Agenda Item 4.1.1
Appendix 1

# Recommendation 4 Task and Finish Group

# Final Report

**Introduction - Recommendation 4**
The NHS Wales Joint Commissioning Committee (NWJCC) approved the setting up of a Recommendation 4 Task and Finish Group in May 2024.

The Task and Finish Group was established to develop the commissioning requirements for the new bespoke road-based service including to:

- Develop the operational model (how the service will work)
- Agree the clinical response criteria (what conditions the service will respond to)
- Identify the infrastructure requirements (what type of buildings, vehicles and equipment the service will need)
- Ensure an appropriate joint communication and engagement plan.

Further information relating to the Task and Finish Group is included in **Appendix 1a**. Members of all health boards, WAST, EMRTS and the NWJCC commissioning team are members of the group.

The Task and Finish Group is supported by the Recommendation 4 Technical Subgroup. Further information relating to the Technical Subgroup is included in **Appendix 2a**.

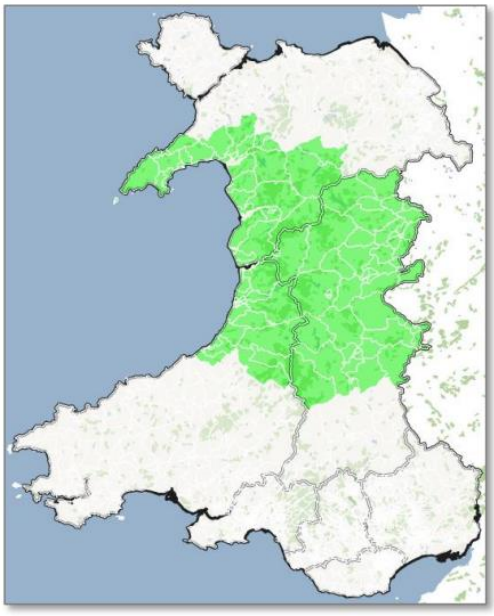
Llais are represented on the Task and Finish Group to ensure the citizen's voice is reflected in the proposals developed. This representation is to augment the work of the group but this will not indicate Llais' support for any proposal.

**Outputs of the Task and Finish Group – Commissioning Requirements**

1. **Operational Model**

**What was done**
In response to the concerns raised during the public engagement, the rural, remote and coastal communities that would be served by the new service areas were considered and agreed by the Task and Finish Group in August. The defined area included the Upper Super Output Areas (USOAs) as shown below:

- South Gwynedd (W03000005, W03000006)
- North Ceredigion (W03000027)
- North Powys (W030000023, W030000024, W03000025).



The following map and table below demonstrate the size and populations of the identified areas.

| Legacy Code | New Code | Name | Sq. Miles | Population |
|---|---|---|---|---|
| W03000005 | W02000018 | Gwynedd 009 | 921.78 | 30,326 |
| W03000006 | W02000019 | Gwynedd 010 | 379.01 | 26,067 |
| W03000023 | W02000097 | Powys 001 | 510.11 | 27,977 |
| W03000024 | W02000100 | Powys 004 | 845.34 | 36,242 |
| W03000025 | W02000107 | Powys 011 | 972.48 | 29,615 |
| W03000027 | W02000116 | Ceredigion 001 | 705.95 | 40,281 |

Omda Emergency UK Ltd were commissioned to find the 2 most effective locations for 2 road vehicles (one at each location) to cover as much of the population as possible within a 60-minute travel duration and within the defined rural and remote geographic area.

**What it showed**

The first part of the modelling undertaken by Omda **(Appendix 3a)** included sensitivity modelling to consider shorter travel durations (30 and 45 minutes), increased utilisation or busyness of the vehicles, using both current base stations as well as any roadside location and manually chosen locations in large towns with populations bases.

The following table shows all options.

| Description | Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|---|
| Optimal Roadside | 60 min | 0% | GridBase8331 | Porthmadog | A487 | Gwynedd | 92% | 96% |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | (187k) |
| Stations, Standbys, Hospitals | 60 min | 0% | Penamser Sb | Porthmadog | A497 | Gwynedd | 89% | 90% |
| | | | Bro Ddyfi Hosp | Machynlleth | A498 | Powys | | (176k) |
| Manned & Deployed Stations | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 89% | 89% |
| | | | Machynlleth | Machynlleth | A498 | Powys | | (174k) |
| 45-minute Roadside | 45 min | 0% | GridBase9820 | Mallwyd (east of Dolgellau) | A458 | Gwynedd | 81% | 85% |
| | | | GridBase12760 | Llangurig (southwest of Llanidloes) | A470 | Powys | | (166k) |
| 30-minute Roadside | 30 min | 0% | GridBase13572 | Four Crosses (west of Welshpool) | A458 | Powys | 44% | 50% |
| | | | GridBase9807 | Tyn y cwm (southwest of Llanidloes) | A44 | Powys | | (98k) |
| 30% Utilisation Roadside | 60 min | 30% | GridBase9124 | Llanelltyd (north of Dolgellau) | A470 | Gwynedd | 89% | 94% |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | (183k) |
| 50% Utilisation Roadside | 60 min | 50% | GridBase12968 | Talerddig (east of Machynlleth) | A470 | Powys | 84% | 88% |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | (172k) |
| Manual West | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 73% | 77% |
| | | | Aberystwyth | Aberystwyth | A44 | Ceredigion | | (150k) |
| Manual East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 94% | 95% |
| | | | Newtown | Newtown | A489 | Powys | | (185k) |
| Manual North | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 75% | 78% |
| | | | Dolgellau | Dolgellau | A470 | Gwynedd | | (152k) |
| Manual North East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 79% | 75% |
| | | | Welshpool | Welshpool | A458 | Powys | | (146k) |

The modelling identified the optimal locations for vehicles to maximise call demand (in this case population) coverage. The Technical Subgroup considered the key results provided and noted that some of these did not include existing bases and were not close to large towns. It was agreed that existing infrastructure and availability of staff were key factors and therefore options that did not include these were discounted.

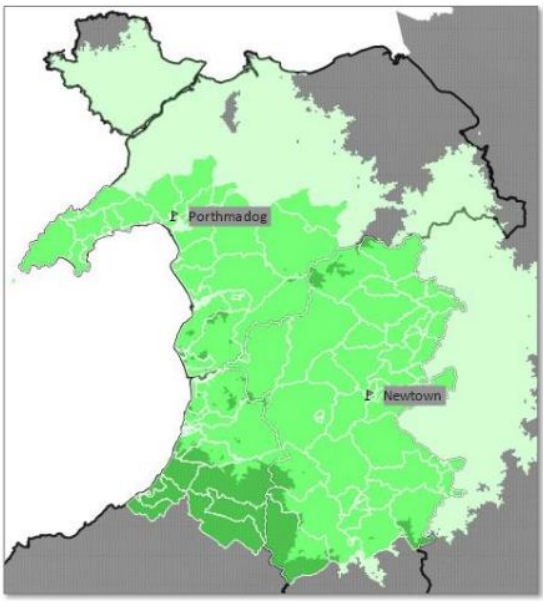
**What is suggested**

The following options were taken forward by Omda for the second part of the modelling as they were felt to provide the 2 most effective and workable locations, as initially requested by the Technical Subgroup.

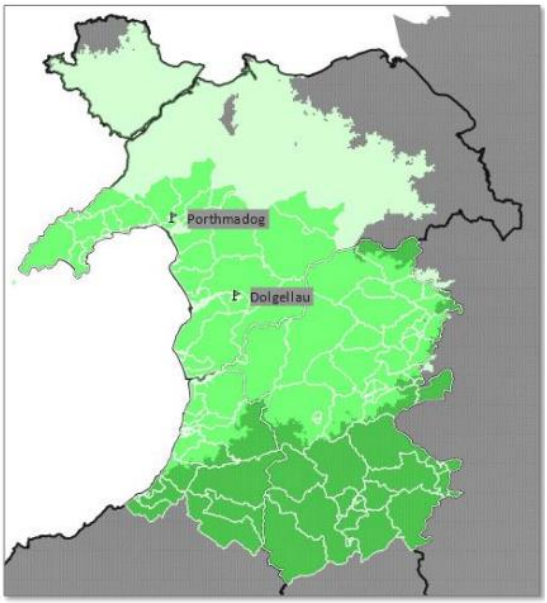
| **Travel duration** | Location | Geographic coverage (of defined area) | Population coverage (of defined area) |
|---|---|---|---|
| **60 min** | Porthmadog and Newtown | **94%** | **95%** |
| **60 min** | Porthmadog and Dolgellau | **75%** | **78%** |

While these were the most effective locations, it was noted that there were areas within the defined area that could not be reached within 60 minutes.

The dark green regions in the following maps cannot be reached within 60 minutes. For the Porthmadog and Newtown option this contains 5% of the population within the defined area, mainly in the north east of Ceredigion. It should be noted that existing staffed CHARU services are currently provided by WAST in this area as well as the proximity to Bronglais Hospital which is able to deliver additional interventions over and above that provided by the ambulance service.




For the Porthmadog and Dolgellau option this contains 22% of the population within the defined area, mainly in the south of the defined area but also in the north east of Powys.




2. **Clinical Response Criteria**

**What was done**

Some members of the Technical Subgroup reviewed a range of scope of practice documents (clinical staffing models, job descriptions and service specifications) from different pre-hospital enhanced care services showed variation in enhanced clinical intervention skillsets across services. It was noted that there was little in terms of standardisation when comparing such services indicating that these have been designed to meet the particular needs of their patients or populations and variation in the authorised scope of practice.

The Technical Subgroup considered the type and nature of conditions that this resource could respond to. In order to optimise the outcomes for the population from the locations taken forward in Part 1 of the modelling, it was agreed that further modelling would be undertaken on the response to:

- EMRTS calls
- Amber 1 calls
- Breathing difficulties calls
- Chest pain calls
- Stroke calls
- CHARU calls.

The Omda report indicated 15,595 incidents of this nature in the defined area per annum.

It was also agreed that the following modelling would be requested:

- The proportion of incidents that can be reached within 30, 60 and 90 minutes
- Average daily incidents by hour.

**Further Omda Modelling**

Omda Emergency UK Ltd were then commissioned to find the 2 most effective locations for 2 road vehicles (one at each location) to cover as much of the incidents as possible within a 60-minute travel duration and within a defined rural and remote geographic area.

**What it showed**

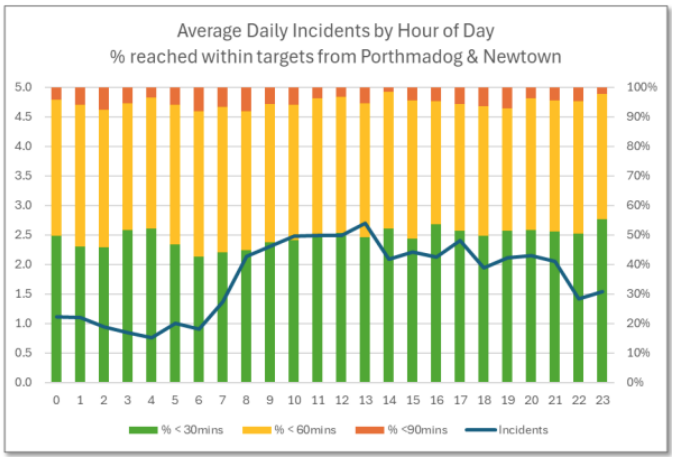
Building on the locations taken forward from Part 1 of the modelling and in response to the request from the Technical Subgroup relating to a clinical response within 30, 60 and 90 minutes and average daily incidents by hour, the second part of the modelling was undertaken by Omda **(Appendix 4a).**

Part 2 indicated 15,595 incidents of this nature in the defined area per annum and showed the proportion of these incidents that can be reached from either of the two options within the agreed response times at lights-and-sirens speed.

| Location | <30 minutes | <60 minutes | <90 minutes |
|---|---|---|---|
| **Porthmadog and Newtown** | 50% | 95% | 100% |
| **Porthmadog and Dolgellau** | 34% | 78% | 98% |

The modelling indicated that locating the vehicles at Porthmadog and Newtown would ensure that more incidents are reached than locating vehicles at Porthmadog and Dolgellau.

The following chart shows the average daily incidents per hour (blue line) and the proportion of incidents across the 24-hour period that can be reached within 30, 60, 90 minutes from Porthmadog and Newtown.




The chart shows that on an average day, there is approximately 1 incident per hour between 00:00 and 07:00, rising through the morning to approximately 2.5 incidents per hour between 10:00 and 14:00, and decreasing slowly for the rest of the day to approximately 1.5 incidents per hour between 22:00 and 00:00.

The chart also shows little variation by hour from the overall averages, and typically 50% of incidents can be reached within 30 minutes, 95% within 60 minutes, and 100% within 90 minutes.

**What was suggested**

The Task and Finish Group recommend that the draft Commissioning Intention is endorsed by the NWJCC members. The key principles of the intention include the Welsh Ambulance Services University NHS Trust delivering a bespoke road-based service that:

- Includes two road-based assets based in Porthmadog and Newtown
- Responds to wide range of conditions
- Provides highly trained staff providing enhanced clinical care over and above the care provided normally by the ambulance service
- Operates on a 24/7 basis
- Offers a rotational model for staff working on this service to develop, enhance and maintain their exposure and skill set.

3. **Infrastructure Requirements**

WAST is responsible for delivering against the strategic requirements of the Commissioning Intention. This includes making decisions relating to infrastructure and the operational model including:

- Appropriate triage, dispatch and communication processes
- Workforce arrangements including:
  - Recruitment and retention
  - Training, induction and familiarisation
  - Roster arrangements and working patterns to meet the needs of the service
- The availability of the skills to respond in line with the clinical response model
- The required infrastructure including:
  - Operational base accommodation
  - Medical equipment and consumables
  - Road vehicles
  - Communications and telephony
- Relevant operational and clinical standard operating procedures

Conversations have taken place between the commissioners and WAST to ensure the necessary arrangements are in place to commence this work.

**The working assumption is that existing WAST infrastructure will be used.**

**Commissioning Intentions**

These draft Commissioning Intentions are based on discussions with the Task and Finish Group and further feedback from health board, Welsh Ambulance Service and EMRTS colleagues.

**CI-A1** - To deliver an additional bespoke road-based service that responds to rural, remote and coastal populations within the defined rural and remote geographic area, seven days per week and 24-hours per day.

**CI-A2** - To ensure that the bespoke service appropriately responds to a wide range of conditions in rural, remote and coastal communities where it can improve outcomes.

**CI-A3** - To ensure that the bespoke service has the required staff, operational, clinical and technological infrastructure

**CI-P1** - Two road-based assets based at the optimal locations, ensuring effective geographic and population coverage seven days per week and 24-hours per day across the defined rural and remote geographic area within a 60-minute travel duration seven days per week.

**CI-P2 -** A bespoke service targeted at a broad range of higher acuity incidents with highly trained staff providing enhanced clinical care over and above the care provided normally by the ambulance service.

**CI-P3** - A rotational working model for staff working on this service to develop, enhance and maintain their exposure and skill set.

**CI-I1** – As a minimum the following measures will be routinely monitored by the service and compared to usual ambulance response, as a mechanism for recognizing areas of improvement:

- Response times
- Back up requests and time to arrival of conveying resource
- Return of spontaneous circulation (ROSC) rates
- Interventions used over and above the normal ambulance service
- Utilisation rates
- Call to door times for STEMI (type of heart attack) and stroke
- Patient experience feedback.

**CI-I2** - An interim evaluation of the impact of the service will be undertaken jointly by the provider and commissioners 6-months post implementation with a final evaluation following 12 months of operation.

**CI-I3** - The provider should develop a set of criteria that it would use as a mechanism for assessing if similar services are required in other parts of Wales, aligned to the needs of the populations in those areas.

**Appendix 1a**

## RECOMMENDATION 4 TASK AND FINISH GROUP

## 1. INTRODUCTION

The JCC approved the setting up of the Recommendation 4 Task and Finish Group at its meeting on 21 May 2024. The Task and Finish Group would develop the commissioning requirements for the bespoke road-based service as part of Recommendation 4. All health boards agreed to work collaboratively and to ensure the attendance of a senior operational or clinical representative to meet the deadline set.

## 2. PURPOSE

The purpose of the Recommendation 4 Task and Finish Group is to:

- Develop an Implementation Plan with key milestones to enable it to be presented to the JCC
- Agree the clinical response criteria
- Request analysis and modelling work to be undertaken as required by the group
- Develop the operational model
- Identify the infrastructure requirements
- Identify the base locations
- Require joint efforts to ensure deadlines are met to enable the JCC to achieve the intended goals
- Establish the bespoke service as soon as possible
- Ensure the required sequencing, including that no changes would be made to bases until the bespoke service is in place (the earliest the bases could move is 2026)
- Ensure an appropriate joint communication and engagement plan. Health board colleagues and processes are key to the delivery of this work
- Provide update briefings to the JCC following each Task and Finish Group meeting
- Develop and agree a Project Plan.

## 3. MEMBERSHIP

The JCC agreed that the Task and Finish Group would be chaired by the Interim Director of Commissioning for Ambulance and 111. The Membership reflected the need to ensure a collaborative working approach in progressing this work.

The membership is:

- Ambulance and 111 Commissioning Team (JCC):
    - Interim Director of Commissioning for Ambulance and 111 **(Chair)**
    - Interim Deputy Director of Commissioning for Ambulance and 111
    - Deputy Director of Communication and Engagement (representing communication and engagement leads)

    - Head of Commissioning and Performance
- Emergency Medical Retrieval and Transfer Service (EMRTS):
    - National Director
    - Director of Operations
    - Clinical Informatics and Research Manager
- Welsh Ambulance Services University NHS Trust (WAST):
    - Director of Paramedicine
    - Director of Operations
    - Assistant Director of Commissioning and Performance
- Health Board senior operational or clinical representative:
    - Aneurin Bevan UHB – Associate Director of Operations (Patient Transport Services)
    - Betsi Cadwaladr UHB –Associate Director For Emergency Care and Deputy Executive Medical Director
    - Cardiff and Vale UHB – Major Trauma Centre Clinical Lead
    - Cwm Taf Morgannwg UHB - Deputy Chief Operating Officer; General Manager (Prince Charles Hospital) and Assistant Director of Transformation
    - Hywel Dda UHB - County Director (Ceredigion)
    - Powys THB – Executive Medical Director and Executive Director of Planning, Performance and Commissioning
    - Swansea Bay UHB – Service Group Director (Morriston Hospital)

The Task and Finish Group has membership from every health board, WAST, EMRTS and the NWJCC Ambulance and 111 Commissioning Team; there are 10 clinicians as part of the Group.

In addition to the core membership listed above, Llais have been represented on the group to ensure that the citizen's voice is reflected in the proposals that are developed. This representation has been to augment the work of the Task and Finish Group but this has not indicated Llais' support for any proposal. The Llais representative has been the Regional Director for Powys.

## 4. ATTENDANCE AT MEETINGS

The Task and Finish Group has met on five occasions. Attendance at Subgroup meetings by members is indicated below.

| Organisation | 28 Jun | 23 Jul | 22 Aug | 26 Sept | 3 Oct |
|---|---|---|---|---|---|
| Interim Director of Commissioning – Ambulance and 111 (Chair) | ✓ | ✓ | ✓ | ✓ | ✓ |
| NWJCC Ambulance and 111 Commissioning Team | ✓*** | ✓** | ✓ | ✓**** | ✓**** |
| Welsh Ambulance Services University NHS Trust | ✓** | ✓** | ✓*** | ✓*** | ✓** |
| Aneurin Bevan UHB | ✓ | ✓ | ✓ | ✓ | ✓ |

| Organisation | 28 Jun | 23 Jul | 22 Aug | 26 Sept | 3 Oct |
|---|---|---|---|---|---|
| | | | | | |
| Betsi Cadwaladr UHB | ✓ | ✓ | | | ✓ |
| Cardiff & Vale UHB | ✓ | | ✓ | | |
| Cwm Taf Morgannwg UHB | ✓** | | ✓** | ✓ | |
| Hywel Dda UHB | ✓ | | | ✓** | ✓ |
| Powys Teaching HB | ✓** | ✓** | ✓** | ✓** | |
| Swansea Bay UHB | ✓ | ✓ | | | ✓ |
| Llais Regional Director (Observer with speaking rights)) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Emergency Medical Retrieval and Transfer Service | ✓** | ✓** | ✓ | ✓** | ✓** |

**Indicates more than one attendee (✓** = 2 attendees)*

## 5. MAIN AREAS OF DISCUSSION

The key discussion points for the Recommendation 4 Task and Finish Group have been:

- Background and context
- Recommendation 4 Task and Finish Group Terms of Reference
- Reporting Arrangements
- Roles and Responsibilities
- Timescales
- Recommendation 4 Technical Subgroup including:
    - Role
    - Terms of Reference
    - Clinical response model
    - Operational model
    - The impact for patients
    - Modelling updates
- Draft Commissioning Intention including the proposed review and evaluation of the new bespoke service
- Communication and Engagement Plan update including:
    - the need for an agreed joint plan
    - the lead role for health boards in engaging with their populations
- The need for ongoing communication with Llais national representatives in addition to Llais' role on this group
- Equality Impact Assessment
- Draft engagement materials
- Project Plan
- Contents of the draft Final Report.

**Appendix 2a**

## RECOMMENDATION 4 TECHNICAL SUBGROUP

### 1. INTRODUCTION

In addition to approving the Recommendation 4 Review Task and Finish Group, the JCC also agreed that it would be supported by a Technical Subgroup.

### 2. PURPOSE

The purpose of the Technical Subgroup is to undertake analysis and modelling work as required by the Task and Finish group. This will include to consider and propose the following for the new bespoke road-based enhanced and/or critical care service in rural, remote and coastal areas:

- Clinical response criteria
- Operational model
- Base locations [modelling to define location (by geography, incidents or population)]
- Infrastructure requirements.

### 3. MEMBERSHIP

The Technical Subgroup is chaired by the Interim Deputy Director of Commissioning for Ambulance and 111. The Membership does not include all health boards, however the membership does reflect the need to ensure a collaborative working approach in progressing this work.

The core membership is:

- Ambulance and 111 Commissioning Team (JCC):
  - Interim Deputy Director of Commissioning for Ambulance and 111 **(Chair)**
  - Head of Information
  - Head of Commissioning and Performance
- Emergency Medical Retrieval and Transfer Service (EMRTS):
  - Clinical Informatics and Research Manager
  - Operations Manager and Lead Critical Care Practitioner (CCP)
- Welsh Ambulance Services University NHS Trust (WAST):
  - Assistant Director of Digital Services: Data & Analytics
  - Assistant Director of Commissioning & Performance
  - Assistant Director of Clinical Delivery
- Powys Teaching Health Board, Director of Performance and Commissioning
- Powys Teaching Health Board, Assistant Medical Director: Primary Care and Community (Service Development) and Assistant Medical Director: Quality, Safety & Clinical Governance
- Betsi Cadwaladr University Health Board, Associate Director For Emergency Care
- Cardiff and Vale University Health Board, Consultant in Emergency Medicine & CD for Major Trauma

## 4. ATTENDANCE AT MEETINGS

The Technical Subgroup has met on four occasions. Attendance at Subgroup meetings by members is indicated below.

| Organisation | 30 July | 7 Aug | 11 Sept | 2 Oct |
|---|---|---|---|---|
| Interim Deputy Director of Commissioning - Ambulance and 111 (Chair) | ✓ | ✓ | | ✓ |
| NWJCC Ambulance and 111 Commissioning Team (including Deputy Chair) | ✓ | ✓** | ✓*** | ✓** |
| Welsh Ambulance Services University NHS Trust | ✓** | ✓** | | ✓** |
| Betsi Cadwaladr UHB | ✓ | | ✓ | |
| Cardiff and Vale UHB | | ✓ | ✓ | ✓ |
| Powys Teaching HB | ✓** | ✓ | ✓ | ✓** |
| Emergency Medical Retrieval and Transfer Service | ✓*** | ✓** | ✓** | ✓*** |

**Indicates more than one attendee (✓** = 2 attendees)*

## 5. MAIN AREAS OF DISCUSSION

The key discussion points for the Recommendation 4 Technical Subgroup have been:

- Background and context
- Terms of Reference
- Response model criteria
- Presentation – Optima modelling
- Presentation – Cymru High Acuity Response Unit (CHARU) modelling
- Population Coverage modelling
- Progressed modelling including clinical response criteria, activity and operational hours
- Agreement of outputs of the Subgroup's work

Omda

# WELSH AMBULANCE SERVICE NHS TRUST

# R4 MODELLING

# PART 1

# PLACEMENT OF 2 RRVS IN SOUTH GWYNEDD, NORTH CEREDIGION, AND NORTH POWYS TO OPTIMISE POPULATION COVERAGE

Version 1.4

GIG CYMRU NHS WALES
Ymddiriedolaeth GIG
Gwasanaethau Ambiwlans Cymru
Welsh Ambulance Services
NHS Trust

Omda

Created by: Andrew Tallack
Reviewed by: Matt Macleod
Predict version: 24.3
26 September 2024

*To protect the environment, please do not print this document unless necessary.*

# EXECUTIVE SUMMARY

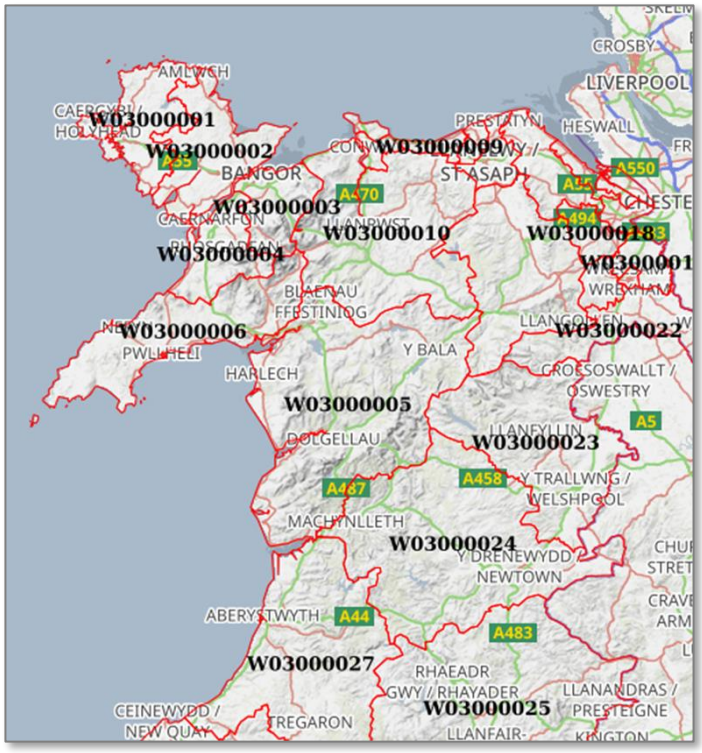
The NHS Wales Joint Commissioning Committee has agreed to develop commissioning intentions for developing an additional bespoke road-based-enhanced and/or critical care service in rural and remote areas of Wales.

This is a direct response to the concerns raised during the public engagement on the review of the 'Emergency Medical Retrieval and Transfer Services' where people shared their anxiety around emergency health provision in rural and remote areas.

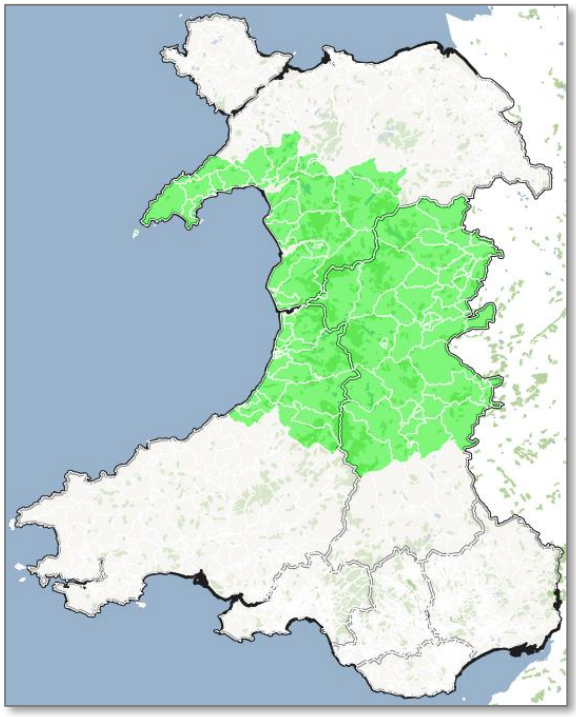
The NHS Wales Joint Commissioning Committee has asked Omda to find the 2 most effective locations for 2 road vehicles (one at each location) to cover as much of the population as possible within a 60-minute travel duration and a defined rural and remote geographic area.

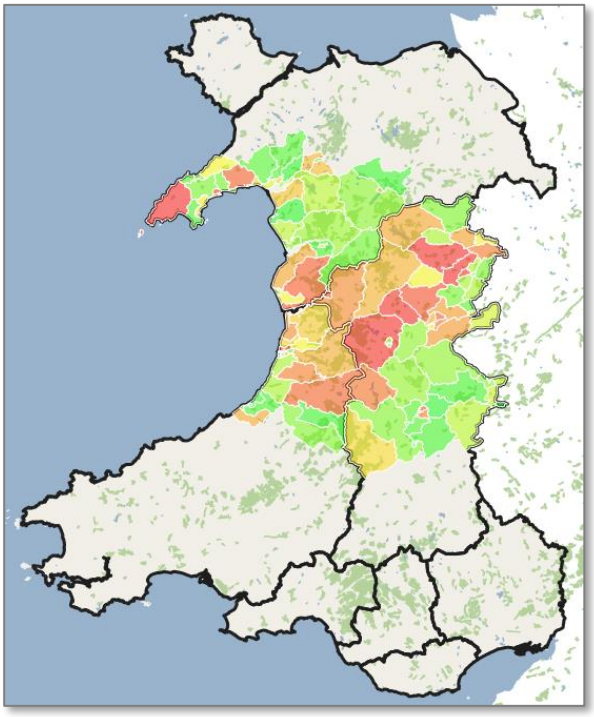
This defined area is the 6 Upper Super Output Areas (USOAs) as shown below:

- South Gwynedd (W03000005, W03000006)
- North Ceredigion (W03000027)
- North Powys (W030000023, W030000024, W03000025)




These USOAs map directly onto the LSOAs used in Predict. The population volumes of these LSOAs are known and taken from the website of the Office of National Statistics for 2017. The full area is shown in green on the left-hand map below. The right-hand map below shows the population of each LSOA in the region of interest, where the colour of each LSOA is selected from a traffic light range, from green (low) to red (high) and from 1000 to 2500 people.





One of Predict's internal tools is called 'Post Plan Builder' which is used here to determine the optimal locations for vehicles to maximise call demand (or in this case population) coverage for a given response time. The optimal pair of locations is found to be:

| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 60 min | 0% | GridBase8331 | Porthmadog | A487 | Gwynedd | 92% | 96% (187k) |
| | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |

Further results are found when the maximum travel duration is decreased from 60 minutes to 45 minutes and 30 minutes:

| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 45 min | 0% | GridBase9820 | Mallwyd (east of Dolgellau) | A458 | Gwynedd | 81% | 85% (166k) |
| | | GridBase12760 | Llangurig (southwest of Llanidloes) | A470 | Powys | | |
| 30 min | 0% | GridBase13572 | Four Crosses (west of Welshpool) | A458 | Powys | 44% | 50% (98k) |
| | | GridBase9807 | Tyn y cwm (southwest of Llanidloes) | A44 | Powys | | |

When returning to the 60-minute maximum travel time, if the locations are required to be at current bases or hospitals rather than any roadside location, different results are found:

| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 60 min | 0% | Penamser Sb | Porthmadog | A489 | Gwynedd | 89% | 90% (176k) |
| | | Bro Ddyfi Hosp | Machynlleth | A498 | Powys | | |

Moreover, if the locations are required to be at current bases where vehicles are manned and deployed from rather than any roadside location, other results are found:

| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 89% | 89% (174k) |
| | | Machynlleth | Machynlleth | A498 | Powys | | |

It is also found that these are the nearest 'bases or hospitals' or 'manned and deployed-from stations' to the already found optimal 'any roadside locations' initially found.

