WESTCOUNTRY RIVERS TRUST CITIZEN SCIENCE

MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

DECEMBER 2021

Criggan Moors, near the river's source, acts like a giant sponge and releases water slowly

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 DECEMBER 2021

1. Phosphate readings were much lower than usual.
2. China clay in the Carbis stream is a concern.
3. Otters, grey wagtails and dippers continue to be present in the Luxulyan Valley section of the Par River.

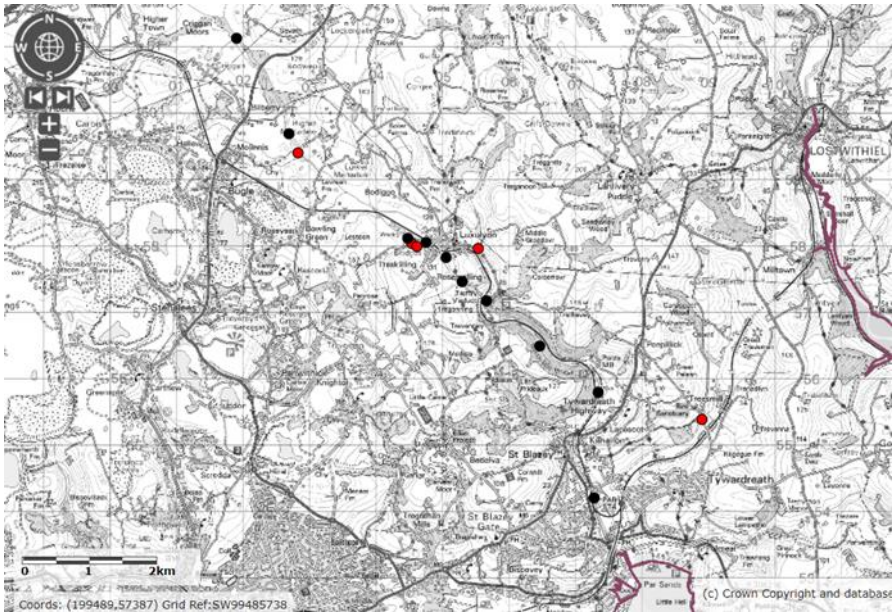
B. OUR GROUP

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. DECEMBER 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 (SX 0455 58114 before Nov 2021)	Joan Farmer & Roger Smith
Treverbyn Stream, SX 04532 58033	Joan Farmer & Roger Smith
Rosemullion, Tregarrick Stream, SX 04623 57990	Joan Farmer, & Roger Smith
Luxulyan allotments, Par River, SX 04732 58045	Joan Farmer & Roger Smith
Luxulyan SWW pumping station, Par River, SX 05033 57849	Joan Farmer & Roger Smith
Cam Bridges, Par River, SX 05292 57454	Roger Smith
Gatty's Bridge, Bokiddick Stream SX 05531 57953	Joan Farmer & Roger Smith
Treffry Viaduct, Par River, SX 05650 57179	Joan Farmer, Sue Perry, Mandy Case & Roger Smith
Lady Rashleigh Mine, Par River, SX 06451 56509	Joan Farmer, Sue Perry, Mandy Case & Roger Smith
Ponts Mill, Par River, SX 07354 55875	Joan Farmer, Sue Perry, Mandy Case & Roger Smith
Middleway, Par Canal, SX 07233 54299	Veronica Jones
Treesmill, Tywardreath Stream, SX 08873 55385	Veronica Jones

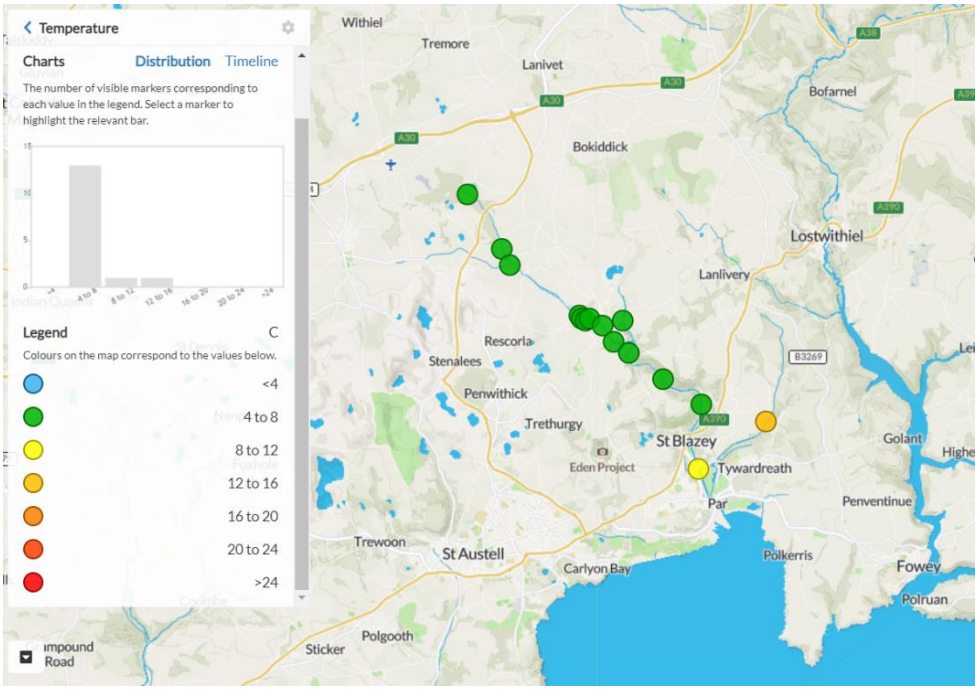
Surveys conducted on these dates, each of which is colour-coded:
10th December 2021
11th December 2021
12th December 2021

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.** Source: Cartographer.



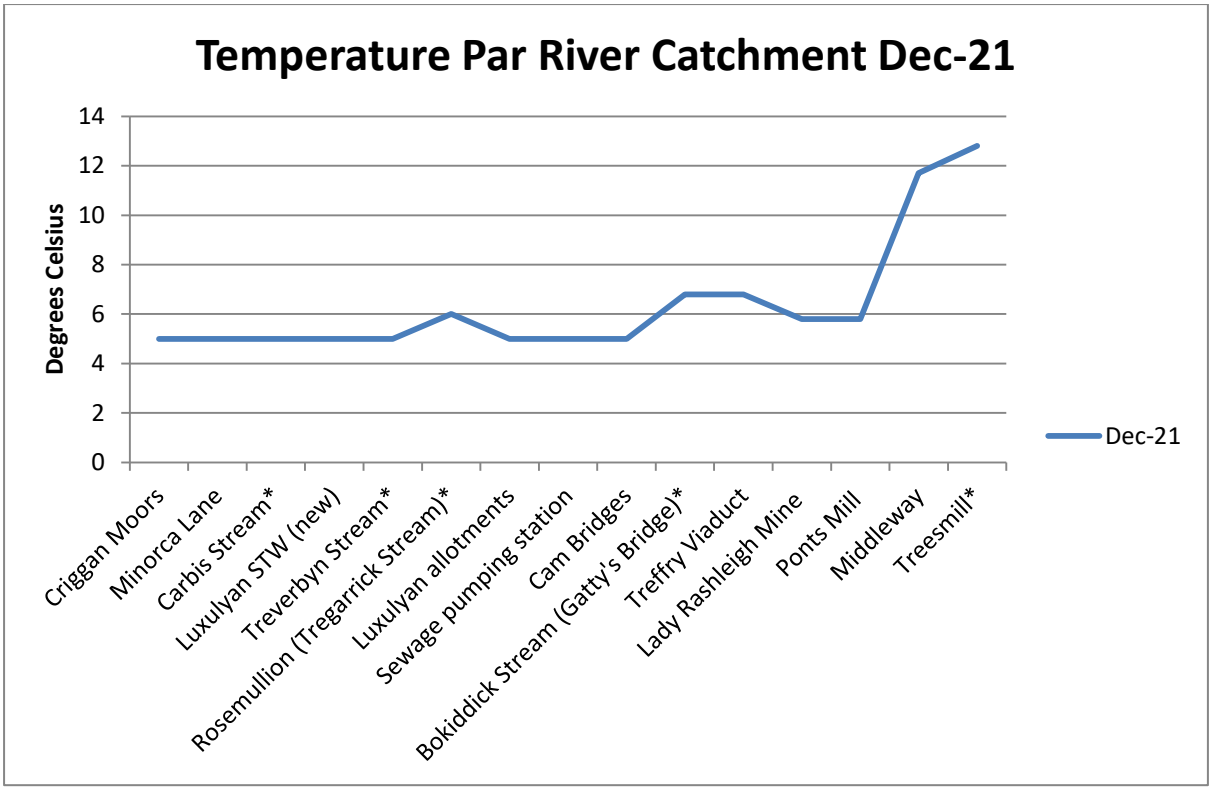
PAR RIVER/TRIBUTARY	LOCATION	Temperature ˚Celsius
Par (Bissa)	Criggan Moors, SX 01882 61133	5
Par	South of Minorca Lane, SX 02657 59788	5
Tributary	Carbis Stream SX 02834 59401	5
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	5
Tributary	Treverbyn Stream, SX 04532 58033	5
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	6
Par	Luxulyan allotments SX 04732 58045	5
Par	Luxulyan SWW pumping station SX 05033 57849	5
Par	Cam Bridges SX 05292 57454	5
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	6.8
Par	Treffry Viaduct SX 05650 57179	6.8
Par	Lady Rashleigh Mine SX 06451 56509	5.8
Par	Ponts Mill SX 07354 55875	5.8
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	11.7
Par	Middleway (Par Canal) SX 07238 54295	12.8

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

10th December 2021

11th December 2021

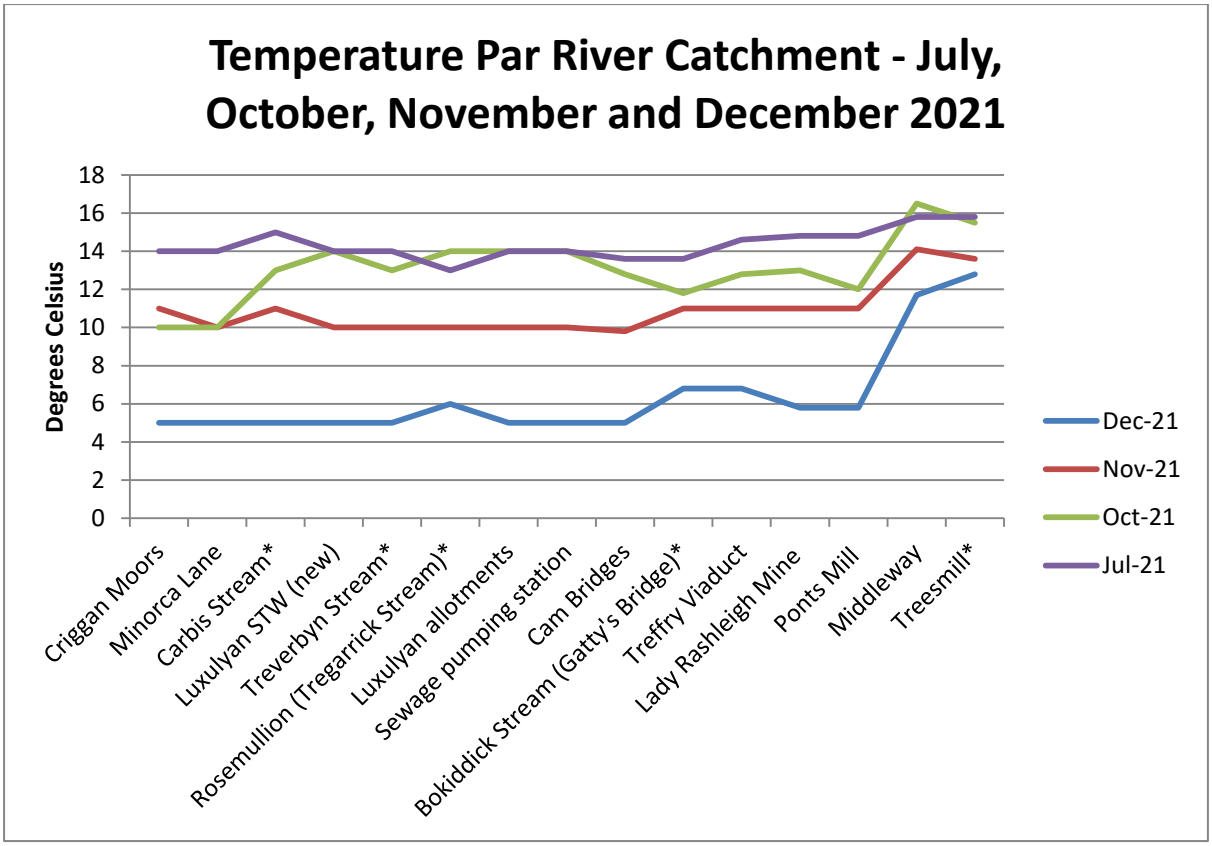
12th December 2021



*indicates a tributary of the Par River.

