

Report to Gouthwaite Board of Management Hydrological Conditions of the Nidd Catchment – 2020 to March 2021

Rainfall

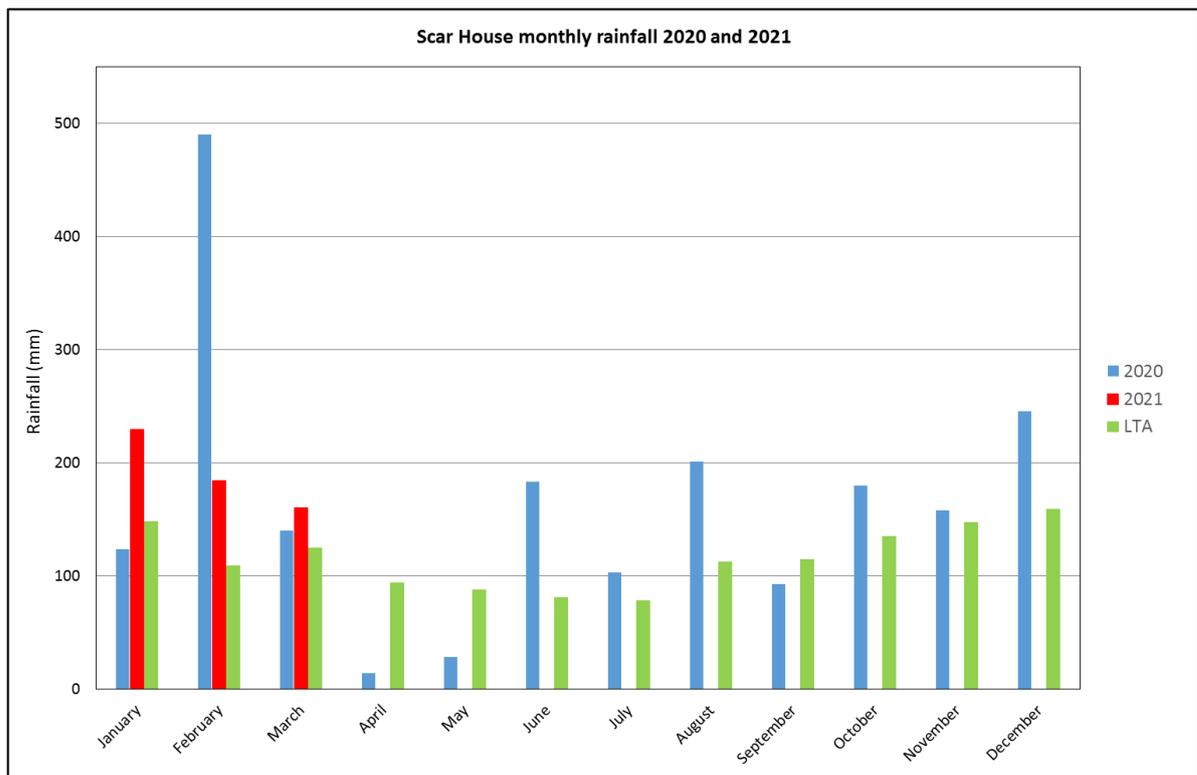
Graph 1 below shows the monthly rainfall totals recorded in the Upper Nidd catchment at Scar House Reservoir rain gauge during 2020 and up to March 2021. All recorded rainfall is compared to the calculated Long Term Average monthly values (LTA).

Total rainfall for 2020 at Scar House was 141% of the LTA. January rainfall was a little below average. As noted in the previous report, February 2020 was the wettest February on record for the Nidd catchment as a whole (since 1891), using the Met Office Had-UK data set. In the region of four times the February LTA was recorded at Scar House, varying a little between the tipping bucket rain gauge and the storage gauge.

Contrasting conditions occurred from the second half of March onwards, with a prolonged dry period extending to the first few days of June. Only 15% of the monthly LTA rainfall was recorded at Scar House in April. For the Nidd catchment as a whole, March to May 2020 was the second driest 3-month period ending 31st May in the same Met Office Had-UK data set from 1891.

