WESTCOUNTRY RIVERS TRUST CITIZEN SCIENCE

MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

FEBRUARY 2022

Almost there! The Par River just before it enters the sea at Par Sands. **Photo: Veronica Jones**

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 FEBRUARY 2022

1. An additional monitoring point, on the Par River at Par Beach (SX 0776 53261) was included. This is tidal but it is intended to test at low tide in order to monitor river, and not sea, water. Thanks to Veronica Jones for testing here. The group now monitors from near the source to the estuary of the Par River.
2. For the first time there was nitrate testing at some points on the Par River.
3. Most results were conducted after 24 hours of dry, or relatively dry, weather but testing at Middleway, Treesmill and Par Beach occurred after heavy, prolonged rain.
4. Phosphate levels between Luxulyan STW and the Treffry Viaduct were *Too High* (500 ppb) but not as high as scores that have been noted in the past.
5. Recent otter spraint, containing fish bones and scales, was found near Luxulyan allotments (SX 04747 58056). This is the second time spraint has been found this far upstream by this group; the previous occasion was 12th September 2021. However, FoLV has not monitored this location in the past so it would be wrong to think that this is a new spot. Additionally, the level of the river dictates the chance of spraint staying in place on this boulder. Therefore, it would be unwise to make generalisations about this but it is indirect evidence about the presence of fish and water quality. Spraint was found at 3 further places downstream.
6. On 21st February we had training from Lydia Deacon (WRT) in testing for E.coli and other coliforms. The results were alarming. More information in **I. Other observations.**

B. OUR GROUP

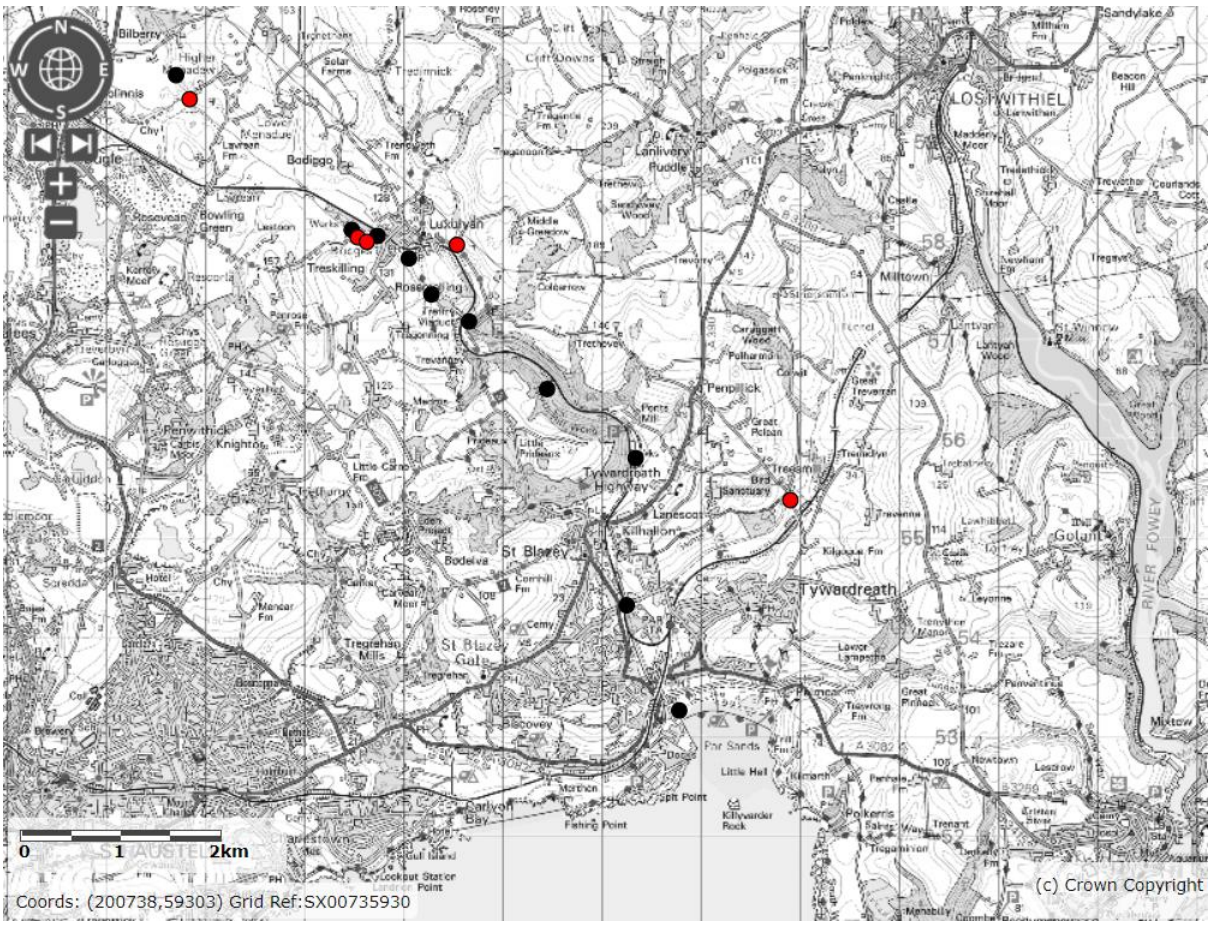
Monitoring is part of the Citizen Science programme run by the West Country Rivers Trust (WCRT) and is carried out monthly by volunteers from the Friends of Luxulyan Valley. The team comprises: Dave Burrell; Mandy Case; Joan Farmer; Veronica Jones; Sue Perry; Linda and Roger Smith; Dave Stillings. They 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, Nick Taylor, Jeremy Roberts, 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. FEBRUARY 2022 MONITORING POINTS

This month we monitored at 16 locations.

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 0455 58114 before Nov 2021)*	Roger Smith
Treverbyn Stream, SX 04532 58033	Roger Smith
Rosemullion, Tregarrick Stream, SX 04623 57990	Roger Smith
Luxulyan allotments, Par River, SX 04732 58045	Roger Smith
Luxulyan SWW pumping station, Par River, SX 05033 57849	Roger Smith
Cam Bridges, Par River, SX 05292 57454	Joan Farmer
Gatty's Bridge, Bokiddick Stream SX 05531 57953	Joan Farmer
Treffry Viaduct, Par River, SX 05650 57179	Joan Farmer
Lady Rashleigh Mine, Par River, SX 06451 56509	Roger Smith
Ponts Mill, Par River, SX 07354 55875	Sue Perry & Roger Smith
Treesmill, Tywardreath Stream, SX 08873 55385	Veronica Jones
Middleway, Par Canal, SX 07233 54299	Veronica Jones
Par Beach slipway, SX 0776 53261	Veronica Jones

*Since November 2021 we had started to monitor near the northern bank near Luxulyan STW, downstream from the previous point. However, the high level and fast flow meant it was not possible to wade across to get a sample. Therefore, testing occurred at the original point (SX 0455 58114). Although this could mean that the water at that point might have been diluted by an adjacent twin outfall (from land drains), the universally low phosphate levels recorded at other points downstream suggest that the result reflected conditions in the whole river at that point.

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

11th February 2022

12th February 2022

13th February 2022

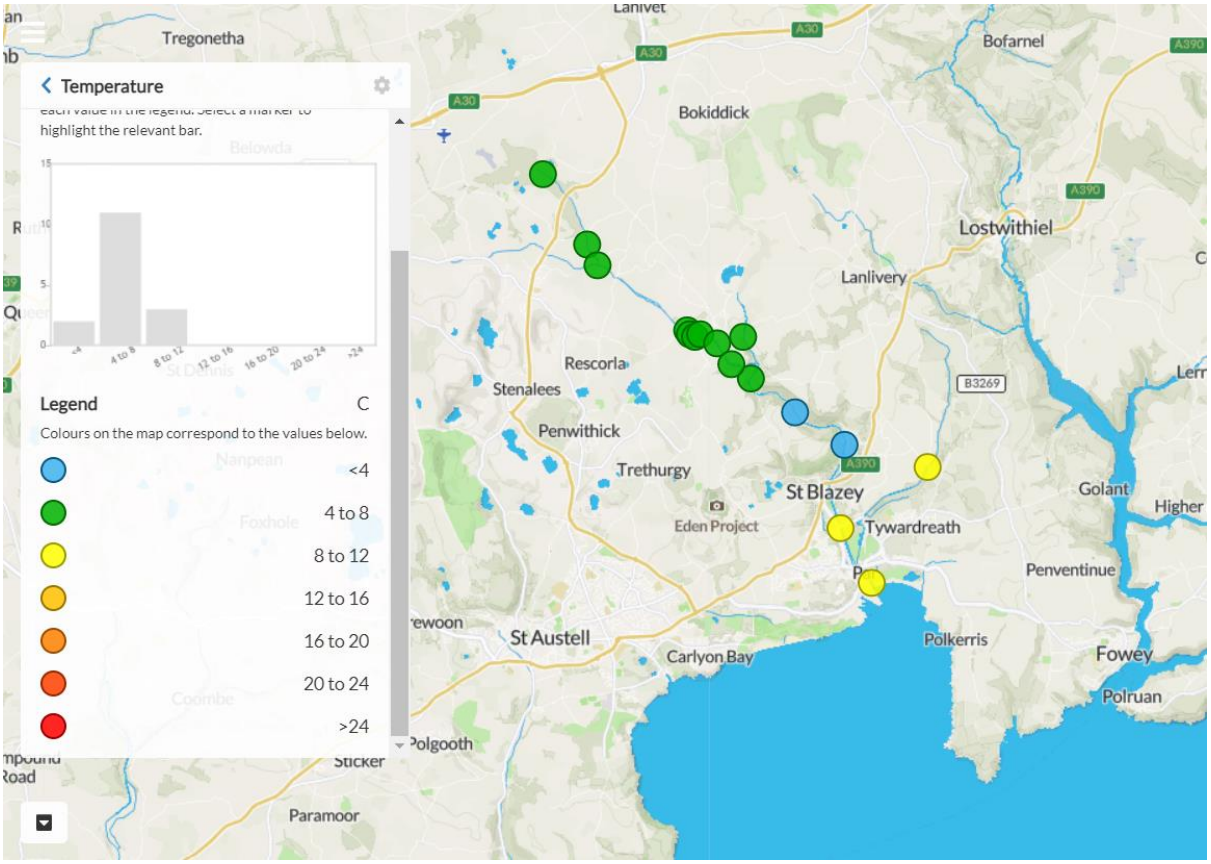
14th February 2022

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, Par River, SX 01882 61133	6
Par	South of Minorca Lane, Par River, SX 02657 59788	6
Tributary	Carbis Stream SX 02834 59401	7
Par	Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)	7
Tributary	Treverbyn Stream, SX 04532 58033	5
Tributary	Rosemullion, Tregarrick Stream, SX 04623 57990	6
Par	Luxulyan allotments, Par River, SX 04732 58045	5
Par	Luxulyan SWW pumping station, Par River, SX 05033 57849	5
Par	Cam Bridges, Par River, SX 05292 57454	5.4
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	5.4
Par	Treffry Viaduct, Par River, SX 05650 57179	5.4
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	2
Par	Ponts Mill, Par River, SX 07354 55875	2
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	11.8
Par	Middleway, Par Canal, SX 07233 54299	10.3
	Par Beach slipway, SX 0776 53261	10.2

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

11th February 2022

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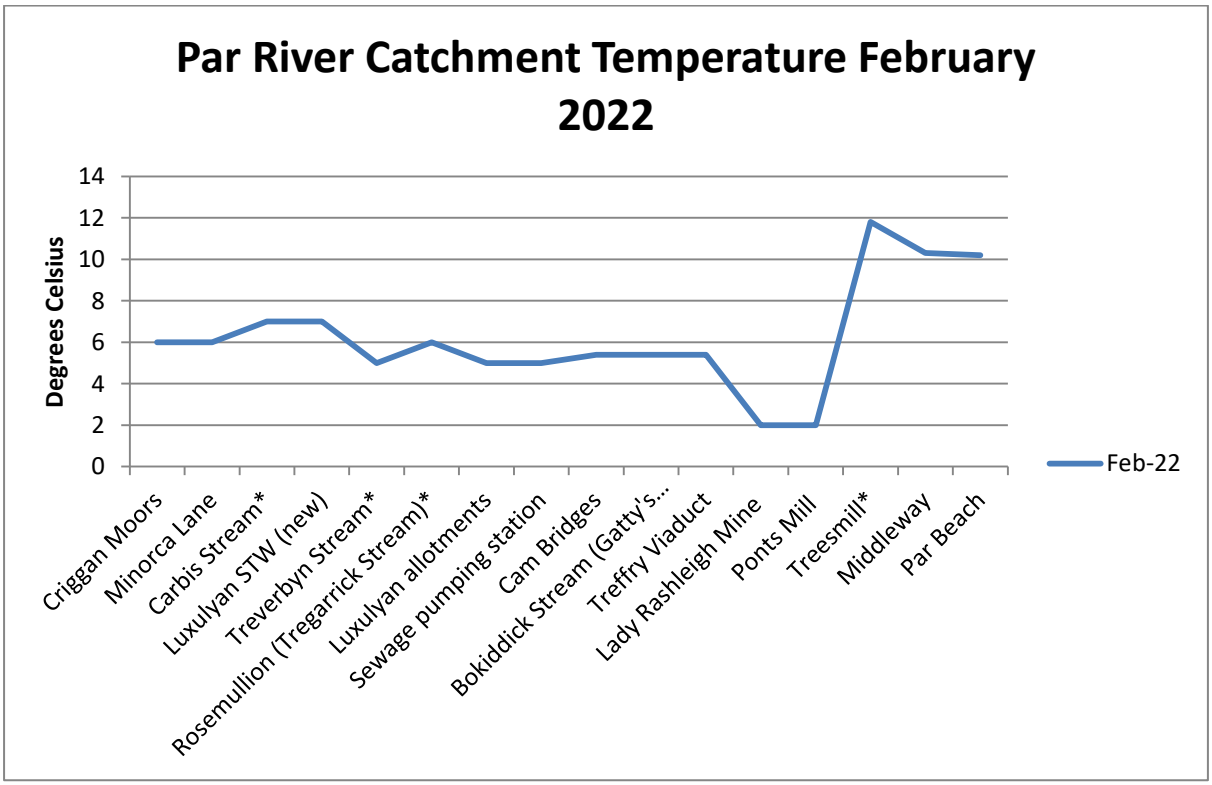
13th February 2022