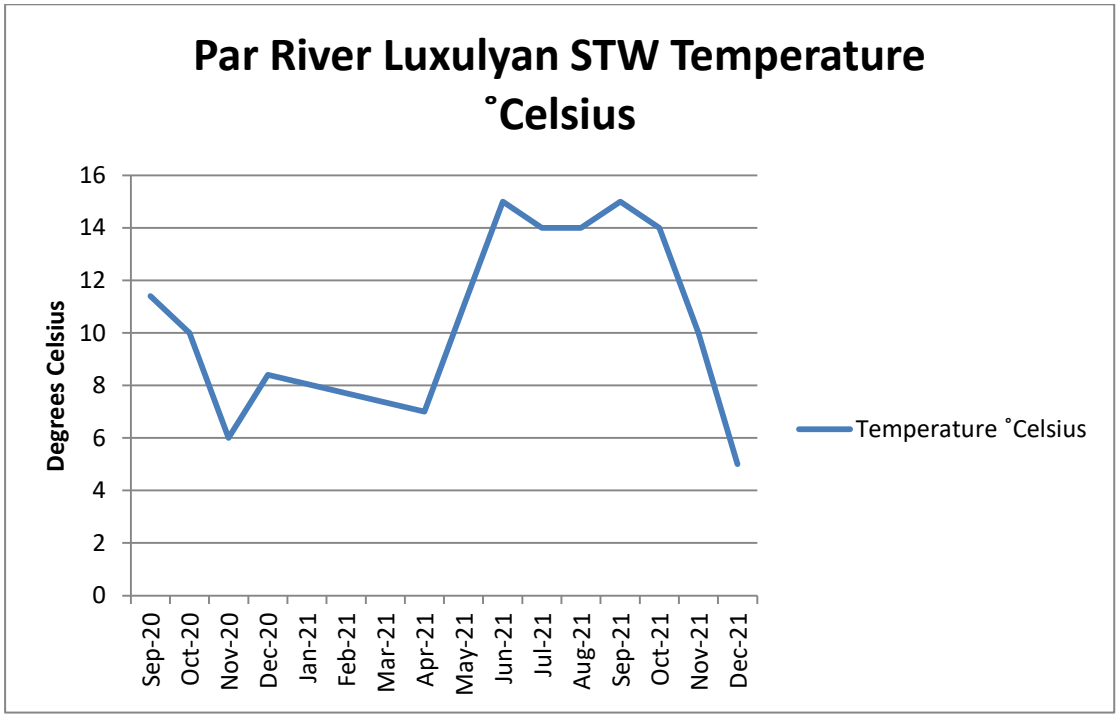
In the recent WRT webinar, Simon Browning emphasised the critical influence of temperature on fish, particularly their spawning, so the relatively high temperatures at Middleway and Treesmill may be noteworthy.

These temperatures are arranged, broadly speaking, from north (upstream) to south (downstream), and in order of flow. Once 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. The readings at Middleway and Treesmill were taken on a later day than the others. Even so, the temperatures are significantly higher. The next graph shows 4 months' worth of data that includes readings at Middleway and Treesmill. The latter 2 have always had the highest temperature so far but in December the difference between these 2 sides and all the others is greatest.

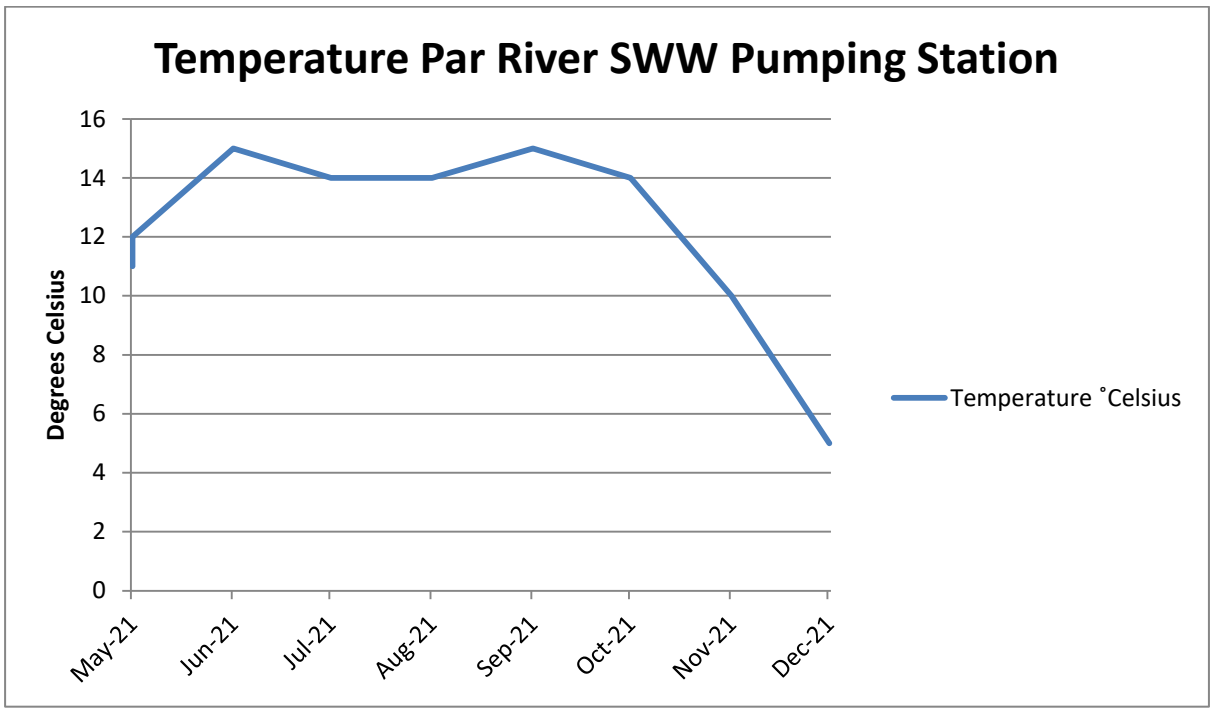


3. **Historical data** on temperature at selected sites (no monitoring January to March 2021):

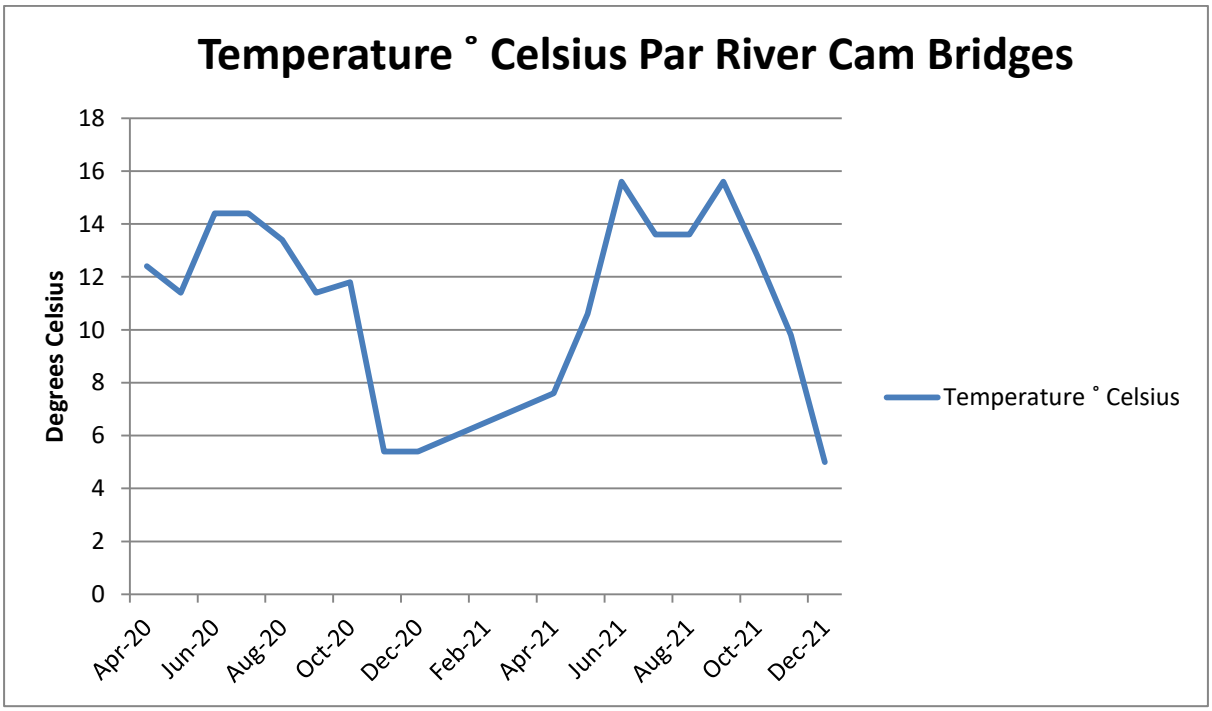
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



