectorate during the quarter (SRN 1, SVT 2, TMS 4).

Milestone Reports

Companies submitted 66 milestone reports (independent of closure reports, change applications and annual progress reports) to the Inspectorate during the second quarter of 2020 (ANH 10, DWR 3, NES 2, PRT 1, SRN 22, SVT 17, TMS 9, WSX 2). The high numbers of reports from Southern Water and Severn Trent Water represent early milestones in the AMP7 schemes, which those companies are delivering on time.

Radioactivity Notices

During the second quarter of 2020, the Inspectorate received no applications to cease regulatory monitoring for radioactivity parameters under regulation 6.

Regulation 15 Applications

Four applications under regulation 15, to use new sources, were received during the quarter (SRN 1, SVT 2, and SWB 1). The applications were in good order and able to be accepted relatively quickly. However, due to a subsequent change in risk at Southern Water’s Weirwood treatment works, the Inspectorate had to serve a prohibition on the site (under Regulation 28(4)d).

Recommendations

Inspectors made 128 recommendations during the second quarter of 2020 (ANH 4, BRL 3, DWR 1, HDC 3, LNW 1, NES 13, SES 2, SEW 10, SRN 15, SST 1, SVT 7, SWB 43, TMS 5, UUT 14, WSX 3, YKS 3).

Figure 2: Number of recommendations by company

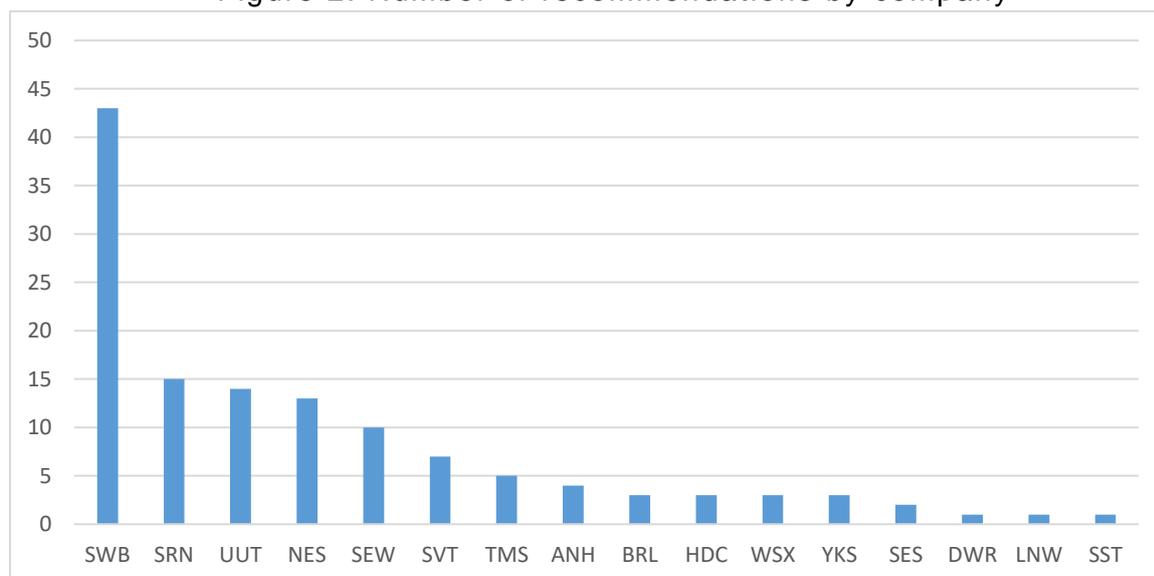
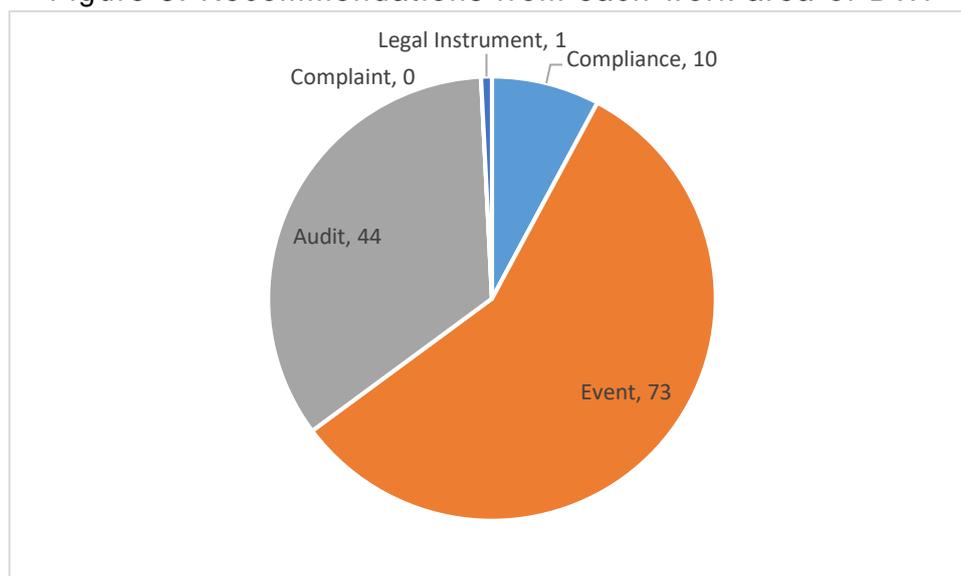


