

Sewer network remediation and works program

for Terrigal and the coastal lagoon catchments

July 2020



Background

Recreational water quality is monitored by Central Coast Council (Council) across the Central Coast's 32 swimming sites as part of the Beachwatch Program that is run in partnership with the NSW Government. The results are used to inform the annual NSW State of the Beaches Report. The Beachwatch program uses long-term microbial water quality trends to highlight areas of concern, which may trigger further investigation.

Terrigal Beach received a "Poor" rating in the annual NSW State of the Beaches Report for the 2011-18 summer bathing periods. The coastal lagoons often receive a "Poor" rating, as the impacts of rainfall are more pronounced for lagoon than beach sites due to reduced dilution and flushing of pollution inputs. Sampling conducted for the Beachwatch Program is not comprehensive enough to determine the source or scale of the factors affecting water quality at recreation sites with suboptimal risk gradings, which is why Council initiated the Terrigal and coastal lagoons audit.

The Terrigal and coastal lagoons audit is a comprehensive water quality improvement program to address pollution risks for recreational swim safety and ecological health. The audit commenced in January 2019 and is being undertaken in partnership between Central Coast Council and the NSW Government's Department of Planning, Industry and Environment (DPIE).

The Audit investigates water quality at several sites on the Central Coast, including Terrigal Beach, Terrigal Haven, and Terrigal, Wamberal, Avoca, and Cockrone Lagoons. A team of scientists from Council, the DPIE and the University of Technology Sydney (UTS) are working collaboratively with technical experts and operational staff from Council to assess the possible sources of pollution in each catchment and determine the impacts on short- and longer-term recreational

water quality, as well as prioritise public and private sewer network upgrades.

The following three phase approach has been developed to determine contamination sources and improve water quality:

Phase 1: Initial investigation to understand the process of microbial contamination, and its influence on swim safety, which includes water quality investigations.

Phase 2: Major catchment investigation to identify microbial contamination hotspots, prioritise funding, and locate faults in public and private sewer infrastructure. This work includes both water quality and infrastructure investigations.

Phase 3: Undertake sewer infrastructure improvement works and long-term water quality monitoring to assess how water quality responds over time following remediation works.

The audit identified that the water quality of Terrigal Beach, the Haven and the lagoons is generally suitable for swimming in dry weather conditions, however, after rain, levels of microbial indicators of faecal contamination in swimming waters increase (Central Coast Council, 2020; Seymour et al. 2019, 2020).

Council, DPIE and UTS studies undertaken as part of the audit identified a major source of the contamination found in stormwater outlets during rainfall was sewage (Seymour et al. 2019, 2020).

In response, major investigations of public and private infrastructure have, and continue to be undertaken, to identify hotspot areas of contamination.

This report provides an update on the sewerage remediation progress and works program in direct response to the water quality investigations, addressing the pollution risks to swim safety and ecological health.



Photo 1: Wet weather sampling day for staff from Central Coast Council and the NSW Government's Department of Planning, Industry and Environment.

Sewer infrastructure investigations

Council has an ongoing sewer network inspection and repair program across the Local Government Area. The Audit has brought more focus to Terrigal and the coastal lagoons in the key areas of: sewer pump station monitoring, CCTV inspections assessing infrastructure for cracks or displacements, our 'Reveal and Seal' program that inspects maintenance holes for tree root intrusion or other issues, and smoke and dye testing of pipe connectivity throughout the catchments.

What's the problem?

In response to the audit, sewer network investigations have found that contamination may occur due to multiple causes, including:

- old or damaged sewer pipes that leak - these can be either private or public assets
- blockages causing overflows due to incorrect disposal of materials (sanitary items, wet wipes, tissues, paper towel and rubbish) as well as other factors such as poorly maintained grease traps from restaurants, tree root intrusion and sediment or debris
- sewer network and private system overflows caused by:
 - illegal connections from private buildings with stormwater connected to sewer or sewer connected to stormwater
 - blackouts affecting private and Council pump stations
 - infiltration of groundwater and rainwater into sewer pipes
 - infiltration of rainwater into broken or damaged manholes
- other: investigations may detect other potential pollution pathways as the program continues.

