Dŵr Cymru
Welsh Water

# Ref 5.8H.2

# South Wales Water Supply Strategy

September 2018

## Introduction

The water supply for South Wales is currently delivered in a number of water supply areas the largest being the South East Wales Conjunctive Use System which distributes the water from 12 water treatment works to the Newport and Cardiff and South East Wales valleys areas. The strategic mains system currently across the South of Wales has a number of restrictions and requirements for strategic link mains as well as improvements to the operation, monitoring and control of the system.

The main strategic mains improvements which will improve resilience and water quality, facilitate maintenance activities and optimise the cost of water production can be summarised as follows;

- **SEWCUS Connectivity improvements;** Improvements to SEWCUS connectivity to remove pinch points within the current system current restrictions between the East and West of the system. This will enable large volumes of water to be supplied from the new SEWCUS North WTW to support Sluvad and Court Farm WTWs or vice versa
- **Strategic East West Link;** Improved East West/West East connectivity that will enable SEWCUS and the Tywi Conjunctive Use System (which includes Felindre WTW) to support each other by up to 30 Ml/day.
- **Renewal and upsizing Taff Trunks;** By upsizing the Taff Trunk mains to twin 1200 mm mains from the new SEWCUS North WTW to Tongwynlais would allow maximised use of the most cost efficient water sources.
- **Improvements to SEWCUS monitoring, control and automation;** Development of mains conditioning as business as usual over the next 5-10 years to enable bidirectional flow through SEWCUS. The installation of improvements to flow, pressure and quality monitoring, actuation of key valves will facilitate the ability to provide flow through the system on a bidirectional basis. This will improve resilience, provide additional water supplies from East to West
- **Optimisation of Cost to Serve for SEWCUS;** the improved strategic linkage and improvements to the capacity and reliability of WTW will further improve the cost optimisation of the water supply to provide water from the most cost effective source.
- **Optimise the UTUBE to enable future Growth;** Cardiff and the surrounding area has seen a considerable volume of development in recent years which is also expected to be sustained for the foreseeable future. The Key assets within the system have been reviewed while considering the in-combination effect of multiple developments. A programme of work has been established to reduce the impact from Growth
- **Resilience at Valley WTW's;** The Need to work on 1 of the main sources within the Cynon Valley highlighted the risk of single supplies within our SEWCUS WRZ at both the Rhondda and Cynon Valley's. This has highlighted that the area is not conjunctive with the rest of the SEWCUS WRZ. A Study has highlighted the option to supply the area via the Rhondda Link main.

An overview of the current Strategic Area Investment Plan (SAIP) for SEWCUS and its links with the Felindre area can be seen in Figure 1 below.

