

7.2 SUMMARY OF EVENTS AND INCIDENTS 2021

Scottish Water is required to tell the Drinking Water Quality Regulator for Scotland (DWQR) about events that could affect water quality. DWQR assesses all events and categorises them in consideration of their impact on public confidence in the water supply. There are five categories used with the three most severe declared by DWQR to be incidents.

Category	Not Significant	Minor	Significant	Serious	Major
No. of Events	639	185	25	4	2

Table 23 Classification of Incidents

The following tables detail the significant, serious and major events declared as incidents. Each individual incident assessment can be viewed on the DWQR website: <https://dwqr.scot/regulator-activity/water-quality-incidents/2021-incidents/>

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Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
4 January 2021 For 1 day Classification: Significant	Stoneybridge WTW, North Region	1,362	Disinfection Failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The Standby operator was called to the WTW due to “low chlorine” and “plant shutdown” alarms • The works was restarted 3 times before it was found that the duty hypo dosing pump was not dosing despite showing a positive flow. • The drop test carried out by the operators to identify the issue was not part of the TOMS procedures. • Throughout the event chlorine dosing was intermittent for 3 hours 15 minutes, with inadequately disinfected water passing through the WTW for a total of 114 minutes • The strength of the hypochlorite solution was previously changed, but the alarm set-points had not been updated to reflect the higher turnover. • Scottish Water responded appropriately to diagnose and mitigate the incident <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Refreshed site specific sodium hypochlorite dosing procedure to ensure the increase in normal operating level of the day tank is documented. • Reviewed alarm levels on sodium hypochlorite day tank • Made improvements to sodium hypochlorite flow switch and telemetry configuration • Added Stoneybridge WTW sodium hypochlorite day tank level alarm to telemetry • Carried out a review of TOMS procedure ‘TOMS-SW-PRC01040512- Disinfection Failure with Automatic Shutdown’ to include drop test of dosing pumps

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9 January 2021 For 2 days Classification: Significant	Penwhirn WTW, South Region	19,746	Aluminium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> Alarms were received on 9th January and the morning of 10th January, but were not responded to straight away. This lack of immediate response prolonged the incident. When the operator attended site, he found that the filtered turbidity and aluminium levels were in excess of the EALs, and that a PLC fault had occurred which had stopped the DAF scrapers and automatic filter washes. The WTW was shut-down and reset, but only three of the five filters could be backwashed due to the capacity of the dirty wash water tanks. There was a lack of clarity in the communication between the ICC and the operator. Despite the occurrence of nuisance alarms from the site the operators first response must always be to attend site. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Investigated installation of PLC watchdog alarm ICC and Penwhirn WTW identified filter turbidity nuisance alarms Considered the options for ICC to record and escalate when standby operator is unable to attend a water quality alarm immediately Developed additional enhanced protocols for alarm management
2 February 2021 For >5 hours Classification: Significant	Turriff WTW, East Region	74,044	Aluminium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> Elevated Aluminium was detected post clarification. The incident occurred following a planned maintenance task to service the coagulant dosing controller. Following the service, the process was restored to automatic control, but unnoticed by the operator, the dose speed had switched to maximum speed, rather than the normal 30% dosing speed. There was no flow meter on site to give visibility of the dosing speed. Reactive sampling was carried out and this showed two failing samples in the final water from the WTW This event and its consequent recovery actions were clearly avoidable had some basic checks been carried out on completion of the service. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Reinforce EAL breach TOMS procedure to Turriff WTW team Reinforced treatment control requirements to Don North team