14th February 2022

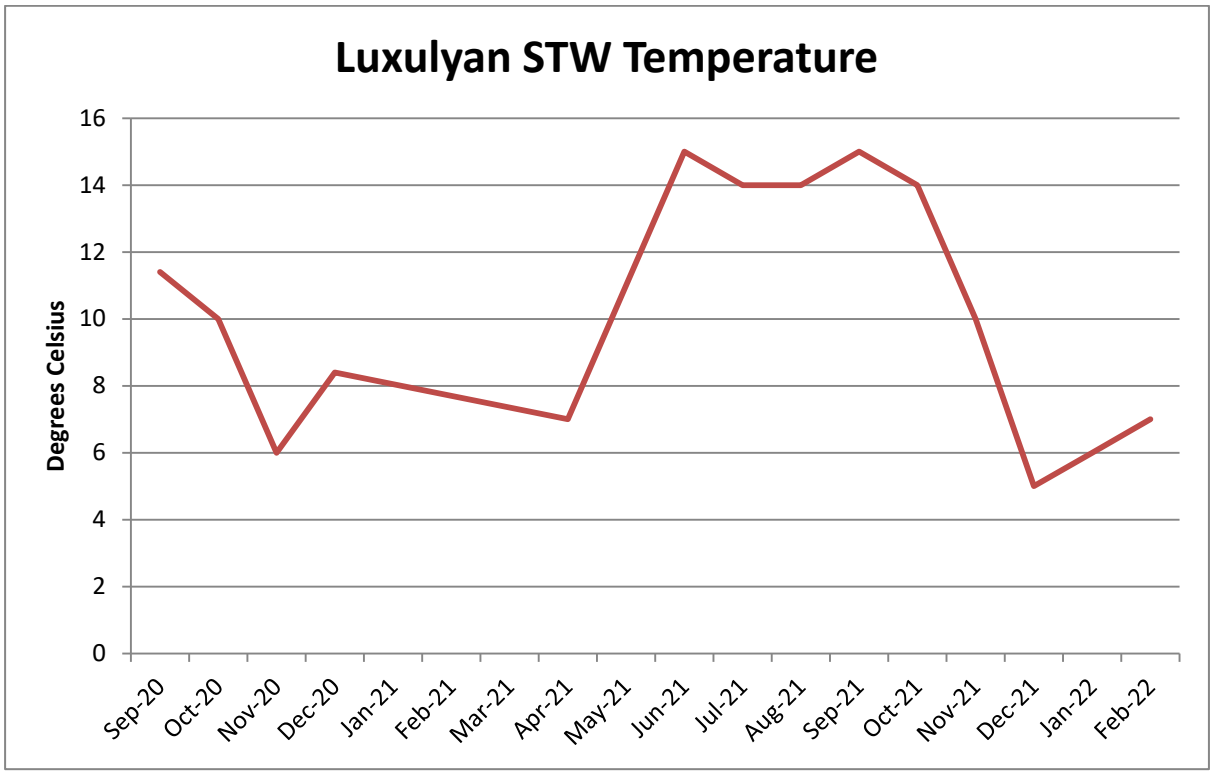


*indicates a tributary of the Par River.

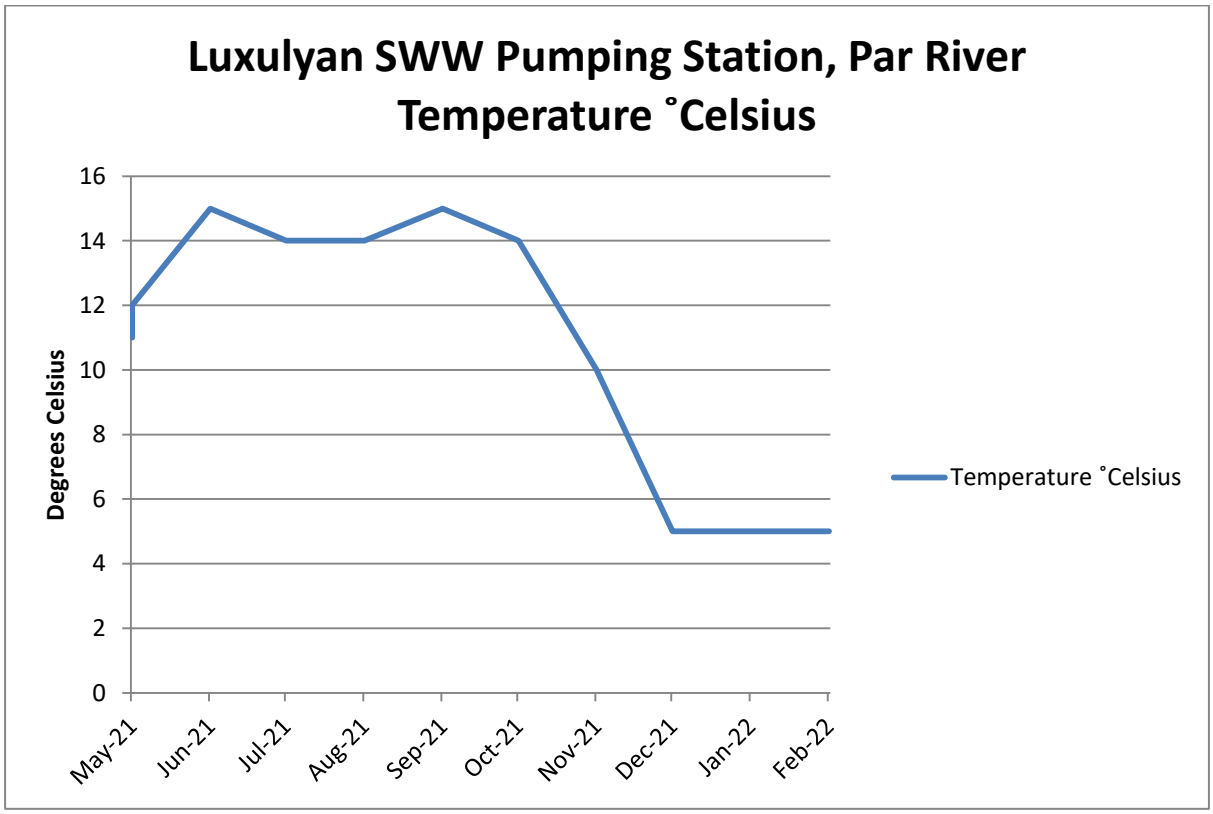
Temperatures from near the source of the Par to Ponts Mill are consistent (readings at Lady Rashleigh Mine and Ponts Mill were taken early on a very cold morning). Once again, temperatures at Treesmill (shallow tributary), Middleway (former canal fed by the river but shallower than the river upstream) and Par Beach (tidal though monitoring was at low tide) were higher but this may be due to local factors.

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

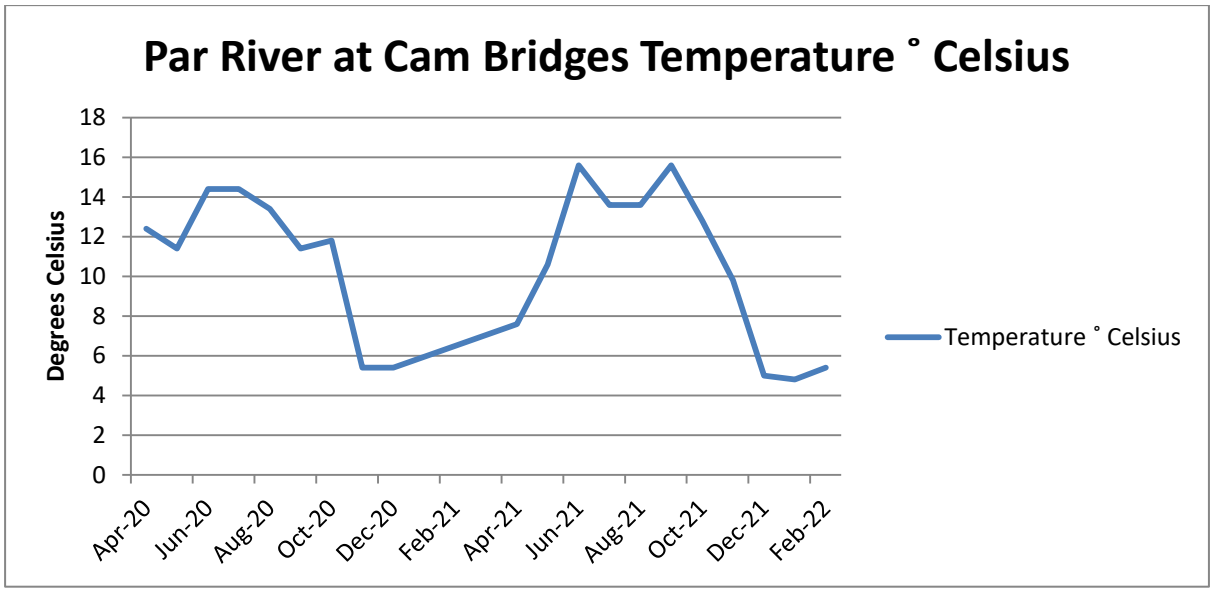
(a) Luxulyan sewage treatment works is usually measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114).



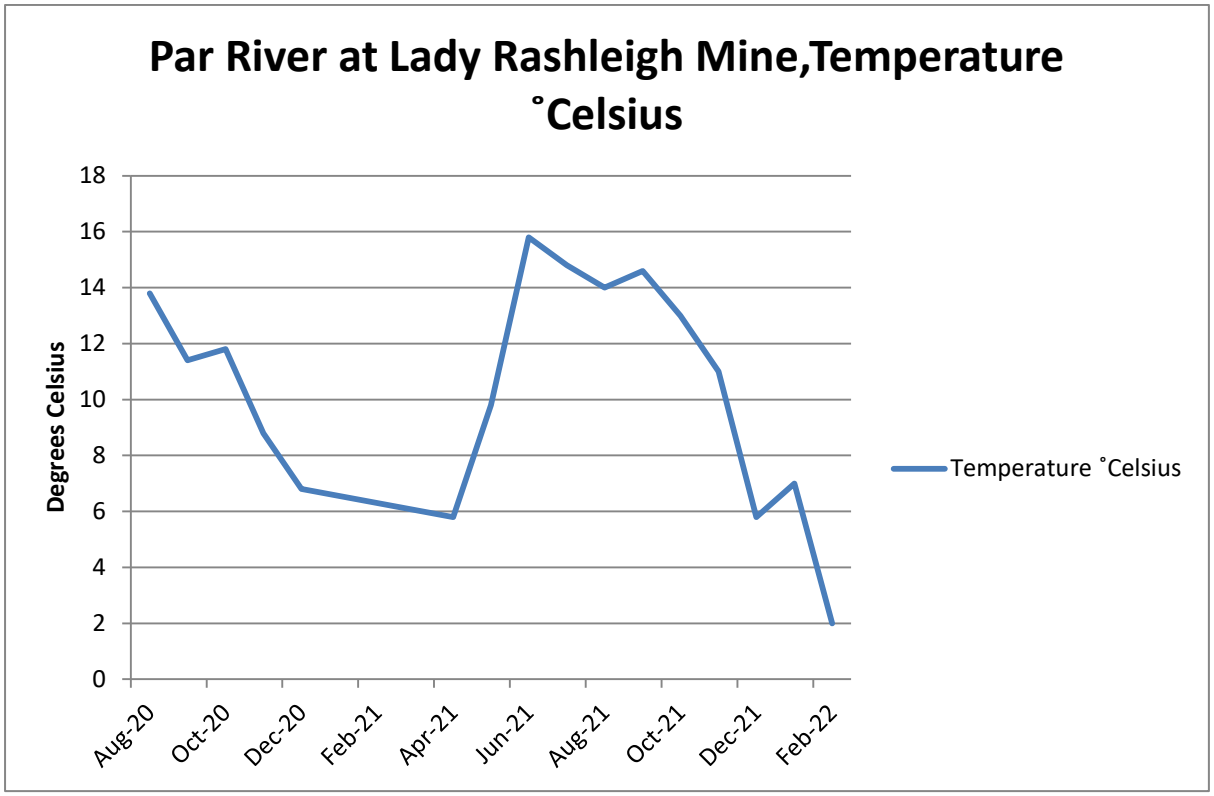
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509