So far, all results have used 0% utilisation (busyness) of vehicles, assuming both vehicles are available continuously to respond to the demand. This may not be possible in practice, therefore further results are found after increasing the vehicles' utilisation (busyness) to 30% and 50%.

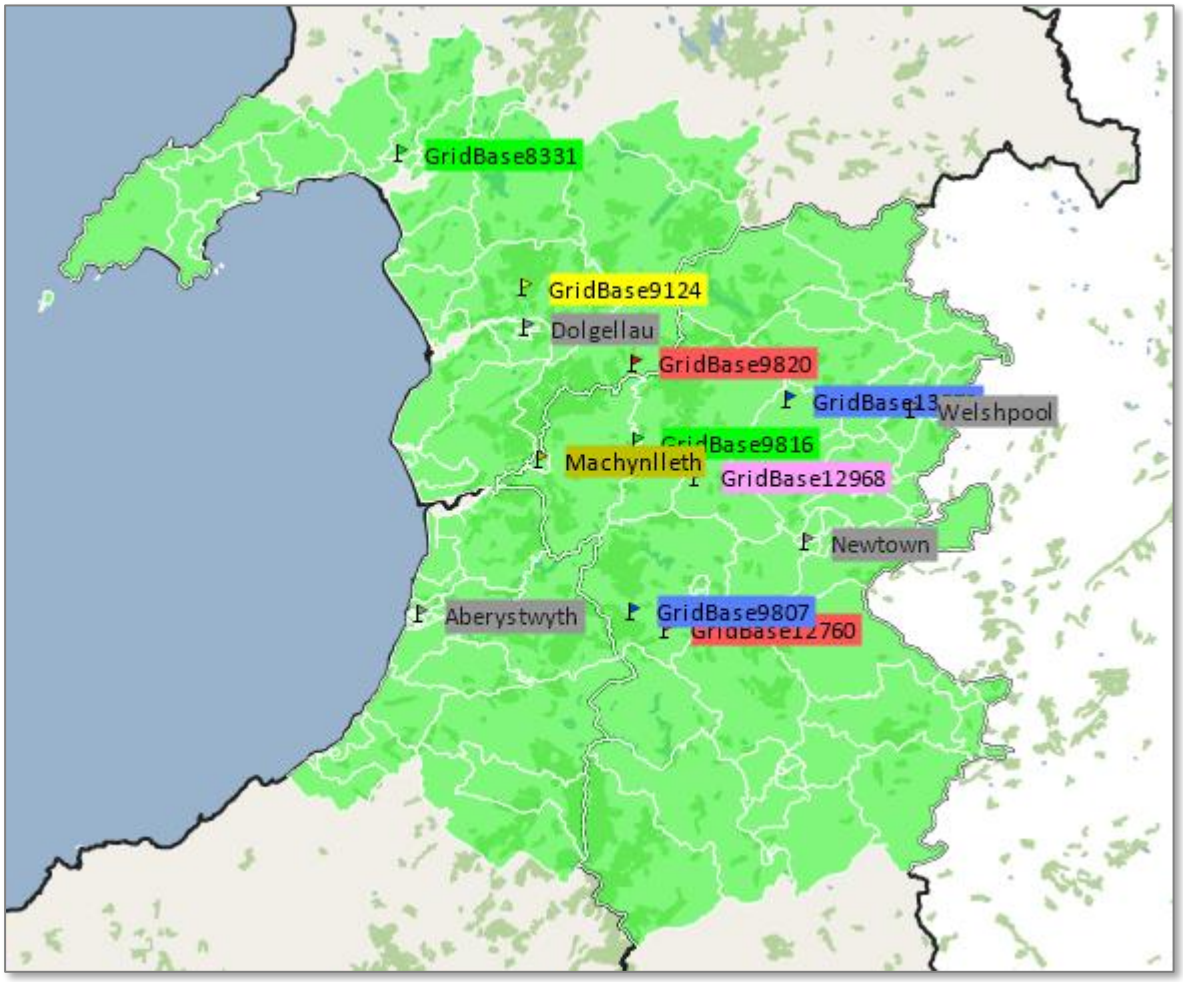
| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 60 min | 30% | GridBase9124 | Llanelltyd (north of Dolgellau) | A470 | Gwynedd | 89% | 94% (183k) |
| | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |
| 60 min | 50% | GridBase12968 | Talerddig (east of Machynlleth) | A470 | Powys | 84% | 88% (172k) |
| | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |

Finally, four other results are calculated using pairs of large towns (Porthmadog and Aberystwyth), (Porthmadog and Newtown), (Porthmadog and Dolgellau), and (Porthmadog and Welshpool) as the base locations for the two road vehicles. These are shown below:

| Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|
| 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 73% | 77% (150k) |
| | | Aberystwyth | Aberystwyth | A44 | Ceredigion | | |
| 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 94% | 95% (185k) |
| | | Newtown | Newtown | A489 | Powys | | |
| 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 75% | 78% (152k) |
| | | Dolgellau | Dolgellau | A470 | Gwynedd | | |
| 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 79% | 75% (146k) |
| | | Welshpool | Welshpool | A458 | Powys | | |

The second of the three pairs (Porthmadog and Newtown) not only gives a population coverage (95%) almost as high as the optimal (96%) but also includes a location (Newtown) in an area perceived to be most at risk from not having coverage.

All locations shown in the tables of results above are shown on the map below:




These results demonstrate the effectiveness of the chosen locations, ensuring that the emergency services can reach a significant portion of the population in the targeted area efficiently.

The grey 'Porthmadog' base, the olive-green 'Porthmadog' base, and both dark-green 'Penamser Sb' & 'Bro Ddyfi Hosp' bases are hidden under the light-green 'GridBase8331' and the olive-green 'Machynlleth' bases.

The two key results found are:

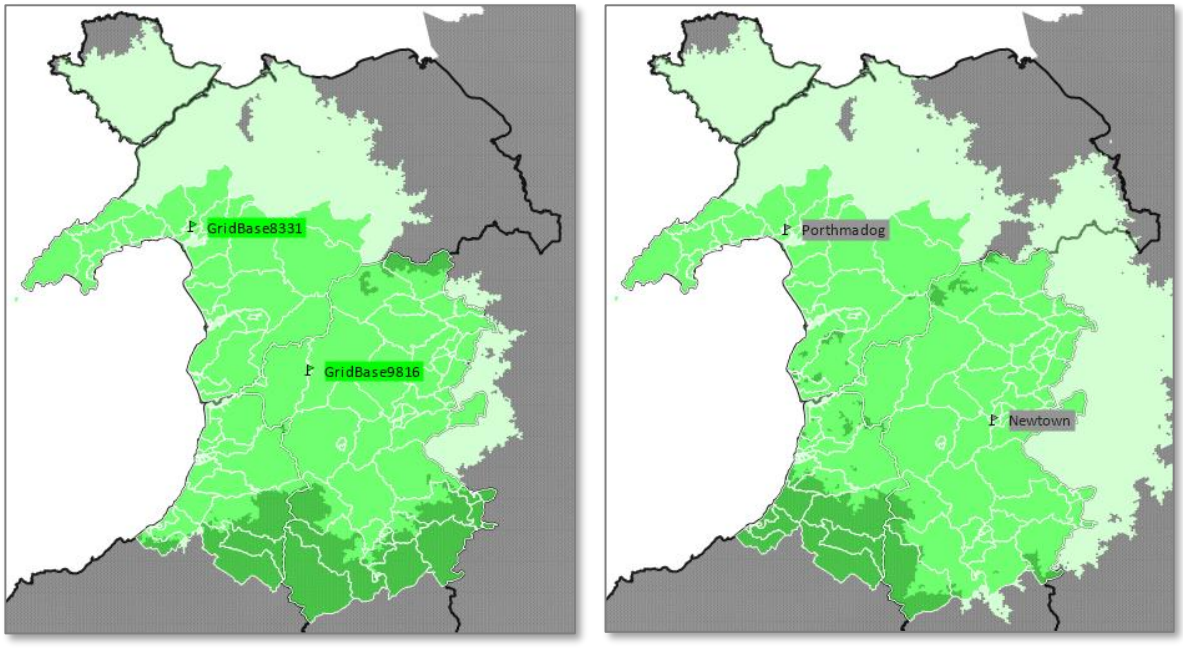
1 Optimal Roadside (GridBase8331, GridBase9816)
2 Manual East (Porthmadog, Newtown)

| # | Desc | Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Optimal Roadside | 60 min | 0% | GridBase8331 | Porthmadog | A487 | Gwynedd | 92% | 96% (187k) |
| | | | | GridBase9816* | Llanbrynmair (nr Machynlleth) | A470 | Powys | | |
| 2 | Manual East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 94% | 95% (185k) |
| | | | | Newtown | Newtown | A489 | Powys | | |

The optimal result is 'Optimal Roadside' (GridBase8331 & GridBase9816 in light-green) near Porthmadog & Machynlleth, giving geographical and population coverage of 92% & 96% respectively.

If this is not a viable option, the 'Manual East' (Porthmadog & Newtown in grey) pairing results in an increased geographical coverage of 94% and a minimally reduced population coverage of 95%, and additionally alleviates the perception of poor coverage in the east of Powys.

The regions which cannot be reached within a 60-minute travel time of each of these two pairs of locations contain a small proportion of the population (4% for 'Optimal Roadside' and 5% for 'Manual East') of the analysed region and are highlighted in dark-green on the maps below (left = 'Optimal Roadside'; right = 'Manual East'):




The 'Optimal Roadside' (left) result has coverage holes in the top right corner of Powys and a belt between north Ceredigion and central Powys.

The 'Manual East' (right) result only has a coverage hole in north Ceredigion. From a geographical point of view this is the best (94%), but from a population point of view the 'Optimal Roadside' is best (96%).

# GLOSSARY

The following abbreviations and words are used in this report:

| Abbreviation | Description |
|---|---|
| WAST | Welsh Ambulance Service Trust |
| LSOA | Lower Super Output Area |
| USOA | Upper Super Output Area |

Omda

# CONTENTS

# 1 INTRODUCTION

The NHS Wales Joint Commissioning Committee has agreed to develop commissioning intentions for developing an additional bespoke road-based-enhanced and/or critical care service in rural and remote areas of Wales.

This is a direct response to the concerns raised during the public engagement on the review of the 'Emergency Medical Retrieval and Transfer Services' where people shared their anxiety around emergency health provision in rural and remote areas. These were particularly concerning conditions that would not require pre-hospital critical care and would not fall into the remit to receive the highly specialised EMRTS service as it currently operates.

The NHS Wales Joint Commissioning Committee has asked Omda to find the two most effective locations for two road vehicles (one at each location) to cover as much of the population as possible within a 60-minute travel duration within a defined rural and remote geographic area.

Two road vehicles are available and can be positioned at any road location. These vehicles typically respond to stroke incidents and at lights-and-sirens speed.

# 2 METHODOLOGY

The goal is to find the best two locations for vehicles to cover as much population as possible within a 60-minute travel duration. This involves several steps:

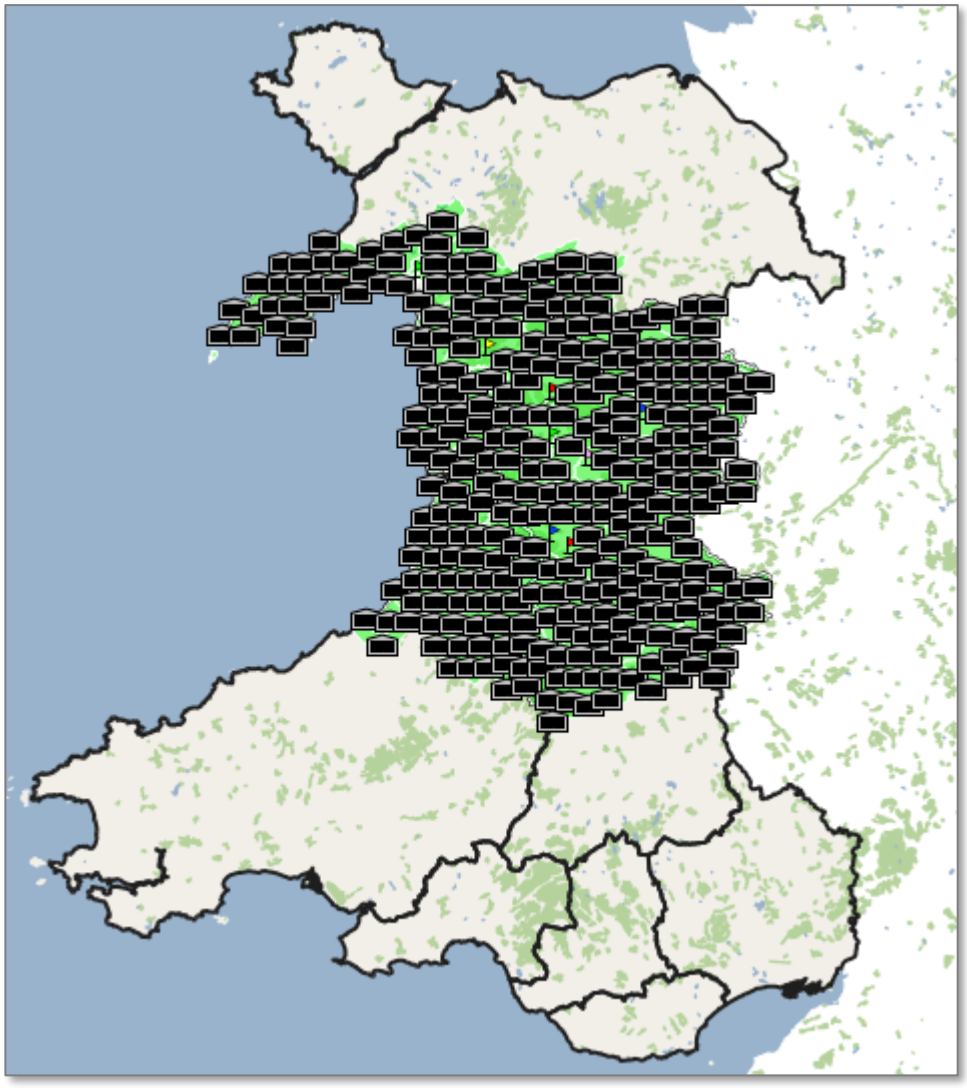
- Initially, a set of locations (Bases) is created from which to select the best, using a Predict tool called 'Base Builder'.
- Next, a call file is created where the geographical spread of incidents matches the geographical spread of the population of Wales.
- Finally, another Predict tool called 'Post Plan Builder' can then use the previously mentioned set of Bases and call file with geographically spread incidents matching geographically spread population numbers, to find the best two locations to cover as many of the incidents (population) as possible within a chosen geography (South Gwynedd, North Ceredigion, and North Powys) and a 60-minute travel duration at lights-and-sirens speed.
- Some sensitivity modelling is added to show results for:
    - shorter travel durations of 30 and 45 minutes
    - increased busyness of the vehicles (30% and 50% utilisation)
    - a set of current base stations rather than any road location

- four manually chosen pairs of locations at big town locations (Porthmadog & Aberystwyth), (Porthmadog & Newtown), (Porthmadog & Dolgellau), and (Porthmadog & Welshpool).

## 2.1 Create a Grid of Bases

To create a set of locations or Bases from which to select the best, a tool within Predict called 'Base Builder' is used. This tool creates a set of equally spaced bases in a grid formation within a chosen rectangular geographical region. These bases are always located on the nearest road.

The map below shows the set of bases created in a 100 x 100 grid covering the relevant part of Wales. Each base is located on the nearest road.



## 2.2 Create a Call File to represent the population spread

Population volumes in various Lower Super Output Area (LSOA) regions are known. These have been taken from the website of the Office of National Statistics for 2017.

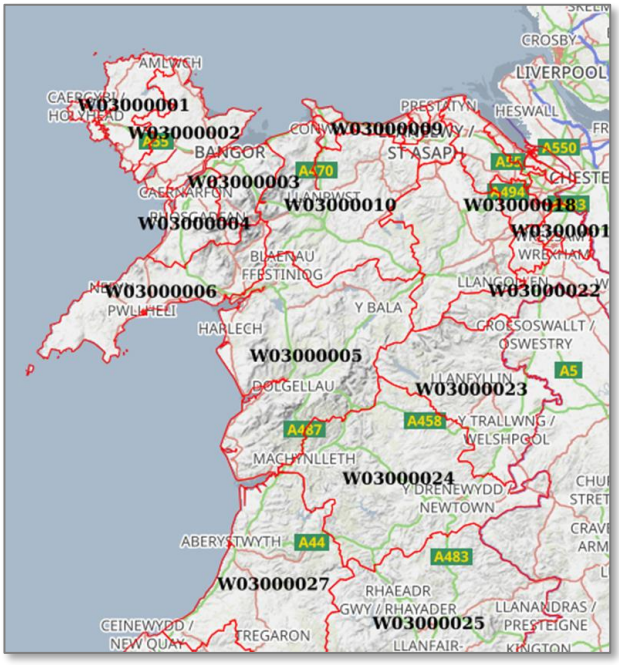
A call file is created so it contains the same number of annual incidents as the population for each LSOA, so when the optimal coverage of incidents is searched for, this also finds the solution to the optimal coverage of the population.

## 2.3 Which two bases give the best coverage?

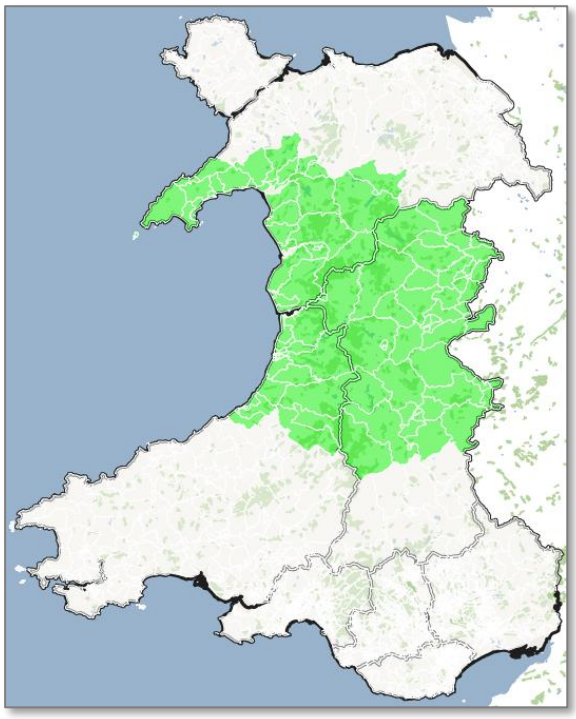
Another Predict tool called 'Post Plan Builder' can now be used to find which two of the bases from the 100 x 100 grid should be chosen to give the best coverage of the population. 'Post Plan Builder' is a tool used to determine the optimal locations for vehicles to maximise call demand (or in this case population) coverage for a given response time.

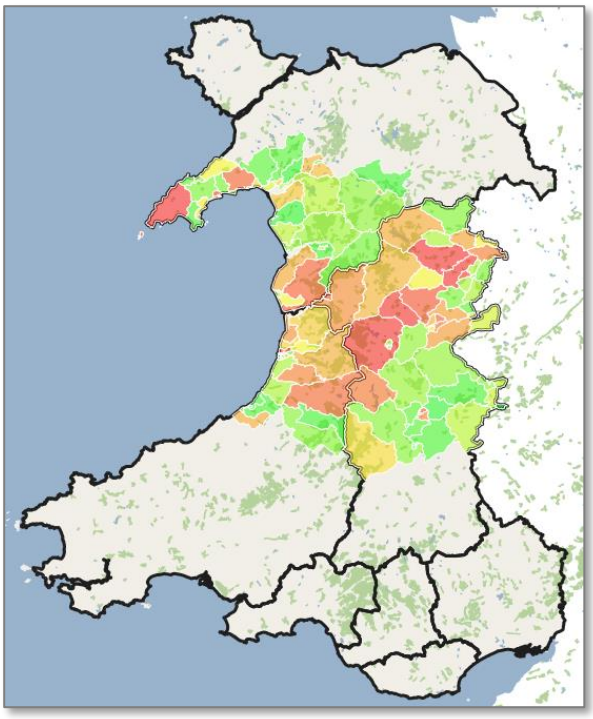
Multiple variables are given certain values in this process to find the optimal locations:

- The vehicles respond at Lights-and-Sirens speed
- The vehicles must respond to the incidents within 60 minutes
- The average utilisation of the two vehicles is 0% so that they will always be available to respond
- The regions containing incidents that the vehicles prioritise responding to have been chosen by the NHS Wales Joint Commissioning Committee and comprise of the six Upper Super Output Areas (USOAs) shown below:
    - South Gwynedd (W03000005, W03000006)
    - North Ceredigion (W03000027)
    - North Powys (W030000023, W030000024, W03000025)



The USOAs map directly onto the LSOAs used in Predict. The full area is shown in green on the left-hand map below. The right-hand map below shows the population of each LSOA in the region of interest, where the colour of each LSOA is selected from a traffic light range, from green (low) to red (high) and from 1000 to 2500 people.

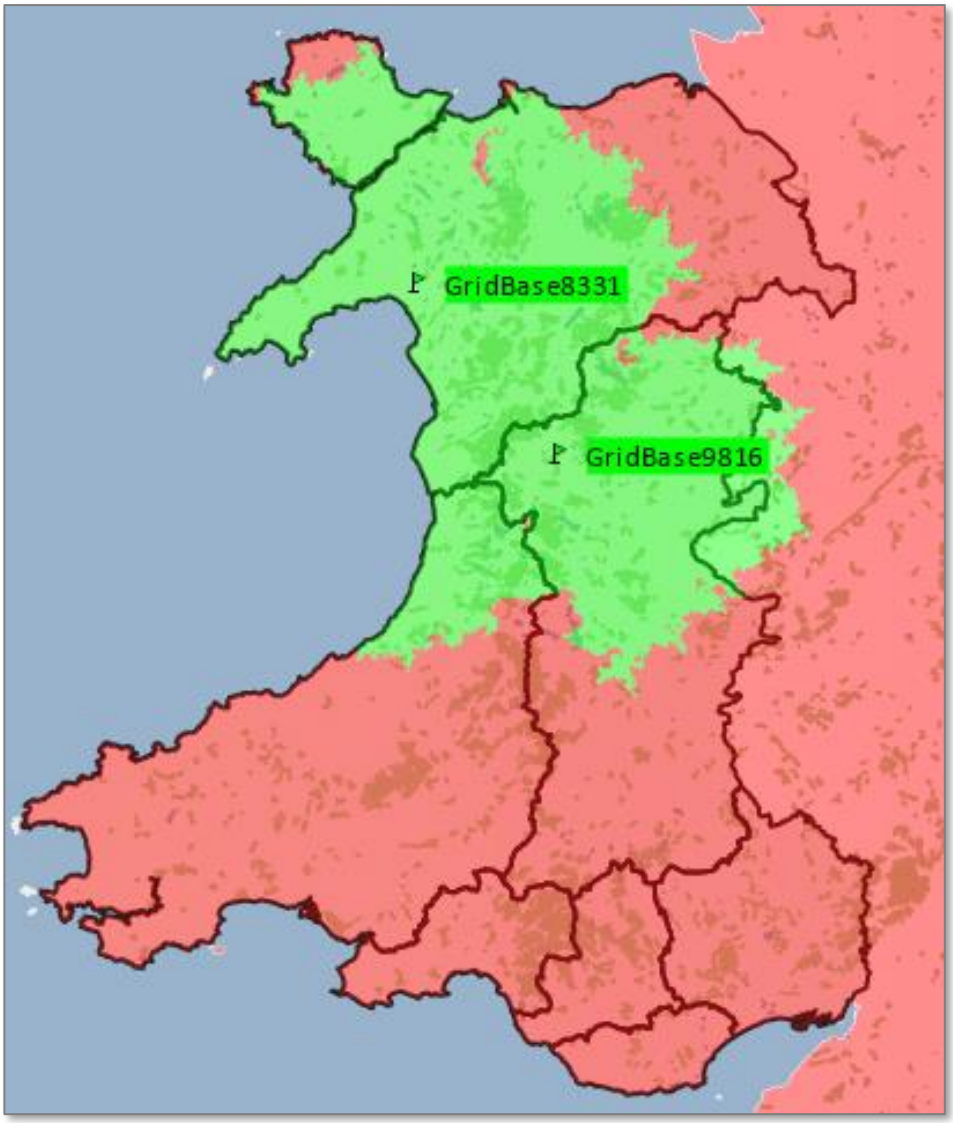




# 3 RESULTS

The map **below** shows the two base locations that give the optimal population coverage for South Gwynedd, North Ceredigion, and North Powys by two vehicles (one at each base) within 60 minutes, at lights-and-sirens speed.

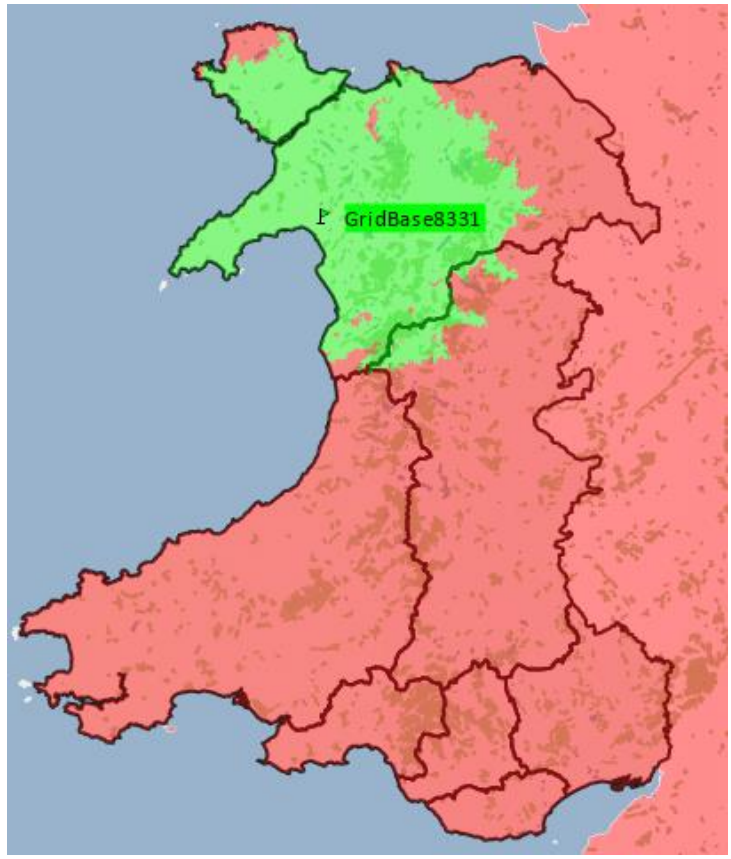
The green area represents the area that can be travelled within 60 minutes.

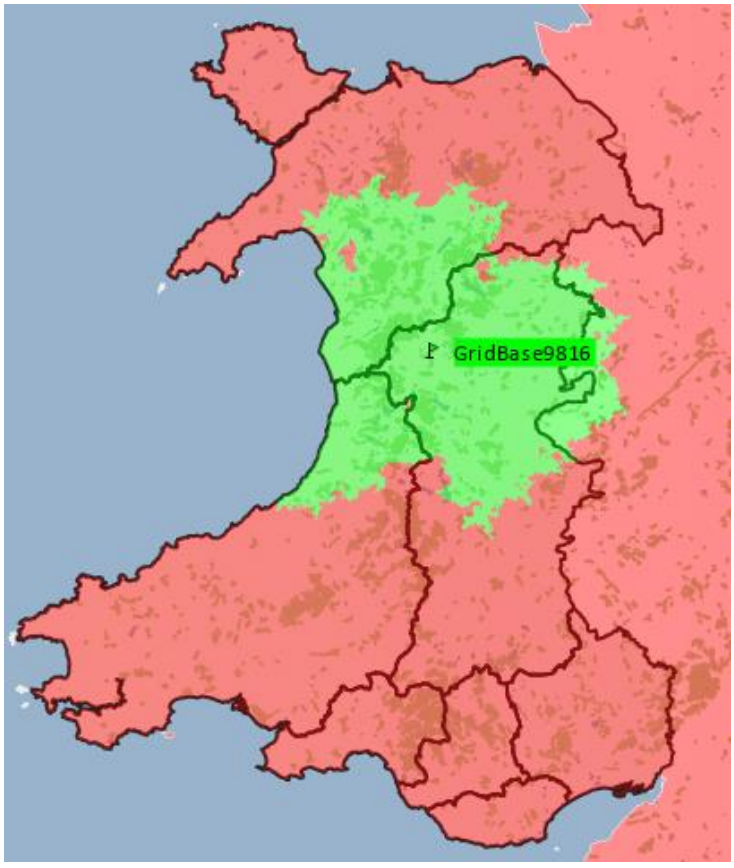



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| GridBase8331 | Porthmadog | A487 | Gwynedd |
| GridBase9816 | Llanbrynmair (east of Machynlleth) | A470 | Powys |

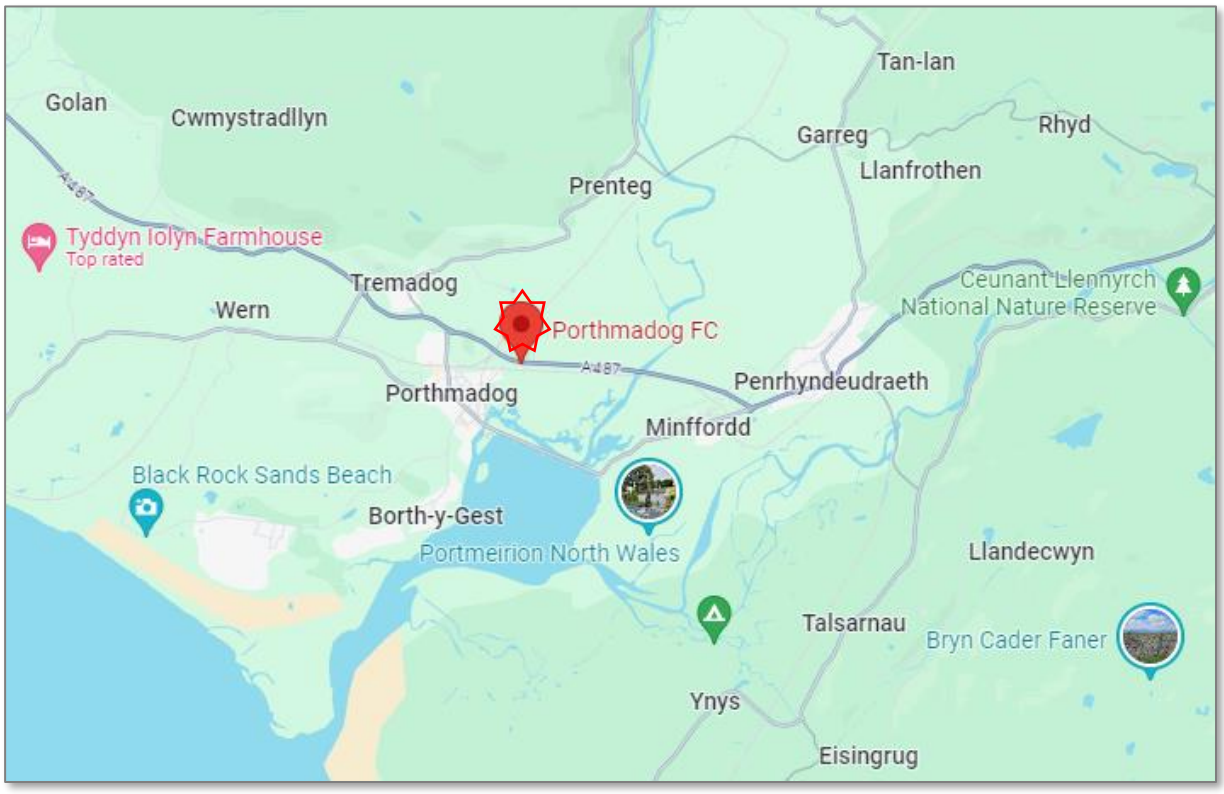
Together, these give a geographical cover of 92% and a population cover of 96% (187k people) of South Gwynedd, North Ceredigion, and North Powys.