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13 February 2021 For 4 days Classification: Significant	Greenock Supply Zone, West Region	26,672	Manganese and Iron failures	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Freezing weather caused a build-up of ice around the raw water intake to Greenock WTWs, resulting in the plant shutting down and downstream network draining down. • The works was able to re-start production that evening and the system recharged, although the change in flow caused some 60 consumer complaints of discolouration and regulatory iron and manganese failures • Tankered water was used to assist with the recharge of the system. • The issue was largely resolved within 36 hours • A relatively low number of complaints were received given the scale of the issue and size of the population supplied • Scottish Water responded promptly to the emergency situation and resolved the issue relatively quickly given the appalling weather conditions <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Scottish Water did not identify any significant learning actions from this incident
9 March 2021 For 8 days Classification: Significant	North Hoy RSZ, East Region	25	Restrictions on water use	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Investigations into a low level alarm on the clear water tank (CWT) at the treatment works identified a burst on the supply extending to Graemsay • Through step testing, the burst was narrowed down to the section of subsea pipe where pipe couplings had failed through corrosion. • 'Boil Notice' was put in place for consumers until the pipe was repaired and the system was recharged, flushed and sampled. • Scottish Water responded well to the situation and took positive actions to establish alternative water supplies • There was a delay in lifting the boil notices due to misunderstandings, communications and transport issues. • There was an unwarranted delay in notifying NHS Orkney Public Health Team after it was determined the supply was at risk • The actions and recommendations arising from an incident assessment in February 2015 were all vouched as having been completed by Scottish Water, however these had not been carried out. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Created a schedule task to undertake 6 monthly inspections and pressure testing of the main to check for leaks on subsea pipe on Graemsay • Raised a project to improve resilience of Graemsay public water supply. • Reviewed Standby Sampling Procedure • Reviewed DWSP following event conclusions

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11 March 2021 For 9 days Classification: Significant	Rawburn RSZ, South Region	7989	Discolouration (Turbidity and Iron failures)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • 70 customer contacts were received following planned work to divert a water main • tankers were on standby to augment supplies by pumping directly in to the main due to concerns that a large area could experience loss of supply. • Turbidity was monitored downstream of the work until the morning of the following day, however contacts began to be received in the afternoon of that day • The risk of discolouration was correctly anticipated by Scottish Water and there was evidence that care was taken in the planning of the work and that Scottish Water procedures were followed. • Scottish Water acknowledged that hydraulic modelling, whilst it couldn't have explicitly predicted the discolouration, could have clarified travel times through the system. • Scottish Water undertook appropriate actions to resolve the incident, including careful flushing and the issue of bottled water to vulnerable consumers. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Reviewed DWSP in light of event • Delivered an incident replay to relevant teams identifying those responsible for providing customer lettering address lists during network projects. • Reviewed network intervention planning in response to the lessons learned from this event. •
2 April 2021 For 2 weeks Classification: Significant	Muirhead DSR, South Region	4558	Manganese failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by disturbed sediment being flushed into the service reservoir following planned work on Ringford WTW Boreholes • Water was flushed into an empty cell at the reservoir through the scour main, before the cell was refilled and returned to supply • There was a lack of sampling carried out at the service reservoir during the operation. • It was disappointing that sampling at the service reservoir and in distribution was not made a priority during and following the flushing work • No outcome report was provided by Scottish Water until 4 February 2022. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Confirmed accuracy of on-line turbidity meter and carried out primary calibration • Added iron analysis to the site work schedule • Carried out an incident replay of this event, reiterating the 'Stop, Think and Act' principles and need for effective communication

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5 May 2021 and 19 May 2021 For 1 day on each occasion Classification: Significant	Glenconvinth WTW, North Region	8,429	Ammonium Failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Ammonium exceedances were reported from two regulatory samples on 5 May 2021 from reservoirs downstream of the WTW, and one regulatory sample taken from the WTW on 19 May 2021 • Investigations found that the root cause of the incident was the ammonium sulphate dosing control system • The SCADA system on site did not include ammonium alarms, with this only being visible on SCADA in the ICC • There was a lack of communication between the operator and the ICC as it was assumed that the operator had visibility of the high ammonium alarm onsite. • The ammonium dosing did not follow at a flow-proportional rate to the output of the WTW's, so was overdosing when the plant fell below a flow rate of 25l/s • It was particularly disappointing that a previous incident in 2015 identified a lack of ammonium monitoring <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Free chlorine and ammonium monitors calibrated and confirmed to be working correctly • Ammonium dosing alarm has been added to the site SCADA • Low/High Ammonium added to the site's shutdown criteria • Ammonium trending function added to the site SCADA to give operators visibility of historic ammonium levels • Updated DWSP in light of root causes of this incident