Figure 3, below, shows the division of recommendations made in each DWI work area. Over half the recommendations made were in relation to drinking water quality events.

Figure 3: Recommendations from each work area of DWI



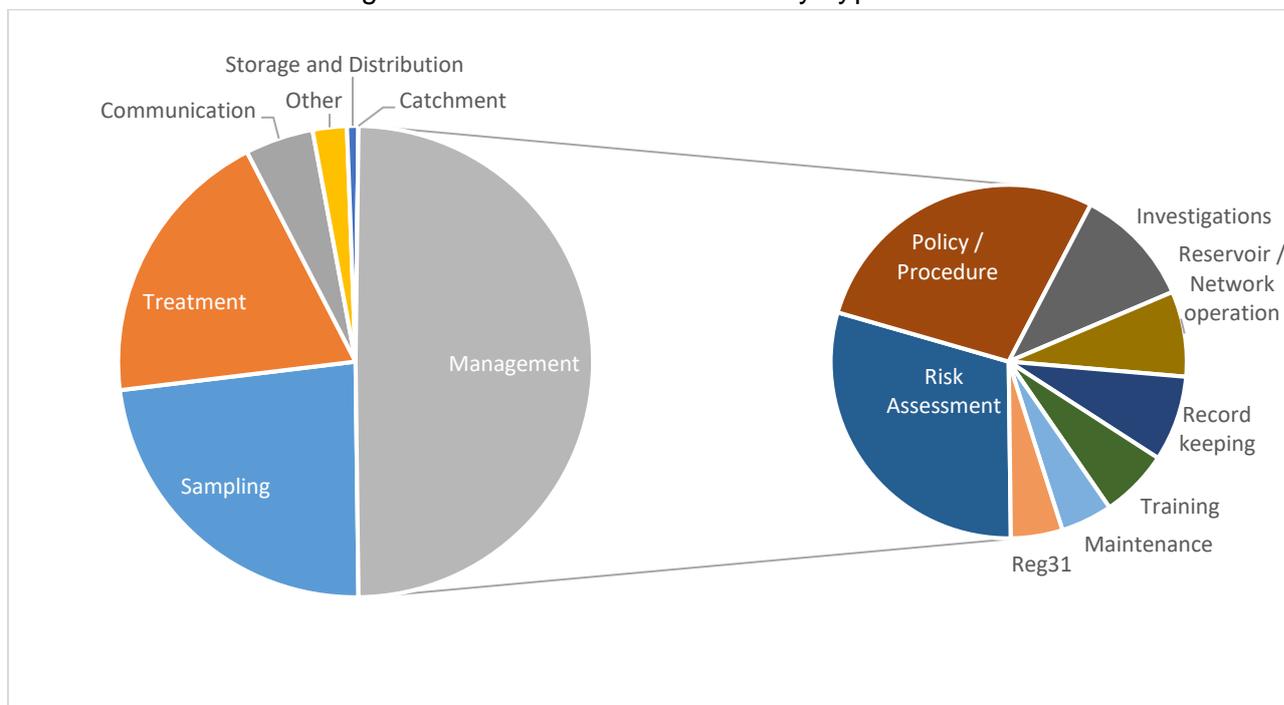
The Inspectorate carried out unannounced audits at South West Water's Regional Alarm Centre, Customer Contact Centre, Lowermoor works and the company's Laboratory in March 2019. The audits led the Inspectorate to conclude that an event of significance occurred at Lowermoor works, in December 2018, which was not notified by the company as an event, under the requirements of regulation 35(6). The Inspectorate found evidence that the company failed to design and continuously operate an adequate treatment process, and limited evidence that a volume of water, presented for final disinfection, exceeded the 1.0 NTU turbidity requirement. However, there was insufficient evidence, to demonstrate that inadequately disinfected water was supplied to consumers in contravention of regulation 26(1).

