

How wastewater/sewage is managed

What is wastewater/sewage?

This is tended to be thought of as the water poured down the drain after washing dishes, taking a bath or flushing the toilet. In fact, wastewater includes all types of used water. This contains a variety of substances, some dissolved and some in the form of solids which will float, sink or stay suspended in the water.

- Domestic water from baths, washing up, toilets etc.
- Industrial wastewater that may contain animal and human waste, oils, sand and sometimes harmful chemicals.
- Rainwater that runs off roofs, roads and paved areas.

Wastewater collection

Collecting this enormous amount of wastewater and getting it to a treatment works is a major engineering task requiring a vast network of sewers spreading out to virtually every home, office, shop, school and factory in the country. In the region covered by Welsh Water alone, this amounts to approximately 36,000km of sewers and drains.

This network has been developed over many years and in some parts of Britain the sewers in use today were designed and built during the 19th century.

Carrying out maintenance work on such a large underground network is both difficult and costly. Apart from deterioration through normal wear and tear, sewers can be damaged by the weight of traffic moving above them, by ground movement or subsidence in the soil. Welsh Water's "sewage Pollution – see it. Report it. Stop it" campaign encourages people to report sewage pollution to Welsh Water. It explains what sewage pollution consists of, what Welsh Water is doing to reduce it and what the public can do to help.

Sewage pollution can have a major impact on wildlife and the amenity value of a water course. Welsh Water is working hard to minimise such pollutions by investing £12.5 million over 5 years. Despite these efforts things can still go wrong and we are encouraging people to help by telling us as soon as they spot sewage pollution entering a water course. Once we know about a possible incident we take action to stop it and clean up when necessary. We will also tell the environment agency, who look after the main rivers in England and Wales.

This campaign is also linked to Welsh Water's 'Drains awareness Wales' and 'The Dirty Dozen' because putting the wrong things down the sewer network can affect its operation and result in blockages. Over 50% of sewage pollutions are caused by blockages in the sewer network.

Sewage network types

There are two main types of sewage network:

Combined sewers – single pipes which carry both domestic and industrial 'foul' water as well as surface rainwater.

Separate sewers – one pipe that carries 'foul' water and another pipe that carries rainwater run-off.

Wherever possible, separate sewers are preferred because rainwater and 'foul' water can be kept apart and in storm conditions rainwater can be easily discharged directly to rivers or the sea, or to soak into the ground.

Industrial effluent

The quality of domestic sewage is fairly predictable and unlikely to contain any highly toxic substances. industrial effluent however varies greatly and companies need to get consent before any discharge into public sewers can take place.



Inlet and grit removal



First stage - primary settlement



Activated sludge

The sewerage company needs to be sure that the effluent:

- is safe and will not be a health risk to service engineers
- Will not damage either the fabric of the pipes and sewers or the equipment at the sewage treatment works, and
- Has been sufficiently treated before discharge to remove any toxic substances.

Wastewater treatment

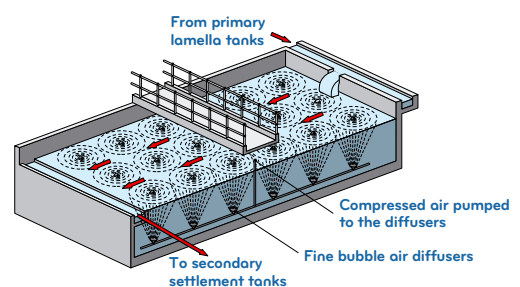
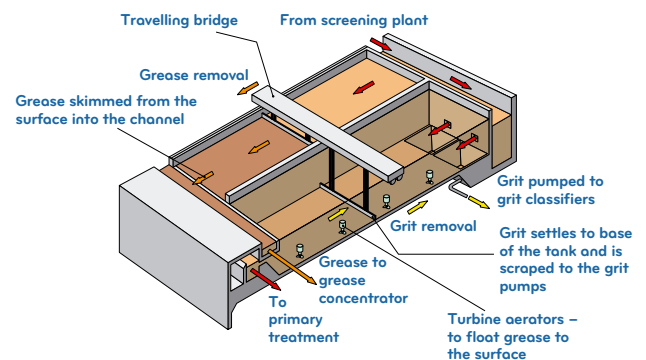
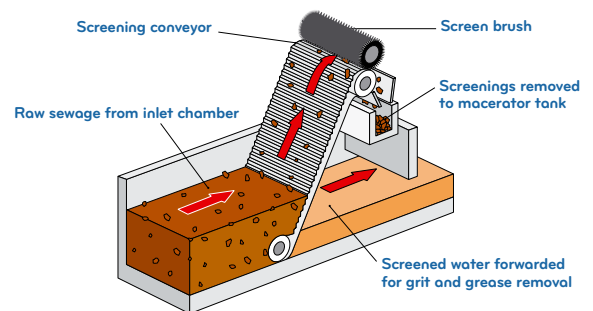
The purpose of wastewater treatment is to remove enough impurities from the wastewater to enable it to be returned safely to a river or the sea where it can again become part of the natural water cycle. Wastewater treatment is a complex process and methods used vary within the company's areas. However, the key processes are as follows:

Screening – metal screens remove large, floating objects such as paper, wood, cans and plastics which could block pipes or damage equipment.