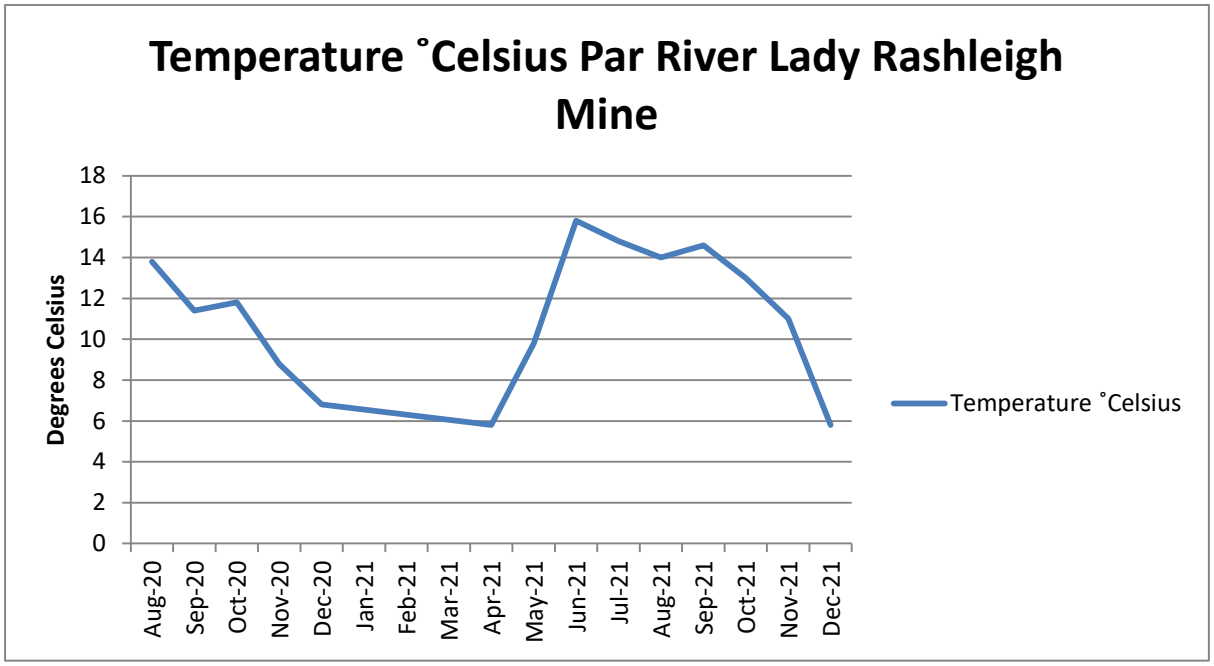
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509

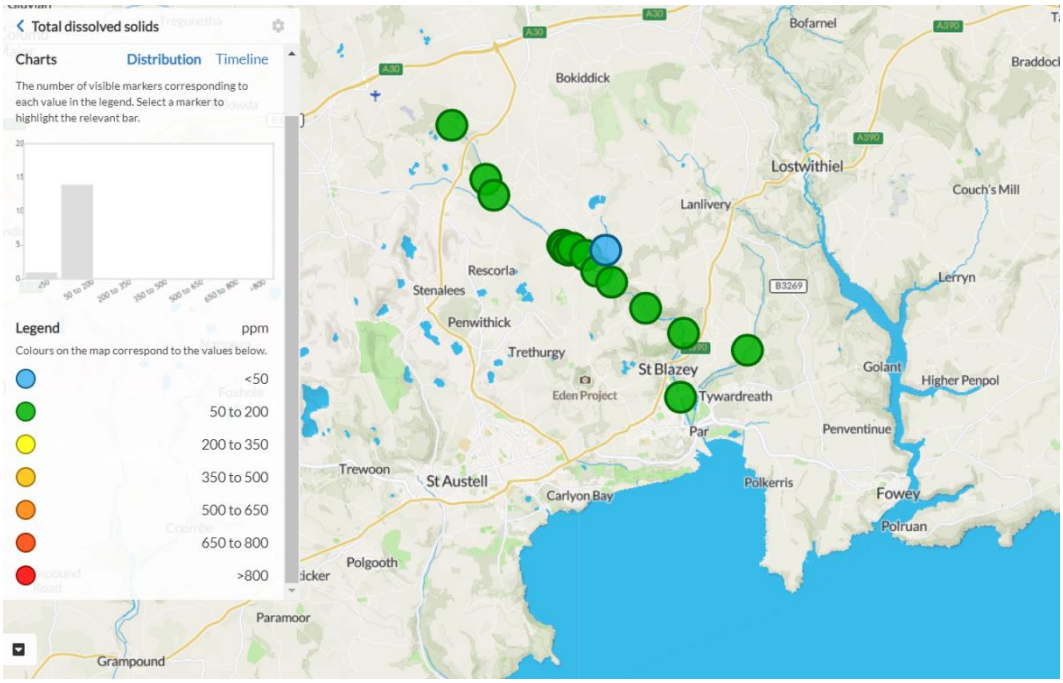


E. TOTAL DISSOLVED SOLIDS

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	72
Par	South of Minorca Lane, SX 02657 59788	66
Tributary	Carbis Stream SX 02834 59401	146
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	127
Tributary	Treverbyn Stream, SX 04532 58033	78
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	177
Par	Luxulyan allotments SX 04732 58045	98
Par	Luxulyan SWW pumping station SX 05033 57849	99
Par	Cam Bridges SX 05292 57454	113
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	45
Par	Treffry Viaduct SX 05650 57179	100
Par	Lady Rashleigh Mine SX 06451 56509	97
Par	Ponts Mill SX 07354 55875	96
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	114
Par	Middleway (Par Canal) SX 07238 54295	123

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

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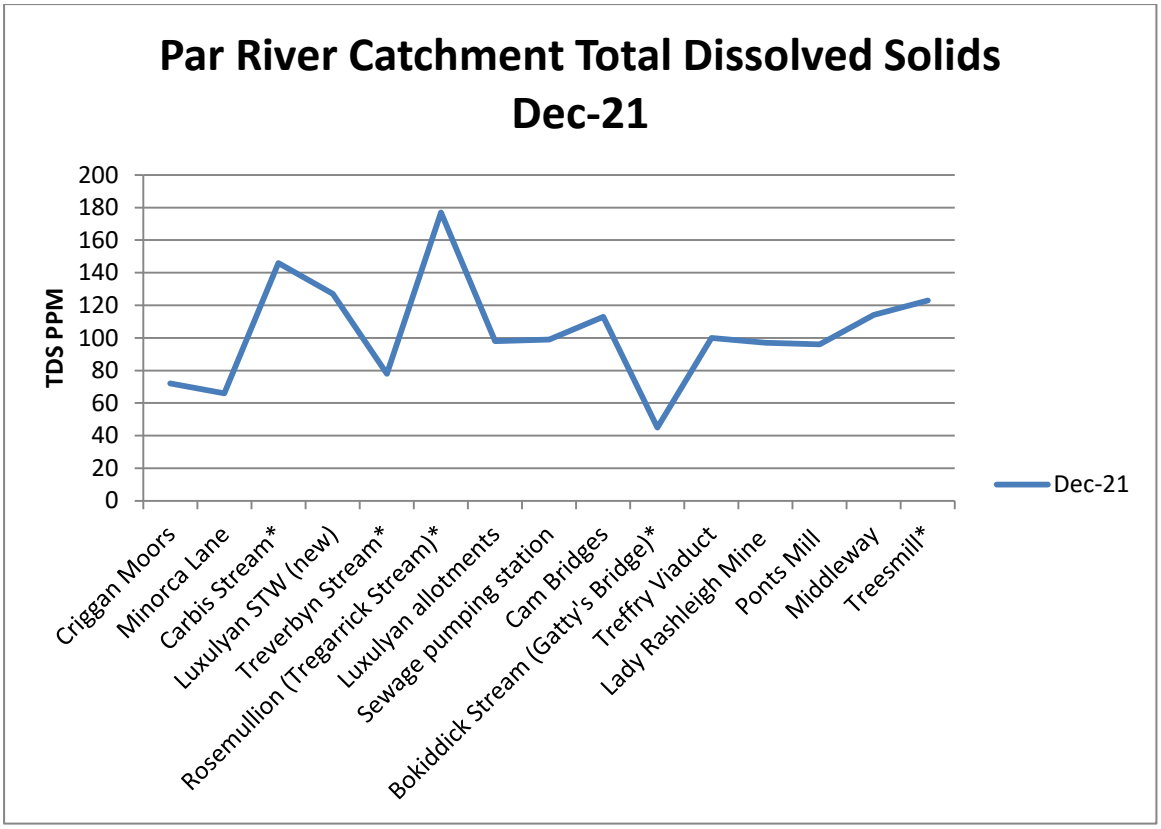
12th December 2021



*indicates a tributary of the Par River.

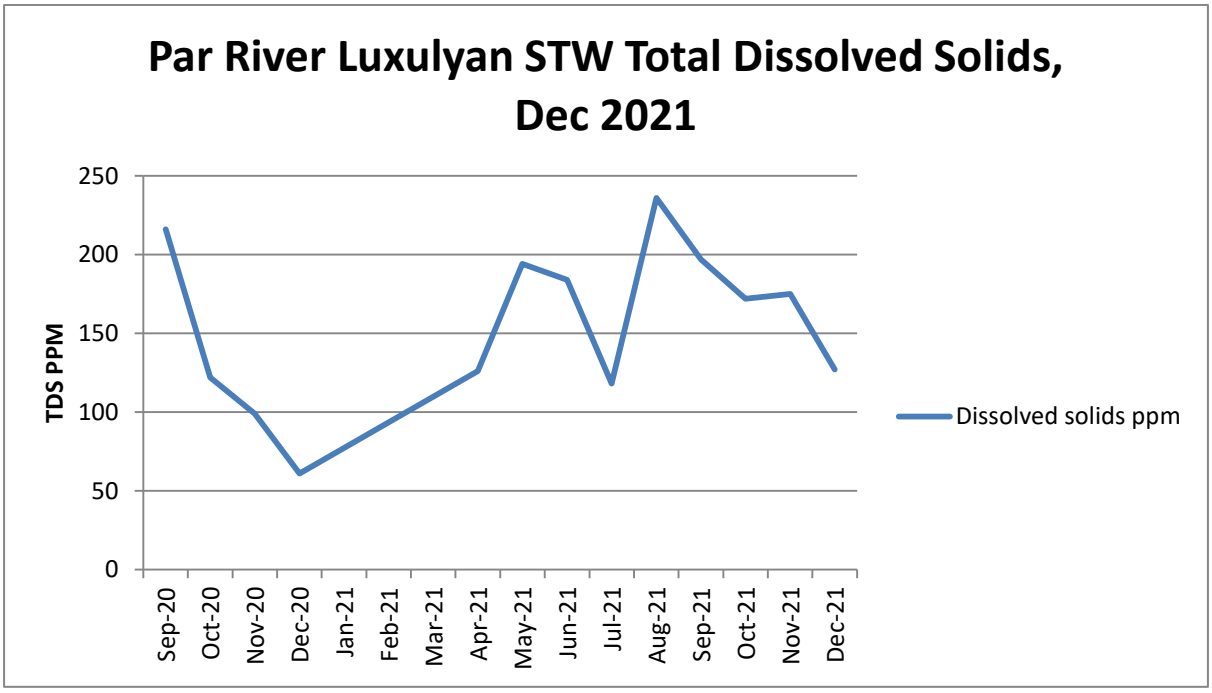
The highest readings were from the Tregarrick Stream at Rosemullion bungalow and the Carbis Stream near Higher Menadue/Lavrean. The former location is a stream containing a thick level of silt believed to have originated from slurry. At the latter, it is quite clearly china clay.

