

Seqwater

compliance review report

Prepared by:
Office of the Water Supply regulator
Department of Environment and Resource Management
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Compliance review report

Water Supply (Safety and Reliability) Act 2008

Seqwater

1. Allegation

It is alleged that Seqwater did not comply with the drinking water service provider (provider) monitoring and reporting requirement notice issued under section 630 of the *Water Supply (Safety and Reliability) Act 2008* (the Act) by the Office of the Water Supply Regulator (the regulator), Department of Environment and Resource Management.

2. Possible breaches/offences

Section 630 of the Act states a notice from the regulator can require a provider to do any of the following:

- to carry out monitoring, described in the notice, of the quality of water supplied to or from the providers drinking water service
- to give the regulator reports, at the intervals stated in the notice, about the results of monitoring mentioned above
- to give the regulator other reports about the operation of the drinking water service, including, for example, reports about whether the quality of water being supplied to or from the provider's drinking water service is consistent with the water quality criteria for drinking water.

Section 630 of the Act specifies that a provider must be in compliance of the above unless the provider has a reasonable excuse.

Using its powers under section 630, the regulator issued a notice to all providers requiring from 2 January 2009 until an approved drinking water quality management plan is in place, to:

- monitor for and report on the detection of *Escherichia coli* (*E. coli*) as specified in the Public Health Regulation 2005
- continue with its existing drinking water quality monitoring program(s) for other parameters (where one is in place)
- report any incident that will or is likely to adversely affect drinking water quality, and
- report drinking water quality monitoring results on a quarterly basis.

The alleged breach by Seqwater relates to the requirement to report any incident that will or is likely to adversely affect drinking water quality. An incident is defined¹ as:

- (a) failure to meet a water quality criterion
- (b) detection of a parameter for which there is no guideline value in the Australian Drinking Water Guidelines (ADWG), or
- (c) an event or a series of events likely to affect drinking water quality or cause difficulty in adequately treating drinking water.

¹ As per the definition in the draft 'Water quality and reporting guideline for a drinking water service.' A copy of the guidelines accompanied the notice that was sent to all providers on 28 November 2008.

Specified under Attachment 1 of the notice an incident includes fluoride, where the fluoride level is greater than 1.5 mg/L.² If above this level, the provider must report to the regulator:

1. by telephone within three hours of receipt of the test result
2. by written confirmation by fax or email within 24 hours (incident reporting form part A)
3. by written confirmation by fax or email upon resolution of the incident (incident reporting form part B).

Additionally, as previously mentioned, incident reporting also includes an event. Examples of events to be reported are included under Attachment 1 of the notice such as equipment failure and contamination of treated water. In such an event, the provider is required to:

1. report by telephone as soon as practicable after becoming aware that the situation has escalated to the level where usual mitigation actions will not control the situation and the ability to provide safe drinking water is compromised
2. written confirmation by fax or email within 24 hours or as soon as practicable
3. written confirmation by fax or email upon resolution of the incident.

3. Other legislation related to this incident

- *Public Health Act 2005*
- *Public Health Regulation 2005*
- *Water Fluoridation Act 2008*
- *Water Fluoridation Regulation 2008*

The Act complements the *Public Health Act 2005*, *Public Health Regulation 2005*, *Water Fluoridation Act 2008* and *Water Fluoridation Regulation 2008*, which specify the water quality standard and monitoring and reporting requirements for fluoride, where fluoride is added to a water supply.

4. Details of the incident

Relevant background

The North Pine Water Treatment Plant is one of number of major water treatment facilities being upgraded as part of the fluoride rollout across the State. The fluoride dosing facility at North Pine Water Treatment Plant was completed in December 2008. The fluoride dosing facility is covered under the defects liability period.³

The fluoride dosing facility has been designed to introduce a solution of sodium fluorosilicate into the treated water, post the treated water pump station, therefore as the final water product water leaving the North Pine Water Treatment Plant. Sodium fluorosilicate is purchased as a dry powder and made into a solution with water in batches at the North Pine Water Treatment Plant. The solution is then dosed into the treated water using an automated process based on the output of two flow meters.