The Inspectorate did, however, find evidence of significant shortcomings in record keeping, maintenance, sampling, risk assessment, investment, training and staff adherence to company procedures. Consequently, the Inspectorate raised 42 recommendations to address those deficiencies found. The large number of recommendations gives rise to significant concern around company systems and procedural support to respond to unplanned situations to keep in check any further escalation and the subsequent and necessary learning. The recommendations were clustered together into three groups. Firstly, recommendations relating to the event itself covering the risk assessment, disinfection, the immediate investigation, and notification. Secondly, recommendations relating to the Inspectorates' site audit of Lowermoor works, covering key operational activities, such as maintenance, on-line monitoring, on-site sampling and verification. Thirdly, recommendations that arose from the company laboratory audit addressing flaws found in the process of authorisation of laboratory results, staff training, the following of internal procedures and incomplete documentation.

A company is required to provide information to the Inspectorate on matters to do with their business of water supply. In order to do this, any investigation by the company or data acquired during an event must be made available. However, if these processes are inadequate a company may be unintentionally or otherwise breaching this duty and could be subject to further action. South West Waters investigational sampling response was wholly inadequate and documented laboratory procedures were not followed such that the information available was inadequate to make a full assessment of circumstances during and following the event. The Inspectorate is considering additional enforcement action because of these serious failings but will take into account the company responses to the recommendations raised.

In this quarter for all companies, almost half of the recommendations made were in relation to management deficiencies (64), with sampling (30) and treatment (25) deficiencies contributing significant numbers. The largest proportion of management related recommendations were in relation to risk assessment deficiencies (19), and this continues an unwanted trend. It remains central to a proactive strategy to ensure risk assessments are and continue to be effective. This quarter, policy and procedure deficiencies contributed a significant number of recommendations (18).

