WESTCOUNTRY RIVERS TRUST CITIZEN SCIENCE

MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

NOVEMBER 2021

Outfall at SX 0447 5811 near Luxulyan STW: questions remain.

CONTENTS & PAGES

It should be noted that no monitoring was done between January and March 2021 but the Excel graphs suggest otherwise.

A. KEY POINTS FROM WRT CSI MONITORING IN NOVEMBER 2021

1. Phosphate readings were high but not as extreme as last month.
2. The significance of the metal outfall pipe at SX 0447 5811 remains unknown. The EA had asked SWW about this.
3. Otters continue to be present in the Luxulyan Valley section of the Par River.

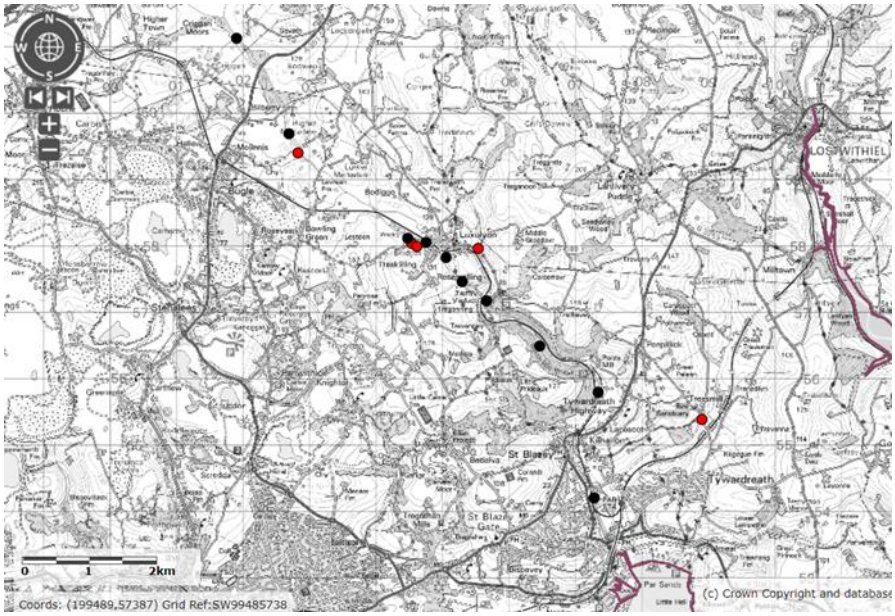
B. OUR GROUP

Monitoring is part of the Citizen Science programme run by the West Country Rivers Trust (WCRT) and is carried out monthly by volunteers from the Friends of Luxulyan Valley. The team comprises: Dave Burrell; Mandy Case; Joan Farmer; Veronica Jones; Sue Perry; Linda and Roger Smith; Dave Stillings. They have received training from Lydia Deacon, Junior Evidence and Engagement Officer of the West Country Rivers Trust (https://wrt.org.uk/project/become-a-citizen-scientist/). Results are logged on the Cartographer website. The support and advice given by Ross Tonkin, Claire and Gary Phillips, David Edwards, Matt Healey, Simon Browning and Lydia Deacon is greatly appreciated. The interest and encouragement offered by Environment Agency officers, especially Lisa Best and Lisa Goodall, has been invaluable.

C. NOVEMBER 2021 MONITORING POINTS

This month we monitored at 15 locations. The Luxulyan STW monitoring point was a few metres away from the previous spot. This was chosen because the readings at the previous spot were being diluted by small outfalls.

This month's monitoring points along the main Par River are shown in **black**. Those in **red** are on tributaries.



Source: https://magic.defra.gov.uk/MagicMap.aspx

LOCATION	MONITORED BY
Criggan Moors, Par River, SX 01882 61133	Roger Smith
South of Minorca Lane, Par River, SX 02657 59788	Roger Smith
Carbis Stream SX 02834 59401	Roger Smith
Luxulyan sewage treatment works, Par River, SX 04472 58114 (formerly SX 0455 58114)	Joan Farmer, Veronica Jones & Roger Smith
Treverbyn Stream, SX 04532 58033	Joan Farmer, Veronica Jones & Roger Smith
Rosemullion, Tregarrick Stream, SX 04623 57990	Joan Farmer, Veronica Jones & Roger Smith
Luxulyan allotments, Par River, SX 04732 58045	Joan Farmer, Veronica Jones & Roger Smith
Luxulyan SWW pumping station, Par River, SX 05033 57849	Joan Farmer & Roger Smith
Cam Bridges, Par River, SX 05292 57454	Joan Farmer & Roger Smith
Gatty's Bridge, Bokiddick Stream SX 05531 57953	Roger Smith
Treffry Viaduct, Par River, SX 05650 57179	Sue Perry, Veronica Jones & Roger Smith
Lady Rashleigh Mine, Par River, SX 06451 56509	Sue Perry, Veronica Jones & Roger Smith
Ponts Mill, Par River, SX 07354 55875	Sue Perry, Veronica Jones & Roger Smith
Middleway, Par Canal, SX 07233 54299	Veronica Jones
Treesmill, Tywardreath Stream, SX 08873 55385	Veronica Jones

Surveys conducted on these dates, each of which is colour-coded:
12th November 2021
14th November 2021
15th November 2021

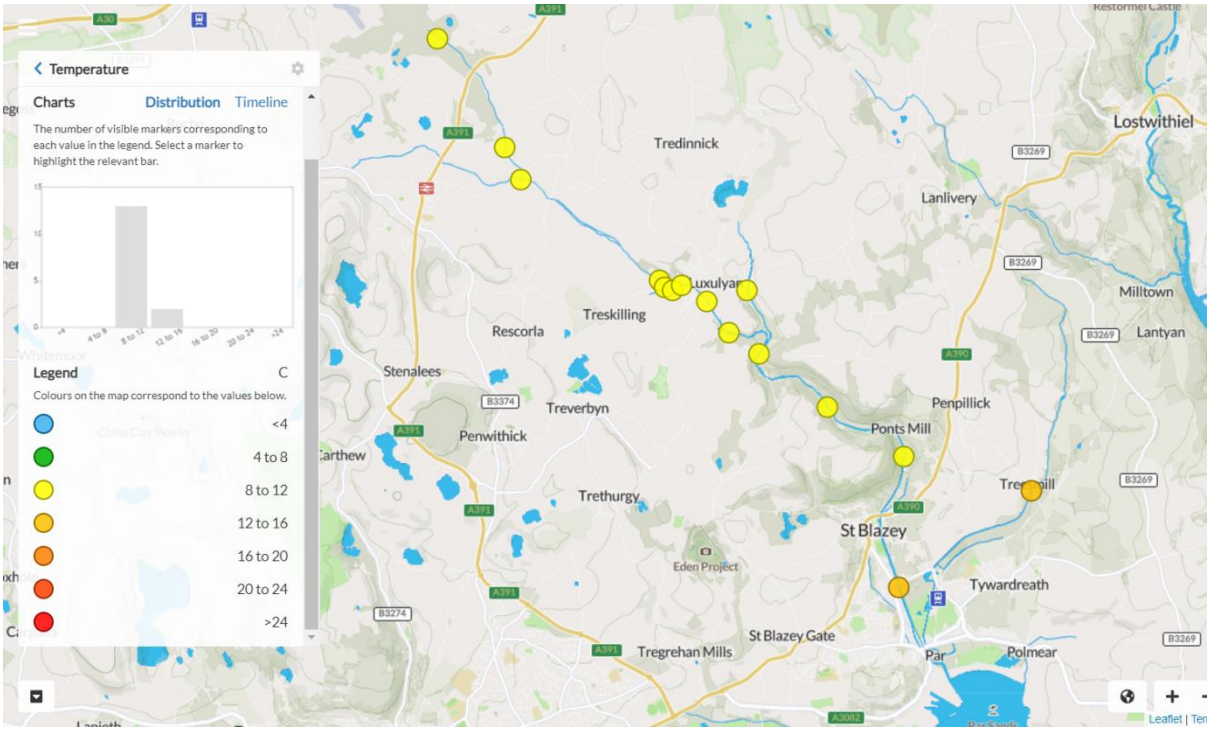
D. TEMPERATURE

1. This is the WRT's explanation of why this is monitored:

Temperature is a vital parameter within the river ecosystem. It controls many of the aquatic species life cycles. Temperature fluctuates with the seasons; however, you do get variation within that, particularly in small rivers and streams. Another important reason to measure temperature is to track the impact of our warming climate on our waterbodies.

2. **Geographical comparison.** The Cartographer website shows temperatures recorded at monitoring sites in the area. (Thanks to Simon Browning (WRT) for showing the filter mechanism on these maps!) Source: Cartographer.

3. These are the results for November 2021:



PAR RIVER/TRIBUTARY	LOCATION	Temperature ˚Celsius
Par (Bissa)	Criggan Moors, SX 01882 61133	11
Par	South of Minorca Lane, SX 02657 59788	10
Tributary	Carbis Stream SX 02834 59401	11
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	10
Tributary	Treverbyn Stream, SX 04532 58033	10
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	10
Par	Luxulyan allotments SX 04732 58045	10
Par	Luxulyan SWW pumping station SX 05033 57849	10
Par	Cam Bridges SX 05292 57454	9.8
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	11
Par	Treffry Viaduct SX 05650 57179	11
Par	Lady Rashleigh Mine SX 06451 56509	11
Par	Ponts Mill SX 07354 55875	11
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	14.1
Par	Middleway (Par Canal) SX 07238 54295	13.6

Surveys conducted on these dates, each of which is colour-coded:

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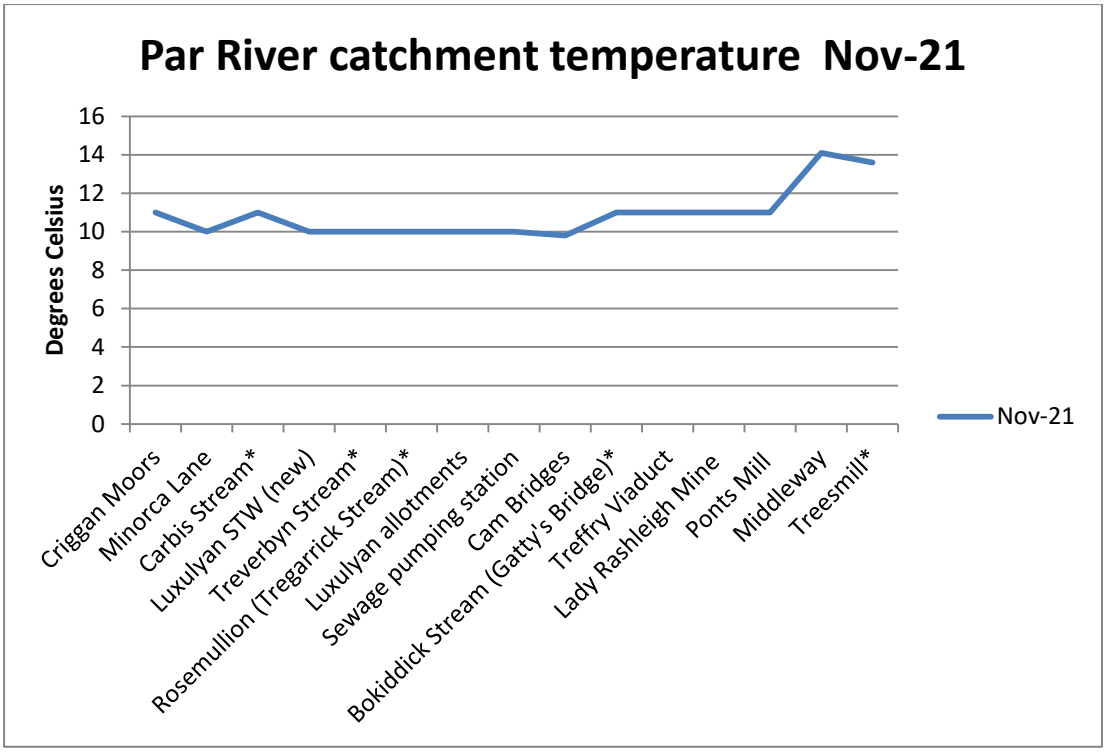
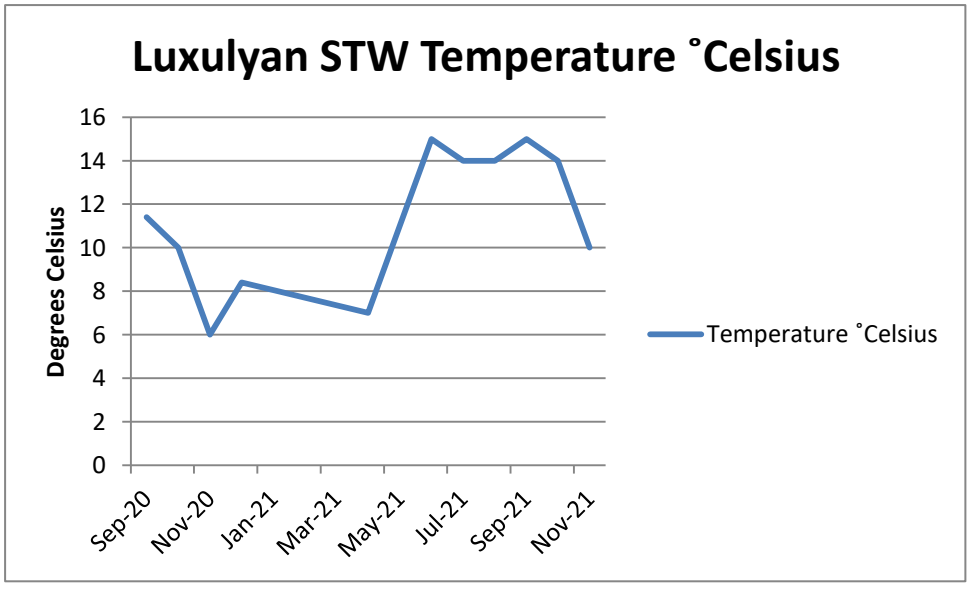


*indicates a tributary of the Par River.

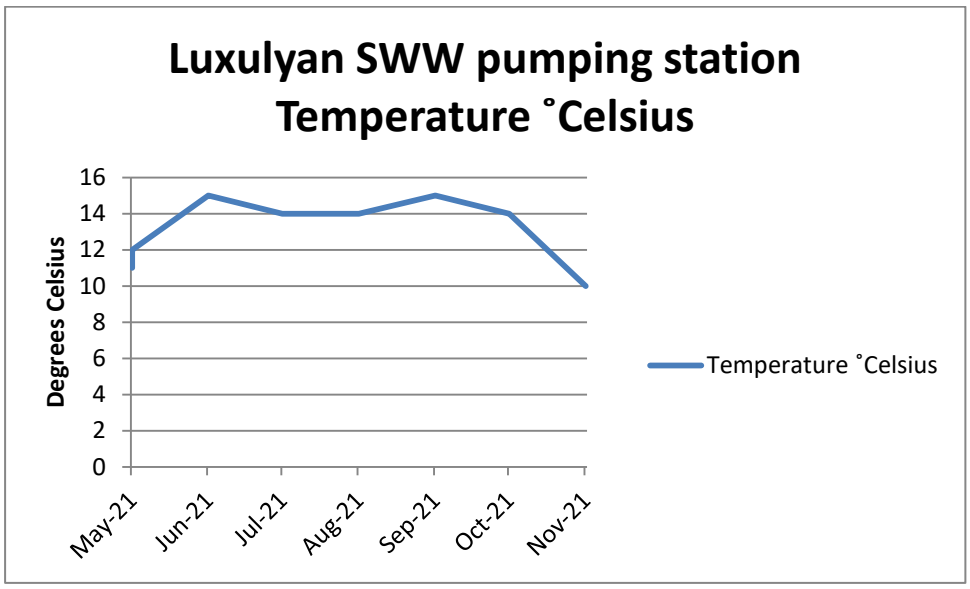
These temperatures are arranged, broadly speaking, from north (upstream) to south (downstream), and in order of flow. Again, the last 2 readings are significantly higher. It should be pointed out that Middleway is the former Par Canal, rather than the river, although it is fed by the river upstream. It does mean that the water is split between two water-courses so that the lower volumes in each might be warmed more quickly.

4. **Historical data** on temperature at selected sites (no monitoring January to March 2021):

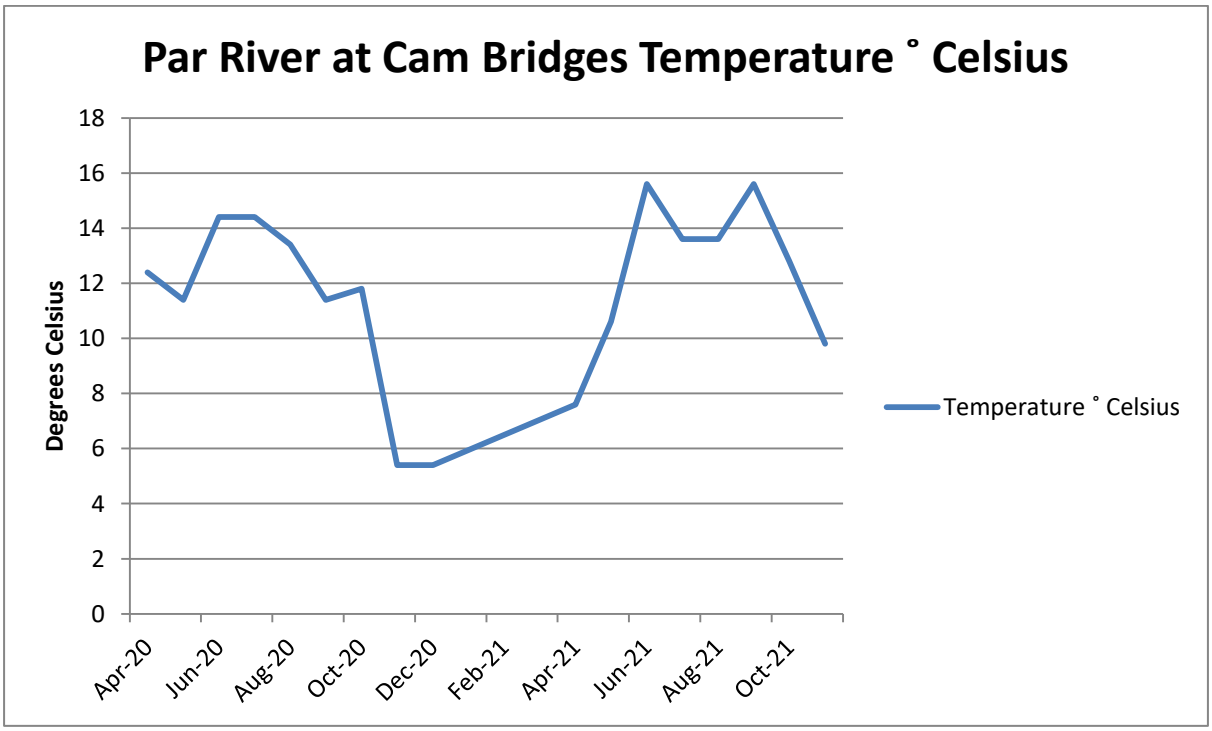
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



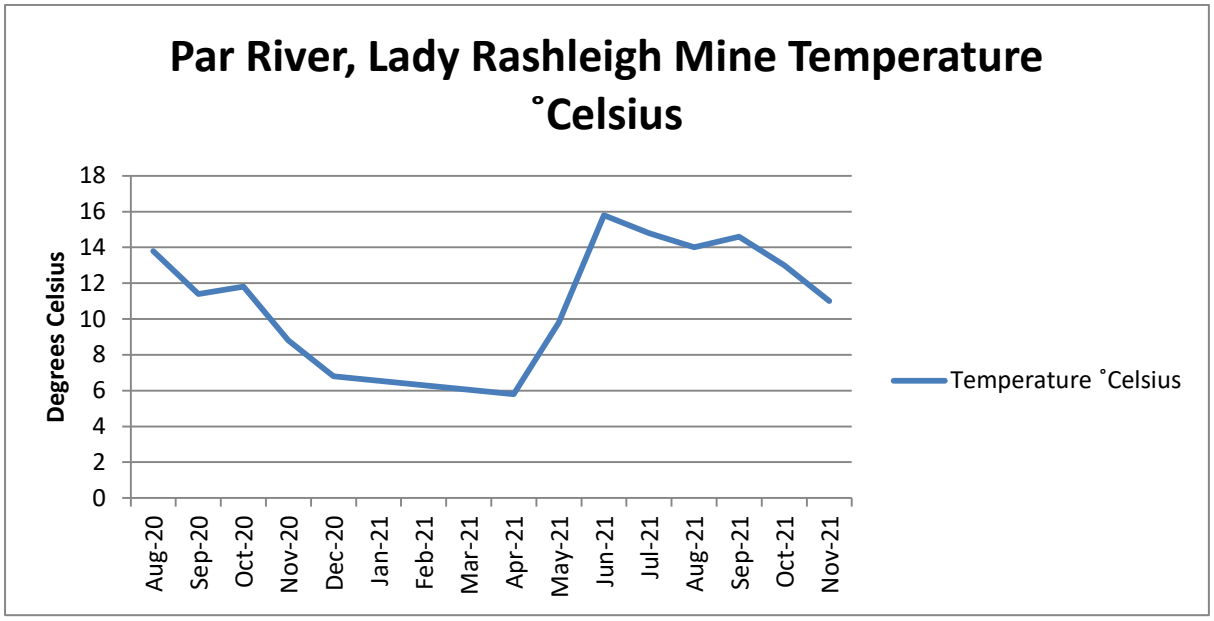
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509