Carbis Stream at SX 02834 59401 running white, presumably with china clay

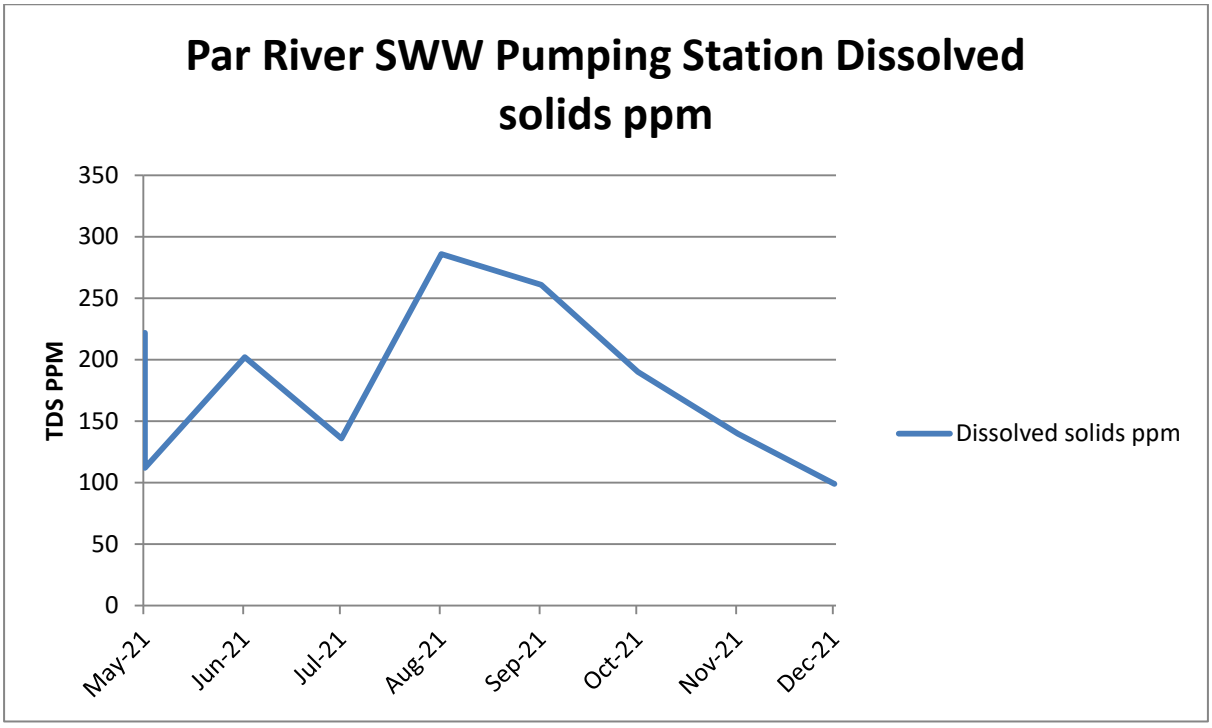
On the right the clay-polluted Carbis Stream meets the Par River

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

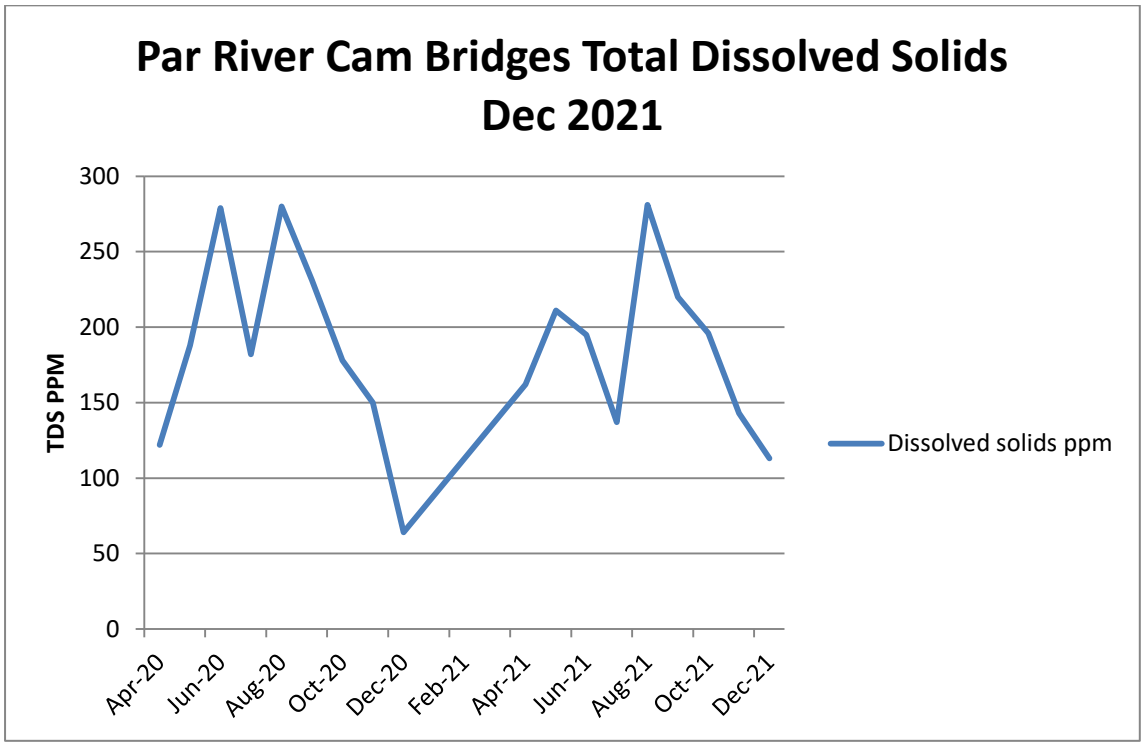
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



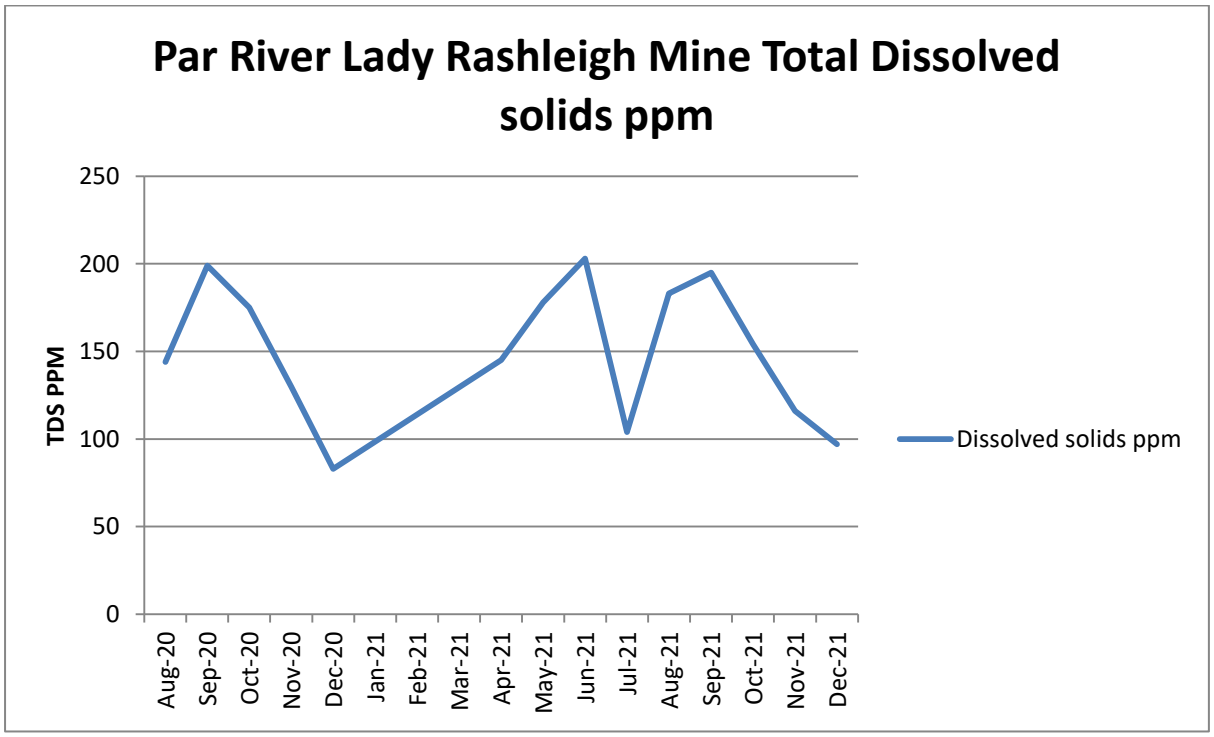
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509

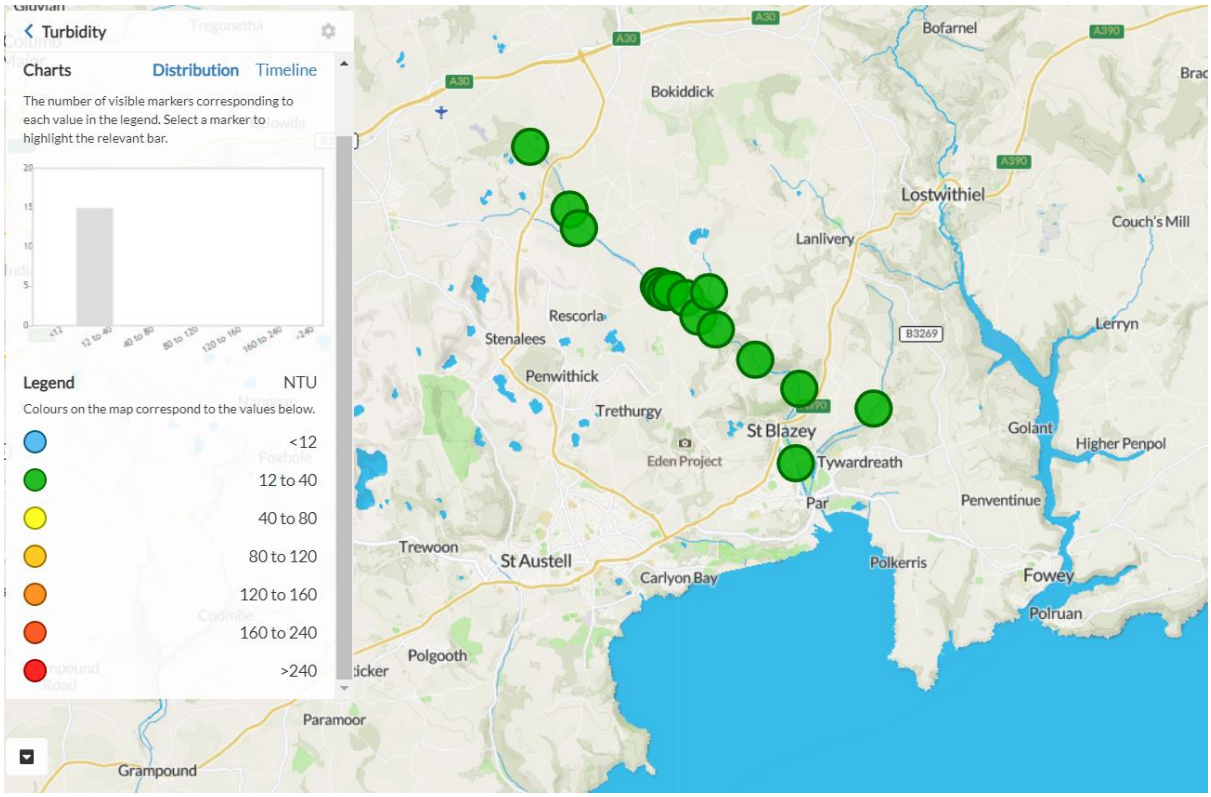


F. TURBIDITY

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	28
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	0
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