The dry spring was followed by a wet summer and autumn. June to August and then October to November 2020 were all characterised by above average rainfall, with brief settled spells during September. Wet conditions continued over the winter, with the three months from December 2020 to February 2021 all recording more than 150% of the LTA rainfall at Scar House. This was ranked as the seventh wettest December to February period in 130 years of record for the Nidd catchment as a whole. From mid-2020 onwards, the persistence of predominantly wet conditions was notable, rather than extreme totals for any individual month.

Rainfall in March 2021 was approximately 130% of the LTA, concentrated in the second and fourth weeks of the month.



Graph 1: Monthly rainfall totals at Scar House Reservoir compared to the LTA for 2020 to March 2021

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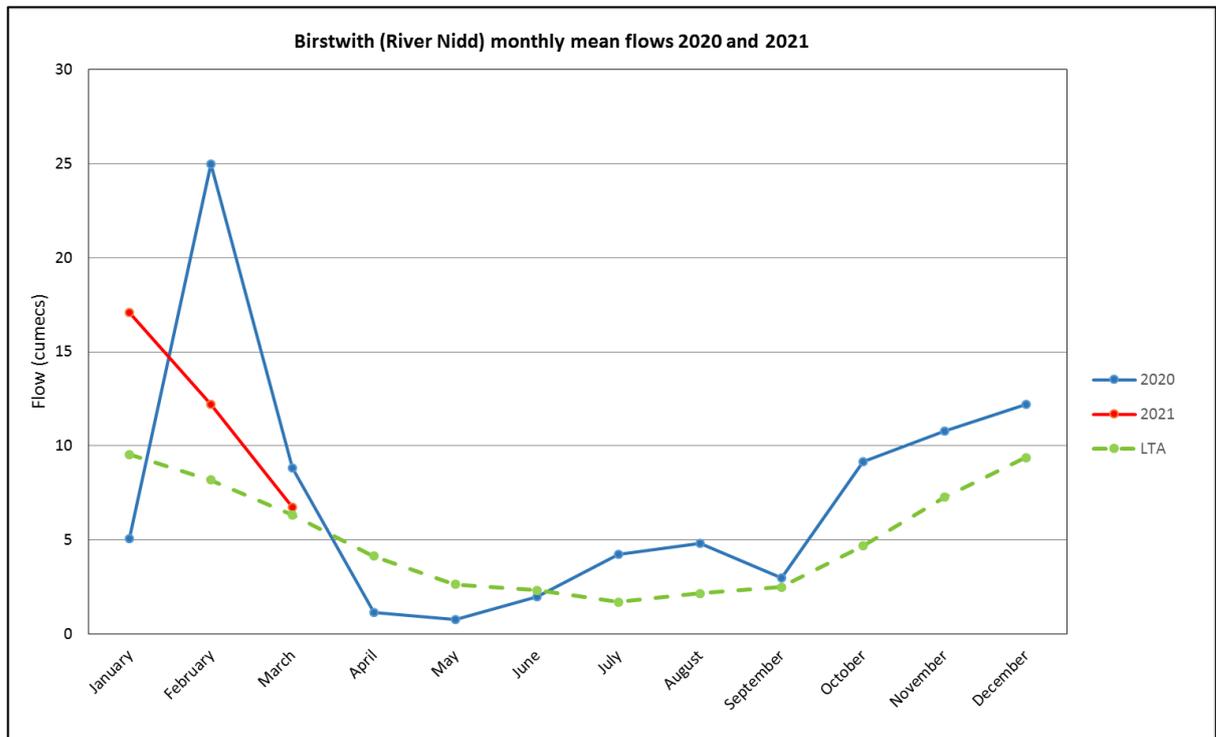
River Flow

Graph 2 shows the monthly mean flows recorded at Birstwith flow gauge on the River Nidd during 2020 and early 2021. They are compared to the calculated LTA.