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>10 May 2021 and 19 May 2021</p> <p>2 Issues for approximately 6 days</p> <p>Classification: Significant</p>	<p>Stoneybridge WTW, North Region</p>	<p>1,361</p>	<p>Aluminium failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Following a significant change in raw water quality, the manual dosing of coagulant was changed on 10 May. • The coagulation pH control was set to flow pace for 20 minutes on plant start-up, which was not able to keep pace with the increased coagulant dosing. • The Clear Water Tank was drained and a Cryptosporidium filter installed. • On 19 May, Operators were called by the ICC for a high high turbidity alarm. Operators found one of the filters to be blocked from the high organic loading and additional coagulant dosing from the previous weeks poorer raw water quality • The filter was isolated, backwashed, drained and treated over the following few days, and on the 22nd, was left overnight running to waste. • Following a plant shutdown and high aluminium and turbidity in the treated water, it was found that the filter outlet valve was passing water forward into supply. • A new coagulation unit had been fitted in 2020 following a water quality incident in 2019, however this was not fully commissioned and implemented. • Raw water quality fluctuates at this site and the auto controller is imperative to assist site operators to manage the plant effectively • Operations staff reacted appropriately to the incident and worked diligently to resolve the issues, however, the sampling response to the incident was poor <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Achieved water into supply under auto coagulant control (optimisation to continue thereafter) • Changed 20 min flow paced setting to 5 minutes • Amended site procedure for backwashing filters to include removing butterfly valves and inserting blank plates • Replaced all butterfly valves in the inlet/outlet set up of the Dynasand filters • Created TOMS procedure for Dynasand filter cleaning • Assessed short term options to provide visibility to on-site operators of water quality signals either through communication with ICC or site connectivity or both

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13 July 2021 For 3 days Classification: Significant	Mannofield WTW East Region	343,175	Aluminium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Raw water quality deteriorated following heavy rain in the catchment, resulting in poor floc formation and increased turbidity and high Aluminium levels in the filtered water • The works was restored to performing within normal operating parameters after some 13 hours. • Formal monitoring of final water quality showed the standard for aluminium to have been breached in three samples. • Samples taken from the outlet of the clear water tank and in distribution all showed no failure of water quality standards • The actions taken by the operators to adjust processes and recover treatment work performance, ensured there was no significant impact on the water quality supplied to consumers • Final water sampling for Cryptosporidium did not take place until 2 days after the coagulation difficulties. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Shared lesson on early escalation to process scientist and team leader during event. • Reviewed opportunities to bring project completion dates forward for investment into improving the WTW • Added Mannofield inlet blend, inlet improvements and treatment improvement projects to the Water Risk Management Group watchlist for monthly review.

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15 July 2021 For 5 weeks Classification: Significant	Burncrooks WSZ, West Region	51,742	Manganese Failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by manganese in the raw water supply. • The manganese levels were exacerbated by reservoir levels being dropped at Jaw reservoir (to minimise damage to the embankment) and by the ResMix being out of operation for 6 days following a power failure. • Burncrooks WTW had no dedicated manganese removal stage or online manganese monitoring. • In total there were 220 consumer contacts. • There was a lack of focus on Jaw Reservoir in the Drinking Water Safety Plan • There was no telemetry signal from the ResMix to SCADA, which left Operational staff unaware of the failure following a power cut • Reactive sampling was carried out to determine the extent of the issue, and staff acted well in sampling the raw, final and network samples for both total and soluble manganese. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Investigated the feasibility of connecting Burncrooks Reservoir RESMIX to telemetry. • Increase Manganese sampling for Raw and Final at Burncrooks WTW to weekly. • Add Manganese monitoring to Burncrooks WTW task scheduling. • Roll out communications Scotland wide to ensure any planned drop in reservoir levels are approved by Water Ops treatment control.

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22 July 2021 For <4 hours Classification: Significant	Loch Calder, North Region	31,856	Disinfection Failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Scottish Water’s investigation reported that the root cause of the incident was plastic debris found in the chlorine dosing pump NRV which prevented dosing • Over the course of the incident water that was not fully disinfected entered supply for 3 hours 22 minutes • Resolving a previously identified issue with the chlorine skid was the reason the second chlorine dosing pump was unavailable for use. If auto changeover to the standby pump had been available (as during normal operation) this would have prevented this incident • Scottish Water responded to the event in an appropriate manner, with all checks being carried out diligently to attempt to identify the issue <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Investigated fitting in-line filter to prevent debris entering the dosing pumps. • Cleaned the bulk storage tanks • Marked hatches for hypo shock dosing and updated procedures on site • Investigated why all visual checks, flow switches and SCADA trends indicated that the chlorine dosing skid was operating as it should whilst no chlorine was dosing • Formalised a plant start-up procedure for Loch Calder WTW