Figure 4: Recommendations by type

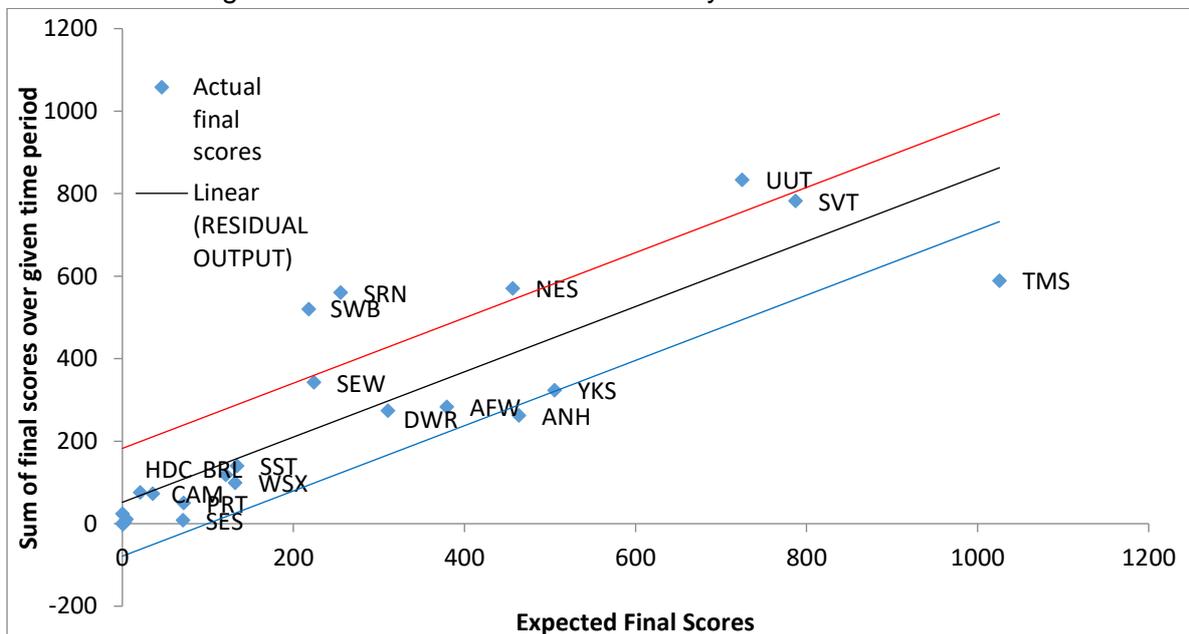


Analysis of the predicted recommendations score against the actual score (figure 5 below) shows that United Utilities, Southern Water, South West and Bournemouth Water and Northumbrian, Essex and Suffolk Water remain

outside of the expected range for recommendations. Companies in this zone are carrying a large regulatory risk and targeted enforcement is an inevitable part of better regulation.

Severn Trent Water have demonstrated a significant improvement by moving into the expected range for recommendations for the first time since this analysis began. It is without doubt, the company have worked hard on improving their recommendations performance and have proactively engaged with the Inspectorate to understand how to achieve this. The team working on this are to be congratulated, although the efforts must continue to ensure the company remain in this much improved position.

Figure 5: Recommendations analysis to 30 June 2020



Appendix 1: Recommendations in Quarter 2, 2020

Company	Date	Work Area	Recommendation Type
South Staffordshire Water Plc	01-Apr-20	Event	Consumer communication
United Utilities Water Plc	01-Apr-20	Event	Risk assessment
	02-Apr-20	Audit	Final water sampling / operation / maintenance
		Audit	Notification to DWI
Anglian Water Services Ltd	17-Apr-20	Audit	On-line monitors
		Event	Policy/procedure
		Event	Treatment operation / maintenance
SES Water	17-Apr-20	Event	Disinfection operation / maintenance
		Event	Risk assessment
Wessex Water Services Ltd	17-Apr-20	Event	Policy/procedure
		Event	Inadequate investigations
		Event	Risk assessment
Thames Water Utilities Ltd	21-Apr-20	Compliance	Risk assessment
Hafren Dyfrdwy	23-Apr-20	Event	Service reservoir or network management /operation /maintenance
		Event	Service reservoir or network management /operation /maintenance
		Event	Service reservoir or network management /operation/ maintenance
Southern Water Services Ltd	24-Apr-20	Compliance	Treatment operation / maintenance
South East Water Plc	27-Apr-20	Event	Sampling (appropriateness or accuracy)
		Event	Policy/procedure
		Event	Treatment operation / maintenance
		Event	Raw water management / operation / maintenance
Dwr Cymru Welsh Water	29-Apr-20	Event	Risk assessment
	29-Apr-20	Event	Treatment operation / maintenance