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



The exact locations can be seen in the maps below:

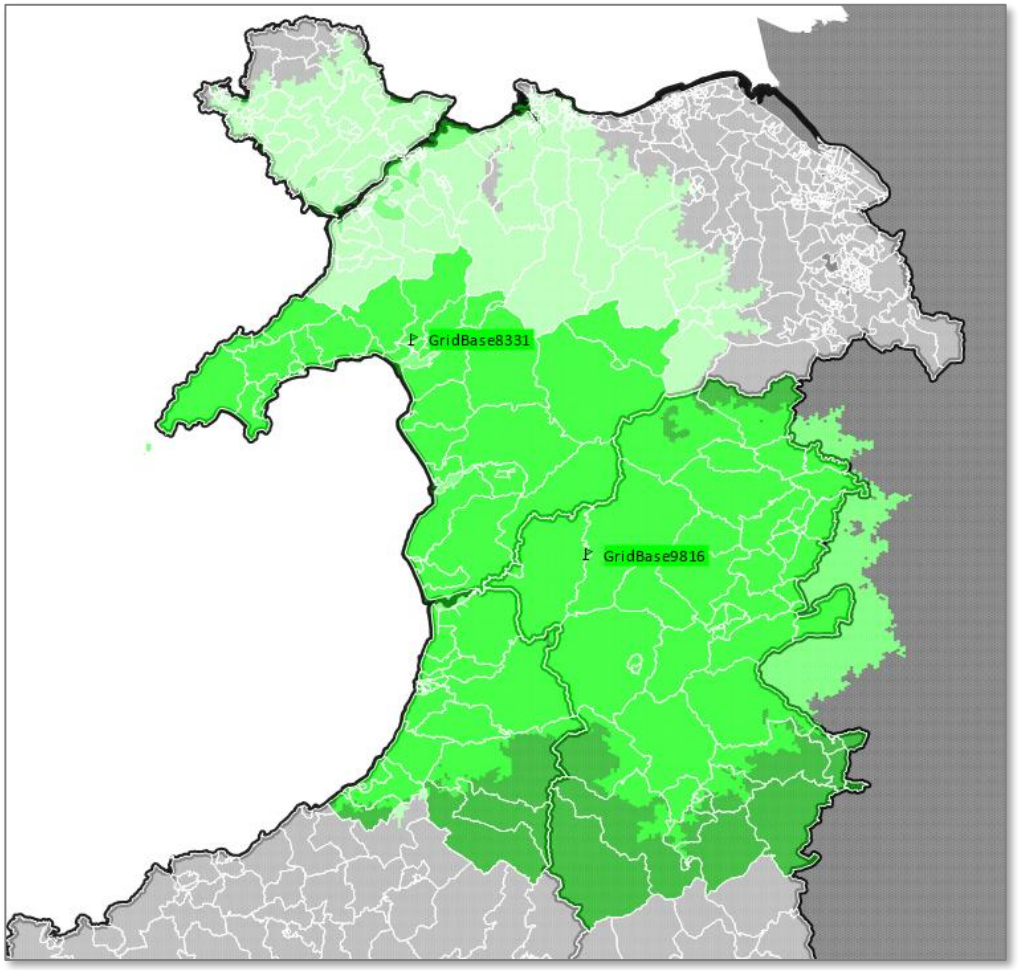



Another map of interest is shown below, where the maps on pages 12 and 13 overlap, indicating where the population that can and cannot be travelled to within the required 60 minutes can be found.

It shows the two optimal roadside locations found in section 3 (GridBase8331, GridBase9816), and where the population area of the six USOAs that the NHS Wales JCC is interested in (from page 12), overlaps with the coverage region within 60 minutes of the two optimal roadside locations (from page 13).

The mid-green and dark-green areas are those of the six USOA population areas which can and cannot be reached within 60 minutes respectively. These are the two regions to concentrate on and show where, the 92%:8% geographical coverage and 96%:4% population coverage that can and cannot be travelled to within 60 minutes of the two optimal locations, lies.

The key point is that the dark-green regions which cannot be reached within 60 minutes contain a very small proportion (4%) of the population of the analysed region. These are found in the northeast of Powys (west of Oswestry), and a strip between northeast Ceredigion and central Powys (between Tregaron and Knighton).



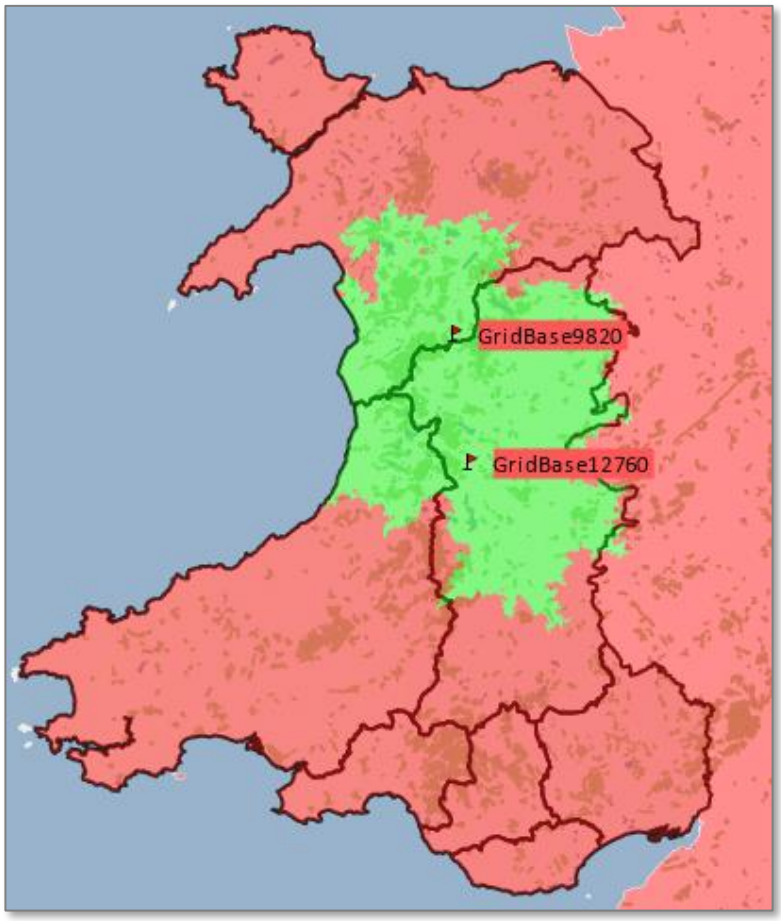
# 4 SENSITIVITY MODELLING

What would the results look like if the need was for the two best locations for optimal coverage within a shorter timeframe than the 60 minutes explored above?

Below we investigate the coverage for a 30-minute and a 45-minute travel duration.

## 4.1 45-minute Coverage

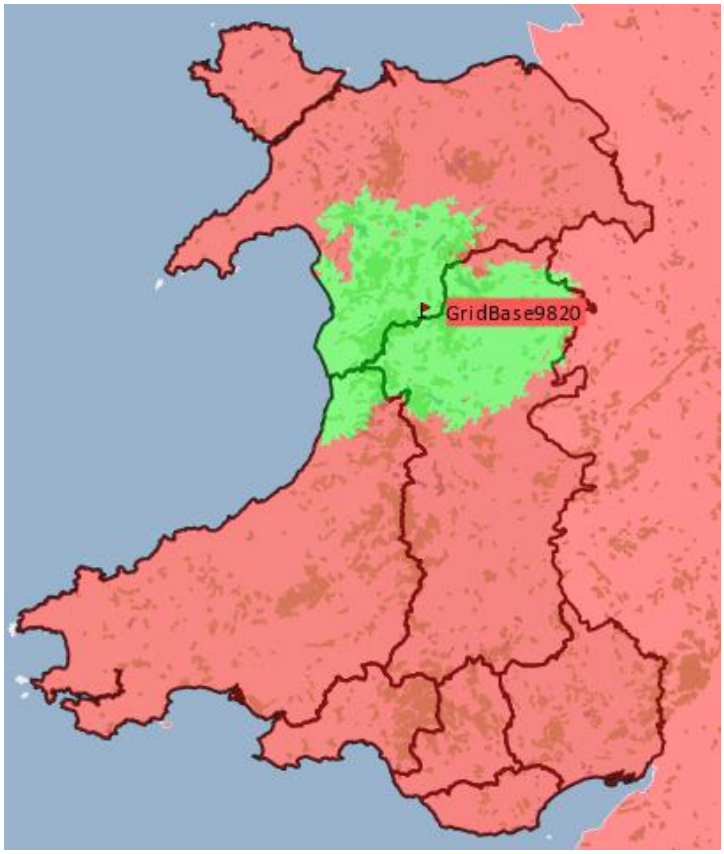
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 45 minutes.

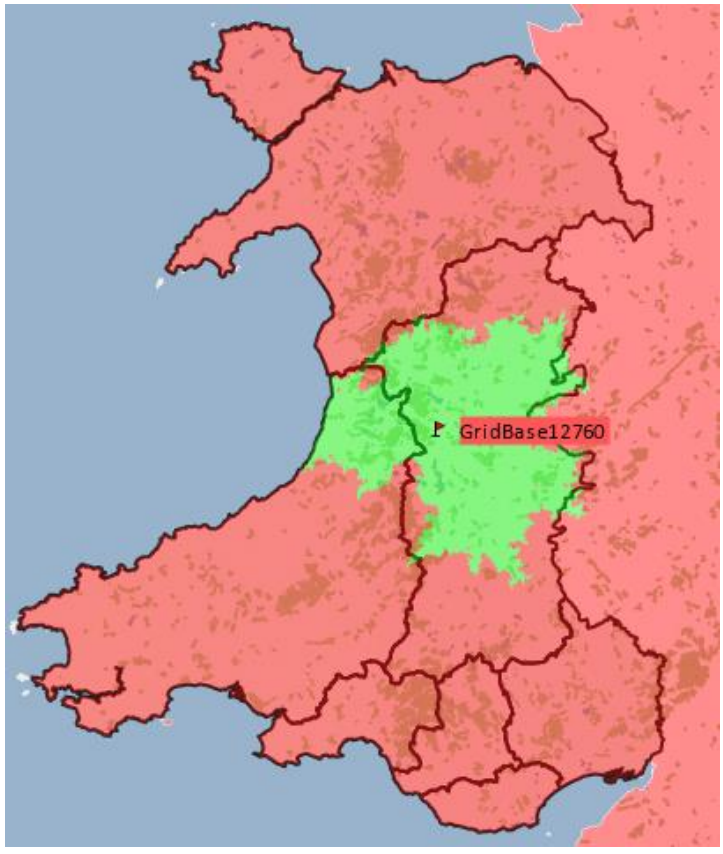



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| GridBase9820 | Mallwyd (east of Dolgellau) | A458 | Gwynedd |
| GridBase9816 | Llangurig (southwest of Llanidloes) | A470 | Powys |

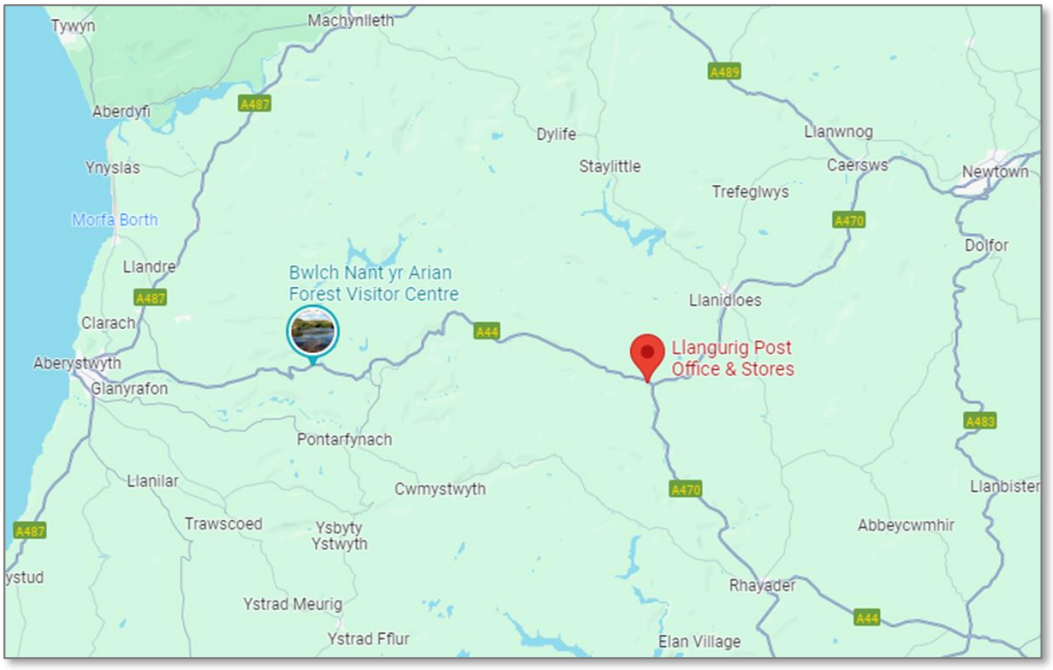
Together, these give a geographical cover of 81% and a population cover of 85% (166k people) of South Gwynedd, North Ceredigion, and North Powys. In comparison, the 60-minute coverage analysis gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 45-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



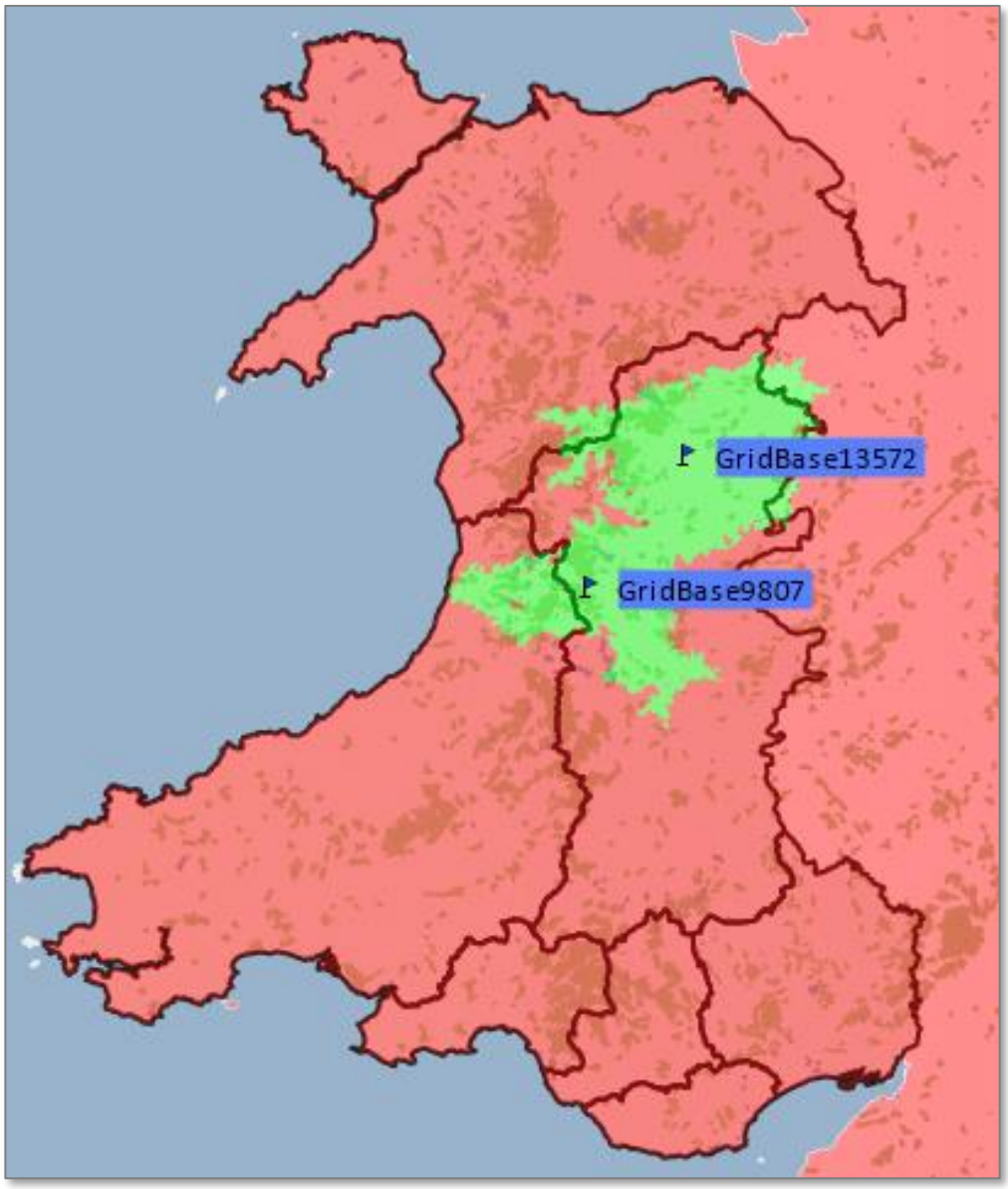



The exact locations can be seen in the maps below:

## 4.2 30-minute Coverage

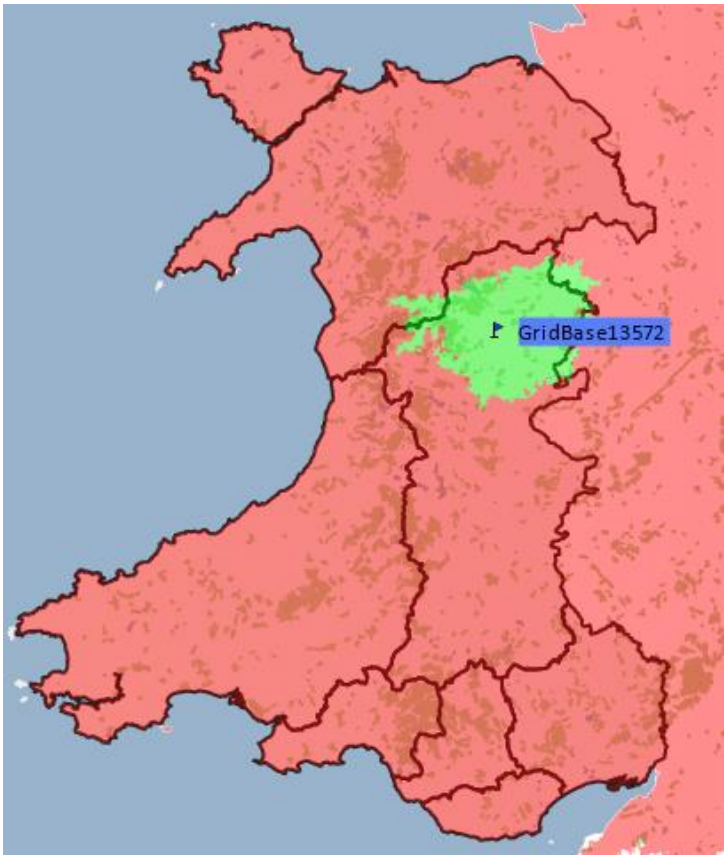
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 30 minutes.

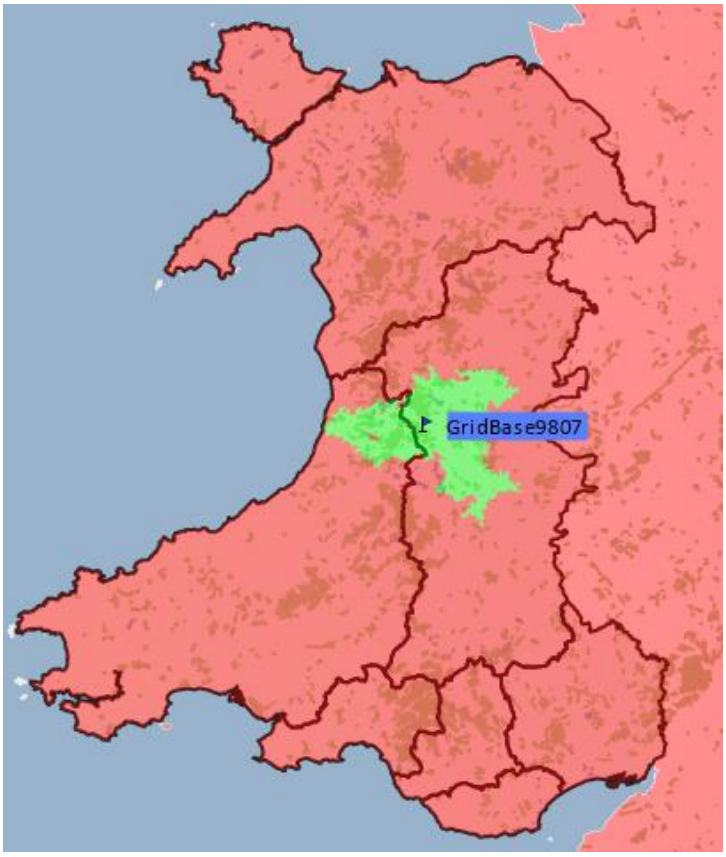



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| GridBase13572 | Four Crosses (west of Welshpool) | A458 | Powys |
| GridBase9807 | Tyn y cwm (southwest of Llanidloes) | A44 | Powys |

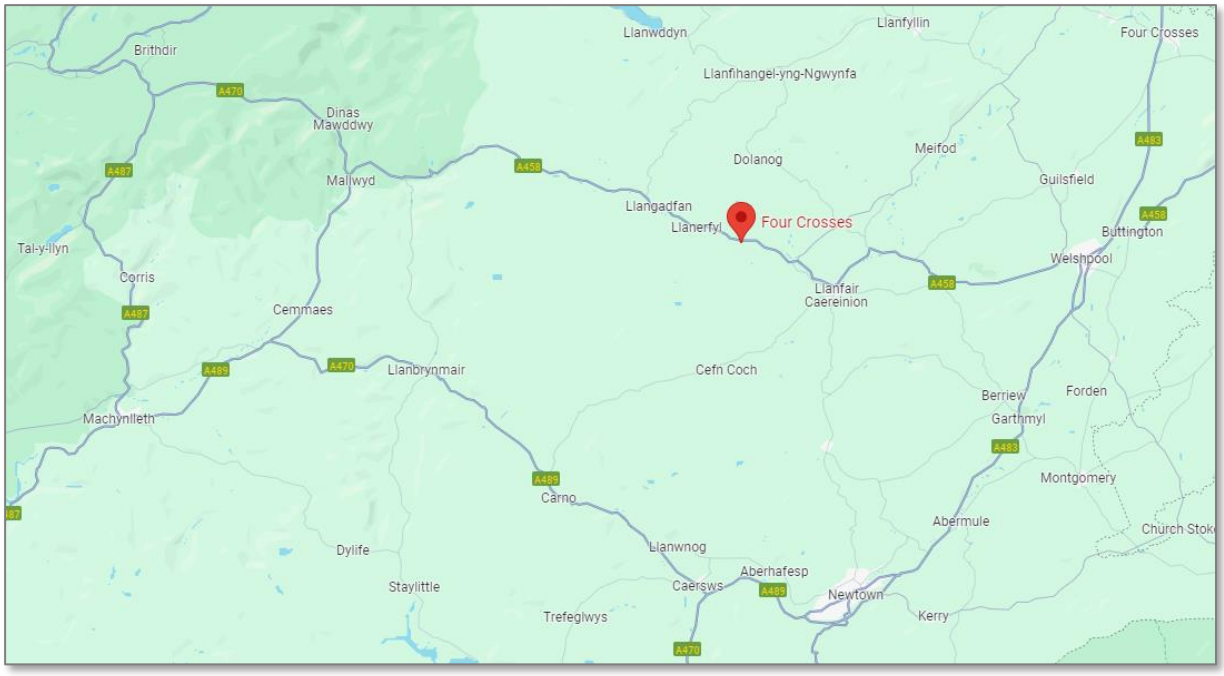
Together, these give a geographical cover of 44% and a population cover of 50% (98k people) of South Gwynedd, North Ceredigion, and North Powys. In comparison, the 45-minute coverage analysis gave corresponding geographical and population coverages of 81% and 85% (166k people), and the 60-minute gave 92% and 96% (187k people).

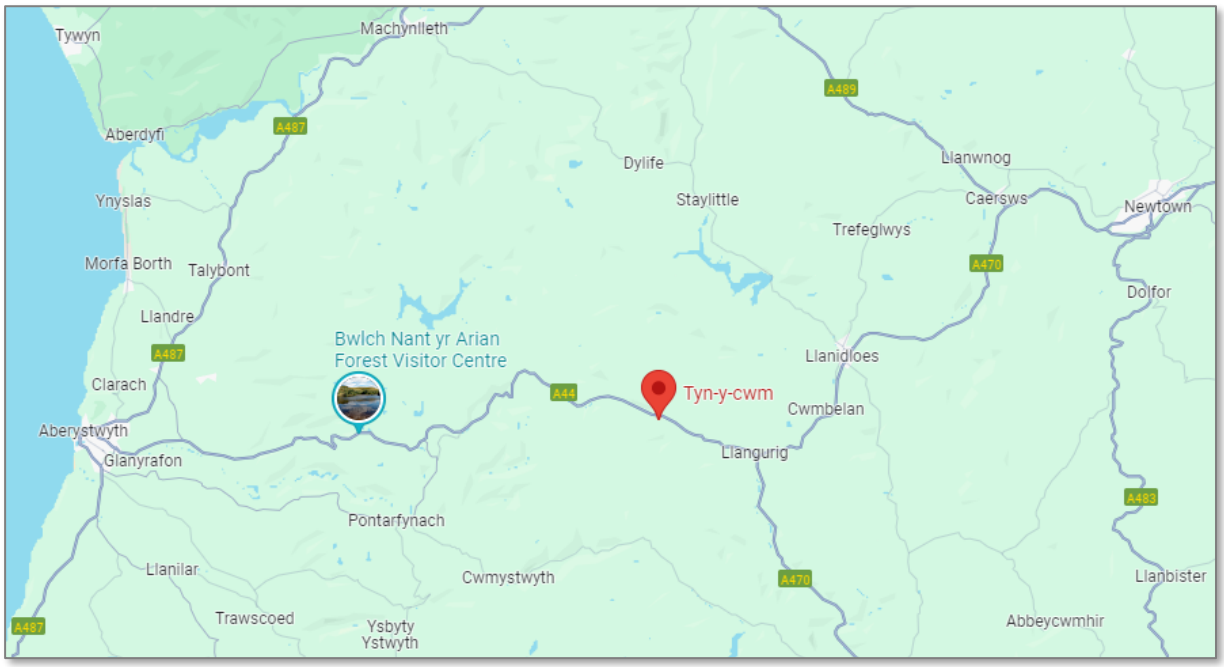
Individually, the 30-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



The exact locations can be seen in the maps below:

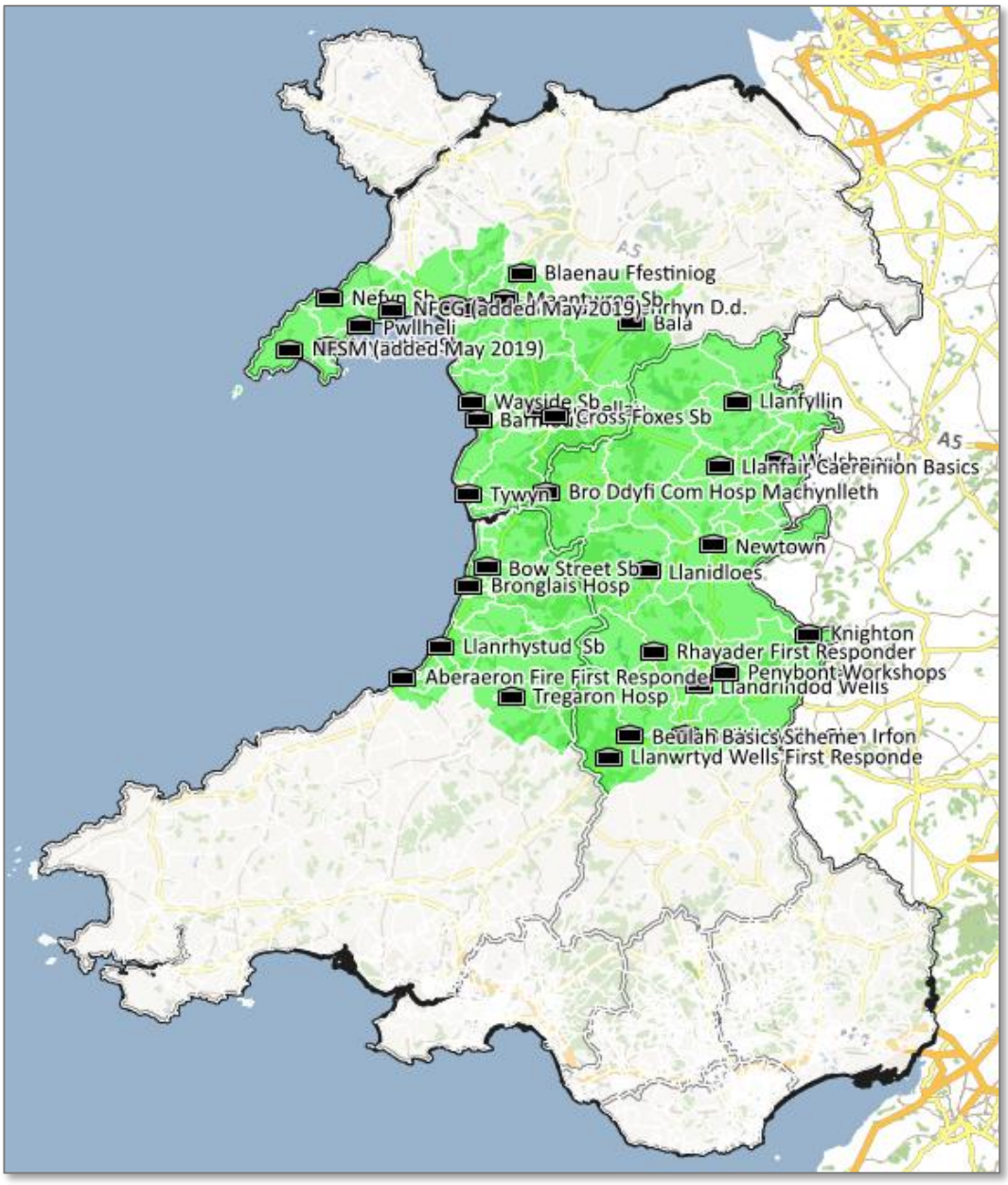


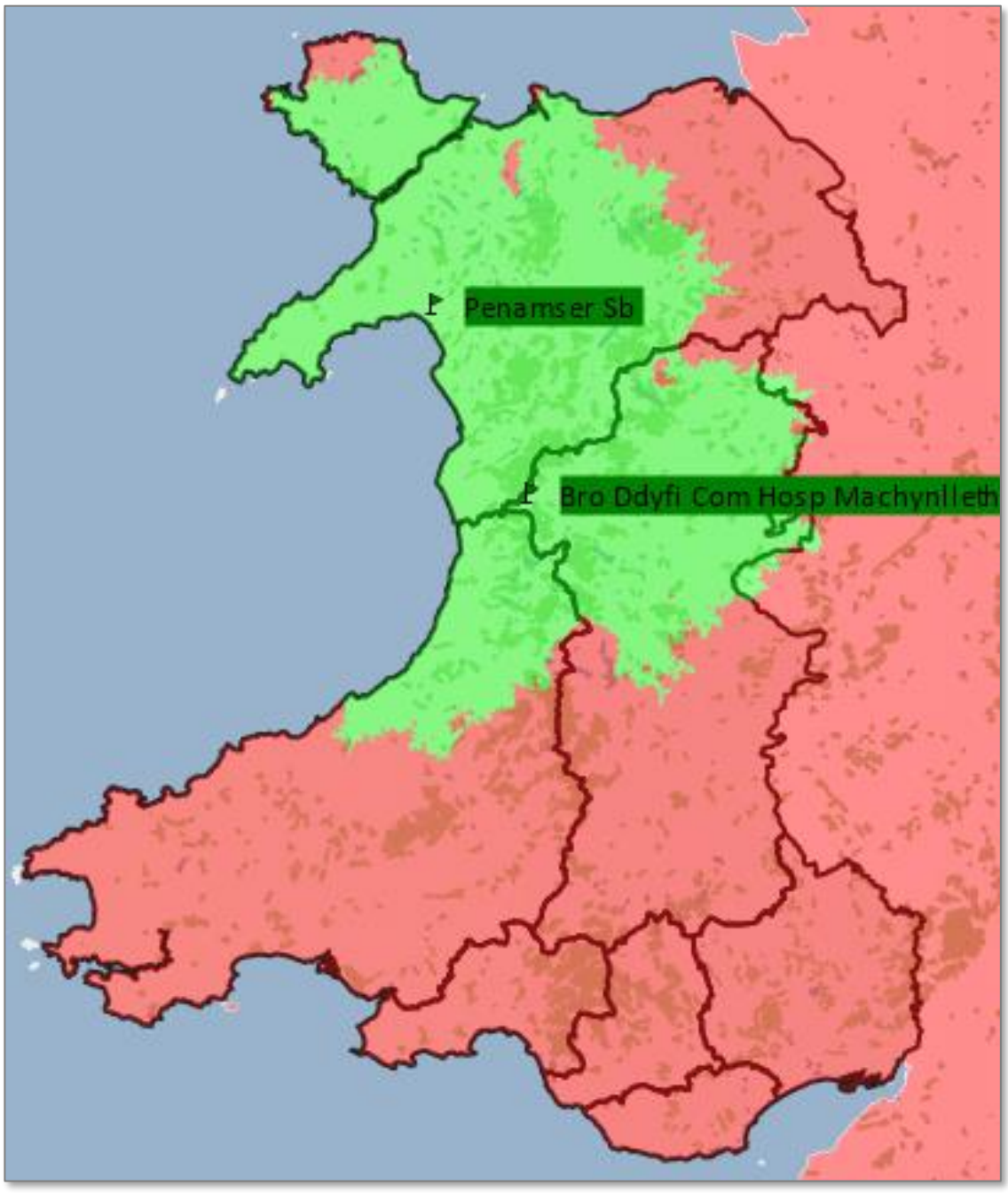
## 4.3 Hospitals, Stations, Standbys & 60-minute Coverage

Rather than find the best roadside location and utilise the 100 x 100 GridBase, what if the best locations from current base stations, hospitals, or standbys want to be found?