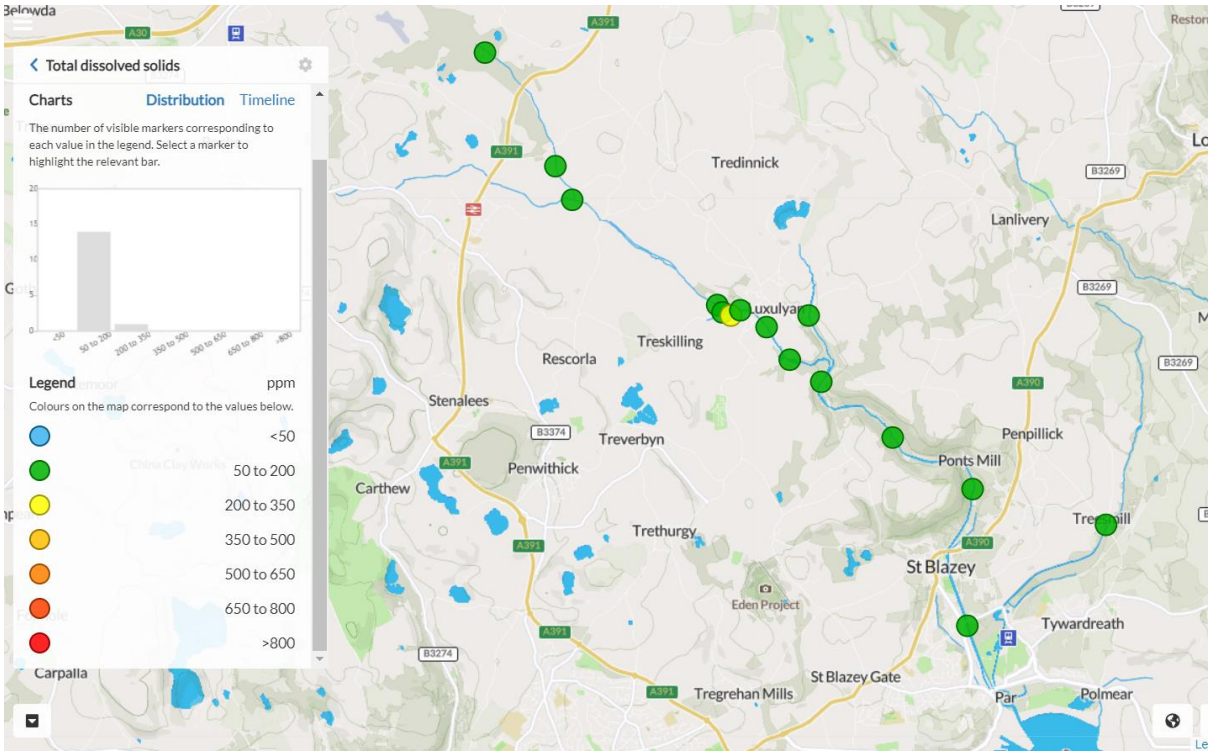
Temperatures in the late summer and autumn appear to be higher in 2021 than in 2020. But with such a limited set of results it would be unjustified to draw any conclusion from this. Nonetheless, over the long term, it is a measure which should be watched.

E. TOTAL DISSOLVED SOLIDS

1. We measure these in ppm (parts per million). This is the WRT's explanation:

Total Dissolved Solids (TDS) is directly related to the conductivity of the water. The more minerals, salts and metals that are dissolved in the water the more conductive it gets. Low levels of dissolved solids in waters such as those on Dartmoor near to the source of the river are a result of very low levels of input from the surrounding landscape. As the river runs down to the sea it collects material from many different inputs, some natural and some man-made such as farms, sewage plants, factories and residential areas. This typically increases the amount of solids dissolved in the water leading to a higher reading. Harmful pollution from things like sewage, slurry and factory discharge will usually elevate your TDS reading. However, some pollutants such as oil can lower conductivity; therefore it should be used as a general indicator of water quality not a specific measure of toxicity. Geology will influence the normal level of conductivity in a watercourse (e.g. Areas dominated by granite generally give a lower conductivity than those with limestone). Regular monitoring will allow the detection of changes in conductivity which can indicate pollution.

2. **Geographical comparison.** Source: Cartographer.



PAR RIVER/TRIBUTARY	LOCATION	Total Dissolved Solids ppm
Par (Bissa)	Criggan Moors, SX 01882 61133	77
Par	South of Minorca Lane, SX 02657 59788	73
Tributary	Carbis Stream SX 02834 59401	173
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	175
Tributary	Treverbyn Stream, SX 04532 58033	86
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	218
Par	Luxulyan allotments SX 04732 58045	138
Par	Luxulyan SWW pumping station SX 05033 57849	140
Par	Cam Bridges SX 05292 57454	143
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	79
Par	Treffry Viaduct SX 05650 57179	123
Par	Lady Rashleigh Mine SX 06451 56509	116
Par	Ponts Mill SX 07354 55875	110
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	112
Par	Middleway (Par Canal) SX 07238 54295	133

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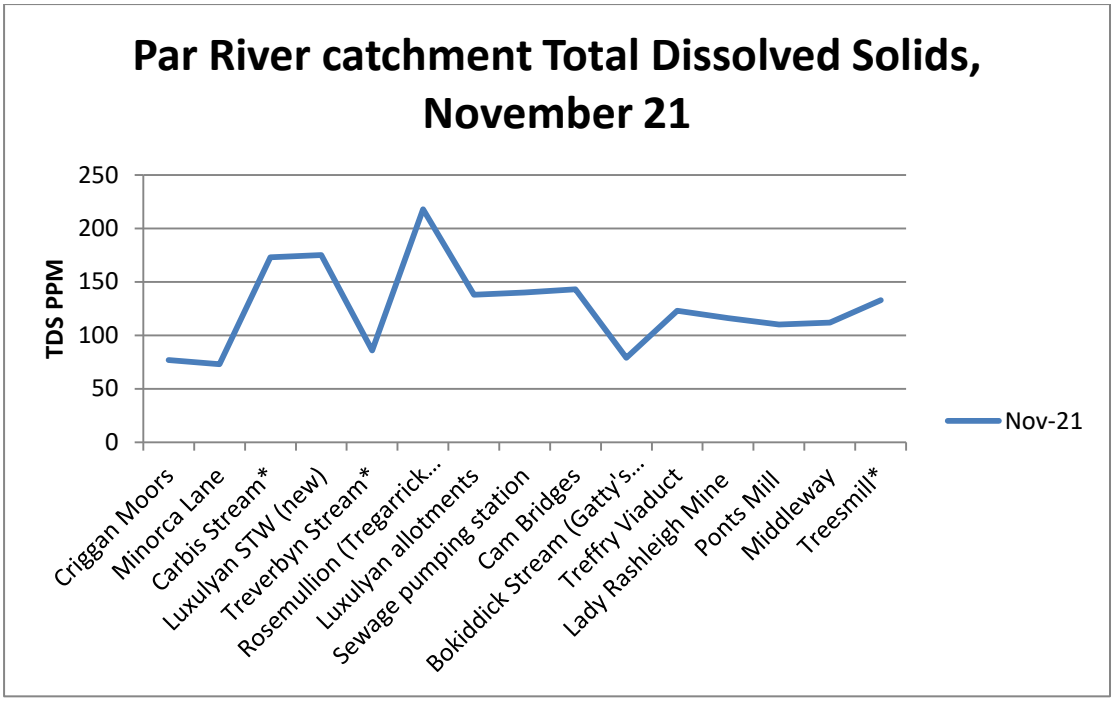


*indicates a tributary of the Par River.

The three highest readings this month were:

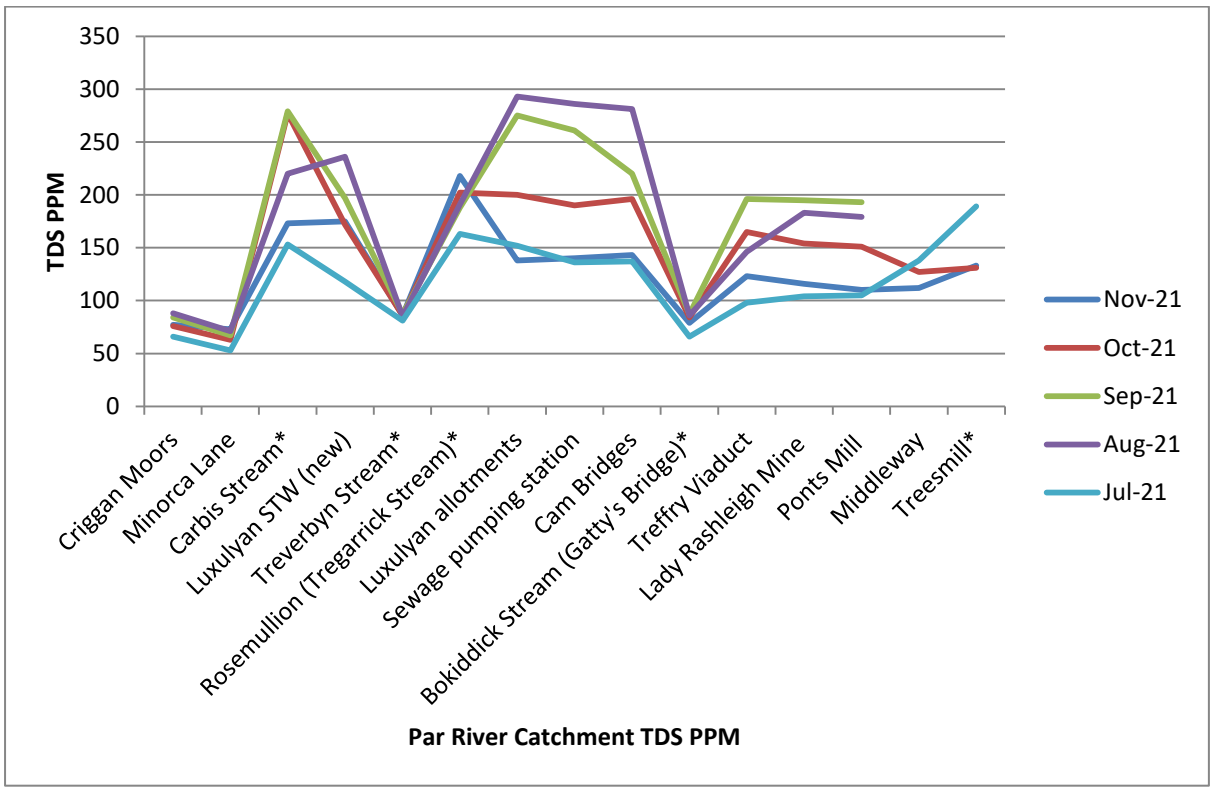
(a) Tregarrick Stream at Rosemullion bungalow. One explanation might be that this is silt derived from farm slurry.
(b) Downstream from Luxulyan STW (new monitoring position at SX 04472 58114) but this is not unusual (see next chart).
(c) Carbis Stream. China clay is visible in the water and is particularly noticeable where this stream joins the Par River:

Carbis stream – white with china clay

Confluence of the Carbis Stream and Par River – note the contrasting colours of the water

Historic deposition of china clay is visible in the banks of the Carbis stream. It had been assumed that the clay in the water had eroded from the banks but this is an untested assumption. It has been noticed that this stream, where it runs parallel to the Bugle to Roche Road, also seems white on occasions. Perhaps the source of the clay is not the adjacent banks?