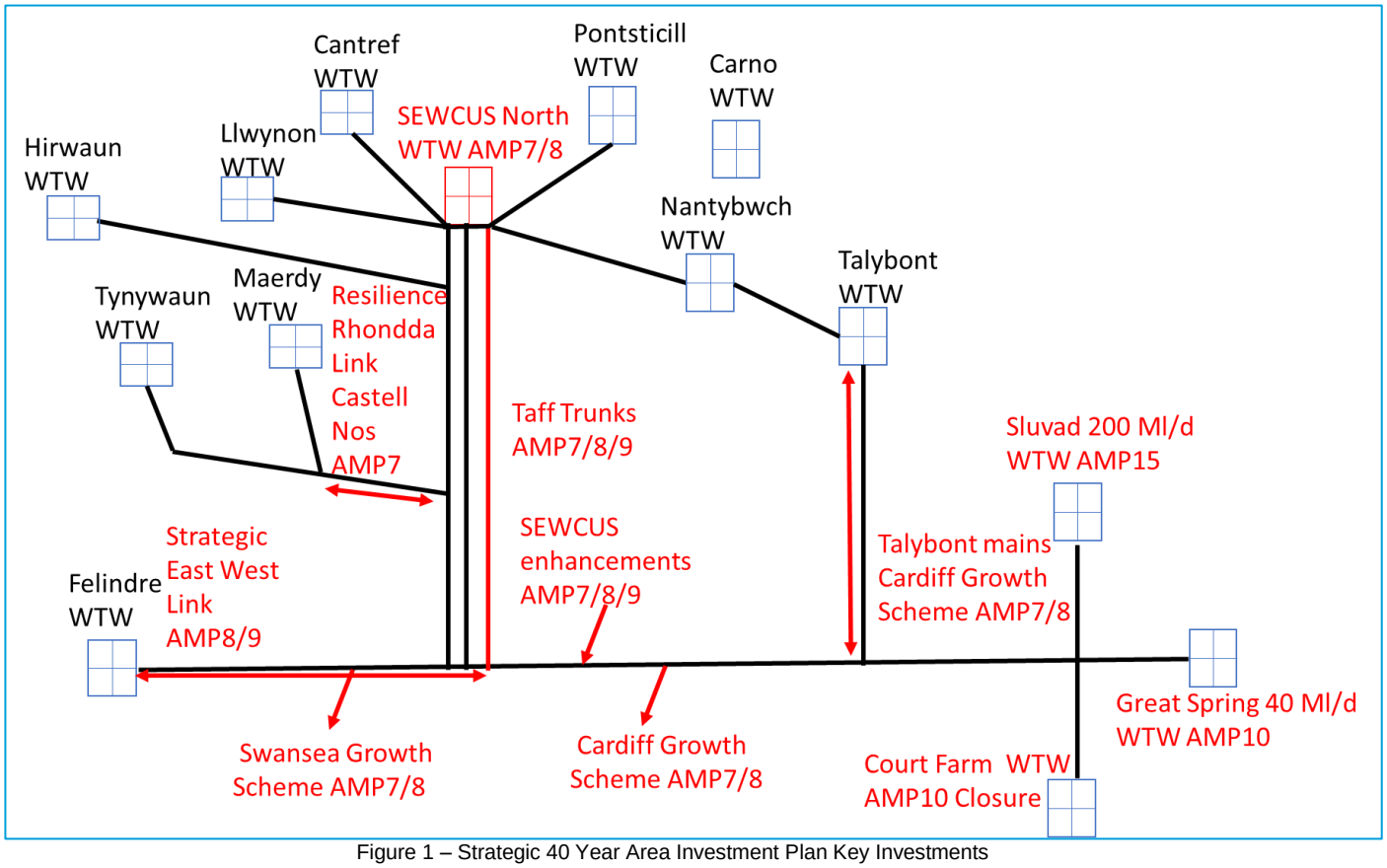


Figure 1 – Strategic 40 Year Area Investment Plan Key Investments

## Overview of the required improvements;

### SEWCUS Connectivity improvements

Improvements to SEWCUS connectivity to remove pinch points within the current system current restrictions between the East and West of the system. The benefit of this will enable larger volumes of water to be supplied from the new SEWCUS North WTW to support Sluvad and Court Farm WTWs or vice versa.

Currently there are two main pinch points the capacity of the Taff Trunk mains limits the capacity of the water supplied from the North of the SEWCUS area to a maximum of 175Ml/d. Once the two Taff Trunk mains have been removed the restriction moves to

During AMP7 there is a project to improve the connectivity of SEWCUS to the North of Cardiff within the Rhiwbina system (20” main). The additional connections will connect into the two 26” mains from Cefn Mably Service Reservoir (SRV) and improve the ability to transfer water from the West to the East, see Figure 2 below.

