Burwood Beach Wastewater Treatment Works (WWTW) is Hunter Water’s largest wastewater treatment works. It services the Newcastle City area and suburbs to Dudley in the south, Wallsend in the west and Mayfield in the north. The Burwood Beach plant was commissioned in 1992.

Wastewater arriving at the plant is pumped to the preliminary treatment facilities by the primary pump station. The preliminary treatment involves screening and grit removal. The screen house uses a mechanical process to remove large (greater than 1.5 mm) non-biodegradable material, things that should not be put into the sewer system. Screenings do not include faecal matter or toilet paper, which are dealt with by the biological treatment process. Screened wastewater flows to the grit removal chambers, which remove sand and fine solids (grit) that cannot be broken down by the downstream biological treatment process. Odours from the primary pump station and screen house are treated using a soil bed filter.

Wastewater flows less than 1,400 litres per second (L/s) are then pumped via the secondary pump station to the activated biofilter (ABF) tower. Flows greater than 1,400 litres per second are released to the ocean following screening and degritting, to protect the downstream biological process from damage and ensure the plant continues to operate effectively during heavy rain.

In the ABF tower wastewater trickles down over specially designed plastic packing on which naturally occurring bacteria grow in layers and break down the organic material in the wastewater. Odour from the ABF is extracted from the tower and pumped to a soil bed filter for treatment.

Once it leaves the ABF tower the wastewater continues on to the activated sludge process. The first step of this process is the aeration tanks. The aeration tanks contain more bacteria, that grow in small clumps known as flocs. The aeration tanks are supplied with plenty of air, which provides the bacteria with oxygen to grow and help further break down the organic material in the wastewater.

From the aeration tanks the wastewater flows to the clarifiers. The clarifiers are used to separate biosolids (sludge) from the effluent using gravity. The clarifiers have a large scraper which slowly moves around the tank to collect the solids. The treated effluent passes over the clarifier weirs and released to the ocean through a 1.5 km ocean outfall. The outfall diffuser system discharges at a depth of approximately 22 metres. Excess biosolids generated by the treatment process are released through a separate pipeline and diffuser system in the ocean outfall.
1. PRIMARY PUMP STATION
Lifts incoming wastewater
All wastewater received at the plant enters the primary pump station. This station contains pumps that lift the wastewater up to the screen house. The primary pump station is covered to minimise the release of odorous gases.

2. SCREEN HOUSE
Removes large solids
Large objects and solids (greater than 1.5 millimetres) present in the wastewater are removed using rotary drum screens. The screenings are washed, dewatered, bagged and then transported to a landfill site.

3. GRIT TANKS
Removes fine solids
Inorganic grit material present in the raw sewage is removed using centrifugal grit chambers. The settled grit is washed, dewatered and collected for disposal at a landfill site. Following screening and degritting the wastewater is pumped to the secondary treatment process.

4. ABF TOWER
Biological treatment
Preliminary treated wastewater and recycled ‘activated sludge’ are pumped over the activated biofilter (ABF). The ABF tower contains specially designed plastic packing where naturally occurring bacteria form layers and break down organic matter in the wastewater. The ABF tower is covered to minimise the release of odorous gases.

5. AERATION TANKS
Biological treatment
The biological reactors, or aeration tanks, have an average detention time of 1.5 hours. Air is pumped into the tank through a system of diffusers located on the floor of the tank. The air allows the activated sludge bacteria to grow and further treat the wastewater by breaking down organic matter.

6. CLARIFIERS
Separates effluent and biosolids
The secondary clarifiers are located downstream of the aeration tanks. Each clarifier is 33 metres in diameter and 4 metres deep. The clarifiers settle the biological solids allowing the clear effluent to flow over the top. The solids are recycled within the biological treatment process.

7. OCEAN OUTFALL
Disperses effluent and biosolids
The ocean outfall was constructed by tunnelling through sandstone. The outfall tunnel is 2.5 metres in diameter and 1.5 kilometres long. Treated effluent is released to the ocean at a depth of 22 meters through a series of diffuser heads, each with 8 outlet ports. Excess solids from the biological process are released via a separate pipeline within the outfall tunnel and a dedicated biosolids diffuser system.

8. SOIL BED FILTERS
Odour control
Odours from the primary pump station and screen house are treated through a soil bed filter, which uses natural processes to absorb and break down odours. Odours from the ABF tower pass through a second soil bed filter. The soil bed filters contain layers of gravel, soil, peat and bark chips. This media allows the growth of natural bacteria which break down and disperse odours.