Grit channels – wastewater flows slowly along wide channels allowing grit and heavy particles to fall to the bottom.

Settling tanks – fine, solid particles settle out of the sewage, falling to the tank floor to form sludge. This process is called sedimentation.

Biological filters – partly treated wastewater is spread over large beds of rough stones or clinker where colonies of bacteria have formed. The





Final settlement tanks



Sludge storage

bacteria remove harmful waste by feeding on organic matter in the sewage converting it to carbon dioxide, water and nitrogen compounds. This biological activity produces a liquid containing humus particles which then settle out in special tanks.

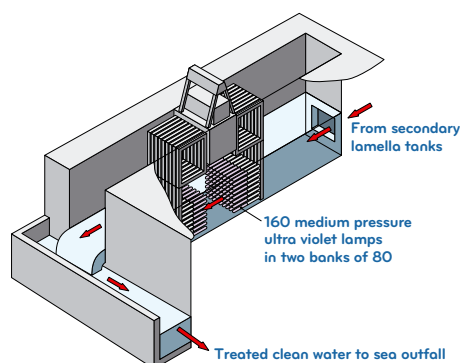
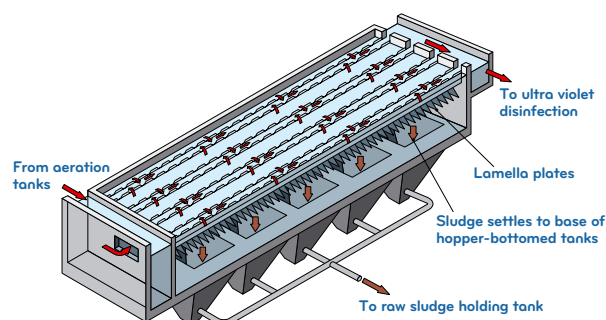
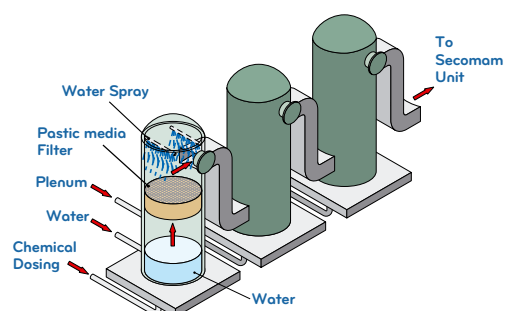
Activated sludge – this is an alternative to biological filtration where a culture of bacteria (activated sludge) feeds on the sewage. The air the bacteria need is pumped in under pressure by surface aerators and fine bubble diffusers.

Final settling tanks – even after final sedimentation the cleaned water, or effluent, still contains organic material. If this is discharged into a river with low natural flow pollution could occur. Also, the water may not be clean enough to be safely abstracted downstream. In these cases 'polishing' treatments such as pebble bed clarifiers, sand filtration and micro-straining are used.

The treated effluent then flows over weirs to rivers and streams where it rejoins the natural water cycle.

Monitoring

As technology creates new, more advanced materials and substances such as chemical compounds or even biological washing powders, water companies and the environment agency need to match these developments with sophisticated monitoring techniques to ensure thorough and safe wastewater treatment for their customers.



Wastewater disposal

When people have finished using water, it is expected that the wastewater produced will be taken away and cleaned properly before it is put back into rivers and the sea. However, the more water people use the more wastewater is created and as environmental protection becomes increasingly important, traditional methods of disposing of wastewater come under closer and closer scrutiny.

Sewers

Welsh Water's network of sewers takes away the wastewater produced by households and businesses as well as the rainwater that runs off roofs and streets into drains. Much of the network is old, often dating back to Victorian times and some sewers are too small to cope with the sheer volume of today's wastewater.

As our climate is changing sometimes flooding occurs when there is heavy rain or flash floods.

Surfacewater

surfacewater is the rainwater that runs from roofs, highways and paved areas into the public sewerage system. For a number of reasons, including more frequent storms and the growth of built up areas, Welsh Water's sewer network has to deal with increasing flows of surface water. Occasionally, the capacity of the network is exceeded in some areas and results in incidents of sewage flooding of homes, gardens and roadways and can cause pollution incidents in streams and rivers.

Storm overflows

There are 3,201 storm overflows on Welsh Water's sewerage system. These are structures on a sewer designed to discharge excess surface water directly into rivers during periods of heavy rainfall to avoid flooding roads and properties.



River discharge

Welsh Water has 836 sewage treatment works across its region, most of which are located inland next to towns and villages. All the inland works use biological processes to clean the wastewater collected from customers so that it can be safely returned to local rivers.

The environment agency sets clear, well defined standards to protect the river and coastal environment and then monitors the performance of Welsh Water's sewage works, the company's 'pass rate' is routinely between 99% and 100%.