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

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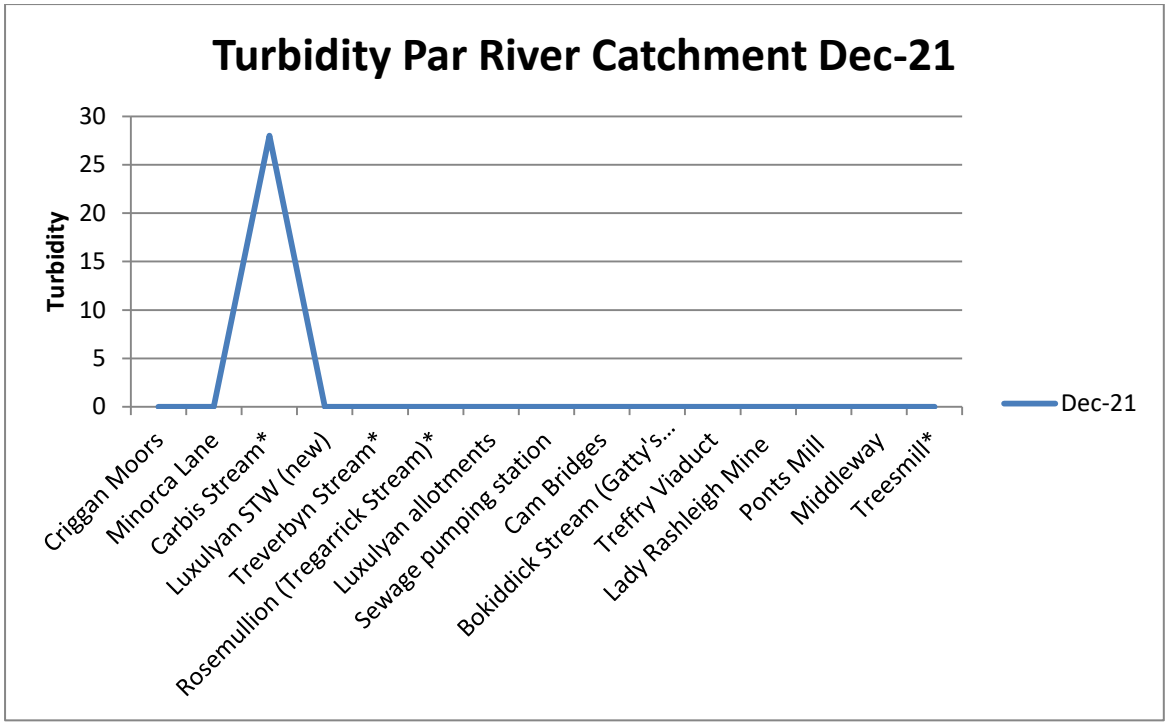
12th December 2021

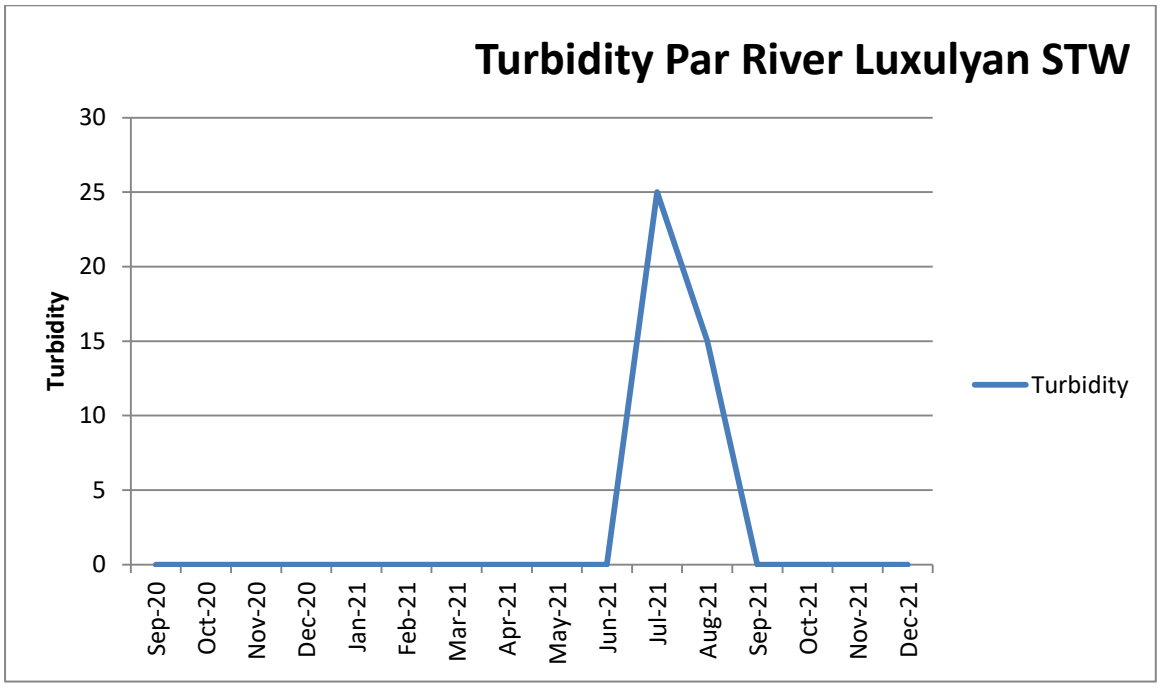


*indicates a tributary of the Par River.

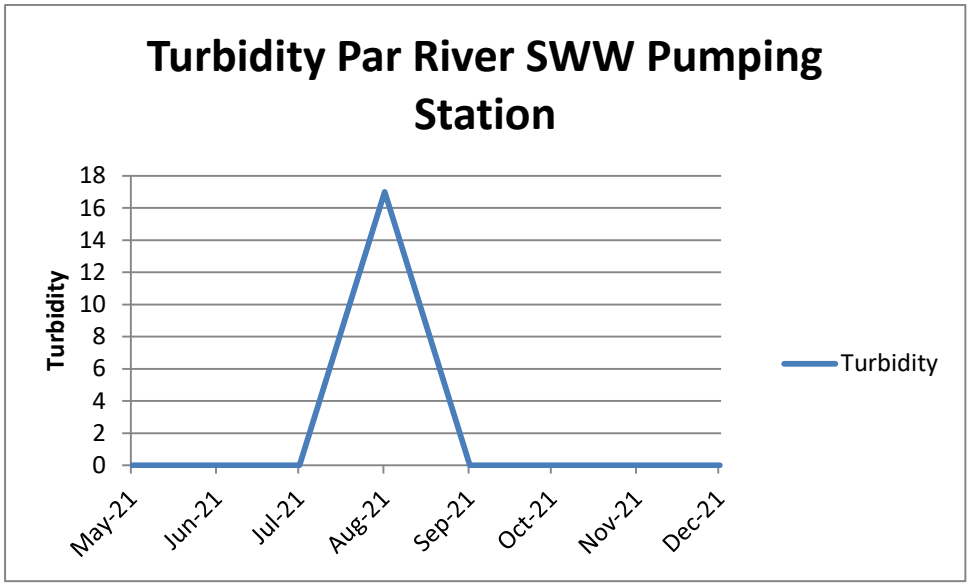
The outlier is the Carbis Stream, which, as shown in the section on Total Dissolved Solids, was running white with china clay.

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

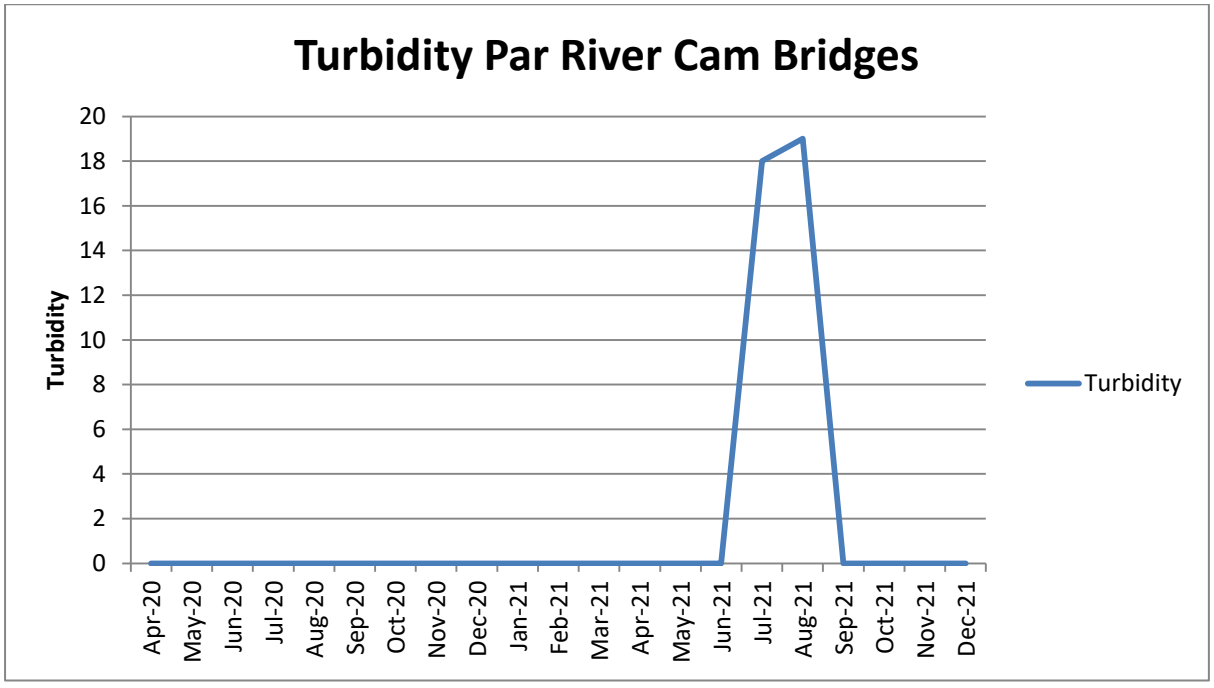
(a) Luxulyan sewage treatment works measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114)



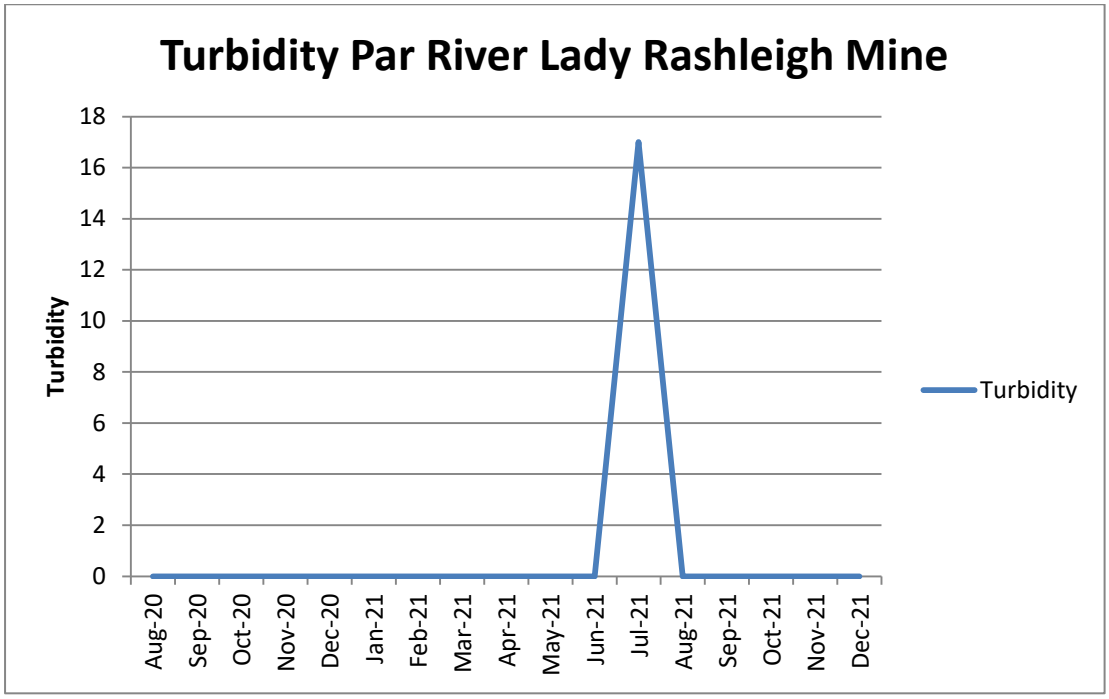
(b) Luxulyan SWW pumping station SX 05033 57849



(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.)