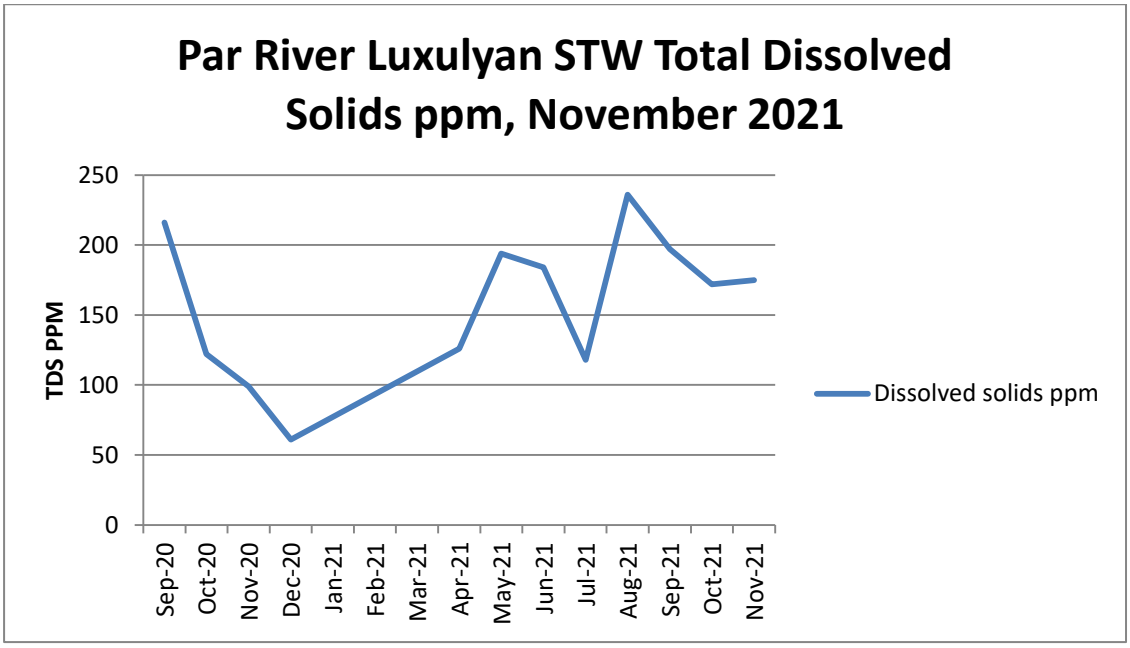
Looking at all our surveys, this is the picture for TDS:



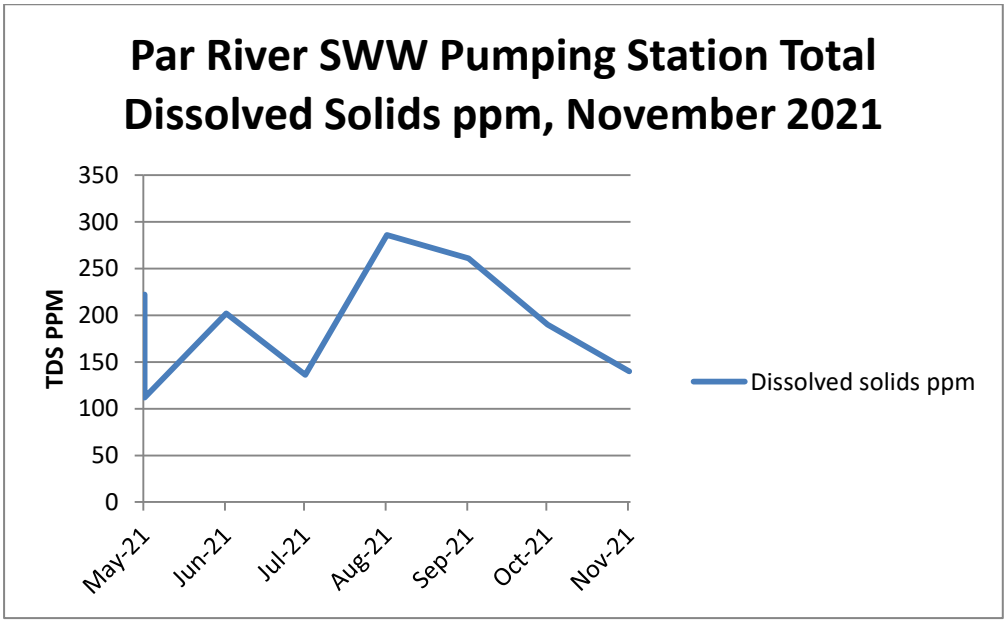
Tributaries seem to have lower TDS than the main river, with the exception of the Carbis Stream.

3. **Historical data** on total dissolved solids at selected sites (no monitoring January to March 2021):

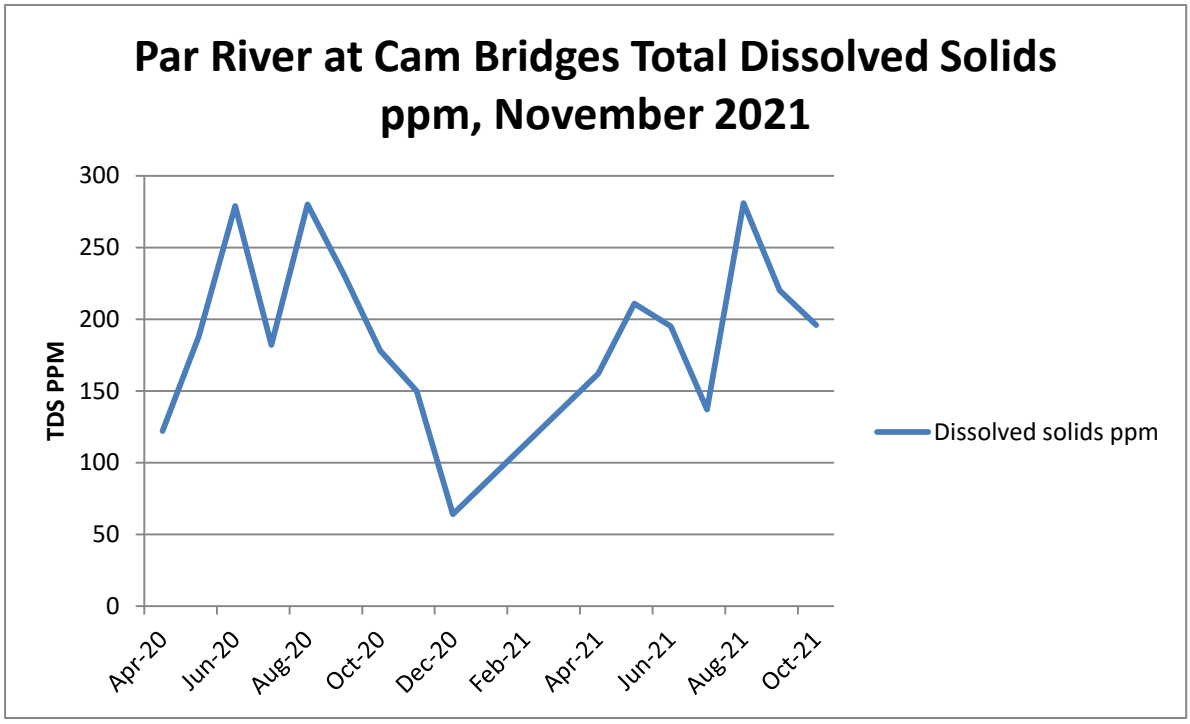
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



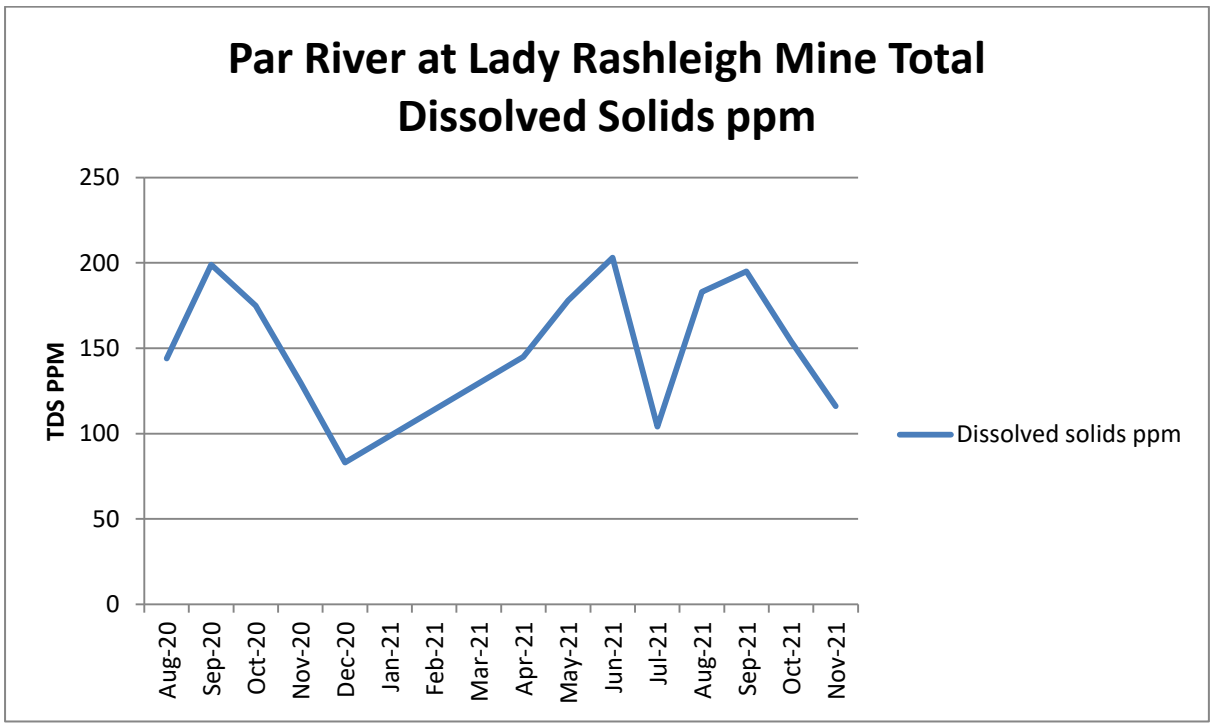
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509

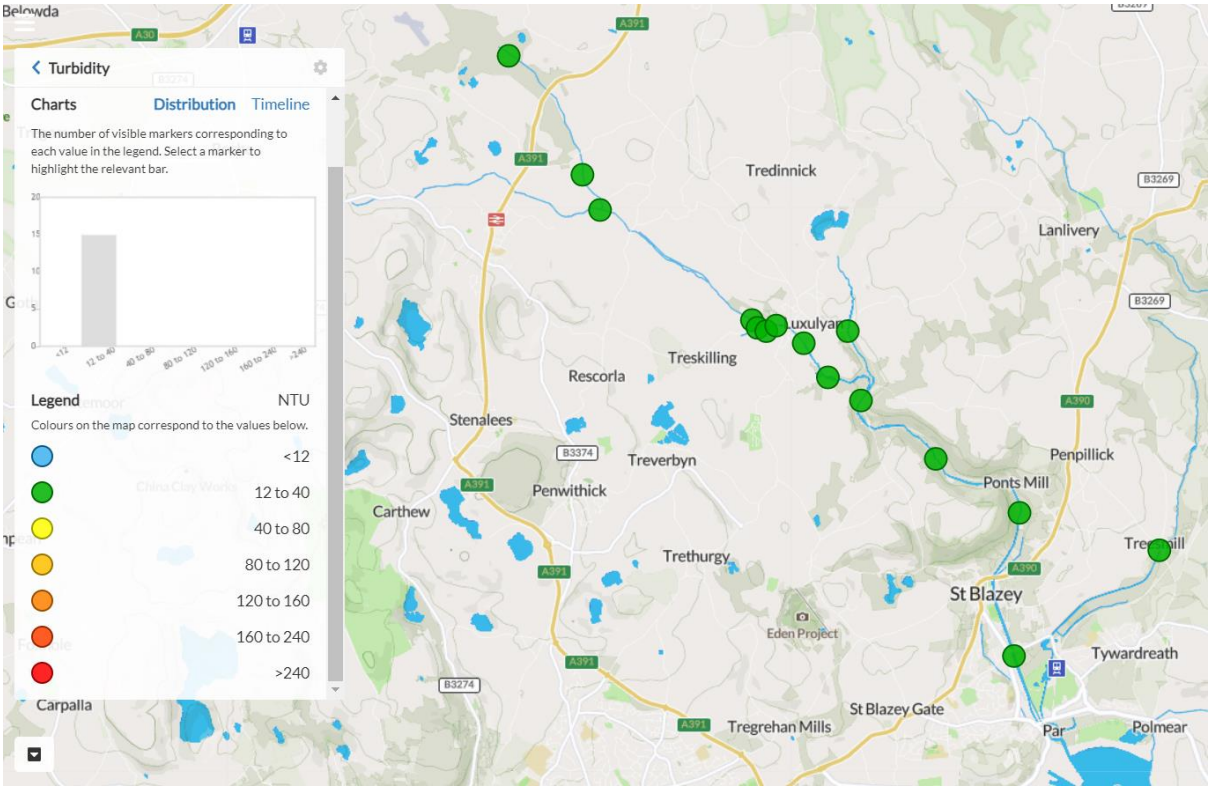


F. TURBIDITY

1. This is the WRT explanation of this measure:

Turbidity tube is a measure of the optical clarity of the water. The more suspended particles in the water the lower the clarity and the higher the turbidity. You will often find your waterbody gets more turbid after heavy rainfall due to soil running off the fields and sediment being mixed into the water column. This loss of topsoil is both a problem for farmer and river. It can often contain chemicals from the fertiliser and pesticides used on the land. An increase in sediment level on the substrate of the river can cause smothering of habitat by removing light and oxygen. Aquatic wildlife such as the less mobile invertebrates and fish eggs struggle to survive in low oxygen conditions and without light, plants are unable to grow. It is a good idea to sample your river after different weather conditions to understand how it responds to rainfall or drought.

