Llywodraeth Cymru
Welsh Government

Wastewater Monitoring in Wales

Report Date: 24 November 2022

Using samples collected up to (unless indicated otherwise): 21 November 2022

Prifysgol Bangor University

GIG Cymru NHS Wales | Iechyd Cyhoeddus Cymru Public Health Wales

Cardiff University Prifysgol Caerdydd

Hafren Dyfrdwy

Dŵr Cymru Welsh Water

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Background

Introduction

In September 2020 Welsh Government began sampling wastewater from 19 Wastewater Treatment Works (WwTW) from across Wales in order to detect the levels of SARS-CoV-2. Since then the programme has undertaken work not only to expand the coverage of the wastewater monitoring but also to improve the testing methodology to make it more representative of the catchments served.

Welsh Government intends to monitor up to 50 WwTW catchments across Wales in order to assist in the early detection of changing viral levels and the potential scale of outbreaks to help inform any public health action taken in the management of the pandemic and beyond.

Methods

Wastewater-Based Epidemiology (WBE) provides comprehensive public health information at a community level. To achieve this, wastewater samples are collected at the inflow of sewage treatment plants across Wales. The samples are then analysed to determine the levels of specific pathogens, as well as summarising their physico-chemical characteristics. This data is then mapped against known infection rates and other public health indicators at the regional level.

Individuals with COVID-19 shed SARS-CoV-2 genetic material in their faeces in the form of ribonucleic acid (RNA), regardless of whether they have symptoms or not. Measurements quantify the amount of viral RNA present in wastewater alongside the presence of different mutations associated with SARS-CoV-2. This information therefore provides a representative and unbiased snapshot of the level of COVID-19 infection within a community at any point in time. In summary, WBE has the potential to act as key capability to aid in the surveillance and control of COVID-19.

Currently, a mixture of 'composite' and 'spot' samples (each comprising 1 litre of wastewater) are collected from each WwTW 5 times a week, Monday to Friday. Spot samples are taken at the same time each day to capture peak flow, while composite samples are collected over a 24-hour period at 15-minute intervals using automatic sampling machines. Welsh Government currently investigates levels of COVID-19 in wastewater at 47 sites across Wales within the Dŵr Cymru Welsh Water (DCWW) and Hafren Dyfrdwy networks.

SARS-CoV-2 Quantification

The reported SARS-CoV-2 wastewater data is the concentration of viral gene copies (gc) detected in the wastewater sample. The viral copy number is obtained using an average of measurements from a single N1 nucleocapsid gene.

Samples are collected from the WwTW and transported at 4°C to laboratories on the day of collection. Samples are clarified to remove solid faecal matter and are subject to a PEG (polyethylene glycol) precipitation process. The quantity of a SARS-CoV-2 RNA present in the wastewater sample is then determined using a RT-qPCR (reverse transcriptase quantitative polymerase chain reaction) laboratory method.

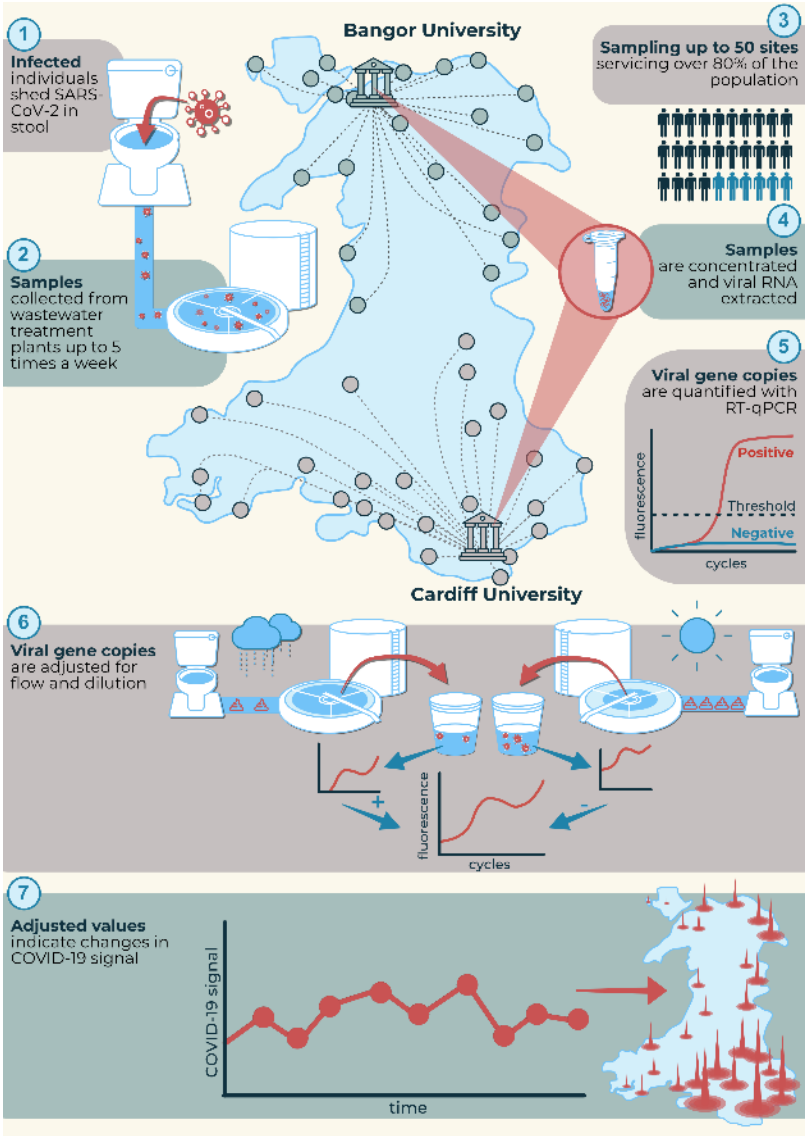


Figure 1 - Process diagram

Data Processing and Modelling

The total amount of SARS-CoV-2 RNA in the sample is corrected for various factors as a result of the RT-qPCR analysis, giving a raw copy number for each target gene. The data is reported as SARS-CoV-2 gene copies per litre (gc/L).

Most sewers in Wales are combined systems that collect waste waters (domestic, industrial, etc.) and stormwater from flooding and rainfall. As such, the collected wastewater samples vary through time and across WwTW. In particular, a sample's dilution can depend on the amount of rain that day. Each WwTW in Wales services a sewage network of different size and population.

The data is 'normalised' to account for variations in dilution and population. To adjust specifically for dilution, we have developed a method for recovering daily flow that is based on daily measures of flow indicators (Ammonium, Electrical conductivity, Orthophosphate concentrations) and dry weather flow. The serviced population at each wastewater site is estimated using the latest ONS population data for its drainage area. With these measures of daily flow dilution and population, we can then report the SARS-CoV-2 signal as a daily rate of gene copies per 100,000 people (gc/day per 100k). This value is then comparable across all the Welsh catchments. Day-to-day variability is smoothed using weekly averaging of the data.

In addition to normalising the data, the data are also studied for samples that could be deemed as 'outliers' on account of being significantly outside of the range of other recent samples. True outliers are then removed from datasets as they could have a negative impact on the trends observed in the figures produced for this report.

Using this Report

Wastewater monitoring is a type of environmental monitoring, so it is difficult to model data around local authorities or health boards. Sewer catchments can receive rainfall or environmental sources of water from anywhere within their relevant geography, which follows the topography of the land. Sewer networks are managed around regions that mostly correspond with river drainage basins and it is these management areas that have been chosen for wastewater regional reporting.

For both National and regional rolling averages the population of all catchments is taken into consideration when reporting the signal per 100,000 people. For example, in Region 4 there are two catchments: one with a population of approximately 400 and the other with a population of approximately 67,100. Individual catchment populations are detailed in Appendix A.

All data relating to wastewater signal (SARS-CoV-2 gc/day per 100k) is represented as an exponential figure ($x10^{12}$) where $1x10^{12}$ = 1,000,000,000,000 unless otherwise stated. The report uses a mixture of line graphs and spark charts; both are based on 10 day rolling averages.

Maps of individual sewer catchments are located in the appendix of this report. Each section of the report contains a map that represents the area that is covered by the region.

Each regional summary is given in the format:

- The trend within the region for the previous four weeks
- The trend within the region compared to the previous week
- Any indicators triggered for the region
- Any inconsistencies or issues in the region

To allow for noise in wastewater signal we only record changes greater than 10% to be decreases or increases.

Any questions on the report, or the Welsh Government Wastewater Programme, can be sent to wastewater@gov.wales.

Alerting Indicators

To highlight potentially concerning changes in wastewater signal, the three following types of alerting indicators are assessed once a week, based on the viral load (gc/day per 100k) measured. The indicator table in the National situation report indicates the number of sites within those regions that have triggered the indicators:

1. The **High Signal Level** indicator highlights the catchment areas where the viral load is high. It corresponds to a situation where the viral loads exceed half of the highest weekly average recorded in the previous 6 months.

2. The **Rapid Increase** indicator highlights the catchment areas where the viral loads have rapidly increased for the last week compared to the previous week. It corresponds to a situation where the weekly average of the viral load has increased by at least 100% since the previous week.

3. The **Increasing Signal Level** indicator highlights the catchment areas where the viral loads are showing signs of continuous increase. It corresponds to a situation where the weekly average of the viral load has increased since the previous week for at least 3 weeks in a row.

'0' corresponds to no alerts present for the region or site, whilst '-' represents no data being available.

To assist in locating which region is relevant for a particular Health Board or Local Authority they are broken down in the tables below.

Betsi Cadwaladr University Health Board	Region 3: Clwyd Region 4: Conwy Region 5: Dee Region 6: Llŷn and Eryri Region 7: Meirionnydd Region 13: Ynys Môn
Hywel Dda University Health Board	Region 1: Carmarthen Bay and the Gower Region 2: Cleddau and Pembrokeshire Coastal Rivers Region 7: Meirionnydd Region 10: Teifi and North Ceredigion
Powys Teaching Health Board	Region 7: Meirionnydd Region 12: Wye Region 14: Hafren Dyfrdwy
Swansea Bay University Health Board	Region 1: Carmarthen Bay and the Gower Region 9: Tawe to Cadoxton
Cwm Taf University Health Board	Region 8: South East Valleys Region 9: Tawe to Cadoxton Region 11: Usk
Cardiff & Vale University Health Board	Region 8: South East Valleys Region 9: Tawe to Cadoxton
Aneurin Bevan University Health Board	Region 12: Wye Region 8: South East Valleys Region 11: Usk

Blaenau Gwent County Borough Council	Region 8: South East Valleys
Bridgend County Borough Council	Region 9: Tawe to Cadoxton
Caerphilly County Borough Council	Region 8: South East Valleys
Carmarthenshire County Council	Region 1: Carmarthen Bay and the Gower Region 10: Teifi and North Ceredigion
Ceredigion County Council	Region 7: Meirionnydd Region 10: Teifi and North Ceredigion
City and County of Swansea	Region 1: Carmarthen Bay and the Gower Region 9: Tawe to Cadoxton
City of Cardiff Council	Region 8: South East Valleys
Conwy County Borough Council	Region 3: Clwyd Region 4: Conwy Region 5: Dee
Denbighshire County Council	Region 3: Clwyd Region 5: Dee
Flintshire County Council	Region 5: Dee
Gwynedd Council	Region 5: Dee Region 6: Llŷn and Eryri Region 7: Meirionnydd
Isle of Anglesey County Council	Region 13: Ynys Môn
Merthyr Tydfil County Borough Council	Region 8: South East Valleys
Monmouthshire County Council	Region 11: Usk Region 12: Wye
Neath Port Talbot Council	Region 9: Tawe to Cadoxton
Newport City Council	Region 8: South East Valleys Region 11: Usk
Pembrokeshire County Council	Region 2: Cleddau and Pembrokeshire Coastal Rivers Region 10: Teifi and North Ceredigion
Powys County Council	Region 7: Meirionnydd Region 9: Tawe to Cadoxton Region 11: Usk Region 12: Wye Region 14: Hafren Dyfrdwy
Rhondda Cynon Taf County Borough Council	Region 8: South East Valleys
Torfaen County Borough Council	Region 11: Usk
Vale of Glamorgan Council	Region 9: Tawe to Cadoxton
Wrexham County Borough Council	Region 5: Dee

Wales Situation Report

Since the last report, SARS-CoV-2 viral load has increased across the country.
The signal increased in 12 regions, decreased in 1 region and remained level in 1 region.

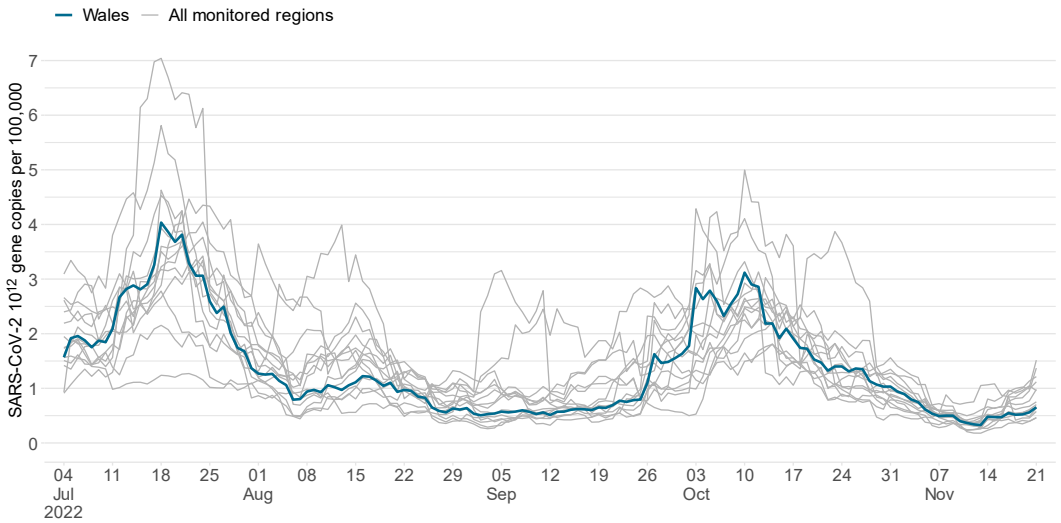


Figure 2 - National (blue lines) and Regions (grey lines) Rolling Mean SARS-CoV-2 gc/day per 100k

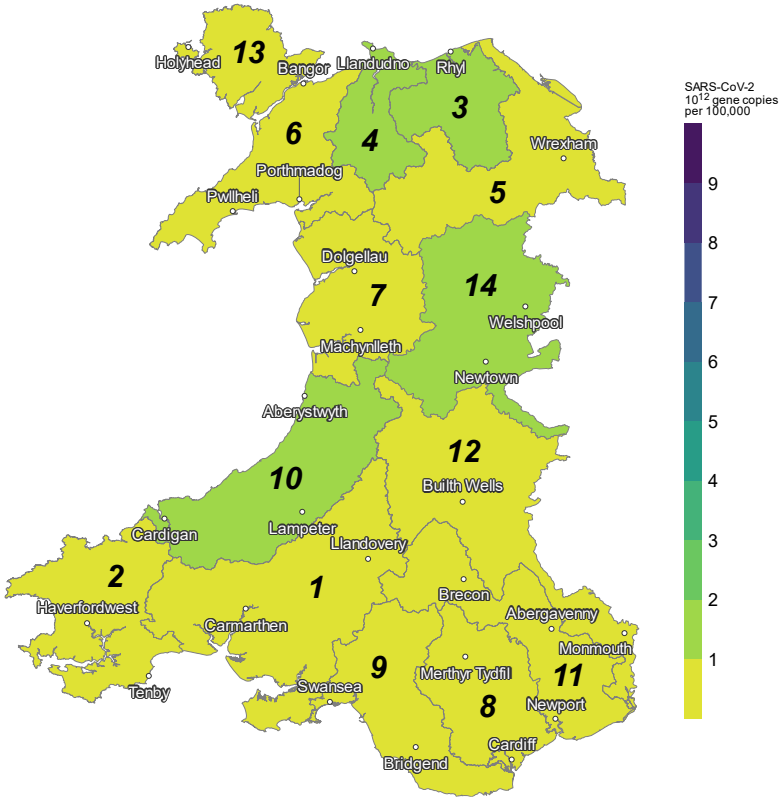


Figure 3 - National Heat Map showing Regional Mean SARS-CoV-2 gc/day per 100k

Wales Situation report:

- The trend in the national mean wastewater signal has been unstable, with both increases and decreases over the last four weeks.
- Since the last report, SARS-CoV-2 viral load has increased across the country. However, the signal decreased at Ynys Môn, and remained level at South East Valleys.

Region name	Number of sites monitored	% regional population covered	No. sites with High Signal Level	No. sites with Rapid Increase	No. sites with Increasing Signal Level
Region 1: Carmarthen Bay and the Gower	4	57	0	1	0
Region 2: Cleddau and Pembrokeshire Coastal Rivers	4	39	0	1	0
Region 3: Clwyd	2	54	0	0	0
Region 4: Conwy	2	82	0	2	0
Region 5: Dee	4	46	1	1	0
Region 6: Llŷn and Eryri	4	34	0	1	0
Region 7: Meirionnydd	3	28	0	1	0
Region 8: South East Valleys	2	82	0	0	0
Region 9: Tawe to Cadoxton	5	73	0	1	0
Region 10: Teifi and North Ceredigion	3	30	0	1	0
Region 11: Usk	4	86	0	1	0
Region 12: Wye	4	36	0	2	0
Region 13: Ynys Môn	3	37	0	1	0
Region 14: Hafren Dyfrdwy	3	26	0	2	0

Table 1 - Regional Alert Indicators Watchlist. Indicates how many sites in the region have hit trigger points since last report.

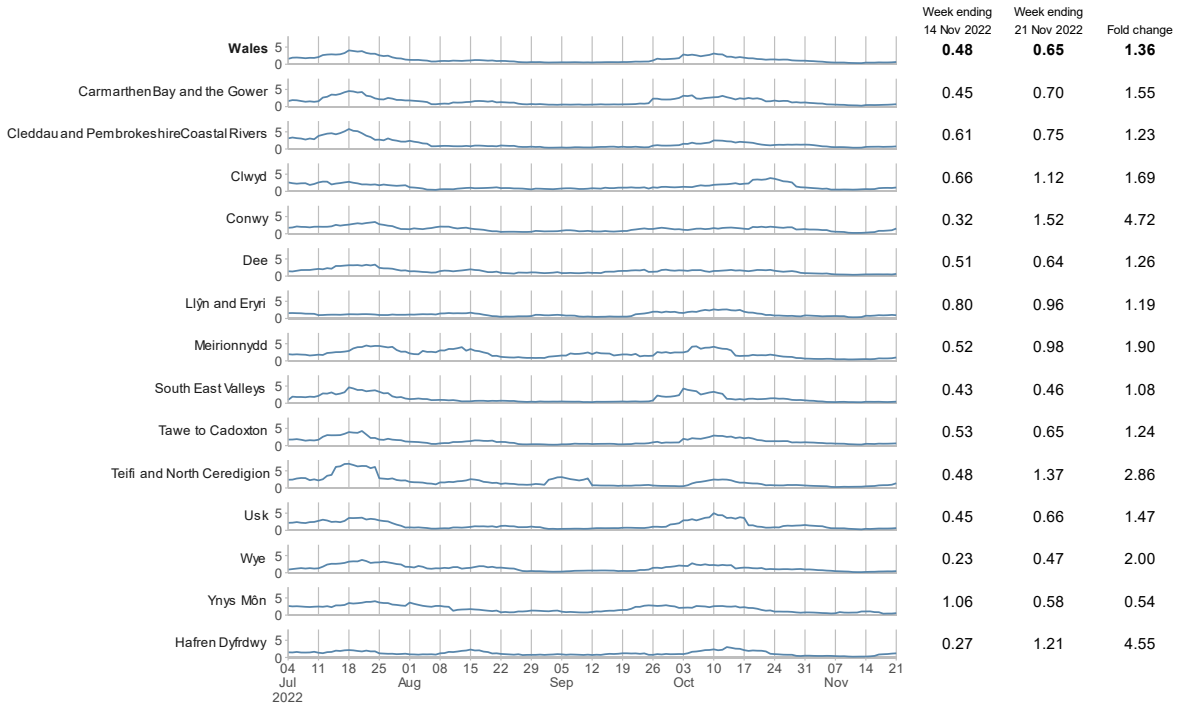


Figure 4 - National & Regional trends and fold change. SARS-CoV-2 gc/day per 100k

Region 1: Carmarthen Bay and the Gower

This section is relevant for:	Hywel Dda University Health Board Swansea Bay University Health Board	Carmarthen County Council Swansea Council

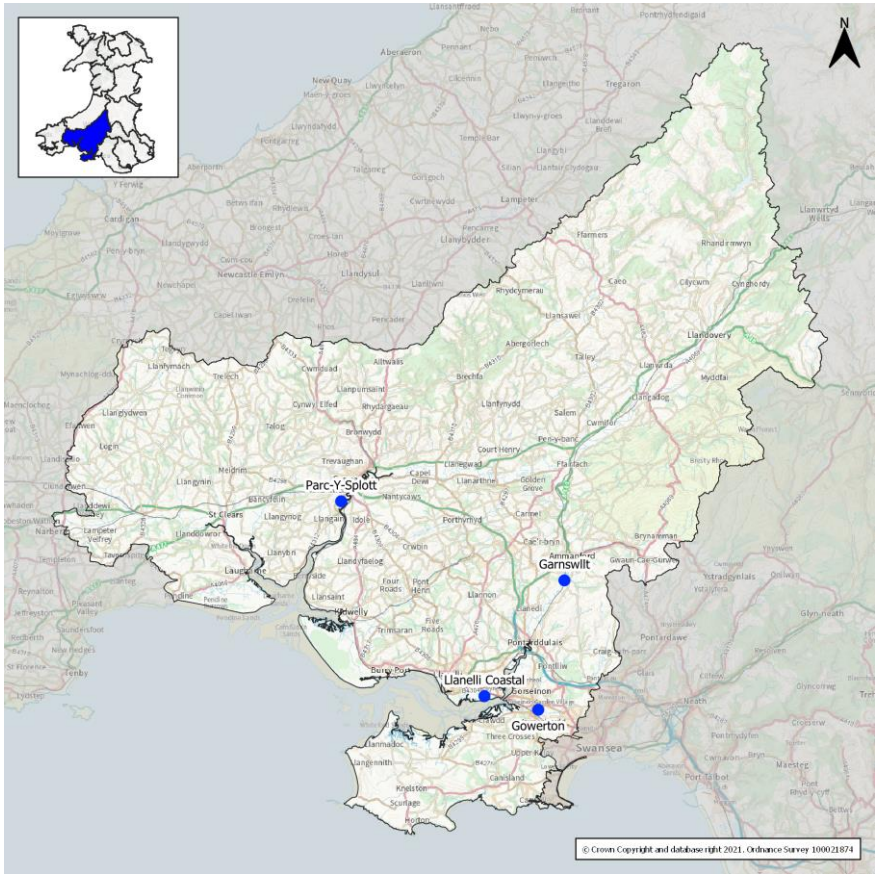


Figure 5 - Region 1 Map

Region 1 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region. However, the signal remained level at Parc-Y-Splott.
- The Rapid Increase indicator was triggered at Gowerton during the last reporting period.
- There was one sample from Garnswllt and Gowerton with a SARS-CoV-2 concentration below the limit of detection (LOD). Also, there was one sample missing from each of the sites in the region.