What's the solution?

Council has a number of actions they may undertake to rectify issues in the sewer network.

- **Cleaning and relining pipes:** Pressure cleaning the sewer network can remove tree root intrusion and allows pipes to be relined. Old or damaged sewer pipes can be relined to renew them and extend the life of the asset by up to 50 years.
- **Resealing and raising maintenance holes:** Maintenance holes are resealed or rebuilt to fix holes and gaps, and/or raised to reduce infiltration from pooling water in wet weather.
- **Dig and replace:** Where pipes have collapsed or cannot be relined, the pipe is dug up and replaced with a new pipe.
- **Sewer pump station upgrades:** Sewer pump stations are currently being investigated as a part of the audit. Where equipment is under-performing appropriate remediation or upgrades may be undertaken to ensure that the likelihood of overflows is minimised during heavy rain.
- **Rectifying illegal connections:** Where structural or

other issues are identified in private infrastructure, Council will work with property owners to rectify issues identified on private land through Council's existing compliance processes. In the interest of privacy, these will not be reported by location.

- **Community awareness programs:** The "3 P's" awareness program and grease trap monitoring program are educating residents and business owners to positively contribute towards improved water quality by preventing overflows.
- **Other:** If other potential pollution pathways are detected as the program continues, additional remediation methods may be required.

As issues and faults are identified, infrastructure is scheduled for repair with timing based on priority of the problem and the risk of water quality impacts.



