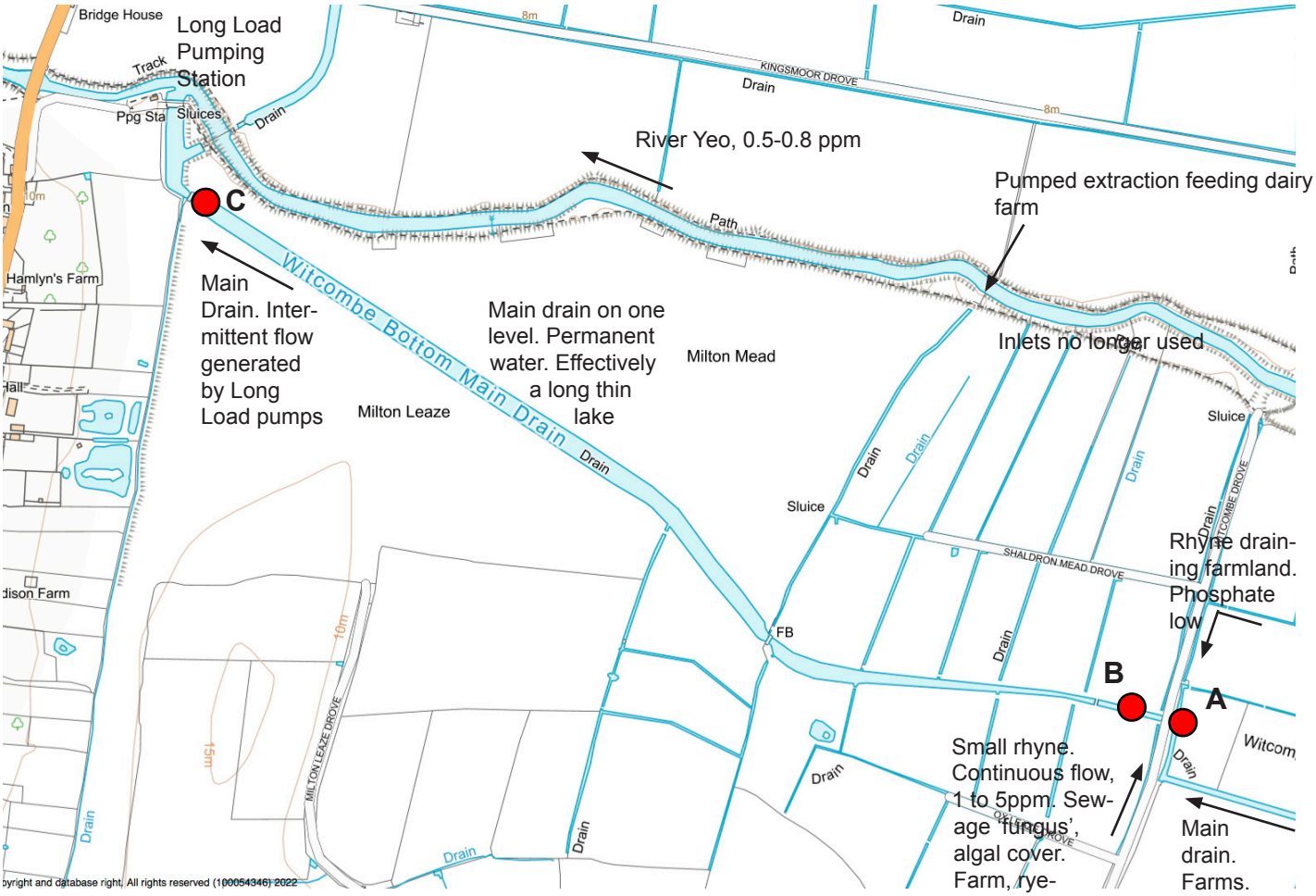
Ash and Martock Nature - Phosphate Survey