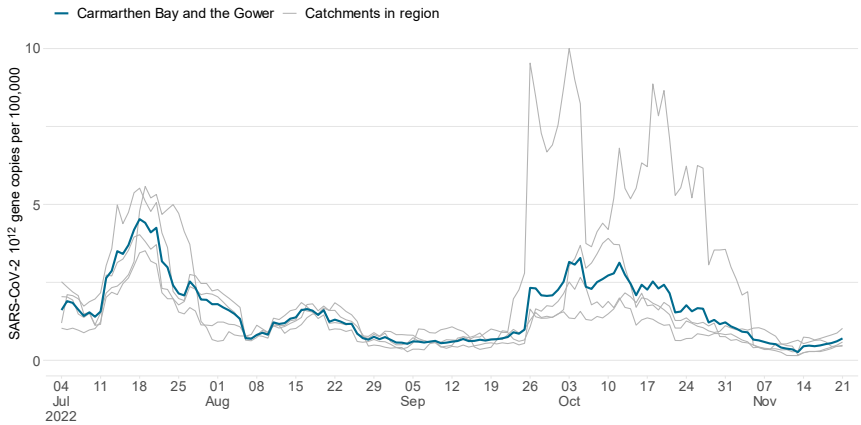
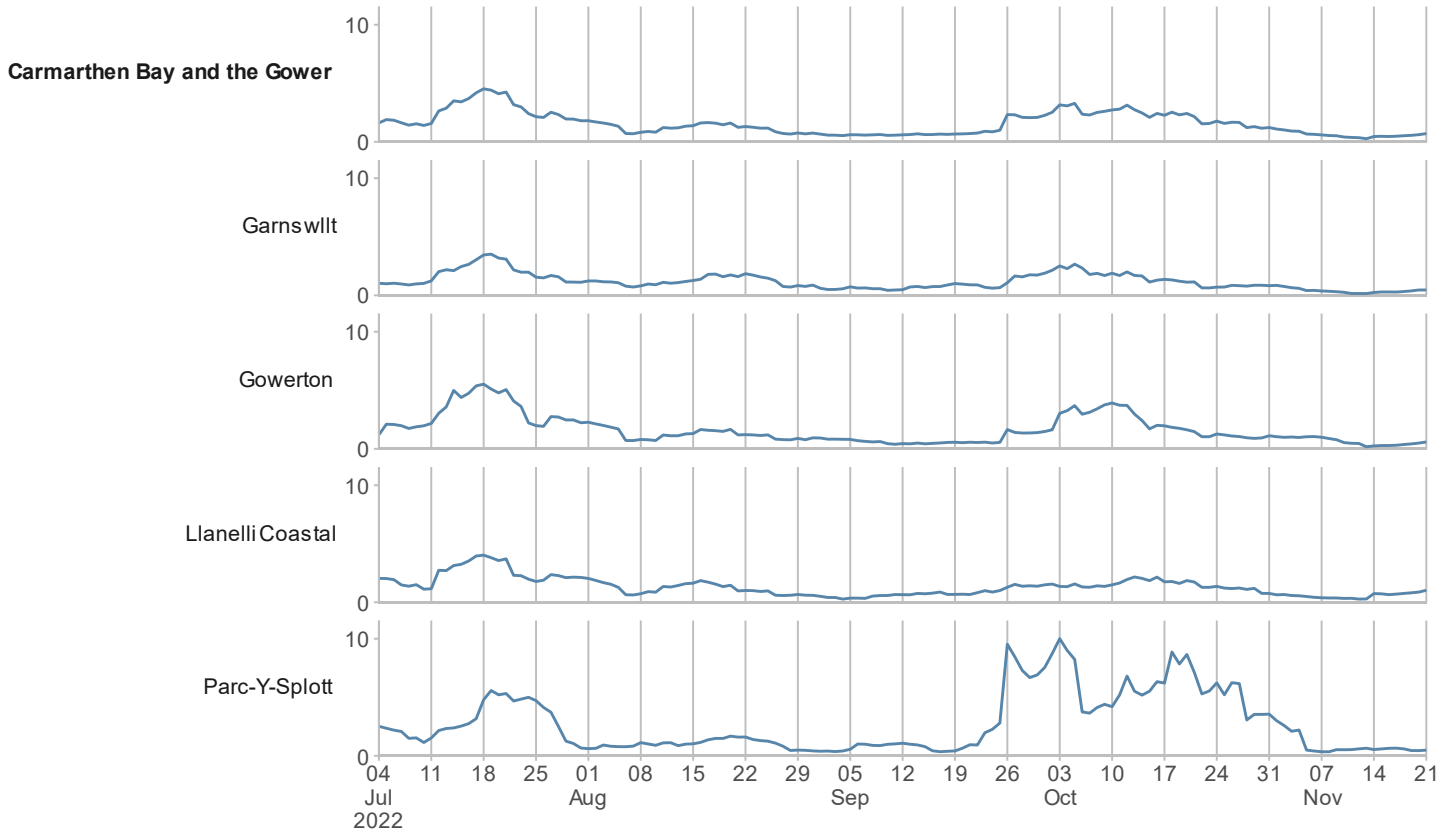


Figure 6 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Carmarthen Bay and the Gower	**0.45**	**0.70**	**1.55**
Garnswllt	0.24	0.45	1.88
Gowerton	0.25	0.59	2.38
Llanelli Coastal	0.74	1.03	1.38
Parc-Y-Splott	0.54	0.48	0.90

Figure 7 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 2: Cleddau and Pembrokeshire Coastal Rivers

This section is relevant for:	Hywel Dda University Health Board	Pembrokeshire County Council

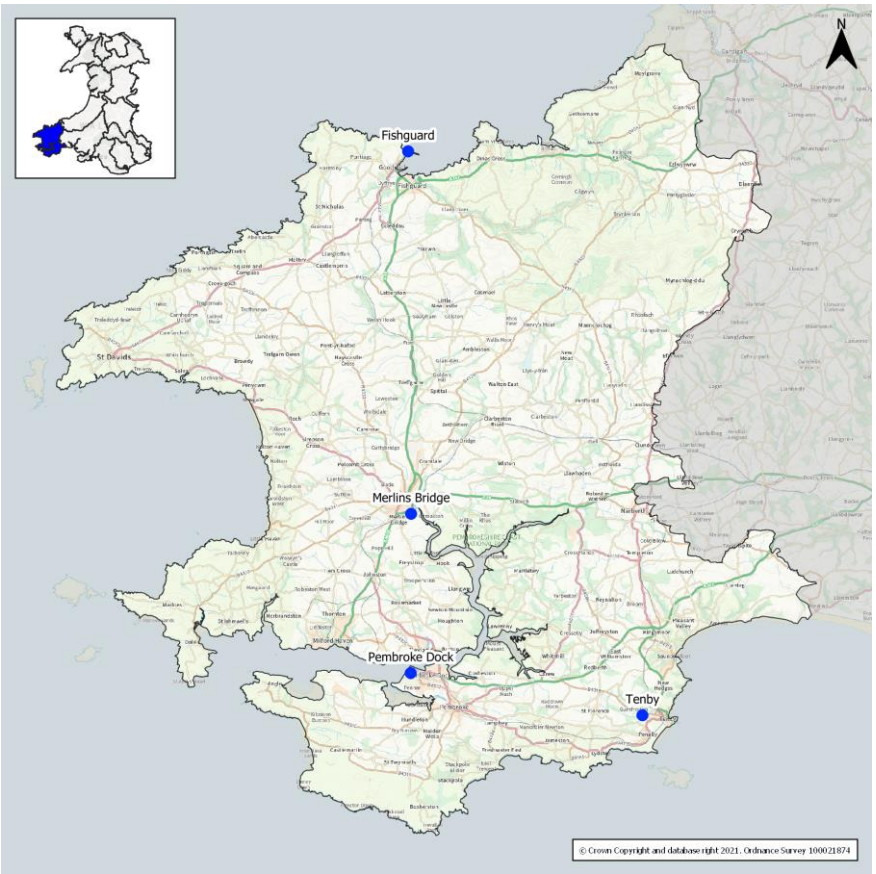


Figure 8 - Region 2 Map

Region 2 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region. However, the signal remained level at Merlin's Bridge and Pembroke Dock.
- The Rapid Increase indicator was triggered at Fishguard during the last reporting period.
- There was one sample from Merlin's Bridge with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing from each of the sites in the region.

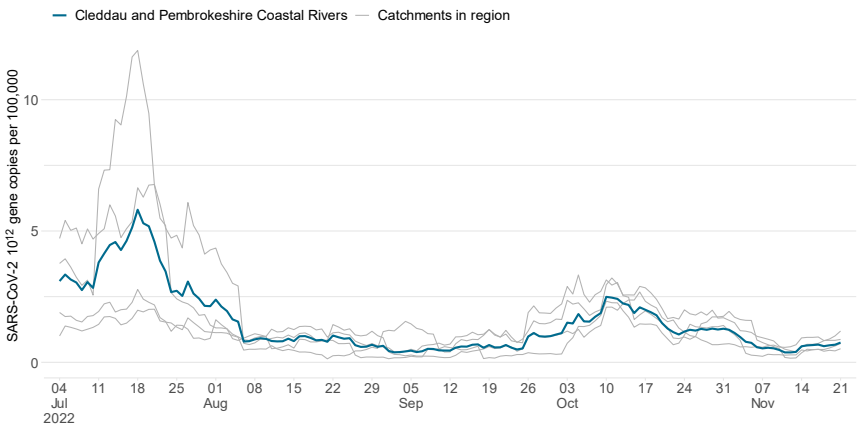
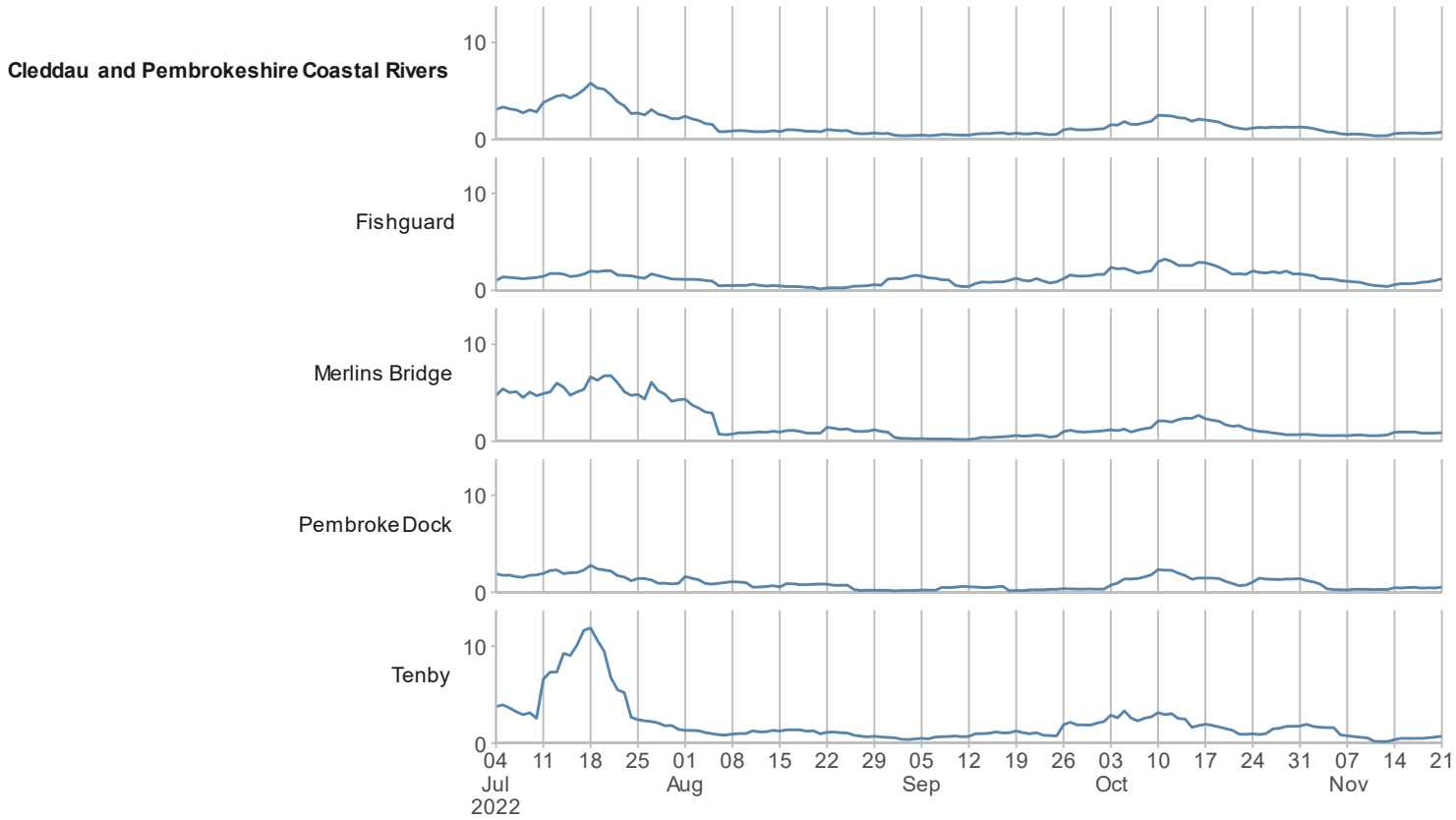


Figure 9 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Cleddau and Pembrokeshire Coastal Rivers	**0.61**	**0.75**	**1.23**
Fishguard	0.59	1.19	2.03
Merlins Bridge	0.93	0.87	0.94
Pembroke Dock	0.47	0.52	1.10
Tenby	0.36	0.72	1.98

Figure 10 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 3: Clwyd

This section is relevant for:	Betsi Cadwaladr University Health Board	Denbighshire County Council Conwy County Council

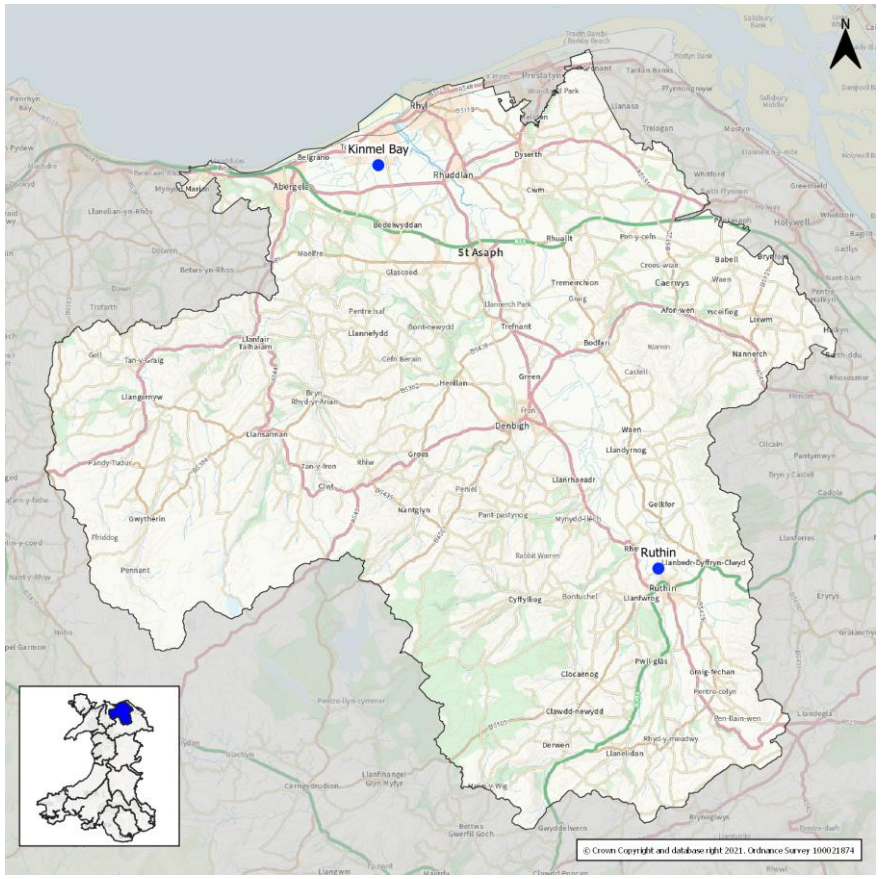


Figure 11 - Region 3 Map

Region 3 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal increased across the region. However, the signal decreased at Ruthin.
- No indicators were triggered during the last reporting period.
- There was one sample from Ruthin with a SARS-CoV-2 concentration below the LOD.

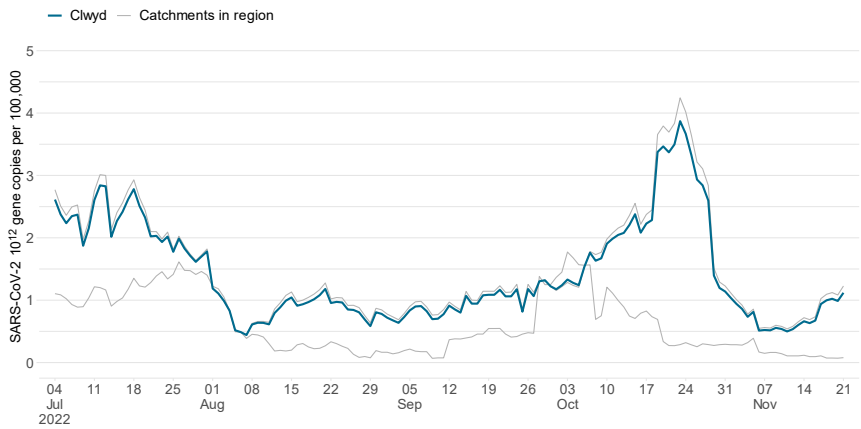
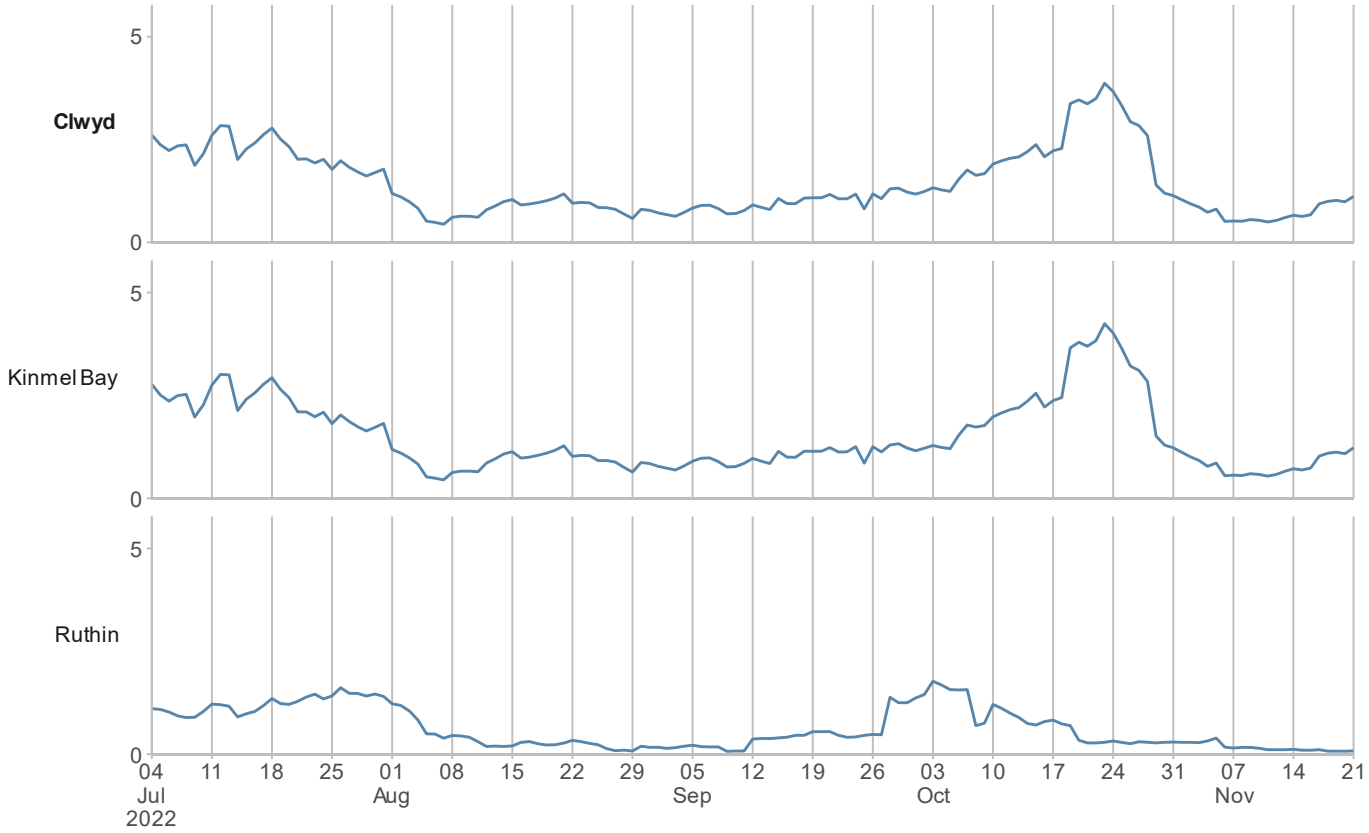


Figure 12 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Clwyd	**0.66**	**1.12**	**1.69**
Kinmel Bay	0.72	1.23	1.71
Ruthin	0.12	0.08	0.67

Figure 13 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 4: Conwy

This section is relevant for:	Betsi Cadwaladr University Health Board	Conwy County Council

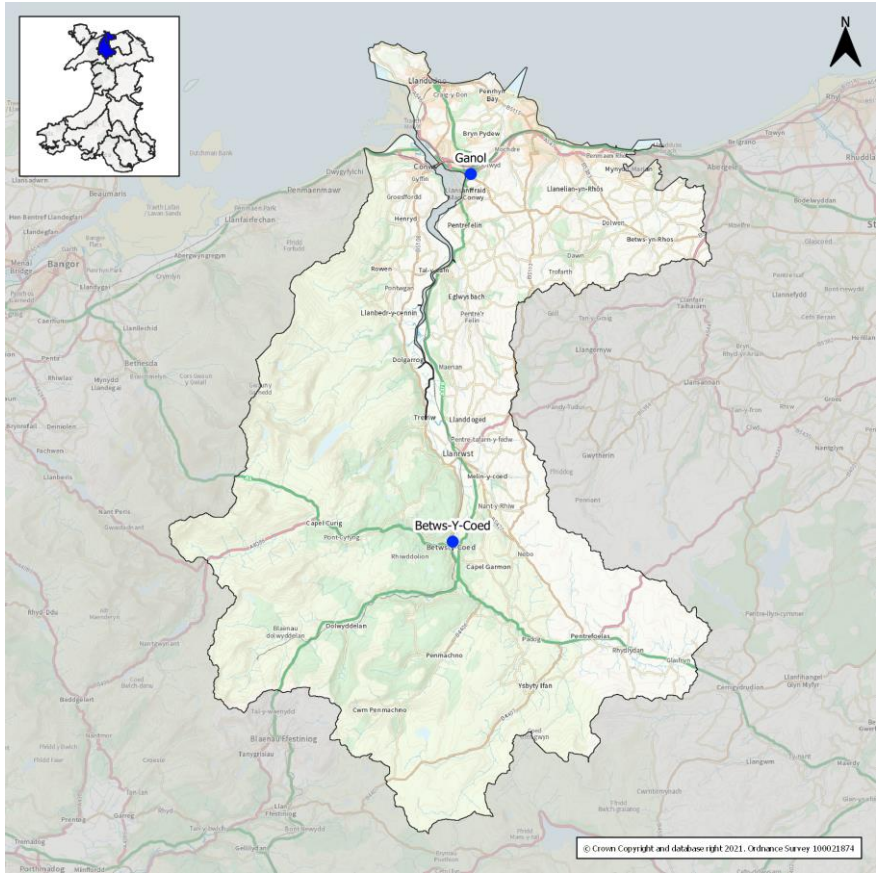


Figure 14 - Region 4 Map

Region 4 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal increased across the region.
- The Rapid Increase indicator was triggered at Betws-Y-Coed and Ganol during the last reporting period.
- There were four samples from Betws-Y-Coed with a SARS-CoV-2 concentration below the LOD. Caution is advised when inferring trends at Betws-Y-Coed due to only one successful sample being collected.

