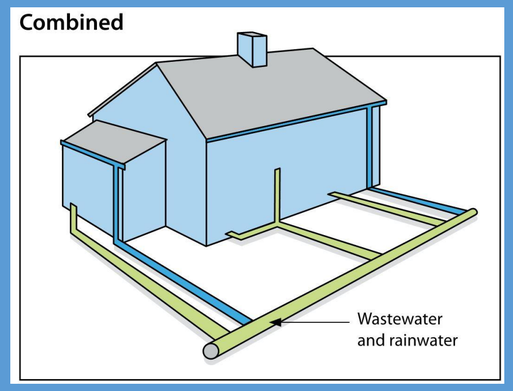
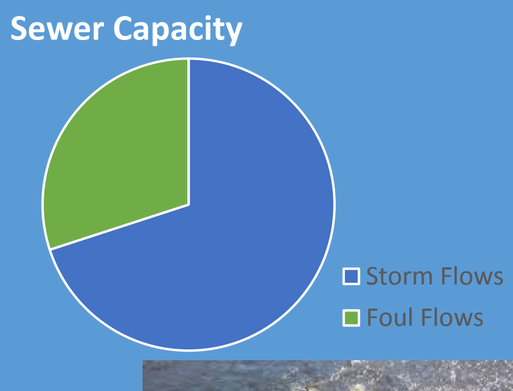
What causes the flooding?

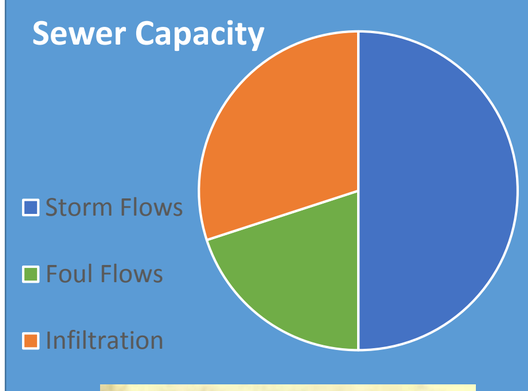
Challenge 1: High Peak Flows





Sewers in the Llangoed area are combined, which means flows from kitchens and toilets are carried by the same sewers that drain rainfall. Our sewers are designed to cope with storms up to a 1 in 30 year return period, but occasionally rainfall can be so heavy that it overwhelms the system. When this happens, waste water can overflow from manholes and gullies and cause flooding.

Challenge 2: High Base Flows



Our sewers were built a long time ago and some of them are starting to show their age. In some places, groundwater is finding its way into the sewers through joints or cracks in the pipework. This is known as infiltration.

The amount of infiltration reaching the sewers tends to be greater after rainfall, when groundwater levels are higher. This additional water takes up part of the sewer capacity and means there is less capacity available to carry storm flows and so smaller storms lead to flooding.

How can we reduce high peak flows?

Remove storm flows.

Identify opportunities to remove water from roofs and pavements draining into the combined network.

Provide storage.

Adding storage increases the network capacity and allows us to slow the flows, lowering the peak flow.

How can we reduce high base flows?

Identify Infiltration

- Flow Surveys
- CCTV (Camera)

Causes of Infiltration

- Land drainage
- Defects in sewer and manholes

Remove Infiltration

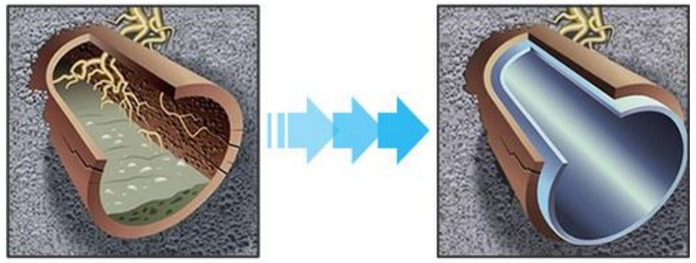
- Sewer relining
- Sewer replacement
- Manhole rehabilitation
- Rebuilding manholes

How do we remove infiltration?

Finding the right solution

There are two ways to repair sewers:

- No dig solutions
- Open cut solutions



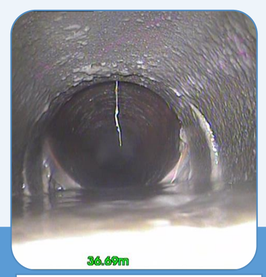
Where possible, no-dig solutions are preferred because they:

- Cause minimal disruption to you, our customers
- Reduce the environmental impact by reducing the need for digging up a large area
- Eliminating construction risks that come with open excavation

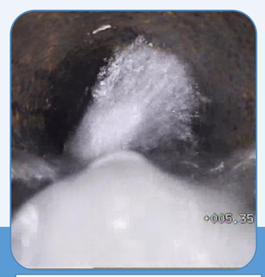
When trenchless solutions are not possible, other solutions are used, most commonly open excavation. This means digging down to carry out the repairs. We will use this method if there are restrictions or defects in the sewer which means we can't line or rehabilitate a manhole. This could include:

Substantial blockage

Pipe collapses



Sharp bends and drops

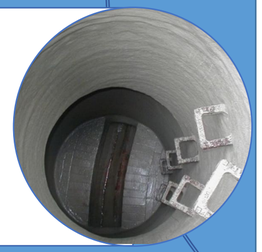


Heavy infiltration

"No-Dig" options

Sewer relining:
A fabric tube soaked in resin is inserted between two manholes and then inflated so that it takes the shape of the sewer. Then "curing" takes place where a UV light is used to harden the fabric and create a new fully enclosed sewer pipe.

