

Draft

Drought Plan 2020:

Annex 1e – Tywyn
Aberdyfi WRZ

March 2019



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1. Tywyn Aberdyfi – WRZ Reference no. 8021

1.1. Tywyn Aberdyfi Water Resources Overview

This water resource zone covers the small coastal area around the towns of Tywyn and Aberdyfi in Mid Wales, see Figure 1. There are approximately 4,700 customers in this zone but the demand can increase significantly during the summer due to tourism.

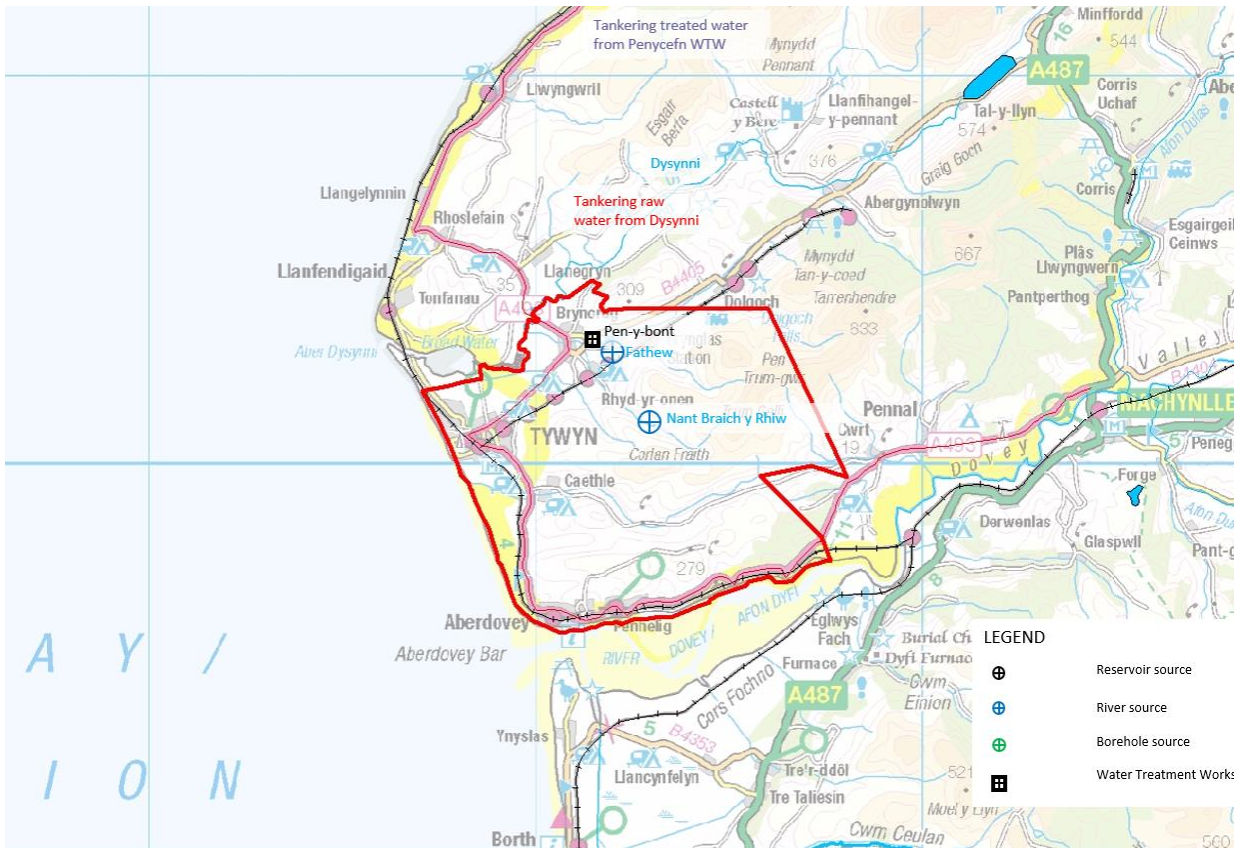


Figure 1 - Map of the Tywyn Aberdyfi WRZ

The water resources within the zone consist of two small river abstractions, the Nant Braich y Rhiw and the Afon Fathew (see Table 1). Penybont is the only treatment works in the zone and is fed from the river abstractions. The Nant Braich-y-Rhiw abstraction licence includes a condition which prevents us from using this source when the river levels are low. This comes into operation in most summers which means we are then wholly reliant upon the Afon Fathew to meet our customer demand.