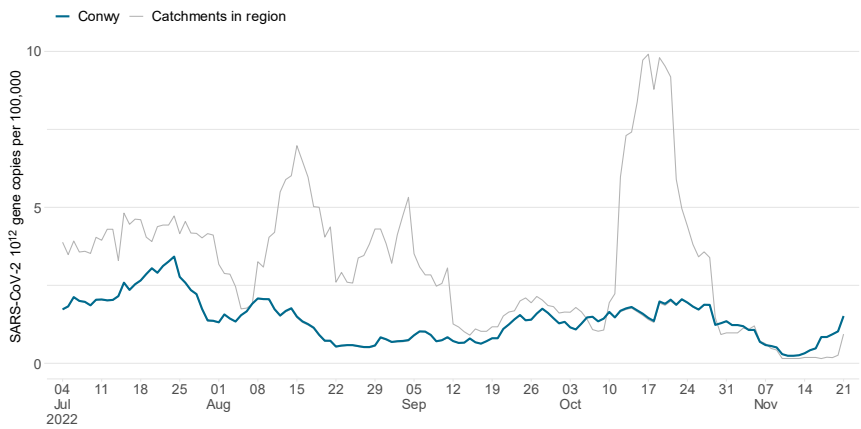
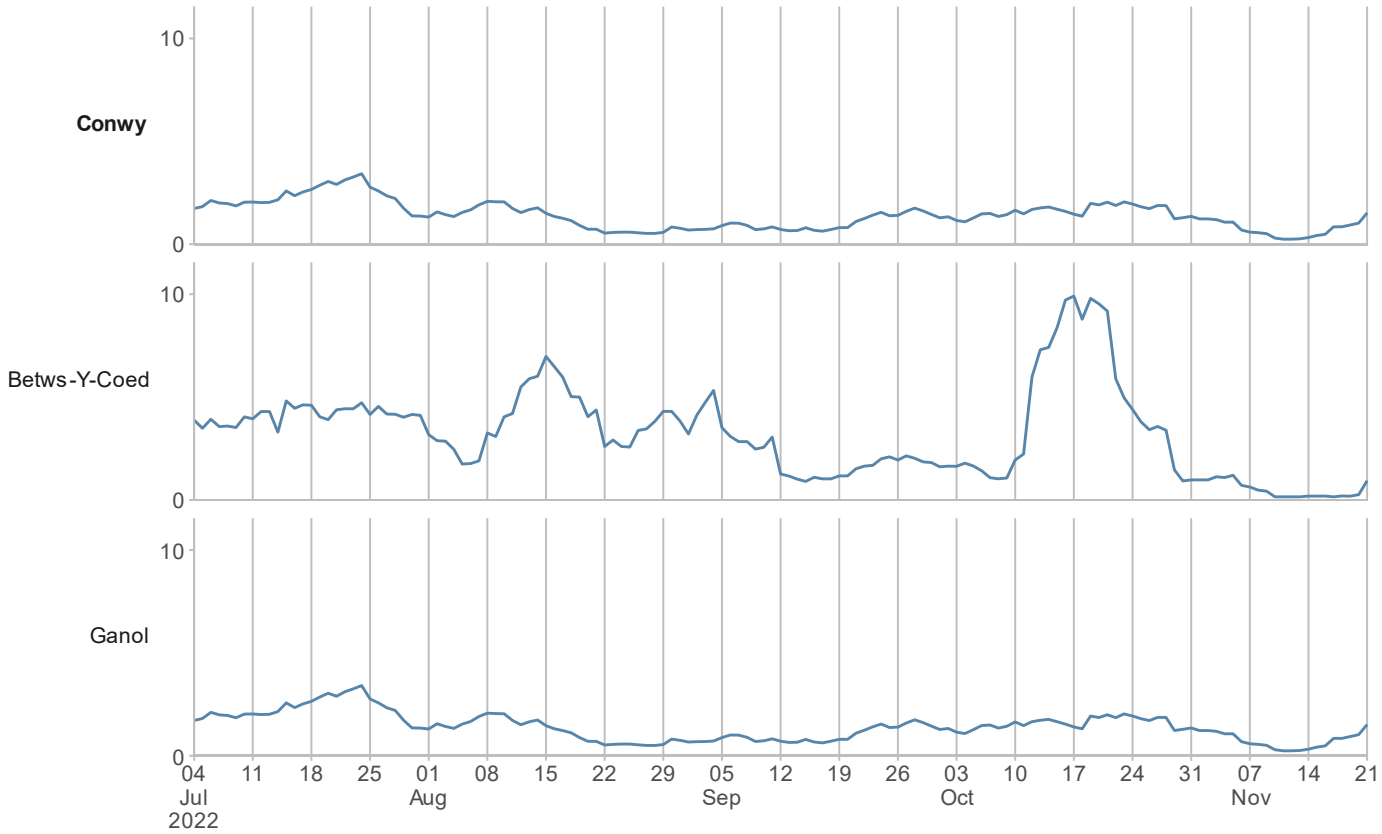


Figure 15 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Conwy	**0.32**	**1.52**	**4.72**
Betws-Y-Coed	0.19	0.94	4.99
Ganol	0.32	1.52	4.72

Figure 16 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 5: Dee

This section is relevant for:	Betsi Cadwaladr University Health Board	Flintshire County Council Denbighshire County Council Wrexham Council	Conwy County Council Gwynedd County Council

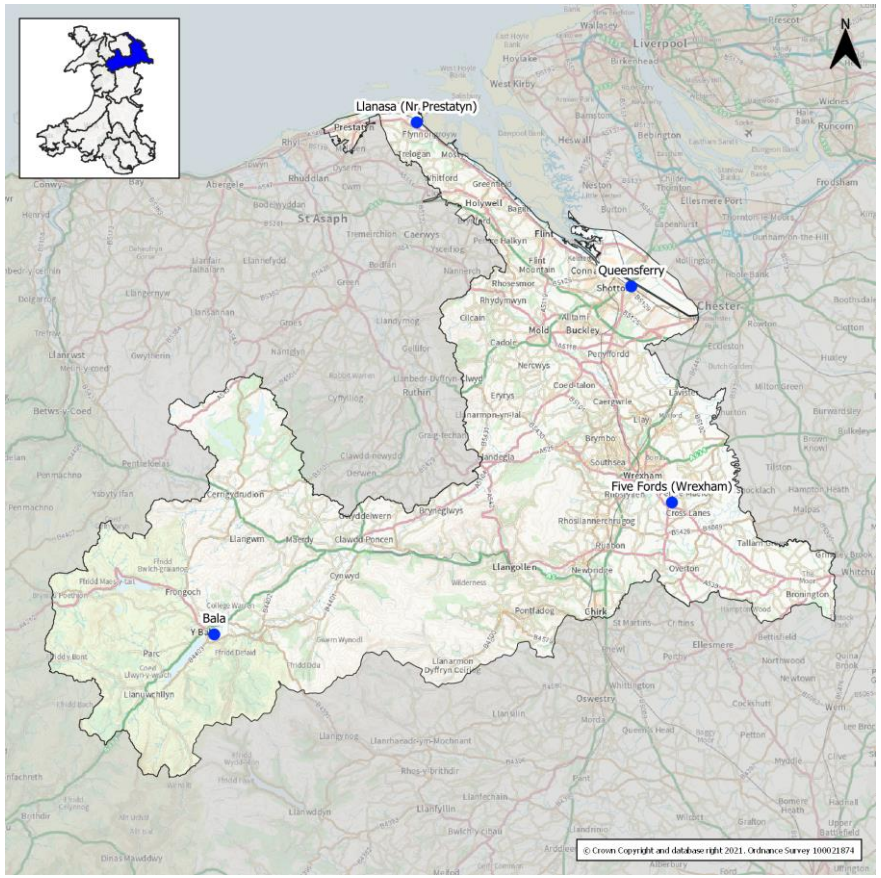


Figure 17 - Region 5 Map

Region 5 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal increased across the region. However, the signal remained level Five Fords (Wrexham).
- The High Signal Level and Rapid Increase indicators were triggered at Bala during the last reporting period.
- There were no sampling issues during the last reporting period.

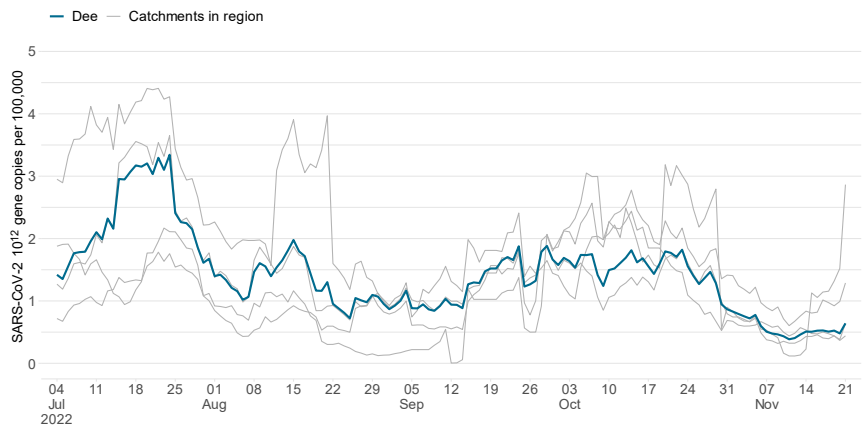
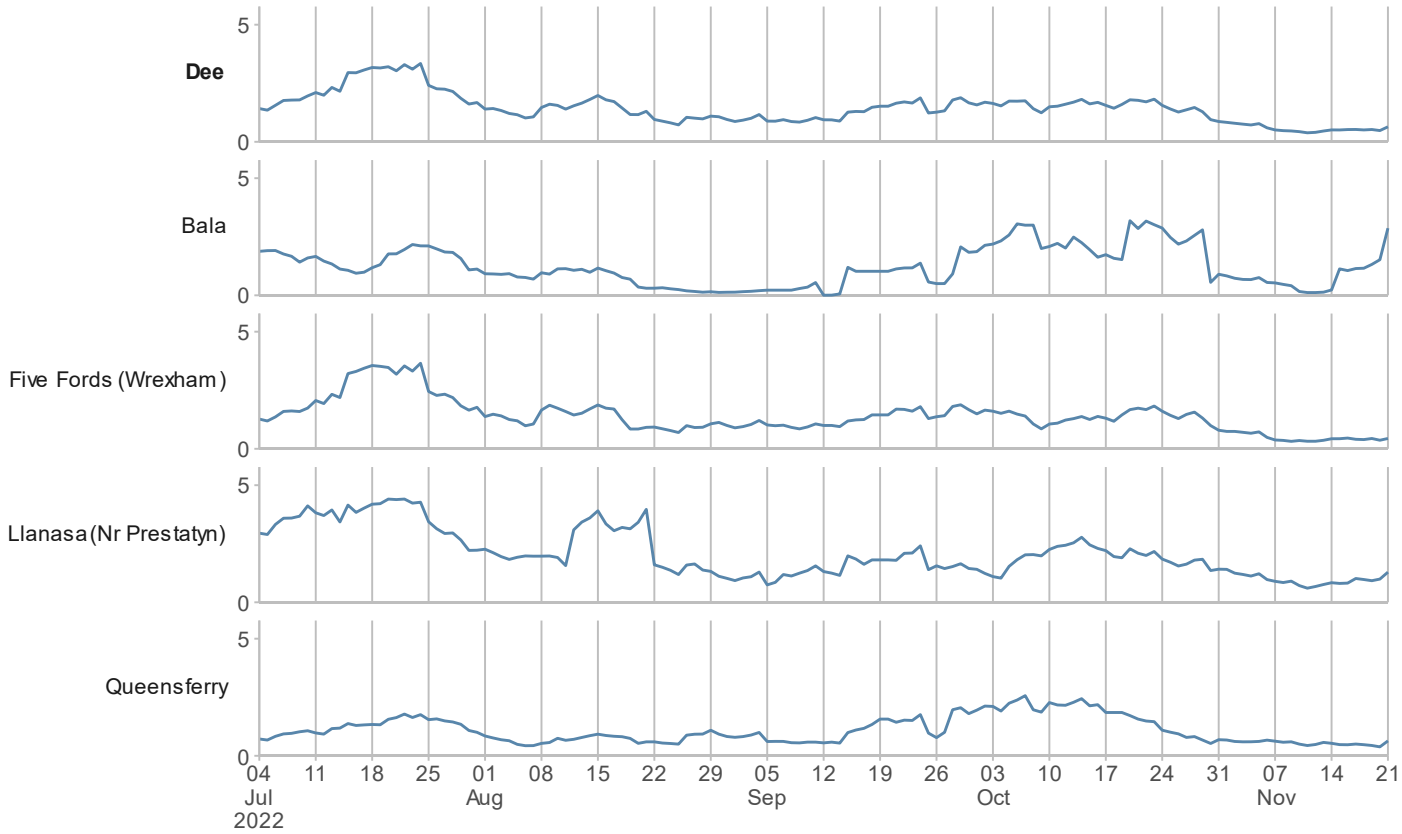


Figure 18 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Dee	**0.51**	**0.64**	**1.26**
Bala	0.23	2.87	12.55
Five Fords (Wrexham)	0.43	0.44	1.02
Llanasa (Nr Prestatyn)	0.84	1.29	1.54
Queensferry	0.53	0.64	1.19

Figure 19 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 6: Llŷn and Eryri

This section is relevant for:	Betsi Cadwaladr University Health Board	Gwynedd County Council

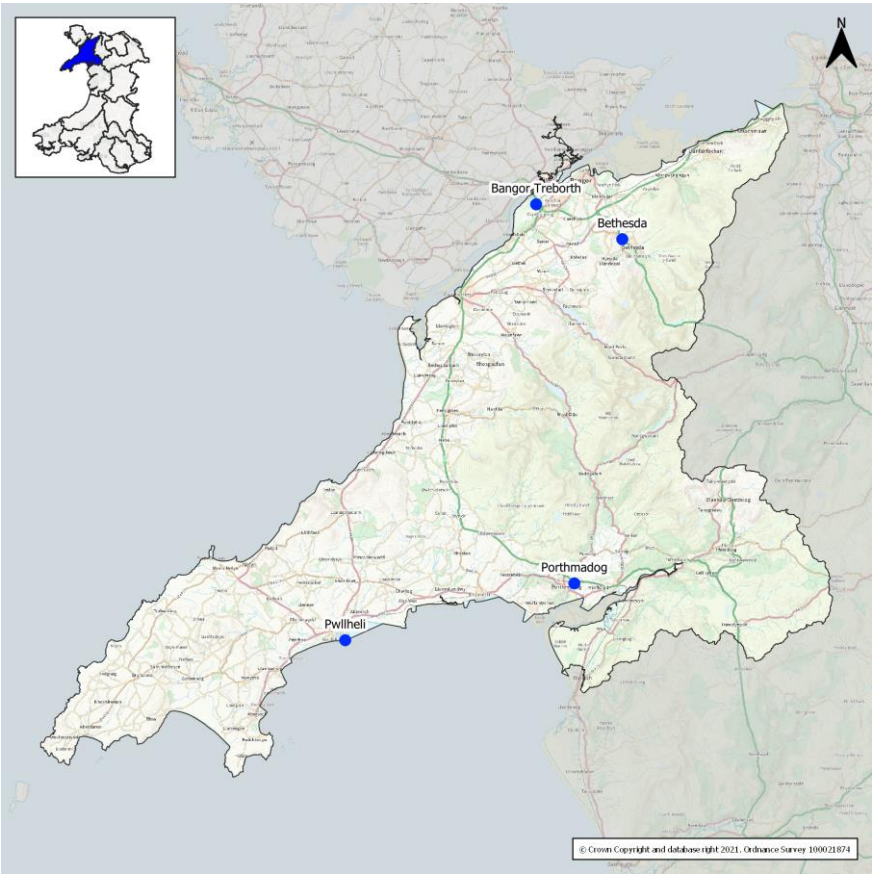


Figure 20 - Region 6 Map

Region 6 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is an increase.
- Compared with last week, the signal has increased across the region. However, the signal decreased at Pwllheli.
- The Rapid Increase indicator was triggered at Bethesda during the last reporting period.
- There was one sample from Porthmadog and Pwllheli with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing from Pwllheli.

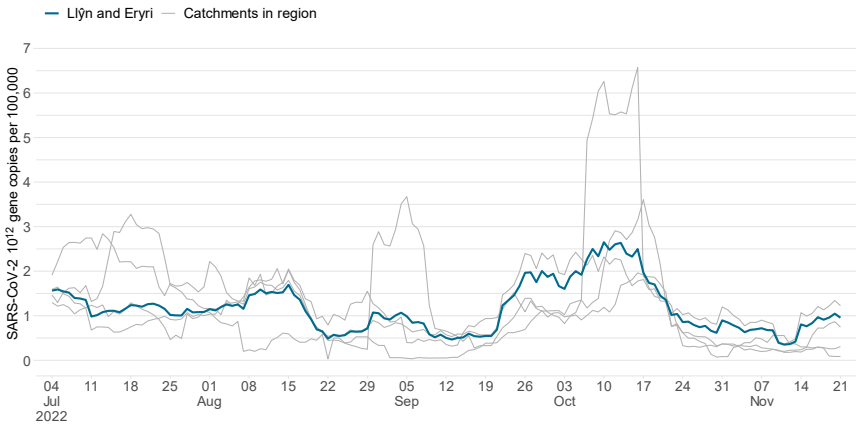
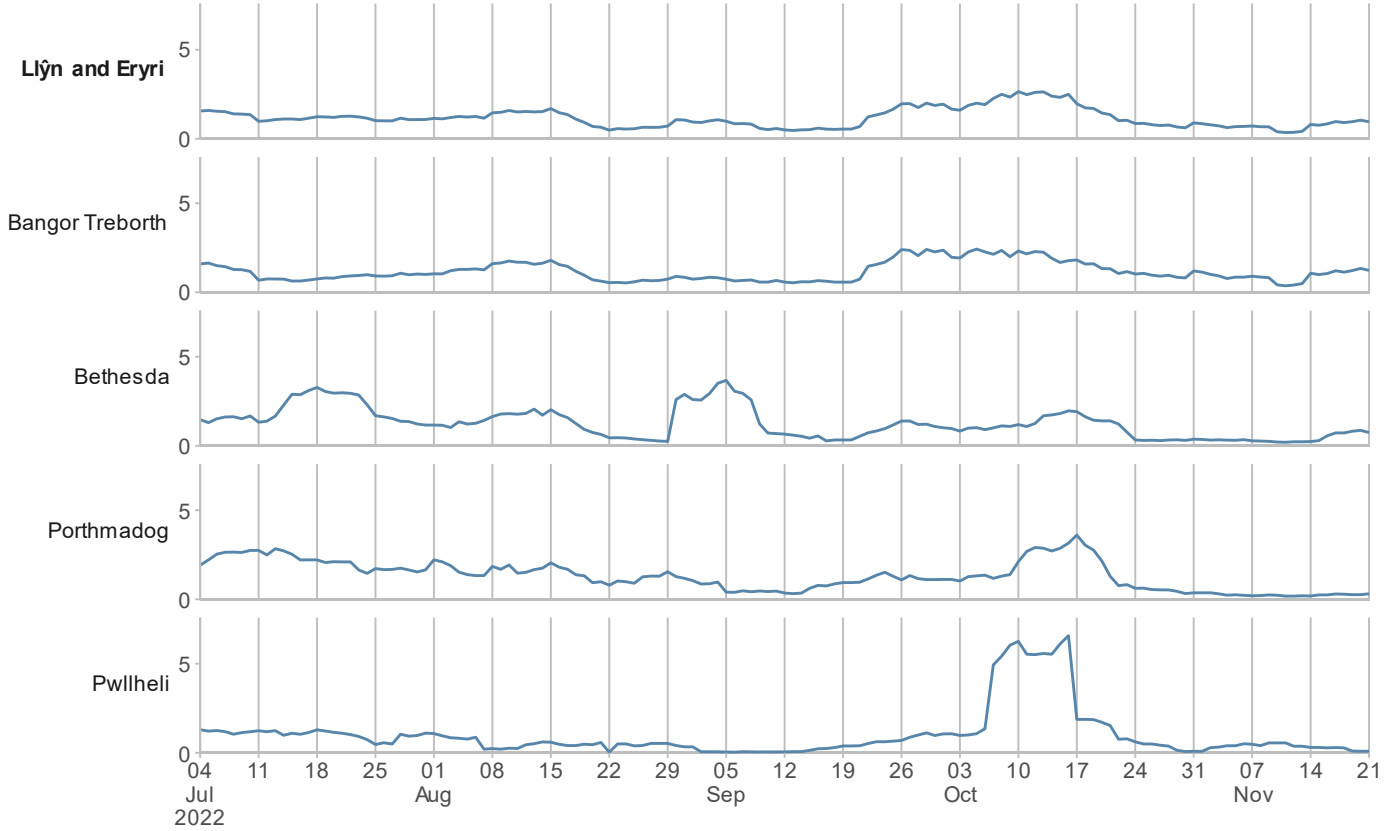


Figure 21 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Llŷn and Eryri	**0.80**	**0.96**	**1.19**
Bangor Treborth	1.07	1.23	1.15
Bethesda	0.24	0.74	3.12
Porthmadog	0.19	0.31	1.66
Pwllheli	0.30	0.09	0.29

Figure 22 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 7: Meirionnydd

This section is relevant for:	Betsi Cadwaladr University Health Board Powys Teaching Health Board Hywel Dda University Health Board	Gwynedd County Council Powys County Council Ceredigion County Council

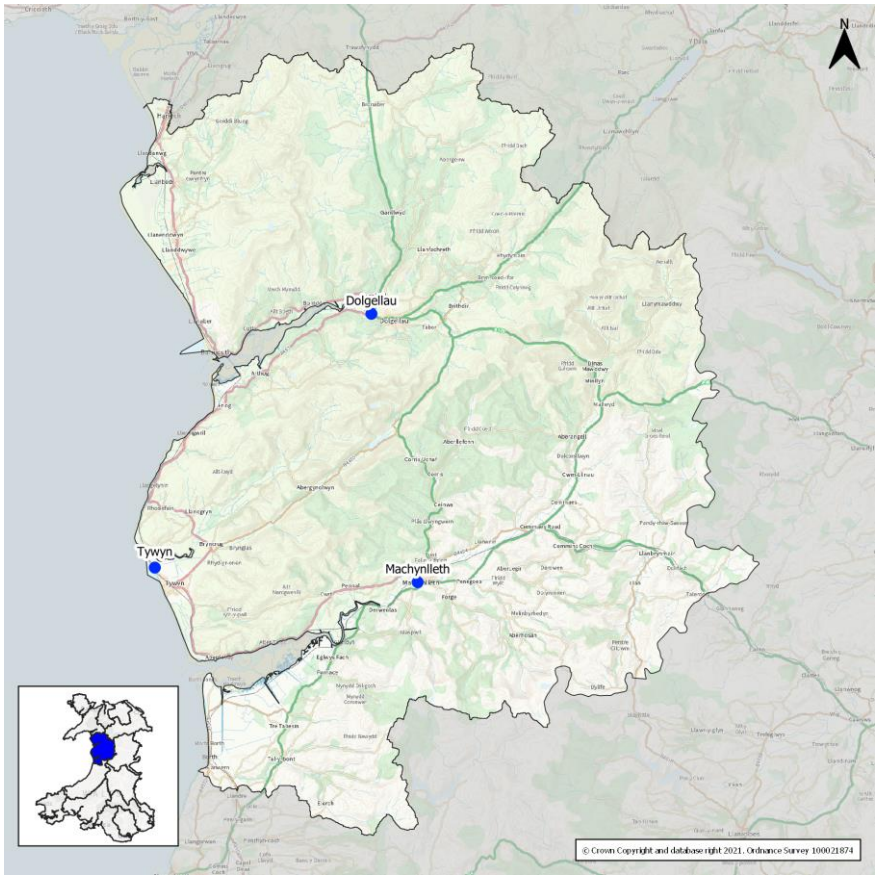


Figure 23 - Region 7 Map

Region 7 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region.
- The Rapid Increase indicator was triggered at Dolgellau during the last reporting period.
- There was one sample from Dolgellau with a SARS-CoV-2 concentration below the LOD.