There are a number of control mechanisms that are integrated into the fluoride dosing facility: a flow meter to control the fluoride dosing, an online analyser to continuously measure the fluoride concentration in the water, and a flow indicator switch that disables the fluoride dosing (when there

² The fluoride concentration may be in the treatment component, reticulation system transmission component or in the raw or source water and the parameter can not be reduced or removed.

³ It includes the flow switch but not the flow meter owned by LinkWater.

is no flow of treated water). The online analyser automatically shuts down and triggers an alarm at a fluoride concentration of 1.2 mg/L, prior to reaching 1.5 mg/L.

Incident summary

This summary is based on the information available to date.

The North Pine Water Treatment Plant was shut down for scheduled maintenance for the period from 27 to 30 April 2009. The fluoride dosing system remained active for a part of this time, however was not dosing immediately following the North Pine Water Treatment Plant shut down. On 28 April 2009 the fluoride dosing facility intermittently commenced injecting fluoride solution into the treated water main. This intermittent dosing occurred for an estimated total of two hours depositing approximately 12,900 litres of fluoride solution into the main over a five hour period. The fluoride dispersed along the main reaching a LinkWater sample point. A sample was collected by LinkWater on 29 April 2009 and sent to the Moreton Bay Regional Council laboratory for testing. LinkWater was notified by the Moreton Bay Regional Council laboratory of a high fluoride result of 31.2 mg/L on 12 May 2009. LinkWater verbally notified Seqwater of this result on that same day. Seqwater undertook initial investigations to assess the veracity of the result given that the North Pine Water Treatment Plant was offline at the time the sample was taken. Seqwater notified SEQ Water Grid Manager and Queensland Health, who then notified the regulator of the high fluoride level result on 13 May 2009.

How the information was received

Time/date incident occurred:	19:38 on 28 April to 00:36 29 April 2009 over-fluoridation occurred.
Location of incident:	Fluoride dosing facility at the LinkWater main leaving the pump station at the North Pine Water Treatment Plant.
Reporting process:	Seqwater to Queensland Health on 13 May 2009. Queensland Health to the regulator on 13 May 2009.
When it was reported:	18:00 on 13 May 2009.
Format:	By telephone initially. Incident reporting form part A from Seqwater was received on 21 May 2009.

Timeline of the incident

Based on information available, the table below has been compiled for the purposes of undertaking the compliance review by the regulator to illustrate the sequence of activities which led to the incident.

Date	Time	Sequence of activities/actions
Several days prior to 24 April 09	12:32	Flow switch operating erratically. Switches on when treated water pumps at North Pine Water Treatment Plant start and switches off when treated water pumps stop. However it often switches on-off erratically up to over hundred times while the treated water pumps are either pumping (i.e. water flow) or not pumping (i.e. no water flow).
24 April 09	12:32	Due to the abnormal 'on-off' operation of the fluoride dosing facility, the fluoride dosing flow switch is taken out of the fluoride dosing facility control loop. This had the effect that, from that time until the flow switch was repaired, the flow switch could not operate to stop the fluoride dosing facility from dosing.
27 April 09	13:14	The North Pine Water Treatment Plant shut down as part of scheduled maintenance.
27 April 09	23:20	The treated water pump at North Pine Water Treatment Plant switched off.
28 April 09 29 April 09	19:38 to 00:36	Fluoride dosing pumps operate intermittently for an estimated total of two hours over a five hour period due to incorrect flow readings by LinkWater's flow meter. The system deposited approximately 12,900 litres of solution into the main over this period.
29 April 09	00:36	Online fluoride analyser records 3 mg/L of fluoride (the analyser's maximum recordable value) and the fluoride dosing is automatically shut down.
29 April 09	04:47 to 08:40	Online fluoride analyser starts recording a sustained period of fluoride levels of greater than 1.5 mg/L (records show 3 mg/L, maximum recordable value by the analyser).
29 April 09	8:00	LinkWater sample taken near Byrnes Road pump station and sent to the Moreton Bay Regional Council laboratory.
29 April 09	10:42	Fluoride dosing flow switch is repaired, but not calibrated as the North Pine Water Treatment Plant was shut down.
30 April 09	7.48	First backwash draws 400 kL from Aspley main pipeline back into the plant.
30 April 09	8:45	Second backwash draws 4 00kL from Aspley main pipeline back into the plant.
30 April 09	10:27	North Pine Water Treatment Plant commenced producing water into the treated water storages, but there was no delivery of water from the treated water cells until 1 May.
30 April 09	Afternoon	As part of the startup process, information is gathered from the Supervisory Control and Data Acquisition (SCADA) system for the period when the North Pine Water Treatment Plant was shut down.
30 April 09	14:13	Based on the trends obtained from the SCADA system, there was a recording from the flow meter that the North Pine Water Treatment Plant had pumped 50 megalitres of treated water overnight when the plant was shut down.
30 April 09	After 14:13	SCADA trends are reviewed to assess whether the fluoride dosing facility had commenced dosing for the period in which the 50 megalitres was recorded. Flow record for 30 April from 03:00 to 07:30 showed no fluoride had been dosed.
30 April 09	17:38	Fluoride dosing facility isolated and Seqwater disables the fluoride dosing system due to a flow meter fault.
1 May 09	20:32	Treated water pumps at North Pine Water Treatment Plant first commenced pumping and delivering water.
2 May 09	-	North Pine Water Treatment Plant back to full operation.
12 May 09	13:28	Fluoride result (Moreton Bay Regional Council laboratory) indicated fluoride