2. **Geographical comparison.** Where scores are shown as 0, it means that the reading using the Secchi tube was <12. Source: Cartographer.



PAR RIVER/TRIBUTARY	LOCATION	Turbidity
Par (Bissa)	Criggan Moors, SX 01882 61133	0
Par	South of Minorca Lane, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	0
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	0
Tributary	Treverbyn Stream, SX 04532 58033	0
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	27
Par	Luxulyan allotments SX 04732 58045	0
Par	Luxulyan SWW pumping station SX 05033 57849	0
Par	Cam Bridges SX 05292 57454	0
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct SX 05650 57179	0
Par	Lady Rashleigh Mine SX 06451 56509	0
Par	Ponts Mill SX 07354 55875	0
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	0
Par	Middleway (Par Canal) SX 07238 54295	0

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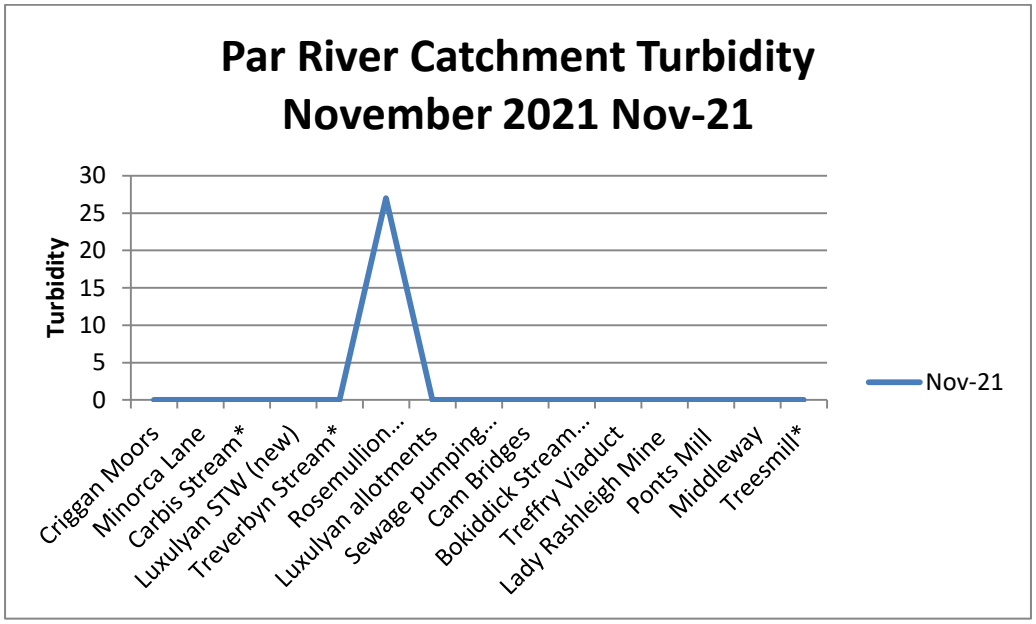
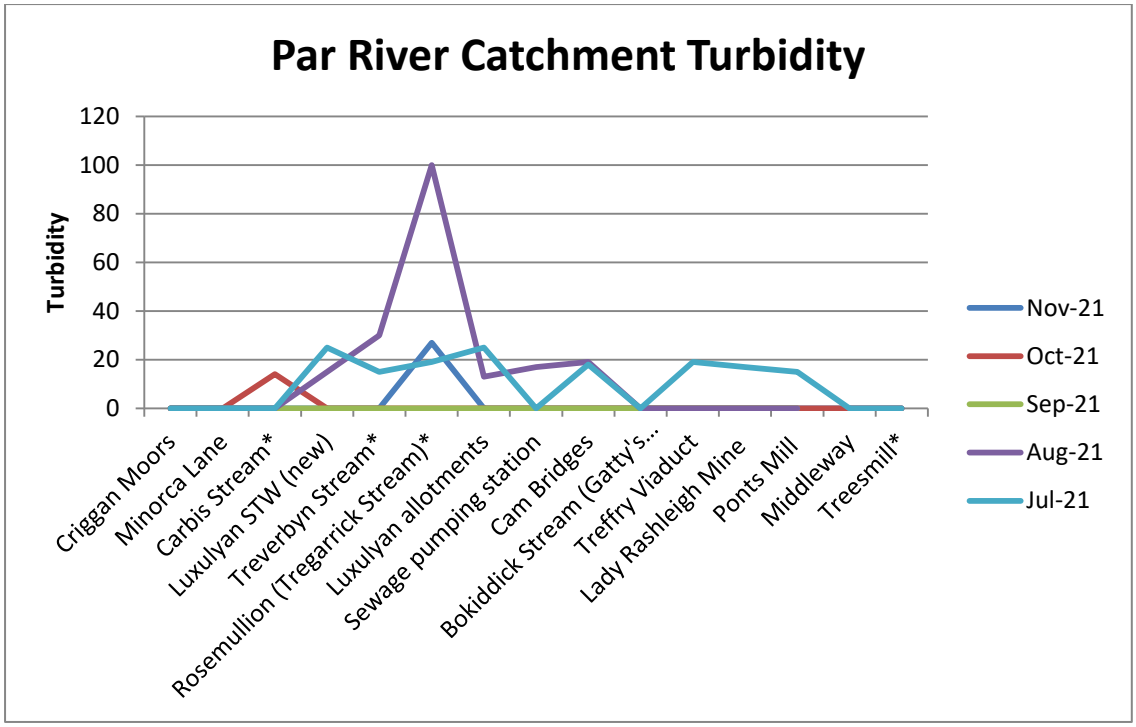


*indicates a tributary of the Par River.

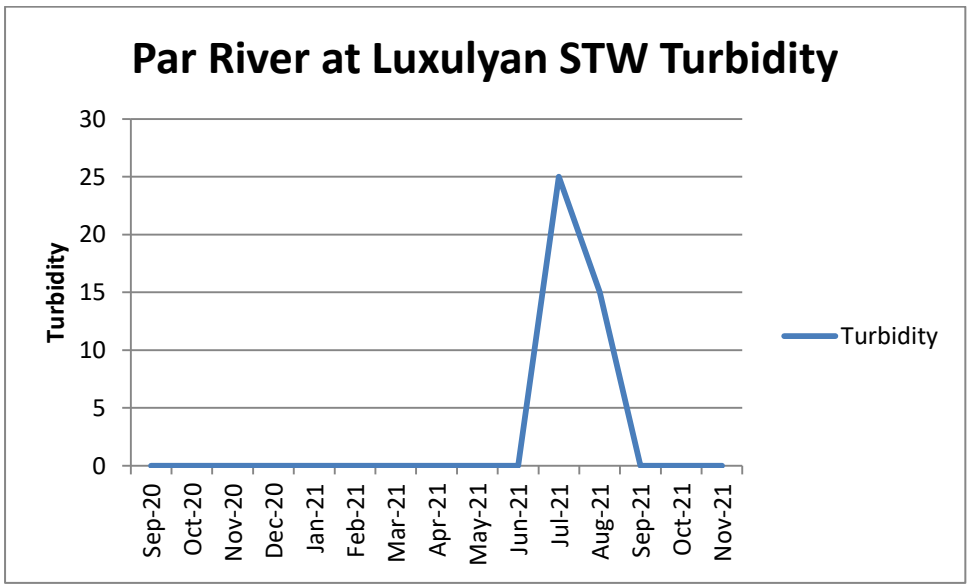
Although the reading on the Carbis Stream was just <12, it can be seen that the silt-laden water in the tiny Tregarrick Stream is an outlier. This is not unusual, as the following graph shows:



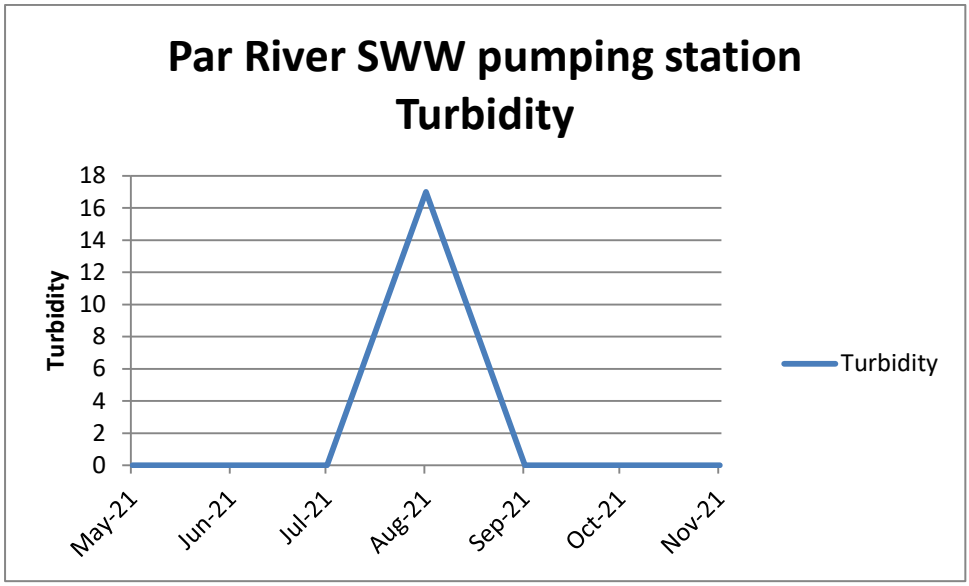
The turbidity in the Carbis stream may be the result of china clay pollution. Turbidity scores for most locations since monitoring began in 2020 are usually <12 (recorded on Excel as 0 for convenience). The Carbis and Tregarrick Streams have been outliers (the latter as a result of thick silt in the stream) although high rainfall preceding readings has sometimes raised levels elsewhere.