The map below shows this set of current base stations covering the relevant part of Wales.



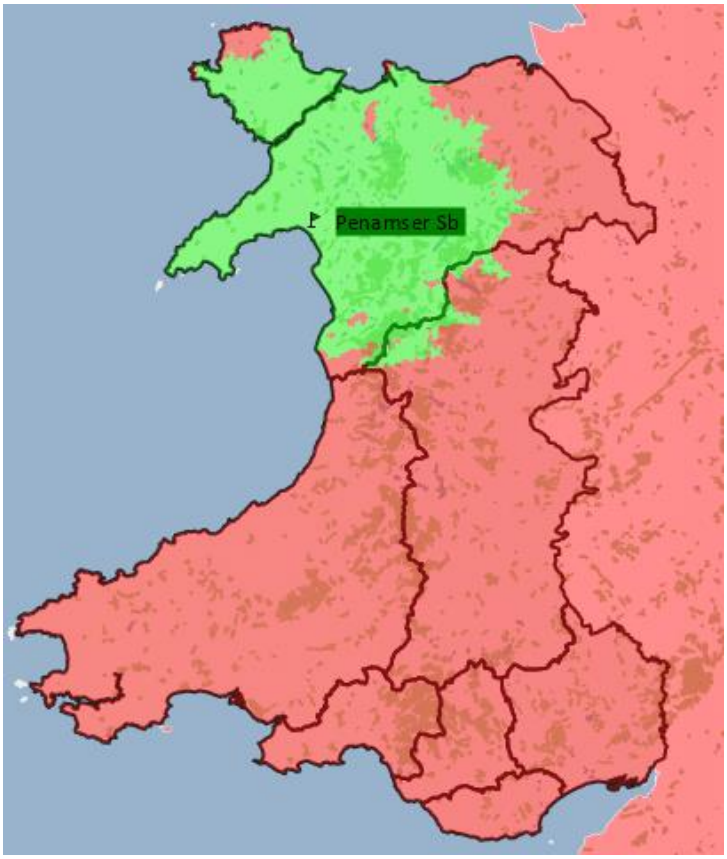
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

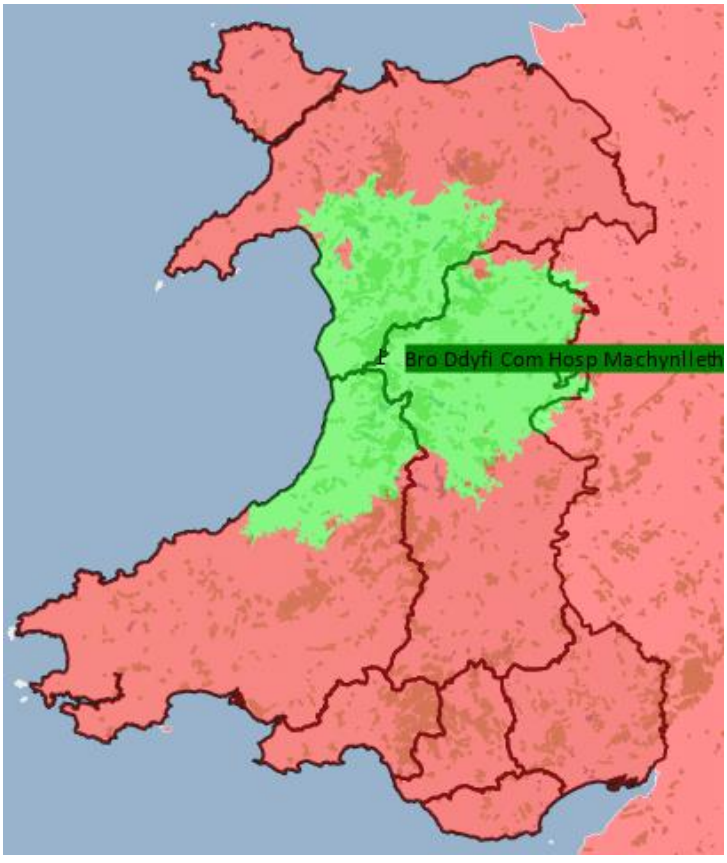



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Penamser Sb | Porthmadog | A497 | Gwynedd |
| Bro Ddyfi Com Hospital | Machynlleth | A498 | Powys |

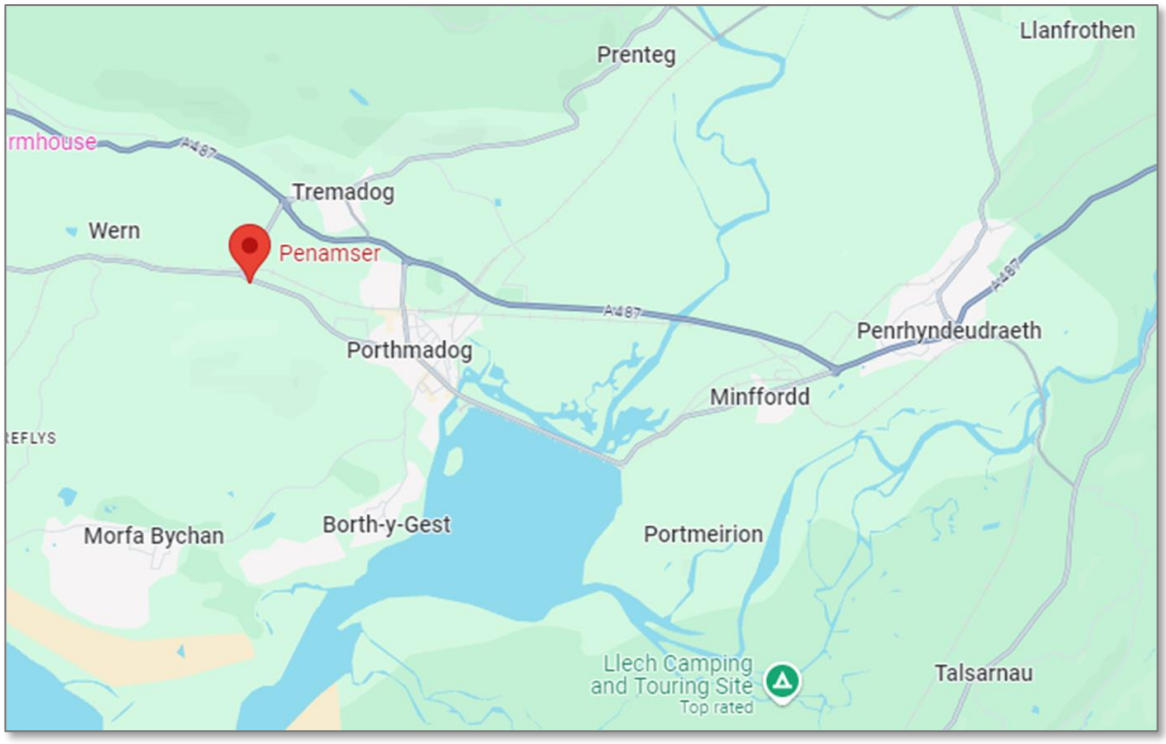
Together, these give a geographical cover of 89% and a population cover of 90% (176k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

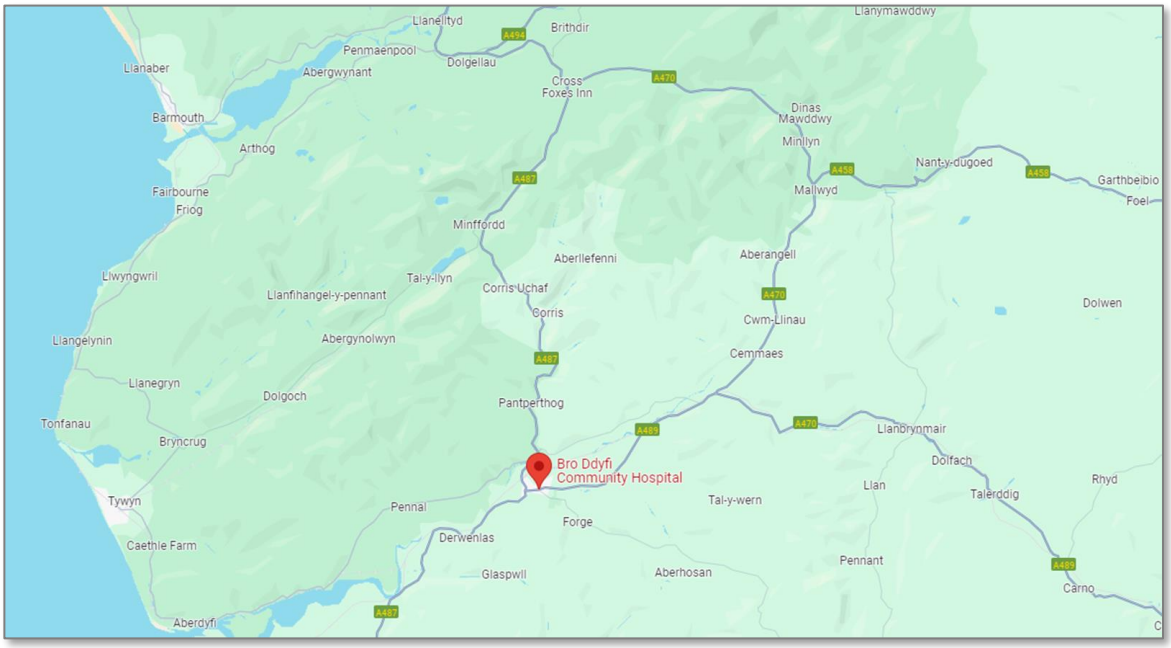
Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



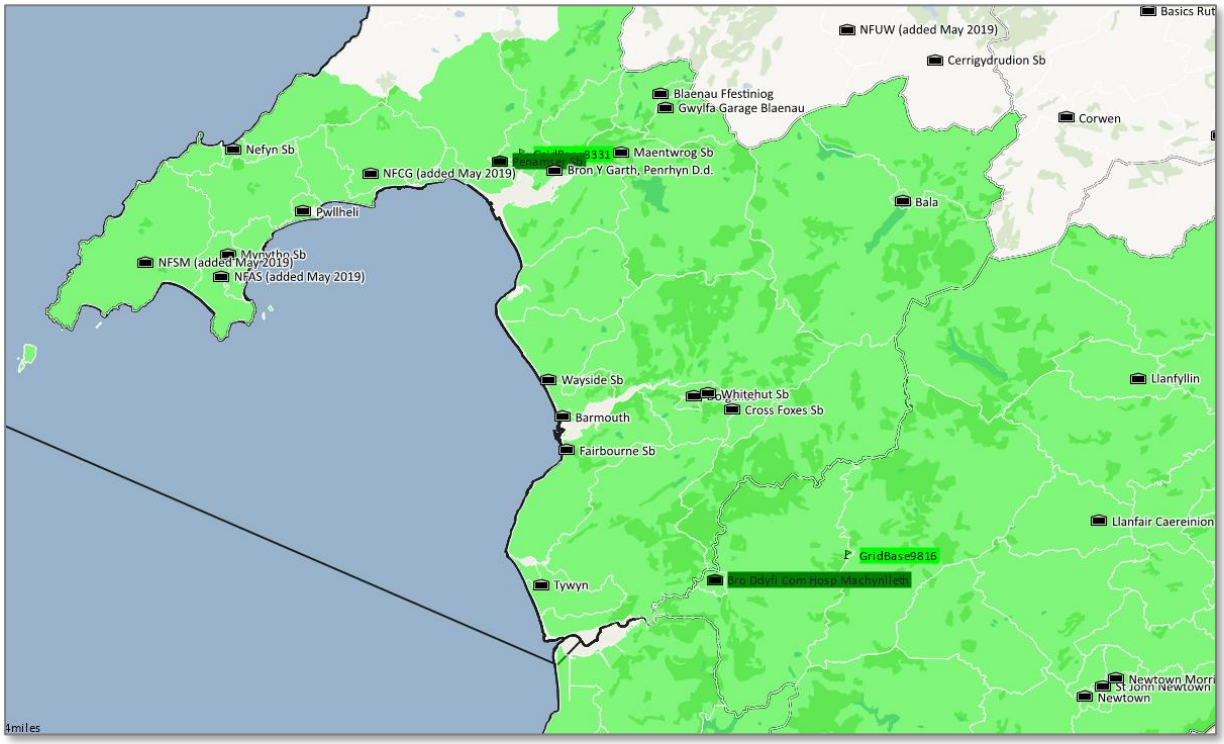



The exact locations can be seen in the maps below:



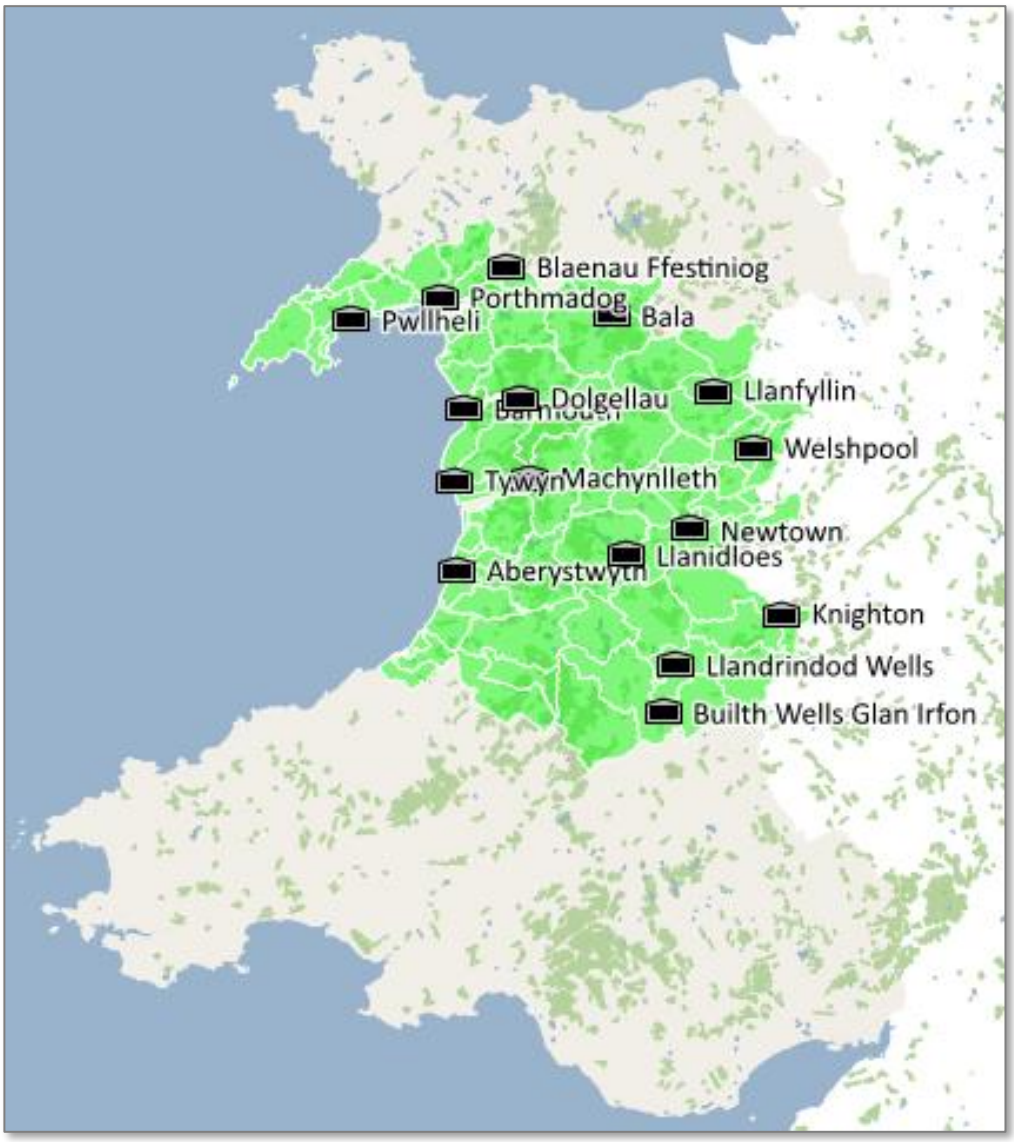
The best base stations seem to be those nearest to the original optimal roadside locations. This is indeed true, and the map below confirms this. It shows all base stations, the optimal two of them (dark-green, and the original optimal roadside locations (light-green).



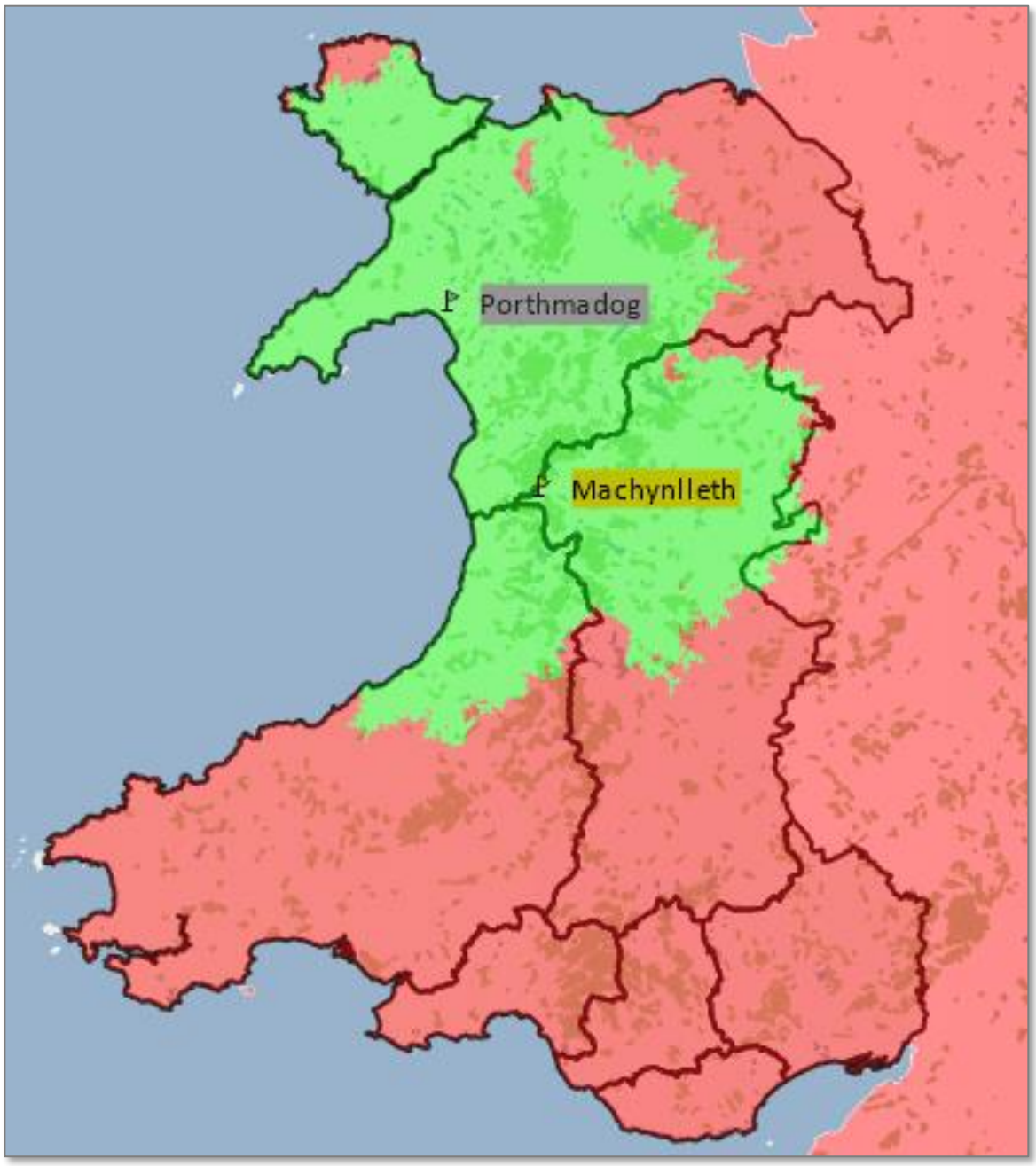
## 4.4 Current Manned Stations & 60-minute Coverage

Rather than find the best roadside location and utilise the 100 x 100 GridBase, what if we want to use only the current manned stations where vehicles are deployed from (no hospitals or standbys)?

The map below shows this set of current base stations covering the relevant part of Wales.



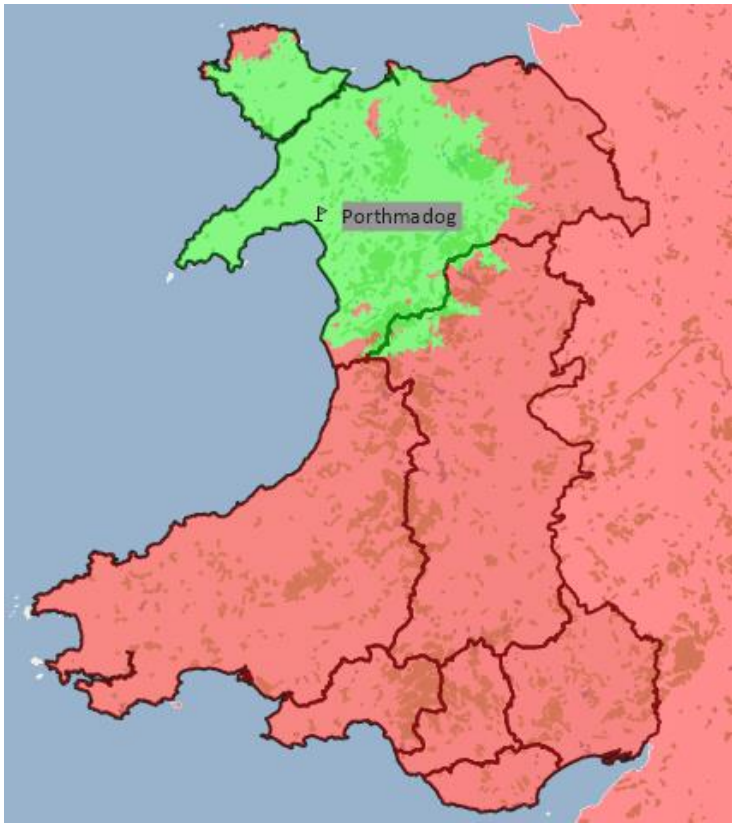
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

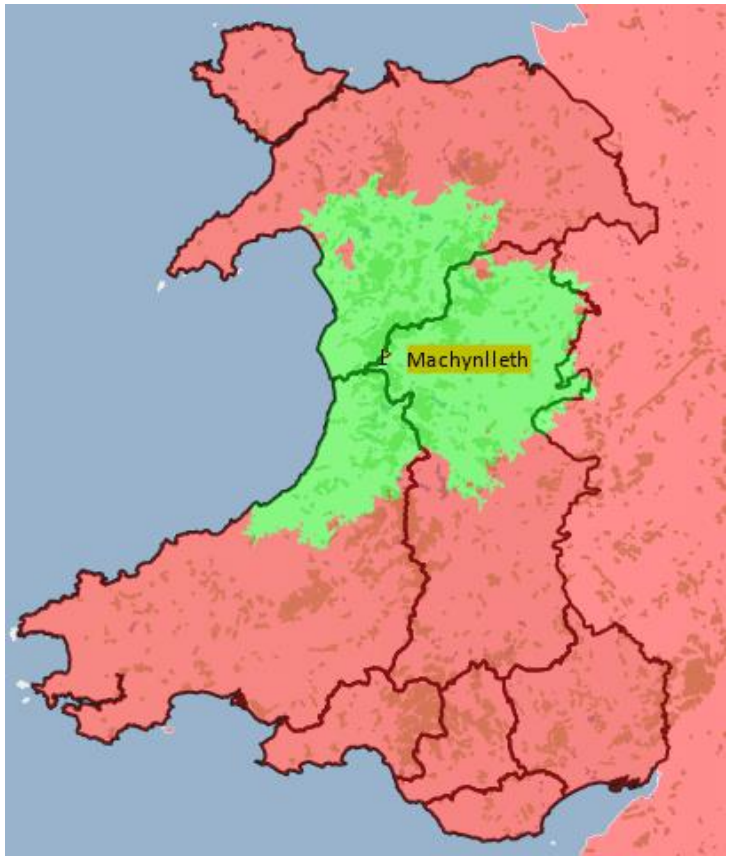



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Porthmadog | Porthmadog | A497 | Gwynedd |
| Machynlleth | Machynlleth | A498 | Powys |

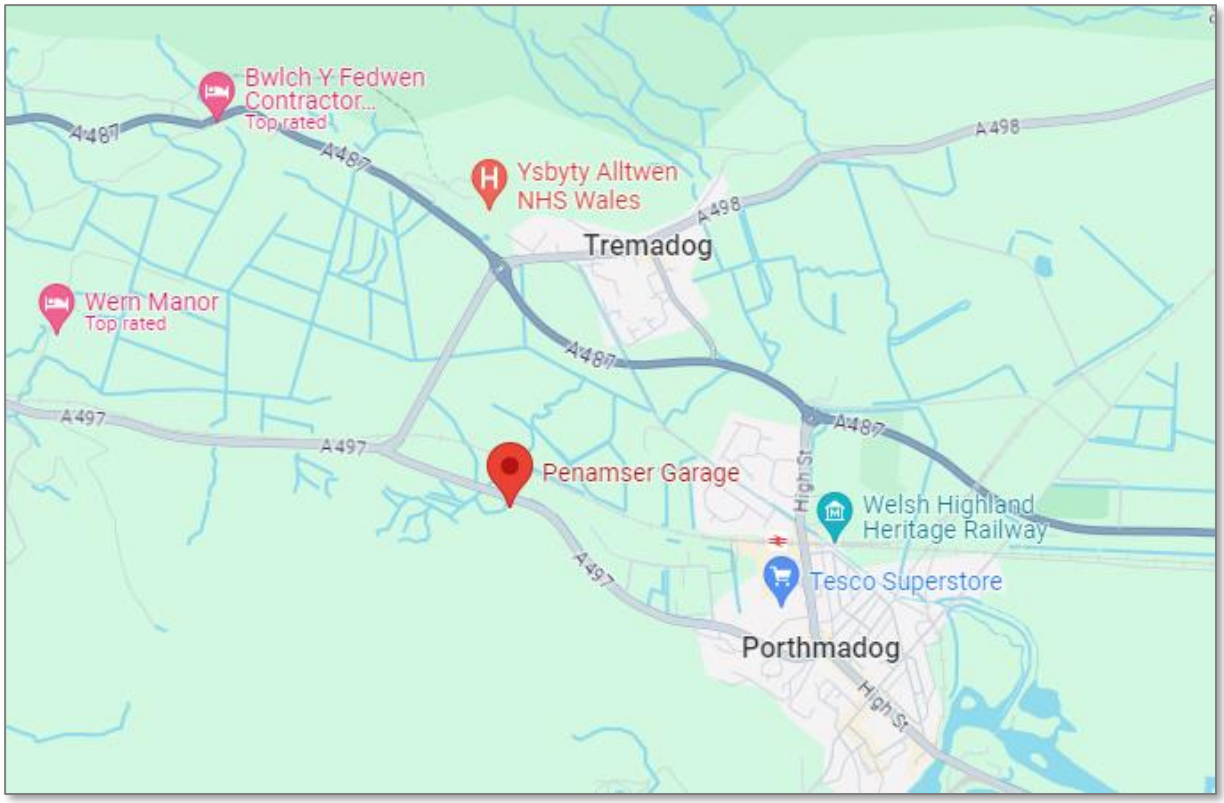
Together, these give a geographical cover of 89% and a population cover of 89% (174k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:

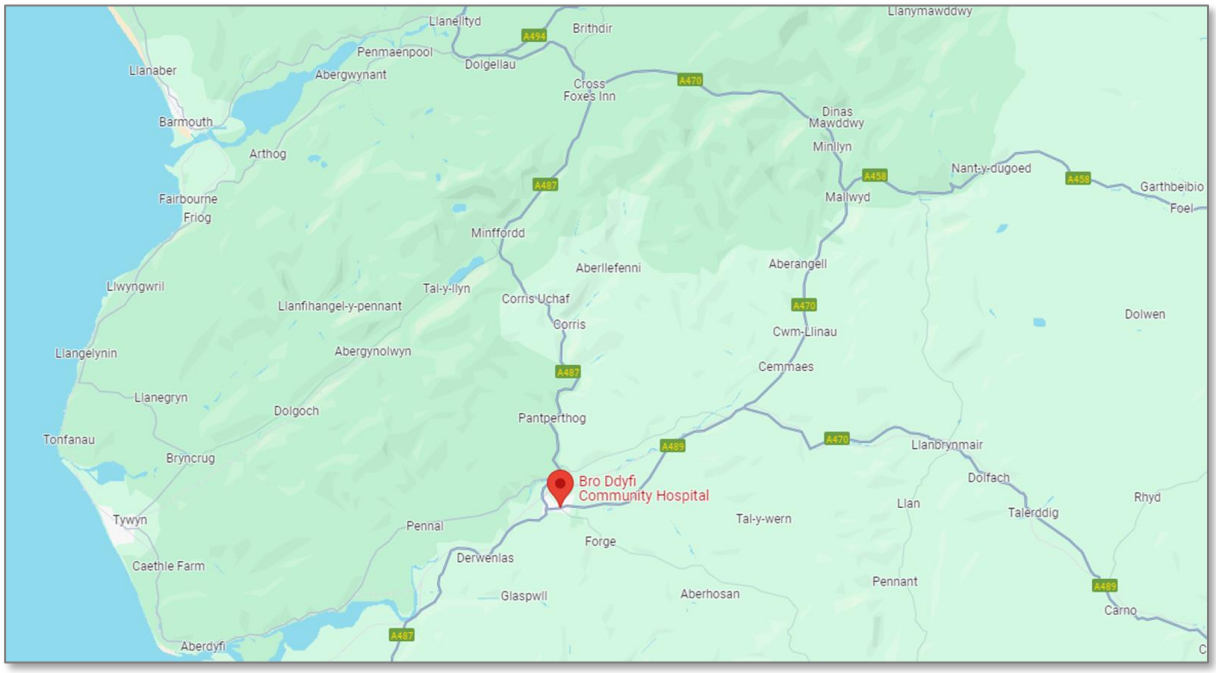


The exact locations can be seen in the maps below:




The 'Porthmadog' station is very near the 'Penamser Garage' marked on the map.