Thames Water Utilities Ltd		Event	Inadequate investigations
United Utilities Water Plc	11-May-20	Event	Inadequate investigations
South East Water Plc	12-May-20	Audit	On-line monitors
		Audit	Disinfection operation / maintenance
		Audit	Service reservoir or network management/operation/maintenance
		Audit	Raw water management / operation / maintenance
		Audit	Notification to DWI
Thames Water Utilities Ltd	12-May-20	Audit	Risk assessment
		Audit	Rapid gravity filtration operation / maintenance
Yorkshire Water Services Ltd	18-May-20	Event	Risk assessment
		Event	On-site analysis
United Utilities Water Plc	27-May-20	Compliance	Risk assessment
		Compliance	Risk assessment
		Compliance	Sampling (appropriateness or accuracy)
		Compliance	Risk assessment
		Compliance	Inadequate investigations
Yorkshire Water Services Ltd	27-May-20	Compliance	Inadequate investigations
Anglian Water Services Ltd	02-Jun-20	Audit	Training/competence/hygiene card
	04-Jun-20	Legal Instrument	Inadequate number of samples taken
Bristol Water Plc	10-Jun-20	Audit	Disinfection operation / maintenance
		Audit	Miscellaneous recommendation (other)
		Audit	Sampling (appropriateness or accuracy)
South East Water Plc	10-Jun-20	Event	Sampling was not timely enough
Southern Water Services Ltd	11-Jun-20	Audit	Delivery of sampling programme
		Audit	Disinfection operation / maintenance
		Audit	Final water sampling / operation / maintenance
		Audit	Treatment operation / maintenance

		Audit	Policy/procedure
		Audit	Treatment operation / maintenance
		Audit	Treatment operation / maintenance
		Audit	Risk assessment
		Audit	Disinfection operation / maintenance
		Audit	Rapid gravity filtration operation / maintenance
		Audit	Rapid gravity filtration operation / maintenance
		Audit	Policy/procedure
		Audit	Risk assessment
		Audit	On-line monitors
South West Water Ltd	15-Jun-20	Event	Miscellaneous recommendation (other)
		Event	Policy/procedure
		Event	Analytical practice/procedure
		Event	Policy/procedure
		Event	Record keeping or review
		Event	Record keeping or review
		Event	Sampling (appropriateness or accuracy)
		Event	Training /competence /hygiene card
		Event	Analytical practice/procedure
		Event	Analysis being fit for purpose (misc)
		Event	Analytical practice/procedure
		Event	Analytical practice/procedure
		Event	Analytical practice/procedure
		Event	Record keeping or review
		Event	Policy/procedure
		Event	Service reservoir or network management/operation/maintenance
		Event	On-line monitors
		Event	Policy/procedure
		Event	Rapid gravity filtration operation / maintenance
		Event	Policy/procedure
		Event	Training/competence/hygiene card
		Event	Maintenance and planning
		Event	Maintenance and planning

		Event	Policy/procedure
		Event	Policy/procedure
		Event	Policy/procedure
		Event	Record keeping or review
		Event	Inadequate communication caused delay in response
		Event	Notification to DWI
		Event	Risk assessment
		Event	Training/competence/hygiene card
		Event	Inadequate follow up sampling
		Event	On-line monitors
		Event	Inadequate number of samples taken
		Event	On-site analysis
		Event	On-site analysis
		Event	Chemical dosing or procurement
		Event	Chemical dosing or procurement
		Event	Maintenance and planning
		Event	Policy/procedure
Northumbrian Water Ltd	17-Jun-20	Event	Risk assessment
Severn Trent Water Ltd		Event	Risk assessment
United Utilities Water Plc	18-Jun-20	Compliance	Inadequate investigations
		Compliance	Inadequate investigations
		Event	Delivery of sampling programme
		Event	Delivery of sampling programme
Severn Trent Water Ltd	22-Jun-20	Audit	Integrity of water storage / storage conditions
		Audit	Risk assessment
		Audit	Risk assessment
		Audit	Risk assessment
		Audit	Miscellaneous recommendation
		Audit	Policy/procedure
Leep Networks Water	26-Jun-20	Event	Notification to DWI
Northumbrian Water Ltd	29-Jun-20	Audit	Policy/procedure
		Audit	Policy/procedure
		Audit	Record keeping or review
		Audit	Chemical dosing or procurement
		Audit	Treatment operation / maintenance
		Audit	Disinfection operation / maintenance
		Audit	Regulation 31
		Audit	Regulation 31
		Audit	Disinfection operation / maintenance
		Audit	Disinfection operation / maintenance

		Event	Regulation 31
		Event	Policy/procedure



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