

Draft

Drought Plan 2020:

Annex 1p – Mid and
South Ceredigion WRZ

March 2019

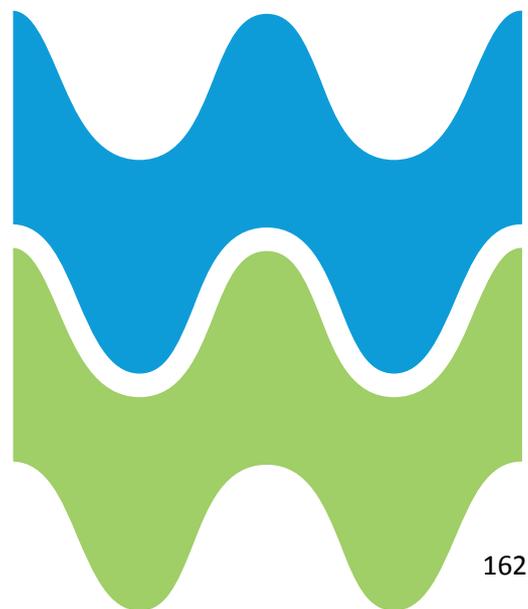


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1. Mid and South Ceredigion – WRZ Reference no. 8202

1.1. Mid and South Ceredigion Water Resources Overview

The Mid and South Ceredigion zone covers the full length of the Afon Teifi and a large portion of Cardigan Bay, extending from St Dogmaels in the south, northwards to Llanrhystud (see Figure 1).

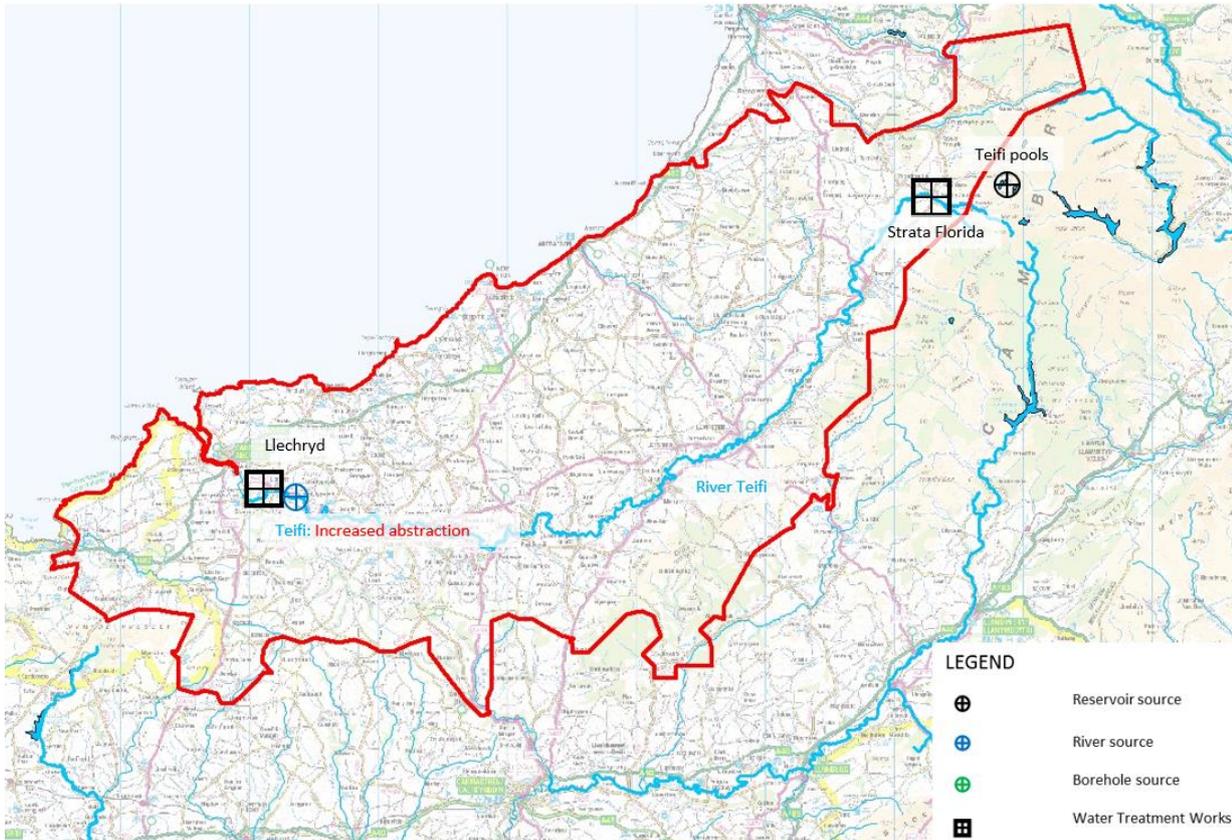


Figure 1 - Map of the Mid and South Ceredigion WRZ

The zone is supplied from two key sources; the Teifi pools reservoir group in the upper Teifi catchment, and a river abstraction from the lower reaches of the Afon Teifi. A list of our raw water sources for the zone is presented in Table 1.