Date	Time	Sequence of activities/actions
		concentration of 31.2 mg/L and was notified to LinkWater.
12 May 09	14:46	LinkWater notifies Seqwater of high fluoride result.
12 May 09		Seqwater initiated an investigation to determine if such a result could be possible since the water treatment plant was offline at the time of the sample.
13 May 09	16:00	Seqwater declares the incident internally and advises the SEQ Water Grid Manager and Queensland Health of high fluoride result.
13 May 09	16:41	Queensland Health notifies the regulator.
13 May 09	17:00	Grid participants advised of a level 2 incident via email.
13 May 09	17:20	Queensland Health confirms notification and takes lead communication role.
13 May 09	18:00	Seqwater verbally notifies the regulator.
13 May 09	18:31	Minister for Natural Resources, Mines and Energy notified of incident by the regulator via the Director-General.
13 May 09	18:40	SEQ Water Grid Manager sends an email about the incident to LinkWater which was CC'd to the regulator, Deputy Director-General (Water & Catchment Division) and the Minister for Natural Resources, Mines and Energy.
13 May 09	20:00	SEQ Water Grid Manager notifies Brisbane City Council Water Distribution and the Moreton Bay Regional Council.
13 May 09	22:46	Seqwater receives SEQ Water Grid Manager Situation report 1: Fluoride incident. SEQ Water Grid Manager advised Seqwater that the incident has now been classified as a Level 3.
14 May 09	19.24	The regulator receives Part A of the incident report from LinkWater.
14 May 09	-	Duplicate water sample analysed by ALS Laboratory indicating fluoride concentration of 19.6 mg/L.
15 May 09	-	Retest of sample by the Moreton Bay Regional Council laboratory indicates 17 mg/L of fluoride.
21 May 09	-	The regulator receives Part A of the incident report from Seqwater.

5. Outcome of the incident

The incident could have posed a risk to public health. It was initially assessed that the over-fluoridated water entered the distribution system, potentially affecting up to 4,000 homes in the Warner and Brendale suburbs. Investigations and modeling have shown that it is most likely that the over-fluoridated water would have been drawn back into the filters at the North Pine Water Treatment Plant. Therefore little, if any, of the over-fluoridated water would have been left in the supply main. There is a possibility that some of the water could have been drawn into the Byrnes Road offtake and the service pipe reticulation systems that supply to residents in approximately 400 homes in Joyner, the YMCA camp Warrawee, four on-site houses and internal plant.

It is noted that if the back-wash did not operate, the incident would have led to a more widespread risk to public health, potentially affecting approximately 4,000 homes with over-fluoridated water. This incident has generated community interest in the potential health impacts of over-fluoridation and the ability of service providers to supply fluoridated drinking water in South East Queensland.