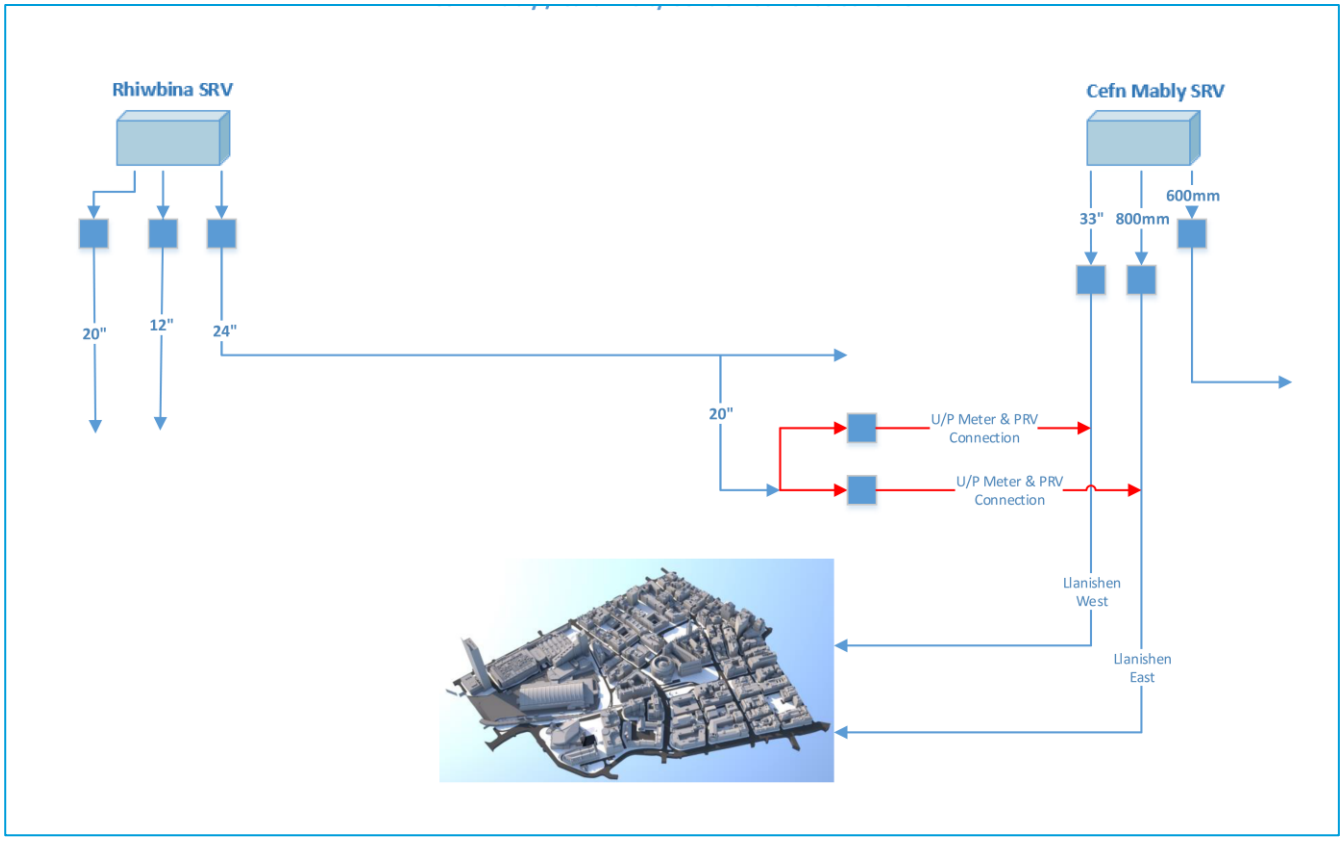


Figure 2 – Improvements to the Rhiwbina system of SEWCUS North of Cardiff

In addition to the improvement of network connectivity in AMP7 there is a project to increase storage at Llwynypia Quarry Service Reservoir to around twice the current capacity of 2.2 Ml. This project will provide a greater time to react to issues across SEWCUS when changes to operation need to be made.