Site Name	Licence No.	Source Type	Status
River Teifi at Llechryd	22/62/8/03/0005	River Abstraction	Operational
Lyn Teifi, Pondygwaith, and Llyn Egnant	22/62/01/0057 and 22/62/01/0087	Impounding Reservoirs	Operational
Aeron borehole	Previously licence exempt	Groundwater abstraction	Mothballed

Table 1 - Licenced sources in the Mid and South Ceredigion WRZ

Strata Florida water treatment works, located near Pontrhydfendigaid, is supplied by the three small reservoirs which comprise the Teifi pools, namely Llyn Teifi, Llyn Egnant, and Pond y Gwaith. Only Llyn

Teifi and Llyn Egnant directly supply the works, with Pond y Gwaith transferring its water to Llyn Teifi. Strata Florida supplies customers along the catchment of the Afon Teifi as far as Llandysul.

Llechryd water treatment works, located just to the east of Cardigan is supplied by an abstraction from the Afon Teifi. The amount of water we can take from the Afon Teifi is unlikely to be restricted by low flows in the river. We balance the way we supply the zone between the reservoir and river sources to make best use of the available water during dry or drought years. There are no imports or exports of water.

1.2. Drought Triggers

The drought status of the zone is assessed by the reservoir storage position at any time in relation to the Drought Action Zones (DAZs), defined for the combined storage of the Teifi pools. The use of the DAZs are described in more detail in Section 2 of the main report and are shown in Figure 2 below.