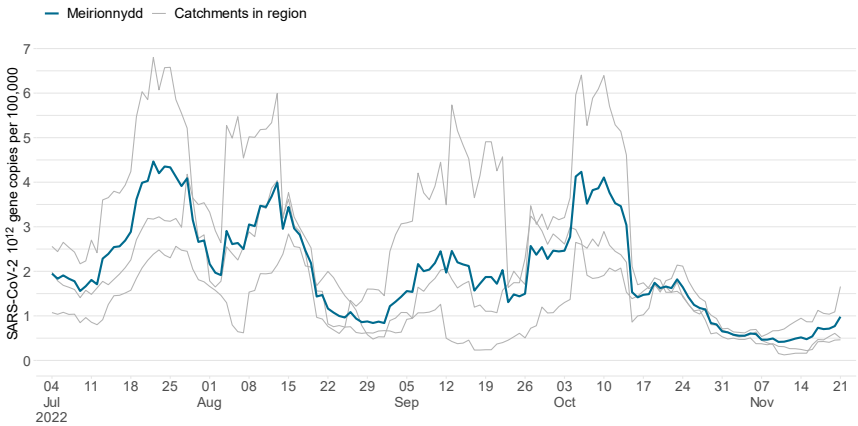
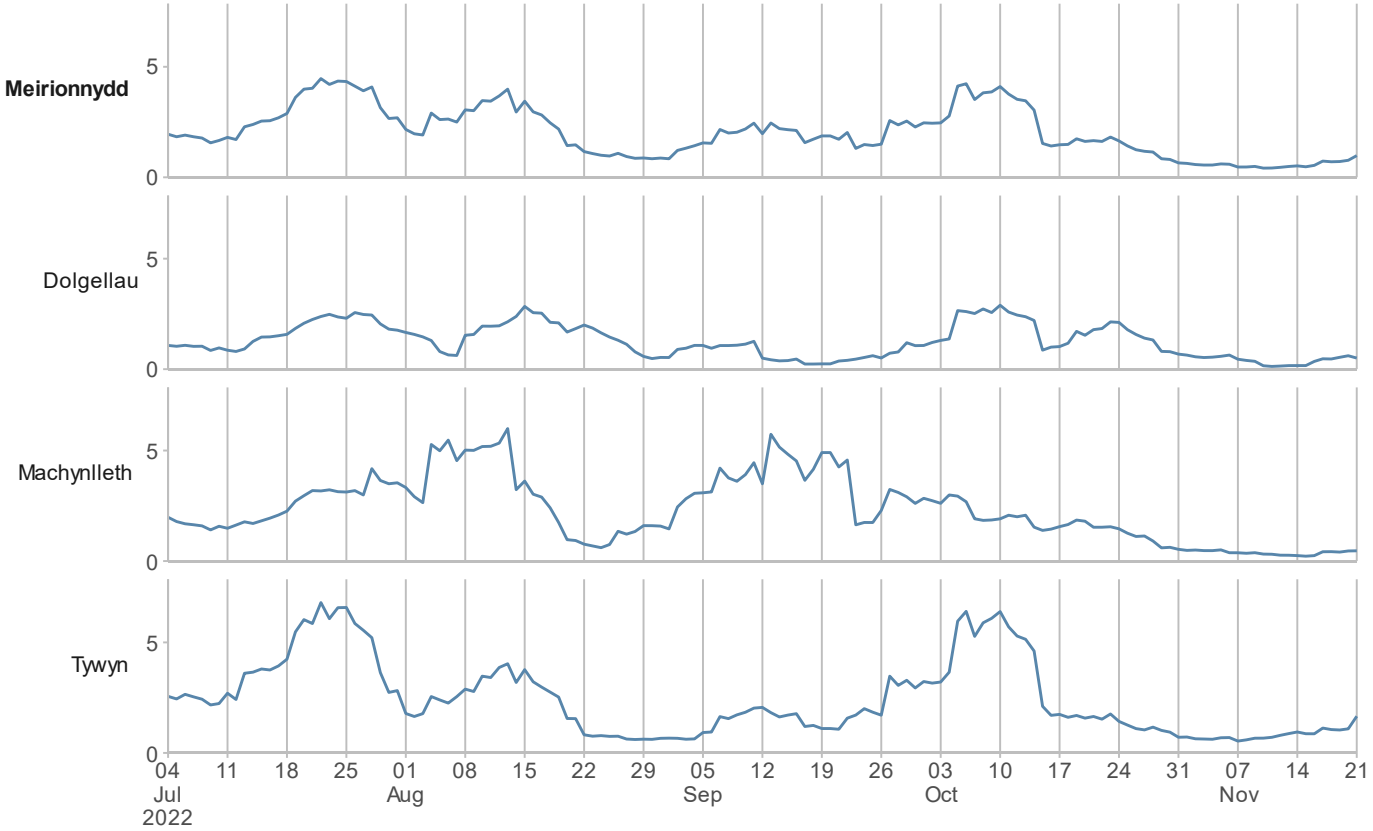


Figure 24 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Meirionnydd	**0.52**	**0.98**	**1.90**
Dolgellau	0.16	0.50	3.10
Machynlleth	0.25	0.46	1.88
Tywyn	0.95	1.66	1.75

Figure 25 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 8: South East Valleys

This section is relevant for:	Aneurin Bevan University Health Board Cardiff & Vale University Health Board Cwm Taf University Health Board	Cardiff Council Rhondda Cynon Taf Council Merthyr Tydfil Council	Caerphilly Council Blaenau Gwent Council Newport Council

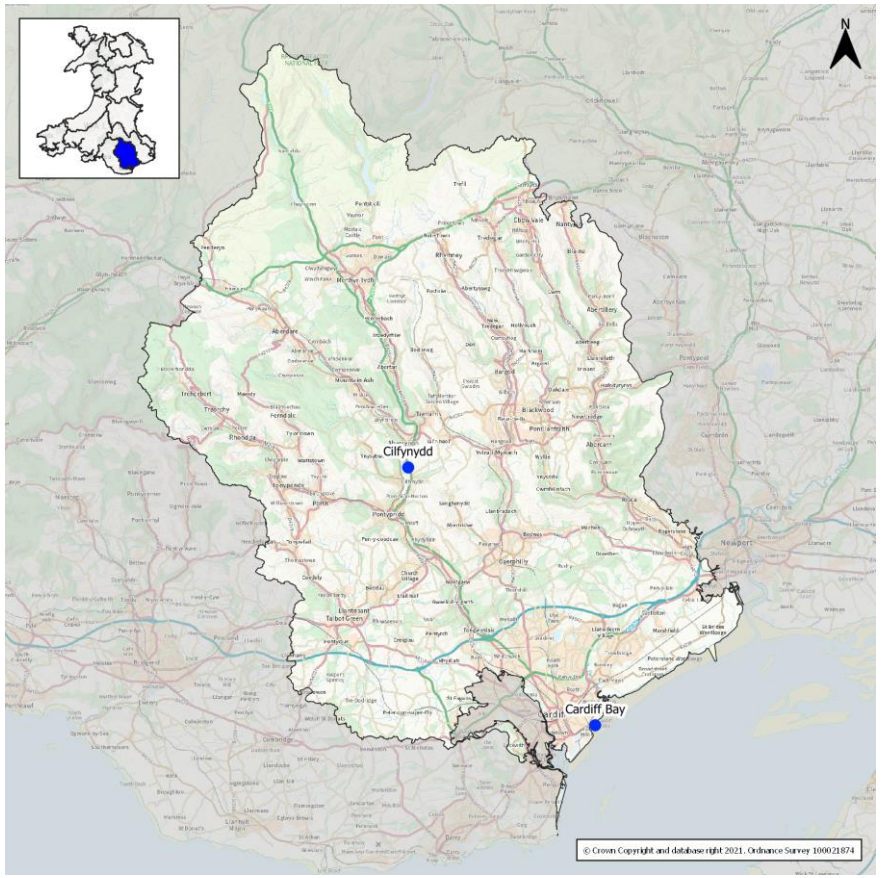


Figure 26 - Region 8 Map

Region 8 situation report:

- Wastewater signal in the region has decreased over the last four weeks.
- Compared with last week, the signal has remained level across the region. However, the signal increased at Cilfynydd.
- No indicators were triggered during the last reporting period.
- There was one sample from Cilfynydd with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing from each of the sites in the region.

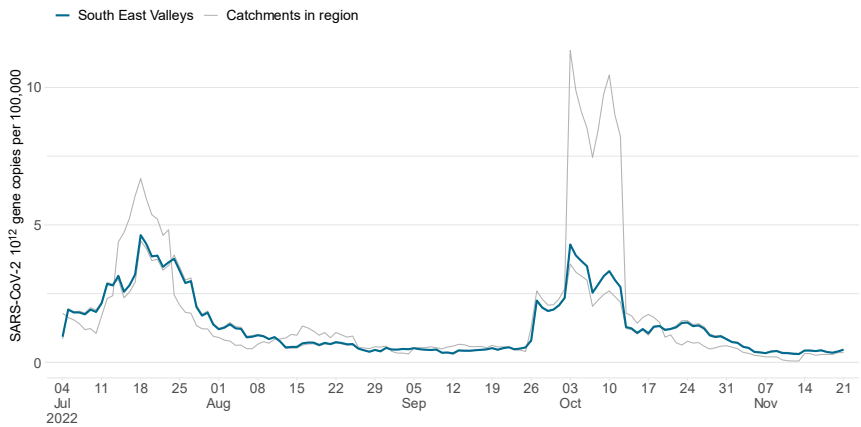
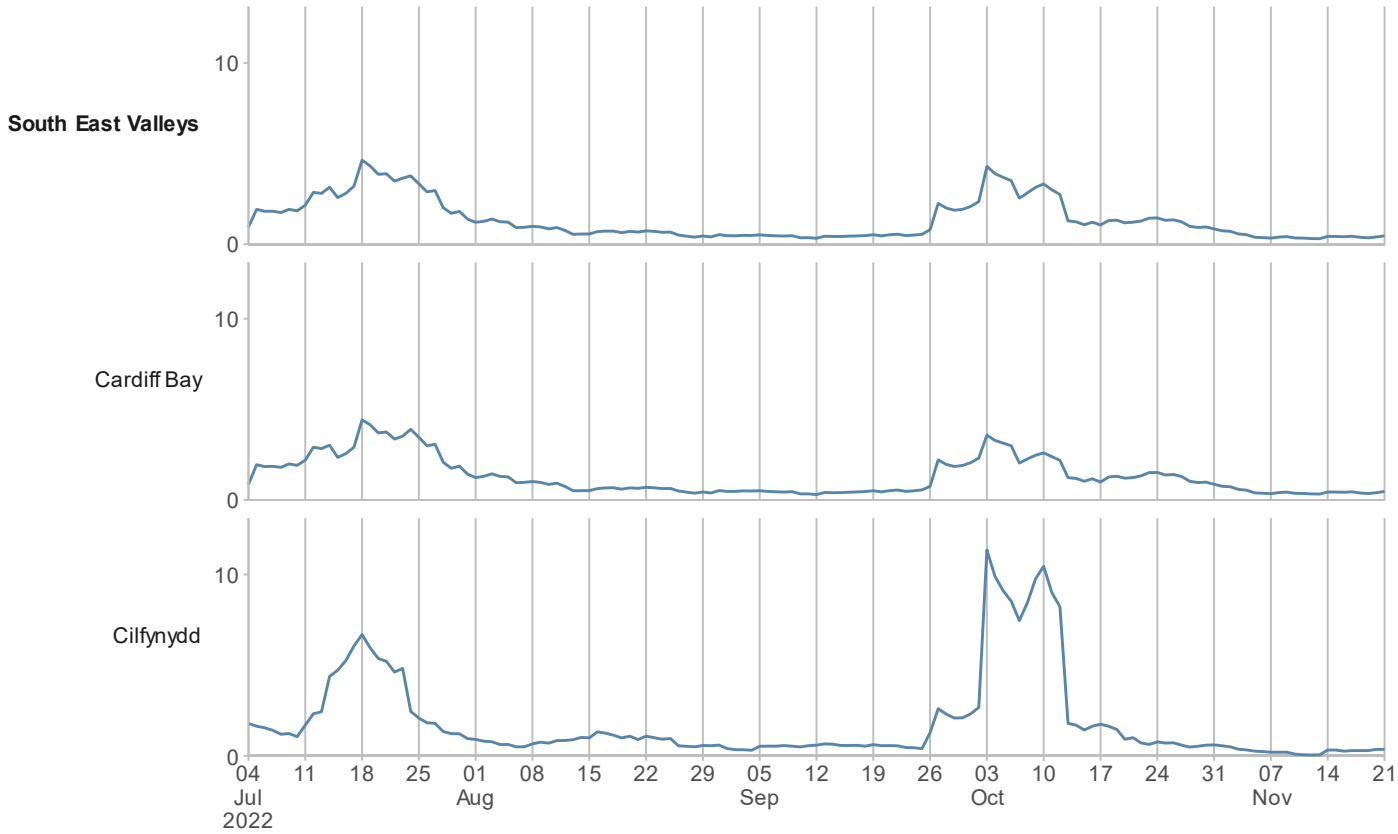


Figure 27 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
South East Valleys	**0.43**	**0.46**	**1.08**
Cardiff Bay	0.44	0.47	1.07
Cilfynydd	0.32	0.35	1.11

Figure 28 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 9: Tawe to Cadoxton

This section is relevant for:	Cardiff & Vale University Health Board Cwm Taf University Health Board Swansea Bay University Health Board	Vale of Glamorgan Bridgend Neath Port Talbot	Swansea Powys

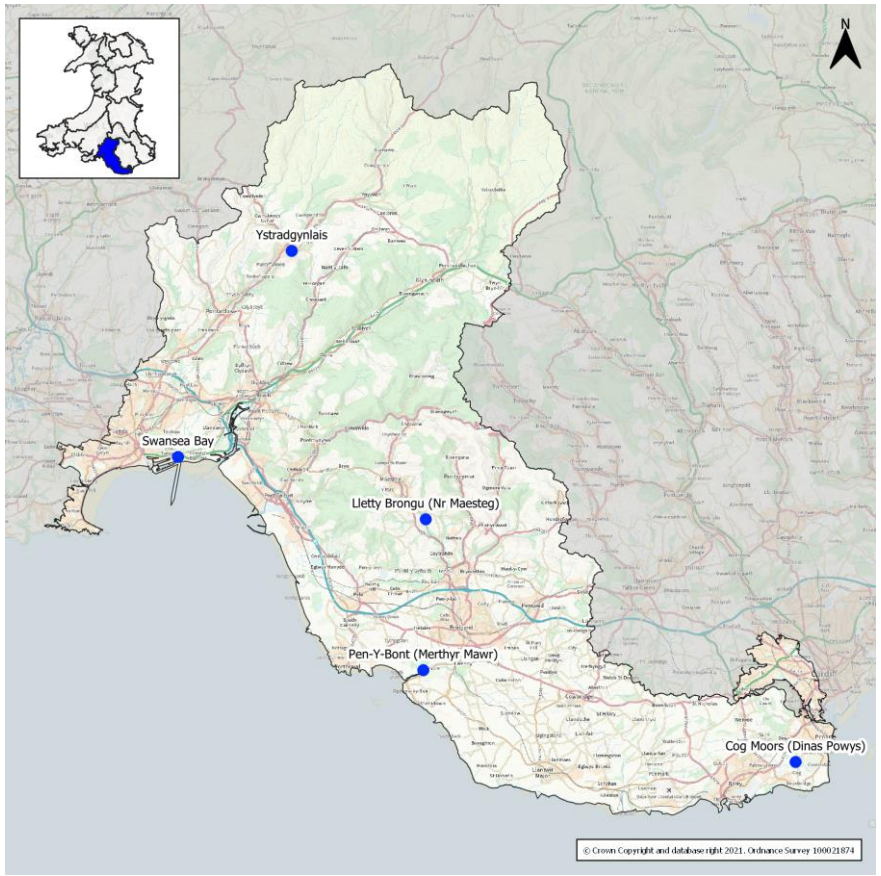


Figure 29 - Region 9 Map

Region 9 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region. However, the signal remained level at Ystradgynlais.
- The Rapid Increase indicator was triggered at Lletty Brongu (Nr Maesteg) during the last reporting period.
- There were two samples from Ystradgynlais, with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing from each of the sites in the region. Access issues at Swansea Bay between August and October resulted in missing samples, hence the breaks in series for that site. Caution is advised when inferring trends at Ystradgynlais due to only two successful samples being collected.

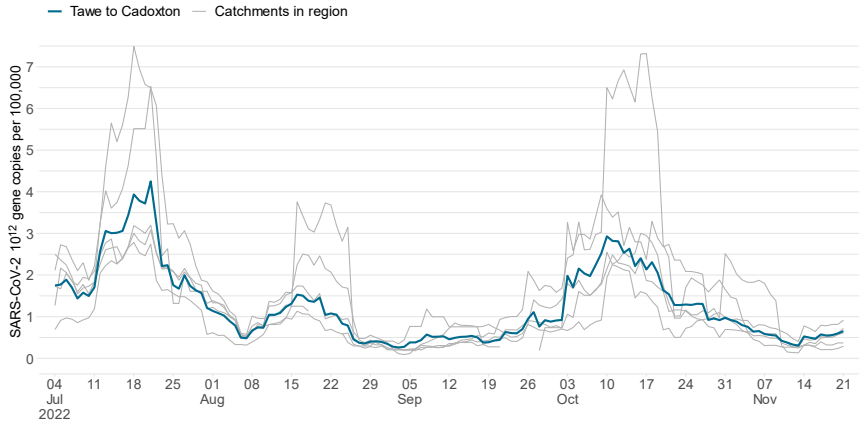
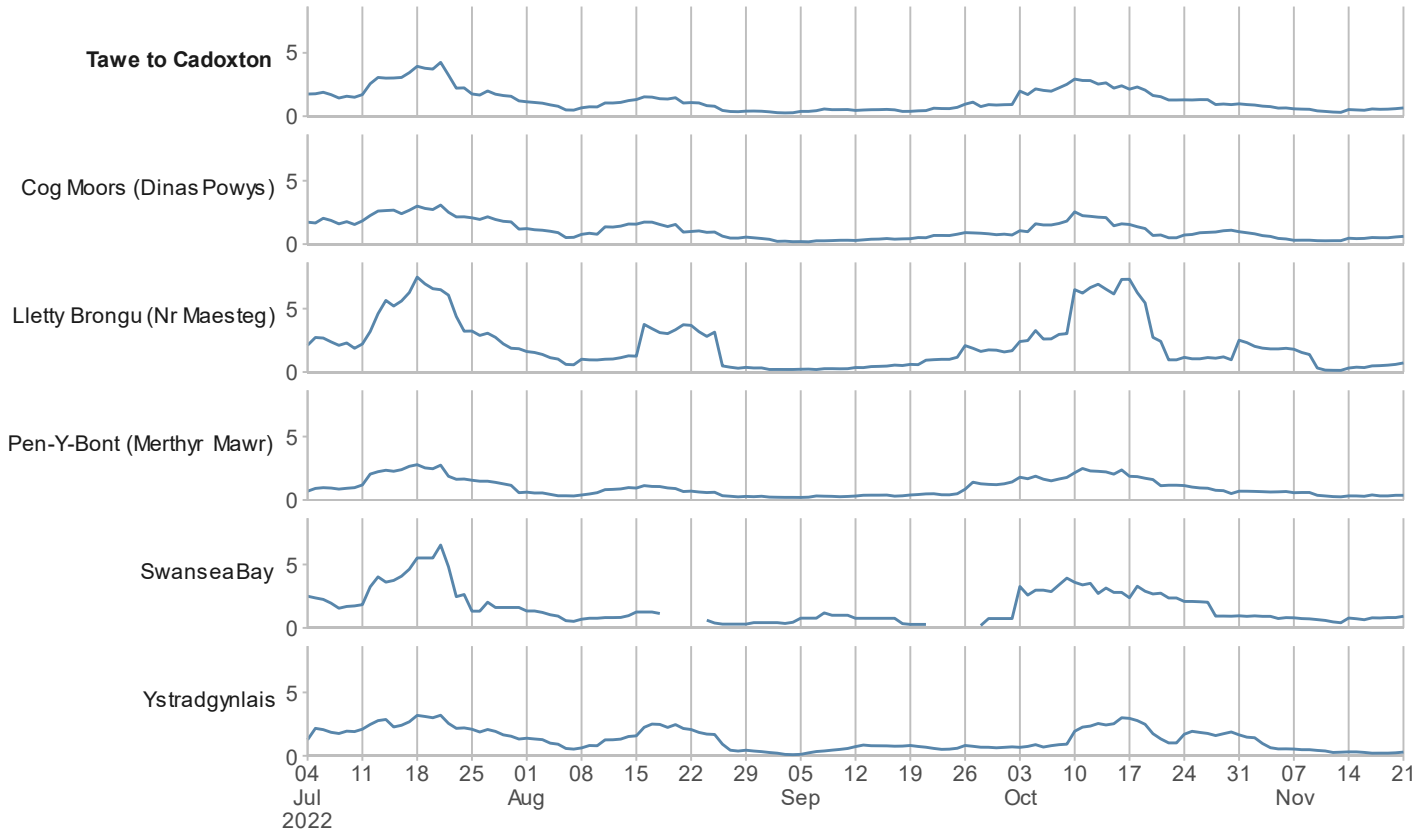


Figure 30 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Tawe to Cadoxton	**0.53**	**0.65**	**1.24**
Cog Moors (Dinas Powys)	0.47	0.61	1.31
Lletty Brongu (Nr Maesteg)	0.32	0.72	2.26
Pen-Y-Bont (Merthyr Mawr)	0.32	0.37	1.15
Swansea Bay	0.78	0.91	1.18
Ystradgynlais	0.31	0.29	0.94

Figure 31 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 10: Teifi and North Ceredigion

This section is relevant for:	Hywel Dda University Health Board	Ceredigion County Council Pembrokeshire County Council Carmarthen County Council

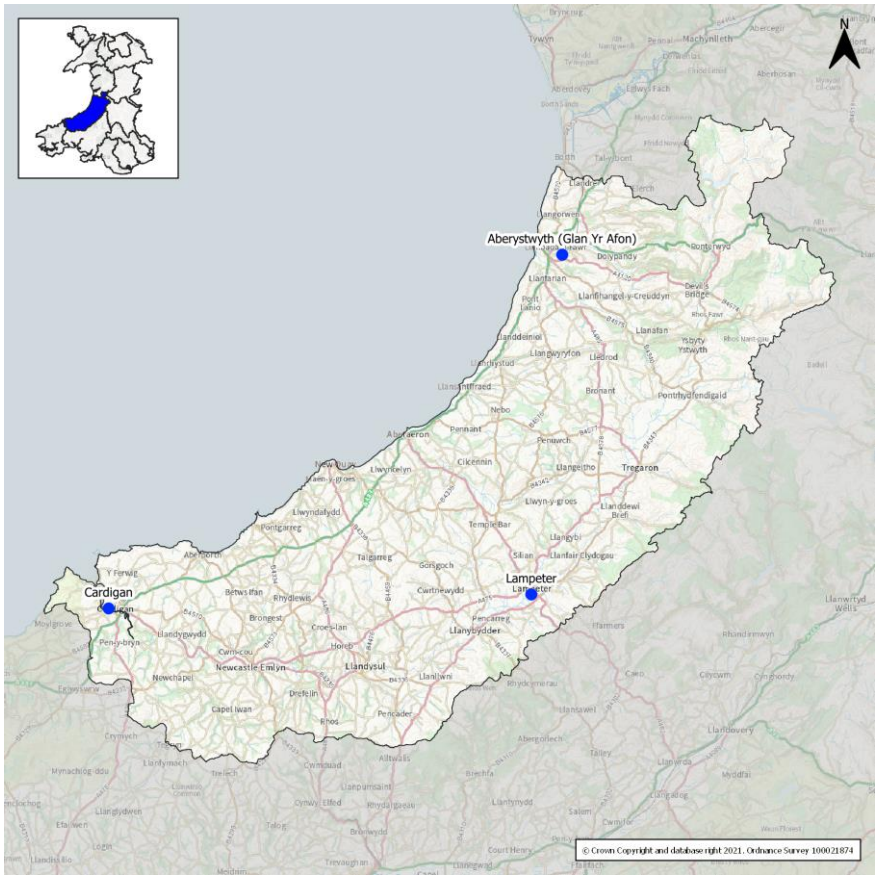


Figure 32 - Region 10 Map

Region 10 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is an increase.
- Compared with last week, the signal has increased across the region. However, the signal remained level at Lampeter.
- The Rapid Increase indicator was triggered at Aberystwyth (Glan Yr Afon) during the last reporting period.
- There were two samples from Lampeter with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing from Cardigan and Lampeter. Caution is advised when inferring trends at Lampeter due to only two successful samples being collected.