Report 2

Witcombe Bottom Moor

Andrew Clegg, May 2022

The Witcombe Bottom Moor lies east of Long Load on the south side of the River Yeo upstream from Wetmoor, a few hundred metres east of the Ramsar boundary. The Moor is fed by a number of small streams running from the higher land to the south around the village of Ash. All these streams and the drainage rhynes on the Moor drain into the Witcombe Bottom Main Drain which is on a single level and is moved in normal conditions into the Yeo at Long Load Pumping Station by a single pump (1m^3/sec) controlled automatically by variations in the Main Drain level. Some typical phosphate concentrations are shown in the map expressed in parts per million (ppm).



Note - a watercourse in a good ecological state has a phosphate load of less than about 0.04ppm

Witcombe Hydrology

The map shows the Moor hydrology under normal conditions. Most of the rhynes between the Main Drain and the Yeo only flow in flood conditions and there is no normally functioning inlet from the Yeo. The Main Drain therefore functions as a slow moving retention lake between points B and C on the map, which, in conditions of low flow, typically removes between 50 and 100% of the phosphate flowing into it.

The main inflows into the Drain are the three rhynes which meet between A and B on the map. Two contain high concentrations of phosphate throughout the year. One of these is the Main Drain extension that is fed by several farms (one, a large dairy) and Tintinhull STW. The second is a small rhyne at the side of the drove which is often algal-covered and containing 'sewage fungus'. It is small but significant with the highest phosphate loads recorded anywhere in this phosphate survey.

The river Yeo water level is artificially varied considerably between winter (low) and summer (high) by a sluice at Long Load. This has no discernible impact on phosphate concentration.

Witcombe Bottom Typical Phosphate Loads (ppm)

Month	Weather	A	B	C (pump)	River Yeo
March 2021	Wet	1.42		0.89	0.51
May 2021	Dry	0.86	0.95	0.28	0.45
Feb 2022	Wet	1.40		0.47	0.49
May 2022	Very dry	1.04	1.19	0.02	0.80
May 2022	After rain	1.51	1.63	0.73	0.82

Note - a watercourse in a good ecological state has a phosphate load of less than about 0.04ppm

In the table:
Column A minus column C gives the phosphate removed by the Drain (mean 0.78ppm)
Column B minus column A gives the phosphate load added by the small tributary west of Witcombe Drove (mean 0.12 ppm)

Emerging patterns

- The river Yeo has a largely permanent phosphate concentration of around 0.5ppm in winter and 0.8ppm in summer. This is notably independent of the rate of flow and river level and is possibly related to legacy phosphate within the river silt. No phosphate from the Yeo reaches the Moor in normal conditions.

- Witcombe Bottom Main Drain accumulates considerable phosphate from dairy farm run-off and from Tintinhull Sewage Works but much is subsequently removed by the plants growing along its length.

- The uptake of phosphate by aquatic plants in the Main Drain is influenced by season and by the flow rate which is determined by the pump activity and the seasonally adjusted retention volume (low in winter as a flood precaution). The phosphate removal varies from almost zero in a wet autumn (which results in a significant subsequent increase of phosphate in the Yeo), to almost complete in dry weather when the pumps operate minimally.

- The mass of phosphate typically entering the Main Drain from agriculture and sewage is significant; of the order of 1 to 4 tonnes annually. The proportion that is then removed by natural processes depends inversely on how many times per day the pump is activated and varies from very little to almost all.

- This figure of phosphate removed can be compared with the target annual removal from the whole Yeo catchment through Entrade of 0.95 tonnes annually. The Main Drain under normal conditions effectively offsets the phosphate effluent of some 10 to 20 thousand houses. This would appear to merit further investigation.

Data sources
Survey data. http://www.somersetlevelsphosphate.org.uk
Pump activity. https://riverlevels.uk/somerset-long-load-long-load
Entrade offset market. https://www.somersetcatchmentmarket.org.uk/about