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7 August 2021 For 5 days Classification: Significant	Black Esk RSZ, South Region	36,032	Manganese, Iron, Aluminium and Coliform failures	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • A 3" burst main led to an increased flow from Black Esk Service Reservoir, which stripped the pipes of their deposits laid down by biofilm build-up and insufficient treatment for manganese at the water treatment works • A total of 123 discolouration complaints were received from throughout the affected area between 7-11th August. • 23 samples were taken during the investigation, with eight failing for manganese, one for iron, one for aluminium and one for coliforms. • Scottish Water responded promptly to repair the burst and took adequate sampling from the affected DMAs to monitor the extent of the discolouration. • Black Esk RSZ is known to have significant manganese deposits, and whilst 32 of the 54 DMAs within Black Esk RSZ were cleaned during the previous investment period, none of these were the ones affected by the burst. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Install PRV on length of 3" AC branch main where the burst occurred • Following installation of PRV, assess whether the 3" branch main requires replacement • Carry out a review of Black Esk WTW and downstream service reservoirs telemetry signals to ensure high/low alarm set-points are appropriate

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7 August 2021 For <2 hours Classification: Significant	Hopes WTW, South Region	6,574	Disinfection failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • An operator was called out to alarms for low pre Chlorine Contact Tank and hypo dosing failure. • There was no chlorine dosing because the dosing day tank was empty. • The WTW had not automatically shut-down as it should have. This was found to be due to a loose wire in the power supply to the PLC. • The day tank is normally automatically batched, however a fault had developed 3 weeks earlier, so this was being carried out manually each day by operators. • The TOMS procedure for a change from automatic to manual processing was not carried out. • A lack of thought and urgency was placed on the issue of the manual hypo batching, despite this being an essential part of the disinfection at the works. • No sample bottles were available on site, so the quality of the final water could not be effectively verified against the online monitors. The operator did not escalate the lack of suitable bottles when discovered. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Configured low alarm level on the hypo batching tank and linked to telemetry. • Promoted the hypo batching tank for further investment • Issued a reminder highlighting the importance of keeping spare sample bottles on site and escalating if there are any issues • Added batching the hypo day tank to the site's task schedule • Issued a reminder highlighting the importance of discussing treatment control mitigation measures with local operational teams

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9 August 2021 For 4 weeks Classification: Serious	Lock Eck, West Region	23	Microbiological failures and restrictions on water use	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • 23 properties were issues with boil notices between 26th August and 1st September 2021. • Scottish Water had carried out two burst main repairs in early August and a customer repeatedly reported discoloured water following these repairs. • Samples taken failed a number of microbiological standards. • DOMS procedures weren't followed as samples were not taken following the two burst main repairs • Scottish Waters GIS system had inaccurate details which impacted the assessment of the source of the contamination. • There were multiple delays in the response to identifying and resolving the issue. • Scottish Water did not appear to give any consideration to disinfecting the contaminated main rather than simply flushing it. • 14 recommendations were made and an Enforcement Notice issued <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Carried out investigations into potential ingress points. • Carried out a model of the event to identify potential ingress points. • Carried out mains rehabilitation of the affected area • Carry out an incident replay with the DOMS working group, to consider any lessons learned. • Reviewed the mains repair process and sampling requirements. • Reviewed criteria for triggering a customer sample following repeat contacts related to bursts.