6. Details of the compliance review

The regulator, in undertaking this compliance review, considered three separate but interrelated issues:

- (a) implications of disabling the fluoride dosing facility flow switch on 24 April 2009
- (b) response to the fluoride dosing facility online analyser records of 3mg/L and sustained recording of 3 mg/L on 29 April 2009, and the records⁴ kept on the activity of the fluoride dosing facility for the previous 24 hour period
- (c) responsiveness to the receipt of information from LinkWater on 12 May 2009.

The compliance review focuses specifically on whether Seqwater met its obligations under the notice issued by the regulator which required a provider to report any incident that will or is likely to adversely affect drinking water quality for (a), (b) and (c) above. In particular, did Seqwater:

1. report the information provided by LinkWater which indicated the high levels of fluoride by telephone to the regulator as per the timeframes set in the notice?
2. provide written confirmation of the incident relating to the high levels of fluoride by fax or email to the regulator as per the timeframes set in the notice (i.e. submit incident reporting form part A)?
3. consider the fluoride levels above 1.5mg/L by the online fluoride analyser as a reportable incident?
4. assess whether the removal of the flow switch and ultimately the fluoride dosing system due to an erratic flow meter would have affected drinking water quality or its ability to treat or provide drinking water, and therefore report it as an event (one type of incident)?

Seqwater has put forward the following information as 'mitigating circumstances' which led to the decisions made for the period from 27 to 30 April 2009 and from 12 to 13 May 2009.

7. Mitigating circumstances

Seqwater has advised that it did not consider the triggering of any online fluoride analyser to constitute an incident on the basis that:

- online analysers are used for operational monitoring and control and not for regulatory compliance purposes.
- the online fluoride analyser is set specifically to shut down the fluoride dosing plant at 1.2 mg/L, which is less than the maximum allowable concentration of 1.5 mg/L.

Seqwater has advised that it did not report the erratic flow meter reading as an event on the basis that:

- it had previously disabled the fluoride dosing facility prior to the North Pine Water Treatment Plant being brought back online.
- the operator had assessed the possibility of the fluoride dosing facility overdosing on 30 April 2009 as a result of the faulty flow meter. However, an examination of the potential for overdosing from 27 to 29 April 2009 was not undertaken.

Seqwater has indicated that it did not:

- take the water sample that showed a high level of fluoride that indicated over-fluoridation occurred (31.2 mg/L).

⁴ Kept on a daily basis when fluoride is added to the water. It is only a record of activity required by the Water Fluoridation Code of Practice (Form 4A).

- take any daily fluoride monitoring grab samples during the period from 27 to 30 April 2009 as the North Pine Water Treatment Plant and fluoride dosing facility were not operational.
- fully appreciate the various pieces of information available at the time which if considered and communicated in a timely manner would have shown that an issue existed and would have allowed for mitigation/contingency measures to be taken.

Seqwater advised that it did:

- instigate an investigation into the incident on the afternoon of 12 May 2009 upon receipt of verbal advice from LinkWater about the sample result. Through its internal investigation determined that while the North Pine Water Treatment Plant was not operating that the fluoride dosing facility had dosed fluoride into the LinkWater main, at which point declared it a Level 2 incident and notified the SEQ Water Grid Manager and Queensland Health, who then notified the regulator.
- instruct staff that if a water treatment plant is offline, the fluoride dosing facility should be physically disabled so that fluoride cannot be dosed inadvertently.

8. Outcome of review

Having viewed the chronology of activities that occurred between 24 April and 13 May 2009, it is apparent that the disabling of the fluoride dosing facility flow switch and faulty flow meter contributed to the intermittent injection of fluoride into the main when there was no water pumping through it.

The fact that the flow meter had been registering incorrect flows previously influenced the operational staff's perception of the information and this, together with the fact that the flow switch had been disabled (which was not communicated internally to staff at North Pine Water Treatment Plant), had limited the initial assessment of the situation. Similarly, a record was made of the activity of the fluoride dosing facility for the previous 24 hour period. This record, which indicated some activity of the facility should have been queried by the operational staff as the North Pine Water Treatment Plant was offline.

The presence of any fluoride in the final water supply was also not considered plausible by Seqwater as the North Pine Water Treatment Plant was offline. This influenced the assessment of the online analyser records which alluded to the emerging situation on 29 April 2009. Regardless of whether the online analyser was used for operational or regulatory purposes, the fact that the water passing through the fluoride dosing facility was final water leaving the North Pine Water Treatment Plant meant care should have been taken to investigate the records closely to determine if the ability of Seqwater to provide drinking water was affected.

