

Draft

# Final Drought Plan

2022

## Appendix G: Compensation only reservoirs



# 1 Introduction

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United Utilities has 12 compensation only reservoirs which have no connection to any of the public water supply reservoirs. Their only purpose is to provide a compensation flow release to the downstream river for environmental protection. As part of the recent guidance it is the Water Companies responsibility to monitor and prepare a drought order for a compensation only reservoir to allow the compensation to be reduced to ensure it is sustainable during drought conditions. It is the Environment Agency's responsibility to submit the drought order to Defra

Following Environment Agency guidance published in 2019<sup>1</sup>, we have agreed our compensation only reservoirs with the Environment Agency and have created drought triggers and corresponding actions. This Appendix details the drought triggers and associated actions for each reservoir.

This Appendix also assesses the risk of each compensation only reservoir needing a drought order to reduce its compensation flow during drought conditions. Our assessment has identified that no compensation only reservoirs require an on-the-shelf application including an environmental assessment. If this situation alters then we will produce the required application documents in line with the drought triggers assigned to the reservoir.

Ennerdale Water and Crummock Water are included as this drought plan takes into account the Thirlmere transfer and the abstraction licences at both of these sources being revoked; after which they will become compensation only reservoirs.

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<sup>1</sup> Position note on compensation-only reservoirs in dry weather (Environment Agency, June 2019)

# 2 Compensation only reservoirs

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We have agreed with the Environment Agency that United Utilities has the following compensation only reservoirs:

- Belmont
- Blackmoss Upper and Lower
- Borrans
- Crummock
- Dubbs
- Ennerdale
- Hoddlesden
- Hollingworth
- Meadley
- Rumworth
- Swineshaw, Glossop
- Worthington system

All of these reservoirs have no connection with other reservoirs in the United Utilities system to provide support during a drought, or to provide water for public water supply. The only purpose of these reservoirs is to provide water for the environment via a compensation flow release to the downstream rivers.

## 2.1 Resilience of compensation only reservoirs

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An assessment as to the resilience of each of the compensation reservoirs was undertaken to understand its vulnerability to a drought and the supply of compensation flow. Depending on the resilience of the reservoir this would determine the likely requirement for a drought order.

For each compensation only reservoir the storage was divided by the compensation flow (plus over-release<sup>2</sup>), where the number of days of supply was greater than 100 days (over three months) these reservoirs are considered resilient, as it would only be in a severe drought that all inflows to a reservoir would dry up. These reservoirs would therefore be considered low risk of the requirement for a drought order.

The reservoirs with less than 100 days storage were then analysed in detail to understand if the inflows and historic storage suggested that there was a risk to the compensation. Where the yield is greater than the compensation flow then this would suggest a reasonable level of resilience, this has been fed from analysis which Atkins undertook for the Environment Agency in 2018.

As well as looking at the storage and yield of the reservoirs against the compensation flow, the historic trends were also analysed. Where historically the trend showed a potentially different risk to the analysis, the catchment controllers were asked about the historic performance of the reservoirs, challenges and resilience of the reservoir.

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<sup>2</sup> The compensation over release is the amount of flow released above the statutory compensation flow to ensure compliance

Where the risk has been altered due to the historic trends and discussion with the catchment controller an asterisk has been placed beside the risk.

Table 1 the risk to compensation flow for each compensation only reservoir

Reservoirs	Number of days of supply of compensation flow with no inflows <sup>3</sup>	Yield is higher than the compensation flow (Atkins study)	Risk
Belmont	100+	Yes	Low
Blackmoss U+L	100+	Yes	Medium*
Borrans	75+	Yes	Low*
Crummock Water	75+	Not included	Low* <sup>4</sup>
Dubbs	100+	Yes	Low
Ennerdale Water	100+	Not included	Low
Hoddlesden	50+	No	Low*
Hollingworth	100+	Yes	Low
Meadley	50-	No	Medium/High*
Rumworth	100+	Yes	Medium/High*
Swineshaw	100+	Yes	Low
Worthington system	100+	Yes	Low

\* Where the risk has been altered due to the historic trends and discussion with the catchment controller

## 2.2 Low risk compensation only reservoirs

For the reservoirs which are considered low risk, no on-the-shelf environmental assessment has been created, this is because the likelihood of requiring a drought order at these sites is low. If a reservoir were to start crossing drought triggers, then the likelihood of requiring a drought order will be assessed and if required the application process started.