The 'Machynlleth' station is at the same location as the 'Bro Ddyfi Community Hospital'.

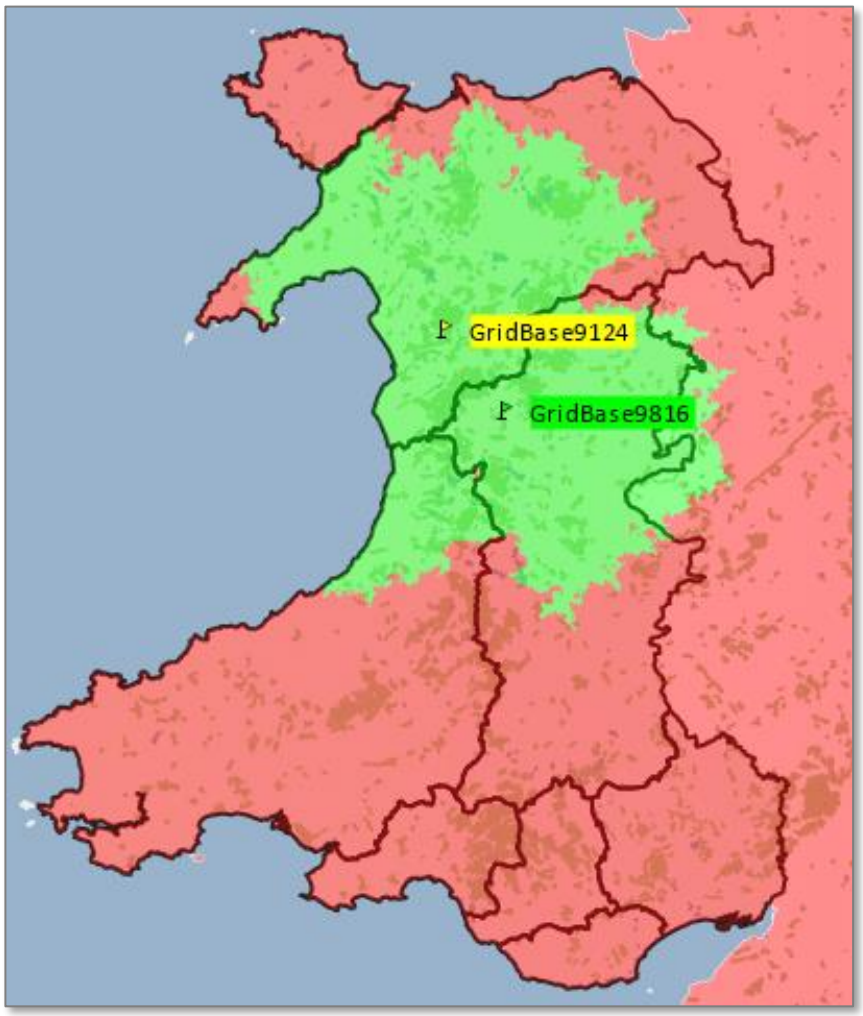
Again, the best stations are those nearest to the original optimal roadside locations.

## 4.5 30%, 50% Utilisations & 60-minute Coverage

So far, all results have used 0% utilisation (busyness) of vehicles, assuming both are available continuously to respond to the demand. This may not be possible in practice, and therefore this section considers increasing the vehicles' utilisation (busyness) to 30% and 50%.

**30% Utilisation**

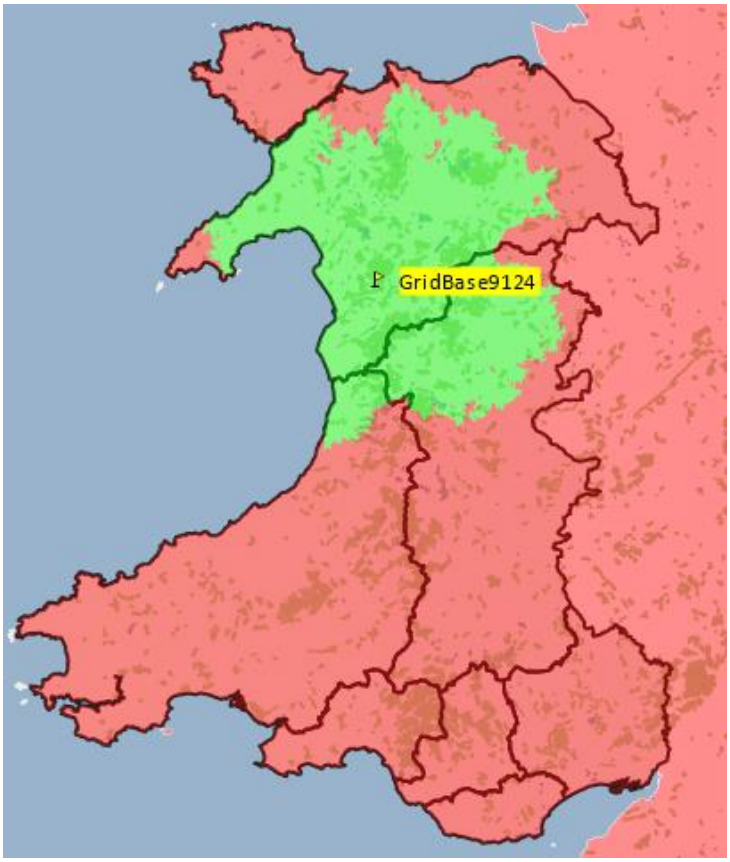
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

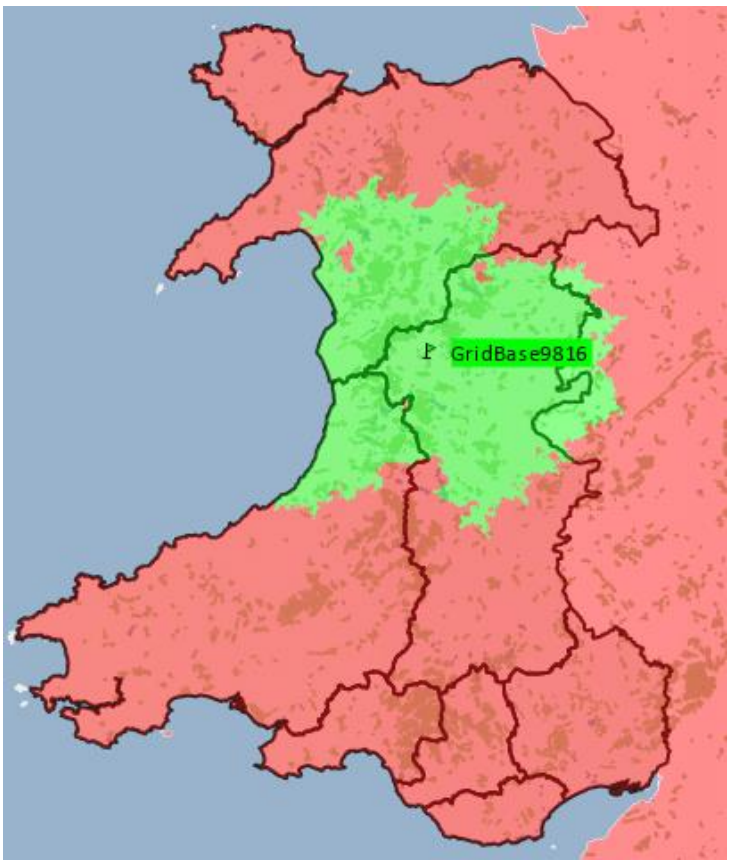



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| GridBase9124 | Llanelltyd (north of Dolgellau) | A470 | Gwynedd |
| GridBase9816 | Llanbrynmair (east of Machynlleth) | A470 | Powys |

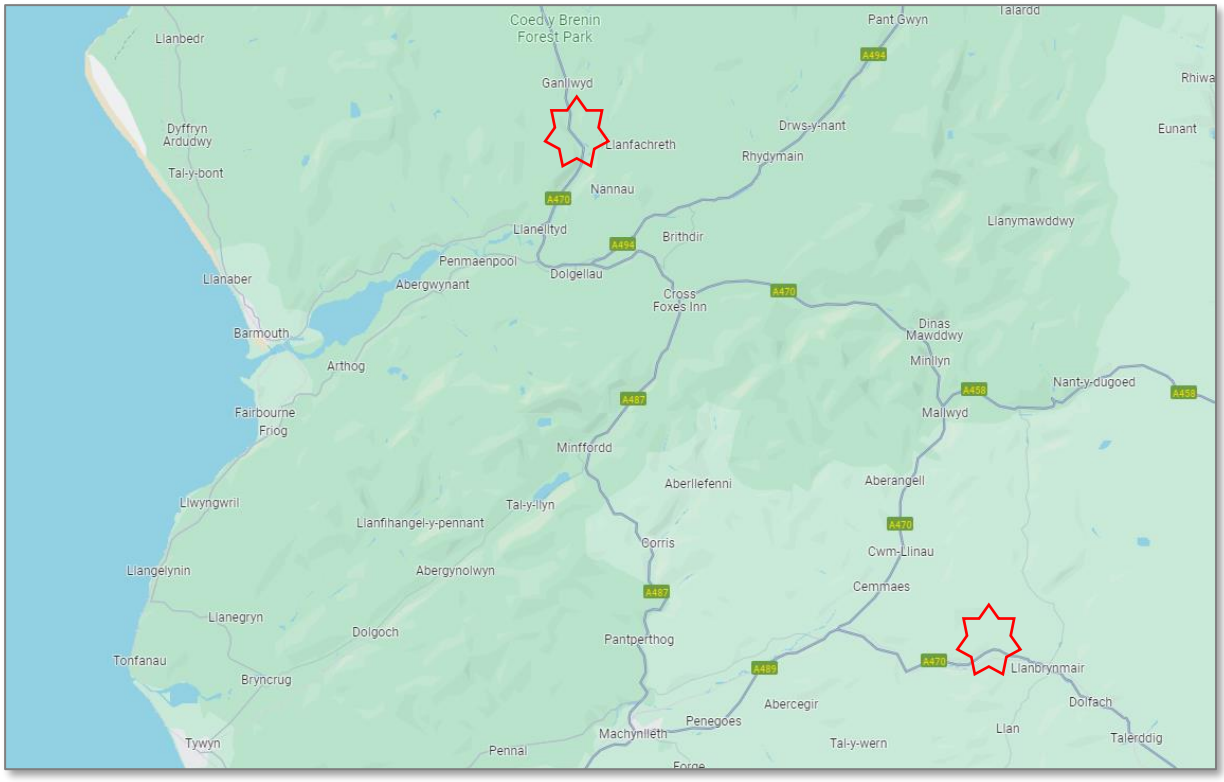
Together, these give a geographical cover of 90% and a population cover of 94% (183k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 0% utilisation with a 60-minute coverage analysis gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



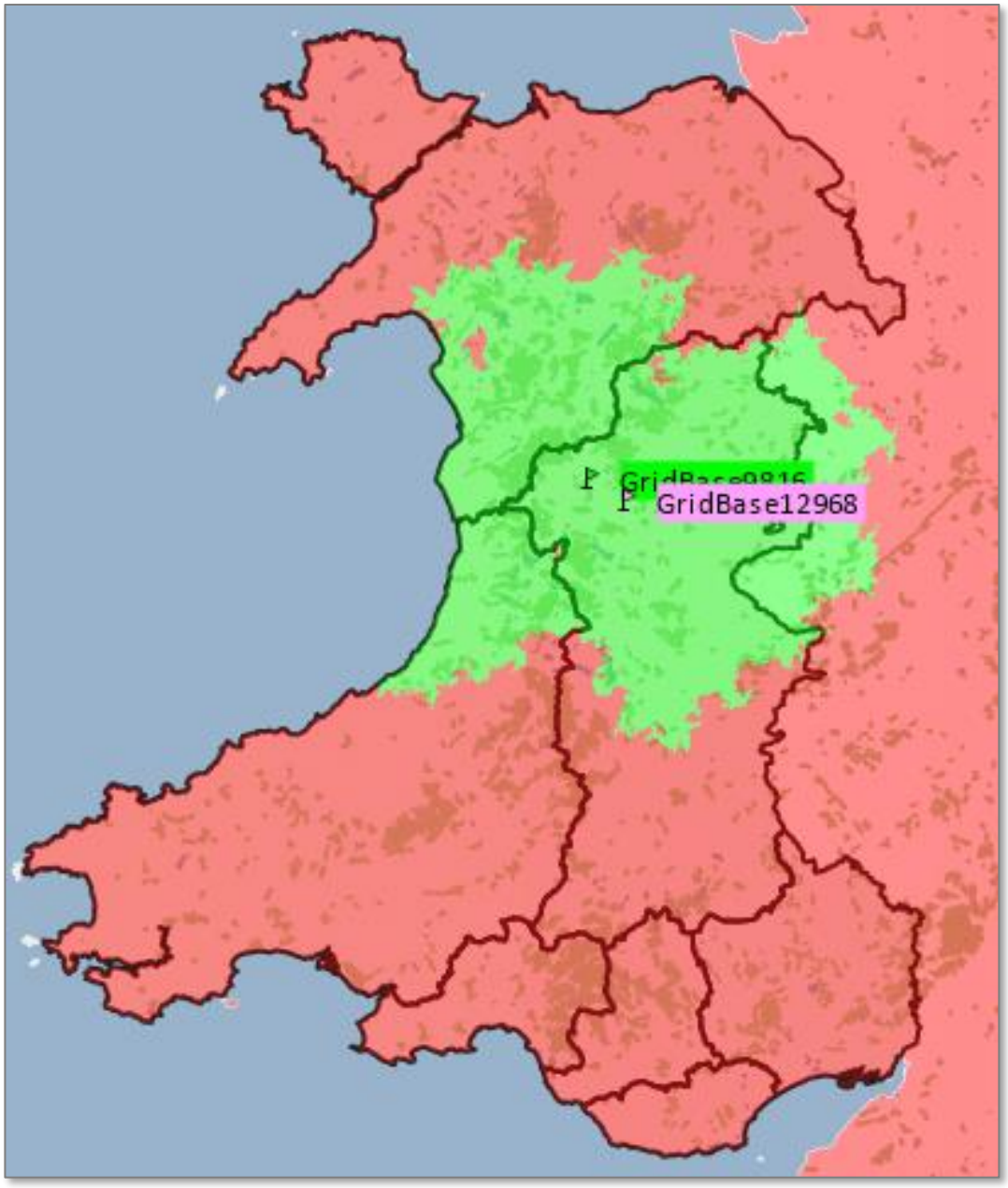
The exact locations can be seen in the maps below:




The two best locations found here are closer to one another than at 0% utilisation. The increase in busyness from 0% to 30% has retained the "best" location (GridBase9816) and moved the other location nearer to it than it was at the 0% location.

### 50% Utilisation

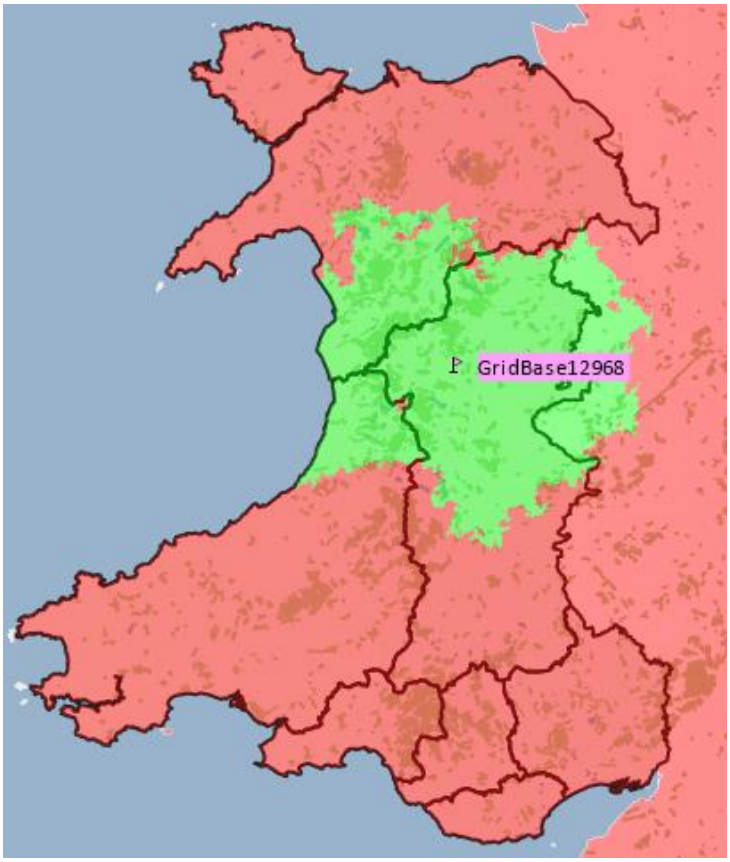
The two best locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

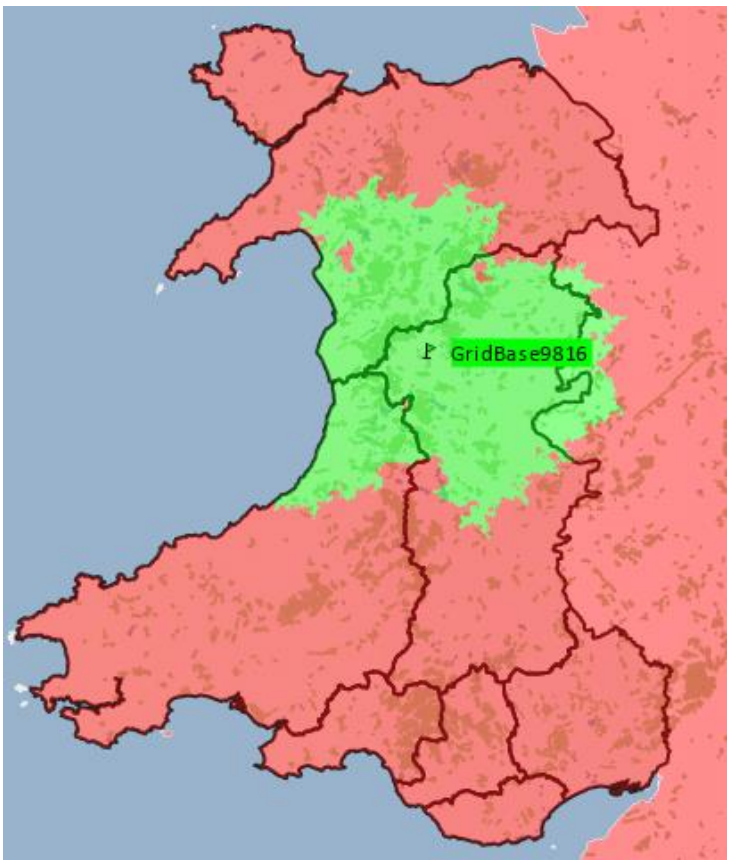



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| GridBase9816 | Llanbrynmair (east of Machynlleth) | A470 | Powys |
| GridBase12968 | Talerddig (east of Machynlleth) | A470 | Powys |

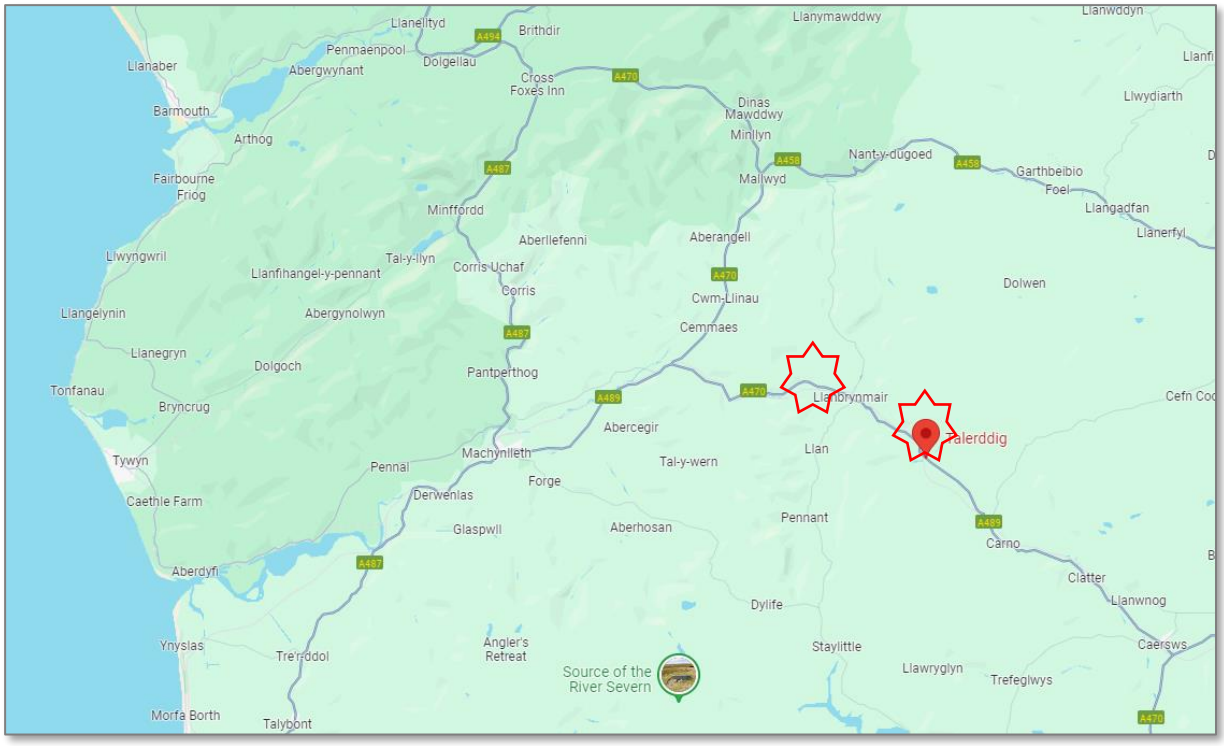
Together, these give a geographical cover of 84% and a population cover of 88% (172k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 0% utilisation and 60-minute coverage analysis gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



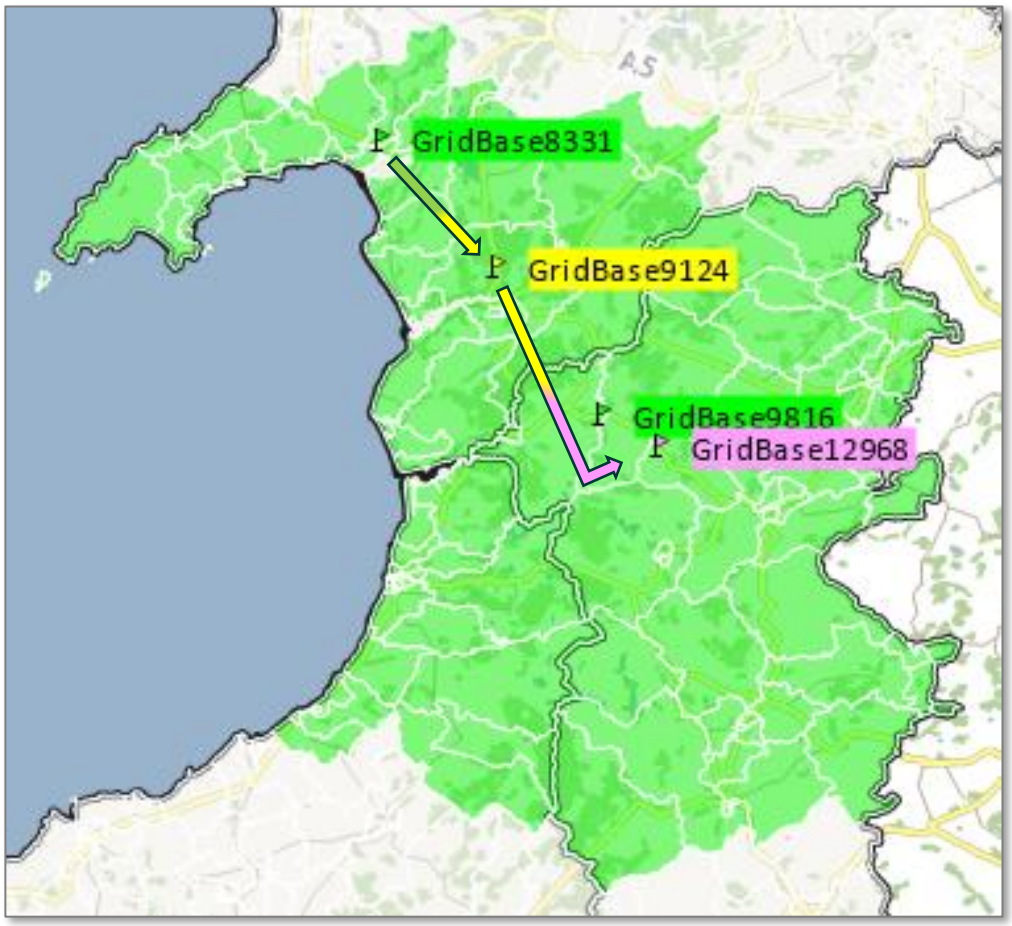



The exact locations can be seen in the maps below:




The two best locations found here are very close to one another. The increase in busyness from 0% to 50% has placed them in almost the same location. This is because the optimal single location is GridBase9816 which is retained from the 0% scenario and the second location moves very close to it to cover it while the other vehicle is busy.

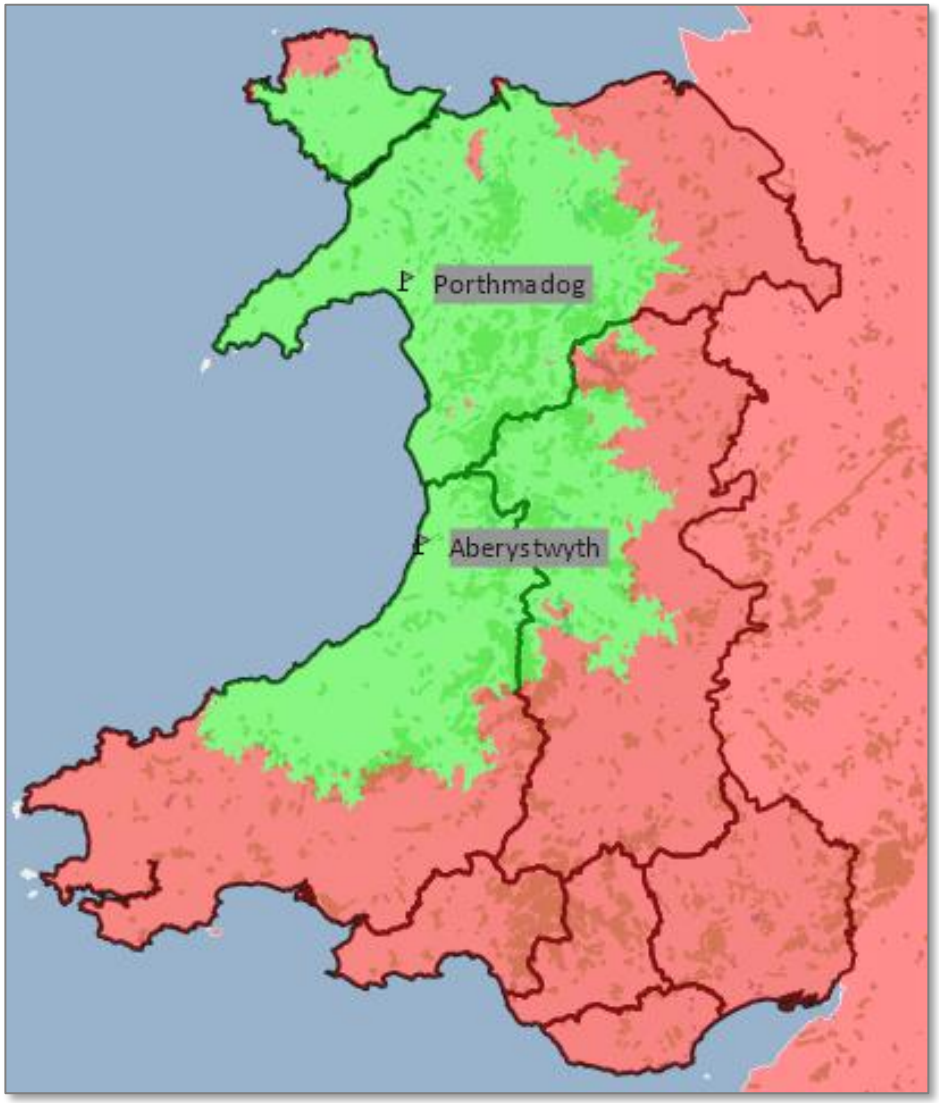
The map below highlights this. GridBase9816 is the best location for the 60-minute coverage (when only one vehicle is used) and remains part of the optimal pair of locations for all utilisations. The second location of the optimal pairs is also shown for each of the 0% (green flag), 30% (yellow flag), and 50% (pink flag) utilisations. As the utilisation (busyness) of the vehicles increases, the second optimal location of the pair gets closer and closer to the best location of GridBase9816.



## 4.6 Chosen pair of locations 1 (Porthmadog & Aberystwyth)

A manually selected pair of locations of the current base stations in the large towns of Porthmadog and Aberystwyth is chosen to see how the results compare to more optimally chosen locations.