Collectively, the disabling of the flow switch, erroneous flow meter, the limited assessment of the online analyser records and dosing facility records and the lack of internal communication across the responsible operational areas contributed to the over-fluoridation on 29 April 2009. It is the responsibility of the provider to ensure that all risks are considered in the supply of drinking water.

It was initially thought by Seqwater that the high fluoride result of 31.2 mg/L was potentially a 'spurious' record due to the fact that the North Pine Water Treatment Plant was offline, the sample was not taken by Seqwater originally, and that no daily grab samples were taken, as there was no fluoridated water passing through the North Pine Water Treatment Plant post 30 April 2009. These factors all contributed to Seqwater's assessment of the situation and hence affected the immediate notification of the situation to the regulator. However, once Seqwater determined there was an issue, it declared it a Level 2 incident and undertook the necessary steps including informing the

regulator verbally. Seqwater was also of the belief that the information it provided for the independent investigator was being translated to the regulator's office.

On current knowledge of the situation, the regulator has concluded the outcomes of the review to be:

1. Seqwater breached the monitoring and reporting notice. That is, Seqwater did not provide the regulator written confirmation (incident reporting form part A) of the incident by fax or email within the required 24 hour timeframe.
2. With respect to the fluoride flow switch, erratic flow meter reading, online analyser records, and records⁵ kept on the activity of the fluoride dosing facility, Seqwater indicated that 'different people had some but not all the information and each had different parts of the overall picture on 30 April 2009'. However, it is the regulator's view that Seqwater should have undertaken a more rigorous assessment of the situation to determine conclusively if the series of activities would have affected drinking water quality or its ability to treat or provide drinking water. This review would have been facilitated if appropriate systems and controls were in place to rapidly "escalate" this information to Seqwater's senior management.

Given the potential public health risk that this incident could have posed, and the desire to mitigate any future incidents of this nature occurring, it is recommended some formal action be taken. Formal action will indicate to Seqwater the seriousness of non-compliance with the notice.

A range of formal actions are available to the regulator including:

- a warning letter from the regulator outlining the alleged offence, reminding Seqwater of its responsibilities for drinking water quality management, and the list of remedial actions it will be required to implement
- a formal warning notice given to Seqwater (non-regulatory notice)
- prosecution action (up to 500 penalty units).

Prosecution action is not recommended at this stage. However, formal warning notice is appropriate given the multiple compliance issues that have occurred. If further breaches occur, serious consideration will be given to taking prosecution action.

RECOMMENDED ACTIONS BASED ON REVIEW OUTCOMES

The regulator will issue a formal warning to Seqwater. It will also include a series of actions to be undertaken by Seqwater to mitigate the future occurrence of such incidents, and reporting requirements of the regulator.

The regulator has provided Seqwater with the opportunity to put forward actions it has taken and will take to prevent a similar incident from occurring in the future. These actions are detailed below.

For each of the listed actions below, a project plan including monthly milestones must be submitted to the regulator for approval by 31 July 2009. Seqwater must report on the progress of the below actions via email on a monthly basis to the regulator until all of the actions are complete.

The regulator may set additional requirements on Seqwater if the actions below are not achieved by the nominated completion dates, or monthly milestones are not achieved.

⁵ Kept on a daily basis when fluoride is added to the water. It is only a record of activity required by the Water Fluoridation Code of Practice(Form 4A).

Equipment failure:

1. Ensure that the erratic performance in future cannot initiate dosing and that a system alarm is incorporated. Specific actions to achieve this outcome are:

- Review and revise the procedures for:
 - re-starting the water treatment plant after shut down (commence review by 1 July 2009, revise procedure by 31 August 2009). Train operational staff and implement this procedure (by 30 September 2009)
 - responding to alarms, particularly when the SCADA system is monitored remotely at Mt Crosby down (commence review by 1 July 2009, revise procedure by 31 August 2009). Train operational staff and implement this procedure (by 30 September 2009)
 - ensuring fluoride dosing facilities are isolated during any water treatment plant shut down (by 30 September 2009). Instruction to ensure fluoride dosing facilities are isolated during shut down has been issued.