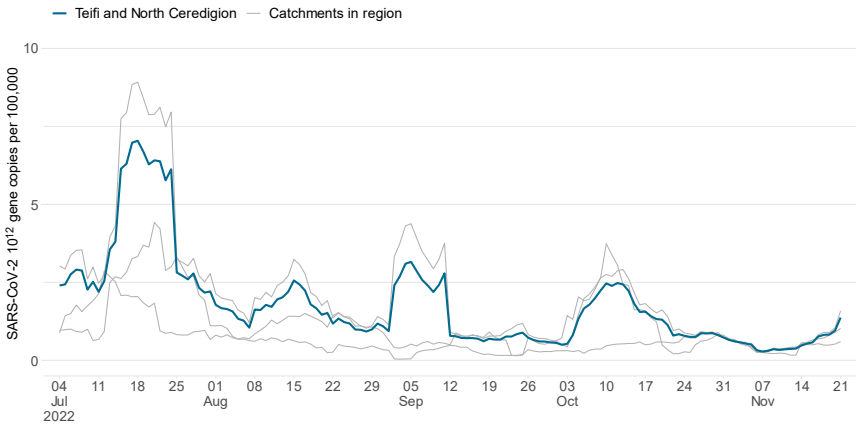
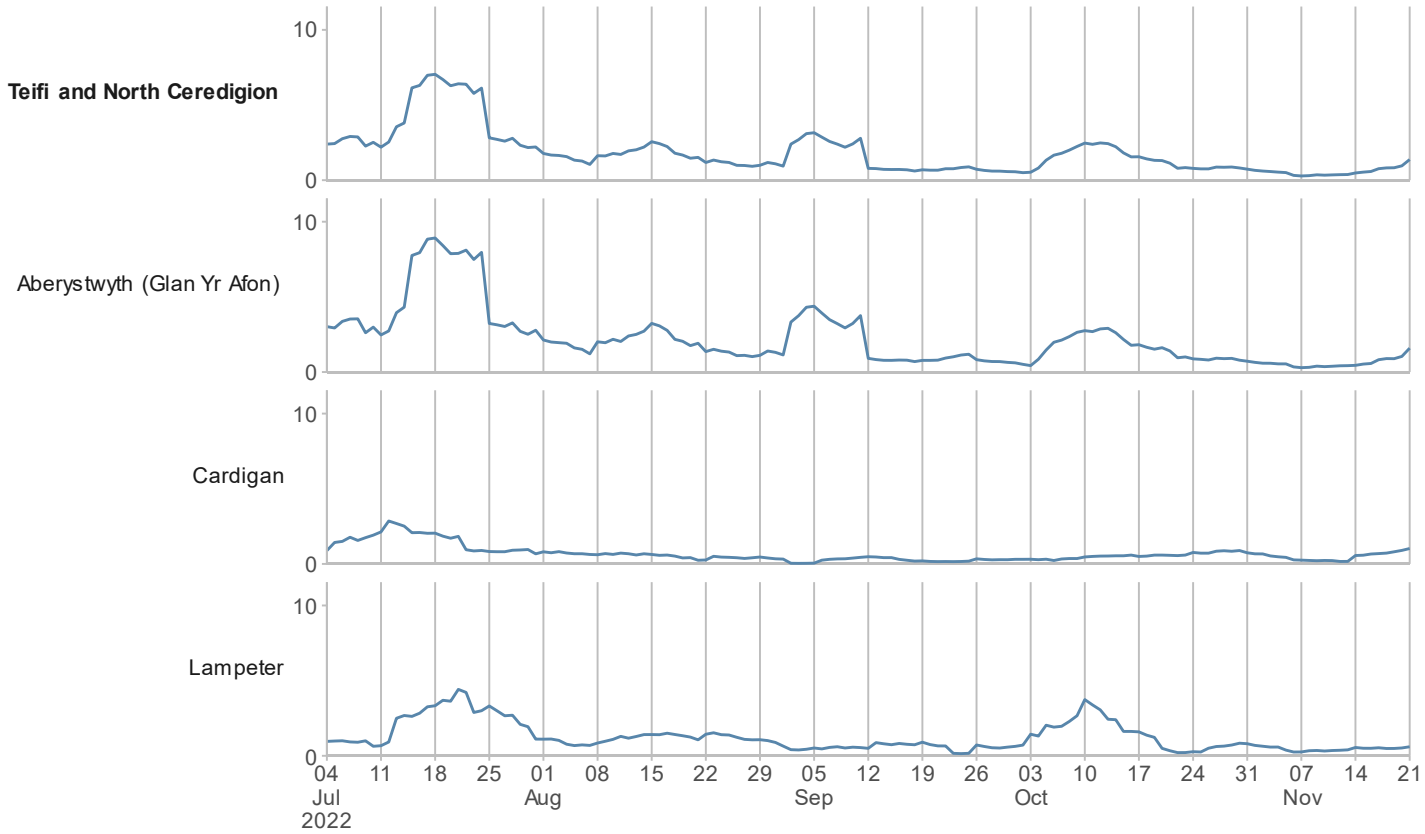


Figure 33 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Teifi and North Ceredigion	**0.48**	**1.37**	**2.86**
Aberystwyth (Glan Yr Afon)	0.45	1.59	3.55
Cardigan	0.56	1.02	1.83
Lampeter	0.55	0.60	1.09

Figure 34 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 11: Usk

This section is relevant for:	Aneurin Bevan University Health Board Cwm Taf University Health Board	Newport Monmouthshire	Torfaen Powys County Council

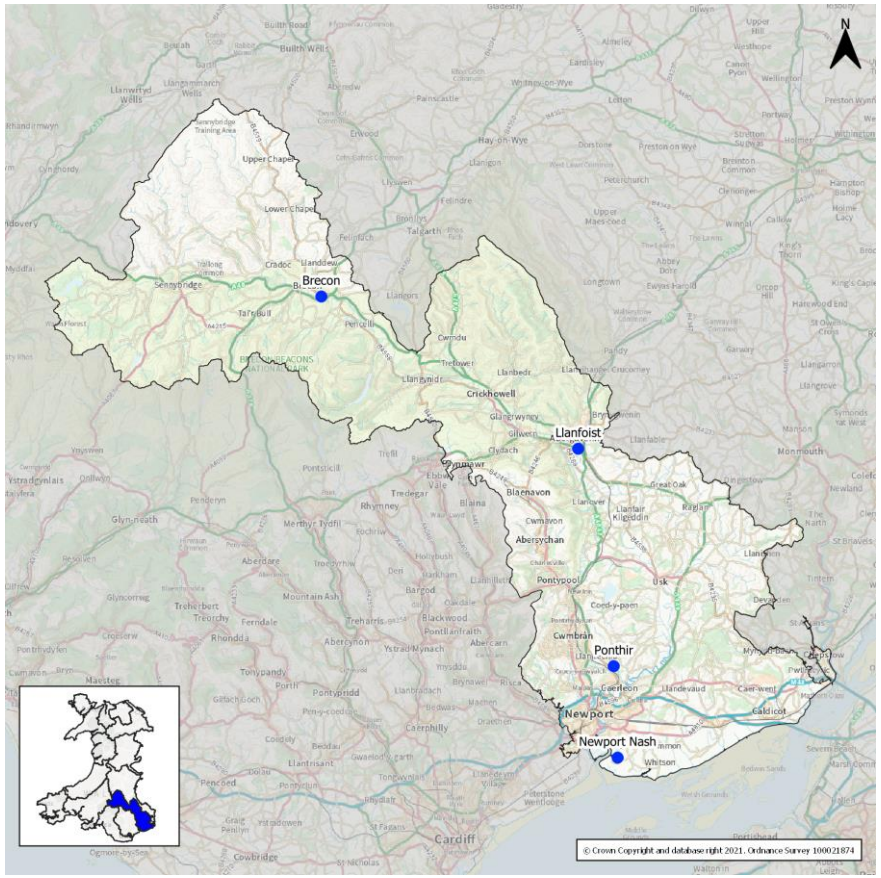


Figure 35 - Region 11 Map

Region 11 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region. However, the signal decreased at Brecon.
- The Rapid Increase indicator was triggered at Llanfoist during the last reporting period.
- There was one sample missing from each of the sites in the region. Access issues at Newport Nash between 20 September – 18 October resulted in some missing samples causing a break in the series for that site.

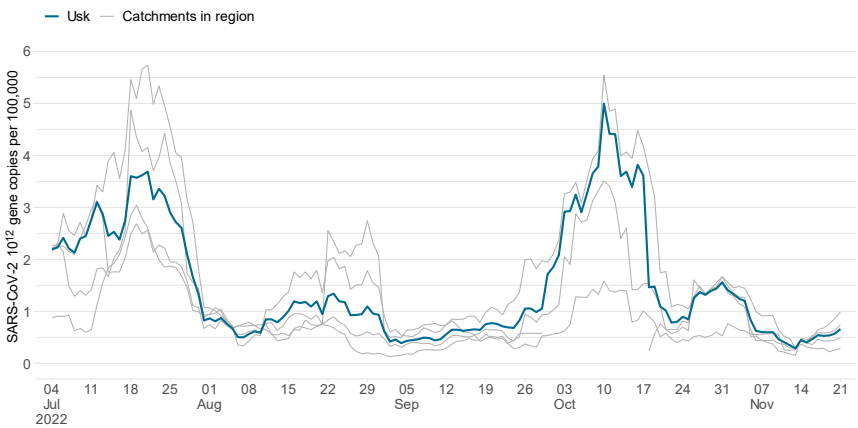
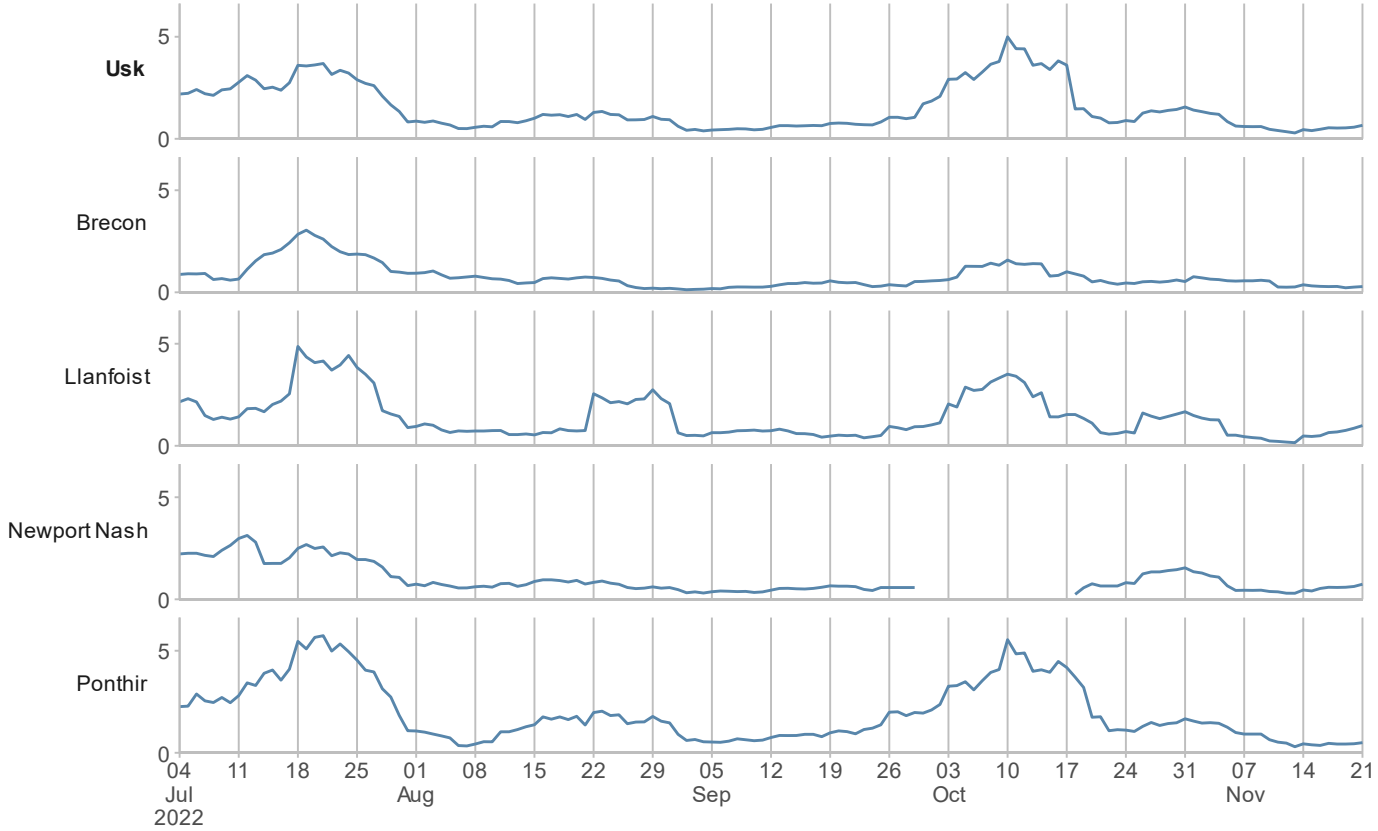


Figure 36 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Usk	**0.45**	**0.66**	**1.47**
Brecon	0.37	0.28	0.76
Llanfoist	0.48	0.99	2.06
Newport Nash	0.46	0.74	1.62
Ponthir	0.44	0.50	1.13

Figure 37 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 12: Wye

This section is relevant for:	Powys Teaching Health Board Aneurin Bevan University Health Board	Monmouthshire Powys

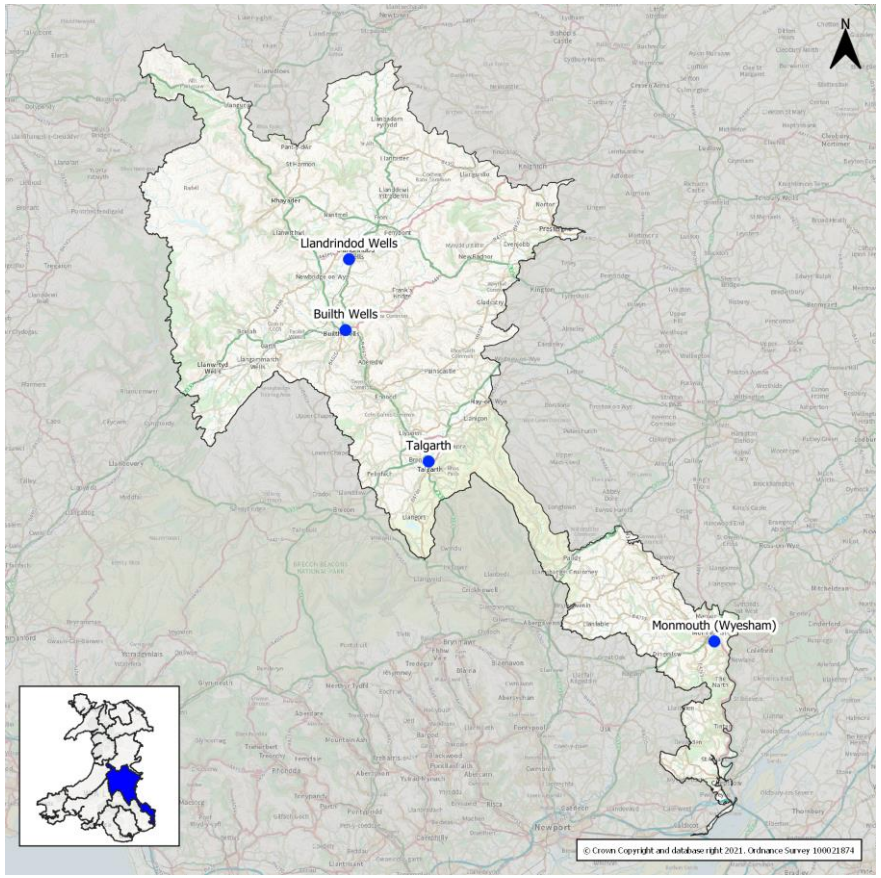


Figure 38 - Region 12 Map

Region 12 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has increased across the region.
- The Rapid Increase indicator was triggered at Builth Wells and Monmouth (Wyesham) during the last reporting period.
- There were two samples from Builth Wells with a SARS-CoV-2 concentration below the LOD. Also, there was one sample missing each of the sites in the region. Caution is advised when inferring trends at Builth Wells due to only two successful samples being collected.

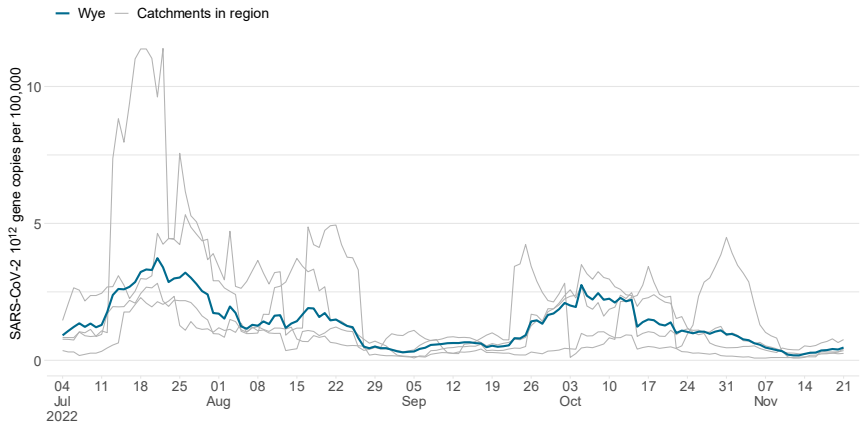
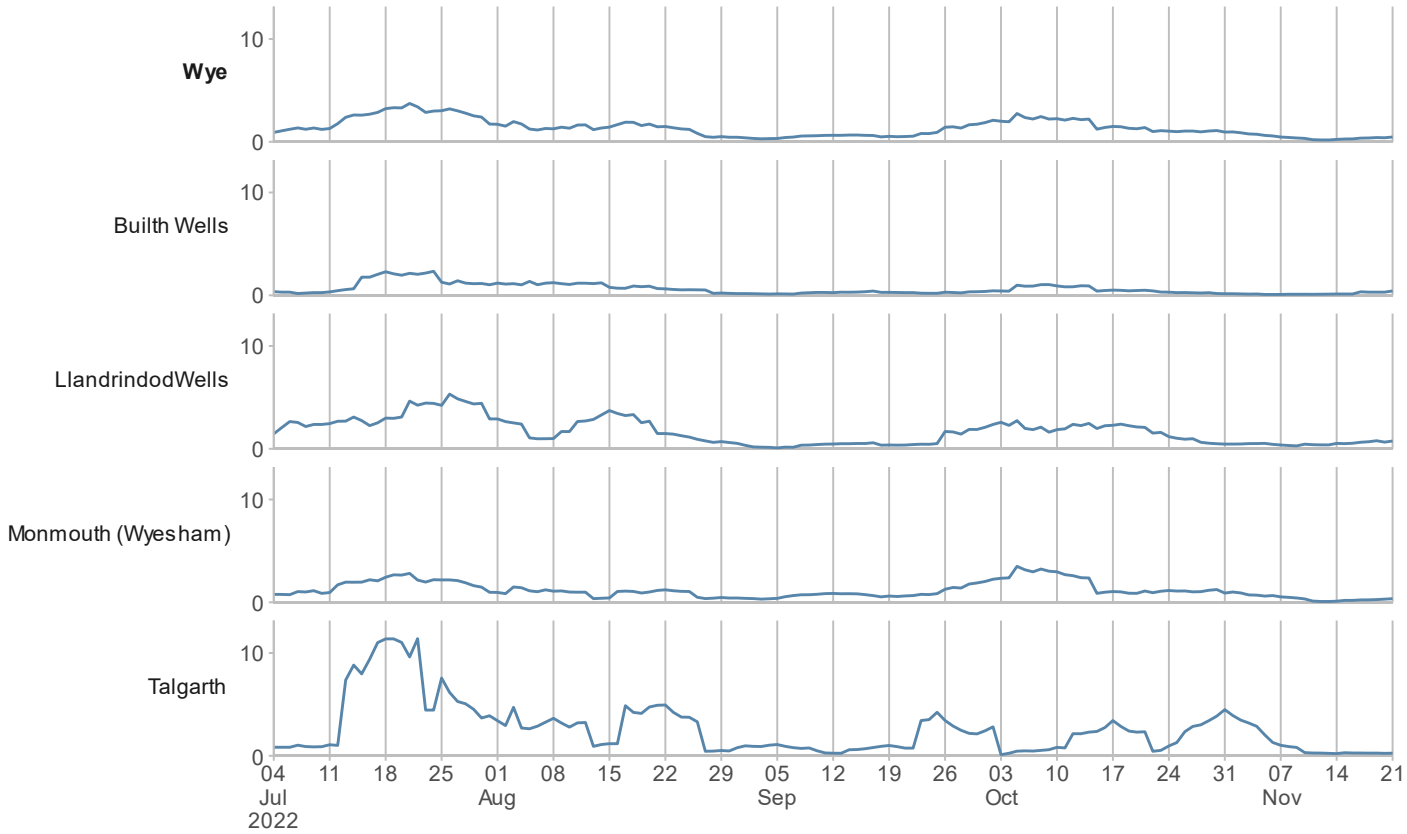


Figure 39 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Wye	**0.23**	**0.47**	**2.00**
Builth Wells	0.13	0.42	3.30
LlandrindodWells	0.53	0.76	1.44
Monmouth (Wyesham)	0.11	0.35	3.30
Talgarth	0.21	0.25	1.18

Figure 40 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 13: Ynys Môn

This section is relevant for:	Betsi Cadwaladr University Health Board	Isle of Anglesey Council

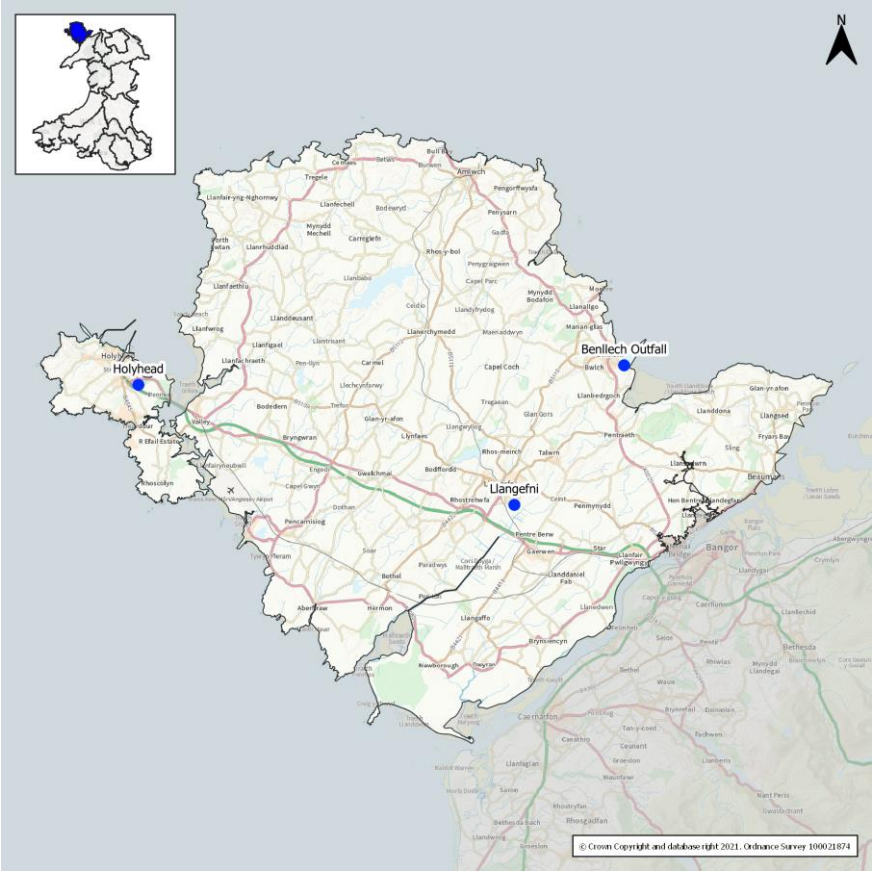


Figure 41 - Region 13 Map

Region 13 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is a decrease.
- Compared with last week, the signal has decreased across the region. However, the signal increased at Benllech Outfall and Holyhead.
- The Rapid Increase indicator was triggered at Holyhead during the last reporting period.
- There was one sample from Llangefni with a SARS-CoV-2 concentration below the LOD.