**Strategic East West/West East Link**

Improved East West/West East connectivity that will enable SEWCUS and the Tywi Conjunctive Systems to support each other with a capacity of up to 30 Ml/day. This will provide resilience and maintenance enabling capacity to support part of Felindre WTW's supply area in the event of a long term outage. The long term average output of Felindre WTW is 118 Ml per day. There is also the opportunity to reduce the output of Felindre to enable maintenance activities to be undertaken at the WTW. The link will also provide the ability for Felindre WTW to support SEWCUS providing additional resilience.

In order to achieve this a new pipeline and associated pumping stations will be required. The high level feasibility undertaken so far has outlined the following scope and cost for the project as follows;

The possible new East – West, West - East pipelines to reinforce existing supplies:

11.725 km of 900mm PE pipe – from Cefn Hirgoed to Llantrisant

4.101 km of 900 mm PE pipe – from Port Talbot to Margam

New Pumps identified to pump 311l/s @ 66 metres head - at Cefn Hirgoed PS

In addition to this the existing connection between Cefn Hirgoed SRV and Llantrisant SRV, see Figure 3 below, with enhancement including additional actuated valves, a control system including mains cleansing, removal of GRP main and a bypass around the Cefn Hirgoed pumping station would provide an additional route to supply water from the SEWCUS area into the Tywi conjunctive use zone to support Felindre. The current mode of operation is to pump from Cefn Hirgoed at 0.83 Ml an hour, (equivalent to c 20 Ml/d) towards Llantrisant. This improvement work is being considered for AMP7/8.

A further enhancement will be the connection from Llantrisant SRV via a new 450mm main into the existing 450mm Bosch main which connects to the North of the Bonvilston SR, see red main Figure 3 below, which would enable additional water to be shared between the two conjunctive use systems. This will be developed further with a view to install during AMP8/9 depending on the cost and complexity of the work required.