As the plant will not be back online until 30 September 2009, all of these actions will be in place prior to this date.

2. Urgent maintenance of flow meter to reinstate accurate performance. Specific actions to achieve this outcome are:

- Seqwater and LinkWater to collaborate to replace the faulty flow meter (has commenced, and to be completed by 30 September 2009).
- improved communication protocols between Seqwater and LinkWater and responsibility on any shared infrastructure (commence review immediately, and to be completed by 31 December 2009).

Control system interlocks not functioning:

1. Control system should be modified to ensure compliance with the Water Fluoridation Regulation in respect of interlocks that ensure that the dosing plant cannot operate with disabled or non-functioning flow meters. Specific actions to achieve this outcome are:

- Review and revise hazard assessments and procedures. This should address amendments to emergency response plans and SCADA alarms and procedures relevant to water fluoridation processes:
 - revise priority documentation (control systems, operational manuals etc) to ensure the design plans and procedures use consistent nomenclature and reflect all additions and modifications made to the system (commence by 1 July 2009, priority documentation to be completed by 31 December 2009, and asset identification and standard nomenclature by 31 December 2009)
 - develop a process to ensure plans and procedures are revised periodically or as modifications occur (by 30 September 2009).
- Improve control system interlocks between the flow meter and flow switch of the fluoride dosing facility (commenced, and to be completed by 30 September 2009).

Control system interlocks not functioning (continued):

2. An additional interlock between treated water pump status and the fluoride dosing system should be incorporated. Specific actions to achieve this outcome are:

- Interlock the control systems for the treated water pumps and fluoride dosing facility (commenced, and to be completed by 30 September 2009).

System operating procedures inadequate or not adhered to:

1. System operating procedures should be thoroughly reviewed and re-structured if necessary to incorporate the fluoride dosing system and its operation. This review must incorporate a review of all procedures. Specific actions to achieve this outcome are:

- Include in Seqwater's Integrated Management System (IMS) routine internal audits of fluoride dosing procedures in consultation with the regulator (by 30 September 2009). This will contribute to Seqwater's third party accreditation of its IMS. First round of audits to be undertaken (by 31 December 2009).

2. Operations and maintenance staff should be instructed in the revised procedures AND

3. Provide supplementary operator training and instruction on the installed fluoride dosing equipment, its control philosophy and the importance of alarm response procedures. Specific actions to achieve this outcome are:

- Seqwater will enforce operator training with respect to fluoridation of drinking water and protocols and processes for managing chemicals including fluoride used for drinking water treatment (commence immediately).
- Undertake further intensive training and monitoring to improve the understanding of the control and operation of the fluoridation process. This should include improved documentation of the fluoridation plant operation (commence immediately, and to be completed by 31 December 2009).

Regulatory requirements not adhered to:

1. Operations staff should be instructed on the requirements of the legislation in respect of the dosing of fluoride and other treatment plant operations. Specific actions to achieve this outcome are:

- Training of staff on the obligations and responsibilities relating to drinking water quality management under the *Water Supply (Safety and Responsibility) Act 2008* (commence immediately, and completed by 31 December 2009).

2. Procedures should be instituted to ensure that clear reporting lines are established internally to the operations group. Specific actions to achieve this outcome are:

- Develop communication procedures including:
 - between operational staff and those responsible for reviewing water quality monitoring results (by 31 December 2009)
 - operator, supervisor and managerial levels of communication with LinkWater, specifically in relation to shared assets and responses to real or potential water quality issues (by 31 December 2009).

Failure to identify water flow direction:

1. Institute procedures to ensure thoroughness of data analysis for problem identification. Specific actions to achieve this outcome are:

- Review record keeping practices and train staff directly involved with fluoridation record keeping (by 31 December 2009).

Fluoride dosing system design:

1. A design review should be undertaken to specifically investigate if an alternative, less risk prone, dosing point can be identified. Specific actions to achieve this outcome are:

- Investigate a new fluoride dosing location and dedicated flow meter located within Seqwater's assets in the North Pine Water Treatment Plant to ensure each entity has control of its assets it needs to meet its accountabilities for water quality (commence by 1 July 2009, and to be completed by 31 December 2009).