Site Name	Licence No.	Source Type	Status
Nant Braich y Rhiw	23/64/13/0032	River Intake	Operational
Afon Fathew	23/64/13/0031	River Intake	Operational

Table 1 - Licensed sources in the Tywyn Aberdyfi WRZ

There are no exports or imports of water from this zone.

1.2.Drought Triggers

As set out in Chapter 2 of our Plan, our water resource zones use Drought Action Zones (DAZs) to assess their drought status at any given point in time. The DAZs are generally based on storage levels in our impounding reservoirs where these are the dominant source of supply, or customer demand for those zones where we do not have storage. In our 2015 Drought Plan, for the Tywyn Aberdyfi zone we used DAZs based on levels of demand however, subsequent analysis undertaken for our 2019 Water Resources Management Plan (WRMP19) concluded that drought risk in the zone is driven from a lack of water resource rather than a restriction in water treatment capacity.

Although flows in the Afon Fathew remained above the level of abstraction we required during the drought of 2018, there is a real risk that the water available in the river could drop below the level of abstraction required to meet demand during severe drought. In order to trigger the necessary drought management actions, we have defined a set of Drought Action Zones based on flows in the Afon Fathew. However, due to the flashy nature of the Afon Fathew and the uncertainty we currently have in our attempts to replicate the river flows in our water resource models, it has been difficult to define a set of triggers that will give us enough time to fully implement all our demand management actions before river flows fall to very low levels.

It is important when setting these trigger points that they are not overly precautionary to the extent that we implement actions most years, as this will reduce the impact of any measures when they are really needed. We have therefore decided to keep the action zones at a level where we would implement measures reasonably close to our Emergency Action trigger point but will supplement them with real time river flow monitoring that will automatically notify us in advance of river flows dropping to these levels. We will monitor our customer demand on a daily basis and then use all this data to make an informed decision on the timing of any drought action implementation.