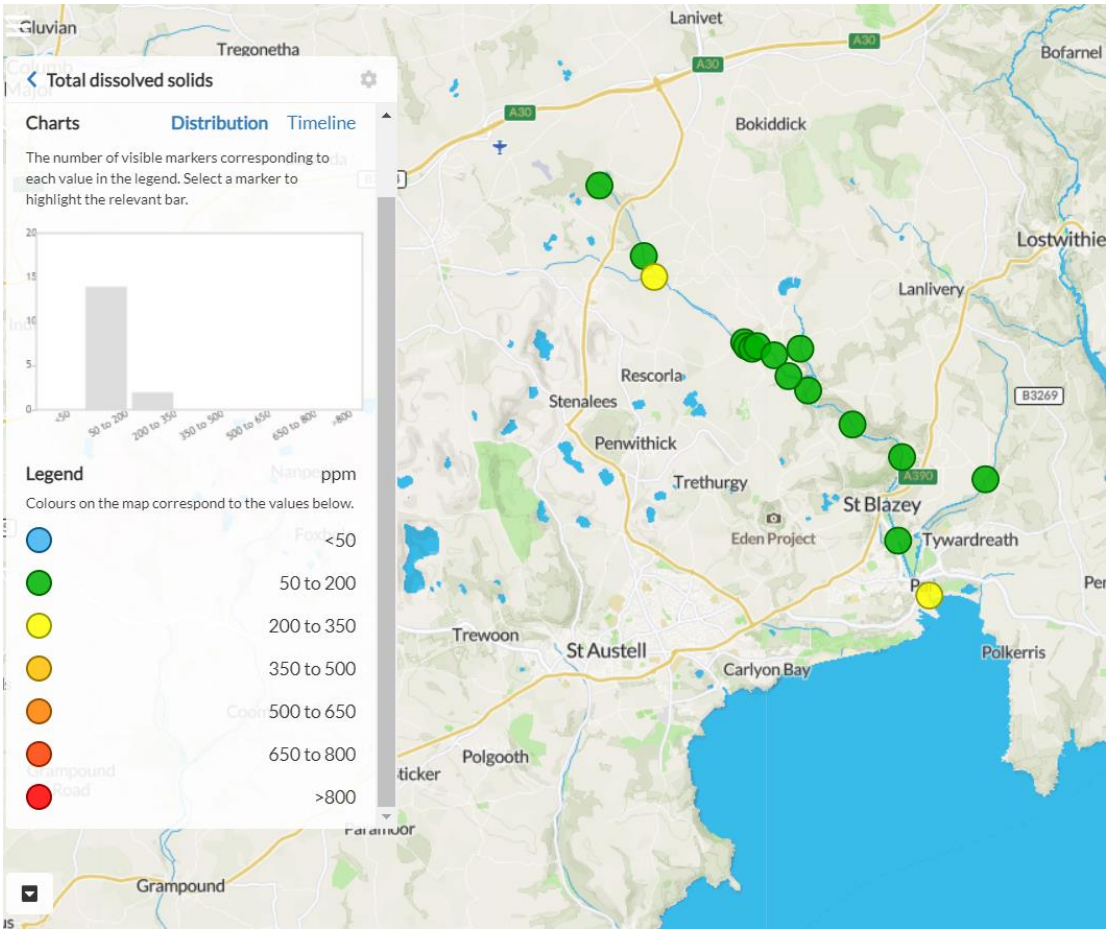


E. TOTAL DISSOLVED SOLIDS

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, Par River, SX 01882 61133	72
Par	South of Minorca Lane, Par River, SX 02657 59788	59
Tributary	Carbis Stream SX 02834 59401	204
Par	Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)*	189
Tributary	Treverbyn Stream, SX 04532 58033	80
Tributary	Rosemullion, Tregarrick Stream, SX 04623 57990	176
Par	Luxulyan allotments, Par River, SX 04732 58045	153
Par	Luxulyan SWW pumping station, Par River, SX 05033 57849	159
Par	Cam Bridges, Par River, SX 05292 57454	162
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	71
Par	Treffry Viaduct, Par River, SX 05650 57179	144
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	99
Par	Ponts Mill, Par River, SX 07354 55875	100
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	122
Par	Middleway, Par Canal, SX 07233 54299	100
Par	Par Beach slipway, SX 0776 53261	269

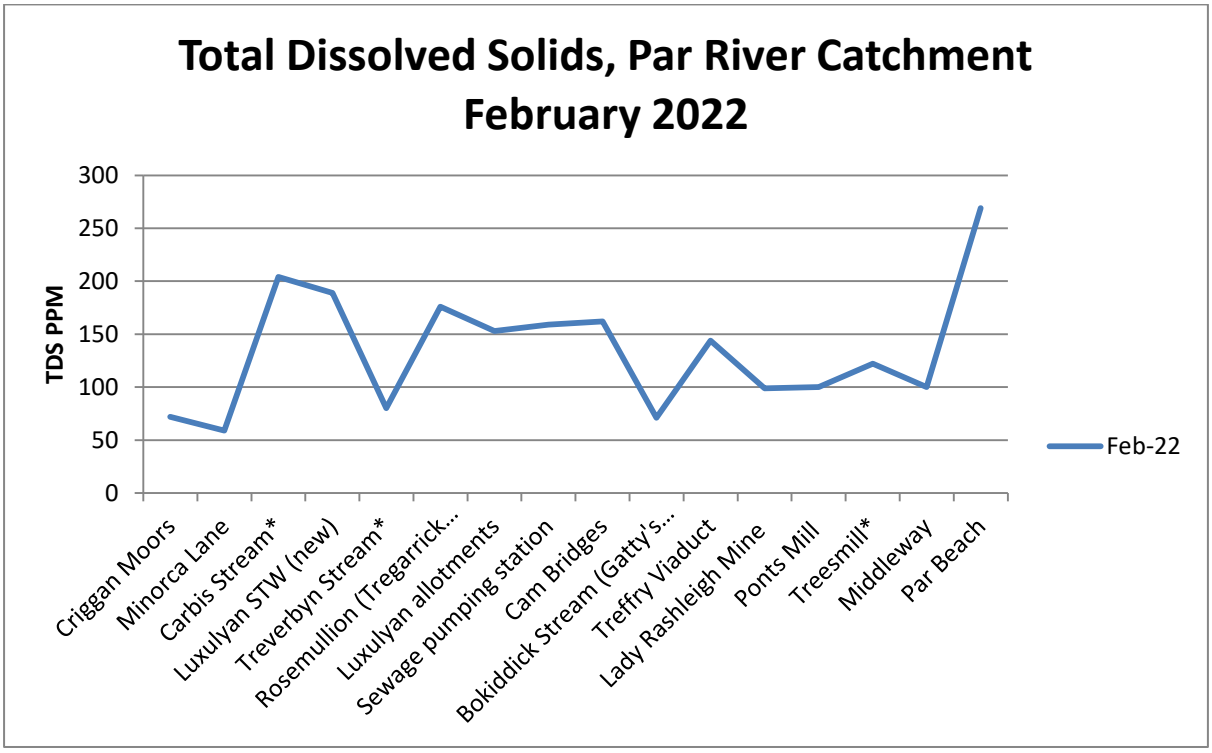
Surveys conducted on these dates, each of which is colour-coded:

11th February 2022

12th February 2022

13th February 2022

14th February 2022



*indicates a tributary of the Par River.

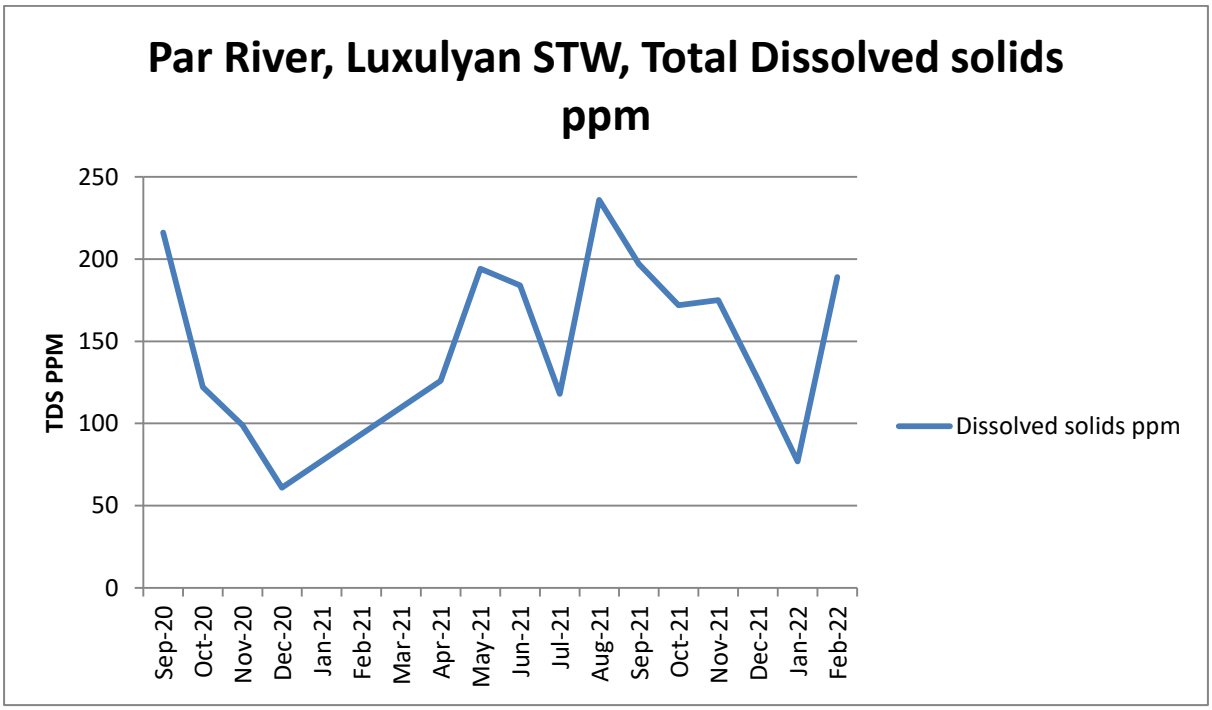
The two highest readings were on the Carbis Stream, where the water was white with china clay, and Par Beach, where, presumably, beach sand had an effect on the reading.

Looking downstream on the Carbis Stream north of the confluence with the Par River.

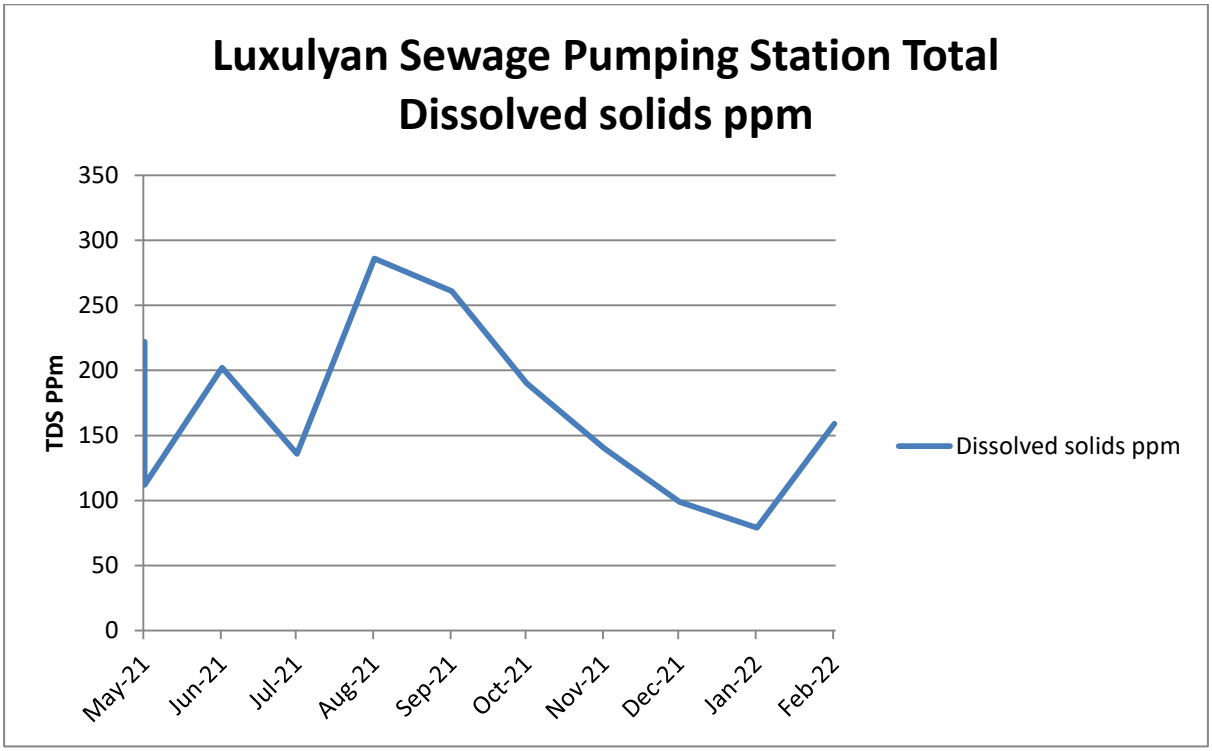
Note the white water of the Carbis Stream as it joins the main Par River near Higher Menadue.