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16 August 2021 For over 6 weeks Classification: Major	Daer WTW, South Region	329,347	Manganese failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a rapid increase in manganese in the raw water supply from Daer Reservoir • Daer WTW had no manganese removal stage and had no monitoring of manganese levels on site. A temporary manganese removal stage was installed at the treatment works, but this took several weeks to take effect • There were exceedances in THM's due to additional chlorine used by Scottish Water whilst installing the temporary removal process • Recommended developing a protocol for increased monitoring and awareness of water quality risks once raw water levels fall to a critical level determined on a site-specific basis. • Recommended Developing a consumer communication and support strategy to be used for water quality incidents of extended duration, to ensure clarity and consistency of message. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installation of on-line manganese monitoring on raw, filtered and final water • Complete a review of the source water manganese risk. • Installation of aeration in the raw water reservoir using temporary blowers and generation • Undertake further water quality investigation of the Daer trunk mains and develop cleaning plan for each, and their associated DMAs • Progress planned conditioning of the Daer trunk and cleaning of the Gair Service Reservoir • Undertook feasibility work and develop outline designs for a dedicated manganese removal processes and bring forward our wider investment appraisal for Daer WTW to allow quicker delivery if required

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18 August 2021 For over 6 weeks Classification: Major	Camps WTW, South Region	329,347	Manganese failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a rapid increase in manganese in the raw water supply from Camps Reservoir • Camps WTW had a manganese removal stage, but this was switched off at the start of the event. • Camps WTW had no monitoring of manganese levels on site. • Recommended developing a protocol for increased monitoring and awareness of water quality risks once raw water levels fall to a critical level determined on a site-specific basis. • Recommended Developing a consumer communication and support strategy to be used for water quality incidents of extended duration, to ensure clarity and consistency of message. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installation of on-line manganese monitoring on raw, filtered and final water • Complete a review of the source water manganese risk. • Carry out a review at all WTW pan-Scotland to identify any mothballed treatment processes
20 August 2021 For 2 months Classification: Significant	Roberton WTW, South Region	36,829	Manganese failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by increased in manganese in the raw water supply from Alemoor reservoir following a period of low rainfall. • The ResMix at Alemoor reservoir (installed in 2017 due to the presence of manganese) was out of service between February and September 2021 as contractors were unable to attend due to Covid restrictions. • No additional monitoring for manganese was being carried out whilst the ResMix was out of service. • Roberton WTW had no manganese removal stage on site. • Recommended conducting a Mains Cleanliness Index assessment of the network to determine the risk of manganese deposits following this incident <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Water was pumped from Acreknowe reservoir to dilute the raw water. • Added routine manganese sampling and installing manganese monitors at the WTW • Completed a review of the source water manganese risk whilst taking account of all learnings

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25 August 2021 For 11 days Classification: Significant	Broadford WTW, North Region	1472	Cryptosporidium detections	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Samples taken from the combined permeate sample point failed microbiological standards on 4 occasions. • A broken seal on one of the membrane stacks was found to be the root cause. • Poor communication and a delay in escalating the primary failure significantly contributed to the duration of the incident. • Appropriate investigative sampling and procedures were undertaken to diagnose and mitigate the incident <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Isolated vessel 4 of the membrane stack and replaced broken O-ring • Emptied, cleaned and replaced the media in the limestone contact tank. • Cleaned the clear water tank to remove any residual Cryptosporidium Oocysts • Added replacement of O-rings and end port adaptor seals to scope of replacement of spiral membranes • Public Health, Scientific Services and Intelligent Control Centre agreed a process and formalised procedure to ensure sample failures are escalated and passed out to the relevant operational teams • Reviewed the "Investigation of Combined Failure in Nano Filtration Plants" TOMS procedure • Reviewed the need to initiate two clear Cryptosporidium samples following a CP failure • Threshold values established for membrane combined permeate failures for escalation by the Lab to PHT and from PHT to Water Operations Regional Managers or Team Managers

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14 September 2021 For >6 hours Classification: Significant	Herricks WTW, East Region	5,755	Disinfection failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Intermittent, erratic dosing had been occurring over the preceding two months, and one of the pumps had been identified as poorly performing. • The site was being run with the one good dosing pump, with the ability to change over to the other pump in the event of a failure. • The automatic plant shutdown was inhibited should the poorly performing pump come into service. • The good pump failed to deliver disinfecting solution due to an airlock, but the treatment works continued to operate due to the automatic shutdown being inhibited. • The works shutdown automatically an hour and 30 minutes later, when the chlorine levels post-disinfection dropped. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Arranged for an investigation into the PID and cause of the erratic chlorine dosing trends • Investigated and confirmed the cause of the telemetry outstation dial out failure and alarm text errors including end to end alarm testing. • Installed and tested flow switches on sodium hypochlorite dosing lines. • Checked and confirmed that the sodium hypochlorite dosing rig has adequate measures in place to minimize generation of trapped oxygen and risk of air locking • Issued a reminder to follow the correct TOMS procedures for removing critical equipment and inhibiting auto shutdowns.
20 September 2021 Intermittent for 2 weeks Classification: Significant	Auchneel WTW, South Region	8,754	Ammonium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • DWQR investigations are still ongoing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Scottish Water investigations are still ongoing.