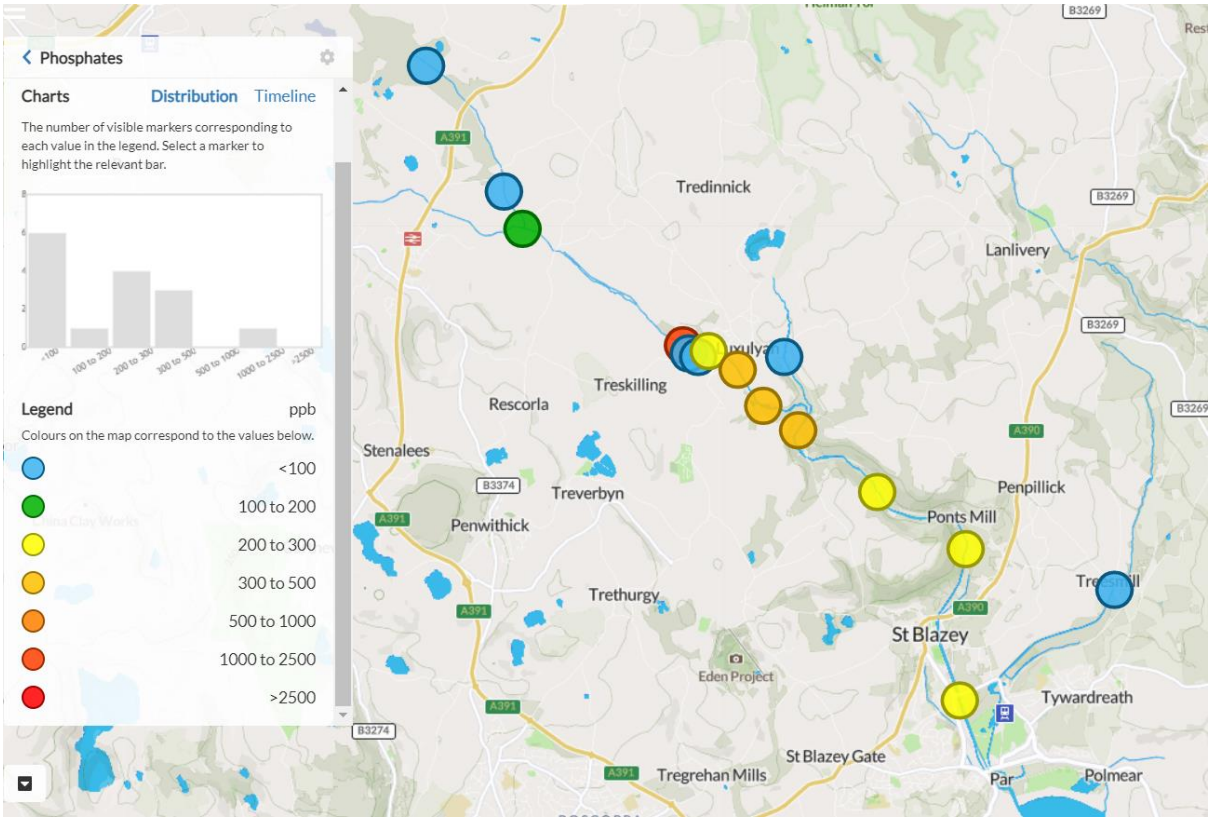
Ranges on phosphate diagnostic colour chart:

0 – 100 OK

200 – 300 HIGH

500 – 2500 – TOO HIGH

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

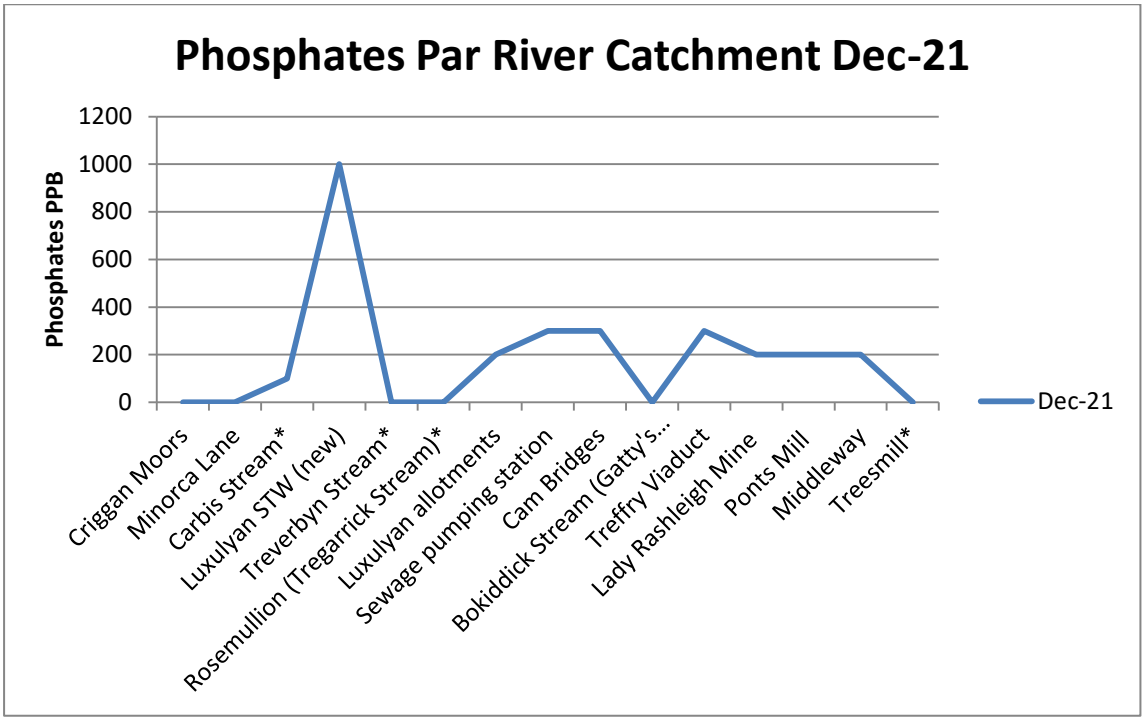


PAR RIVER/TRIBUTARY	LOCATION	Phosphates ppb
Par (Bissa)	Criggan Moors, SX 01882 61133	0
Par	South of Minorca Lane, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	100
Par	Luxulyan sewage treatment works SX 04472 58114 (formerly SX 0455 58114)	1000
Tributary	Treverbyn Stream, SX 04532 58033	0
Tributary	Tregarrick Stream, Rosemullion, SX 04623 57990	0
Par	Luxulyan allotments SX 04732 58045	200
Par	Luxulyan SWW pumping station SX 05033 57849	300
Par	Cam Bridges SX 05292 57454	300
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct SX 05650 57179	300
Par	Lady Rashleigh Mine SX 06451 56509	200
Par	Ponts Mill SX 07354 55875	200
Tributary	Tywardreath Marsh Stream (Treesmill) SX 08902 55414	200
Par	Middleway (Par Canal) SX 07238 54295	0

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

10th December 2021

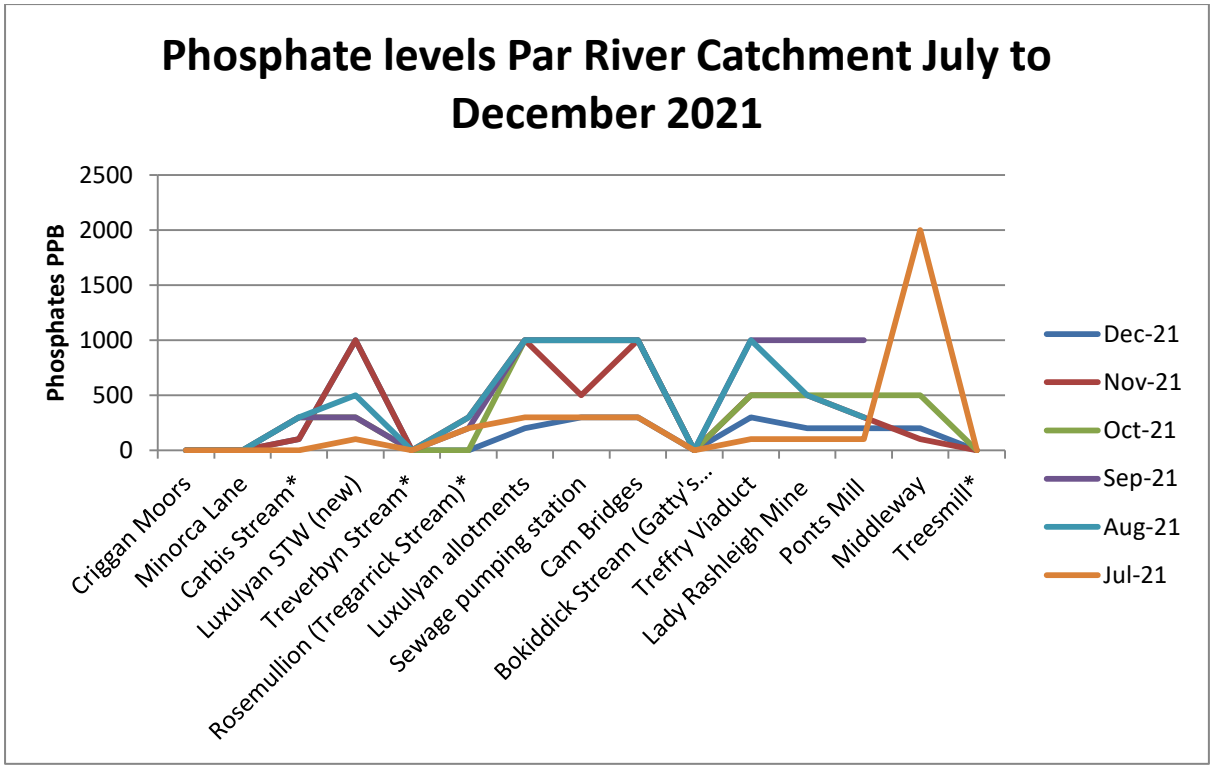
11th December 2021 12th December 2021



*indicates a tributary of the Par River.

This month's readings were an improvement in that, with the exception of the reading nearest the STW, levels tended to be ***High*** rather than ***Too High*** (WRT grading). It isn't known if this was related to higher water levels or not. The Environment Agency has been in touch with South West Water after our group reported very high phosphate levels near the STW on 9th October 2021. Recently, strimming has taken place near our monitoring spot at SX 04472 58114 raising the possibility of activity in the vicinity but this might be irrelevant. Whether this means some sort of action has been taken to limit phosphates coming from the STW it is impossible to say. Our group hopes to learn more about the EA investigation but accepts that it may take some time to complete.