In 2020, low flows in January were followed by exceptionally high flows responding to February's series of storms, with the February monthly mean flow at Birstwith representing over 300% of the LTA. Flows remained elevated in March, declining during the final week.

Flows during the sustained dry period in April and May were very low, with monthly means below 30% of the LTA at Birstwith. There was a slight increase in flow during the second half of June, although the monthly mean remained a little below the LTA.

Short duration responses to rainfall in early July and in late August (associated with Storm Francis) resulted in monthly mean flows above the LTA, although daily means remained moderate. Flows in September were a little above average overall; in October the monthly mean was almost twice the LTA, although again daily means remained moderate. In early November there was a high flow peak triggered by Storm Aiden. Flows on the upper Nidd remained responsive to rainfall from November 2020 through to February 2021, with monthly mean flows well above the LTA, reflecting the wet winter. Flows were more moderate in March, giving a monthly mean just a little above the LTA.



Graph 2: Monthly mean flow at Birstwith (River Nidd) compared to the LTA for 2020 to March 2021

Reservoir Level

Graph 3 overleaf shows the reservoir level at Gouthwaite during 2020 and early 2021 relative to the spill level of 11.89m. Reservoir levels rose above the spill level only briefly in mid-January 2020, but then again for most of the very wet February and the first half of March. Reservoir levels declined during the dry period from late March onwards, to approximately 57% of full capacity, at a level 1.3m below average for early June. The water levels recovered fully later on in June, particularly after 79mm of rain in three days from the 26th to the 28th (recorded at Scar House).

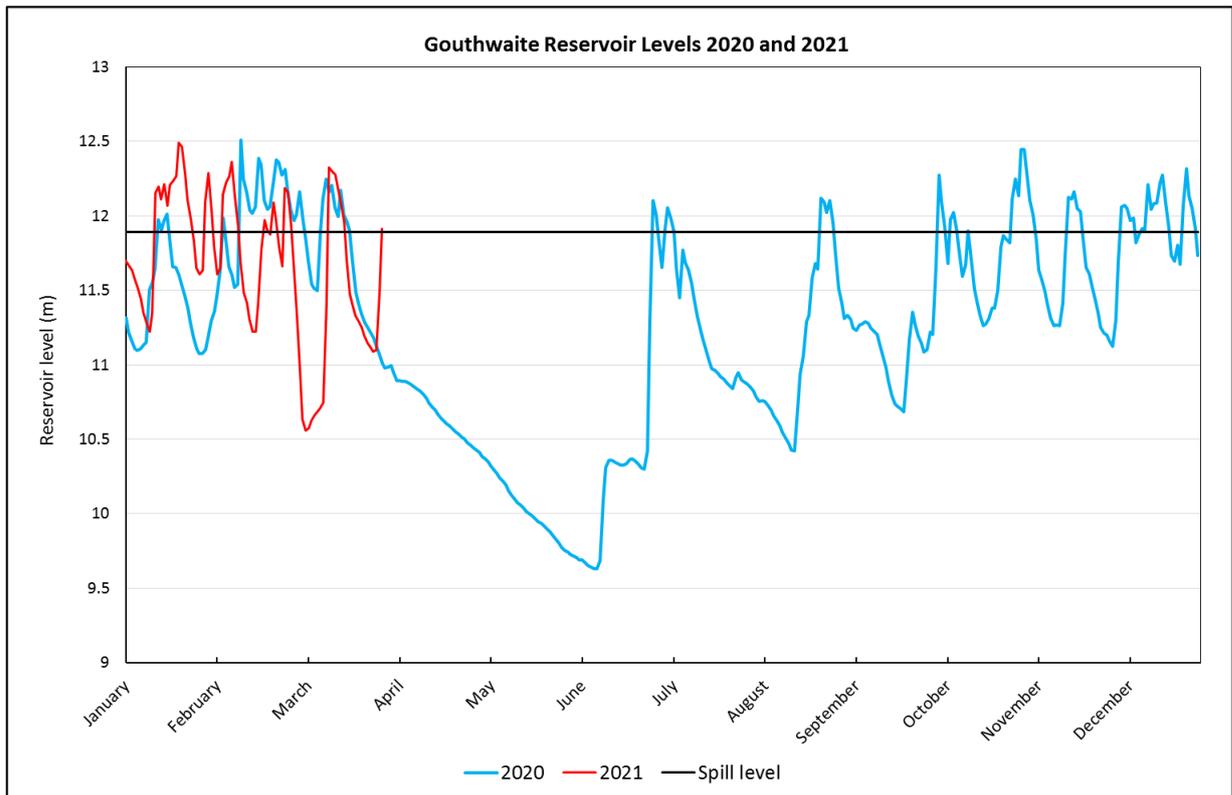
Brief periods of spill occurred in early July and late August, both followed by several weeks of decreasing water levels through operation of control rules, and a subsequent rise in response to further rainfall. Periods of spill occurred more frequently between October 2020 and the end of

