Cherbourg's Journey to being funded

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Abstract

The councils water treatment plant had received upgrades in 2020 funded through an indigenous water infrastructure funding provided by the state government to address water quality issues. The plant previously had sodium hypochlorite dosing for disinfection and Alum for coagulation in the upgrade these were changed to chlorine gas and an ACH blend. After the upgrades council continued to have water quality issues. With a new management team in place, council embarked on the journey to fix the water quality issues. Between 2022 and 2024 there was many reported incidents due to water quality issues and plant failures. Constant boil water alerts were issued the longest lasting 18 months. Low chlorine levels were the major factor in the water quality issues. Faults were identified throughout every process of treatment causing algae and dissolved organic break through which led low chlorine retention. Council worked with the Strategic Water Initiatives team in RDMW to assist in applying for funding through the national water grid fund through the federal government. Funding was granted after a 3 year process of identifying faults and working with an underperforming plant.

Introduction

Cherbourg aboriginal shire council is located in south east Queensland. The council is a unique situation where the whole shire is owned by council including all the housing. There are 340 houses within community with around 1500 residents. The council is the landlord for the housing and do not charge utility rates so it is fully reliant on government funding for operations and any upgrades to infrastructure. Council had been struggling with water quality concerns for a number of years and community had lost faith in councils ability to deliver safe and healthy drinking water.

2020 Water treatment plant upgrades

In 2020 council received funding through ICCIP funding program, all indigenous councils were given this funding to upgrade their water and waste water infrastructure. With this funding the water treatment plant was given a facelift upgrade. The water treatment plant had extensive work done to the buildings and made WHS compliant. The coagulant and dosing system was changed from Alum to a poly blend, Sodium hypo was changed to Chlorine gas, River pumps intake point and pumps upgraded from a pontoon to a well setup, 2x 2ML reservoirs replaced, Electrical switch boards replaced and integration of SCADA, Carbon filter beds replaced PAC, Sand filter media replaced and the Backwash pumps replaced.

August 2022

In 2022 the council saw the upgrades to the water treatment plant completed in February. The water and sewerage department also saw some changes with new senior management being appointed as well as a new water and sewerage manager. The council was under investigation from the water regulator due to a previous water events where town ran out of water. There were many other problems that management faced in the first couple of months of taking over such as the DWQMP was out of date by 2 years. RDMW gave council 2 months to update the plan, the investigation was also finalized and council was fined for non compliances. There were an increase of the number of incidents and quality incidents as they were now being reported to the regulator. The table below shows some of the incidents. They all revolved around Ecoli detections, High turbidity and low chlorine levels.

Drinking Water Incident	INV	Start Date	End date	Description	Advisory	Time advisory in place
DWI-146-16-08233	INV110010	17/12/2019	19/08/2021	Low chlorine levels in the water supply.	Boil water alert	17/12/2019 – 30/07/2020
DWI-146-20-08717	INV122874	30/11/2020	19/08/2021	Elevated turbidity throughout the system believed to be due to recent system upgrades.	Boil water alert	30/11/2020 – 17/06/2021
DWI-146-21-09360	INV138706	17/12/2021	20/12/2021	E.coli detected at Bert Button Reservoir believed to be due to contamination of sample tap.	Boil water alert	17/12/2021- 20/12/2021
DWI-146-22-09410	INV139082	7/01/2022	23/11/2022	E.coli detected at Bert Button reservoir. Free chlorine low.	Boil water alert	07/01/2023 - 14/06/2022
DWI-146-22-09914	INV151961	28/10/2022	23/11/2022	E.coli detected in reservoir believed to be due to the ingress of frogs or other things.	Boil water alert	28/10/2022 – 22/11/2022

2023

With the current water team comprising of 2 employees more staff was needed for the increasing problems. 2023 saw a new trainee start bringing water team up to 3 staff. The water plant warranty period ended in February and the full handover was completed. Water quality incidents increased still around the same issues of high turbidity and low chlorine. One notable incident was when a lightening strike struck one of the cast iron pipes causing a power surge and blowing up on one of the PLC cards. A new PLC card could not be sought due to it being obsolete and was not manufactured anymore a 2nd hand card with a lower amount of inputs was found and installed meaning the plant had 3 inputs that could not be seen on SCADA. The water team had to learn how the new plant worked with SCADA something the plant had not had before. Maintenance schedules and SOPs had to be developed were not part of the plant upgrade. Internal investigations started on the low chlorine issues. A boil water alerts was still in place form the previous year. During 2023 Cherbourg was selected to be apart of the QAO audit on water security in Queensland the audit findings were submitted to parliament which showed very damming evidence that Cherbourg's water quality was lacking.