Manhole rehabilitation:
Resin injections and spray lining manholes means all the holes, cracks and faults are covered and stops rain water from getting into the sewer.



Sewer relining in pictures

1. Liner is prepared off site, the resin is then added so that all fabric is soaked

2. Sewer is cleaned using pressurised water or robotic cutters

3. Liner inserted into sewer

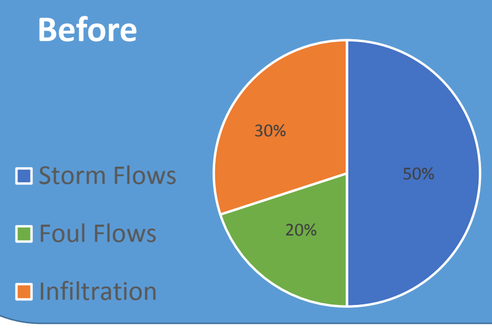
4. UV light train used to activate the resin and 'cure' the liner

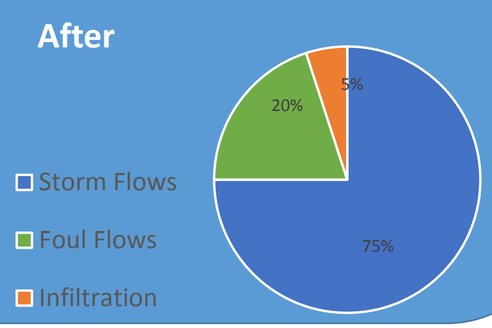
Image Credits: 1 – 3. Pipe Lining Technologies, Inc., 4. ITS PipeTech

Benefits of Rehabilitation (Phase 1)

Benefit 1: Increased capacity

Phase 1 of the scheme is to repair the network in the area to remove infiltration of surface water. The main benefit of this work is that the reduced volume of groundwater in the sewers leaves more space to carry storm flows and allows the sewers to handle larger storms without causing flooding. Smoother pipe surfaces also increase the capacity.





Benefit 2: Increased lifespan

Another benefit is that with all of the newly relined sewers and manholes, the life time of the network will increase.

- The liners will prevent root intrusion
- Less flow will arrive at our pumps and treatment works, reducing the operational costs and increasing lifespan

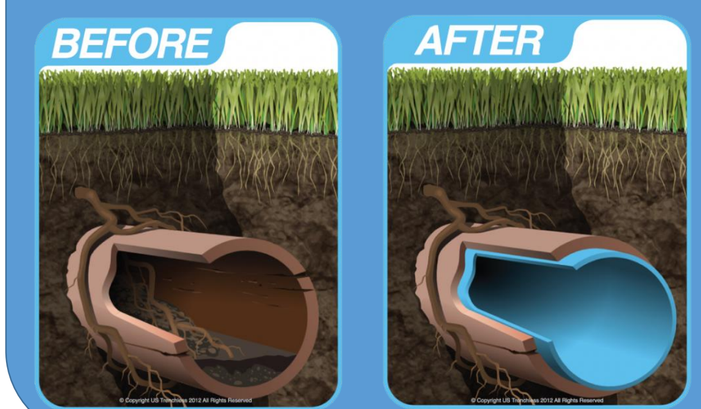
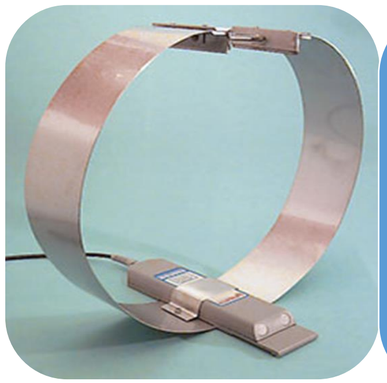


Image Credit: Cloud 9 Services Inc.

Next Steps



Flow monitoring
This will allow us to see the impact of the rehabilitation work carried out and understand what volume of flow is arriving at Llangoed

Final design of storage options
We will use the flow monitoring data and other information to assess the volume of storage needed to prevent future flooding.

How will we increase storage?

Upsizing: putting in larger sewers

Following flow monitoring, we will be able to see how much extra capacity is needed. Where larger sewers are needed, we will use open excavation, digging down to the pipe, removing it and replacing it with a larger pipe.
Great care will be taken to ensure that properties affected by this are put back to the condition they were found in. An example of a previous project can be seen below.

Example of previous work

New storage tank

A storage tank need to be placed underground to capture the extra flow of water during heavy rainfall and hold it until flows reduces and there is room in the network. Tanks like these can be made of plastic or concrete.

Installation of a pre-cast concrete tank in Barry shown above. The tank took 10 days to build.

Gaerwen tanks

Large plastic pipes in a row make up the storage tank, as shown below. These are brought to site on lorries. The ground has been excavated and the pipes put in place. These are connected together and to the sewer network and buried. These pipe sections make it easy to install providing a robust solution to prevent future flooding.

Benefits of increased storage (Phase 2)

Benefits of additional storage

Benefit 1	Reducing the risk of flooding during exceptional rainfall events up to and including 1 in 30 year return period.		
Benefit 2	Prevent further upsizing of the network in the near future	Reduce need for surface water removal where it is not cost effective	
Challenges	Flows still eventually end up at treatment works and need to be treated. No reduced cost of treatment.	Tanks will be designed to be self-cleaning.	Drain down time to be designed to ensure storage is available when it is needed.

Timeline of investment

- Phase 1: Construction start - Autumn 2017
- Evaluate benefits – January to April 2018
- Decision on need and extent of Phase 2 April 2018
- Public event to update Customers May 2018
- Phase 2 Construction if required November 2018