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

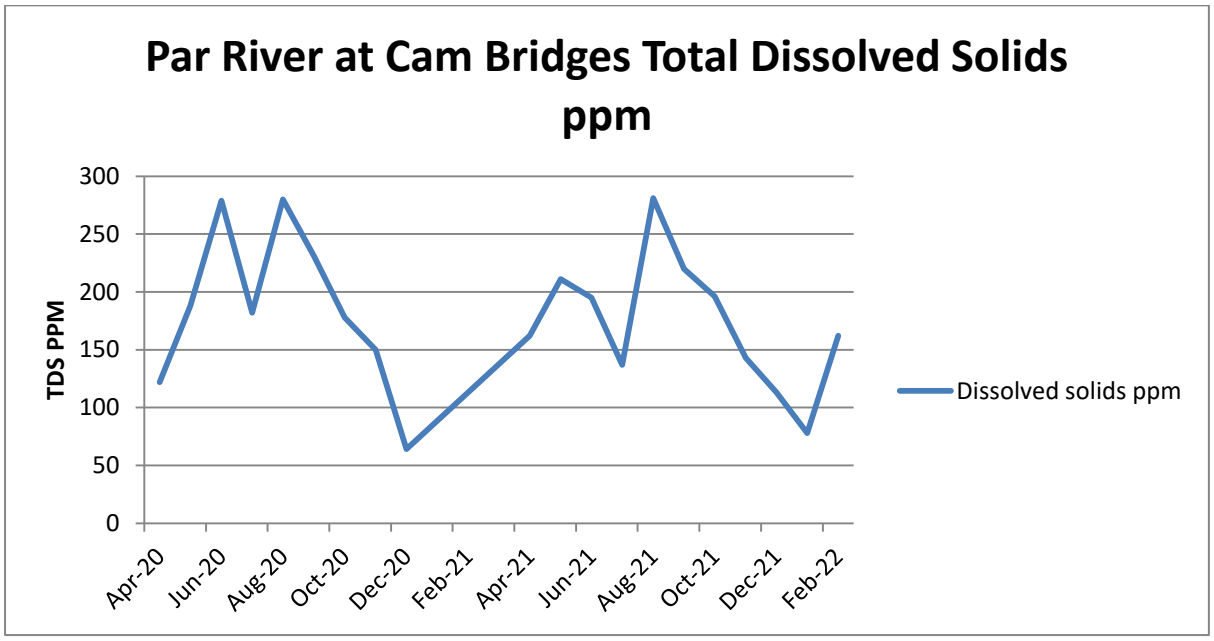
(a) Downstream from Luxulyan sewage treatment works at SX 04472 58114.



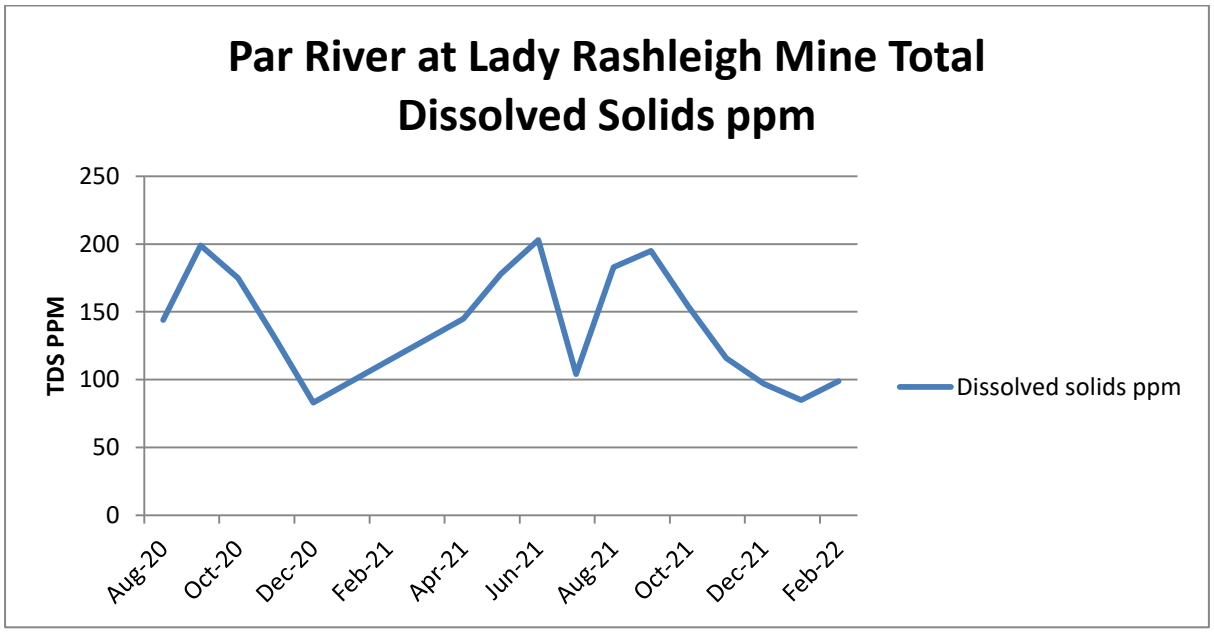
(b) Luxulyan SWW pumping station SX 05033 57849



(c) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509

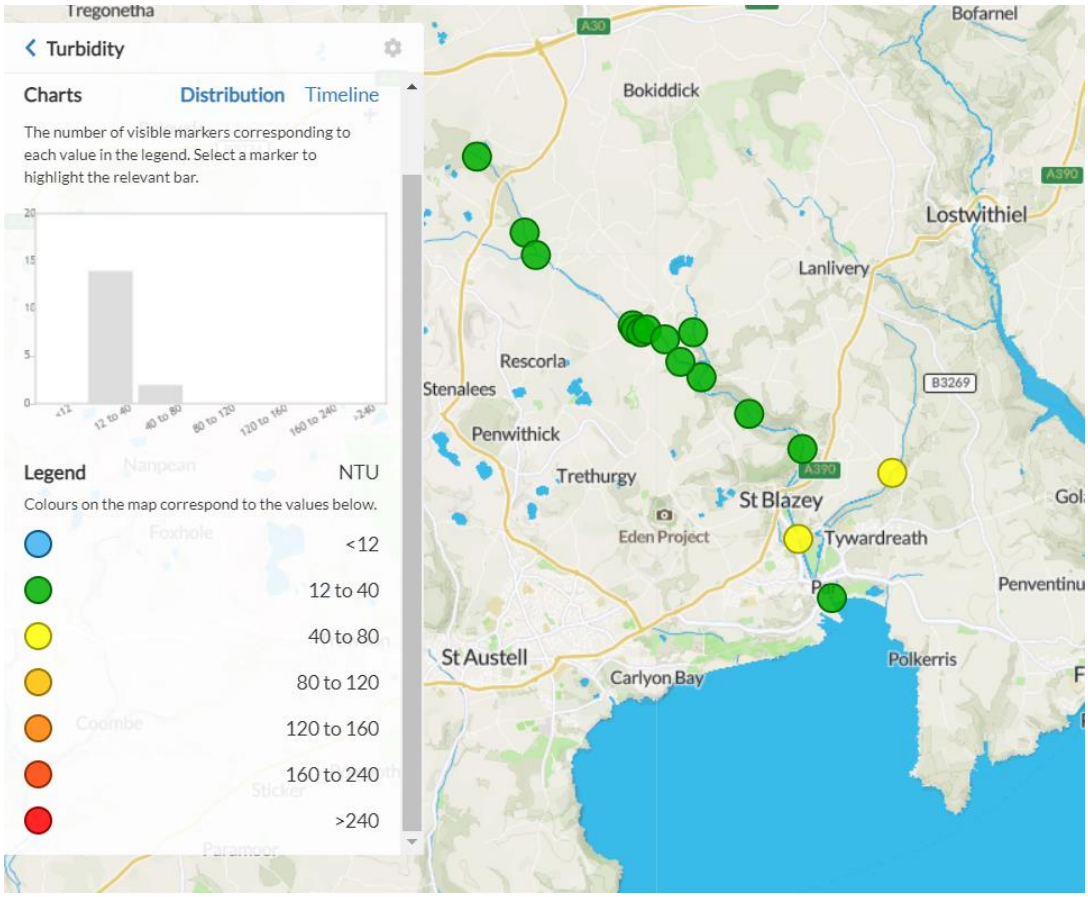


F. TURBIDITY

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, Par River, SX 01882 61133	0
Par	South of Minorca Lane, Par River, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	27
Par	Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)*	0
Tributary	Treverbyn Stream, SX 04532 58033	0
Tributary	Rosemullion, Tregarrick Stream, SX 04623 57990	0
Par	Luxulyan allotments, Par River, SX 04732 58045	0
Par	Luxulyan SWW pumping station, Par River, SX 05033 57849	0
Par	Cam Bridges, Par River, SX 05292 57454	0
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	0
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	0
Par	Ponts Mill, Par River, SX 07354 55875	0
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	40
Par	Middleway, Par Canal, SX 07233 54299	50
Par	Par Beach slipway, SX 0776 53261	13

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

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12th February 2022
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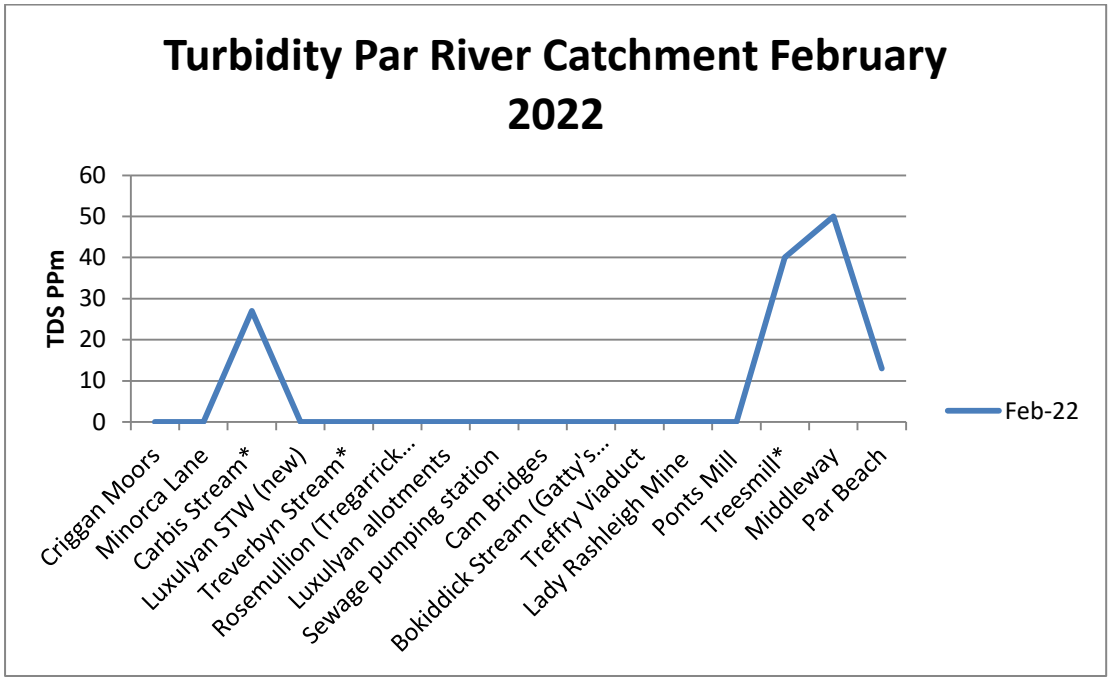
14th February 2022