In our previous drought plans Ennerdale Water was considered a high risk reservoir in regards to the requirement for a drought order, however with the removal of the abstraction licence there is no future requirement for a drought order. The compensation flow can be provided without intervention down to 2.68m BTWL, this significantly improves the resilience of Ennerdale Water compared to previous drought plans.

## 2.3 Medium risk compensation only reservoirs

There are compensation only reservoirs which have less than 100 days storage, and the yield is greater than the compensation flow with no inflows: Borrans and Crummock Water.

Borrans was included in the Atkins study which determined that the yield of Borrans is higher than the statutory compensation flow requirement; showing the reservoir was more resilient than the storage alone suggests. The likelihood of requiring a drought order at Borrans is considered low and no on-the-shelf environmental assessment has been created.

Crummock was a supply reservoir, however with the commissioning of the Thirlmere transfer scheme the abstraction licence was revoked, and Crummock became a compensation only reservoir. The yield of Crummock was calculated in Hydro-Logic® Aquator and was higher than the compensation flow requirement, therefore showing the

<sup>3</sup> This is based on net storage of the reservoir

<sup>4</sup> Crummock has been assessed as a medium risk, however due to modelling the risk has been categorised as low

reservoir was more resilient than the storage alone suggested. The likelihood of requiring a drought order at Crummock is considered low and no on-the-shelf environmental assessment has been created.

If either Borrans or Crummock were to start crossing drought triggers, then the likelihood of requiring a drought order will be assessed and if required the application process started.

Blackmoss Upper and Lower were moved into the medium category, this is because historic trends show that the reservoir has crossed the new drought triggers on a more regular basis than expected. The new drought triggers allow more meaningful monitoring to take place and therefore will allow action to take place sooner and potentially reduce the risk.

## 2.4 High risk compensation only reservoirs

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There are two compensation only reservoirs which have less than 100 days storage of compensation flow with no inflows and the yield of the reservoir is less than the statutory compensation flow requirement: Hoddlesden and Meadley. This suggests that the storage in the reservoir is not sufficient to protect the compensation flows and that inflows are likely to be less than the statutory compensation flow requirement.

Hoddlesden, when reviewed, showed a greater resilience than the number of days storage and the calculated yield suggests as the reservoir is very rarely below top water level. The resilience of Hoddlesden in the recent dry weather in 2018 and 2020 suggests that the inflows are sufficient to provide confidence in being able to provide the compensation flow and therefore no on-the-shelf environmental assessment has been created, and the risk reduced to low.

The compensation flow at Meadley has previously been assessed and accordingly reduced to make it more sustainable, this has improved its resilience. In the recent 2018 and 2020 dry weather, Meadley was able to supply the required compensation, therefore no on-the-shelf environmental assessment has been created. The risk for Meadley has been reduced slightly to Medium/High, due to the historic data and the reduction made to the compensation flow to improve the sustainability of the compensation flow.

If either Hoddlesden or Meadley were to start crossing drought triggers, then the likelihood of requiring a drought order will be assessed and if required the application process started.

Rumworth was moved into the Medium/High category, because historic trends show that the reservoir cross the new drought triggers on a more regular basis than expected. The new drought triggers allow more meaningful monitoring to take place and therefore will allow action to take place sooner and potentially reduce the risk.

# 3 Drought triggers for compensation only reservoirs

Prior to the recent guidance none of these reservoirs had any triggers set on them, however as part of the new position statement regarding compensation only reservoirs written by the Environment Agency, triggers have been defined and agreed. Table 2 sets out the drought triggers and the relevant actions when the drought trigger is crossed for the compensation only reservoirs.

Table 2 Drought trigger actions for compensation only reservoirs

Drought Trigger	Action
1	Increase in monitoring of the reservoir level Confirm compensation release through gauging and adjust if necessary Assess rate and reason for reduction in storage
2	Forecast potential need for a drought order* Liaise with Environment Agency and Natural England Review requirement for environmental monitoring
3	Depending on the forecast, start application for a drought order* Undertake environmental monitoring and actions ( e.g. fish rescue) if required Produce contingency plan
4	Implement drought order (there is no requirement for a TUB to be in place as it is a compensation only reservoir and has no impact on public water supply) Review contingency plan in case of reaching dead water
Dead water	Undertake contingency plan