3. Historical data on turbidity at selected sites (no monitoring January to March 2021):

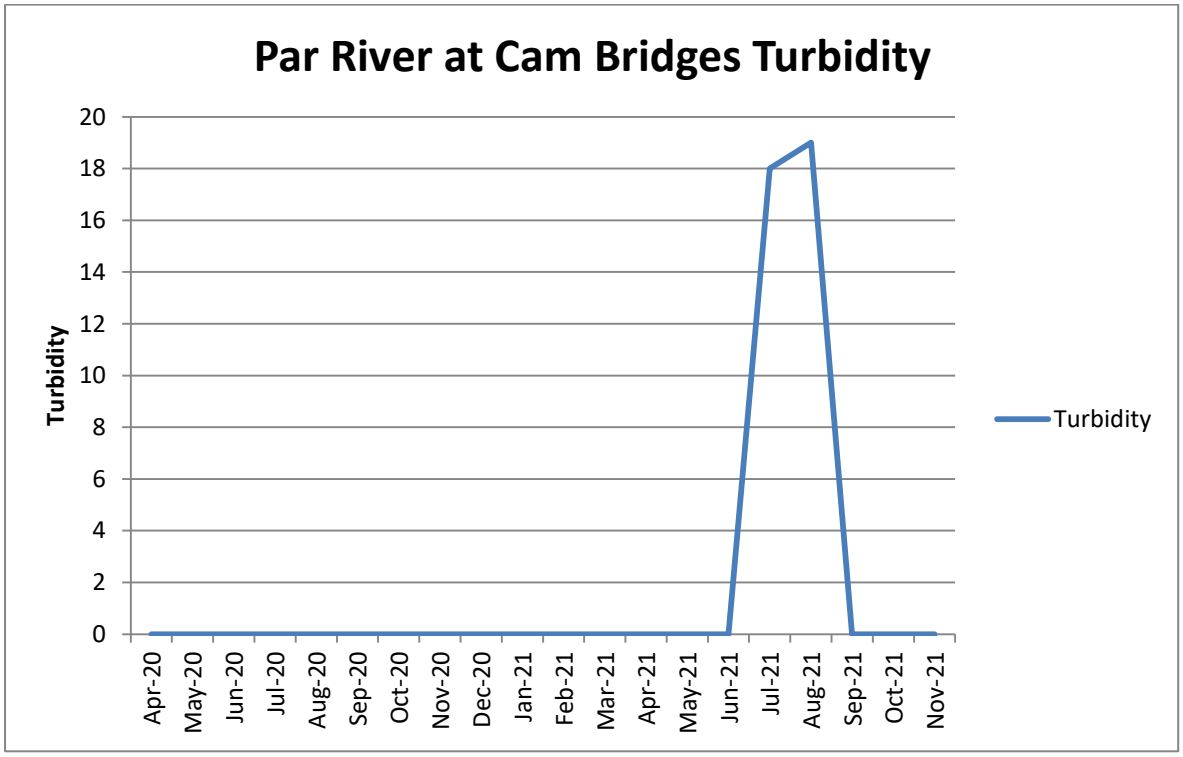
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



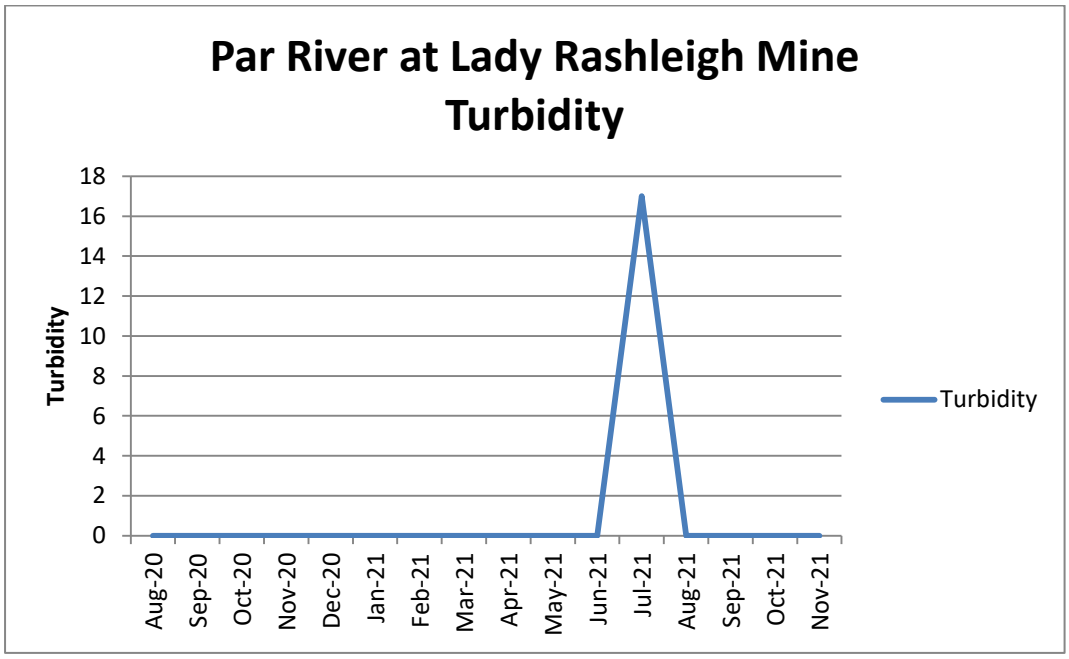
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509



G. PHOSPHATES

1. This is the WRT's explanation of this measure.

Phosphate occurs naturally within the river ecosystem, but in very low levels under 0.05 mg/l. Therefore, higher levels may indicate anthropogenic input. Phosphate is found in animal and human waste, cleaning chemicals, industrial runoff and fertiliser so this can be a good indicator of pollution. Having raised levels of phosphate can lead to increases in plant growth within the watercourse. This leads to a depletion of oxygen due to the plant's aerobic respiration during the night. Without oxygen aquatic species cannot survive and the river ecosystem collapses. (It is important to note that phosphate is taken up by plants. You may get a low reading but high plant growth, indicating eutrophication.)

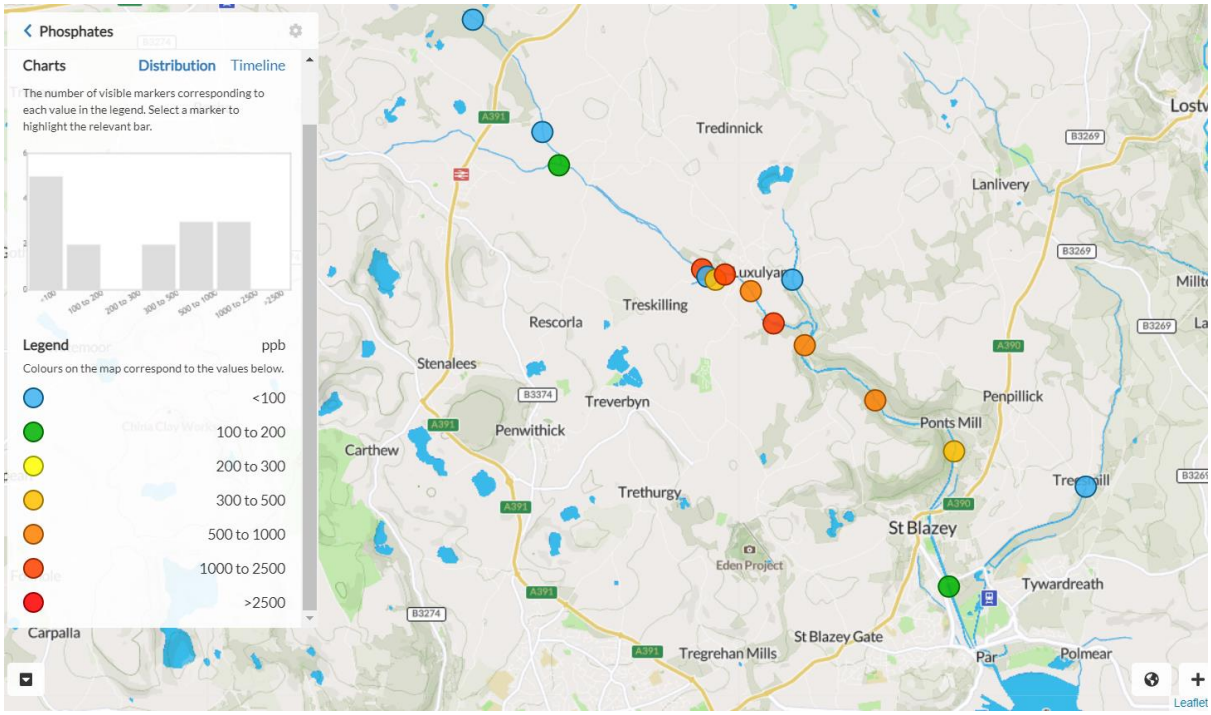
Ranges on phosphate diagnostic colour chart:

0 – 100 OK

200 – 300 HIGH

500 – 2500 – TOO HIGH

2. **Geographical comparison.** Source: Cartographer.



PAR RIVER/TRIBUTARY	LOCATION	Phosphates ppb
Par (Bissa)	Criggan Moors, SX 01882 61133	0
Par	South of Minorca Lane, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	100
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	1000
Tributary	Treverbyn Stream, SX 04532 58033	0
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	300
Par	Luxulyan allotments SX 04732 58045	1000
Par	Luxulyan SWW pumping station SX 05033 57849	500
Par	Cam Bridges SX 05292 57454	1000
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct SX 05650 57179	500
Par	Lady Rashleigh Mine SX 06451 56509	500
Par	Ponts Mill SX 07354 55875	300
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	100
Par	Middleway (Par Canal) SX 07238 54295	0