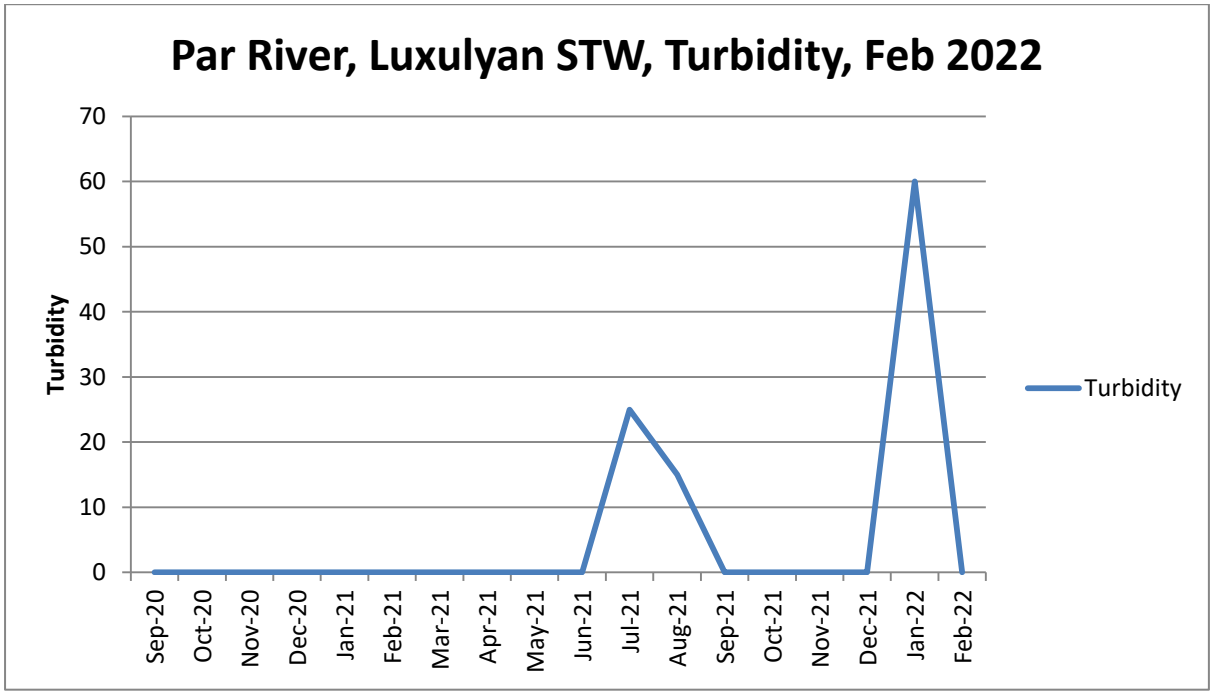
*indicates a tributary of the Par River.

The high figure for Total Dissolved Solids on the Carbis Stream is consistent with the high Turbidity recorded. Those at Treesmill and Middleway (photo below) may be explained by the heavy rain that preceded monitoring.

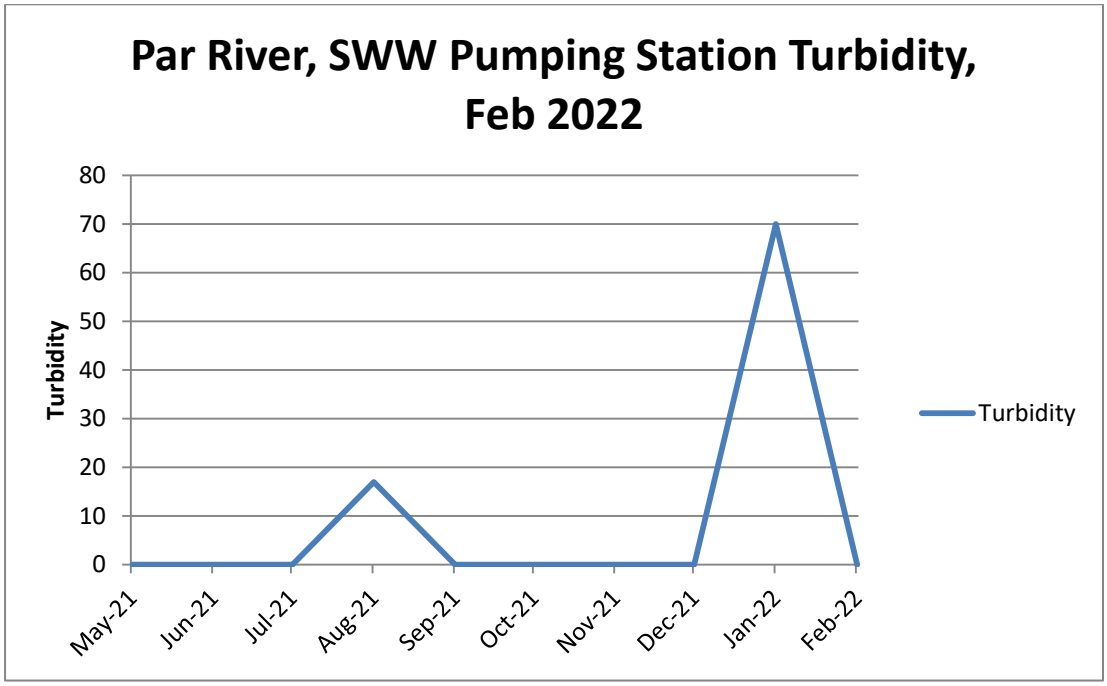
Par Canal at Middleway. Heavy rain and the StARR engineering work may have contributed to the muddiness of the water. **Photo: Veronica Jones**

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

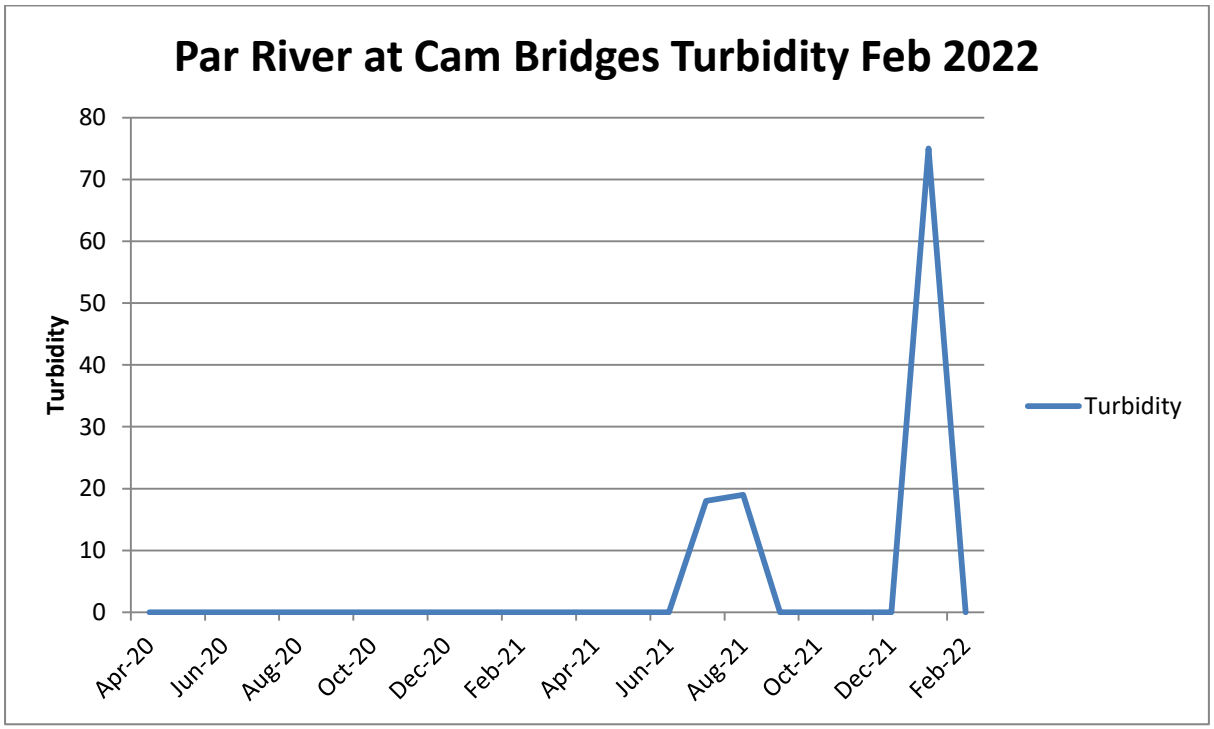
(a) Luxulyan sewage treatment works is measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114).



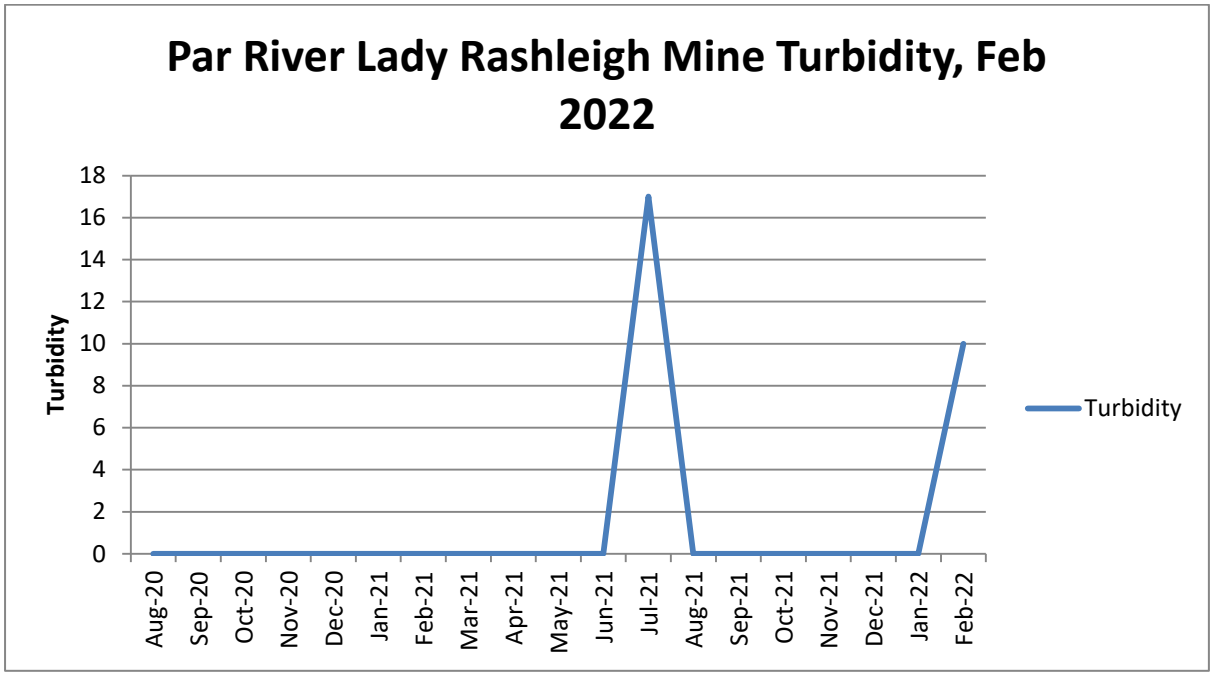
(b) Luxulyan SWW pumping station SX 05033 57849



