

Mangrove Creek Dam

Central
Coast
Council



Mangrove Creek Dam

The Central Coast has the third largest urban water supply system in New South Wales.

The water supply system serves the region's population of more than 345,000 people, delivering water to more than 135,000 homes and businesses.

The system includes three dams, three weirs, three water treatment plants, over 50 reservoirs, and more than 2,200 kilometres of pipelines.

Mangrove Creek Dam is the Central Coast's largest dam, located 50km north-west of Gosford in a narrow valley.

Constructed between 1978 and 1982, the dam provides 93% of the region's water storage with a maximum capacity of 190 billion litres of water.

Mangrove Creek Dam is a concrete faced rockfill dam that provides on-stream storage of water. The dam has a catchment area of 101 square kilometres and provides water to the Central Coast local government area.

Facts and figures

General facts

- **Maximum capacity:** 190 billion litres
- **Highest recorded level:** 100% first reached on 5 July 2022
- **Lowest recorded level:** 10.27% on 24 February 2007
- **Water surface area:** 7km² at full supply level
- **Maximum depth:** 65m
- **Average annual rainfall:** 960mm
- **Catchment area:** 101 km²



Mangrove Creek Dam



Dam Wall



Spillway

Dam facts

- **Type:** Concrete faced rockfill
- **Height:** 80m
- **Length:** 380m
- **Width at base:** 250m
- **Width at crest:** 6m
- **Volume of rock fill:** 1,340,000m³
- **Volume of concrete:** 13,500m³
- **Intake tower height:** 47m

Spillway facts

- **Type:** Concrete lined chute
- **Length of spillway:** 240m
- **Width:** 20m tapering to 10m
- **Discharge capacity:** 570m³/s

Why the dam was built

Mangrove Creek Dam was built due to a rising demand for water from an expanding population. The dam was built to boost water supply storage for the Central Coast and to help provide a more reliable water supply.

The dam location was determined by the NSW Department of Public Works in the 1970's after extensive investigation. The decision was based on environmental, physical and financial considerations as outlined below.

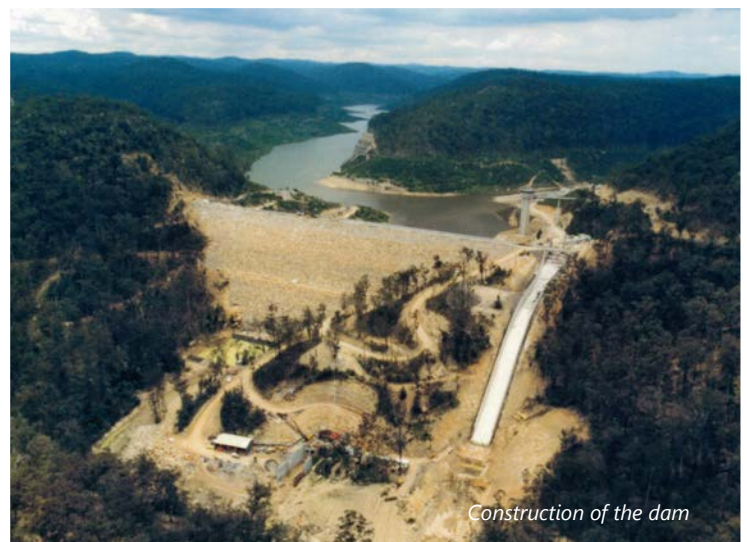
How the dam was built

Mangrove Creek Dam was built using rolled, soft rockfill of sandstones and siltstones. This material was obtained from a quarry located within the storage area. These sandstones and siltstones were crushed and compacted to form the dam embankment.

The embankment also contains approximately 100,000 cubic metres of processed basalt. This material was incorporated into various filters and drains within the embankment to cope with seepage within the embankment and foundations.

The concrete face which tapers from 600 millimetres at the base to 300 millimetres at the crest acts as a seal between the water and the dam embankment.

Provision was made to increase the height of the dam wall by 25 metres to a total capacity of 420 billion litres if the need arose in the future. The enlargement of Mangrove Creek Dam was considered in the Central Coast Water Security Plan (2021) but was not selected as a preferred option at this time



Construction of the dam

Dam size

For a dam this size, the site is the closest possible location to the coastal areas where most people live.

Future water supply works

The dam site is located relatively close to all other water catchments – which minimises the costs associated with transfer pipelines and pumping stations.

Geology

The site has a rock foundation. Areas with a sandy base are not suitable for dam construction. The naturally V-shaped valley is the ideal storage with a small surface area compared to volume, which means less surface evaporation.

Catchment

The land comprises extensive undeveloped, uninhabited land which helps to maintain a pristine catchment area.

Mangrove Creek Dam was proposed as a large storage dam, not primarily a collection dam. Its catchment area was small but the shape of the valley and its geology enabled the construction of an 80 metre high wall that would store 190 billion litres of water.

How the dam works

Mangrove Creek Dam is the largest of the region's three dams and acts as a main back up to the water supply. Water is released from the dam when stream flows are low in Mooney Mooney Creek, Ourimbah Creek and Wyong River.

Water drawn from the dam via the intake tower is released via valves at the outlet works. It flows 20 kilometres downstream to Mangrove Creek Weir and is pumped to Upper Mooney Dam. From here the water is further pumped to Somersby balance tanks and then transferred from the balance tanks to Somersby Water Treatment Plant. After treatment, the water is then distributed around the Central Coast.

Although Mangrove Creek Dam is an on-stream dam, the Mardi-Mangrove Link pipeline also captures excess flows in Wyong River and Ourimbah Creek and transfers these to Mangrove Creek Dam for storage, via Mardi Dam. The two-way pipeline also allows water to be released from the dam, through Boomerang Creek Tunnel back to Mardi Dam or directly to Mardi Water Treatment Plant. From Mardi Dam, water is pumped to Mardi Water Treatment Plant for treatment and distribution.