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24 September 2021 For 12 days Classification: Serious	Carron Valley B, West Region	13	Microbiological failures and restrictions on water use	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Scottish Water proactively installed a boundary box where a new development was being built in an area where there had previously been a fuel spill. • Samples taken failed a number of microbiological and metal standards. • 13 properties were issued boil notices and bottled water whilst investigations continued. • Flushing was carried out and the water main and terminal hydrant were renewed. • There is clear evidence of several different teams within Scottish Water working well together to investigate a complex situation • Recommendation made that Scottish Water assesses it's capacity to inject disinfectant into water mains in a controlled manner under emergency situations <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Surveyed of all assets around the affected properties and Carron Valley reservoir • Carried out an assessment as to whether any rationalisation of the network is required • Carried out mains rehabilitation for the affected assets

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26 September 2021 For <2 hours Classification: Significant	Craighead WTW, East Region	4929	Disinfection failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a power failure to the dosing control panel for the sodium hypochlorite, resulting in the dosing pumps tripping • Two formal samples of the final water supplied to consumers were taken to monitor the impact of the 90 minute cessation of disinfection and both were found to meet water quality standards. • Scottish Water's investigation into the failure of the disinfection flow switches found serious internal corrosion. These switches had been inserted on the sodium hypochlorite dosing lines less than 2 weeks prior to the event to enable a works shutdown facility on low dosed flow. • The response made by Scottish Water staff to the incident was timely and the necessary steps were taken to restore disinfection • Risk control measures to enable auto shut down of the works did not activate and this was to be tested <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced and tested flow switches on sodium hypochlorite dosing lines with ceramic flow switches • Tested station auto-shutdown on low dosed chlorine residual • Undertook an investigation into why the auto-shutdown did not activate • Undertook an investigation into the PLC coding and whether a PLC watchdog auto-shutdown is feasible • Confirmed with manufacturer that the flow switches are suitable for use in sodium hypochlorite dosing systems
15 October 2021 For 2 days Classification: Significant	Daer Camps A, South Region	88, 730	Discolouration (Turbidity, Iron and Manganese failures)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • DWQR investigations are still ongoing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Review network control processes/procedures to ensure flow conditioning is considered where there is flow reversals • Review network control processes/procedures to ensure contingencies are in place for work to overrun

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>24 October 2021</p> <p>For >6 hours</p> <p>Classification: Significant</p>	<p>Glendevon WTW, East Region</p>	<p>147,741</p>	<p>Aluminium and Cryptosporidium failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Elevated Aluminium and one cryptosporidium oocyst was detected on the final water from the WTW. • An alarm was received by the Intelligent Control Centre at 6:50am for high aluminium, but this was not acted upon as no other condition alarms had been raised. • When an operator arrived on site, he swapped the dosing to the standby pump and found that the speed of the duty pump had fallen from 60% to 18% • This led to weaker floc formations passing forward onto the filters and rising turbidity and aluminium in the treated water • A signal control fault was found within the dosing pump. • The High Alarm point on the filter turbidity monitors was found to not be linked to telemetry <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Investigated the cause of polymer dosing pump speed change • Connected individual filter turbidity Hi alarms to telemetry. • Investigated polymer dosing speed default settings and the cause of speed not matching on SCADA. • Arranged for E&M to look at adjusting the flow switch low flow alarm level so that alarm is generated earlier. • Requested ICC to add a 'Do Not Defer' on one poly pump failing. • Reviewed alarm and EAL levels for individual and combined filtered aluminium and turbidity
<p>4 November 2021</p> <p>For 1 week</p> <p>Classification: Serious</p>	<p>Glendevon A RSZ, East Region</p>	<p>90,657</p>	<p>Discolouration (Turbidity, Iron and Manganese failures) following an 18" Burst main and a Faulty Valve</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a burst water main and a faulty valve that both lead to the distribution network draining down • The faulty valve also failed in September 2020. • There was no clear evidence provided that samples were taken from the injection points <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Investigate if the trunk main should be scoped for mains conditioning. • In the event of a large-scale burst, ensure resource to flush network to minimise risk of discolouration throughout the affected area • Faulty ball valve to be repaired or replaced. • Contingency plans to be in place if ball valve fails