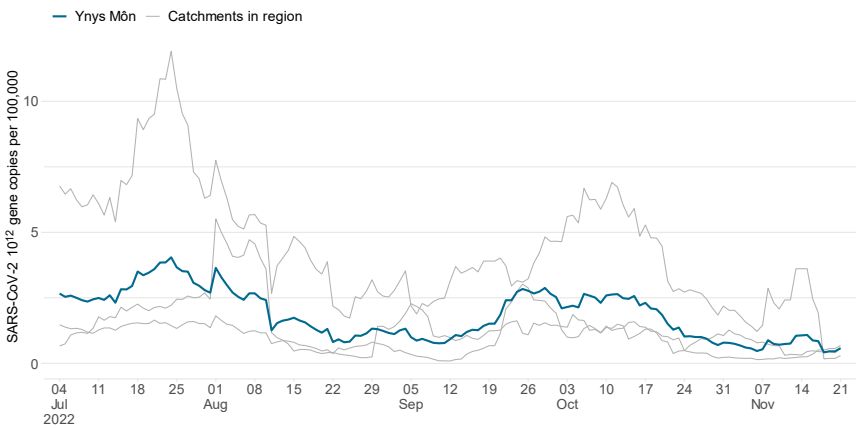
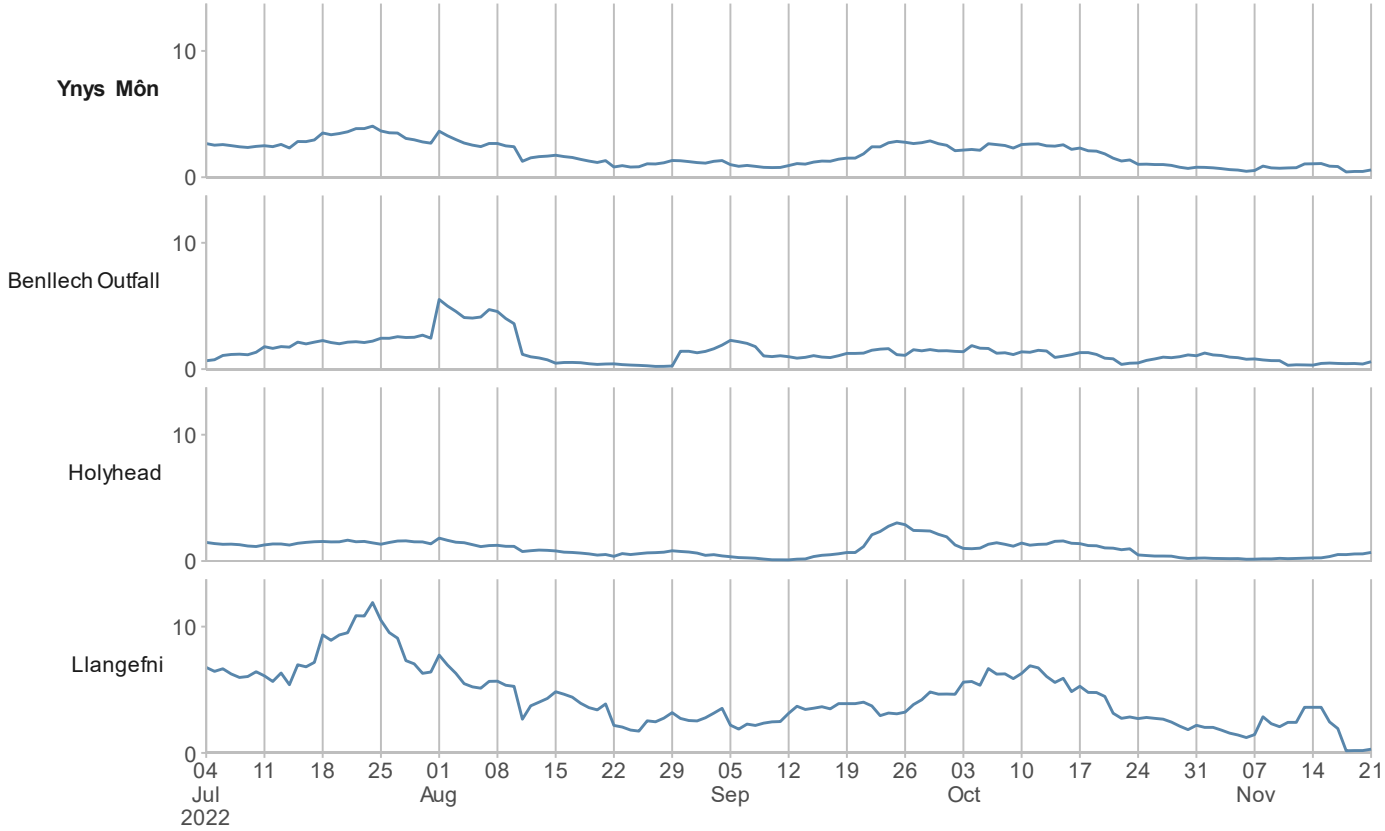


Figure 42 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Ynys Môn	**1.06**	**0.58**	**0.54**
Benllech Outfall	0.32	0.59	1.85
Holyhead	0.25	0.68	2.77
Llangefni	3.61	0.30	0.08

Figure 43 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Region 14: Hafren Dyfrdwy

This section is relevant for:	Powys Teaching Health Board	Powys County Council

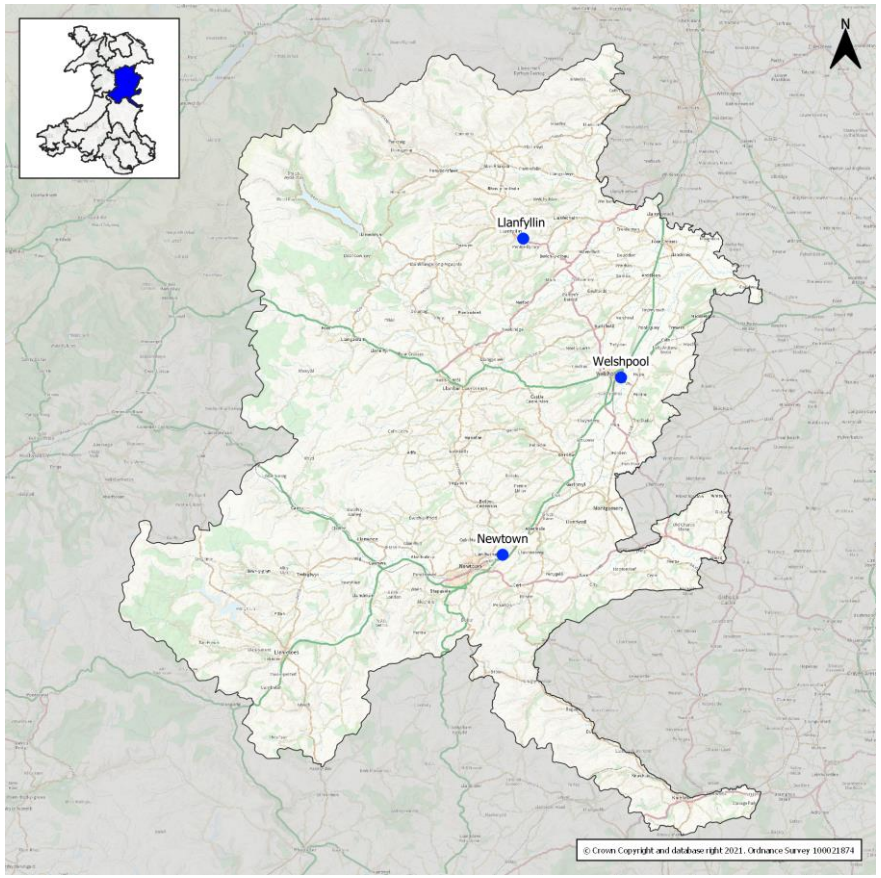


Figure 44 - Region 14 Map

Region 14 situation report:

- Wastewater signal in the region has been unstable, with both increases and decreases over the last four weeks. However, the overall signal change in that period is an increase.
- Compared with last week, the signal has increased across the region.
- The Rapid Increase indicator was triggered at Newtown and Welshpool during the last reporting period.
- There were two samples from Llanfyllin with a SARS-CoV-2 concentration below the LOD.

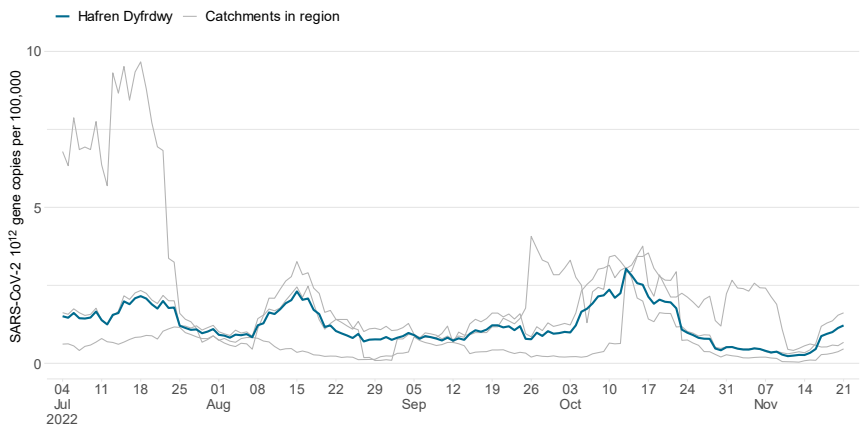
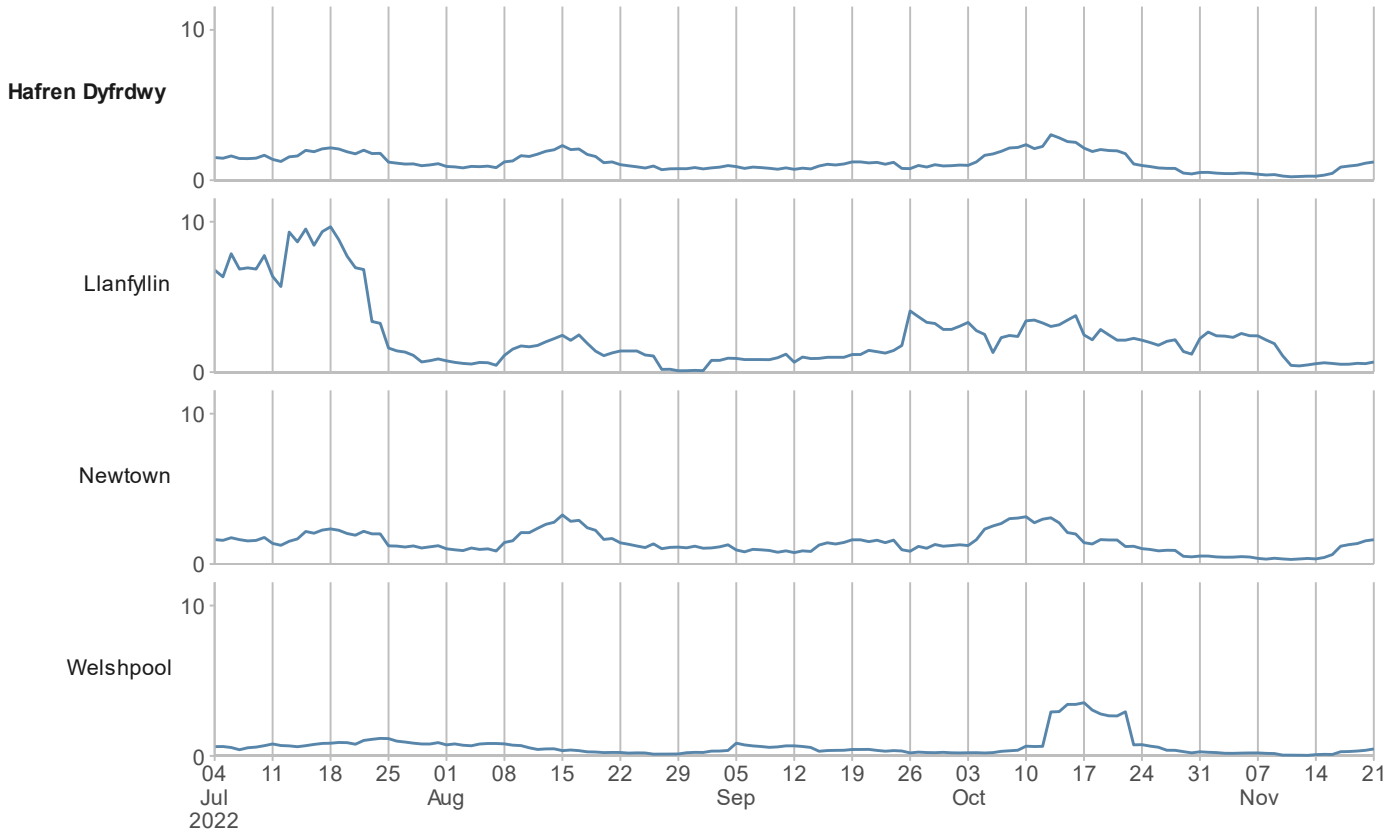


Figure 45 - Regional mean (blue lines) Site mean (grey lines) SARS-CoV-2 gc/day per 100k



	Week ending 14 Nov 2022	Week ending 21 Nov 2022	Fold change
Hafren Dyfrdwy	**0.27**	**1.21**	**4.55**
Llanfyllin	0.56	0.67	1.20
Newtown	0.34	1.62	4.77
Welshpool	0.08	0.46	5.55

Figure 46 - Regional & Catchment trends and fold change. SARS-CoV-2 gc/day per 100k

Appendix A – Data and Indicators

Site Level Indicators

The following table provides site level detail on the catchment populations, indicators, normalised signal mean for the week relevant for this report and the type of sampling being undertaken (Composite, Spot or Mixed). Sites not currently monitored will have no data.

Table 2 - Site Level Indicators

Site Name	Region	Catchment Population	High Signal Level	Rapid Increase	Increasing Signal Level	SARS-CoV-2 weekly mean, gc/day per 100k	Sampling Type	Successful Samples (Number / Total Samples)
Garnswllt	Carmarthen Bay and the Gower	28,151	0	0	0	0.45	Composite	3/5
Gowerton	Carmarthen Bay and the Gower	52,162	0	1	0	0.59	Composite	3/5
Llanelli Coastal	Carmarthen Bay and the Gower	52,059	0	0	0	1.03	Composite	4/5
Parc-Y-Splott	Carmarthen Bay and the Gower	17,308	0	0	0	0.48	Spot	4/5
Fishguard	Cleddau and Pembrokeshire Coastal Rivers	5,499	0	1	0	1.19	Composite	4/5
Merlins Bridge	Cleddau and Pembrokeshire Coastal Rivers	15,366	0	0	0	0.87	Mixed	3/5
Pembroke Dock	Cleddau and Pembrokeshire Coastal Rivers	16,726	0	0	0	0.52	Composite	4/5
Tenby	Cleddau and Pembrokeshire Coastal Rivers	9,727	0	0	0	0.72	Composite	4/5
Kinmel Bay	Clwyd	48,234	0	0	0	1.23	Composite	5/5
Ruthin	Clwyd	5,041	0	0	0	0.08	Composite	4/5
Betws-Y-Coed	Conwy	419	0	1	0	0.94	Composite	1/5
Ganol	Conwy	67,101	0	1	0	1.52	Composite	5/5
Bala	Dee	2,054	1	1	0	2.87	Composite	5/5
Five Fords (Wrexham)	Dee	93,434	0	0	0	0.44	Composite	5/5
Llanasa (Nr Prestatyn)	Dee	22,066	0	0	0	1.29	Composite	5/5

Site Name	Region	Catchment Population	High Signal Level	Rapid Increase	Increasing Signal Level	SARS-CoV-2 weekly mean, gc/day per 100k	Sampling Type	Successful Samples (Number / Total Samples)
Queensferry	Dee	29,503	0	0	0	0.64	Composite	5/5
Bangor Treborth	Llŷn and Eryri	25,945	0	0	0	1.23	Composite	5/5
Bethesda	Llŷn and Eryri	4,721	0	1	0	0.74	Composite	5/5
Porthmadog	Llŷn and Eryri	2,908	0	0	0	0.31	Composite	4/5
Pwllheli	Llŷn and Eryri	4,714	0	0	0	0.09	Composite	3/5
Dolgellau	Meirionnydd	2,431	0	1	0	0.50	Composite	4/5
Machynlleth	Meirionnydd	2,158	0	0	0	0.46	Composite	5/5
Tywyn	Meirionnydd	3,363	0	0	0	1.66	Composite	5/5
Cardiff Bay	South East Valleys	612,002	0	0	0	0.47	Composite	4/5
Cilfynydd	South East Valleys	61,721	0	0	0	0.35	Composite	3/5
Cog Moors (Dinas Powys)	Tawe to Cadoxton	204,292	0	0	0	0.61	Composite	4/5
Lletty Brongu (Nr Maesteg)	Tawe to Cadoxton	19,375	0	1	0	0.72	Composite	4/5
Pen-Y-Bont (Merthyr Mawr)	Tawe to Cadoxton	118,106	0	0	0	0.37	Mixed	4/5
Swansea Bay	Tawe to Cadoxton	168,225	0	0	0	0.91	Mixed	4/5
Ystradgynlais	Tawe to Cadoxton	10,532	0	0	0	0.29	Composite	2/5
Aberystwyth (Glan Yr Afon)	Teifi and North Ceredigion	18,026	0	1	0	1.59	Composite	5/5
Cardigan	Teifi and North Ceredigion	4,509	0	0	0	1.02	Composite	4/5
Lampeter	Teifi and North Ceredigion	3,046	0	0	0	0.60	Composite	2/5
Brecon	Usk	8,172	0	0	0	0.28	Composite	4/5
Llanfoist	Usk	14,830	0	1	0	0.99	Composite	4/5

Site Name	Region	Catchment Population	High Signal Level	Rapid Increase	Increasing Signal Level	SARS-CoV-2 weekly mean, gc/day per 100k	Sampling Type	Successful Samples (Number / Total Samples)
Newport Nash	Usk	164,985	0	0	0	0.74	Composite	4/5
Ponthir	Usk	91,460	0	0	0	0.50	Composite	4/5
Builth Wells	Wye	2,554	0	1	0	0.42	Composite	2/5
Llandrindod Wells	Wye	5,650	0	0	0	0.76	Composite	4/5
Monmouth (Wyesham)	Wye	10,817	0	1	0	0.35	Composite	4/5
Talgarth	Wye	1,508	0	0	0	0.25	Composite	4/5
Benllech Outfall	Ynys Môn	2,605	0	0	0	0.59	Composite	5/5
Holyhead	Ynys Môn	15,719	0	1	0	0.68	Composite	5/5
Llangefni	Ynys Môn	5,824	0	0	0	0.30	Composite	4/5
Llanfyllin	Hafren Dyfrdwy	629	0	0	0	0.67	Composite	3/5
Newtown	Hafren Dyfrdwy	10,184	0	1	0	1.62	Composite	5/5
Welshpool	Hafren Dyfrdwy	5,022	0	1	0	0.46	Composite	5/5

"-" Indicates where no data is available. This could be as a result of no samples being taken or missing metadata.
"Mixed" is used to indicate the weekly mean is made up of both spot and composite samples.

Appendix B – ONS COVID-19 Infection Survey

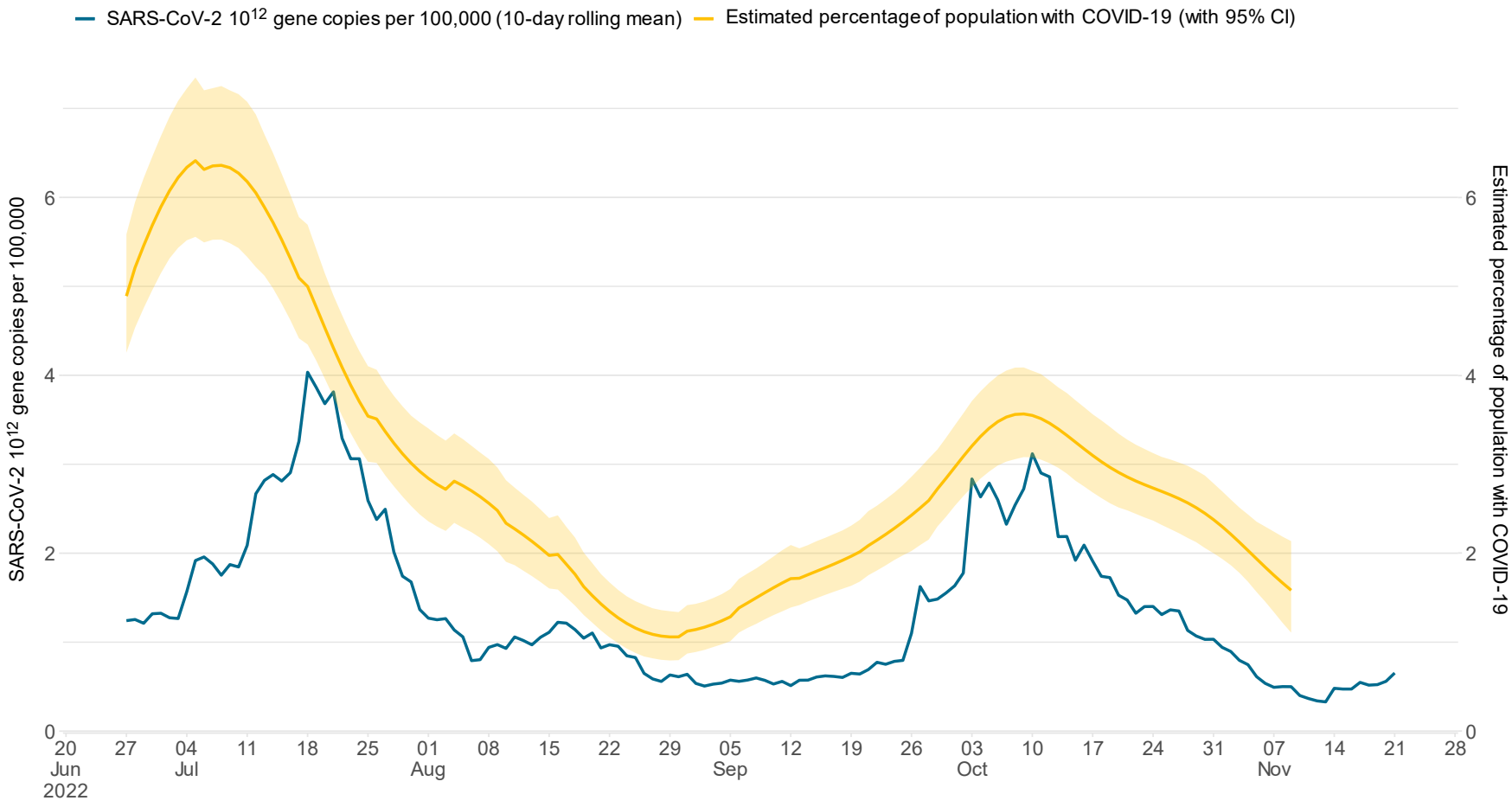
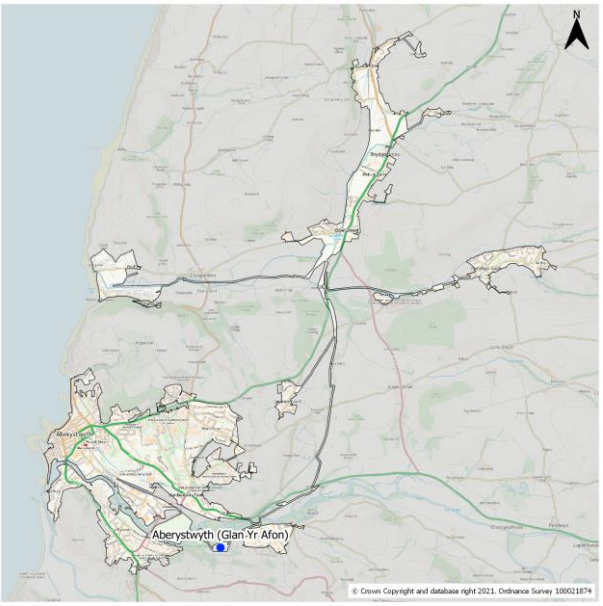


Figure 47 – ONS CIS vs Wastewater National Mean (SARS-CoV-2 gc/day per 100k)

Appendix C – Sewer Catchment Maps

The maps featured in this report may not be used or reproduced without permission from our relevant partners, Dŵr Cymru and Hafren Dyfrdwy.

Maps are reproduced in alphabetical order and have been provided to give context to the physical sewer areas of the monitored wastewater catchments used in this report.



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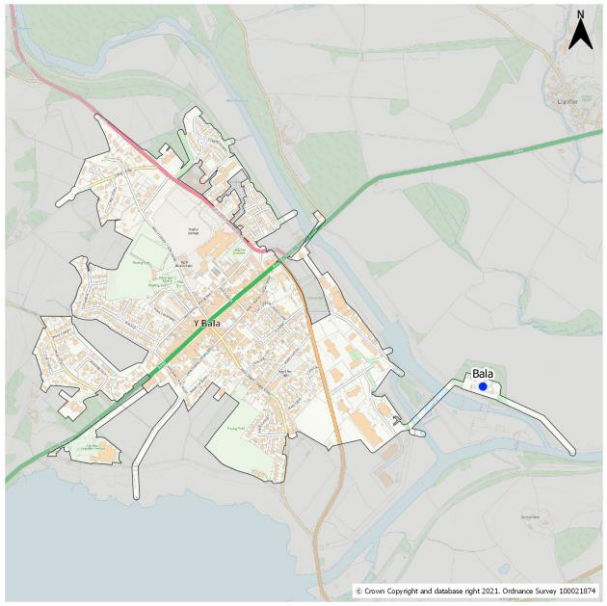

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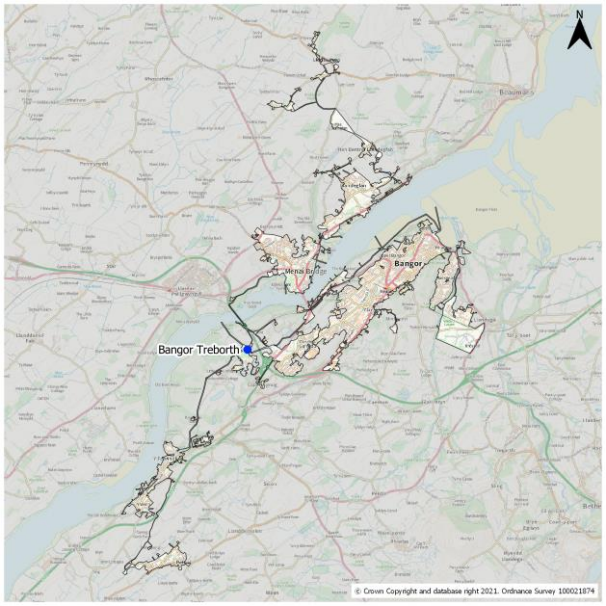
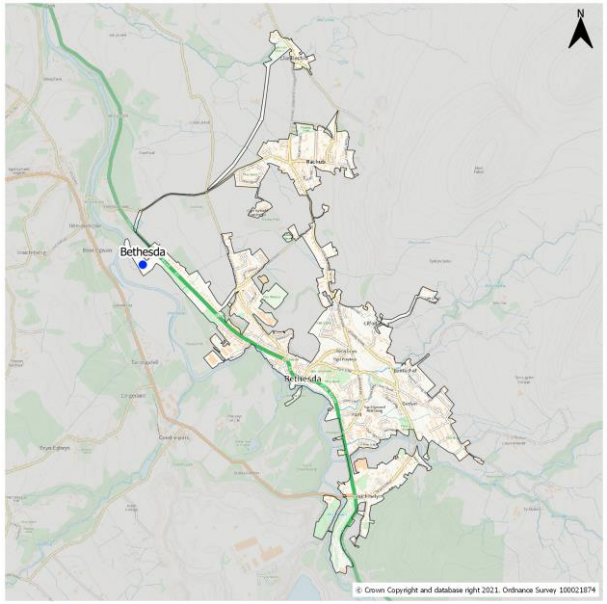