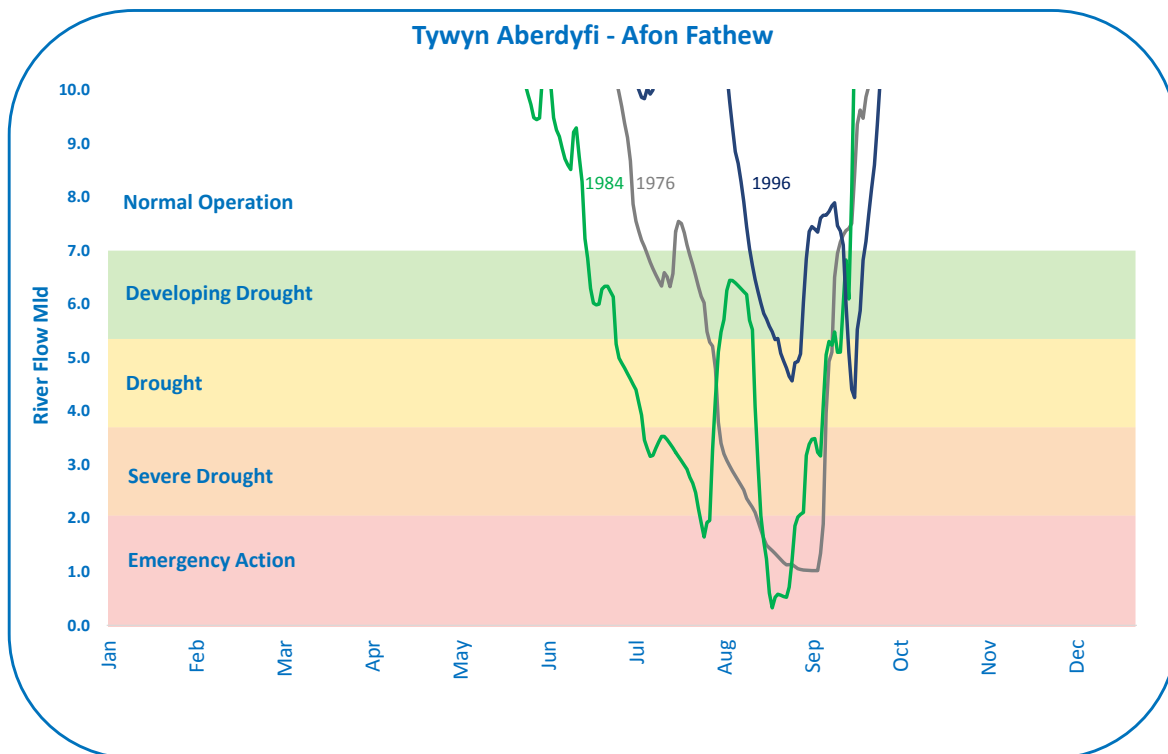


Figure 2 - DAZ for Tywyn Aberdyfi - based on flow in the Afon Fathew

1.3. Assessment of Drought Risk

1.3.1. Scenario Testing

Drought resilience assessment work undertaken for WRMP19 indicated that there is a risk we may need to implement wide spread pressure management and local water rationing options due to a shortage of raw water to meet our customer's demand, for drought events more severe than a 1:60 return period.

For this Drought Plan we have followed the methodologies outlined in the Drought Vulnerability Framework to examine our drought risk in greater detail. We have used advanced statistical techniques to generate more extreme drought events against which we can test our supply systems. Our baseline drought scenario testing encompasses the period 1958 – 2015 and includes the known drought events of 1959, 1976, 1984, 1989 and 1995. Figure 2 shows that if we were to experience a repeat of the conditions seen in 1976 then river flows in the Afon Fathew would fall below the level required to meet our customer demand and so additional measures would be needed. It is therefore clear that currently we are not resilient to more extreme droughts such as those of a 1:200 or 1:500 return period frequency.

Although there is a risk of not being able to meet all our customer demand from the Afon Fathew, the shortfalls in volume will be relatively small. Therefore in the short term we are confident we could manage the drought risk by tankering additional supplies from neighbouring WRZs. However, given the forecast of hotter/ drier summers under climate change, the delivery of our WRMP19 scheme with a new intake on the much larger Afon Dysynni is a key action for us to complete. This will allow us to comfortably meet customer demand in the area in even the most extreme droughts. For this plan we have retained the Drought Permit option to allow us to temporarily take water from the Afon Dysynni until such time as the permanent scheme is in place.

1.3.2. Drought Response Surface

In order to provide the outputs necessary to produce the Drought Response Surface (DRS) charts, an amended version of the DVF 1b methodology was taken whereby for drought durations of 3, 6, 12 and 18 month durations each month, the daily means flows are compared against the demand for the zone with the 'failure' calculated as *the number of days where flow < demand*. Full details of the approach taken in Tywyn Aberdyfi are given in Appendix 1.

The key conclusions that can be drawn from the DRS (Figure 4 and 4) is that significant risk exists (flow < demand for up to 1 week) for return period events of between 1:50 and 1:100 whilst more significant risk exists (flow < demand for up to 1 month) for return period events between 1:100 and 1:200. The lack of storage in the WRZ means that we are vulnerable to extremely hot, dry summers where river levels will be very low. The risks are therefore higher for short term events (i.e. 3 to 6 months duration) as it is very unlikely the river flows would become so low in the winter. The orange boxes in the DRSs below for 12 and 18 month durations just reflect the extreme low flows in the summer during that longer period.

Figure 5 and Figure 6 show the effects of climate change upon our drought risk and highlight the potential for the 'failures' to become much more severe in terms of their frequency and duration, with shortfalls in supply for up to a week likely to occur much more regularly than once every fifty years.