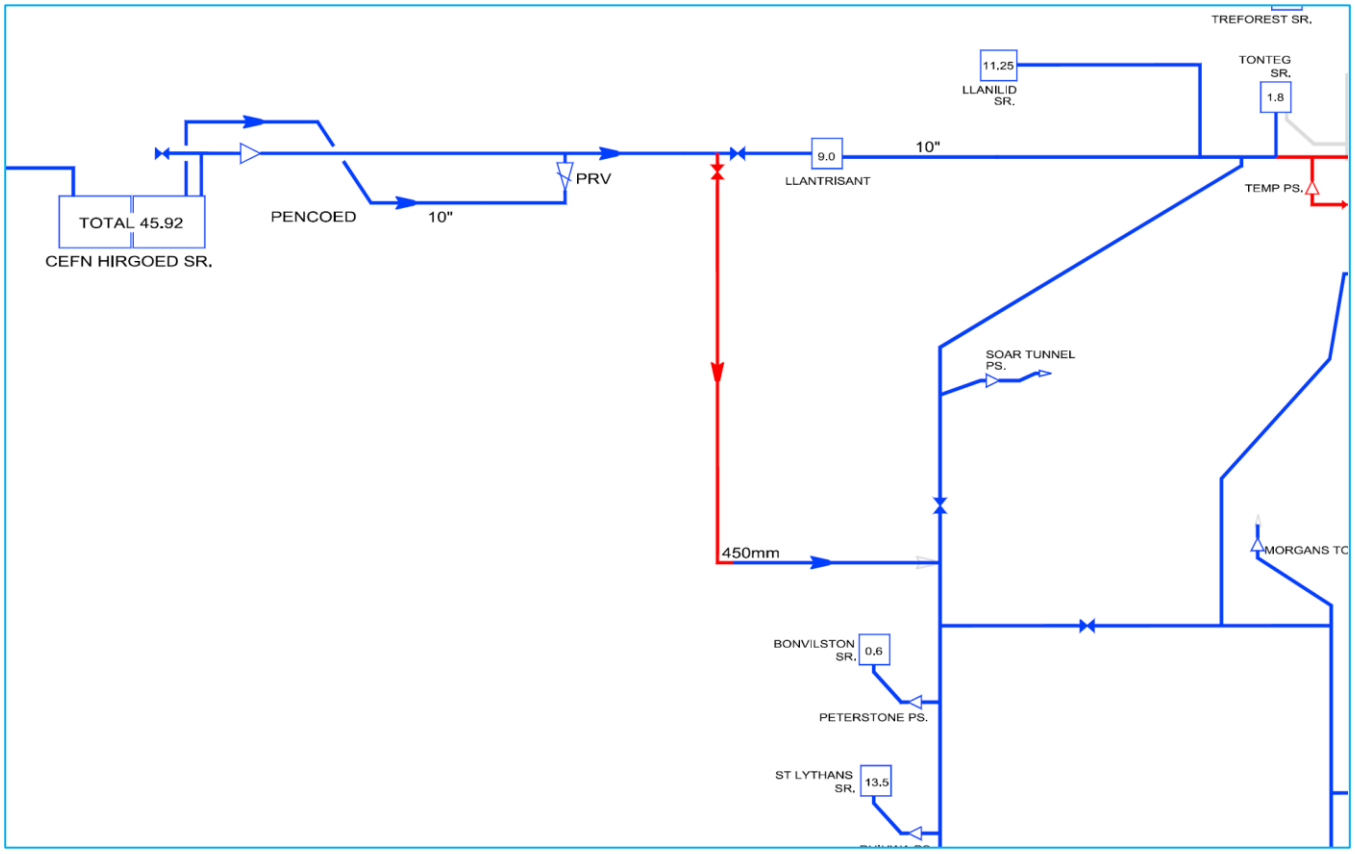


Figure 3 - Cefn Hirgoed SRV and Llantrisant SRV East to West/West to East Connectivity

**TAFF Trunks Upgrade**

The Taff trunk mains deliver the majority of the treated water supplied from the existing WTW of Llwynon, Cantref and Pontsticill. The capacity of the existing 31", 24" Pontsticill mains and 29" and 27" Llwynon mains limits the volume of water that can be delivered into the distribution network from the three sites. The condition of the pipelines has also resulted in many leaks and a few bursts over the last five years. The construction of the new SEWCUS North WTW will provide a maximum output flow of 225 Ml/d which provides the opportunity to consistently supply increased volumes of water into supply. As part of the connecting pipework for the new SEWCUS North WTW the current Taff Trunks will replace 2.2 km of the existing Taff Trunks with 1200mm twin mains from the new WTW site to the Mormon Church on the A4102 to the West of Merthyr Tydfil by the end of AMP8.

The remaining section of the Taff Trunks will need to be hydraulically modelled to review and update the existing scenarios and establish the required pipeline diameter and future flows between the Mormon Church to the West of Merthyr Tydfil to Tongwynlais SRV and on to Wenallt SRV and Rhiwbina SRV to the North of Cardiff, see 2 x 48 inch (1200mm) mains in red Appendix 1 – South Wales Strategic Pipeline Improvements Schematic below. At present it is estimated that the pipelines will need to be twin 1200 mm trunk mains and the current planned programme would be to undertake feasibility for the project in AMP8 and delivery in AMP9. The addition of separate inlets for each 48" pipe into Tongwylais is critical for effective control at the Southern end of the system balancing the gravity sources from the North against the river sources from the East of the SEWCUS area.

The other key investment required to enable the available raw water to be treated and distributed is the installation of improvements to control and automation at key locations, Tongwylais SRV, Wenallt SRV, Rhiwbina SRV, Llantrisant SRV and Cefn Hirgoed would all facilitate the ability to distribute more water from the new Merthyr WTW.

A long term improvement to the current SRVs in SEWCUS will be to build a Wenallt/Rhiwbina Super SRV that will increase storage to improve resilience and simplify the current complicated arrangements of tanks at these sites to improve control. It is currently forecast that that this complex project will be planned in AMP9/10 for delivery in AMP10/11.