(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

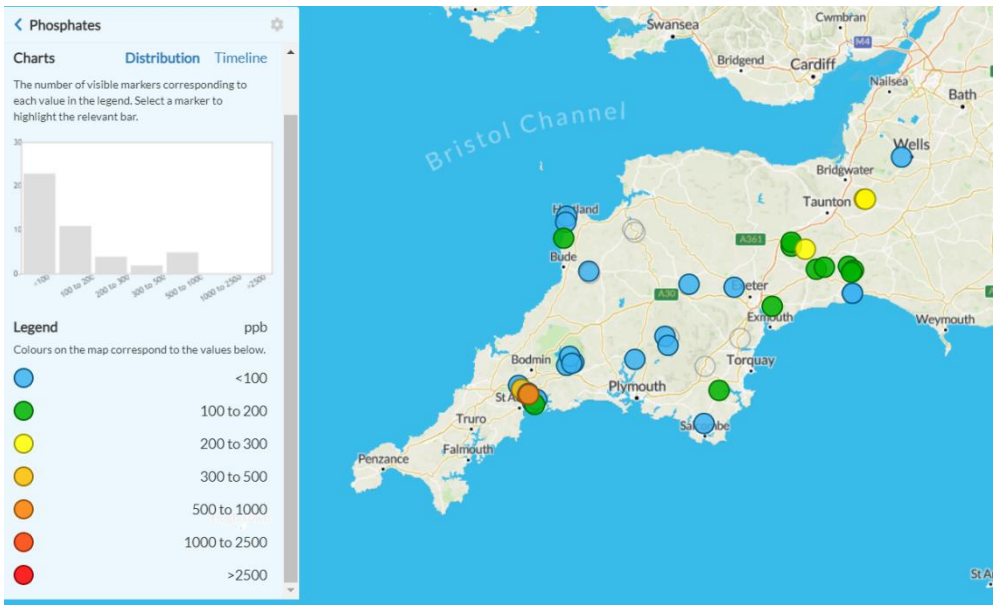
200 – 300 HIGH

500 – 2500 – TOO HIGH

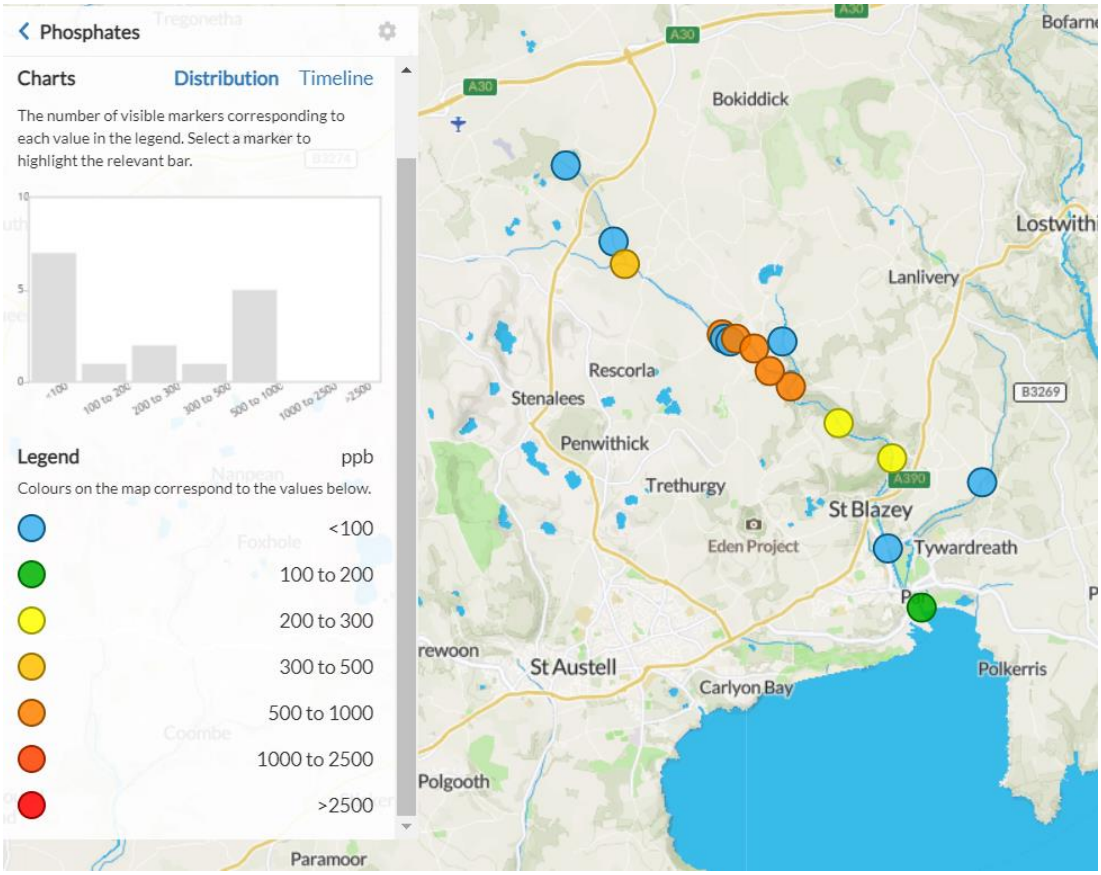
Phosphate levels were relatively low for the second month running. Levels at all sites monitored were OK according to the WRT guidance. Maximum scores of 2500 PPB have been recorded at some sites but these precede the date range in the historical graphs. They have been recorded on Cartographer.

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

(a) South West



(b) Par River catchment



PAR RIVER/TRIBUTARY	LOCATION	Phosphates ppb
Par (Bissa)	Criggan Moors, Par River, SX 01882 61133	0
Par	South of Minorca Lane, Par River, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	300
Par	Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)*	500
Tributary	Treverbyn Stream, SX 04532 58033	0
Tributary	Rosemullion, Tregarrick Stream, SX 04623 57990	0
Par	Luxulyan allotments, Par River, SX 04732 58045	500
Par	Luxulyan SWW pumping station, Par River, SX 05033 57849	500
Par	Cam Bridges, Par River, SX 05292 57454	500
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	500
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	0
Par	Ponts Mill, Par River, SX 07354 55875	200
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	0
Par	Middleway, Par Canal, SX 07233 54299	0
Par	Par Beach slipway, SX 0776 53261	100

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12th February 2022
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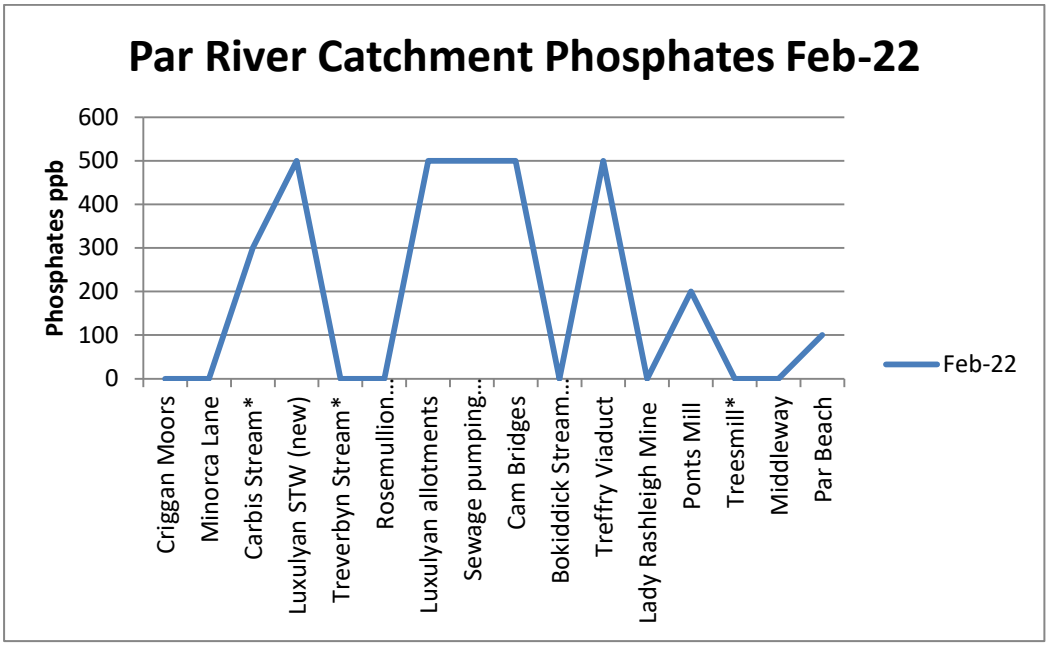
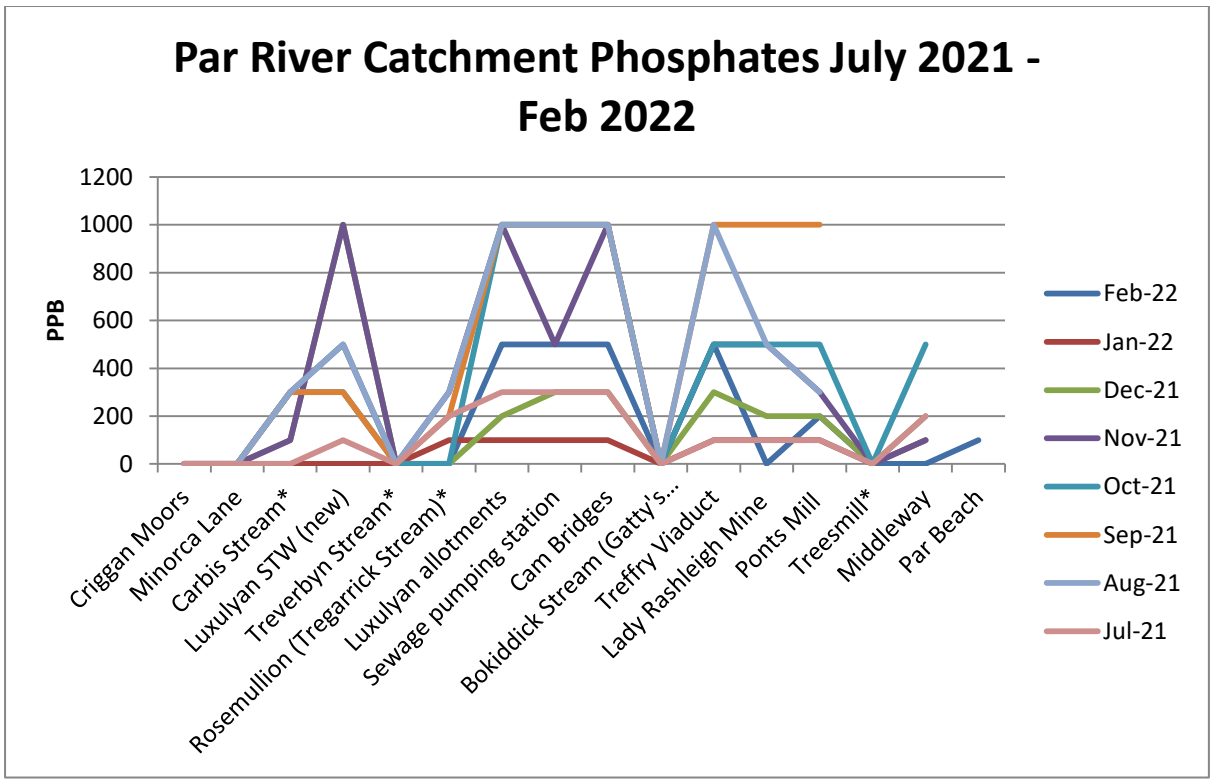
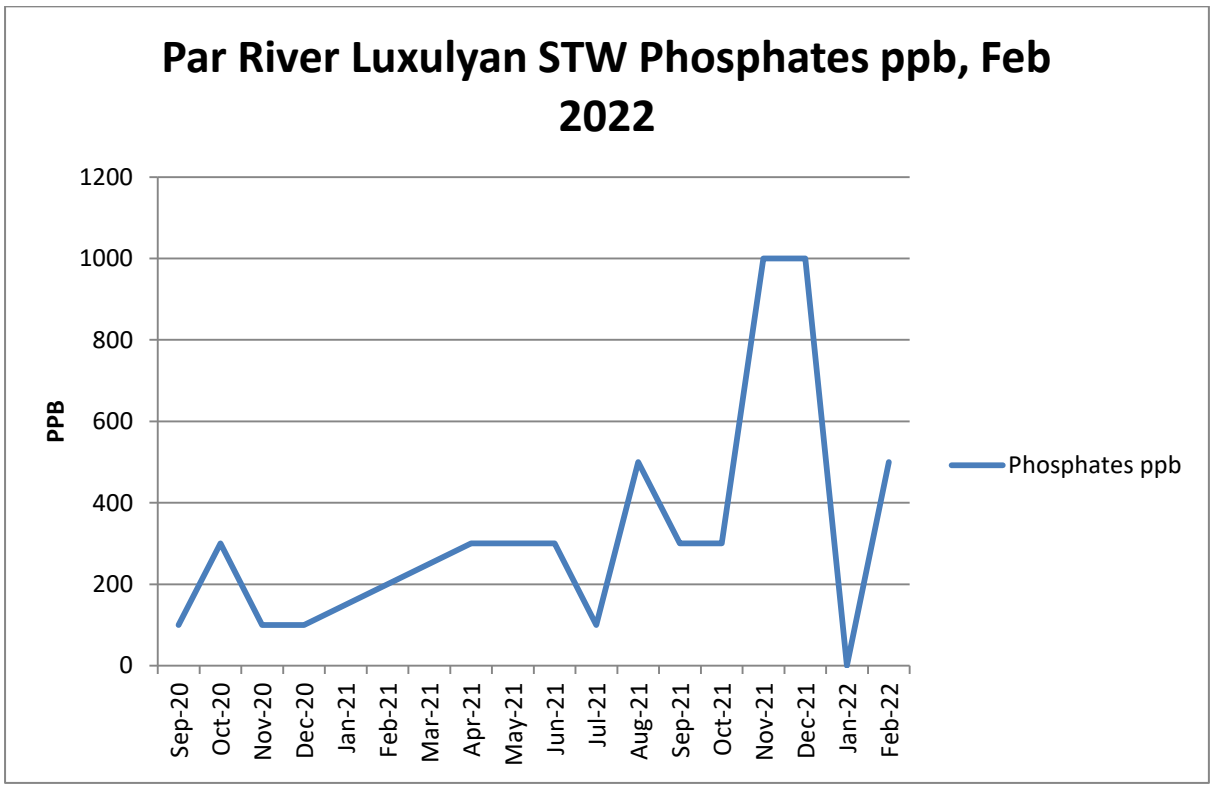


*indicates a tributary of the Par River.