\*Based on current drought triggers, the commencement of a drought order application is from trigger 3 and is based on the number of day's storage to deadwater for each reservoir. If local evidence arises where a drought order application may need to commence earlier (e.g. between trigger 2 and 3), this will be discussed and agreed with the Environment Agency

## 3.1 Compensation only reservoir triggers

The compensation only reservoir drought triggers were calculated to allow enough time between triggers to allow actions to take effect or allow preparation for the next trigger and associated actions. The drought triggers are defined as:

- Trigger 1 = Half way between full and trigger 3
- Trigger 2 = Half way between trigger 1 and trigger 3

- Trigger 3 = 68 days<sup>5</sup> to dead water (maximum of 28 days for Defra to process a drought order plus 10 days to evidence and write an application)
- Trigger 4 = 30 days<sup>6</sup> to dead water (implementation of drought order once granted)
- Dead water = currently defined as either 10% of gross volume or based on a physical limit of the compensation flow release structure

The spreadsheet calculation involved calculating the historic inflows using rainfall runoff factors, minus the compensation flow (with compensation over release as defined in our Water Resources Management Plan 2019). All the reservoirs were started at 100% storage, with a maximum of 100% storage. For the reservoirs with less than 100 days storage, the minimum factored inflows over two months were used to supplement the storage; in reality it is likely that the inflows would be greater than those used in the build up to a drought.

Table 3 Compensation only reservoir drought triggers

Reservoir	Trigger 1 (% net full)	Trigger 2 (% net full)	Trigger 3 (% net full)	Trigger 4 (% net full)
Belmont	66.63	49.94	33.26	14.67
Blackmoss U+L	74.31	61.46	48.62	21.45
Borrans	77.09	65.64	54.18	23.90
Crummock Water	61.87	42.81	23.75	10.48
Dubbs	62.25	43.37	24.50	10.81
Ennerdale Water	79.27	68.90	58.53	25.82
Hoddlesden	89.08	83.62	78.16	34.48
Hollingworth	64.50	46.74	28.99	12.79
Meadley <sup>7</sup>	67.00	51.00	35.00	15.00
Rumworth <sup>8</sup>	69.95	49.95	39.90	17.60
Swineshaw	63.98	45.97	27.96	12.33
Worthington system	67.46	51.19	34.92	15.40

<sup>5</sup> Minimum number of days, as this has been calculated with no inflows, so in reality is likely to be longer. For the reservoirs with less than 100 days storage, the minimum factored inflows over two months were used to supplement the storage; however it is likely that actual inflows would be greater than those used in the build up to a drought

<sup>6</sup> Minimum number of days, as this has been calculated with no inflows, so in reality is likely to be longer. For the reservoirs with less than 100 days storage, the minimum factored inflows over two months were used to supplement the storage; however it is likely that actual inflows would be greater than those used in the build up to a drought

<sup>7</sup> The drought triggers have been calculated using the average % full of the other reservoirs and linked to reservoir level to deadwater. E.g. Trigger 1 level = Deadwater level minus (deadwater level \* 0.67)

<sup>8</sup> At 1.16m BTWL (Trigger 2) the EA give permission to reduce the compensation flow at Rumworth from 1.4 MI/d to 0.5 MI/d and put the 1 MI/d onto High Rid reservoir. Therefore Trigger 2 aligns with this level rather than being half way between Trigger 1 and 3

# 4 Monitoring

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The monitoring and close control of the compensation flow release is of great importance for these compensation only reservoirs. In line with the actions specified with the crossing of triggers, monitoring will increase as triggers are crossed to ensure the likelihood and risk of crossing further triggers is reduced and understood.

During dry weather events, reservoir storage information for compensation only reservoirs will be provided frequently to the Environment Agency (normally weekly). If a drought order is required, we will produce the appropriate drought documents work closely with the Environment Agency.

In the event that a drought order is granted by Defra to the Environment Agency, we will ensure that we operate our compensation only reservoirs in accordance with it.

Following a drought event, our joint post incident reviews with the Environment Agency will ensure we capture and learn any lessons associated with compensation only reservoirs. Trigger levels will be re-assessed as our understanding of the risk level of any CORs changes and updated if required; for example: any updates to bathymetry surveys, and changes to modelled inflows and associated reservoir yields.

If we identify a new compensation only reservoir (e.g. due to changes to our public water supply network) then we will notify the Environment Agency.