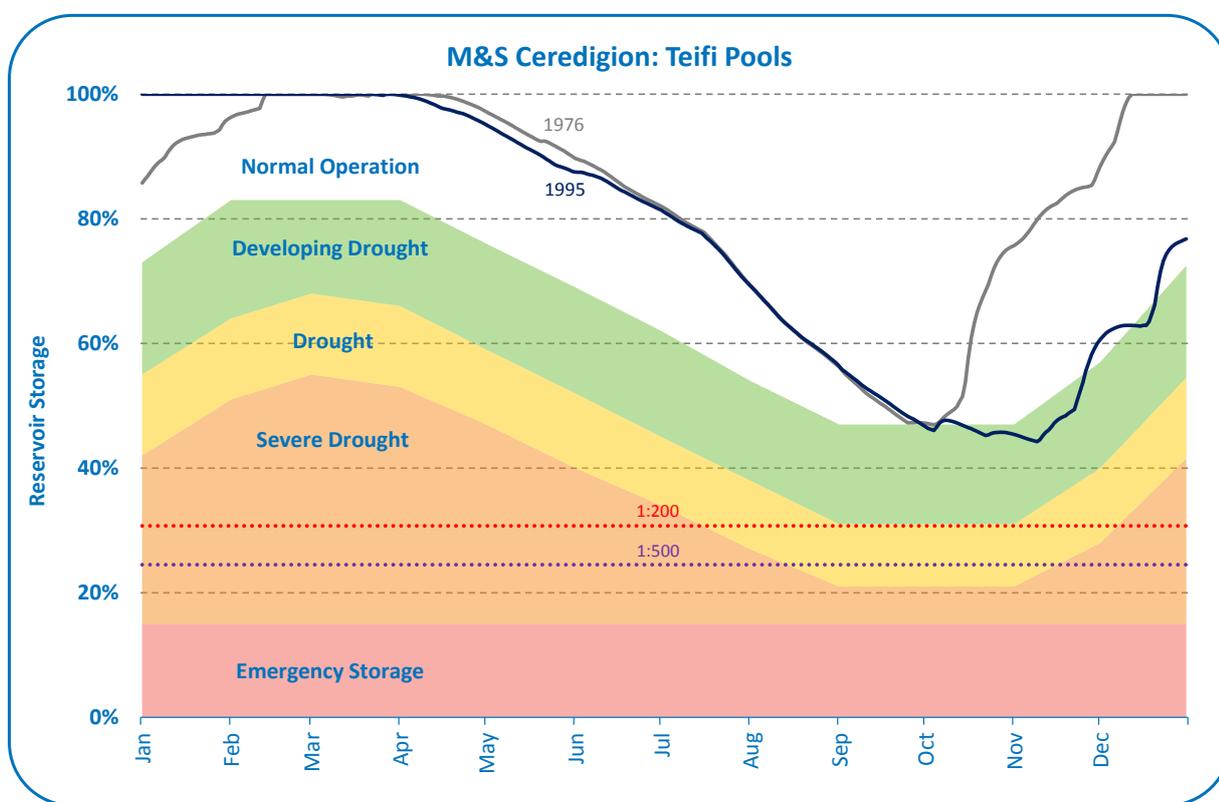


Figure 2 - Teifi Pools Drought Action Zone and results of scenario testing

1.3. Assessment of Drought Risk

The reported supply demand balance at WRMP19 shows the zone to be in a healthy position with a forecast 3.51 MI/d surplus at 2024/25, increasing to 6.67 MI/d by 2049/50. Application of the Drought Vulnerability Framework (DVF) screening methodology classified the WRZ as low risk to drought and so only a simple approach was required to test the system performance under more extreme drought events.

However, the performance of our reservoirs during the summer of 2018 gave us some concerns that there may be a higher drought risk than initially identified. Taking a precautionary approach we subsequently re-classified as moderate risk of severe drought impact, primarily due to the level of uncertainty around the inflow sequences we use in our water resource modelling.

Drought risk for the zone is undertaken through assessment of the combined storage position in Llyn Teifi, Llyn Egnant and Pondygwaith (collectively known as the 'Teifi Pools' reservoir group) against the DAZs we have defined, as shown in Figure 2. The flow record used for scenario testing covers the period 1960 – 2015 and so encompasses the known drought events of 1976, 1984, 1989 and 1995.

Using Extreme Value Analysis techniques, an estimation of the level of drawdown we could see at the Teifi Pools, under 1:200 year and 1:500 year (i.e. events with a 0.5% and a 0.2% chance of occurring in any year respectively) drought return period scenarios were produced. The results in Figure 2 show that even during these more severe drought events, reservoir levels would not fall to into the Emergency Storage DAZ and so there is minimal risk of us needing to implement extreme supply side measures. Reservoir levels could fall into the Severe Drought Action Zone and so we still need ensure that during a drought, we carefully manage our water resources.

We are working to increase the accuracy of our inflow sequences for the Teifi pools, as the data we currently use does not model reservoir drawdowns and recoveries as well as we would like. During the development of this Plan, a variety of techniques were tested, such as transposition of flows from gauged local catchments, and the development of Catchmod models, none of which yielded improvements from previous transposed flows. This may in part be due to the stark differences of the catchment of the Teifi pools compared to local donor sites. To improve our understanding of the hydrology, we are installing a weir at Llyn Teifi to produce direct measurement of spill from the reservoir through the winter, and will be looking to survey the assets which govern the transfer from Pondygwaith.

Overall, our scenario testing and Extreme Value Analysis tell us that the risk of needing to implement extreme supply side measures (i.e. widespread pressure management or water rationing) is negligible but that during these severe drought events, we need to ensure careful management of our water resources as reservoir storages will fall to levels we have not experienced before. To provide an additional level of drought resilience, we have retained one environmental supply side option to provide extra water resource, in the event that this is required. Section 1.5 provides details of this.

1.4.Drought Management of the WRZ

As the identified drought risk in the zone is low then our water resources management philosophy is to ensure we operate our water resources in line with our control curves and take all necessary actions in good time, in order to maintain this high level of drought resilience and balance

The following sections describe the operation of the zone as we move into a drought period and the actions that we will take to ensure that we minimise the impact on customers. In the event of extreme drought we have an option to increase the quantity of water resource available for public water supply, details are outlined together with supporting summary information on the requirements of this option in Section 1.5.

1.4.1. Normal Action Zone

During normal weather conditions we optimise our sources to minimise the cost of operations. In the Mid and South Ceredigion zone this means that we make maximum use of Strata Florida treatment

works that gravitate supplies to our customers, extending the area of supply to Llandysul and Pencader. The area of supply from Llechryd is minimised to as far as Horeb in the central region of the zone

As reservoir storages start to decline we make small, stepped reductions in the supply area of Strata Florida. The reduction in supply from Strata Florida is offset by increasing the supply from Llechryd, which incrementally picks up demand in the Llandysul and Pencader areas.

1.4.2. Developing Drought Action Zone

As reservoir storages move into the developing drought action zone, the operations which may be necessary to preserve resource are less frequently undertaken. This increases the risk of the operations impacting our customers, and so to authorise these activities, the 'Gold' incident command centre will convene. In 2018, a Silver command centre operated out of Carmarthen to govern the local response to the dry weather, taking instruction from the Gold command and coordinating the local teams involved in making the appropriate changes to our networks.