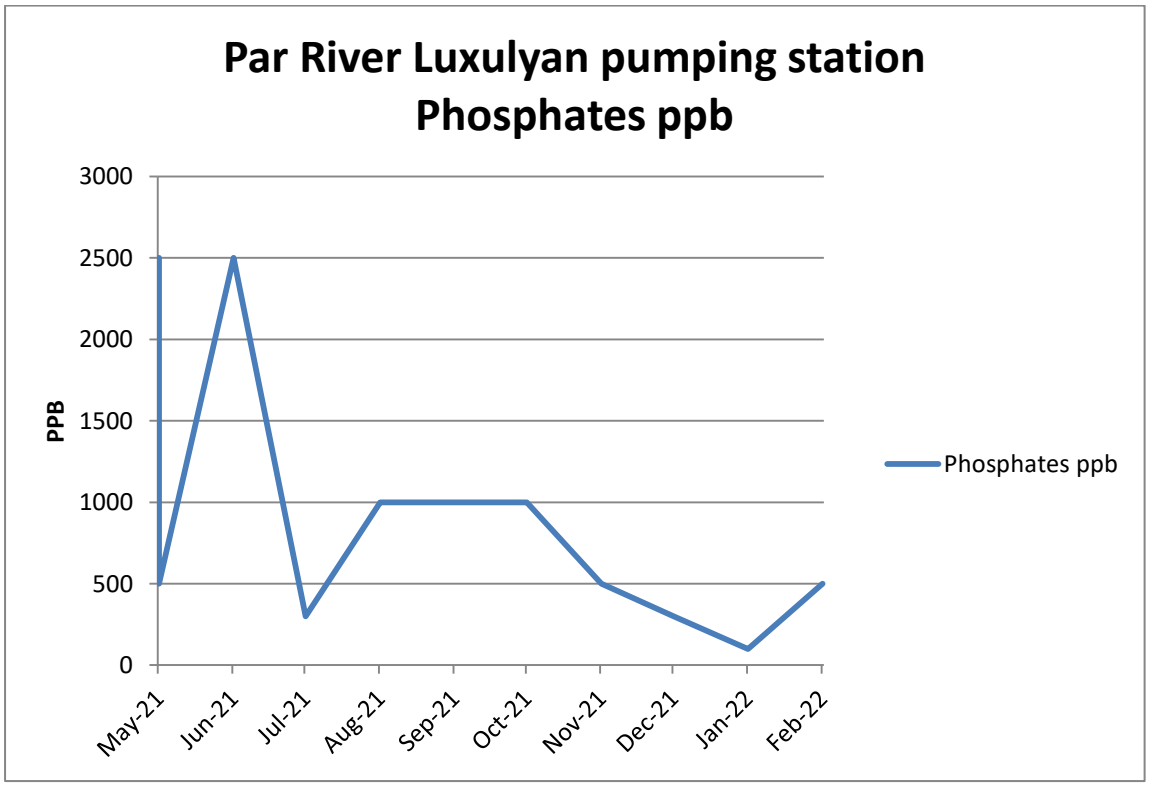


N.B. Readings of 2500 PPB have been recorded on dates preceding those shown in this graph.

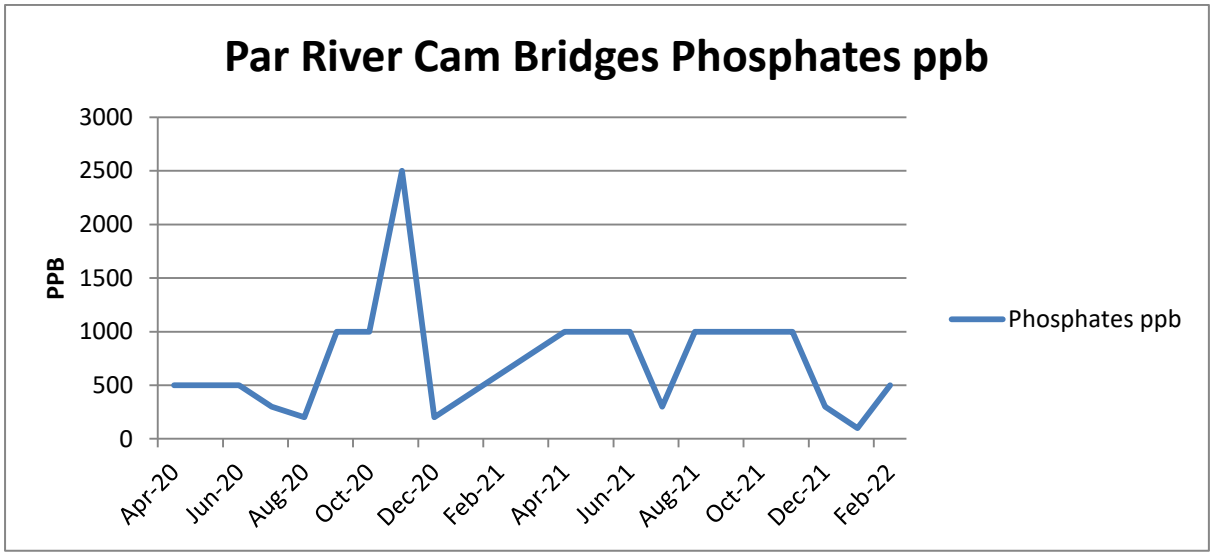
5. **Historical data on phosphates at selected sites (no monitoring January to March 2021):** Luxulyan sewage treatment works is measured from November 2021 at SX 04472 58114 (formerly at SX 0455 58114).



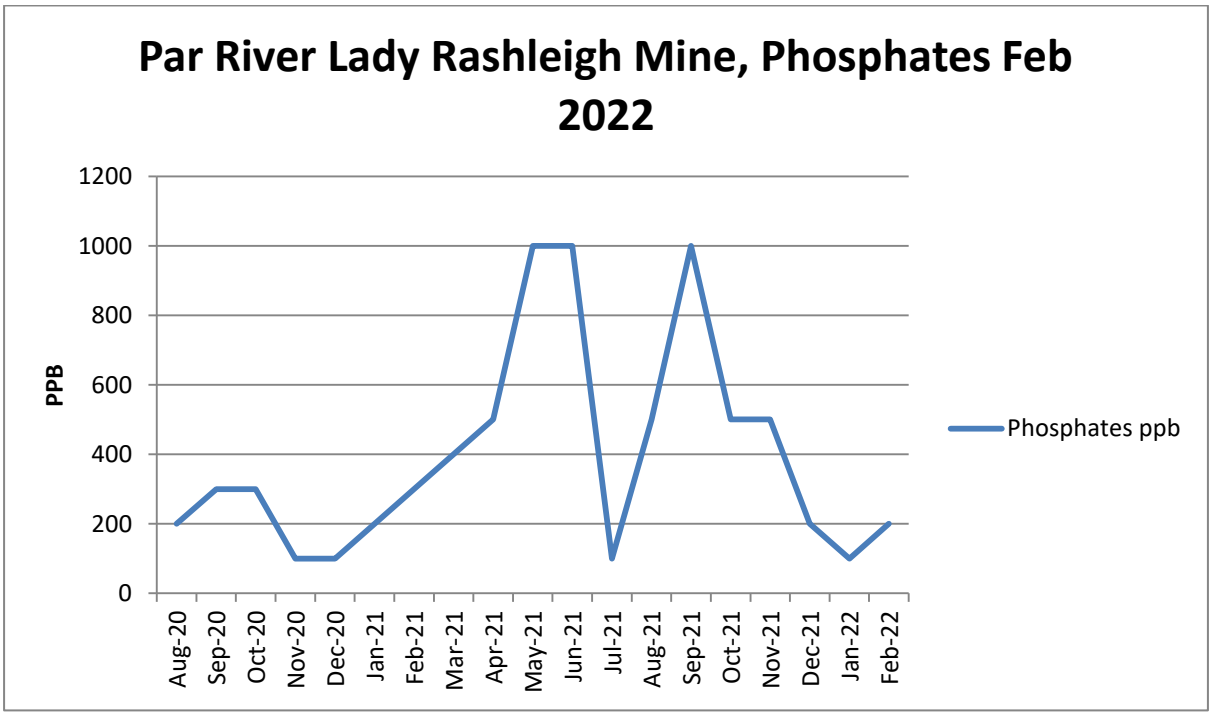
(a) Luxulyan SWW pumping station SX 05033 57849



(b) Cam Bridges SX 05292 57454



(d) Lady Rashleigh Mine SX 06451 56509



H. NITRATES

1. The WRT kit has these ranges for nitrates:

Nitrate (ppm NO_3)		
0	10	30
60	120	200

2.

PAR RIVER/TRIBUTARY	LOCATION	Nitrates ppm
Par (Bissa)	Criggan Moors, Par River, SX 01882 61133	10
Par	South of Minorca Lane, Par River, SX 02657 59788	10
Tributary	Carbis Stream SX 02834 59401	10
Par	Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)*	10
Tributary	Treverbyn Stream, SX 04532 58033	10
Tributary	Rosemullion, Tregarrick Stream, SX 04623 57990	30
Par	Luxulyan allotments, Par River, SX 04732 58045	10
Par	Luxulyan SWW pumping station, Par River, SX 05033 57849	10
Par	Cam Bridges, Par River, SX 05292 57454	10
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	10
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	10
Par	Ponts Mill, Par River, SX 07354 55875	10
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	-
Par	Middleway, Par Canal, SX 07233 54299	-
Par	Par Beach slipway, SX 0776 53261	-

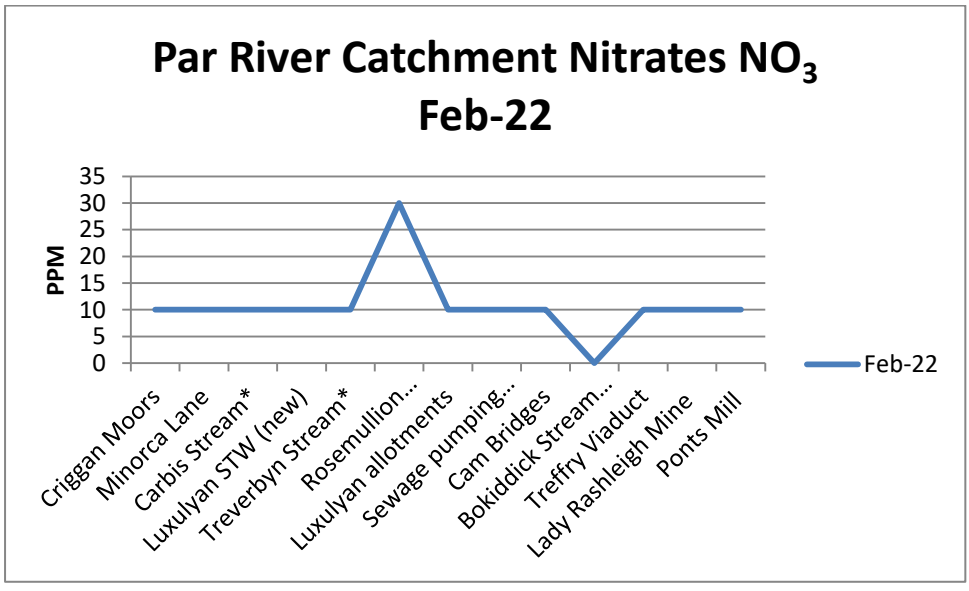
Surveys conducted on these dates, each of which is colour-coded:

11th February 2022

12th February 2022

13th February 2022

14th February 2022



I. OTHER OBSERVATIONS

1. **E.coli (EC) and Total Coliform(TC)**

   (a) On 21st February 2022 Lydia Deacon of WRT trained Joan Farmer, Veronica Jones, Sue Perry and Roger Smith in the use of the Aquagenx CBT EC+TC MPN Kit which 'simultaneously detects and quantifies E. coli (EC) and Total Coliform (TC) bacteria in a 100 mL sample'.

   (b) Key information:

What is the difference between total coliform and E. coli?

Total coliform is a large collection of different kinds of bacteria. Faecal coliform are types of total coliform that exist in faeces. E. coli is a subgroup of faecal coliform. https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs//331-181.pdf

Why is E. coli in river water a concern?

The presence of E. coli **indicates faecal contamination of the drinking water** and as a result, there is an increased risk that enteric pathogens may be present. https://www.canada.ca/en/health-canada/programs/consultation-e-coli-drinking-water/document.html

Particular thanks are due to Joan Farmer for allowing the use of her home for the unpleasant process of incubating the samples.

Incubated samples **Photo: Joan Farmer**

(c) Samples were taken from the Par River at the Treffry Viaduct (SX 05650 57179) and Lady Rashleigh Mine (SX 06451 56509).