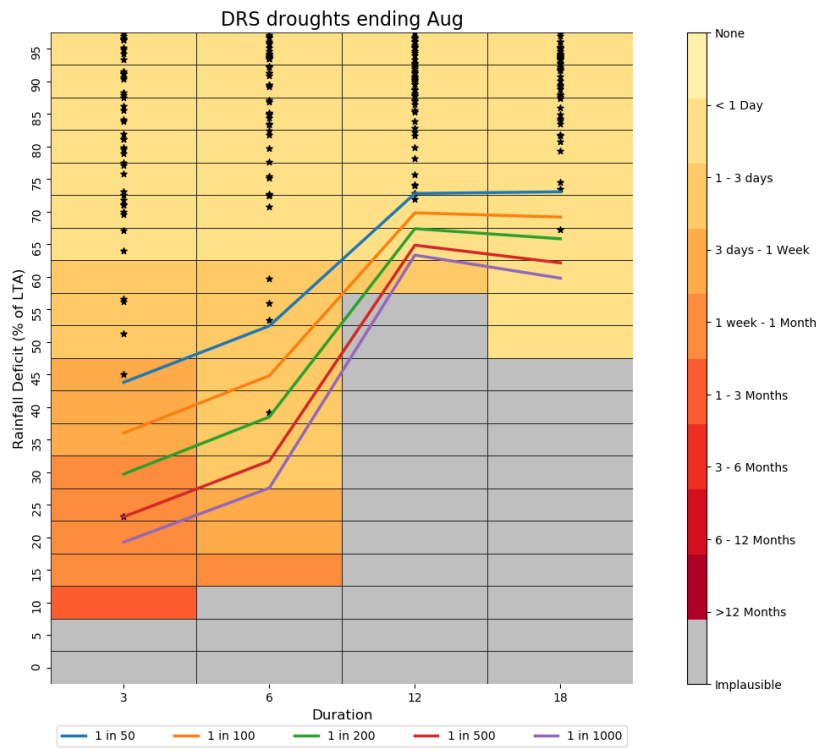


Figure 3 - DRS for Tywyn Aberdyfi - droughts ending in August

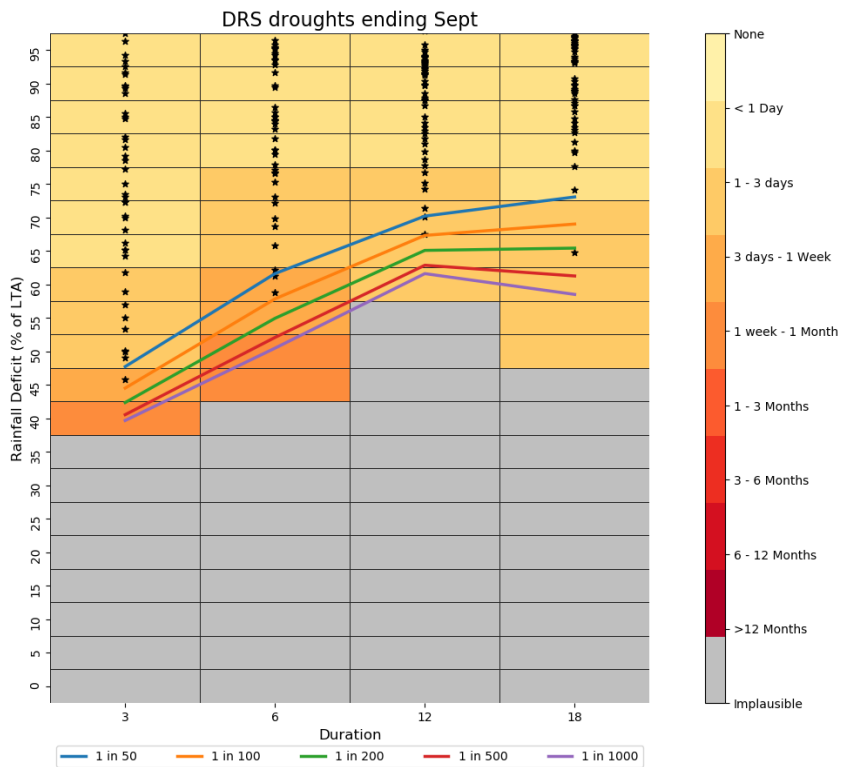


Figure 4 - DRS for Tywyn Aberdyfi - droughts ending in September

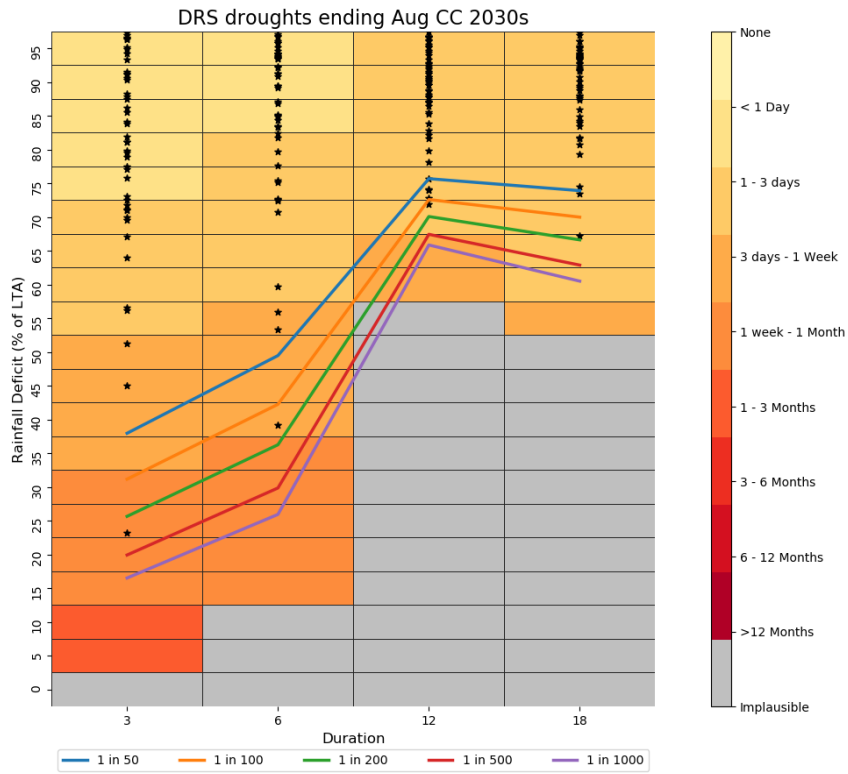


Figure 5 - DRS for Tywyn Aberdyfi - droughts ending in August with the effects of climate change

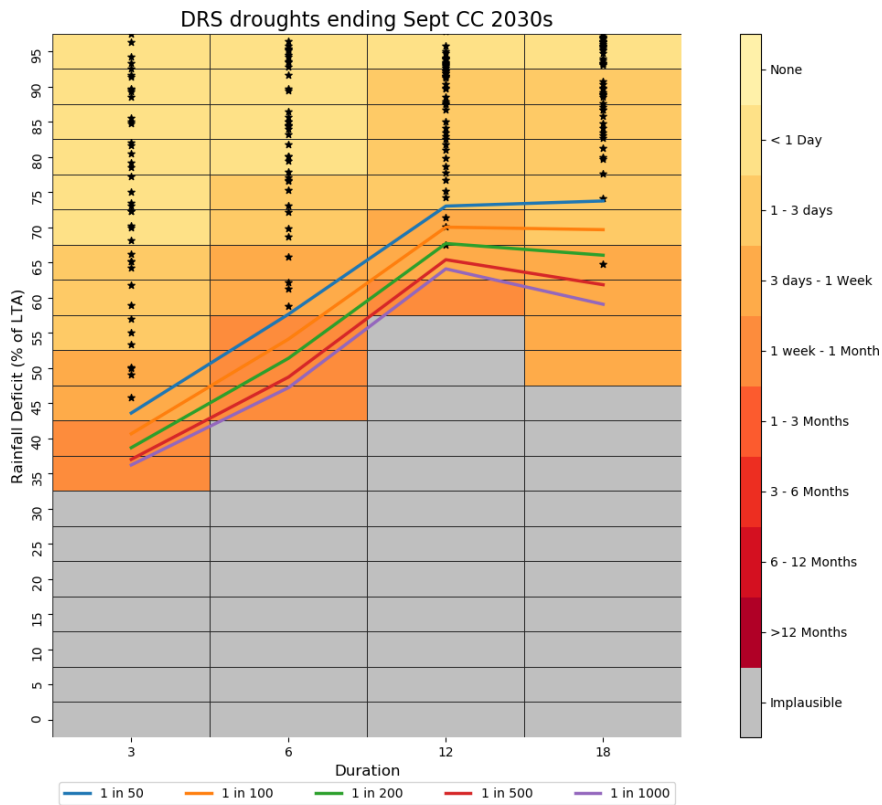


Figure 6 - DRS for Tywyn Aberdyfi - droughts ending in September with the effects of climate change

1.4.Drought Management of the WRZ

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 our customers. In the event of extreme drought, options to increase the quantity of water resource available for public water supply may be required e.g. abstraction and/or tankering from the Dysynni.

1.4.1. Normal Operation

During normal weather conditions we use both the Nant Braich y Rhiw and Afon Fathew sources and blend the water at Penybont where it is treated. The Nant Braich y Rhiw abstraction licence does not allow us to abstract from this source when the flow in the river is below 0.95 Ml/d, this occurs most summers. During this time we are then solely reliant on the Afon Fathew.