Bangor Treborth

Benllech Outfall



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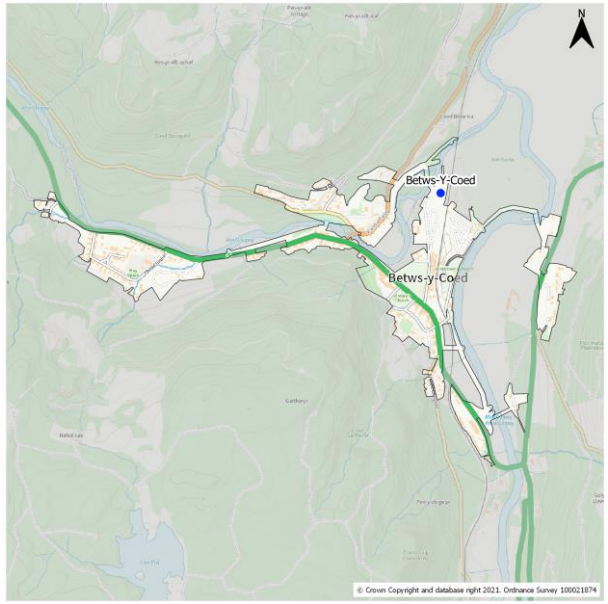
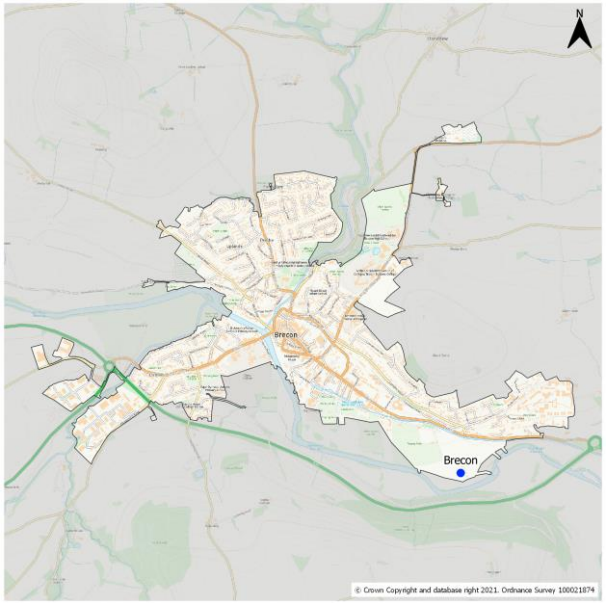


Betws-Y-Coed



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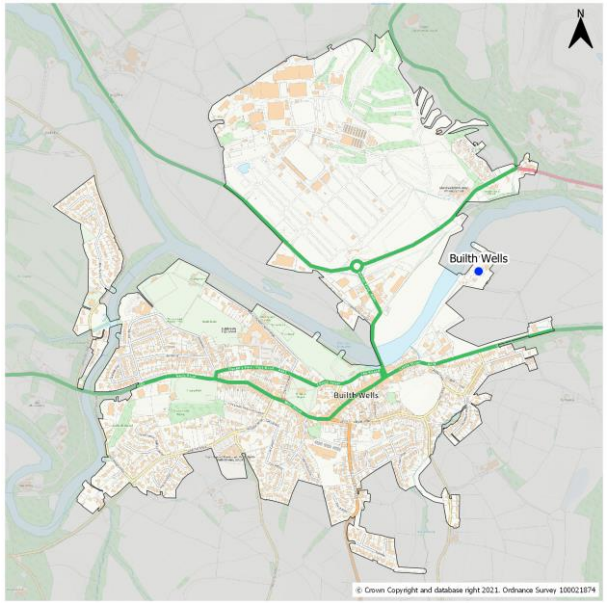
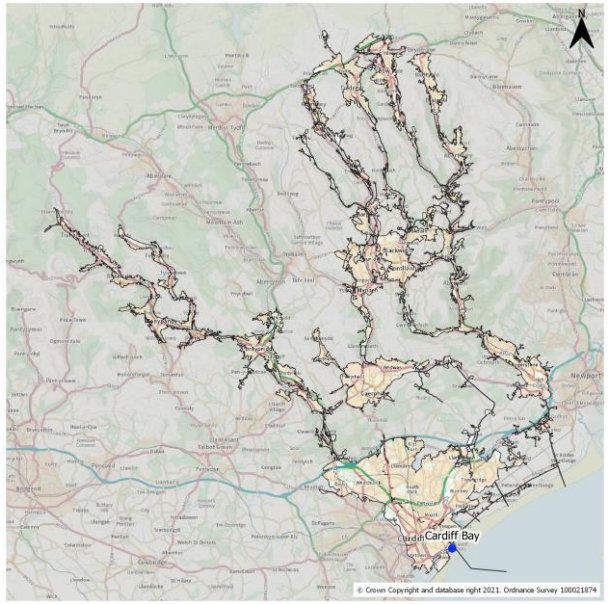


Builth Wells



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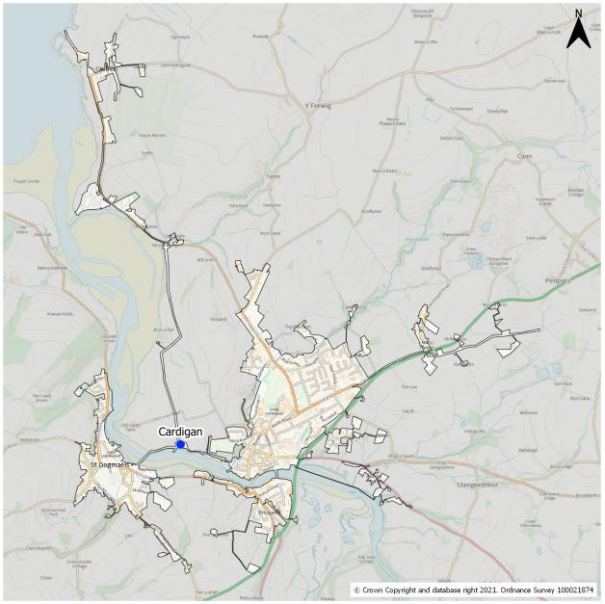

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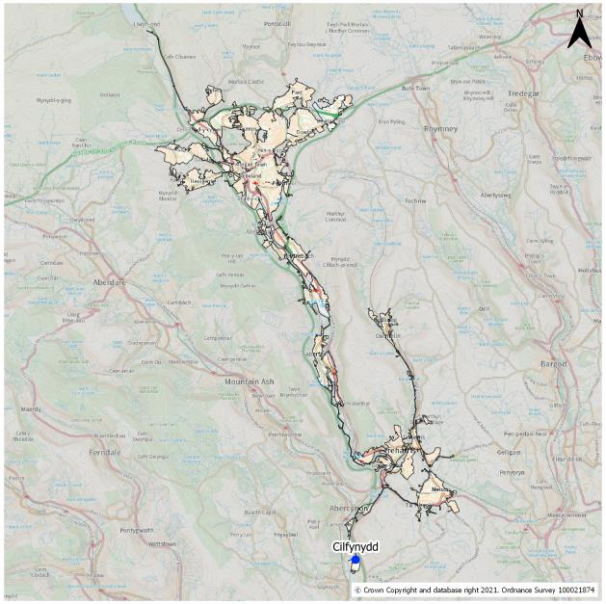

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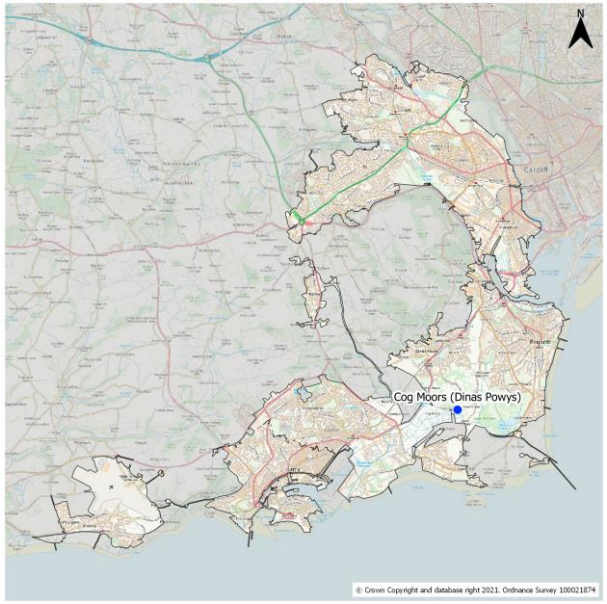

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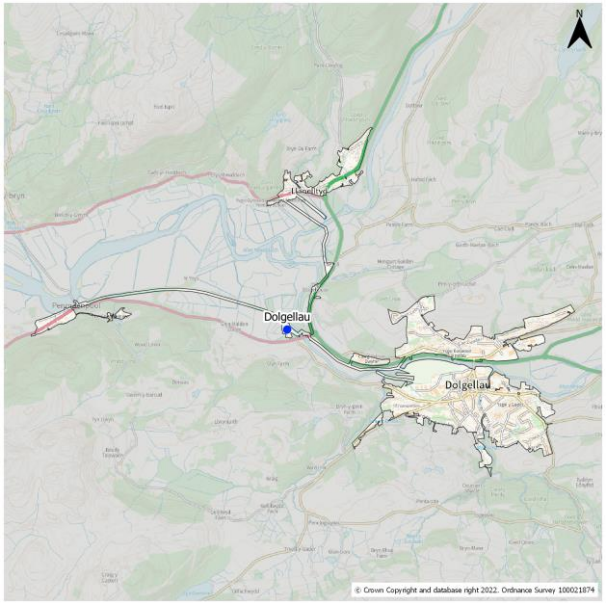

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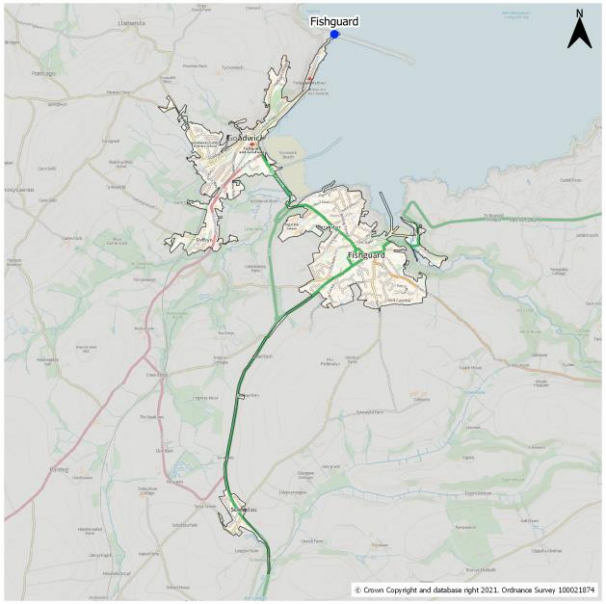

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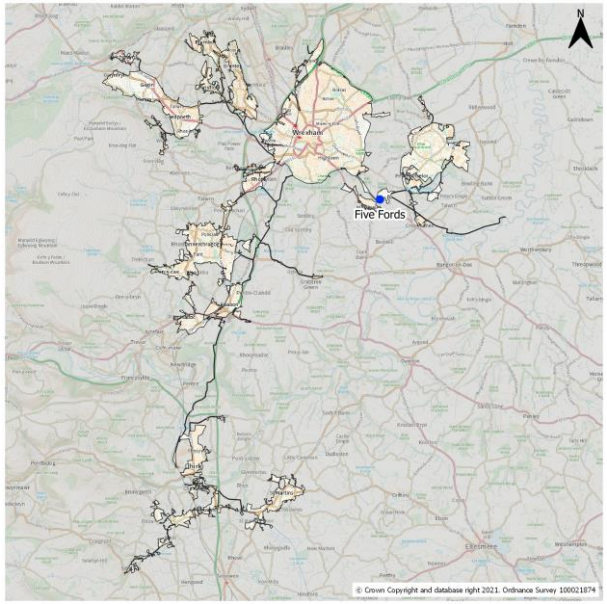

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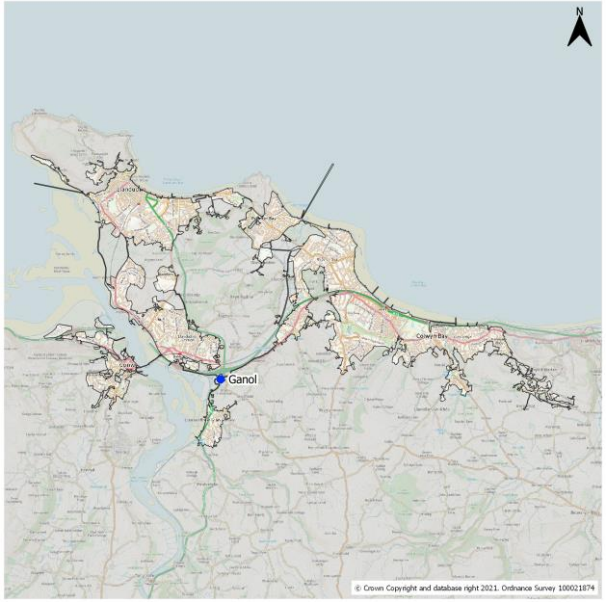

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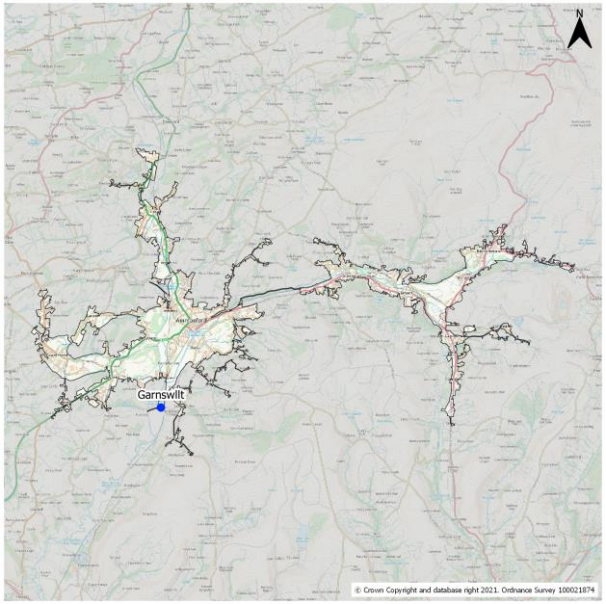

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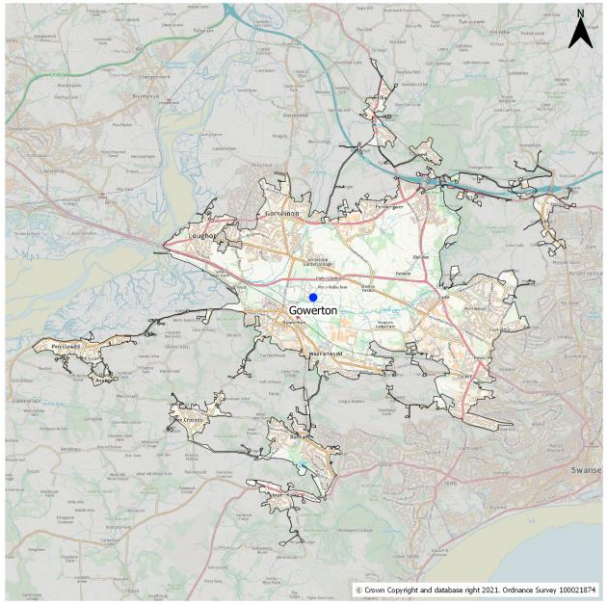

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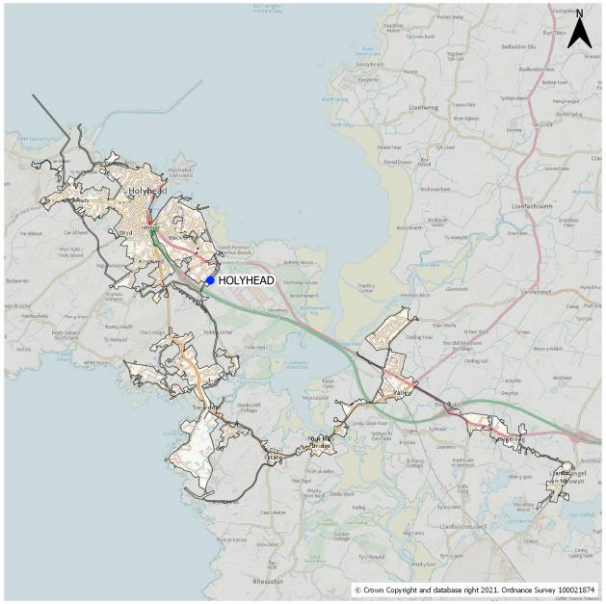

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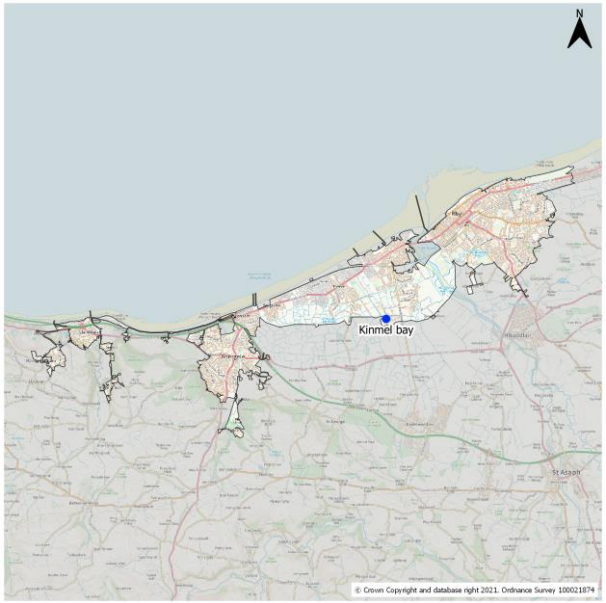

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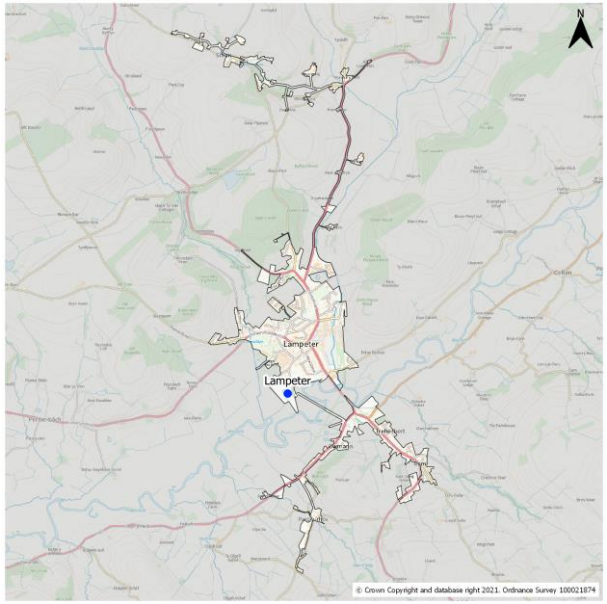

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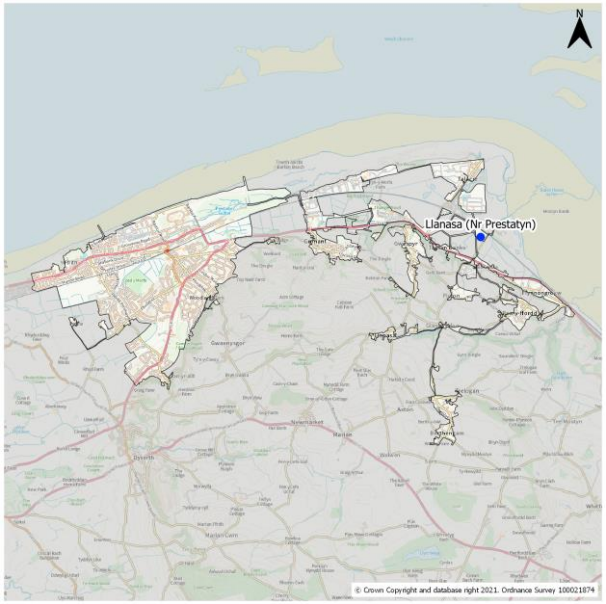

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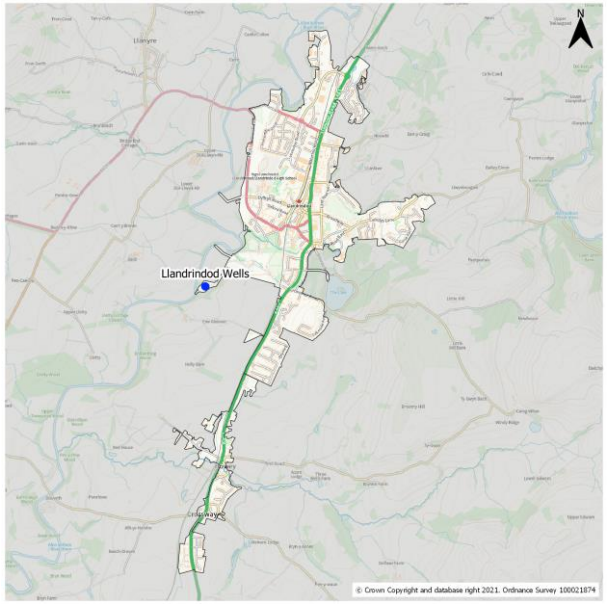

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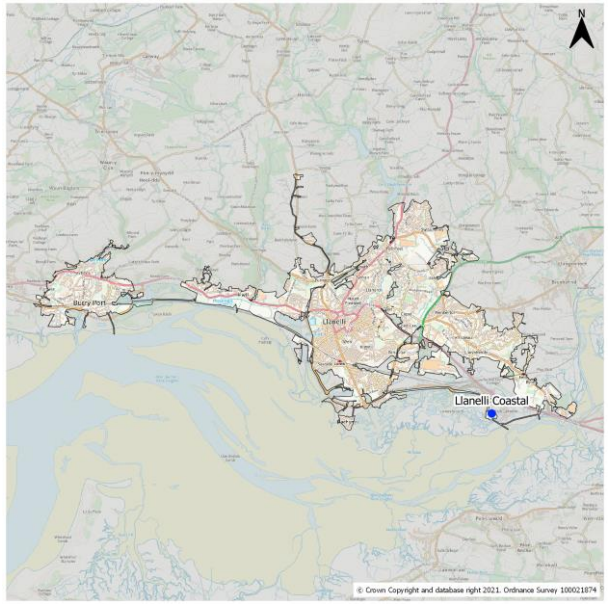

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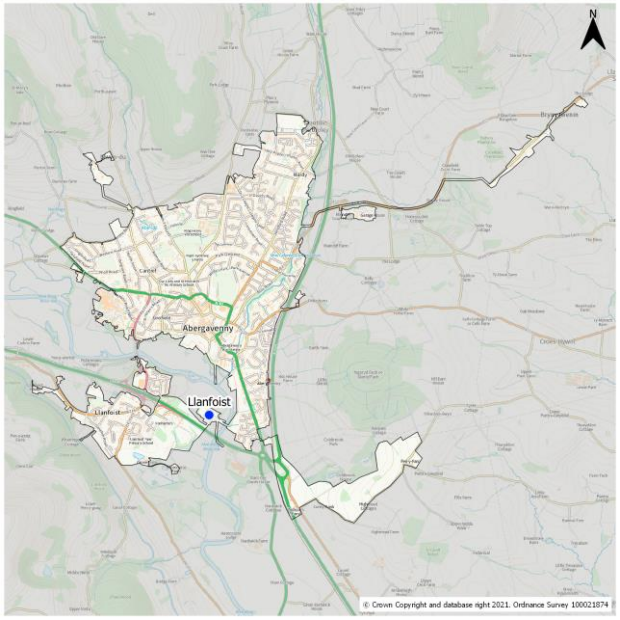

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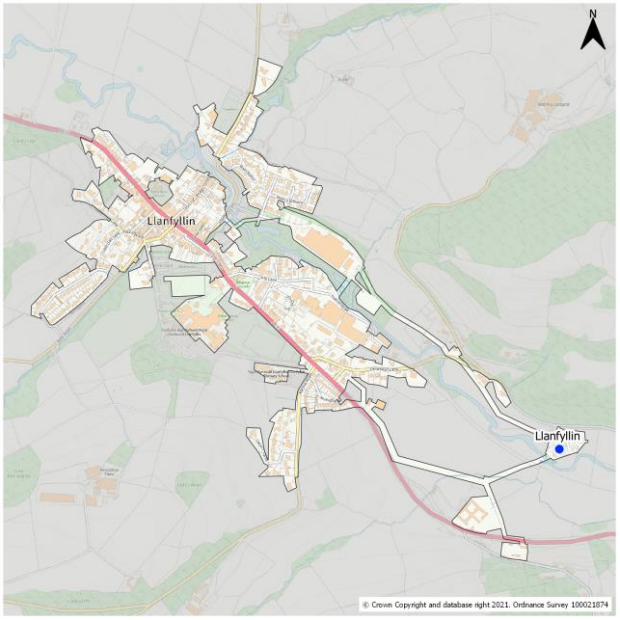