Making the necessary changes to our water supply networks allows us to pump more water from the Llechryd system into areas normally supplied by Strata, such as Cwrt-newydd, Llanllwni, and Brechfa. Depending on the total demand in the zone, this may increase the supply of Llechryd as far northwards as Lampeter. This reduces Strata treatment works to its minimum operating level and accordingly lowers the demand on the Teifi pools.

1.4.3. Drought Action Zone

Once all changes to our water supply systems have been made and both Llechryd and Strata Florida treatment works are running at their sustainable maximum outputs, the operation of the zone will be fully optimised to preserve water resource. As reservoir storage enters the Drought Action Zone we will prepare to bring the Aeron borehole back into supply for nearby industrial customers. We will need to ensure that this source is compliant with relevant water quality standards prior to being used.

In the event that dry weather continues and our forecasts indicate that storage may continue to decline, we will start preparations to request our drought order. Our modelling shows that this would be an unprecedented level of drought, far beyond that seen in our historic records. This permission from NRW and Welsh Government would enable us to take more water from the Afon Teifi at our Llechryd abstraction point. To support this request, we will commence environmental monitoring in line with our Environmental Assessment Reports (Appendix 24) and submit our application for the option identified in Section 1.5.

1.4.4. Severe Drought Action Zone

Although the risk of reaching the Severe Drought action zone is very low if we are in this position, subject to receiving the necessary permissions from NRW and Welsh Government, we would implement our Drought Order scheme. As set out in Section 1.5, the option available to us is to increase the abstraction from the Afon Teifi at Llechryd. This option will allow us to increase the output of Llechryd treatment works and further reduce the supply required from Strata Florida works. Depending on the timing of this option, it will either preserve storage in the Teifi Pools, which will enable us to maintain customer supplies for longer, or increase the rate of recovery of the Teifi Pools, in order to ensure winter refill.

1.5. Supply-side drought management action

Table 2 provides the information required by Appendix G of NRW's Water Company Drought Plan Technical Guideline (Dec 2017). The table summarises the key information from within the associated Environment Assessment Reports including any potential environmental impacts, risks to the scheme implementation and any necessary mitigation that may be required.

Action Implementation Assessment	Name:	Increase the Llechryd abstraction from 19 MI/d to 21 MI/d and obtain variation of annual licence amounts
	Trigger(s)	Combined storage of Teifi Pools crossed into Severe Drought Action Zone.
	Deployable Output or yield of the action	2 MI/d yield
	Location	Afon Teifi at Llechryd
	Implementation timetable	Preparation time: We assume a decision from Welsh Government within 28 days of submitting the Drought Order application. The practical implementation of the option could be effected immediately. Time of year effective: The option is most likely to be implemented during the summer period. Duration: Drought orders are valid for up to six months, but it would be removed sooner if water resources have returned to adequate levels to safeguard future water supplies, as agreed with the Welsh Ministers.
	Risks associated with action	The application, as applied for, is not approved. Increases in abstraction have potential environmental impacts. These will be assessed through the EAR submitted with the application.
	Other considerations	N/A
Environmental Assessment: alone & in-combination	Risk to the Environment	Reduced flow in the Afon Teifi
	Summary of likely environmental impacts	The EAR has concluded that there is potential for negligible impact on flows in the Afon Teifi, leading to negligible impacts on the physical environment of the river, including water quality. Because these impacts are negligible, further environmental assessment has not been required.
	Baseline information used	Hydrological data: <ul style="list-style-type: none"> • Daily abstraction data from Llechryd River intake • NRW river gauging at Glanteifi flow gauge on the Afon Teifi <p>Baseline ecological data has not been required because the EAR concluded there to be negligible impact on flows.</p>
	Summary of additional monitoring requirements	Screening has not identified any environment features for which environmental assessment is required and, therefore, no feature specific monitoring will be required. However, the EAR recommends that current hydrological monitoring should continue during the development of drought conditions and implementation of the drought order to monitor and confirm baseline conditions.
	Mitigation & Compensation measures	The mitigation measures that could be considered at the on-set of drought, during implementation of the drought permit and post-drought permit implementation include: <ul style="list-style-type: none"> • Temporary reduction or cessation of the terms of the Drought Order/Permit • Fish distress monitoring with triggers and response plan • Protection of 'spate flows' • Reduction of fish predation • Physical in-river works • Provision of alternative compensation flows • Provision of alternative water supplies if other water users are at risk of derogation. <p>Potential mitigation measures have also been proposed and further discussion with NRW is required in order to develop suitable mitigation measures.</p>
	Impact on other activities	A reduction in flows on the Afon Teifi has negligible potential impact on landscape, visual amenity and archaeology.

	Any permissions or approvals required and constraints that apply	N/A
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Table 2 - Option 8202-1 Increase the Lechryd abstraction by 2 Ml/d and obtain variation of annual licence amounts