(d) Results (Most Probable Number/100 mL) taken on 23rd February 2022:

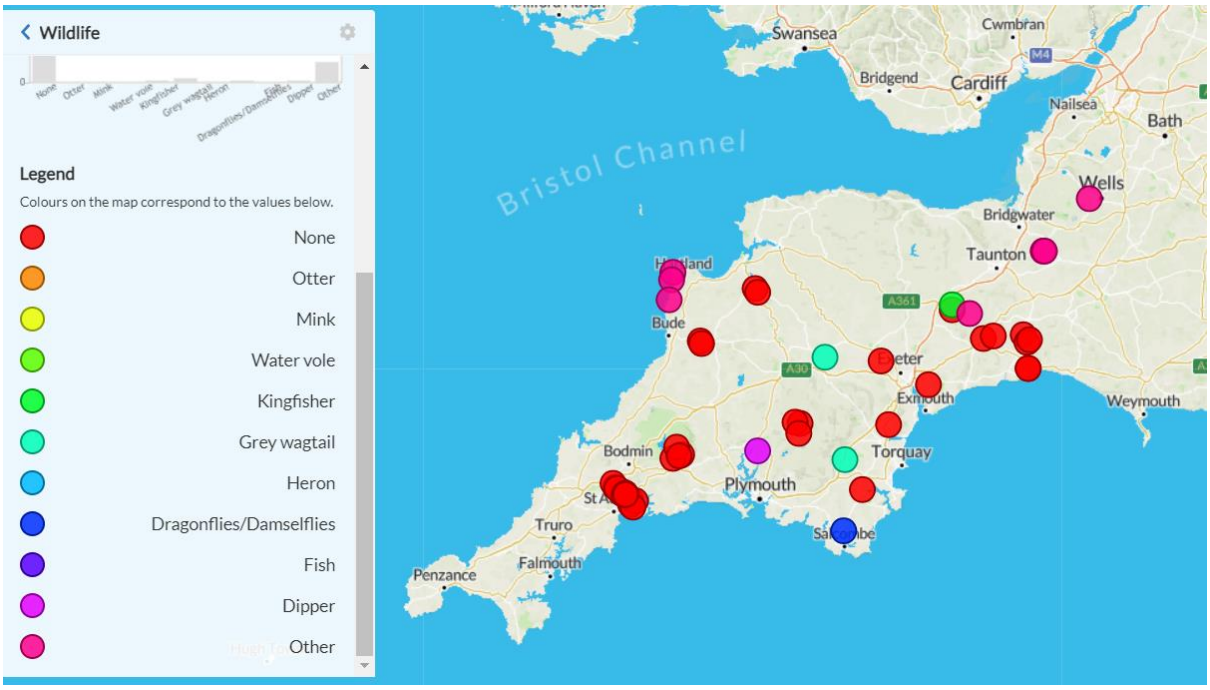
LOCATION	E.coli (EC) MPN/100mL	EC Risk level	Total coliform (TC) MPN MPN/100mL	TC Risk level
Treffry Viaduct SX 05650 57179	31	Very High Risk/Unsafe	32	Very Unsafe
Lady Rashleigh Mine SX 06451 56509	31	Very High Risk/Unsafe	32	Very Unsafe

(e) The results are extremely worrying. But this was the result of an initial training exercise, with the possibility of errors in testing and incubation. It is also based on testing at 2 sites on one occasion. Therefore we are unsure about informing the Environment Agency Hotline.

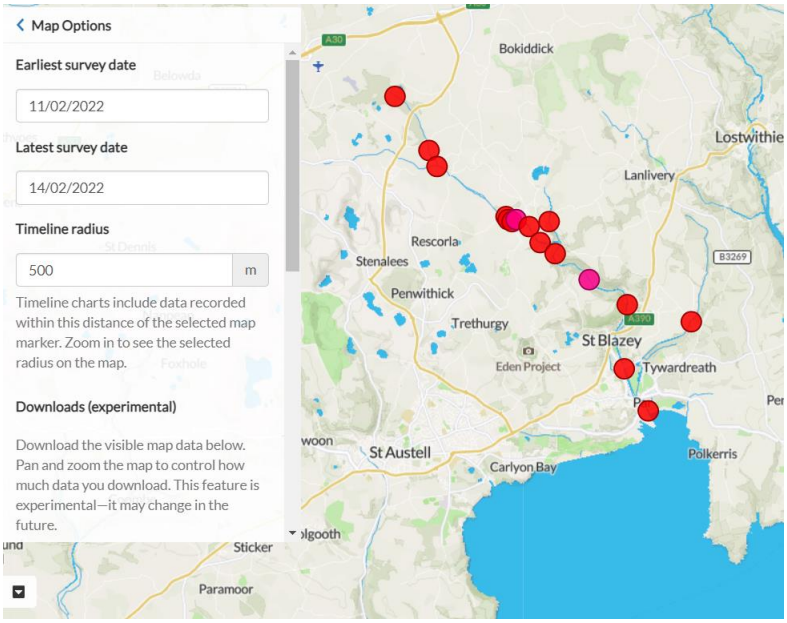
2. Wildlife

Source: Cartographer.

(a) South West:



(b) Par River



3. **Otter survey:**

(a)

EVIDENCE	SEEN/ ORKS*	LOCATION	NOTES
Spraint - fresh			
Spraint – recent	✓*	SX 04747 58056 3 recent spraints on boulder opposite Luxulyan allotments	Fish bones and scales in spraint.
	✓*	SX 06471 56497 Downstream from bridge at Lady Rashleigh Mine on boulder	Fish bones and scales in spraint.
Spraint - old	✓*	SX 07312 56164 under canal bridge at Ponts Mill	
	✓*	SX 04747 58056 1 old spraint on boulder opposite Luxulyan allotments	
	✓*	SX 06456 56498 LRM – boulder in river	
Anal jelly			
Sign heap			
Staining			
Tracks			
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

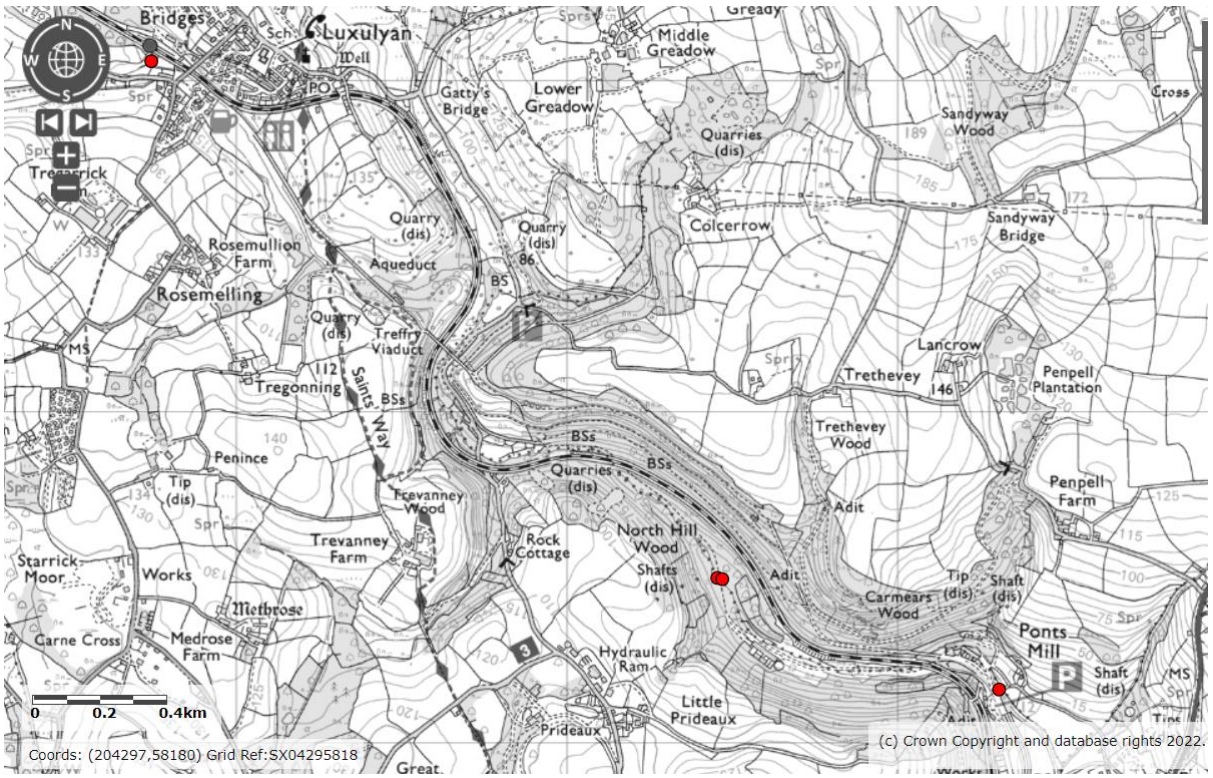
***Report sent to ORKS: https://erccis.org.uk/**

(b)Map

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

Red dots – definite evidence. Recorded on ORKS.
Grey dots – possible evidence. Not recorded on ORKS.

Note that there are 2 dots near Lady Rashleigh Mine.



(c) **PHOTOGRAPHS**

Unfortunately, there are no photos of the spraint at Lady Rashleigh Mine and Ponts Mill because the spotter forgot his camera.

(i) Near Luxulyan allotments, looking upstream.

(ii) Fish bones and scales in the spraint near the allotments.

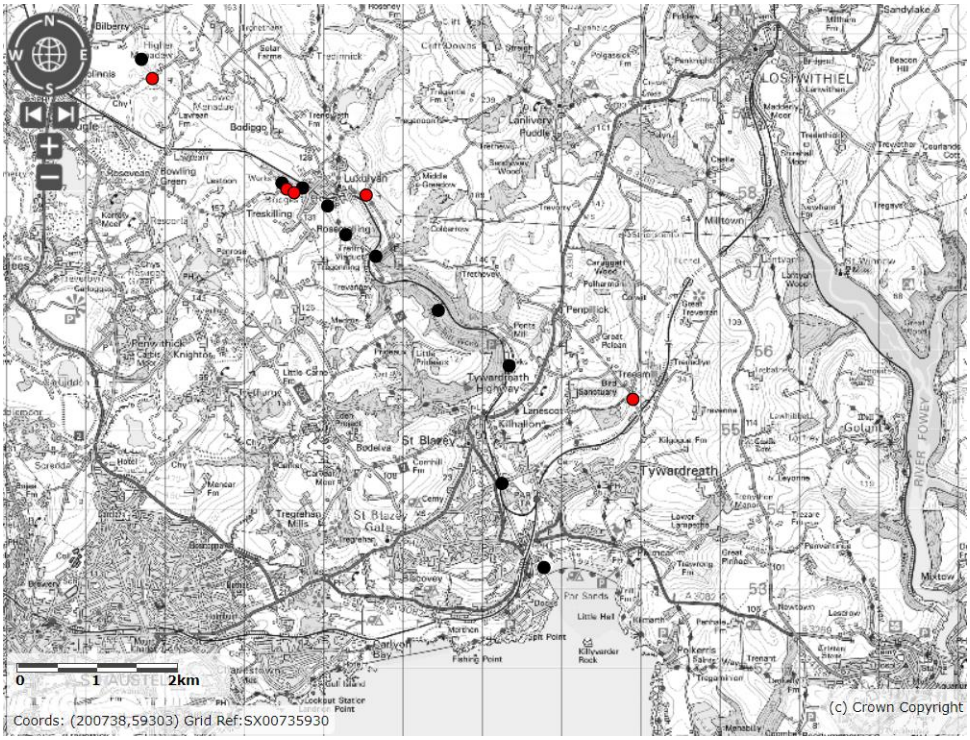
J. DISCUSSION

1. Current pollution was indicated by:
    - *Too High* levels of phosphate (WRT guidance), presumed to be linked to SWW's sewage treatment works at Luxulyan.
    - The presence of china clay in the Carbis Stream indicated by discolouration, high turbidity and elevated Total Dissolved Solids.
    - Potentially high levels of E.coli and Total Coliforms at Treffry Viaduct and Lady Rashleigh Mine.

The slightly higher Nitrate level at Rosemullion on the Tregarrick Stream was noted but we do not yet know what is considered to be a high level for this chemical.

2. On the positive side, the presence of otters and fish between Luxulyan allotments and Ponts Mill was proved.

3. It is proposed to reduce the number of regular sample points from 16 to 9. This will free up time to incorporate additional monitoring for riverflies, E.coli and Total Coliforms. These are the proposed sites:



LOCATION
Criggan Moors, Par River, SX 01882 61133
South of Minorca Lane, Par River, SX 02657 59788
Carbis Stream SX 02834 59401
Luxulyan sewage treatment works, Par River, (SX 0455 58114 before Nov 2021)*
Treverbyn Stream, SX 04532 58033
Rosemullion, Tregarrick Stream, SX 04623 57990
Luxulyan allotments, Par River, SX 04732 58045
Luxulyan SWW pumping station, Par River, SX 05033 57849
Cam Bridges, Par River, SX 05292 57454
Gatty's Bridge, Bokiddick Stream SX 05531 57953
Treffry Viaduct, Par River, SX 05650 57179
Lady Rashleigh Mine, Par River, SX 06451 56509
Ponts Mill, Par River, SX 07354 55875
Treesmill, Tywardreath Stream, SX 08873 55385
Middleway, Par Canal, SX 07233 54299
Par Beach slipway, SX 0776 53261

Even so, all of the 16 current points will still be visited every month and, if it is thought necessary, photographs will be taken and CSI tests conducted. Additionally, if need dictates, other sites will be added, as has been the case recently with 2 sites on the Treverbyn Stream near Innis Fishery (results not included here).

Roger Smith on behalf of the Par River Monitoring Group, 26th February 2022