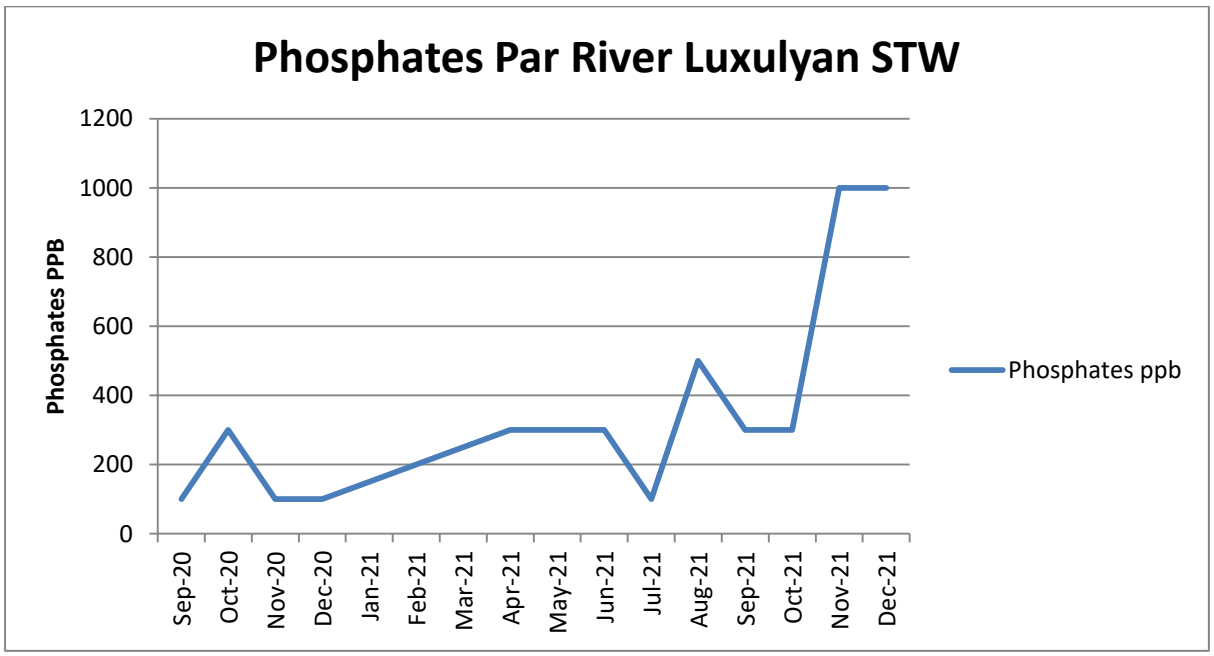
As the following chart shows, elevated phosphate levels in the main river tend to be the norm. Note that from November a slightly different monitoring point was chosen downstream from the STW. This was following our discovery of a phosphate level of 2500 ppb nearby. We believe the new monitoring point is more representative of the phosphate level in the river. The EA seems to have established that the STW is a source of high phosphate levels.



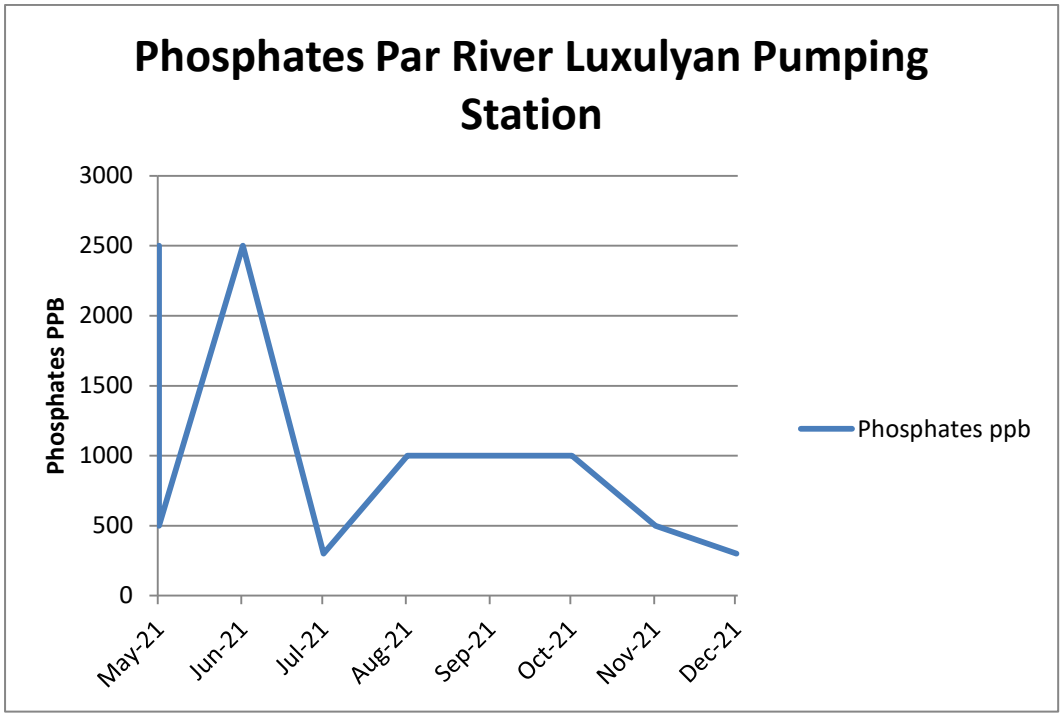
4. **Historical data on phosphates at selected sites (no monitoring January to March 2021):**

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

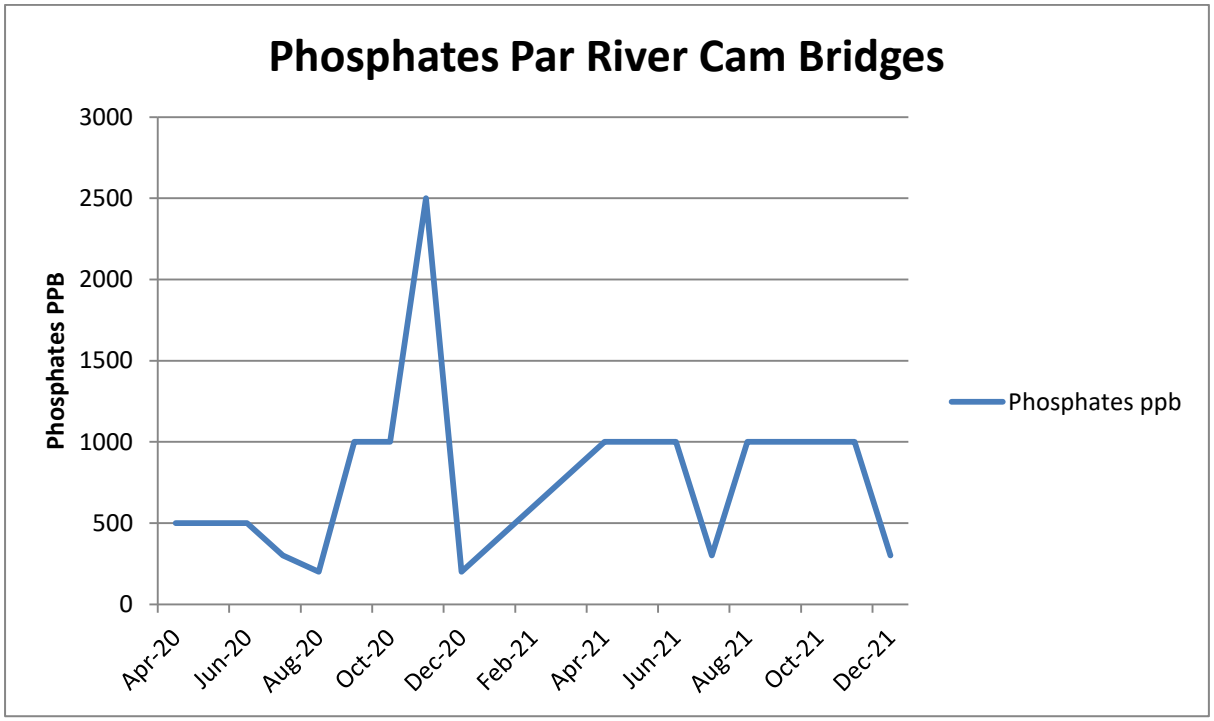
Measurements at the old monitoring spot, before November 2021, may have been diluted by the proximity of 2 small outfalls (believed to be land drains).



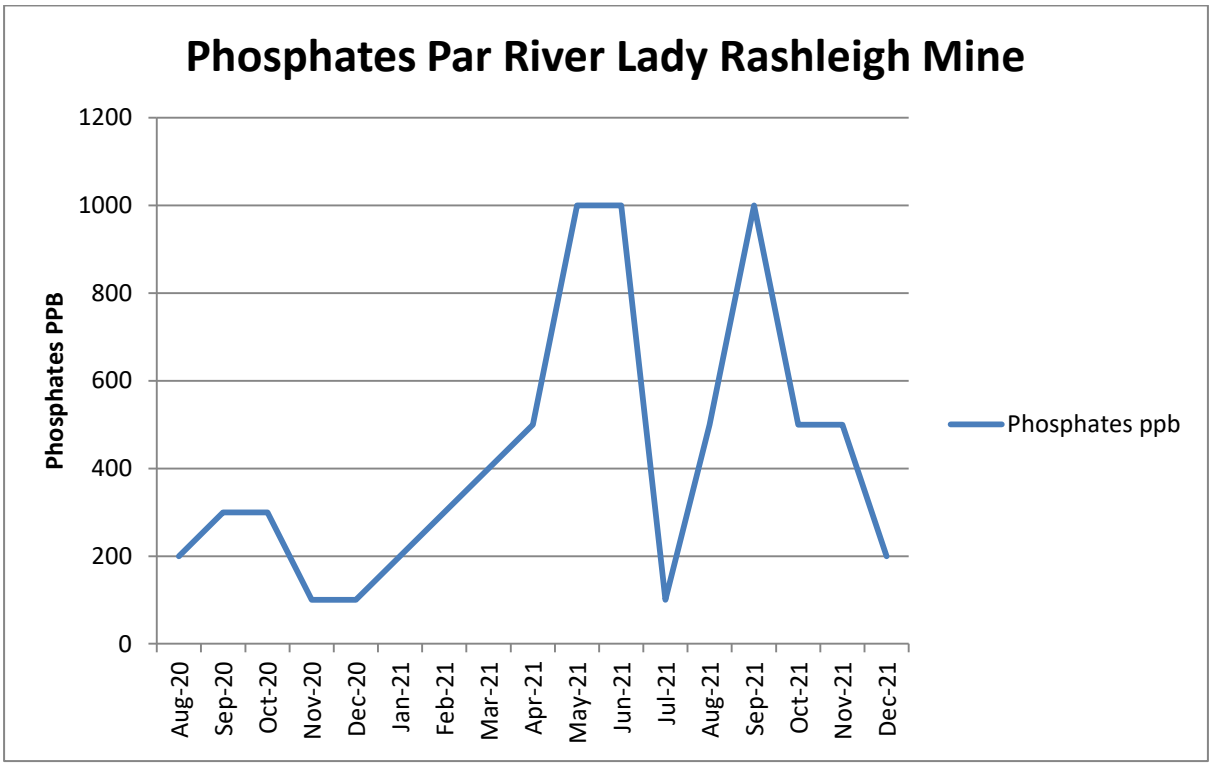
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454