**Improvements to SEWCUS monitoring, control and automation;** The long term vision is that Welsh Water will be in a position to remotely control the strategic network to optimise cost and raw water resources, increase the resilience of our network and maintain our strategic mains so that they are conditioned to allow variations to and bidirectional flow without any adverse impact on our customers. This vision has been developed into the SMART programme under an AMP 6 project entitled Network Optimiser and Control System (NOCS). The NOCS project will install asset control software alongside DCWW's Telemetry system to optimise pumping and available raw and treated water resources. The system to be installed is Suez's 'AquaAdvanced Energy' and whilst SEWCUS is targeted for the initial installation, it is anticipated that this will roll out across the company over the upcoming AMP periods.

Development of mains conditioning processes and protocols as business as usual over the next 5-10 years to enable bidirectional flow through SEWCUS. The installation of improvements to flow, pressure and quality monitoring, actuation of key valves will facilitate the ability to provide flow through the system on a bidirectional basis. This will improve resilience, provide additional water supplies from East to West and West to East within SEWCUS.

The programme of improvements is part of our SMART networks programme the objective of which is to provide more real time data, data analytics and to proactively identify and control issues across the strategic network. The first phase of this upgrade work will be undertaken during AMP7 to improve monitoring, control and automation across SEWCUS and other strategic mains.

**Optimisation of Cost to Serve for SEWCUS;** the improved strategic linkage and improvements to the capacity and reliability of WTW will further improve the cost optimisation of the water supply using the most cost effective source. At present the WTW in the North of SEWCUS are supplied from raw water sources that both fill and supply them by gravity. In the East of SEWCUS two WTWs Court Farm and Sluvad rely on raw water from river sources which has to be pumped to raw water storage at Court Farm WTW and Llandegfedd impounding reservoir. In the case of Sluvad further raw water pumping is required to transfer the water from the Llandegfedd impounding reservoir to the WTW. Consequently there is a high level of power cost involved in addition to the variable treatment costs for water treatment costs including; WTW power, sludge and chemicals.

With improved connectivity and the new Merthyr WTW in place the opportunity to optimise operational costs and using the gravity raw water sources when available and minimising energy costs in the East of SEWCUS during this period.

**Optimisation of the SEWCUS UTUBE for Growth;** Cardiff and the surrounding area has seen a considerable volume of development in recent years which is also expected to be sustained for the foreseeable future. The Key assets within the system have been reviewed while considering the in-combination effect of multiple developments. The main areas highlighted from the model has indicated that the Llwynon mains do not supply enough to meet demand. The model also highlights that the Talybont main restricts the volumes of water that could be used to support Cardiff. The current zone set up is also been seen to be a limiting issue and will need re-configuration and cleaning to enable reverse flows and support a more resilient water supply strategy A programme of work has been established to reduce the impact from Growth

**Improve Conjunctive Use to Rhondda and Cynon Valley;** The Need to work on Castell Nos the main source within the Cynon Valley highlighted the risk to WTW's that have a single source of supply within our SEWCUS WRZ It has also been established that there is a similar situation within the Rhondda Valley. This has highlighted that the area is not conjunctive with the rest of the SEWCUS WRZ. A Study has highlighted the option to supply the area via the Rhondda Link main.

The South Wales Strategic Pipeline Strategy will continue to develop as improvements are completed, hydraulic model scenarios developed, to incorporate the latest thinking regarding SMART and the monitoring, control and data analytics upgrades made to the network and the programme of improvements and rationalisation of water treatment works is undertaken to deliver the Strategic Area Improvement Plans. The strategy will continue to develop as resilience, demand, growth, water resources and operational flexibility improve across South Wales over the next 40 years.

Appendix 1 – South Wales Strategic Pipeline Improvements Schematic