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February 2021, with reservoir levels lying above the spill level on 46% of days during those five months.

Reservoir levels fell through application of the control rules in very late February and early March, declining to 72% of full capacity. The water level rose again above the spill level following just over 100mm of rainfall in five days from the 9th to the 13th. In the second half of March, reservoir levels began to decrease at a very similar rate to 2020, until a further spell of wet weather during the final week caused levels to rise just above the spill level once more.



Graph 3: Gouthwaite Reservoir levels 2020 to March 2021

Compensation Releases

Graphs 4 and 5 overleaf show the reservoir release flows, including any spill, for 2020 and early 2021, together with the required compensation releases under the current control rules.

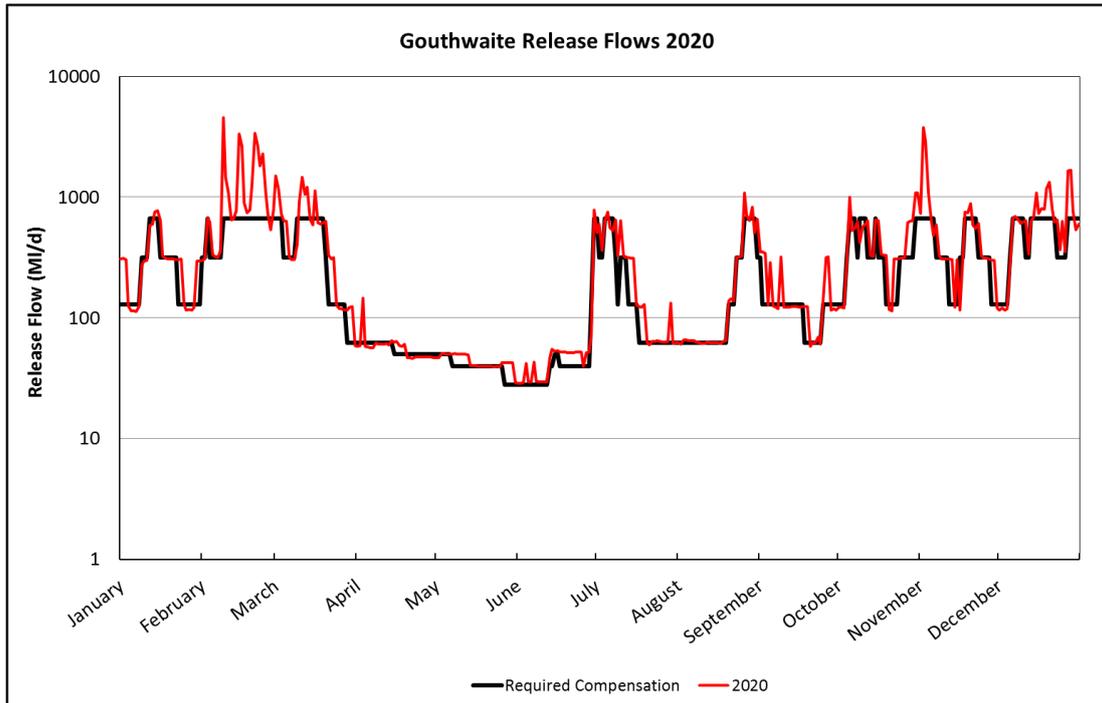
Throughout 2020 and in 2021 to date the release flows were well controlled. They closely followed the required compensation rates, allowing for a few days lag on occasion when stepping down from a high control band (e.g. May and July 2020).