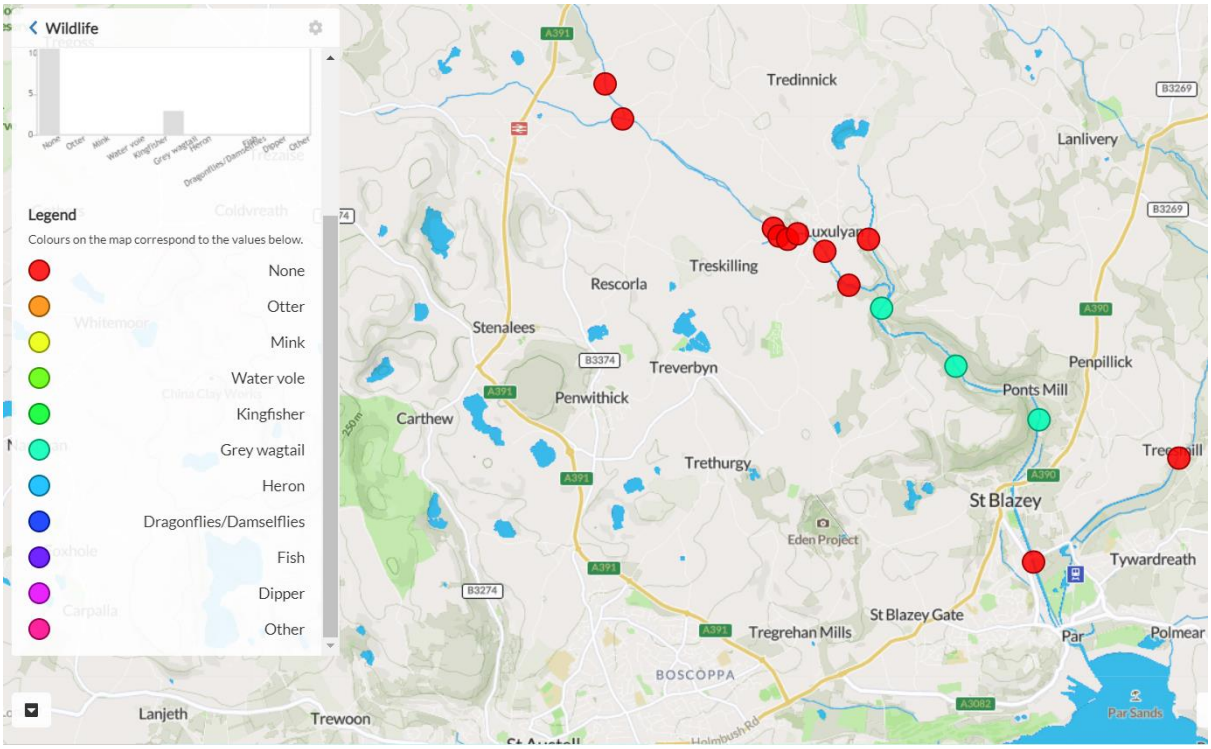


(d) Lady Rashleigh Mine SX 06451 56509



H. OTHER OBSERVATIONS

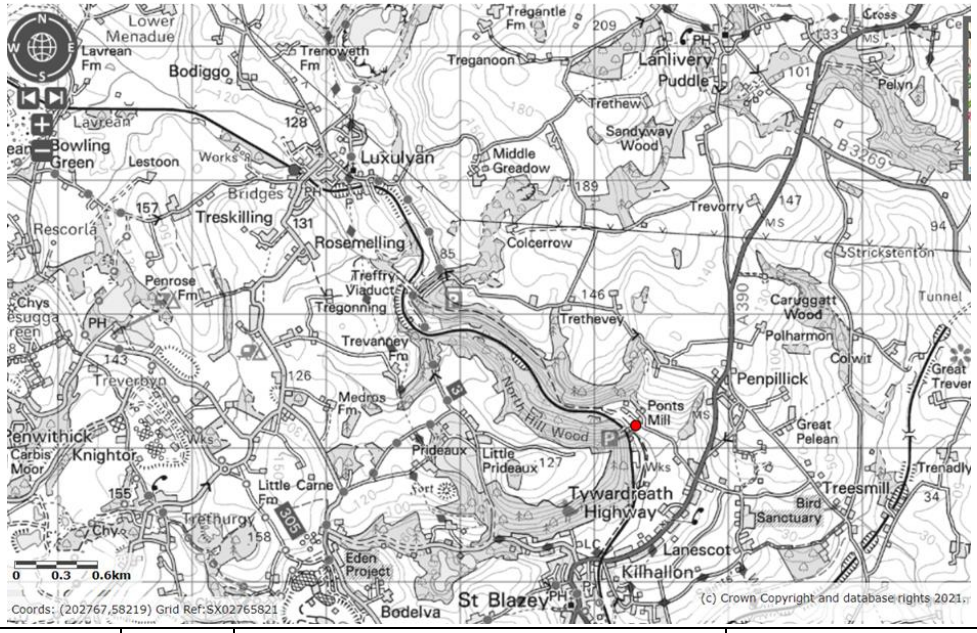
1. Wildlife



Source: Cartographer.

Grey wagtails were seen in Luxulyan Valley, as well as a dipper, although that doesn't show up on the above map.

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			
Spraint – recent	✓*	SX 07312 56164 under canal bridge at Ponts Mill	
Spraint - old			
Anal jelly			
Sign heap			
Staining			
Tracks	✓*	SX 07312 56164 under canal bridge at Ponts Mill	
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

3. Photographs

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Blurry photograph of spraint on rock below canal bridge at Ponts Mill

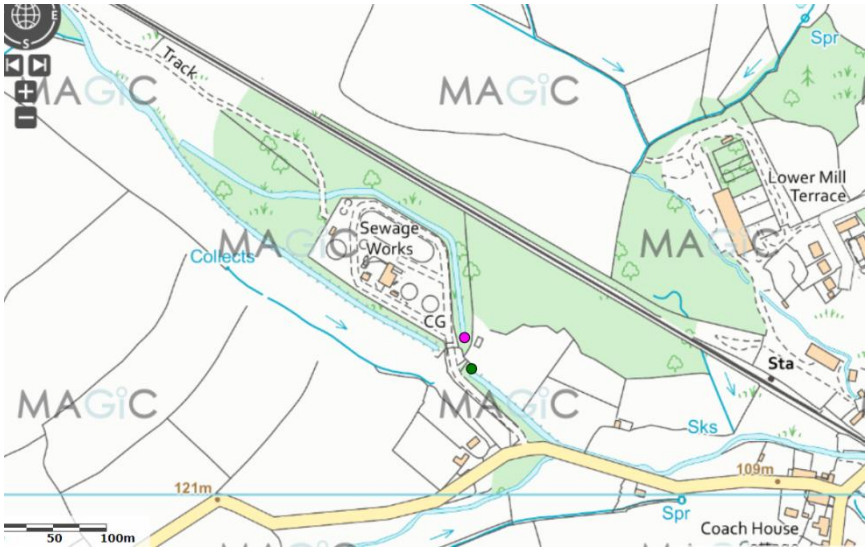
Close inspection suggested five toes in many of the footprints.

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 lower than in previous months. This may be temporary and related to recent rain and a higher water level, although it would be wonderful if it was the result of positive action at the STW. Only time will tell.

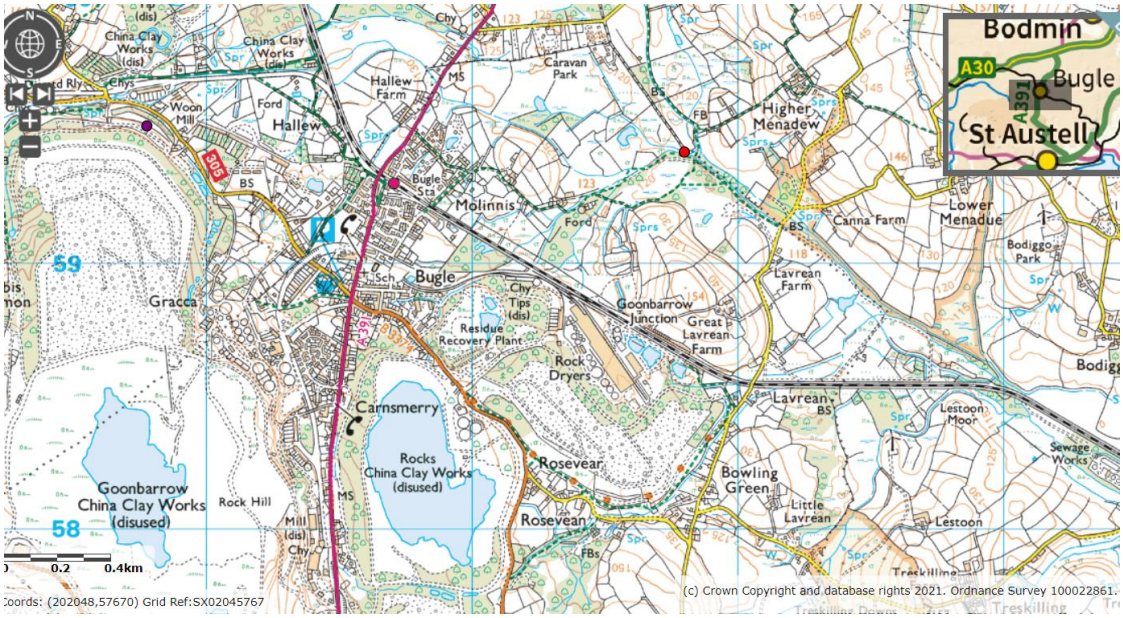
2. Initial feedback from the Environment Agency in response to our emergency report in October suggests that the channel flowing to the north of the STW (see map) 'was a leat which runs around the back of the STW, likely to be some flood alleviation channel built to protect the site' and was probably within the SWW compound. Although it had been impossible to inspect it fully, it was likely to be 'a slow moving ditch, likely to be full of rotting vegetation as it looks very overgrown, it could be a historic build-up of PO4 in bottom sediments. Given the low flow of this outfall, I can't imagine that this would have a significant impact on the main river, especially in comparison to the STW FE, which has historically had much greater phosphate concentrations (mean 8mg/l)'.



On this occasion, no unpleasant discharge could be seen in or around this outfall.

The EA also stated that: 'Our Area Water Quality team are reviewing the potential impact from the STW to determine if Phosphate removal will be required in the future. It is not currently a condition within the discharge permit.'

Although SWW needs to be probed further, the initial results of the Environment Agency have provided greater certainty about the source of elevated phosphate levels in the river. Ensuring that phosphates are not discharged at all may require pressure to be placed on SWW itself.



3. The pollution of the Carbis Stream with china clay needs further examination. The source of the china clay could be the banks of the stream, where a higher water level washes previous deposits into the stream, or current discharges, or both. Near the purple dot in the following map, the Carbis Stream can be seen by the road. Often it runs clear; at the monitoring point at SX 02834 59401 (red dot), however, it is more often white than not. This suggests that the clay enters the river closer to Bugle but as the map suggests, there are various watercourses in addition to the Carbis Stream that might act as conduits for pollution. Therefore it cannot yet be said where this china clay is coming from. The impact on fish and other wildlife is unknown.

4. It is hoped that the group will soon be able to add further tests to its monitoring. Three members have carried out the training needed to undertake riverfly monitoring. FoLV generously paid for the equipment and two sites (Luxulyan allotments on the Upper Par and Lady Rashleigh Mine on the Lower Par) have been approved. WRT hope to provide the group with training and equipment to carry out testing for E.coli in 2022.

5. One other development with the potential to enhance the riverside habitat is the G7 Project for Nature Recovery (https://www.cornwallwildlifetrust.org.uk/g7).

Roger Smith, 21st December 2021