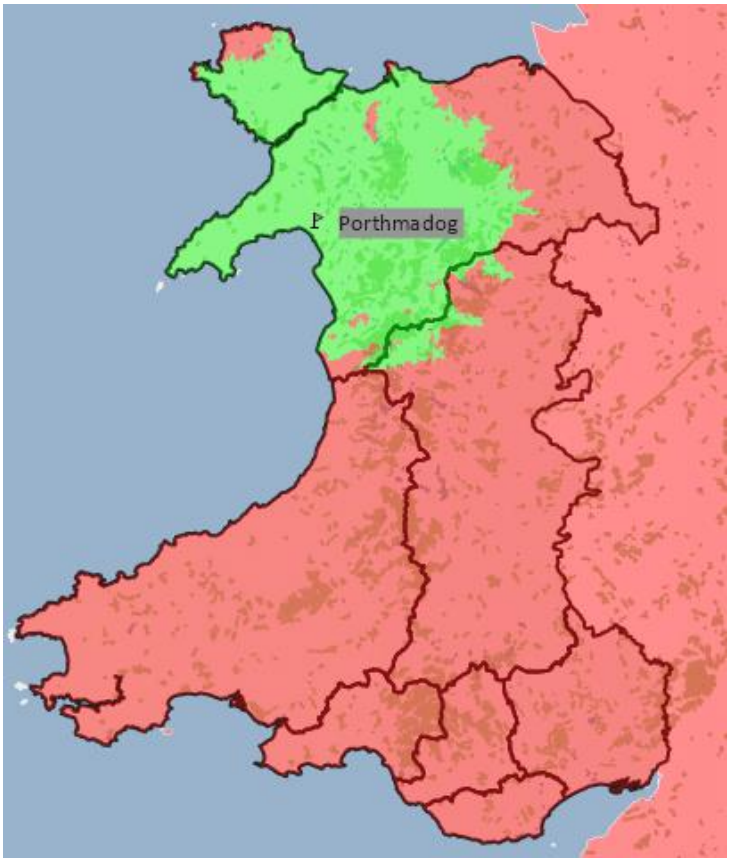
The two locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

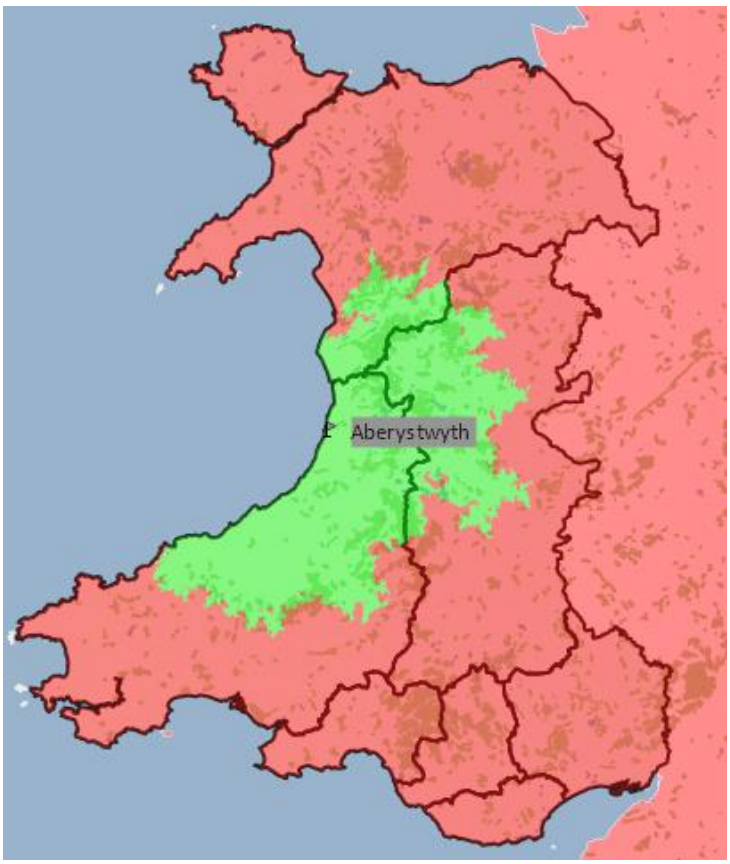



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Porthmadog | Porthmadog | A497 | Gwynedd |
| Aberystwyth | Aberystwyth | A44 | Ceredigion |

Together, these give a geographical cover of 73% and a population cover of 77% (150k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:

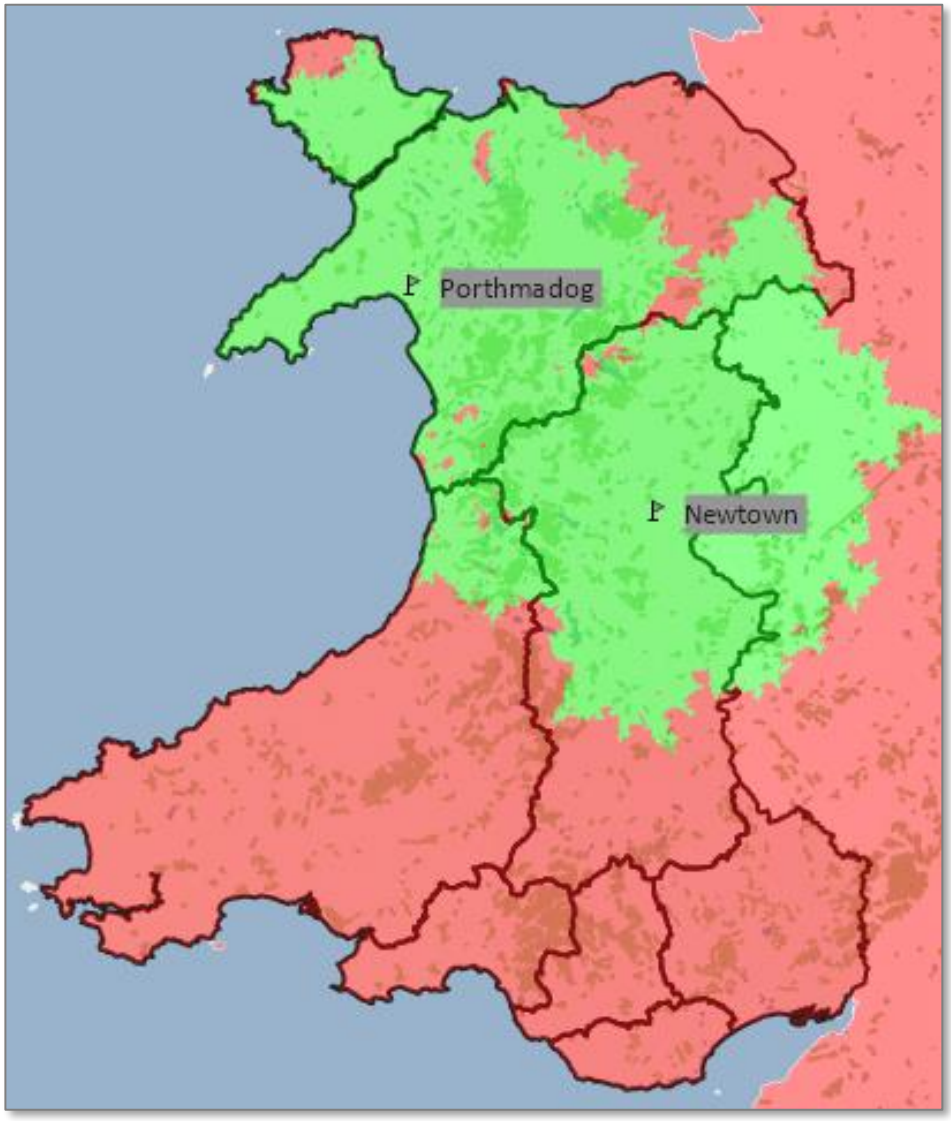


## 4.7 Chosen pair of locations 2 (Porthmadog & Newtown)

A second manually selected pair of locations of the current base stations in large towns is chosen. This time in Porthmadog and Newtown.

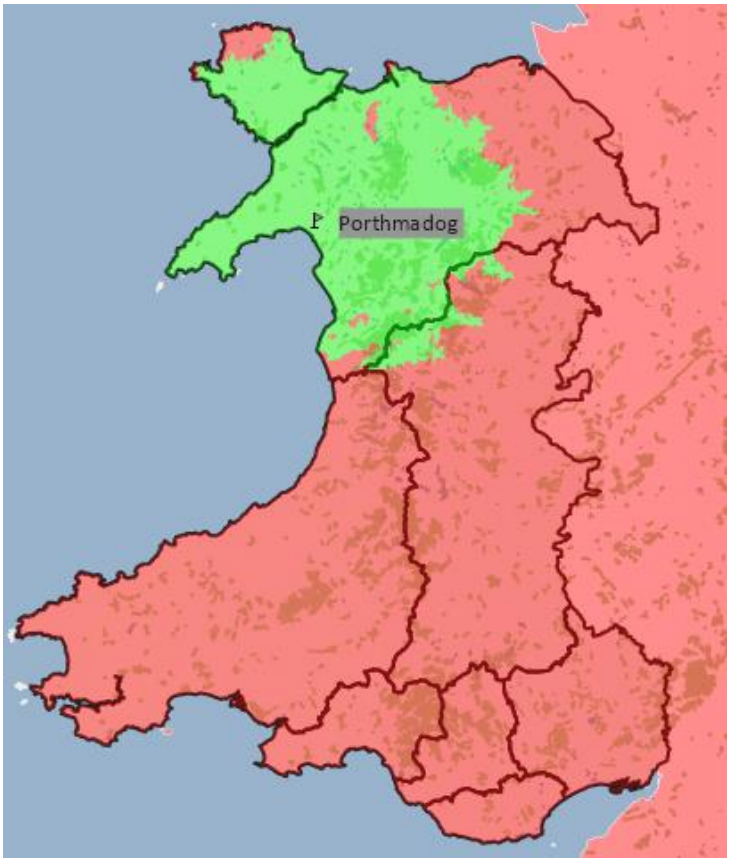
The two locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

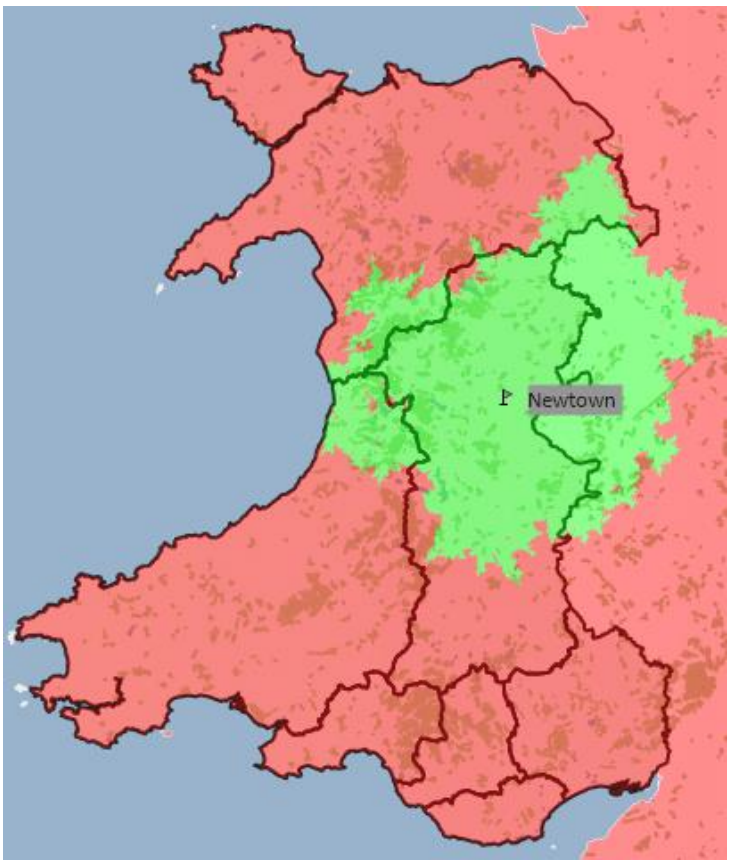



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Porthmadog | Porthmadog | A497 | Gwynedd |
| Newtown | Newtown | A489 | Powys |

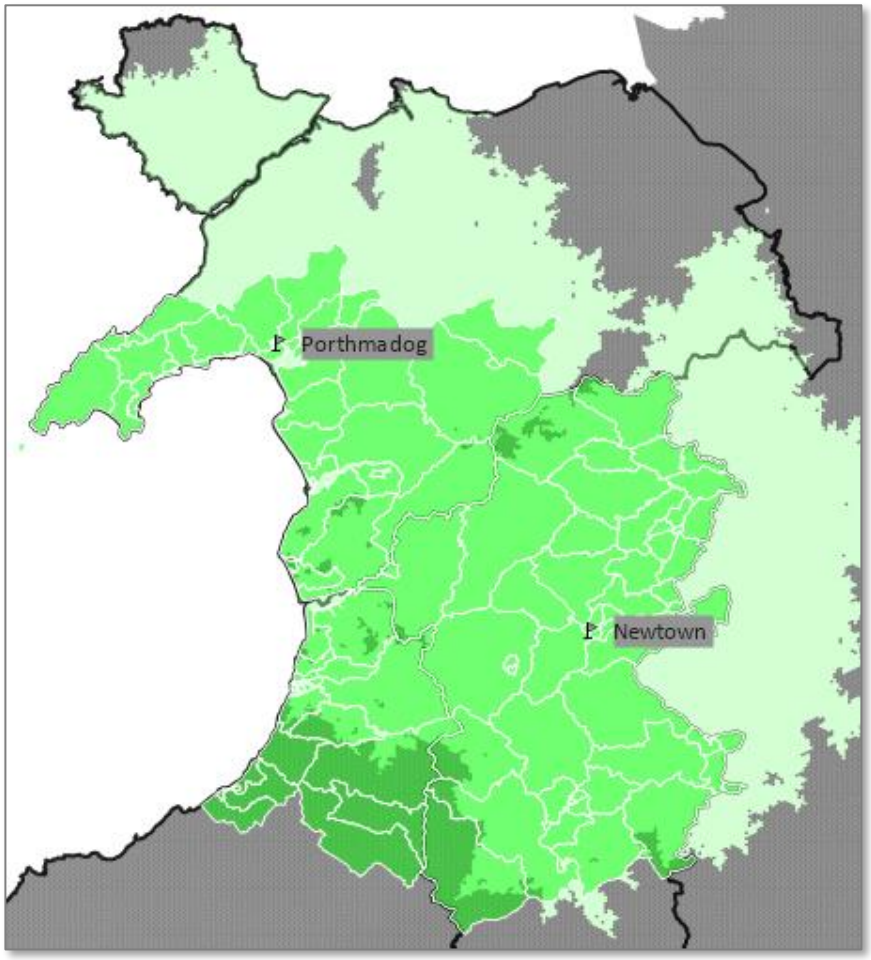
Together, these give a geographical cover of 94% and a population cover of 95% (185k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



This option has results (geographical coverage = 94% & population coverage = 95%) that are the closest we have seen to the original and optimal pairing found in section 3 (geographical coverage = 92% & population coverage = 96%).

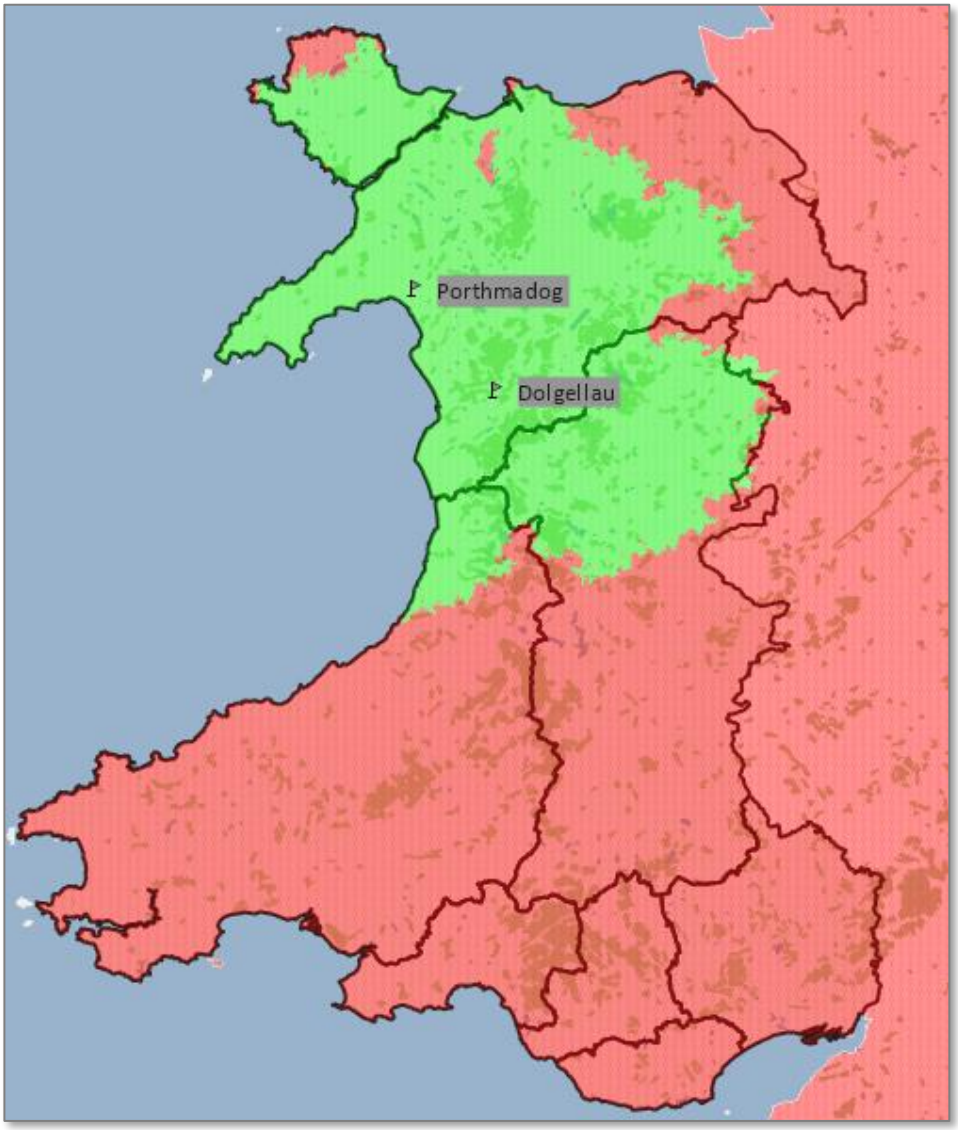



The dark-green regions which cannot be reached within 60 minutes again contain a very small proportion (5%) of the population of the analysed region. These are mainly found in the northeast of Ceredigion and, in comparison to the optimal pair found in section 3, there is no longer a coverage gap in northeast Powys which can now be covered from Newtown.

## 4.8 Chosen pair of locations 3 (Porthmadog & Dolgellau)

A third manually selected pair of locations of the current base stations in large towns is chosen. This time in Porthmadog and Dolgellau.

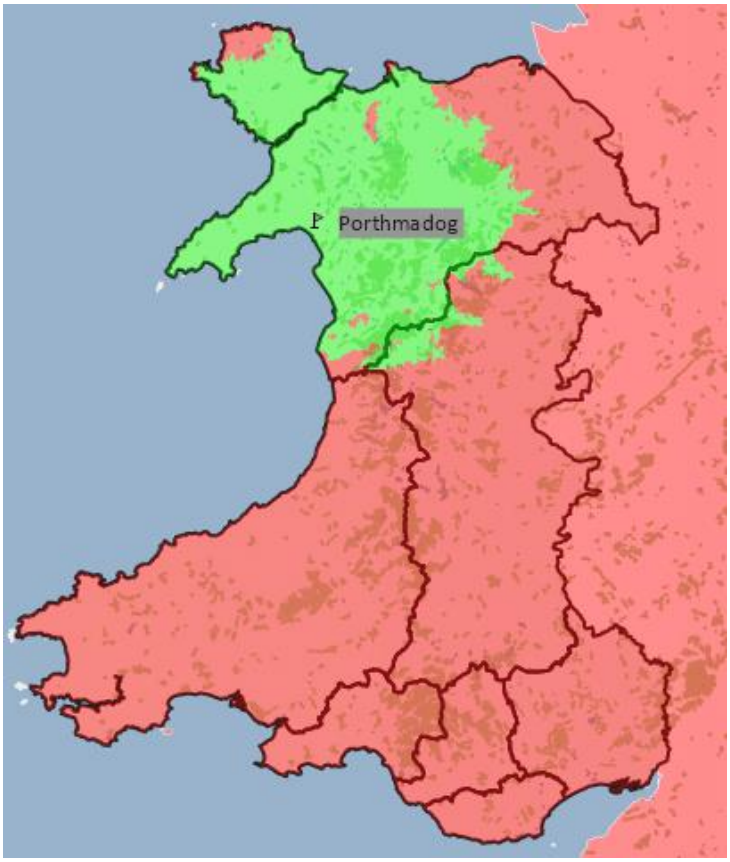
The two locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

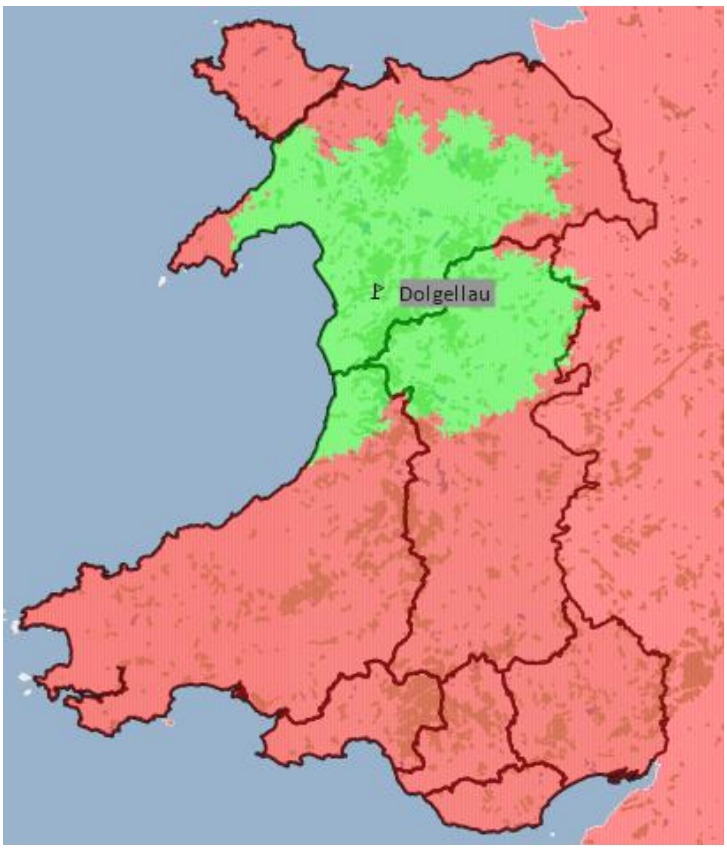



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Porthmadog | Porthmadog | A497 | Gwynedd |
| Dolgellau | Dolgellau | A470 | Gwynedd |

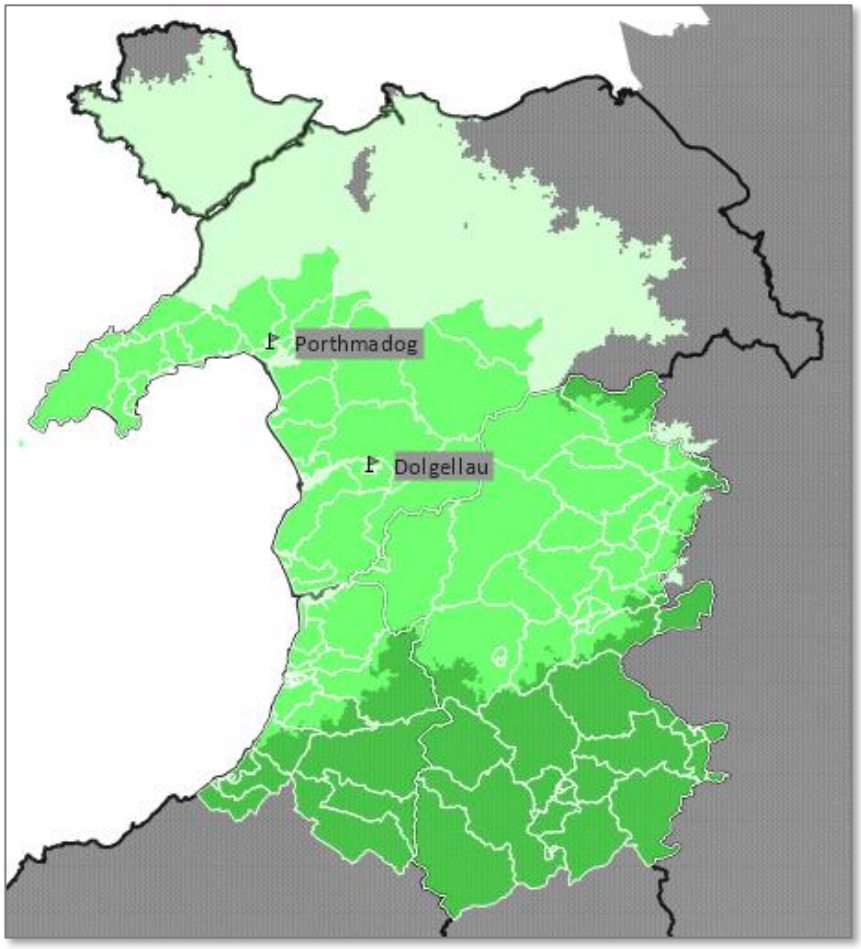
Together, these give a geographical cover of 75% and a population cover of 78% (152k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



This option has results (geographical coverage = 75% & population coverage = 78%) much worse than the previous 'Porthmadog & Dolgellau' option (geographical coverage = 94% & population coverage = 95%).

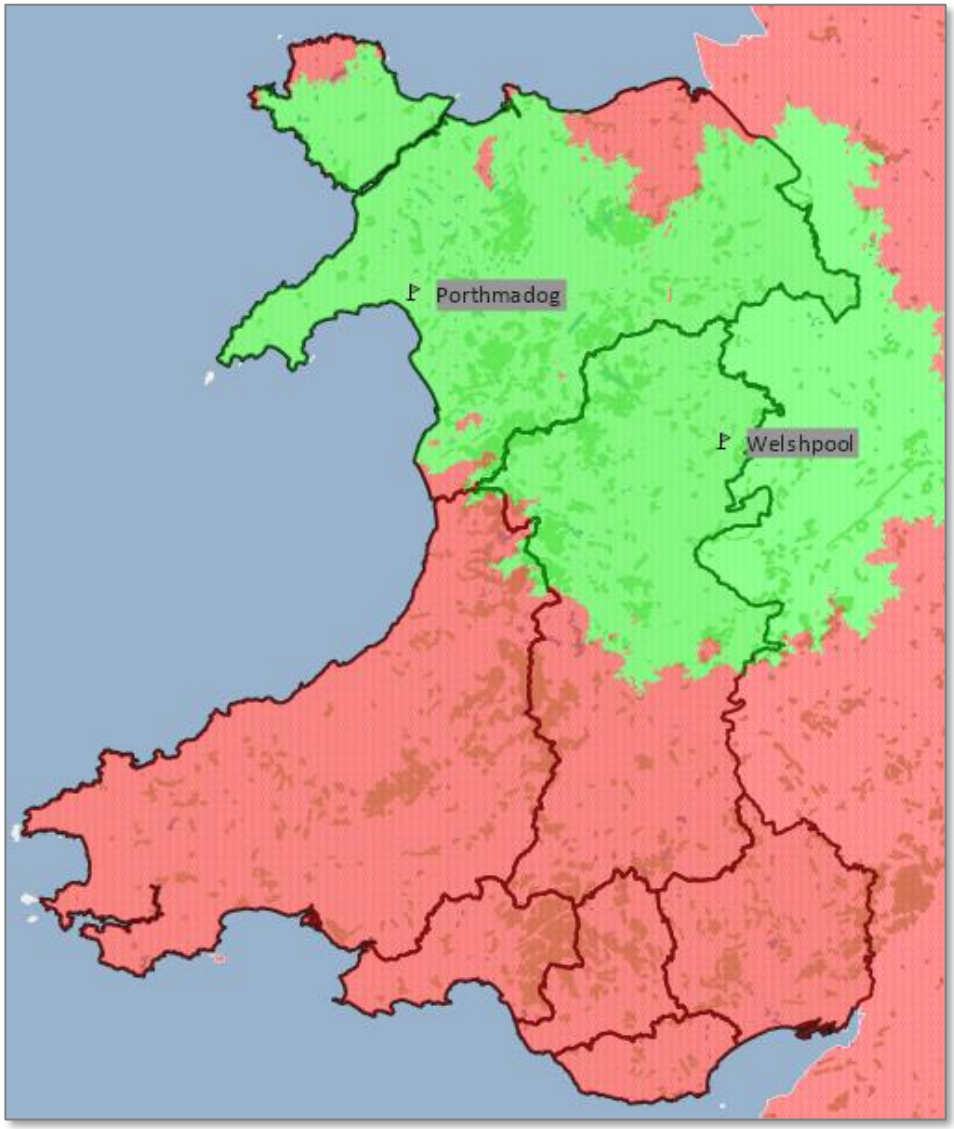



The dark-green regions which cannot be reached within 60 minutes contain a large proportion (22%) of the population of the analysed region. These are mainly found in the south of the region.

## 4.9 Chosen pair of locations 4 (Porthmadog & Welshpool)

A fourth manually selected pair of locations of the current base stations in large towns is chosen. This time in Porthmadog and Welshpool.

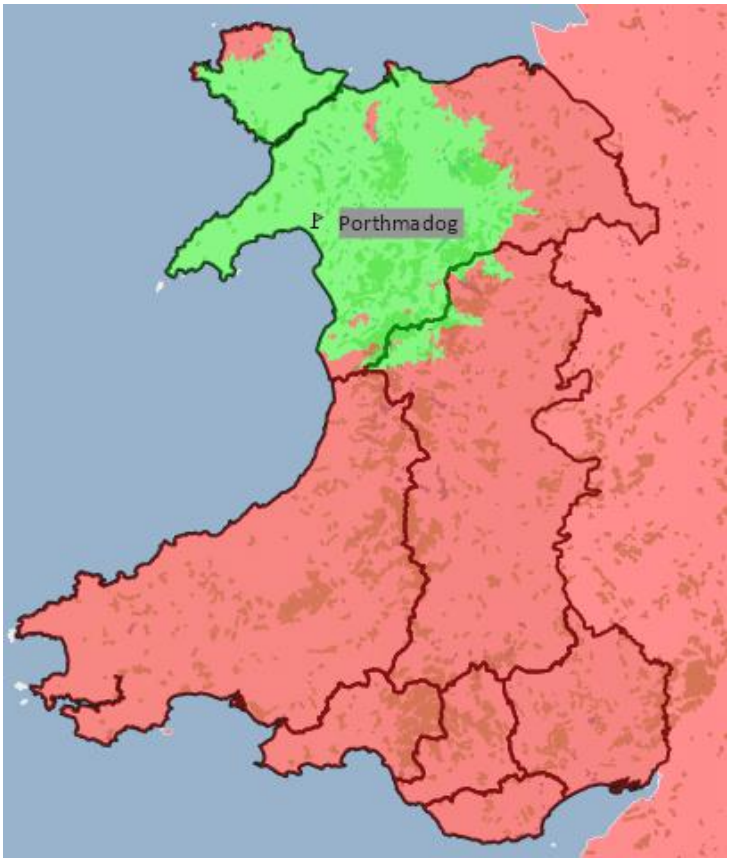
The two locations are shown on the map below. Like the main results in section 3, the green area represents the area that can be travelled within 60 minutes.