Graph 4 shows a short period in June when releases were 10 MI/d higher than the required compensation requirements, but reservoir levels were close to the boundary between the two control bands during this period. A similar incidence at a boundary between control bands occurred in late March 2021. Otherwise releases have been restricted to the minimum requirements.

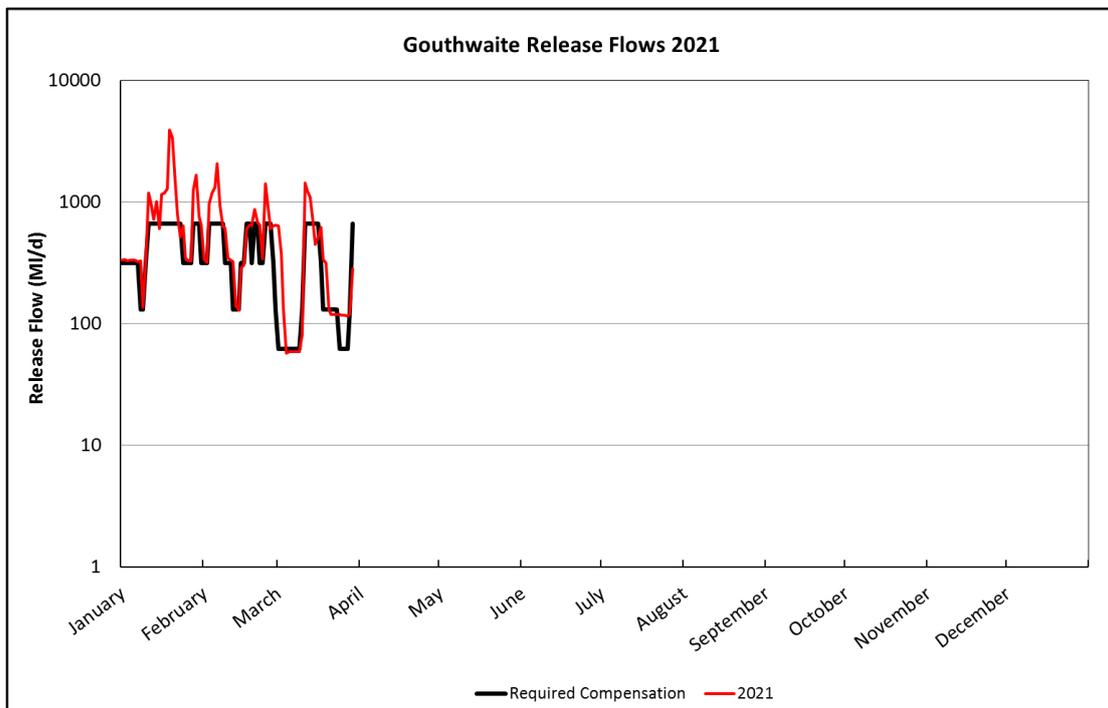
Spills occurred during the extended period of high reservoir levels in February to mid-March 2020, and during episodes in the summer, autumn and December. For much of January and February 2021, flows alternated between overflows and the 314 MI/d release required for the first control band below spill level. In March 2021 there was larger fluctuation between brief periods of spill and releases of 130 MI/d or 62 MI/d, responding to changing weather conditions.

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Graph 4: Compensation releases 2020



Graph 5: Compensation releases 2021