Outlet



Mardi Dam inlet

Mardi-Mangrove Link

Construction of the Mardi-Mangrove Link started in March 2010 and the project was officially completed in July 2012. The Mardi-Mangrove Link was the largest water infrastructure project completed on the Central Coast since the mid-1980s when Mangrove Creek Dam was built.

The Mardi-Mangrove Link is made up of two pipelines totalling 21 kilometres in length. The Link means that during high flows, water can be transferred from Wyong River and Ourimbah Creek, via Mardi Dam to the large Mangrove Creek Dam for storage, instead of allowing it to flow to the ocean.

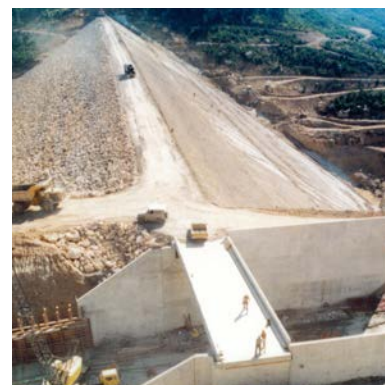
The Mardi-Mangrove Link helps protect the region against extended periods of below average rainfall.

Spillway

A spillway is a structure used to provide the controlled release of flows from a dam to a downstream area. Spillways release floods so that the water does not overtop and damage or even destroy the dam. Water flows out of the dam via the spillway when water levels are greater than 100% of the dam's capacity.

The Mangrove Creek Dam spillway was built in 1982. The spillway is 240 metres long and has a crest with a maximum width of 20 metres. The spillway channel can be divided into four segments: the upper, gently sloping portion, the steeply sloping portion, the flip-bucket area, and the stilling basin.

In times of flood the spillway transfers excess water from behind the dam down a smooth decline into Mangrove Creek. The spillway is lined with concrete on the bottom and sides to protect the dam and topography. The flip-bucket area of the spillway slows the water down by causing the water to rise and fall back down on itself, protecting the base of the dam from erosion. The stilling basin then continues to slow the water protecting the environment downstream of the dam.



Construction of spillway bridge and spillway



Boomerang Creek tunnel

Boomerang Creek Tunnel

In 1989, Boomerang Creek Tunnel, an 11-kilometre tunnel linking Mangrove Creek Dam and Wyong River, was completed. The three-metre diameter tunnel can transfer water from the dam to Wyong River for extraction downstream at Lower Wyong River Weir and pumped for storage in Mardi Dam. The Mardi-Mangrove Link also allows water to be directly transferred between the two dams.

Dam safety

As a dam owner, Council must comply with the requirements of the Dams Safety Act 2015 and the Dams Safety Regulation 2019.

Council has a dam safety management system and plan in place to ensure the safety of people, property and the environment is not put at risk from the dam.

The dam safety management system provides a comprehensive and integrated system for the management of all aspects of foreseeable risks in relation to the failure of the dam that addresses all aspects of the life cycle of the dam, including the design, construction, operation, maintenance and decommissioning.

Mangrove Creek Dam is staffed 365 days of the year to enable daily monitoring and safety inspections of the embankment and surrounding structures.

Instrumentation located within the dam embankment allows staff to monitor and record any movement activities, seepage or any other physical changes to the dam and surrounding structures. There are also regular surveys carried out on the structure.

Emergency management

A Dam Emergency Plan (DEP) is part of the management system.

The purpose of this DEP is to:

- provide processes and procedures to manage likely risks to people and property in the unlikely event of a dam failure
- enable a collaborative response with emergency agencies, emergency management groups, engineering specialists and regulators
- outline the roles and responsibilities for various staff and agencies in the event of an emergency at Mangrove Creek Dam
- identify, evaluate and classify potential emergency situations which could threaten the security of Mangrove Creek Dam and/or surrounding areas
- provide timely notifications for appropriate internal personnel and external emergency management agencies
- define the probable extent of flood emergencies through inundation maps and
- outline emergency instructions, including potential preventative actions, for Council to take prior to and following the development of an emergency.

Monitoring and maintaining water quality

Mangrove Creek Dam staff carry out sampling and water quality monitoring on a weekly basis.

The samples collected are sent to various laboratories for analysis.

The stored water is maintained at its highest quality by the process of destratification.

Destratification involves compressed air being pumped into the lower levels of the dam adjacent to the intake tower to continually turn the water over. This process is used to reduce temperature variations over depth, help control algal growth and reduce levels of dissolved metals.



Water sampling

Water catchment

A catchment is an area where water is collected by the natural landscape. In a catchment, all rain and run-off water eventually flows to a creek, river, lake or ocean, or into the groundwater system. Natural and human systems such as rivers, bush land, farms, dams, homes, plants, animals and people can co-exist in a catchment.

Healthy catchments provide:

- a source of clean drinking water
- habitat for plants and animals, and
- healthy vegetation and waterways.

Mangrove Creek Dam has a catchment area of 101 square kilometres and is a pristine environment with minimal habitation.



Mangrove Creek Dam catchment

Restricted access

To maintain the health of the Mangrove Creek Dam catchment, access to the surrounding area is restricted. The restricted area covers about 101 square kilometres of land around the dam and protects our water supply by acting as a buffer zone to help stop nutrients and other substances that could affect the quality of water entering the dam.

By restricting access to the area we benefit by:

- protecting water quality
- protecting large areas of bush land and plant and animal habitats
- protecting threatened plants and animal species and
- preserving evidence of Aboriginal occupation dating back many thousands of years.



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