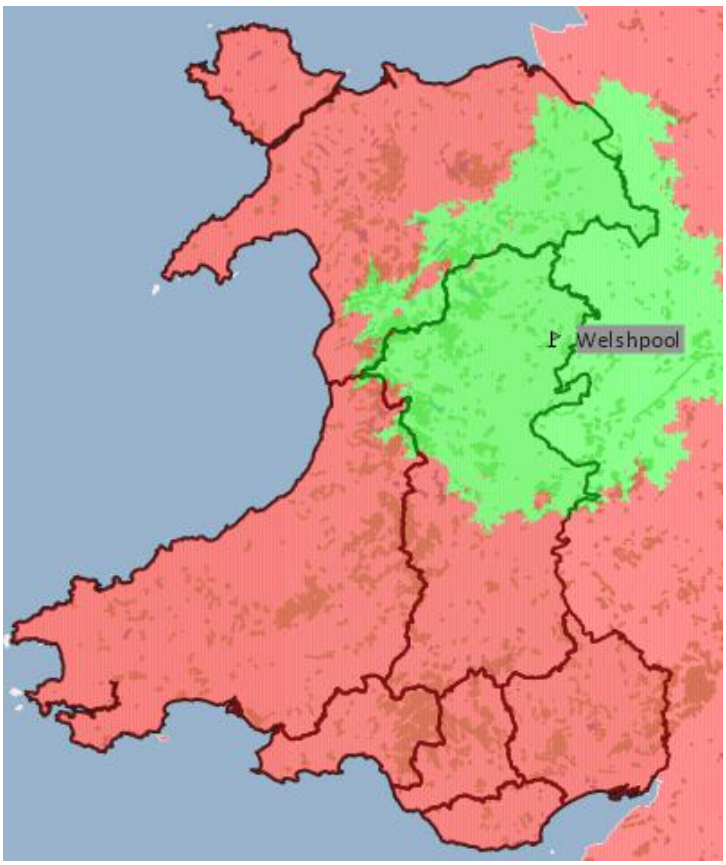



| Base | Nearest Town/Village | Road | County |
|---|---|---|---|
| Porthmadog | Porthmadog | A497 | Gwynedd |
| Welshpool | Welshpool | A458 | Powys |

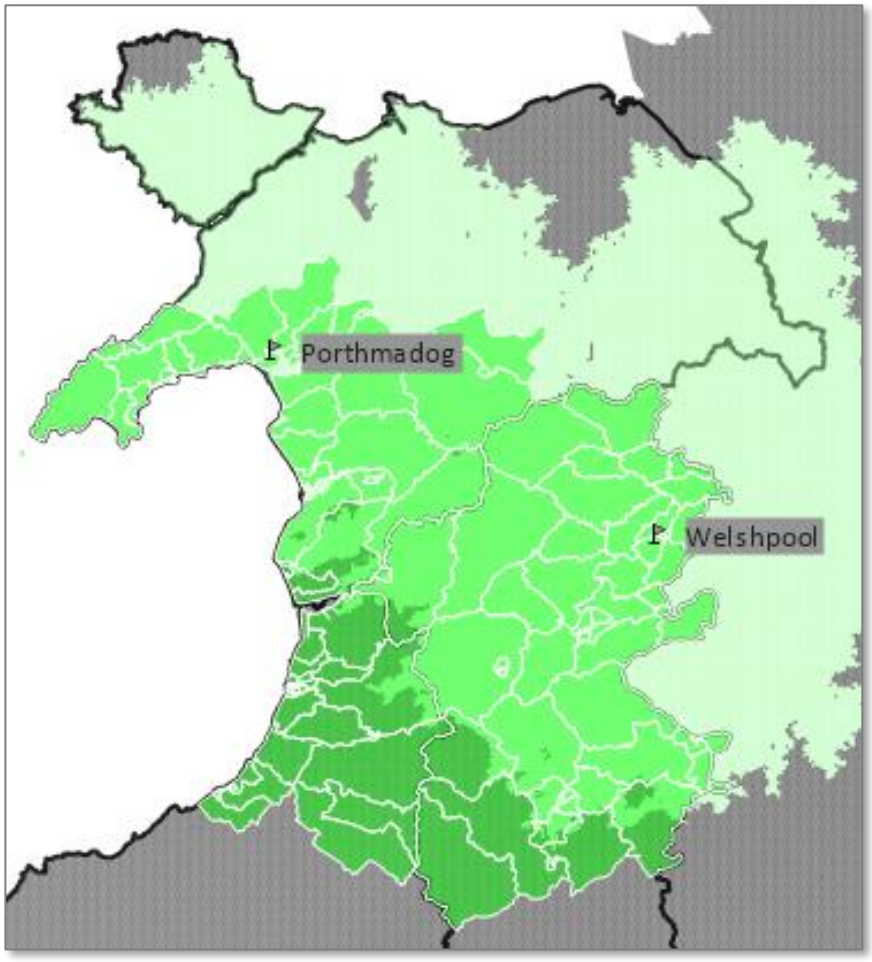
Together, these give a geographical cover of 79% and a population cover of 75% (146k people) of S. Gwynedd, N. Ceredigion, and N. Powys. In comparison, the 60-min coverage analysis for any roadside location gave corresponding geographical and population coverages of 92% and 96% (187k people).

Individually, the 60-minute coverages of each of the two locations can be seen below, which in turn show where the two overlap:



This option has results (geographical coverage = 79% & population coverage = 75%) much worse than the previous 'Porthmadog & Dolgellau' option (geographical coverage = 94% & population coverage = 95%).




The dark-green regions which cannot be reached within 60 minutes contain a large proportion (25%) of the population of the analysed region. These are found in the southwest of the region.

# 5 CONCLUSIONS

The analysis conducted here by Omda has successfully identified the optimal and several other optional locations for two emergency vehicles to maximise coverage within the requested South Gwynedd, North Ceredigion, and North Powys regions within 60 minutes.

Using advanced tools and methodologies, the study concludes that the best locations to place the vehicles are at Porthmadog (on the A487) in Gwynedd, and at Llanbrynmair (on the A470 east of Machynlleth) in Powys. These give a geographical coverage of 92% and a population coverage of 96% (187k people) within a 60-minute travel duration at lights-and-sirens speed.

If the optimal locations need to be a certain type of location (we have investigated two types in this report: 1) current base stations, hospitals, or standby points, 2) current 'manned' and deployed-from stations), and not just any roadside location, then the best locations are those nearest the overall optimal locations initially found. These are 'Pensamer Sb' in Porthmadog and 'Bro Ddyfi Community Hospital' in Machynlleth (for stations, hospitals, and standbys), and 'Porthmadog' and 'Machynlleth' (for manned and deployed-from stations). They give reduced geographical and population coverages of 89% & 90% (176k) and 89% & 89% (174k) respectively.

The optimal locations move more centrally if the maximum travel duration decreases from 60 minutes to 45 or 30. Unsurprisingly, their geographical and population coverages decrease as the maximum travel duration decreases.

Changing the utilisation (busyness) of the two vehicles also changes the locations. However, it retains the single best location (if the algorithm found only one optimal location rather than two, this would be it) which is GridBase9816* near Llanbrynmair, Powys. However, it moves the second location nearer the first. The busier the vehicles become (the higher their utilisation), the closer the second location gets to the first (GridBase9816). When the utilisation is 30% the second location moves to GridBase9124 (Llanelltyd, north of Dolgellau), and when it is 50% the second location moves to Gridbase12968 (just a few miles from the first at Talerddig).

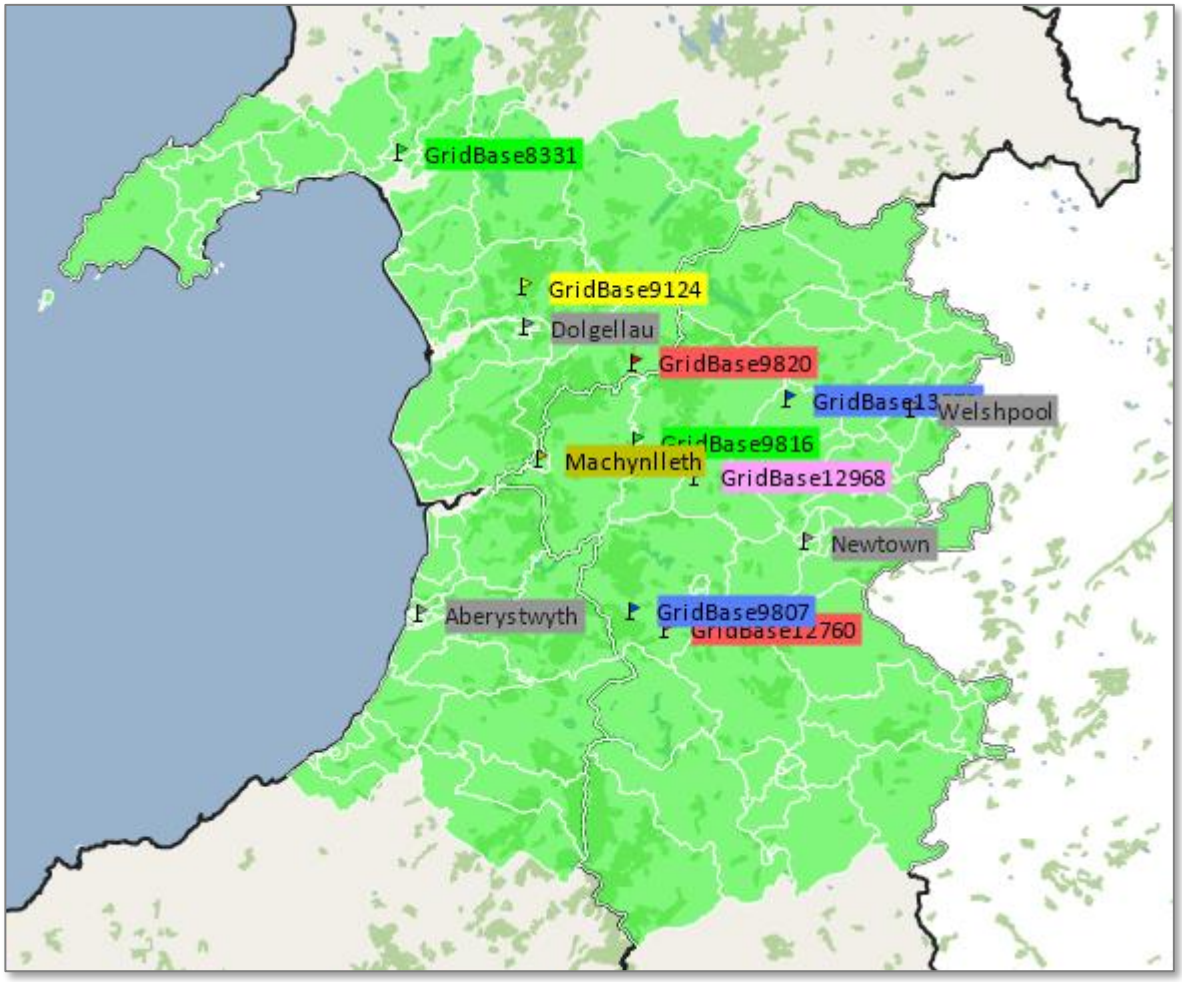
Using some manually selected pairs of current base stations (Porthmadog & Aberystwyth), (Porthmadog & Dolgellau) or (Porthmadog & Welshpool) results in geographical and population coverages of (73% & 77% [150k]), (75% & 78% [152k]), and (79% & 75% [146k]) respectively.

However, if a more central current base station (Newtown) is used with Porthmadog, the results become much better and are almost as good as the optimal result. Using the pair 'Porthmadog & Newtown' results in a geographical coverage of 94% and a population coverage of 95% (185k).

This pairing not only gives a population coverage (95%) almost as high as the optimal (96%) but also includes a location (Newtown) in an area perceived to be most at risk from having poor coverage.

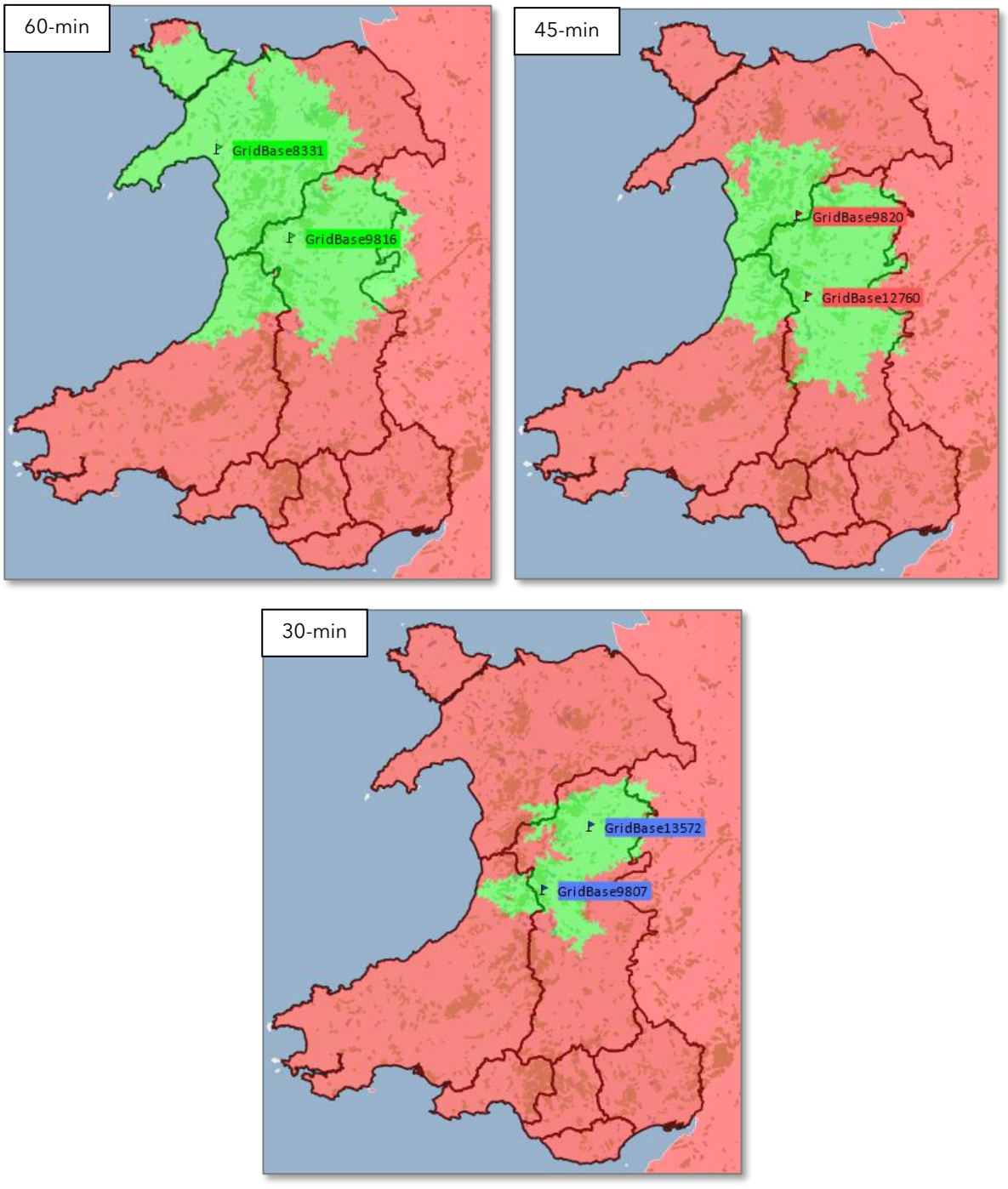
The table and map below show all location pairs found in this analysis.

| Description | Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|---|
| Optimal Roadside | 60 min | 0% | GridBase8331 | Porthmadog | A487 | Gwynedd | 92% | 96% (187k) |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |
| Stations, Standbys, Hospitals | 60 min | 0% | Penamser Sb | Porthmadog | A497 | Gwynedd | 89% | 90% (176k) |
| | | | Bro Ddyfi Hosp | Machynlleth | A498 | Powys | | |
| Manned & Deployed Stations | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 89% | 89% (174k) |
| | | | Machynlleth | Machynlleth | A498 | Powys | | |
| 45-minute Roadside | 45 min | 0% | GridBase9820 | Mallwyd (east of Dolgellau) | A458 | Gwynedd | 81% | 85% (166k) |
| | | | GridBase12760 | Llangurig (southwest of Llanidloes) | A470 | Powys | | |
| 30-minute Roadside | 30 min | 0% | GridBase13572 | Four Crosses (west of Welshpool) | A458 | Powys | 44% | 50% (98k) |
| | | | GridBase9807 | Tyn y cwm (southwest of Llanidloes) | A44 | Powys | | |
| 30% Utilisation Roadside | 60 min | 30% | GridBase9124 | Llanelltyd (north of Dolgellau) | A470 | Gwynedd | 89% | 94% (183k) |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |
| 50% Utilisation Roadside | 60 min | 50% | GridBase12968 | Talerddig (east of Machynlleth) | A470 | Powys | 84% | 88% (172k) |
| | | | GridBase9816* | Llanbrynmair (east of Machynlleth) | A470 | Powys | | |
| Manual West | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 73% | 77% (150k) |
| | | | Aberystwyth | Aberystwyth | A44 | Ceredigion | | |
| Manual East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 94% | 95% (185k) |
| | | | Newtown | Newtown | A489 | Powys | | |
| Manual North | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 75% | 78% (152k) |
| | | | Dolgellau | Dolgellau | A470 | Gwynedd | | |
| Manual North East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 79% | 75% (146k) |
| | | | Welshpool | Welshpool | A458 | Powys | | |




'Bro Ddyfi Hosp' (dark-green) is hidden behind 'Machynlleth', the base station of 'Porthmadog' (grey and olive-green), and the Standby Point 'Penamser Sb' (dark-green) are hidden behind 'GridBase8331'.

The three maps below compare the best locations (flags) and coverage regions (highlighted in green) for 60-minute, 45-minute, and 30-minute travel durations.



The two key results found are:

1 Optimal Roadside (GridBase8331, GridBase9816)
2 Manual East (Porthmadog, Newtown)

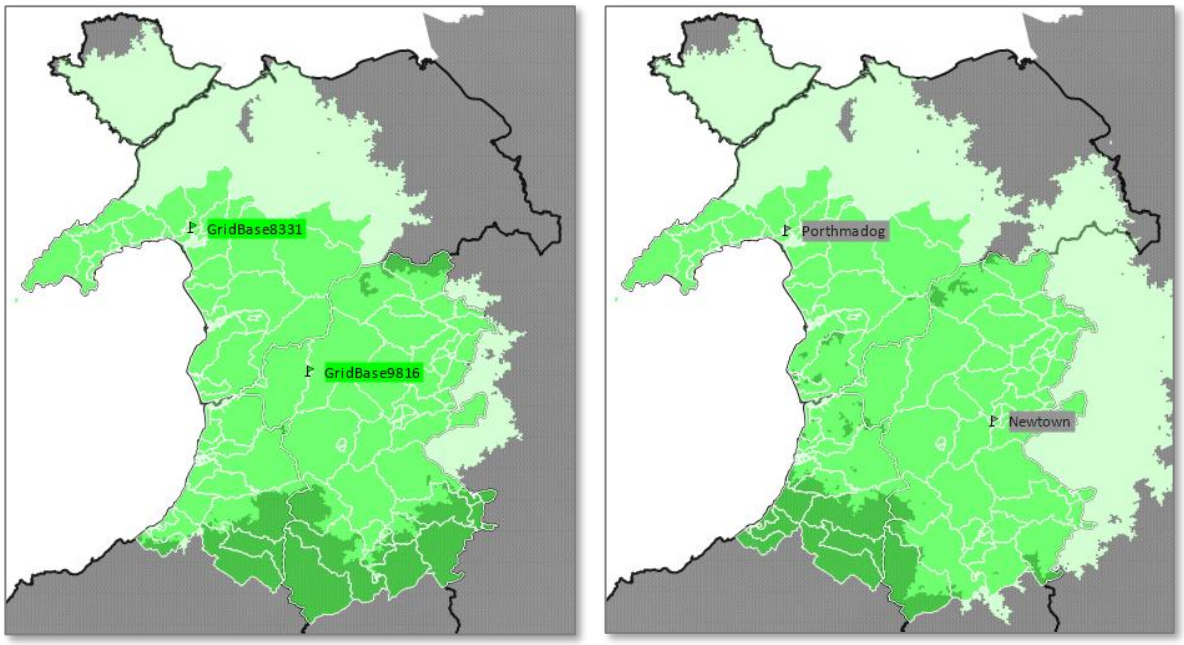
| # | Desc | Travel Duration | Utilisation | Base | Nearest Town/Village | Road | County | Geographical Coverage | Population Coverage |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Optimal Roadside | 60 min | 0% | GridBase8331 | Porthmadog | A487 | Gwynedd | 92% | 96% (187k) |
| | | | | GridBase9816* | Llanbrynmair (nr Machynlleth) | A470 | Powys | | |
| 2 | Manual East | 60 min | 0% | Porthmadog | Porthmadog | A497 | Gwynedd | 94% | 95% (185k) |
| | | | | Newtown | Newtown | A489 | Powys | | |

The optimal result is **'Optimal Roadside'** (**GridBase8331** & **GridBase9816** in light-green) near Porthmadog & Llanbrynmair, giving geographical and population coverage of 92% & 96% respectively.

If this is not a viable option, the **'Manual East'** (**Porthmadog** & **Newtown** in grey) pairing results in an increased geographical coverage of 94% and a minimally reduced population coverage of 95%, and additionally alleviates the perception of poor coverage in the east of Powys.

The maps below (left = 'Optimal Roadside'; right = 'Manual East') show the overlap of the six USOA regions of interest and the 60-minute coverage region that can be reached from each pair of locations. The mid-green region shows where can be reached and the dark-green shows where cannot be reached.

The regions which cannot be reached are a small proportion of both the geography (8% for 'Optimal Roadside' and 6% for 'Manual East') and the population (4% for 'Optimal Roadside' and 5% for 'Manual East') of the analysed region.



The ‘Optimal Roadside’ result (left map) has coverage holes in the top right corner of Powys and a belt between north Ceredigion and central Powys.

The ‘Manual East’ result (right map) only has a coverage hole in north Ceredigion. From a geographical point of view this is the best (94%), but from a population point of view the ‘Optimal Roadside’ is best (96%).

These results demonstrate the effectiveness of the chosen locations, ensuring that the emergency services can reach a significant portion of the population in the targeted areas efficiently.

Omda

# WELSH AMBULANCE SERVICE NHS TRUST

# R4 MODELLING

# PART 2

# INCIDENTS REACHED

# WITHIN CERTAIN DURATIONS

Version 1.0

GIG CYMRU NHS WALES
Ymddiriedolaeth GIG
Gwasanaethau Ambiwlans Cymru
Welsh Ambulance Services
NHS Trust

Omda

Created by: Andrew Tallack
Reviewed by: Matt Macleod
Predict version: 24.3
25 September 2024

*To protect the environment, please do not print this document unless necessary.*

# EXECUTIVE SUMMARY

The NHS Wales Joint Commissioning Committee has asked Omda a follow-up question based on the solutions found in the recently produced document 'WAST Population Coverage V1.4.pdf', where locations were sought to place two separate RRVs to cover as much of the population as possible within a 60-minute travel duration within a defined rural and remote geographic area.

The question is now to investigate the coverage of EMRTS and high-priority WAST incidents from two of the solutions found in PART 1:

- Porthmadog & Newtown
- Porthmadog & Dolgellau

The incidents of interest are all EMRTS, and Amber1, Breathing Difficulties (06), Chest Pain (10), Stroke (28), and CHARU-responding WAST incidents.

The results are the proportions of incidents that can be reached within 30, 60, and 90 minutes of either of the bases in the pairs.

The utilisation of the two vehicles is 0% so they will always be available to respond.

The regions containing incidents that the vehicles respond to have been chosen by the NHS Wales Joint Commissioning Committee and comprise of six Upper Super Output Areas (USOAs):

- South Gwynedd (W03000005, W03000006)
- North Ceredigion (W03000027)
- North Powys (W030000023, W030000024, W03000025)

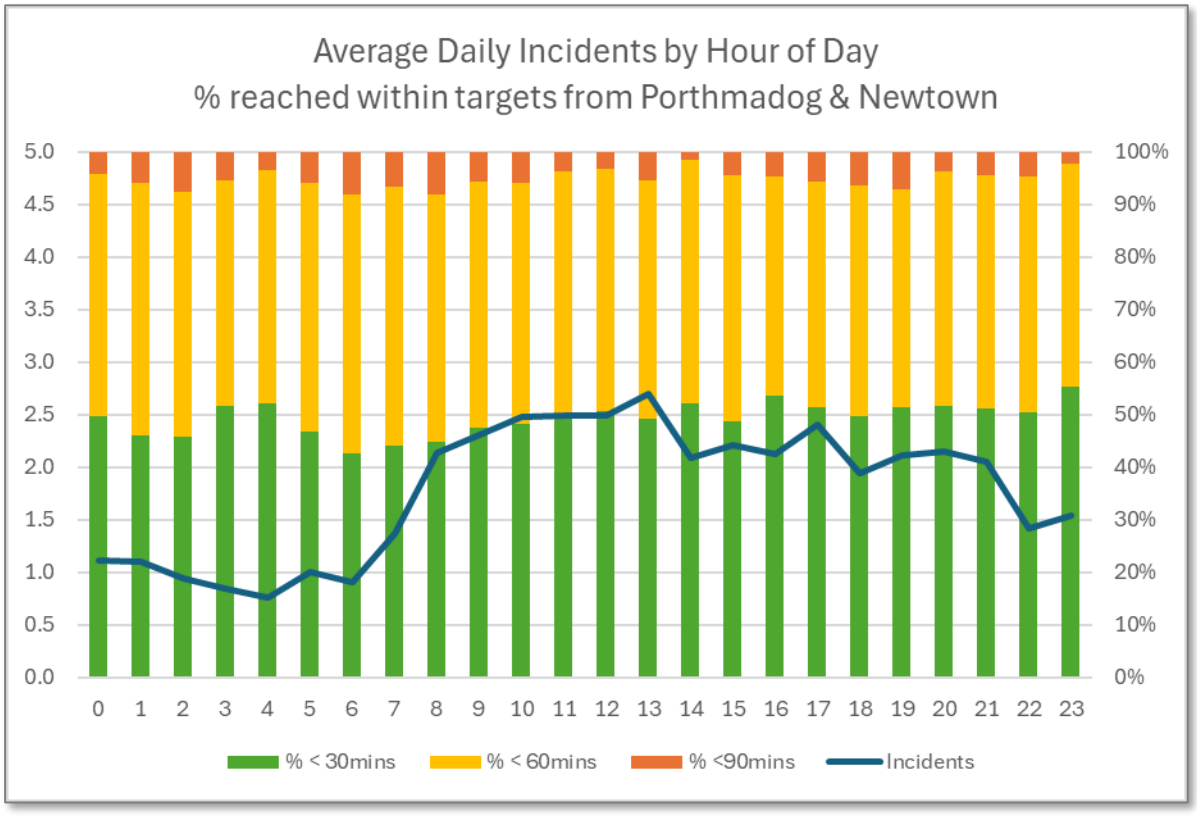
The number of annualised relevant incidents is **15595**.

The table below shows the proportion of these incidents that can be reached from either of the two bases in each pair within the corresponding target durations at lights-and-sirens speed:

| TARGET: | <30 minutes | <60 minutes | <90 minutes |
|---|---|---|---|
| **Porthmadog & Newtown** | **50%** | **95%** | **100%** |
| Porthmadog & Dolgellau | 34% | 78% | 98% |

It shows that putting vehicles at Porthmadog and Newtown allows them to reach far more incidents than putting them at Porthmadog and Dolgellau.

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes from the best pair of bases 'Porthmadog & Newtown'.




Thus, basing vehicles at Porthmadog and Newtown gives the best coverage of EMRTS and other high-priority incidents.

# GLOSSARY

The following abbreviations and words are used in this report:

| Abbreviation | Description |
|---|---|
| WAST | Welsh Ambulance Service Trust |
| LSOA | Lower Super Output Area |
| USOA | Upper Super Output Area |

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# CONTENTS

# 1 INTRODUCTION

The NHS Wales Joint Commissioning Committee has asked Omda a follow-up question based on the solutions found in the recently produced document 'WAST Population Coverage V1.4.pdf', where locations were sought to place two separate RRVs to cover as much of the population as possible within a 60-minute travel duration within a defined rural and remote geographic area.

The follow-up question investigated in this report (PART2) is:

For two of the solutions found in PART 1:

- Porthmadog & Newtown
- Porthmadog & Dolgellau

What proportion of incidents can be reached at lights-and-sirens speed within certain durations:

- 30 minutes
- 60 minutes
- 90 minutes

in the same region of interest as in PART 1?