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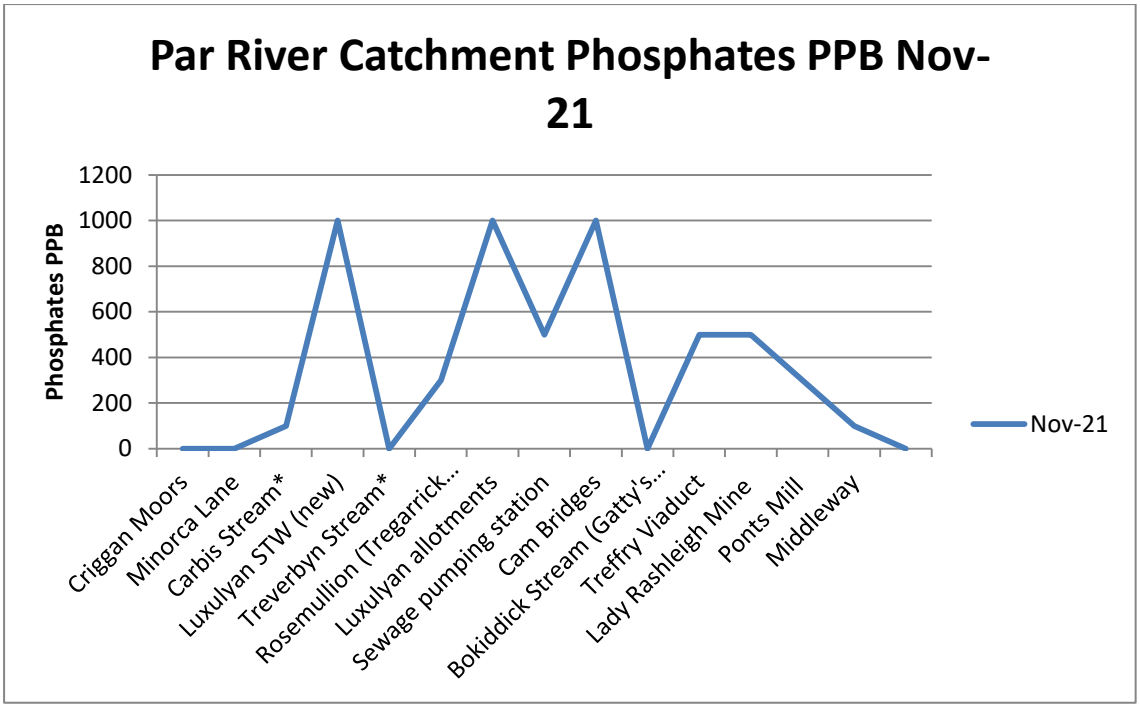
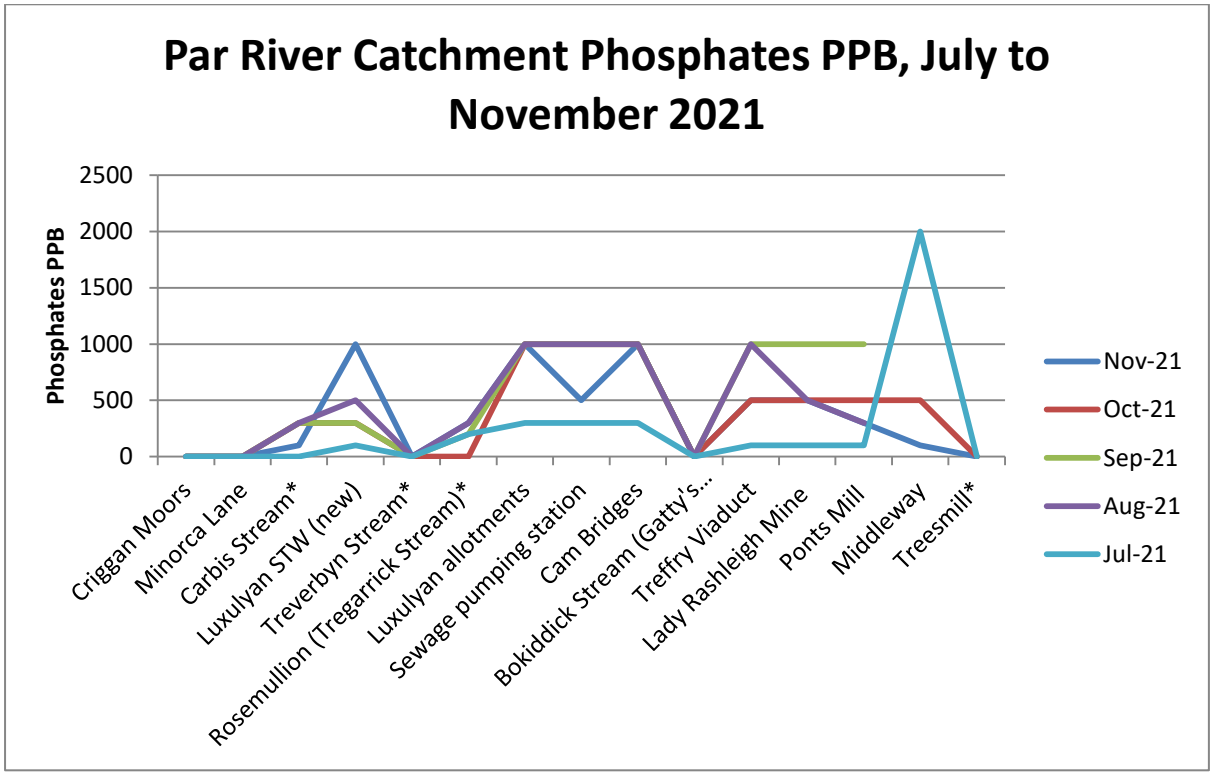


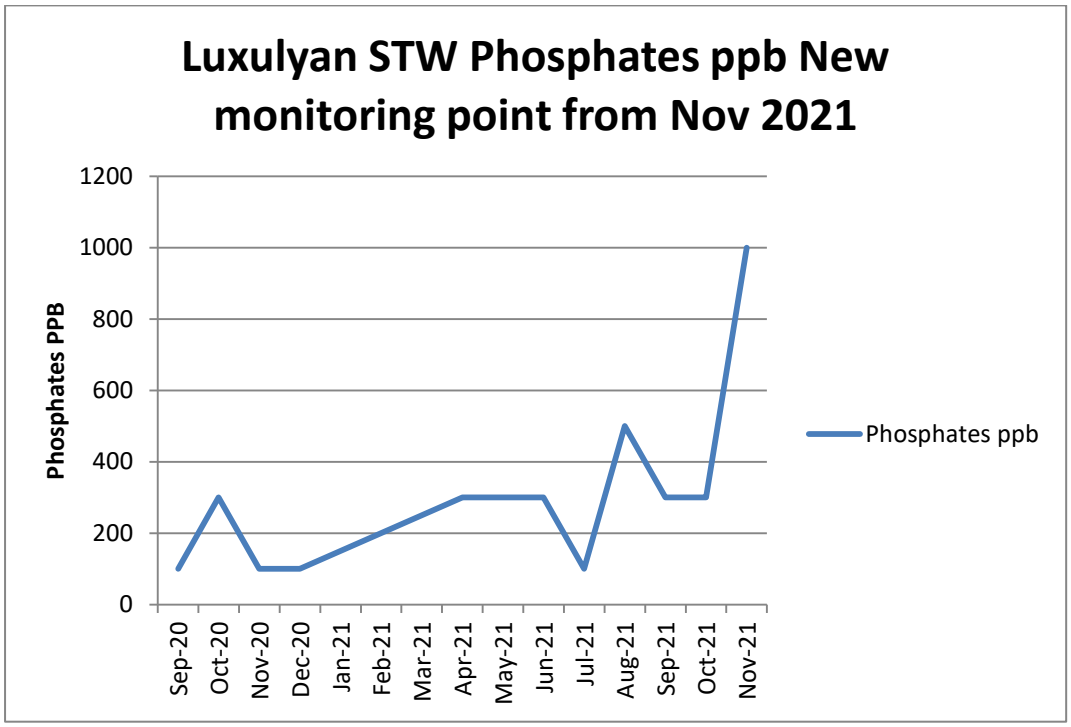
*indicates a tributary of the Par River.



It would seem that the selection of a new monitoring point, downstream from the Luxulyan STW, on the opposite bank, and a few metres from the unexplained outfall, is indicating the point where phosphate levels become elevated. This does not prove that the SWW treatment works is the cause but it will be interesting to see what the EA investigations initiated in October 2021 reveal.

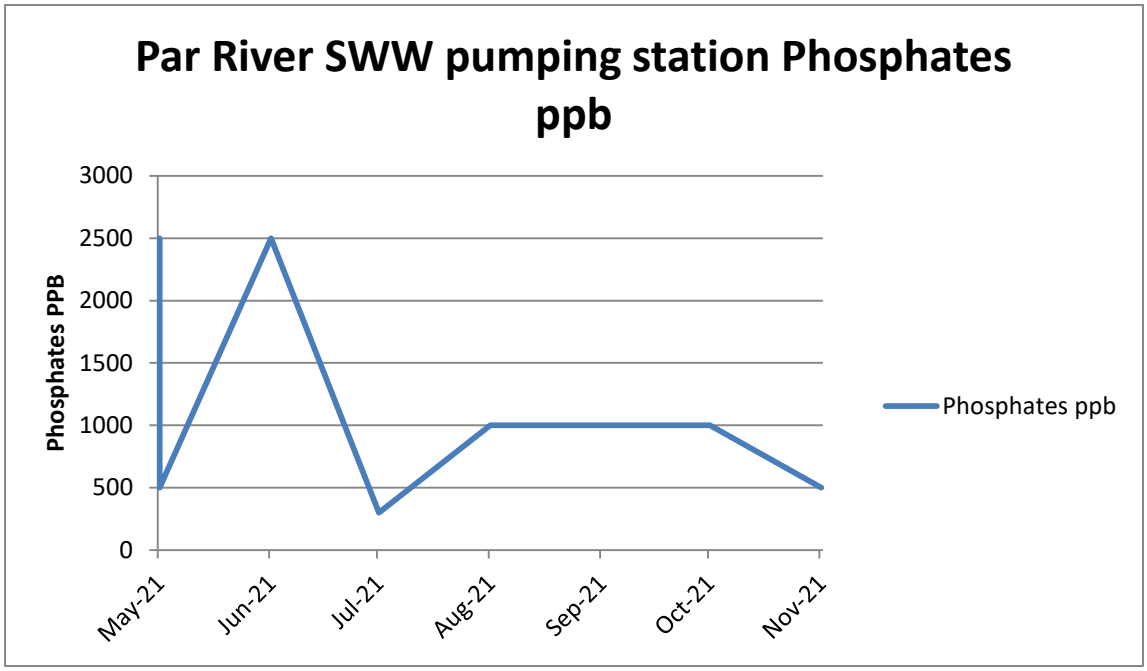
4. **Historical data on phosphates at selected sites (no monitoring January to March 2021):**

(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)

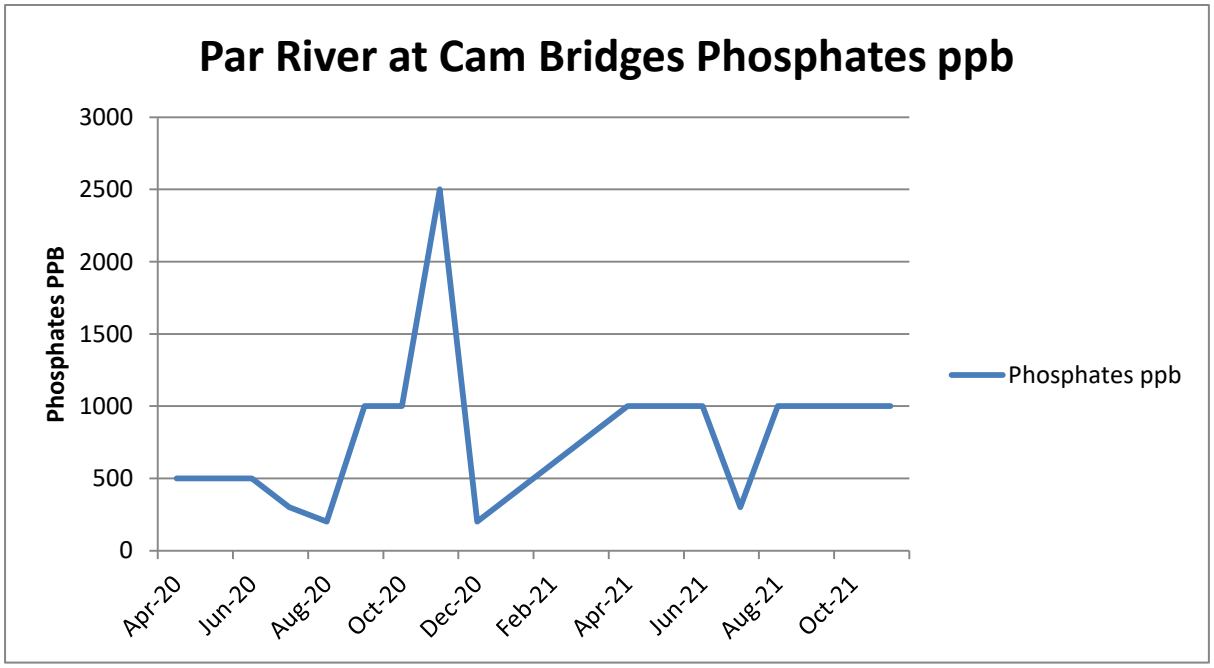


The new monitoring point was selected after very high phosphate levels were detected in October 2021. Two small outfalls from field drains next to the previous monitoring point were thought to have been diluting readings. Two outfalls from the STW are known. An EA investigation has confirmed high phosphate readings in this vicinity. Ammonia levels were recorded but our group does not know if these were significant. The purpose of the outfall at SX 0447 5811 is unknown. On this occasion only a trickle was emerging, yet the red-stained deposit was still evident (see photo on page 1).