Photo 2: CCTV inspection camera



Photo 3: Pipe relining process



Photo 4: Root intrusion - private sewer pipe



Photo 5: Root intrusion - maintenance hole

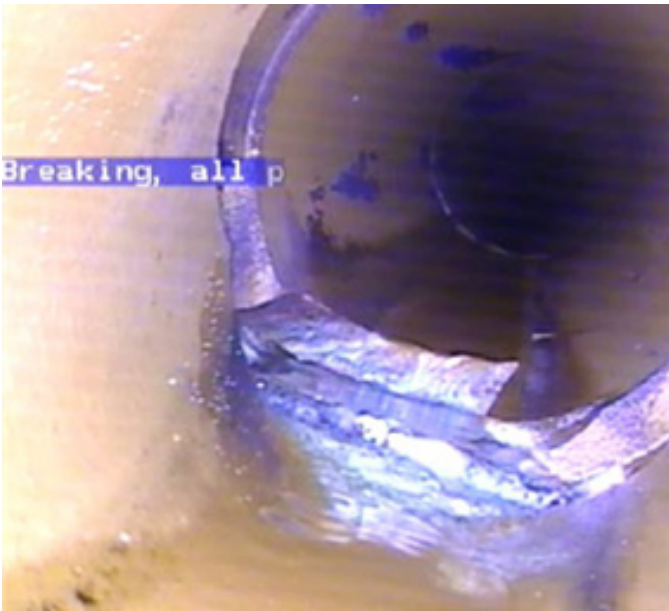


Photo 6: Damaged sewer pipe

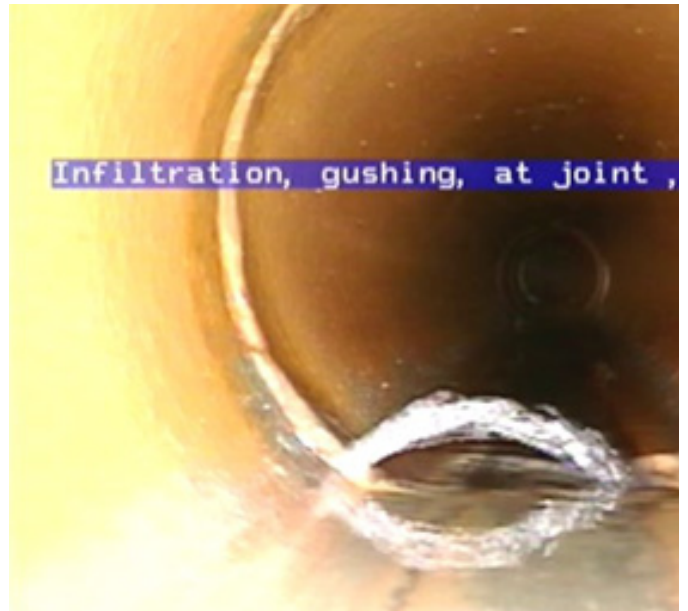


Photo 7: Groundwater infiltration into sewer



Photo 8: Illegal stormwater to sewer connection detected during smoke testing



Photo 9 Illegal private sewer to stormwater connection – toilet paper visible



Progress made in the remediation and works program

Considerable progress has been made throughout the investigation and remediation program, with works from 19 January 2019 - 30 June 2020, completing 57.7 km of sewer pipe inspections, of which 14.1 km of sewer pipes were identified as needing upgrades, 12.3 km have been relined to date. Overall, 1812 maintenance holes and 344 private properties have been inspected in which 11 illegal connections were identified and more are expected as the project continues.

July 2020 update

Outcomes at a glance for Terrigal and Coastal Lagoons

Percentage of the public high-risk sewer network that has been investigated using CCTV:

82%

Terrigal Beach

100%

Terrigal Haven

51%

Terrigal Lagoon

57%

Wamberal Lagoon

7%

Avoca Lagoon



Sewer pipes inspected so far



Length with defects



Sewer pipes upgraded



Maintenance holes inspected



Private properties inspected



Illegal connections and other private defects for rectification

	Sewer pipes inspected so far	Length with defects	Sewer pipes upgraded	Maintenance holes inspected	Private properties inspected	Illegal connections and other private defects for rectification
Terrigal Beach and Haven	9.2 km	0.9 km	0.9 km	316	1	0
Terrigal Lagoon	28.5 km	12.3 km	10.5 km	890	343	11
Wamberal Lagoon	15.4 km	0.9 km	0.9 km	491	0	-
Avoca Lagoon	4.6 km	*	*	115	0	-
Terrigal and Coastal Lagoons Audit progress	57.7 km	14.1 km	12.3 km	1812	344	11

*Works in Avoca Lagoon are underway and results will be reported in subsequent reports

Investigations are continuing and are addressing Terrigal Beach, Haven and Terrigal, Wamberal, Avoca and Cockrone Lagoons.

How can this help to improve water quality?

Reducing sewer overflows in wet weather - Where Council has relined or replaced the sewer pipes and resealed manholes, there will be less infiltration of ground water and rainwater into the sewer network. Additionally, reducing the number of houses illegally connected from their stormwater to the sewer network will also reduce the rainwater entering the sewer network. These actions can reduce the number of potential sewage overflows in wet weather in both small and large rainfall events.

Reducing sewer exfiltration into groundwater and waterways - Where Council has relined or replaced the sewer pipes, there will be less sewage exiting the sewer network.

Reducing direct sewer connections to the environment - Although rare, illegal connections have been found to occur on private property and may be accidental or intentional.

Cumulative impact from the above sources – There is no single point source of microbial contamination of natural waters in the Terrigal and coastal lagoons audit area. As such the program needs to adopt a holistic approach to remediation works and management.

Adapting the remediation and works program to recent research results from the partnership program

Recent progress throughout Phase 2 of the audit program has identified priority microbial source locations in Terrigal Beach, the Haven, Terrigal Lagoon and Avoca Lagoon catchments (Johnson 2020). These priority areas provide 'hotspots' within the catchment that can be used to focus CCTV, pipe network smoke and dye testing, and follow-up water quality investigations based on identified priorities. Priority mapping is further combined with Council databases of high-risk infrastructure to facilitate a staged and targeted approach which will help deliver efficient and cost-effective results.

The program has a series of expected timeframes (Table below). The Terrigal and coastal lagoons audit has seen considerable progress, particularly in Terrigal Beach, Haven and Lagoon catchments, with Phase 1 completed, and Phases 2 and 3 well underway. Once priority remediation works have been completed in these areas, the works program will move to target priority zones in the Avoca Lagoon catchment; and will bring into focus investigations within the remaining lagoon catchments of the audit (i.e. Wamberal and Cockrone Lagoons).