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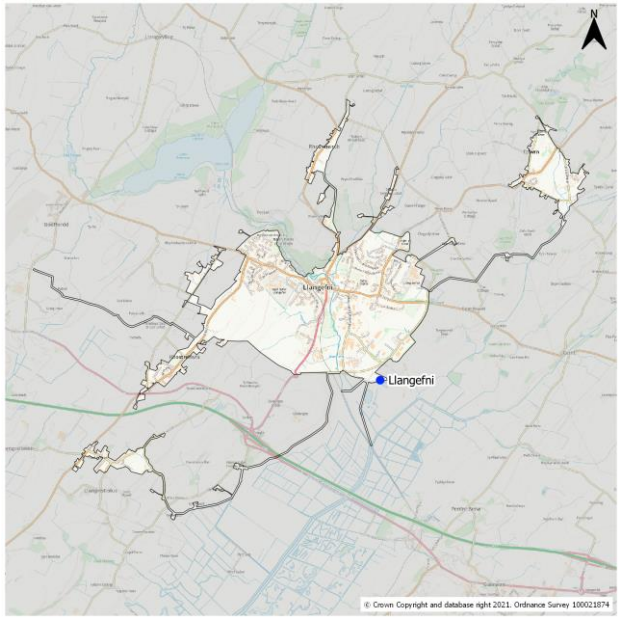

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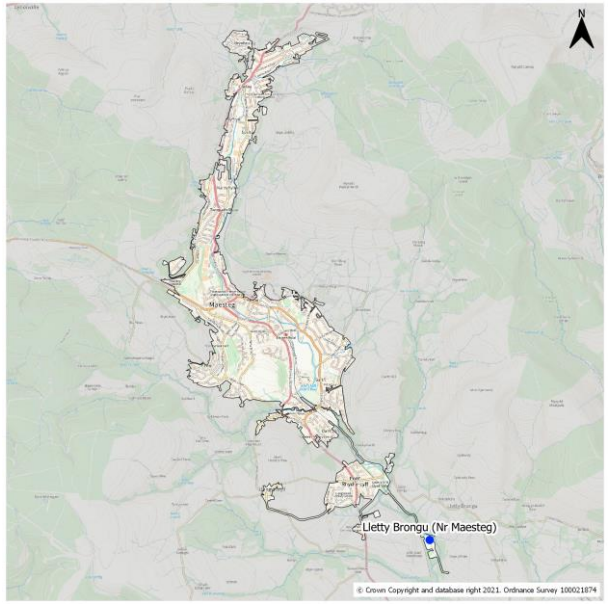

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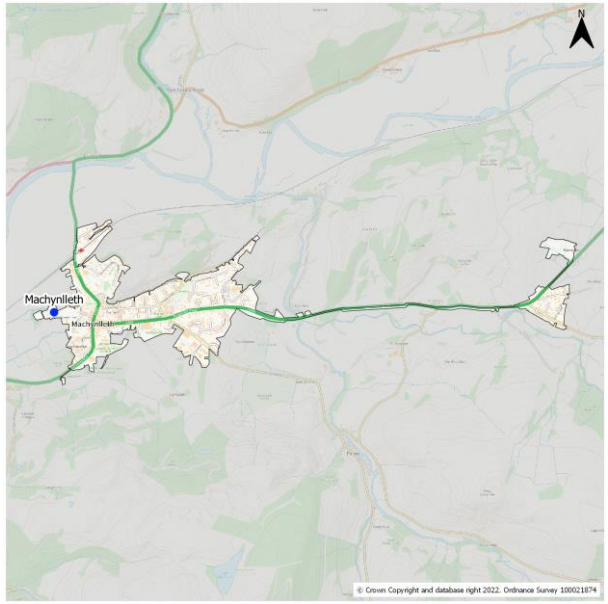

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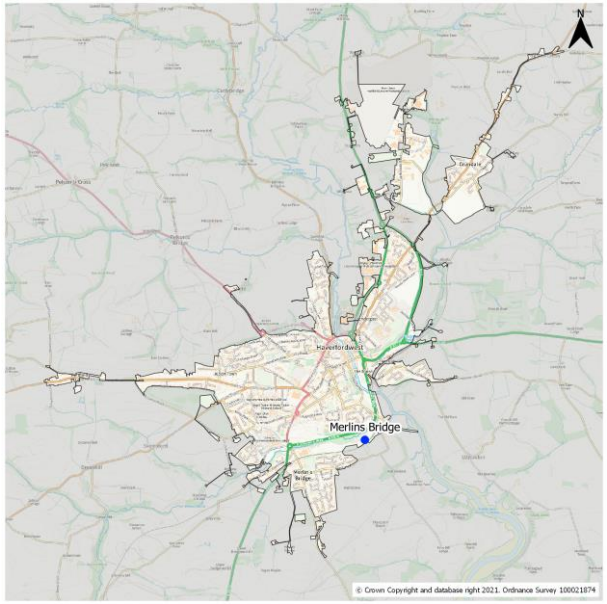

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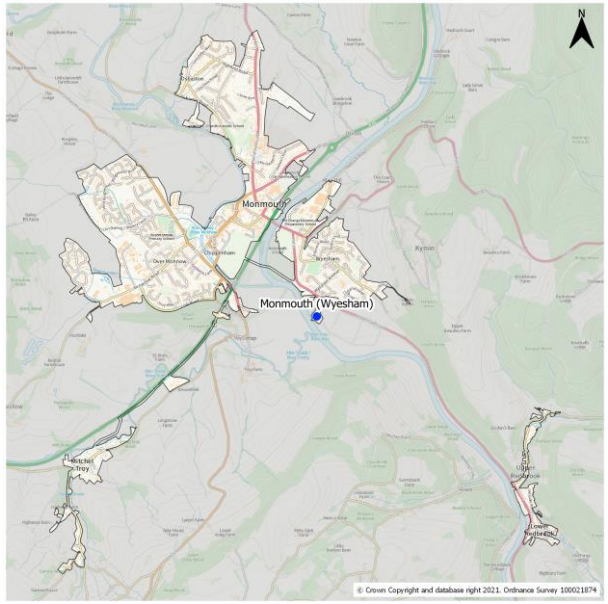

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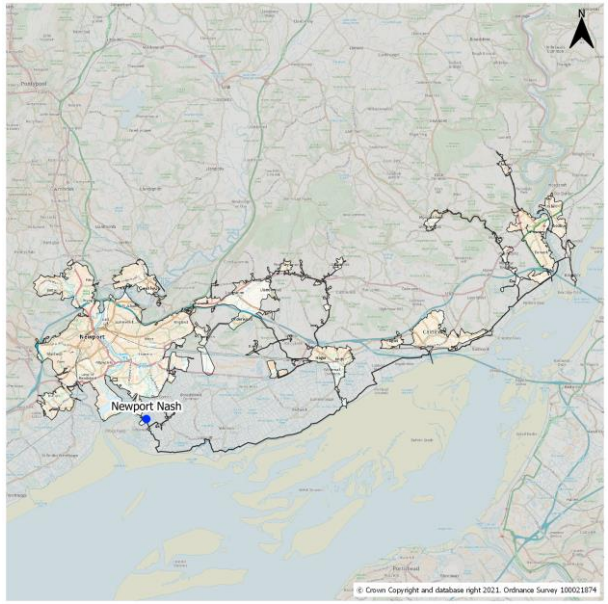

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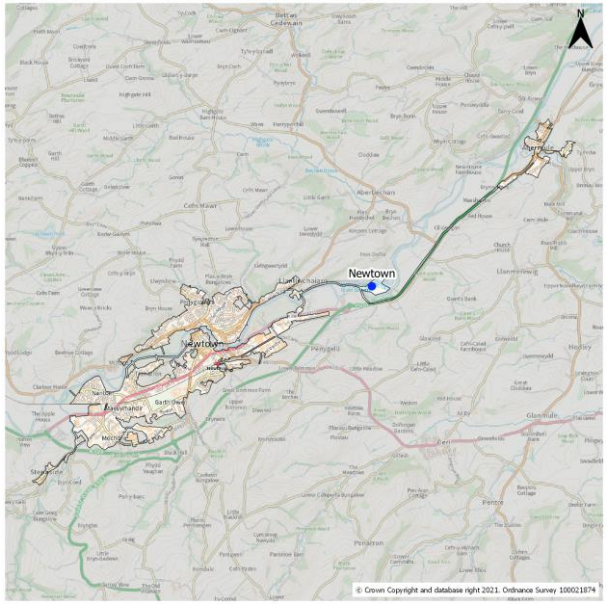

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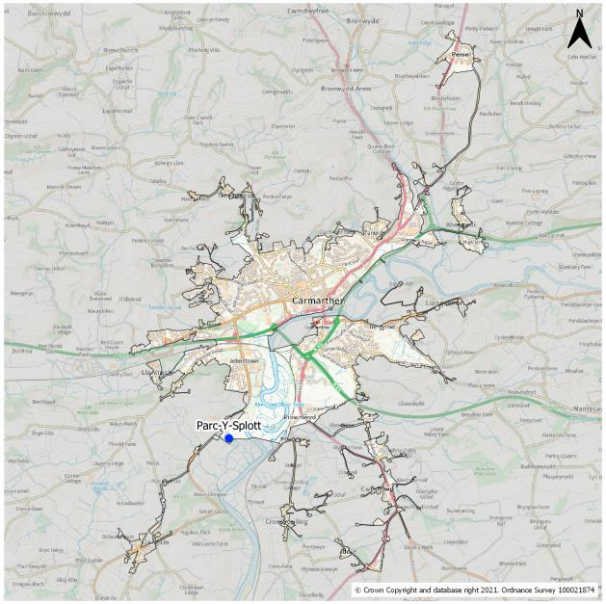

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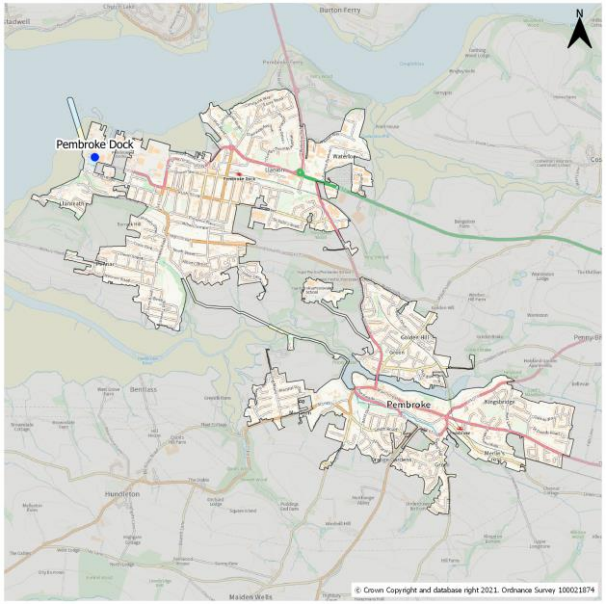

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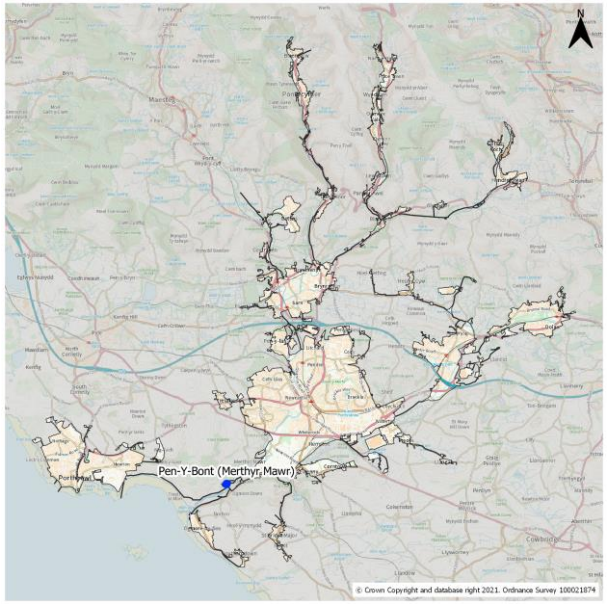

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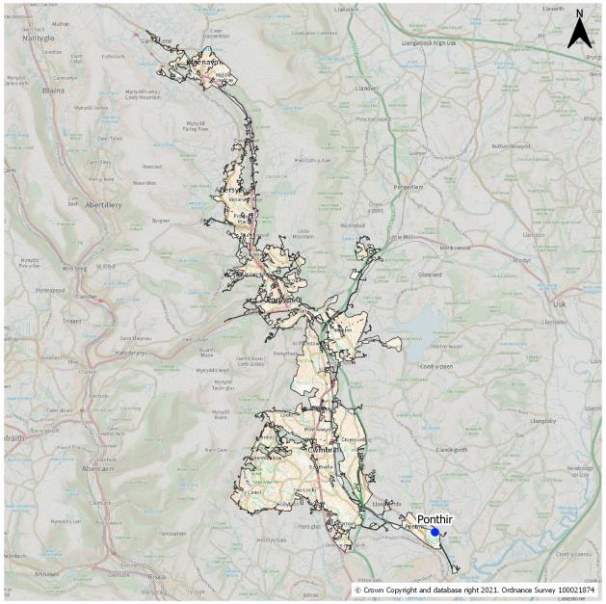

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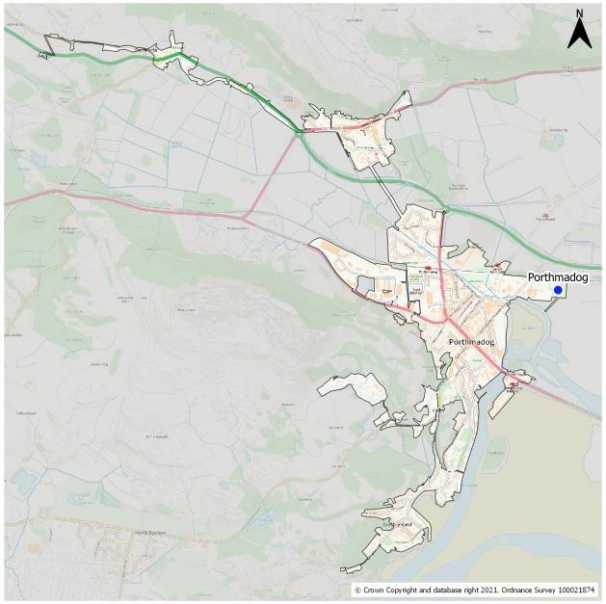

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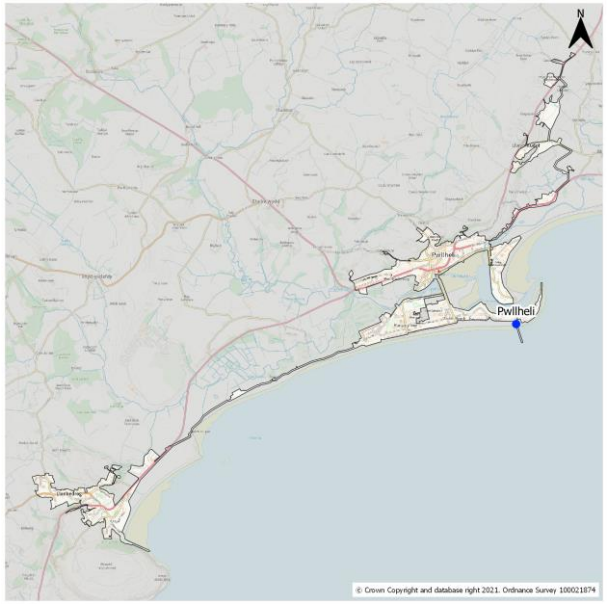

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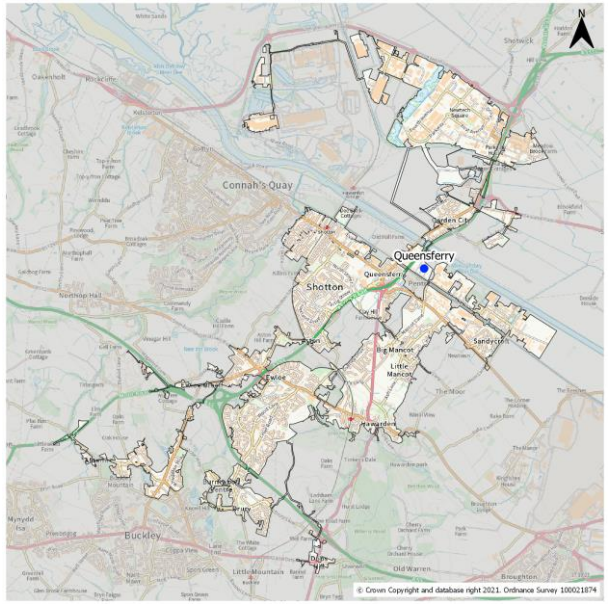

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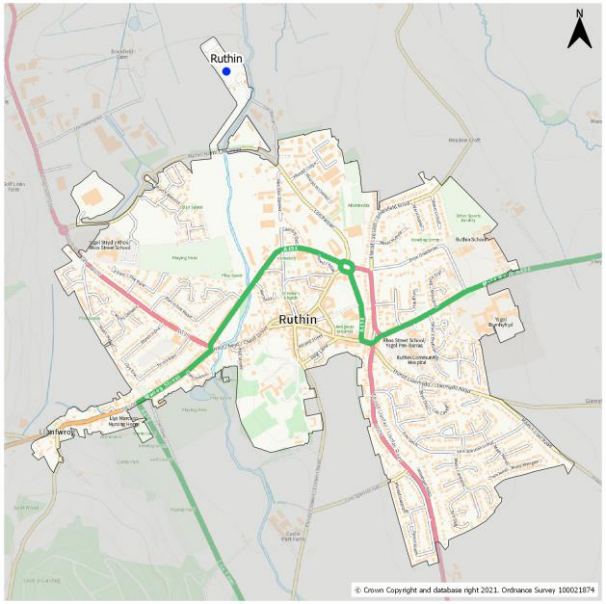

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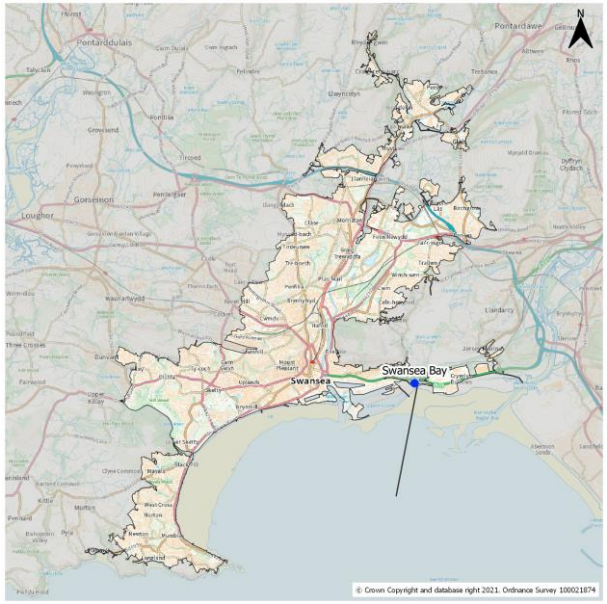

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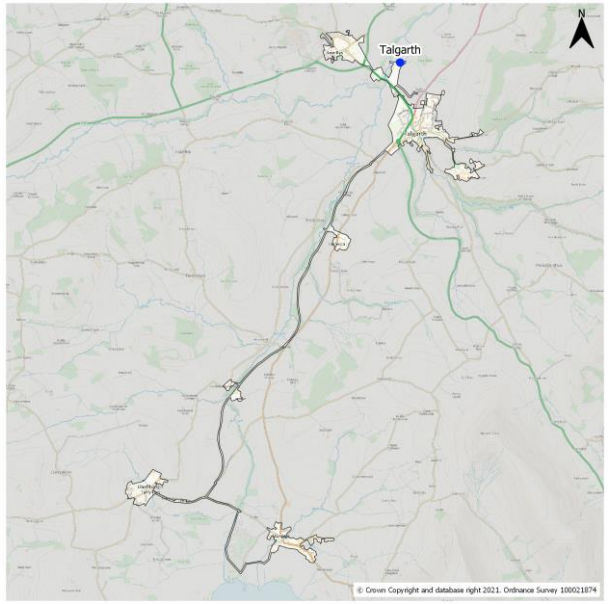

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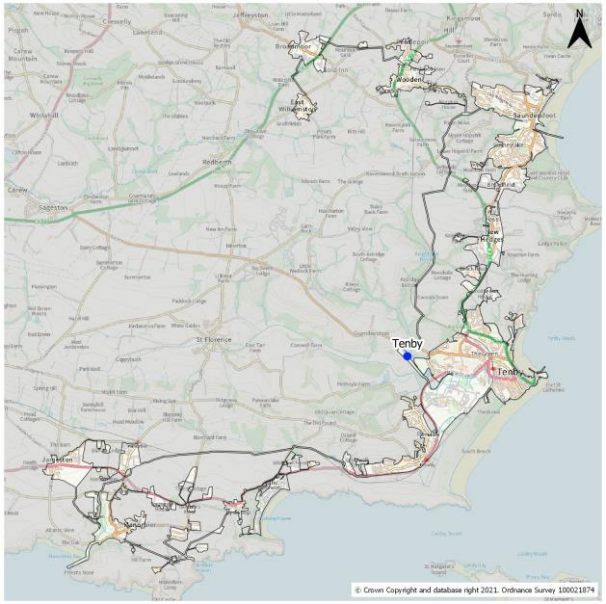
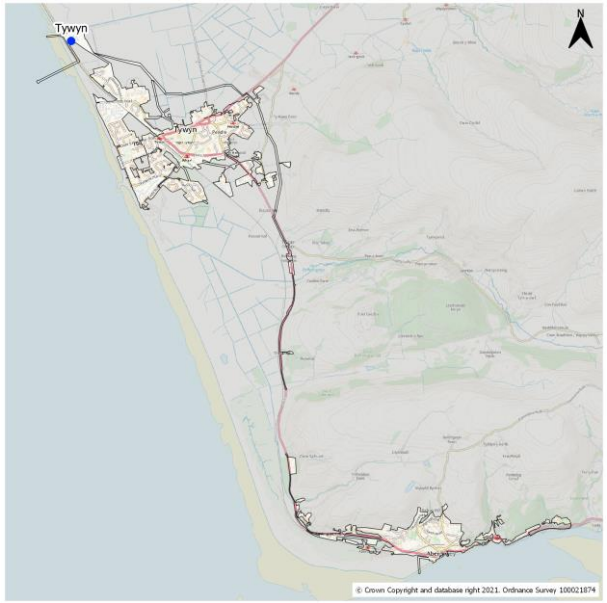


Tenby



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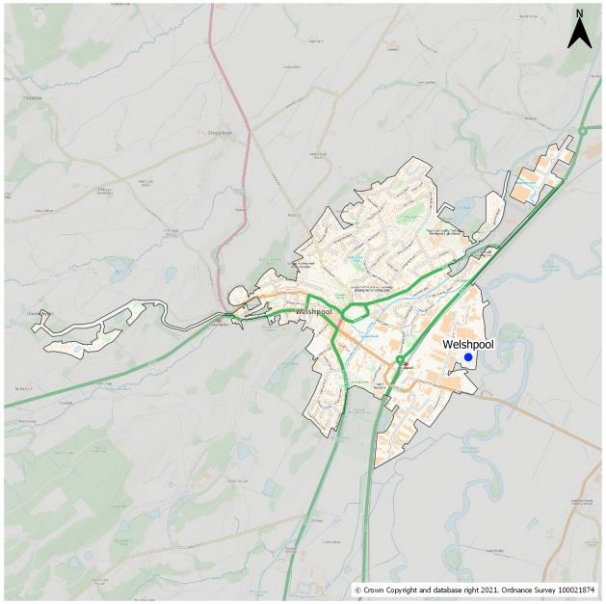
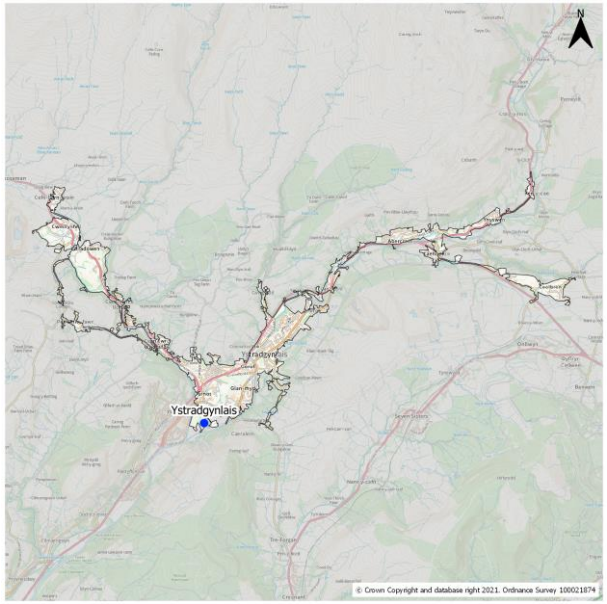


Welshpool



Ystradgynlais

Acknowledgements

We acknowledge and thank the following organisations for their valuable contributions toward the programme and in the production of this report (alphabetical order):

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Centre for Environmental Biotechnology

Cardiff University
School of Biosciences
School of Mathematics
Water Research Institute

Dŵr Cymru Welsh Water

Hafren Dyfrdwy

Iechyd Cyhoeddus Cymru / Public Health Wales

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