- South Gwynedd (W03000005, W03000006)
- North Ceredigion (W03000027)
- North Powys (W030000023, W030000024, W03000025)

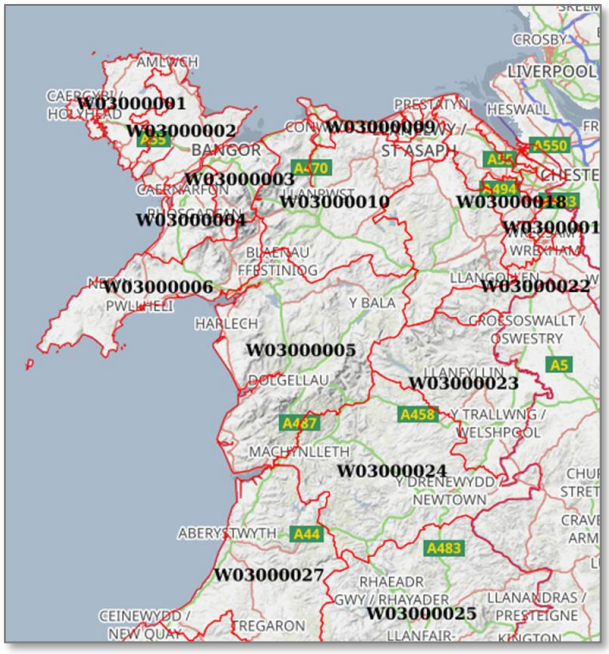
The incidents that these vehicles will respond to are:

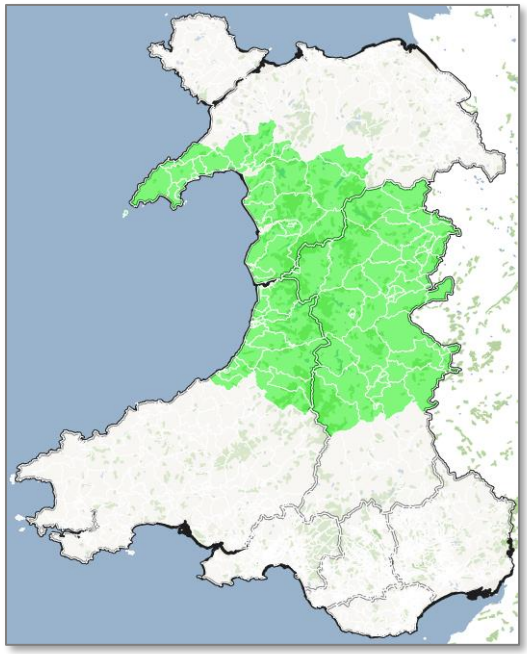
- EMRTS
- WAST Amber1
- WAST Breathing Difficulty (06)
- WAST Chest Pain (10)
- WAST Stroke (28)
- WAST CHARU

# 2 METHODOLOGY

The goal is to find the proportion of relevant incidents that can be reached within given time frames from given pairs of locations where the vehicles are based. This involves several steps:

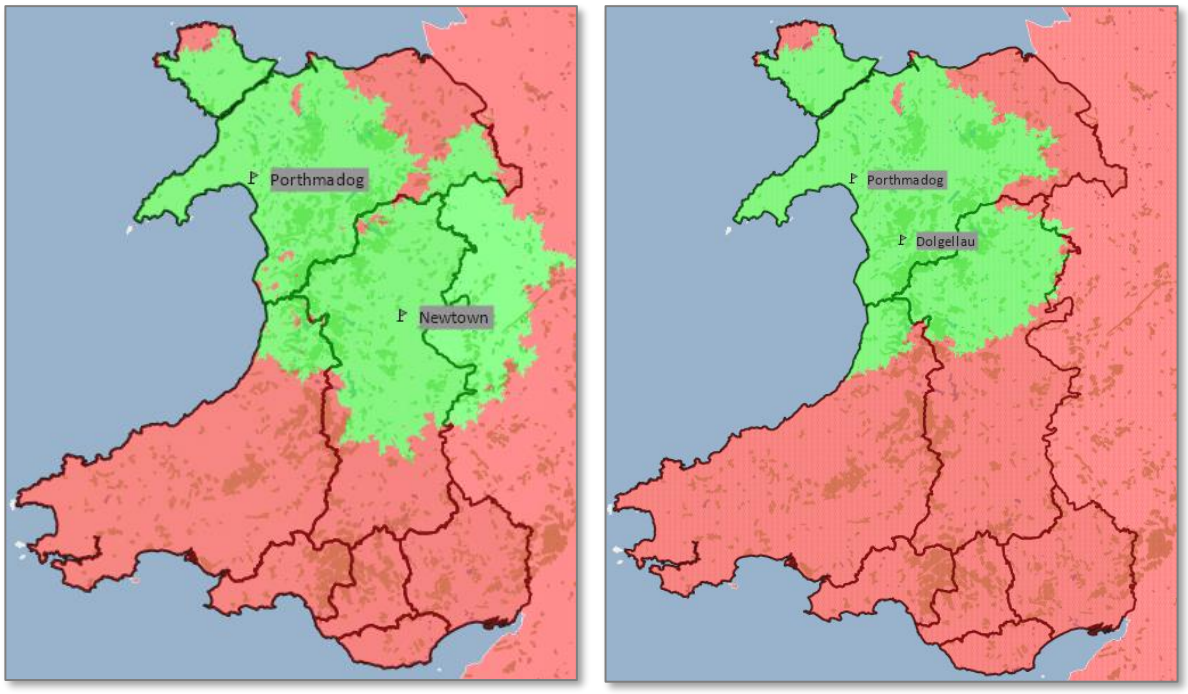
- Create a call file comprising the relevant incidents described in the introduction. All incidents are in the region of interest. All EMRTS incidents are included. All WAST incidents that are defined to be Amber 1 priority, Breathing Difficulty (06), Chest Pain (10), Stroke (28), or those that CHARU vehicles would usually respond to, are also included. The data is from January 2023 to May 2023 (5 months). This is then annualised and results are shown as such. This may not show a true representation of a full year due to seasonality.
- The incident locations are then analysed to determine the time it takes for a vehicle from each relevant base location to reach the incident site at lights-and-sirens speed.
- Further calculations can be made to understand the proportion of incidents that can and cannot be reached within certain durations (30, 60, 90 minutes).
- The average utilisation of the two vehicles is 0% so they will always be available to respond.
- The regions containing incidents that the vehicles respond to have been chosen by the NHS Wales Joint Commissioning Committee and comprise of the six Upper Super Output Areas (USOAs) shown below:
    - South Gwynedd (W03000005, W03000006)
    - North Ceredigion (W03000027)
    - North Powys (W030000023, W030000024, W03000025)



The USOAs map directly onto the LSOAs used in Predict. The full area is shown in green on the right-hand map.

- The two pairs of base locations investigated in this report are 'Porthmadog & Newtown' and 'Porthmadog & Dolgellau', which can be seen in the maps below (the green regions are those that can be reached within 60 minutes at lights-and-sirens speed):



# 3 RESULTS

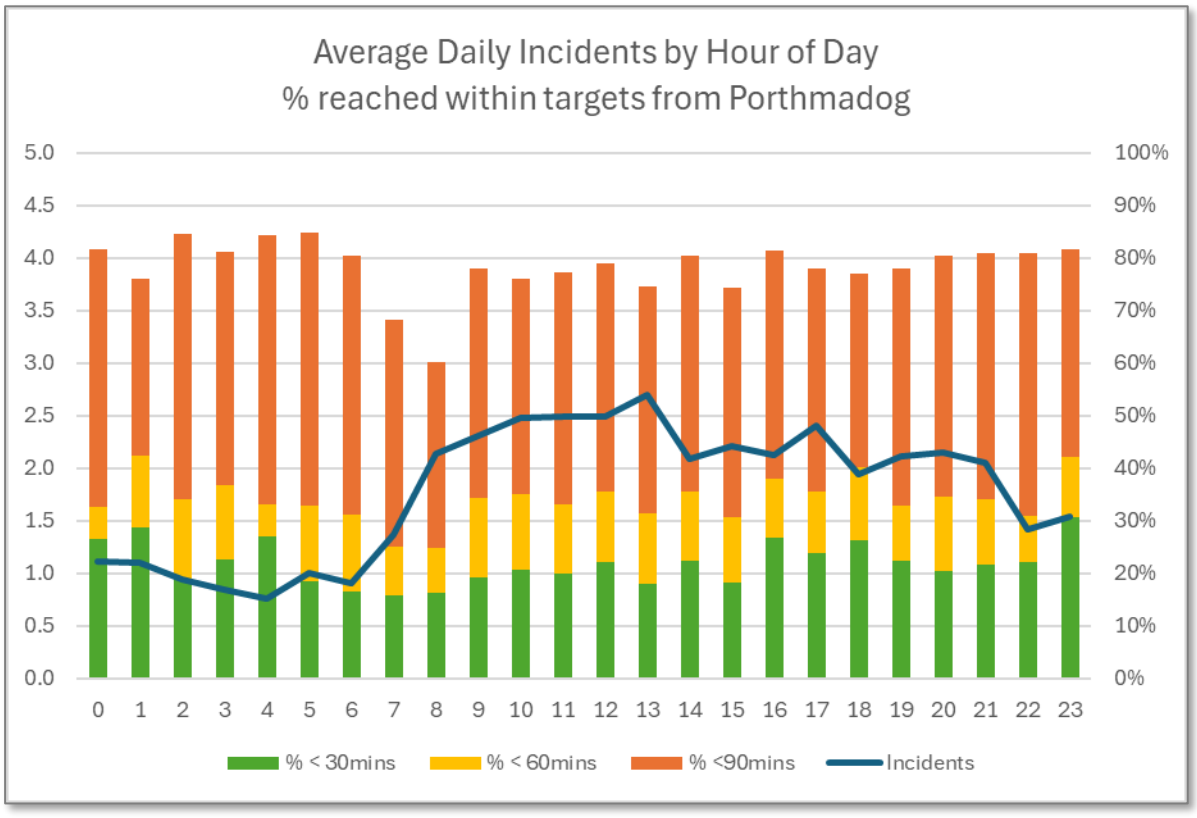
The tables below show the volume and proportion of annual incidents that can and cannot be reached within 30, 60, and 90 minutes from each base station and pairs of base stations. The charts below show these, split by the hour of the day. The number of annualised relevant incidents is **15595**.

## 3.1 Porthmadog

The table below shows that 22%, 35%, and 78% of incidents can be reached within 30, 60, and 90 minutes respectively from Porthmadog.

| Base Location: | Porthmadog | | |
|---|---|---|---|
| TARGET: | <30 minutes | <60 minutes | <90 minutes |
| Incidents: | 3379 | 5302 | 12108 |
| % Met Target: | 22% | 34% | 78% |
| % Unmet Target: | 78% | 66% | 22% |

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes. (e.g. in the first hour of the day (00:00-01:00) there are on average 1.1 incidents per day, 27% of all incidents in this hour band are reached within 30 minutes, 33% within 60 minutes, and 82% within 90 minutes).

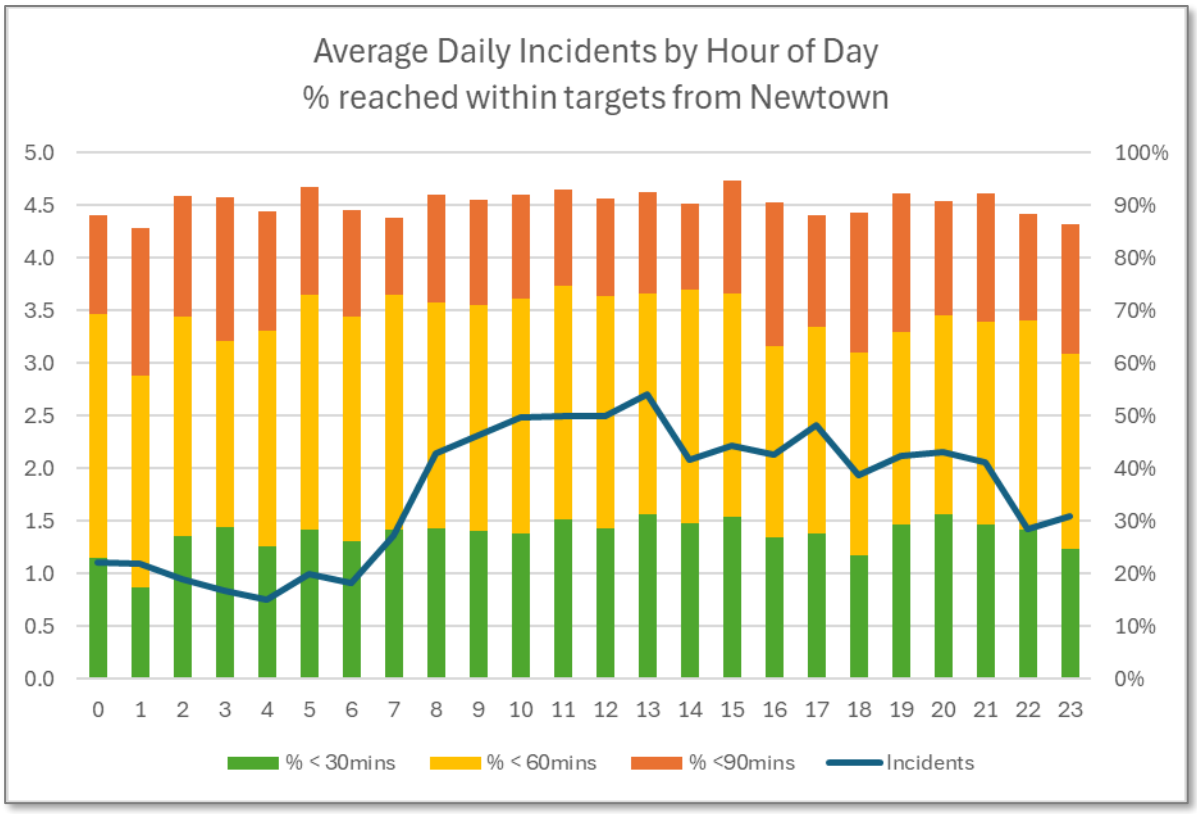


## 3.2 Newtown

The table below shows that 28%, 68%, and 90% of incidents can be reached within 30, 60, and 90 minutes respectively from Newtown.

| Base Location: | Newtown | | |
|---|---|---|---|
| TARGET: | <30 minutes | <60 minutes | <90 minutes |
| Incidents: | 4368 | 10798 | 14146 |
| % Met Target: | 28% | 69% | 91% |
| % Unmet Target: | 72% | 31% | 9% |

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes. (e.g. in the first hour of the day (00:00-01:00) there are on average 1.1 incidents per day, 28% of all incidents in this hour band are reached within 30 minutes, 69% within 60 minutes and 91% within 90 minutes).

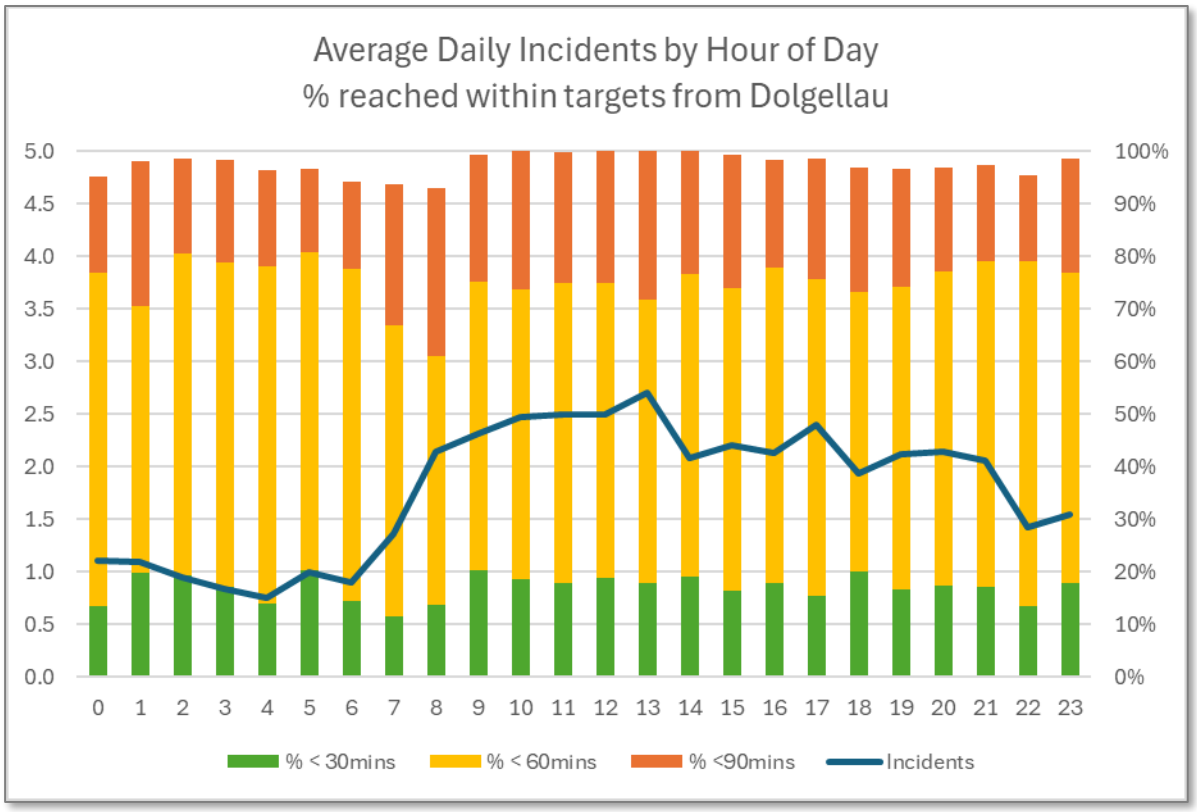


## 3.3 Dolgellau

The table below shows that 18%, 76%, and 98% of incidents can be reached within 30, 60, and 90 minutes respectively from Dolgellau.

| Base Location: | Dolgellau | | |
|---|---|---|---|
| TARGET: | <30 minutes | <60 minutes | <90 minutes |
| Incidents: | 2698 | 11662 | 15274 |
| % Met Target: | 17% | 75% | 98% |
| % Unmet Target: | 83% | 25% | 2% |

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes. (e.g. in the first hour of the day (00:00-01:00) there are on average 1.1 incidents per day, 17% of all incidents in this hour band are reached within 30 minutes, 75% within 60 minutes, and 98% within 90 minutes).

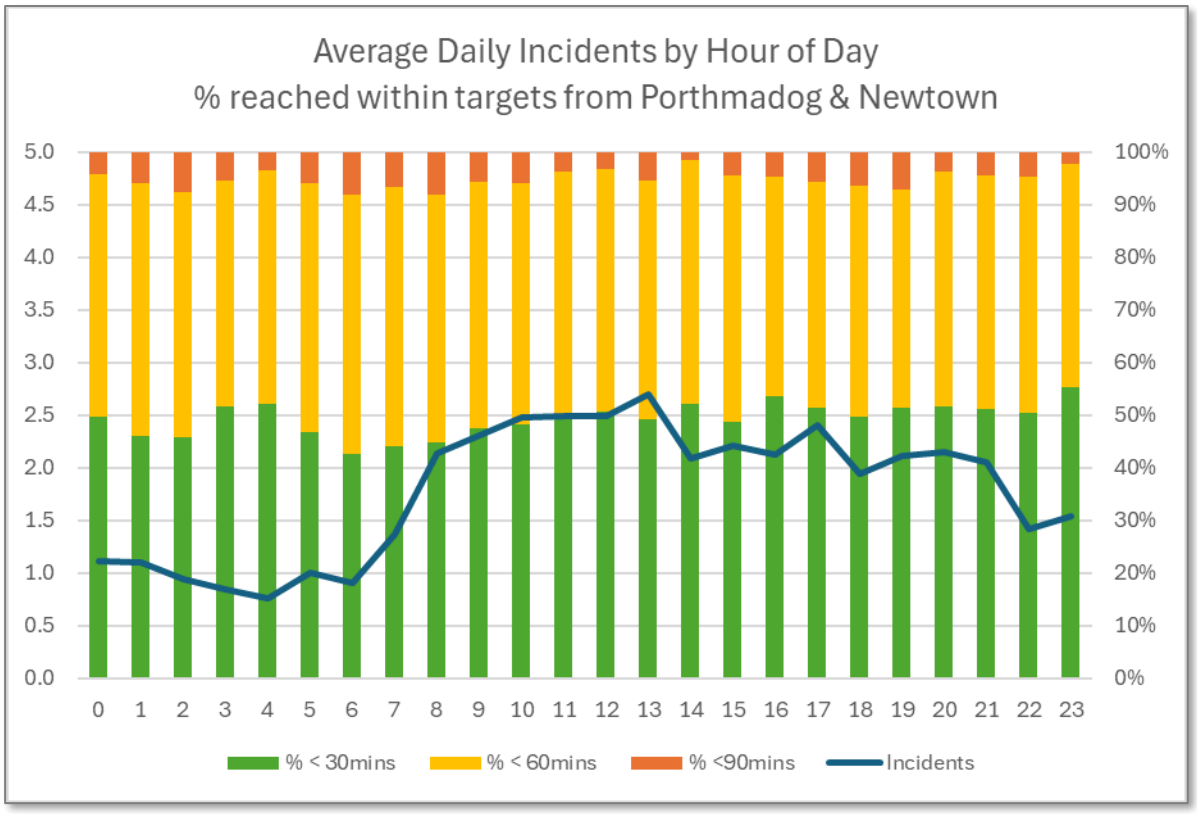


## 3.4 Porthmadog & Newtown

The table below shows that 50%, 95%, and 100% of incidents can be reached within 30, 60, and 90 minutes respectively from Porthmadog or Newtown.

| Base Location: | Porthmadog & Newtown | | |
|---|---|---|---|
| TARGET: | <30 minutes | <60 minutes | <90 minutes |
| Incidents: | 7747 | 14808 | 15595 |
| % Met Target: | 50% | 95% | 100% |
| % Unmet Target: | 50% | 5% | 0% |

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes. (e.g. in the first hour of the day (00:00-01:00) there are on average 1.1 incidents per day, 50% of all incidents in this hour band are reached within 30 minutes, 95% within 60 minutes, and 100% within 90 minutes).

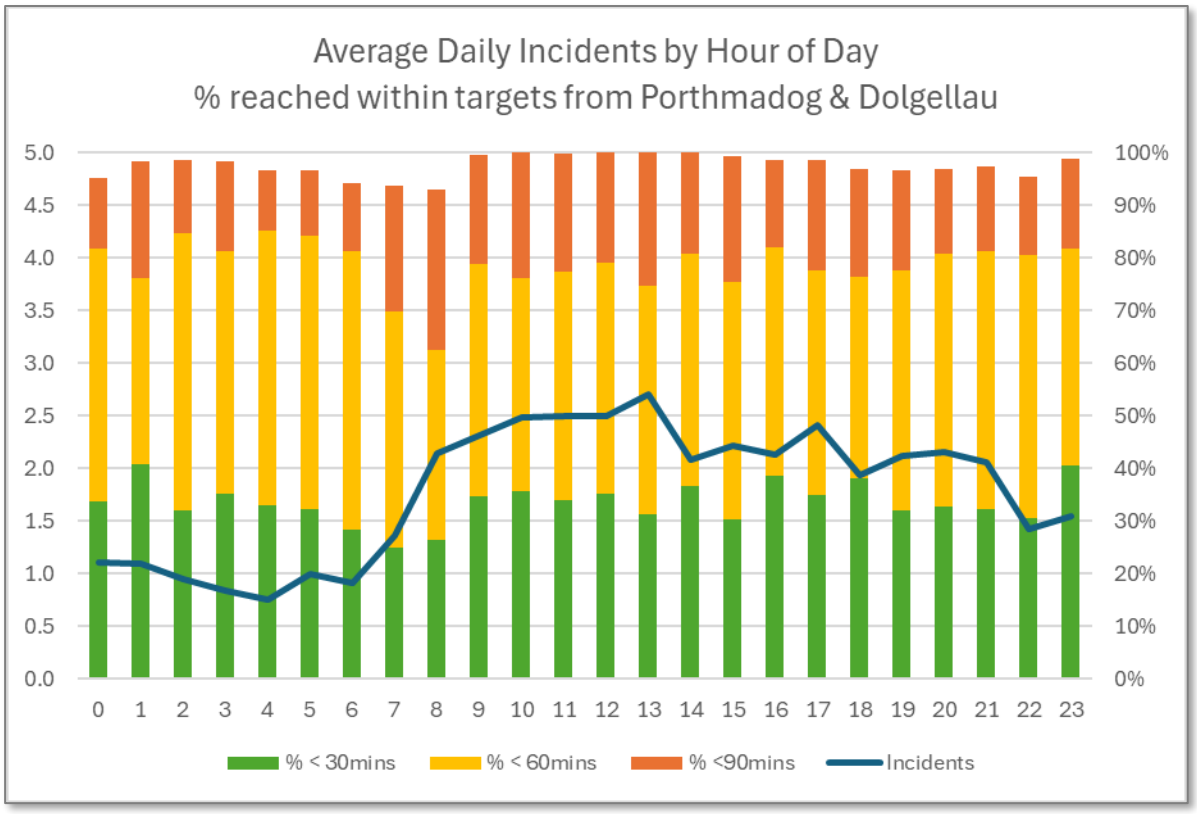


## 3.5 Porthmadog & Dolgellau

The table below shows that 34%, 79%, and 98% of incidents can be reached within 30, 60, and 90 minutes respectively from Porthmadog or Dolgellau.

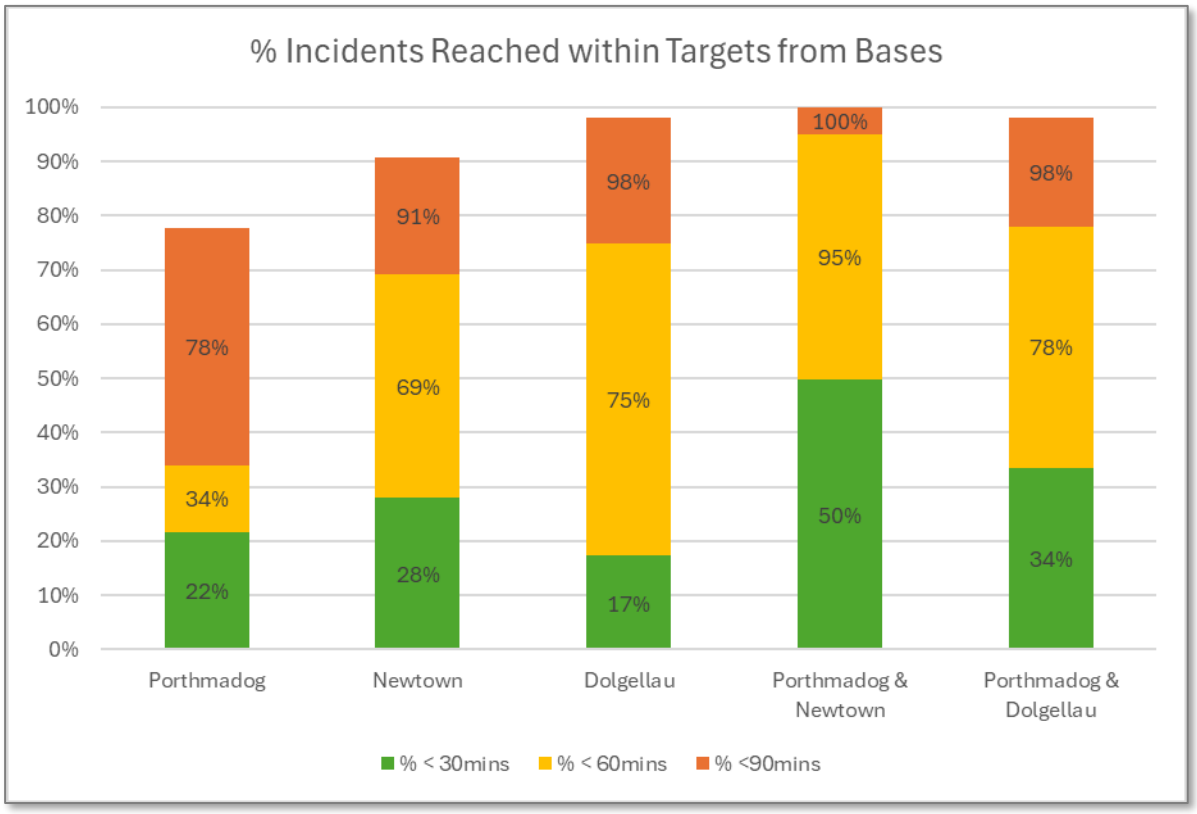
| Base Location: | Porthmadog & Dolgellau | | |
|---|---|---|---|
| TARGET: | <30 minutes | <60 minutes | <90 minutes |
| Incidents: | 5237 | 12146 | 15274 |
| % Met Target: | 34% | 78% | 98% |
| % Unmet Target: | 66% | 22% | 2% |

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of day that can be reached within 30, 60, and 90 minutes. (e.g. in the first hour of the day (00:00-01:00) there are on average 1.1 incidents per day, 34% of all incidents in this hour band are reached within 30 minutes, 78% within 60 minutes, and 98% within 90 minutes).



## 3.6 Summary

The table below shows the proportion of incidents reached within the 30, 60, and 90-minute targets from the individual and paired bases investigated:




It shows that by themselves (see the first three columns), the Newtown base can reach more incidents within 30 minutes than Porthmadog and Dolgellau, but Dolgellau can reach more incidents within 60 and 90 minutes than Porthmadog and Newtown.

When combined (see the last two columns), Porthmadog and Newtown bases can reach more incidents within 30, 60, and 90 minutes than Porthmadog and Dolgellau combined.

# 4 CONCLUSIONS & RECOMMENDATIONS

## 4.1 Conclusions

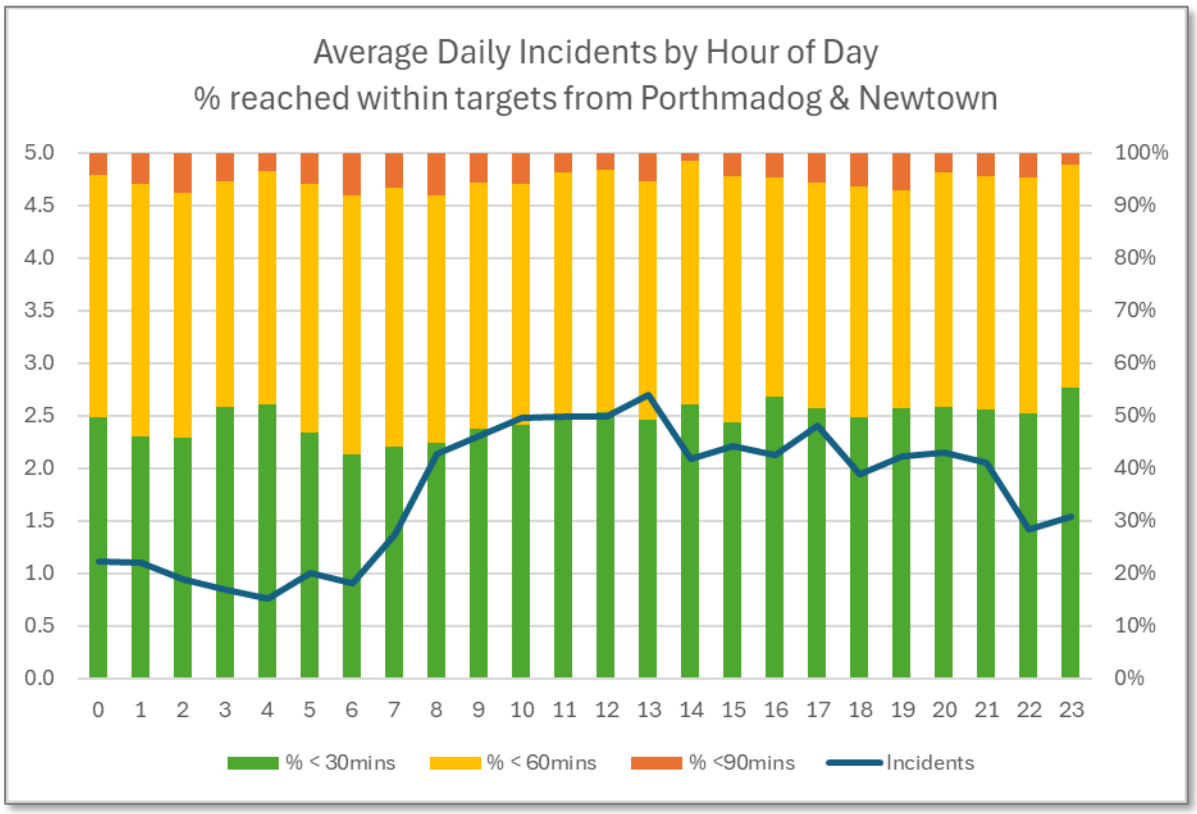
The number of annualised EMRTS, WAST Amber1, WAST Breathing Difficulty (06), WAST Chest Pain (10), WAST Stroke (28), and WAST CHARU-responds-to incidents within South Gwynedd, North Ceredigion, and North Powys is **15595**.

The percentages of these that are reachable within 30, 60, and 90 minutes from the chosen locations or pairs of locations are shown in the table below:

| TARGET: | <30 minutes | <60 minutes | <90 minutes |
|---|---|---|---|
| Porthmadog | 22% | 34% | 78% |
| Newtown | 28% | 69% | 91% |
| Dolgellau | 17% | 75% | 98% |
| **Porthmadog & Newtown** | **50%** | **95%** | **100%** |
| Porthmadog & Dolgellau | 34% | 78% | 98% |

These results indicate that vehicles based at both Porthmadog & Newtown can reach more incidents than at Porthmadog & Dolgellau within 30, 60, and 90 minutes. 50% of incidents can be reached within 30 minutes, 95% within 60 minutes, and 100% within 90 minutes.

The chart below shows the average daily incidents by hour (blue line), and the proportion of incidents in each hour of the day that can be reached within 30, 60, and 90 minutes.




It shows that on an average day, there is approximately 1 incident per hour between 00:00 and 07:00, rising through the morning to approximately 2.5 incidents per hour between 10:00 and 14:00, and decreasing slowly for the rest of the day to approximately 1.5 incidents per hour between 22:00 and 00:00.

It also shows little variation by hour from the overall averages, and typically 50% of incidents can be reached within 30 minutes, 95% within 60 minutes, and 100% within 90 minutes.

## 4.2 Recommendations

Basing vehicles at Porthmadog and Newtown give the best coverage of EMRTS and other high-priority incidents.