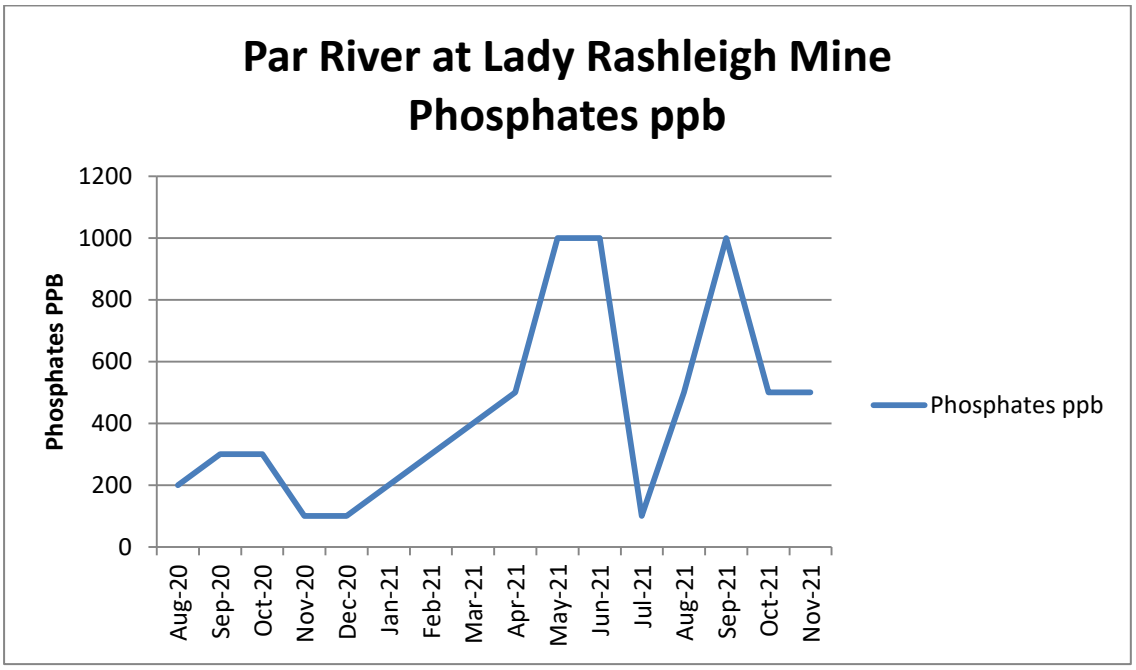
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454

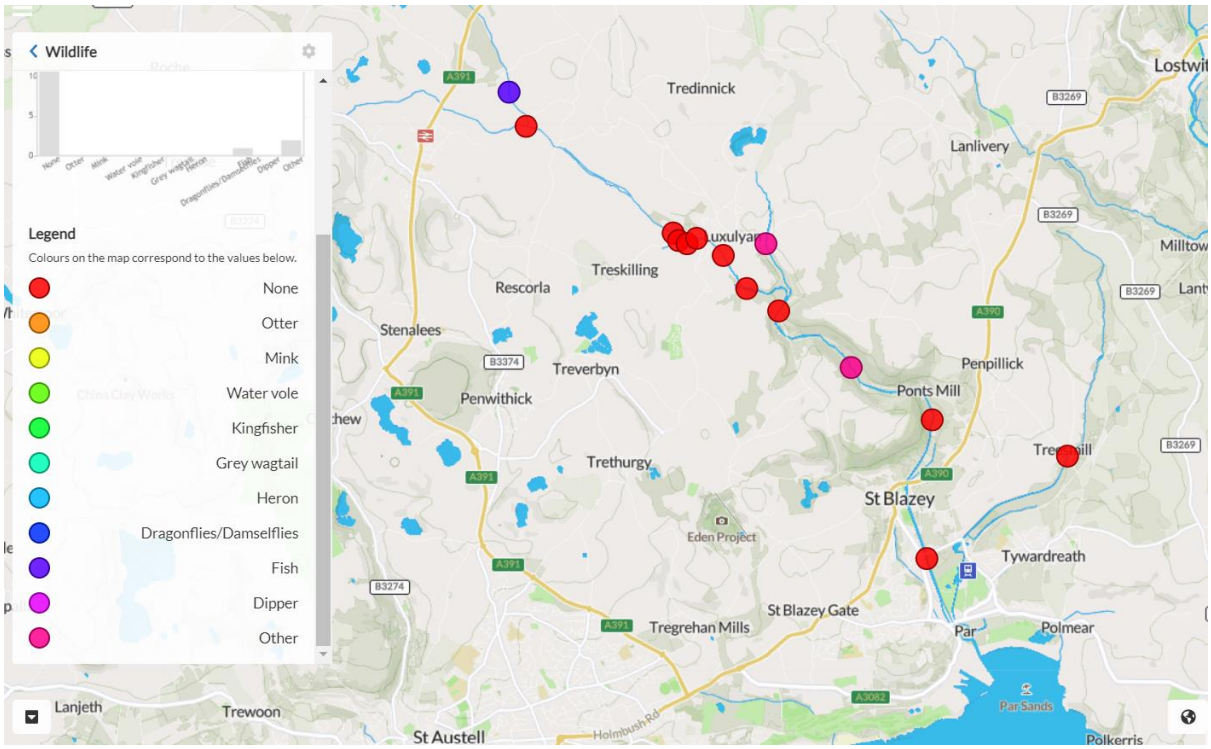


(d) Lady Rashleigh Mine SX 06451 56509



H. OTHER OBSERVATIONS

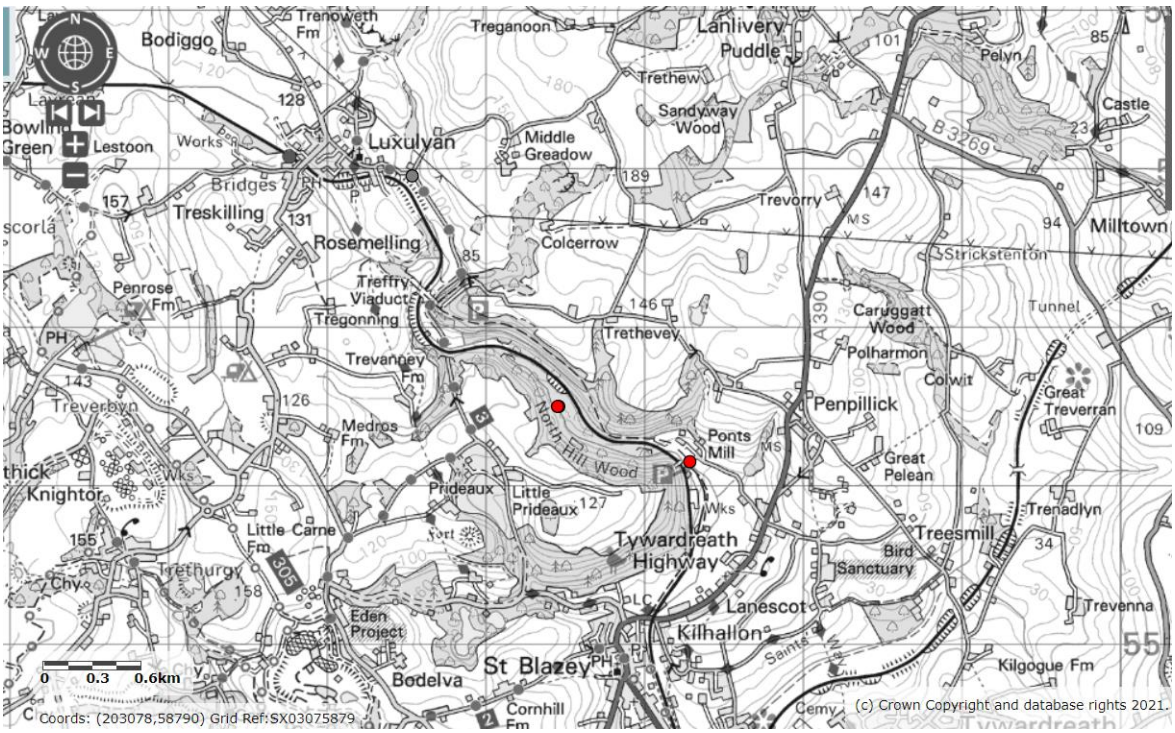
1. Wildlife



Source: Cartographer.

2. **Otter survey:**

Source: https://magic.defra.gov.uk/MagicMap.aspx



Red dots – definite evidence of otters. Recorded on ORKS database.

Grey dots – possible evidence. Not recorded on ORKS database

EVIDENCE	SEEN/ ORKS*	LOCATION	NOTES
Spraint - fresh	✓	SX 06456 56498 Lady Rashleigh Mine – boulder in river	Also, on a boulder and a tree trunk an unidentified odourless deposit.
Spraint – recent	✓	SX 07312 56164 Gully on north side (west bank) of canal bridge at Ponts Mill	
Spraint - old			
Anal jelly			
Sign heap			
Staining			
Tracks	?	SX 0553 5795 Scratch marks on sand in bankside hollow near Gatty's Bridge	Besides the scratch marks ther was a strong smell reminiscent of spraint but none could be found. The sand had been scraped up into a small pile.
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

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Boulder at Lady Rashleigh Mine (SX 06456 56498) with spraint on the left

Close-up of spraint shows fish bones

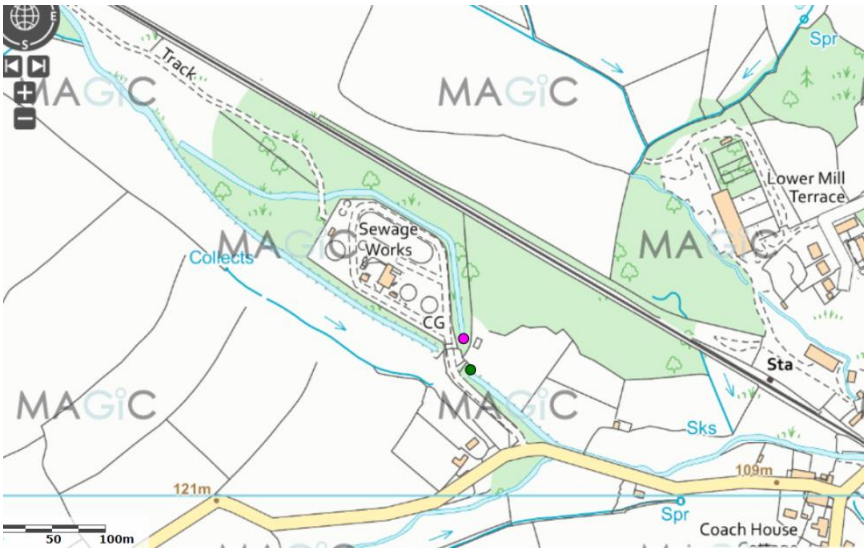
A more detailed report on the monthly surveys and a table of cumulative results is available if required.

I. DISCUSSION

1. Phosphate levels were high but not as high as in October. This is first detected at about the new monitoring point downstream from the STW at SX 04472 58114.

Looking upstream from the new monitoring point at SX 04472 58114. The unexplained outfall is on the right. The known STW outfalls are upstream from the far end of the bridge.

2. Our group awaits the conclusions of the Environment Agency following our report to their hotline last month. The outfall near the new monitoring point was only issuing a trickle this time but its purpose is unexplained. Is it linked to the STW? In the map below, the green dot is the mystery outfall while the purple one shows a watercourse flowing to the north of the STW. The 2 known outfalls are on the southern side of the works.



3. The Carbis Stream continues to flow white. This is not the only watercourse in the clay country to do so. It has been assumed that this is the result of material washed from its banks when the stream is higher; however, it is no more than a guess, so a more careful search for the cause of this contamination is warranted.

Roger Smith, 25th November 2021