DWI-146-22-09980	INV153975	02/12/2022	07/06/2023	E.coli detected at Bert Button reservoir. Free chlorine low.	Boil water alert	18/05/20233
DWI-146-23-10113	INV155369	10/01/2023	7/06/2023	Low chlorine in reservoir suspected to be a malfunction of chlorine dosing system	Boil water alert	10/01/2023 - 18/05/2023
DWI-146-23-10161	INV156564	09/02/2023	07/06/2023	Elevated turbidity throughout the system	Boil water alert	09/02/2023 – 18/05/2023
DWI-146-22-09630	INV145174	10/06/2023	07/06/2023	Phytoplankton detected within the system and low chorine throughout system	Boil water alert	Boil water alert in place at the time.
DWI-146-23-10577	INV168833	9/11/2023	Open	E.coli detection at Bert Button Reservoir believed to be due to contamination of reservoir. Low chlorine levels also observed.	Boil water alert	09/11/2023 - ongoing
DWI-146-23-10583	INV169010	14/11/2023	Open	High turbidity and low chlorine throughout the reticulation system	Boil water alert	14/11/2023 – ongoing

2024

In 2024 the council made some significant breakthroughs in moving towards better water quality. The boil water alerts continued. The council became apart of the Urban water risk assessment report being done by ARUP. ARUP visited site with engineers to assess plant and water quality concerns, out of this Veolia were engaged as part of the project to work on site with operators to look at the plant process's. Cherbourg also took part in the Water connections tour. Members of the tour included state and federal government employees from various departments in the water space. The tour met with operators and councilors to discuss water quality issues. After this the Strategic Urban Water Funding | Strategic Water Initiatives team in RDMW were engaged to assist in applying for funding. IPS was engaged as engineers to assess the plant for the application they used the findings that came out of ARUP and Veolia's reports as well as their own to produce the report. In September an application was submitted for $25.5 million. Funding was granted through the national water grid funding and was a 50/50 split with state government. Boil water alert was still in place and manual dosing of reservoirs started to increase chlorine levels.

2025

Although council had the funding approved they were still struggling with the water treatment plant and network. Manual dosing was still in place, dosing ever day. The boil water alert was lifted as long as manual dosing continued. Two reservoirs that serve houses above the main reservoirs failed and temporary poly tanks had to be installed. DSDILGP department started working with council to deliver the funded projects. Council was due to have its DWQMP audit and was conducted, numerous critical non compliances were found due to infrastructure faults in water quality

Investigation

The problems that council faced was Low chlorine levels and Ecoli detections. An investigation into each stage of the treatment process was conducted and the findings and some solutions were as follows.

Clarifier

- Identified that floc was being carried over to media filter
- Started weekly jar testing
- Increased algae growth within clarifier
- Monthly cleaning scheduled implemented full drain down and clean
- Chemical supplier change
- DeSludge automatically turns on every time plant turns on meaning sludge blanket lost every day

Filters

- Media loss through backwashing
- Large amounts of algae growth
- Implemented cleaning schedule and procedures
- Turned backwash rates down (increased levels of filter breakthrough turned backwash pressures back up)
- Sand measurements taken found 100mm out of 600mm of top layer missing
- Carbon filter media decreasing
- Found large amounts of carbon in reservoirs
- Carbon being backwashed with chlorinated water causing breakdown
- Carbon media replaced (problem increased as different type of carbon media was installed)
- After backwash the water is released straight to res no ripening period meaning turbid water can go to res's
- BGA breakthrough into res's

Disinfection

- Chlorine dosing system on max dosage at 500 grams per hour
- Changed flow rates
- Lowered flow rates down to 15l/s however town used more water then plant could make
- Chlorine system had adjustability at low flow rates

- Flow rate turned back up to 23l/s
- Chlorine analyzers turned onto simulation due to plant continually tripped for high chlorine level in treated water at analyzer
- Chlorine dosing set at 5ppm after dosing level went down to 3.5ppm in reservoir 0.5
- Chlorine levels in town down to 0.2

Distribution

- Town trunk main is the original cast iron suppling the town for 60+ years contributing to the chlorine breakdown.

Conclusion

- Faults in clarifier
- Faults in filtration
- Faults in disinfection
- End of life infrastructure revamped but still not functioning correctly
- Aging pipe work to town causing chlorine depletion before getting to residents

Funding

The funding council received was split into 3 project. 1) Replacement of 2.3km of cast iron water main, 2) replacement of the 2 reservoirs above the water treatment plant and the optimization of the water treatment plant.

Outcomes and Learnings

ICCIP funding was given to upgrade the infrastructure however a set amount was given not what was actually needed. Due to the plant being upgraded everyone thought that the water quality should have been good and put the issues down to operator errors. No investigation work was performed and detailed planning done on what would work best for the current raw water quality. A complete system overhaul from catchment to tap needed to have been done in the original planning. The current funding application was only submitted after extensive engineering reports were completed to support the needs for the funding. The boil water alert was in place for 2 years in total. Council found the evidence gathering started with the reporting of the incidents to build a detailed picture of what was actually happening. With council being fully reliant on state and federal government funding for its operational budget and any infrastructure upgrades, they were unable to engage the necessary team of process engineers, electrical engineers and all the other staff that were involved in the report that led to the funding. This highlights a greater need for funding to be made available for the investigation to be completed before applying for the actual infrastructure upgrade to ensure that the funding is spent in the right way and the infrastructure is fit for purpose for the next 25 to 50 years of its life.