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5 November 2021 For 3 days Classification: Significant	Mannofield WTW East Region	343,175	Aluminium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • A high turbidity alarm was generated and upon attendance, the operator found coagulation pH to have risen • Manual adjustments to the pH dose control were made 3 times throughout the day to respond to deteriorating raw water quality. • The operator later noticed that the dosing pump sounded noisy and found this to be air-locked and the batching tank empty. • Swapping to the standby tank did not restore dosing and it was found that a fault had taken place in the control wiring to the dosing system. • In the days prior to the incident, a contractor had been making changes to the dosing system, including software controls for automation of duty/standby changeovers. • Although the work had the necessary approvals it is clear there was not a full appreciation held of the possible consequences of failure modes. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Arranged for further modifications to be made to increase visibility of polymer dosing system status • Reviewed the current operating plan at Mannofield WTW to better control known risks and support the capital works at the site.

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24 November 2021 For 3 weeks Classification: Significant	Papa Stour WTW East Region	14	Trihalomethane (THM) failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Elevated Trihalomethanes (THM's) in the treated water leaving Papa Stour WTW were recorded between 24 November and 15 December 2021. • There was a significant deterioration in the raw water quality due to a prolonged period of adverse weather. • The Inverness filters at Papa Stour did not have the ability to remove the additional organics from the raw water which led to higher levels of organic THM precursors passing onto the disinfection process • The site's emergency action level (EAL) for filtered colour post-GAC was breached for a month before the GAC media was replaced. • investigation found that the Inverness Filter had been performing less effectively since 2019 with GAC Media needing to be replaced more frequently • Despite a temporary filter being in supply, no additional monitoring of the water was carried out during treatment <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced GAC media every 3-4 months whilst a review of the operational management approach for the site is reviewed. • Investigated the possibility for additional colour and turbidity instrumentation on site for both raw water and post-GAC filtered water (pre-disinfection) • Promoted the need for the installation of aeration into CWT B • Investigated the feasibility of relocating raw water sample point from filtered water to raw water storage tank • Undertook a survey of the newly refurbished Inverness Filter

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27 November 2021 5 events within 5 weeks Classification: Serious	Rosebery WTW, South Region	152,733	Cryptosporidium / Disinfection failures	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The Programmable Logic Control (PLC) failed due to being overloaded. • The PLCs were set up in a way that the fail safe command to shut the inlet to the works didn't work. • This resulted in two occasions of untreated water passing through the treatment works and into distribution for a total time of 7.5hrs, with two cryptosporidium failures on the final water. • The time to resolve the first failure was elongated due to Storm Arwen <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Capital investment programme to investigate network upgrades at site to cope with demand • Investigate if the alarm category of the PLC watchdog alarm should be raised from a P2 to ensure it is passed out as a matter of urgency • Coding to be adjusted to ensure WTW inlet valves automatically shut down in the event of a future PLC failure • Report and newsletter included a reference to consider the impact on PLC systems when adding new equipment to existing technology

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1 December 2021 For 4 hours Classification: Significant	Killin WTW, West Region	831	Aluminium failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> DWQR investigations are still ongoing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Changed Killin WTW mimic within the ICC to ensure both process streams are clearly identified. Identified any other sites with dual processes and ensured the mimics within the ICC are clearly labelled to differentiate between them Ensured Emergency Plant Shutdown alarm is configured correctly and working then ensured all relevant shutdown criteria's are included in the alarm Installed a sample point from the combined process streams (DAF/Membrane) at Killin WTW for cryptosporidium sampling Ensured that Killin WTW complies with the water quality monitoring policy Completed a WTW process review to identify any additional risk controls to manage current water quality concerns
22 December 2021 For 3 weeks Classification: Significant	Fair Isle, East Region	65	Manganese failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> DWQR investigations are still ongoing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Scottish Water investigations are still ongoing.