1.4.2. Developing Drought Action Zone

As the river flow moves into the developing drought action zone, the 'Gold' command centre may convene. Experience from the prolonged dry weather of 2018 demonstrated the effectiveness of having this clear structure in place for decision making; local dry weather action plans were produced by our Water Resources team and updated and issued regularly to 'Gold' command, who then provided management of the response required across all the teams involved and coordinated activities.

In the developing drought zone we will review the tankering plan to ensure that if the dry weather continues and river flows recede, we will be able to maintain customer supplies without imposing any demand restrictions. We will increase our leakage effort and targeting to reduce losses on the network.

We will be closely monitoring river levels in the Afon Fathew to provide us with additional data we can use to help us take appropriate management actions.

1.4.3. Drought Action Zone

In the event that dry weather continues we will consider tankering treated water, probably from the Penycefn Treatment works in the neighbouring South Meirionydd zone. The amount of water required is likely to be small and just enough to support the abstraction from the Afon Fathew and meet the shortfall.

If we become concerned about our ability to meet the demand from the Fathew alone and suspect that we may not be able to continue the tankering support (due to reservoir levels in Llyn Cynwch or treatment capacity in Penycefn) we will consider implementing temporary use bans (hosepipe bans) and will submit our drought permit application to Natural Resources Wales (NRW). This permission from NRW will enable us to abstract raw water from the Afon Dysynni to supplement our existing abstraction from the Afon Fathew. To support this request, we will commence environmental monitoring in line with our Environmental Assessment Reports (Appendix 13).

1.4.4. Severe Drought Action Zone

In the very unlikely situation that river flows enter the Severe Drought Zone and we are concerned that we may not be able to tanker enough treated water, we will look to implement non-essential use bans and subject to having gained approval from NRW, will implement our drought option to commence abstracting raw water from the Afon Dysynni to be treated at our Penybont WTW.

1.5. Supply-side drought management action

Until our WRMP19 scheme to develop a permanent source of abstraction from the Afon Dysynni is in place, our scenario testing shows we are running a risk and so we have retained a drought permit option that will wholly mitigate this. Table 2 below 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 (EARs) including any potential environmental impacts, risks to the scheme implementation and any necessary mitigation that may be required.

Action Implementation Assessment	Name:	Tankering raw water from Afon Dysynni
	Trigger(s)	River flow in the Afon Fathew crosses into Severe Drought Action Zone.
	Deployable Output or yield of the action	1 MI/d yield
	Location	Afon Dysynni in the Pont y Garth area
	Implementation timetable	Preparation time: We assume a decision from NRW within 14 days of submitting the Drought Permit application. The practical implementation of the option could be effected within one week. Time of year effective: The option is most likely to be implemented during summer and autumn period. Duration: Drought permits are valid for up to six months, but implementation is most likely to be shorter than this.
	Risks associated with action	The application, as applied for, is not approved.
	Other considerations	May need a Flood Risk Activity Permit if sandbags are using to make a temporary impoundment across a section of the river
Environmental Assessment: alone & in-combination	Risk to the Environment	Reduced flow in the Afon Dysynni
	Summary of likely environmental impacts	The hydrological assessment has concluded that there is a negligible impact on river flows as a result of implementing the drought permit. Consequently, there are negligible impacts on the physical environment of the river, including water quality.
	Baseline information used	Hydrological data: <ul style="list-style-type: none"> • Daily abstractions from Bryncreg intake, Afon Fathew • Daily abstractions from Braich y Rhiw intake, Nant Braich y Rhiw • Daily stream flows in the Nant Braich y Rhiw • NRW flow gauge data from Pont y Garth weir on Afon Dysynni
	Summary of additional monitoring requirements	Screening has not identified any environment features for which environmental assessment is required, however the EAR recommends continuance of current hydrological monitoring should drought conditions develop.
	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	Due to the negligible hydrological impact of the drought permit, the EAR has identified negligible impact on landscape, visual amenity, recreation and archaeology.
	Any permissions or approvals required and constraints that apply	May need a Flood Risk Activity Permit if sandbags are using to make a temporary impoundment across a section of the river

Table 2 - Option 8021-1 Tanker Raw water from the Afon Dysynni