Terrigal and Coastal Lagoon expected timeframes

Location	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Terrigal Beach and Haven	P1	P1, 2, 3	P2, 3	Monitoring**			
Terrigal Lagoon*	P1	P1, 2, 3	P2, 3	P2, 3	P3	Monitoring**	
Avoca Lagoon*		P1, 2	P2, 3	P2, 3	P2, 3	P3	Monitoring**
Wamberal Lagoon*		P1, 2	P1, 2, 3	P2, 3	P2, 3	P3	Monitoring**
Cockrone Lagoon*		P1	P1, 2, 3	P2, 3	P2, 3	P3	Monitoring**

Phase 1 - Initial investigation (develop understanding)

Phase 2 - Major investigations and cost-benefit analysis (detailed catchment investigations to find hotspots for poor quality water and investigate infrastructure)

Phase 3 - Works program to fix broken infrastructure

*lagoon catchments are considerably larger than the Terrigal Beach and Haven catchment and will take longer to complete

** monitoring periods may provide recommendations to revisit phases 2 and 3 depending on water quality results

Refining water quality investigation methods

Initial investigations have focused on establishing a general understanding of microbial dynamics throughout each sub-catchment of the audit area. The investigations undertaken have employed a combination of both traditional methods and emerging technology. Council will now build on these investigations, looking to refine sampling methods to guide water quality investigations and remediation works.

This approach presents opportunities to expand and improve our general understanding of the risks that defective public and private sewer infrastructure have on the environment and on human health, as well as refine investigation techniques to advance our understanding of water quality problem areas within, and beyond, the audit area.

Microbial contamination occurs both in developed as well as developing countries and poses a major challenge to water quality management worldwide (Clark et al. 2003, Schiff and Kinney 2001, WHO 2003). The ongoing investigations will provide improved outcomes for the audit, as well as for other water quality managers.





Conclusions

The Terrigal and coastal lagoons audit is one of the most comprehensive recreational water quality investigations in NSW, and the outcomes documented in this report give a snapshot of sewerage remediation works undertaken to date throughout the catchment to reduce contamination and improve water quality. Outcomes of the audit will continue to be reported on Council's website: yourvoiceourcoast.com/tcla

References

- Central Coast Council, (2020). *Terrigal and Coastal Lagoon Audit: Terrigal Catchment Audit Water Quality Investigation Report 2*. Report prepared by Central Coast Council in partnership with the NSW Department of Planning, Industry and Environment. January 2020.
- Clark, A., Turner, T., Dorothy, P., Goutham, J., Kalavati, C., and Rajanna, B. (2003). *Health hazards due to pollution of waters along the coast of Visakhapatnam, east coast of India*. *Ecotoxicology and Environmental Safety*, 56 (3), 390-397.
- NSW Department of Planning, Industry and Environment, (2019). *Beachwatch State of the Beaches 2018-2019: Central Coast Region*. Report prepared by the NSW Department of Planning, Industry and Environment. September 2019.
- Johnson C. (2020). *Towards safer swimming – Terrigal region: Terrigal Bay, Terrigal Lagoon and Avoca Lagoon stormwater catchment audit*. NSW Department of Planning, Industry and Environment, Parramatta, NSW.
- Schiff, K., and Kinney, P. (2001). *Tracking sources of bacterial contamination in stormwater discharges to Mission Bay, California*. *Water Environ Res.* Sep-Oct;73(5):534-42.
- Seymour, JR., Williams N., and Sibon, N. (2019). *Microbial source-tracking in NSW coastal habitats: Final Report*. Report for NSW Department of Planning, Industry and Environment, prepared by the University of Technology Sydney.
- Seymour, JR., Williams, N., and Sibon, N. (2020). *Microbial source-tracking to assess the spatial extent and temporal persistence of water quality issues at Terrigal Beach*. Report for NSW Department of Planning, Industry and Environment, prepared by the University of Technology Sydney.
- World Health Organization (WHO). (2003). *Emerging issues in water and infectious disease*. Geneva, World Health Organization, 22pp.



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