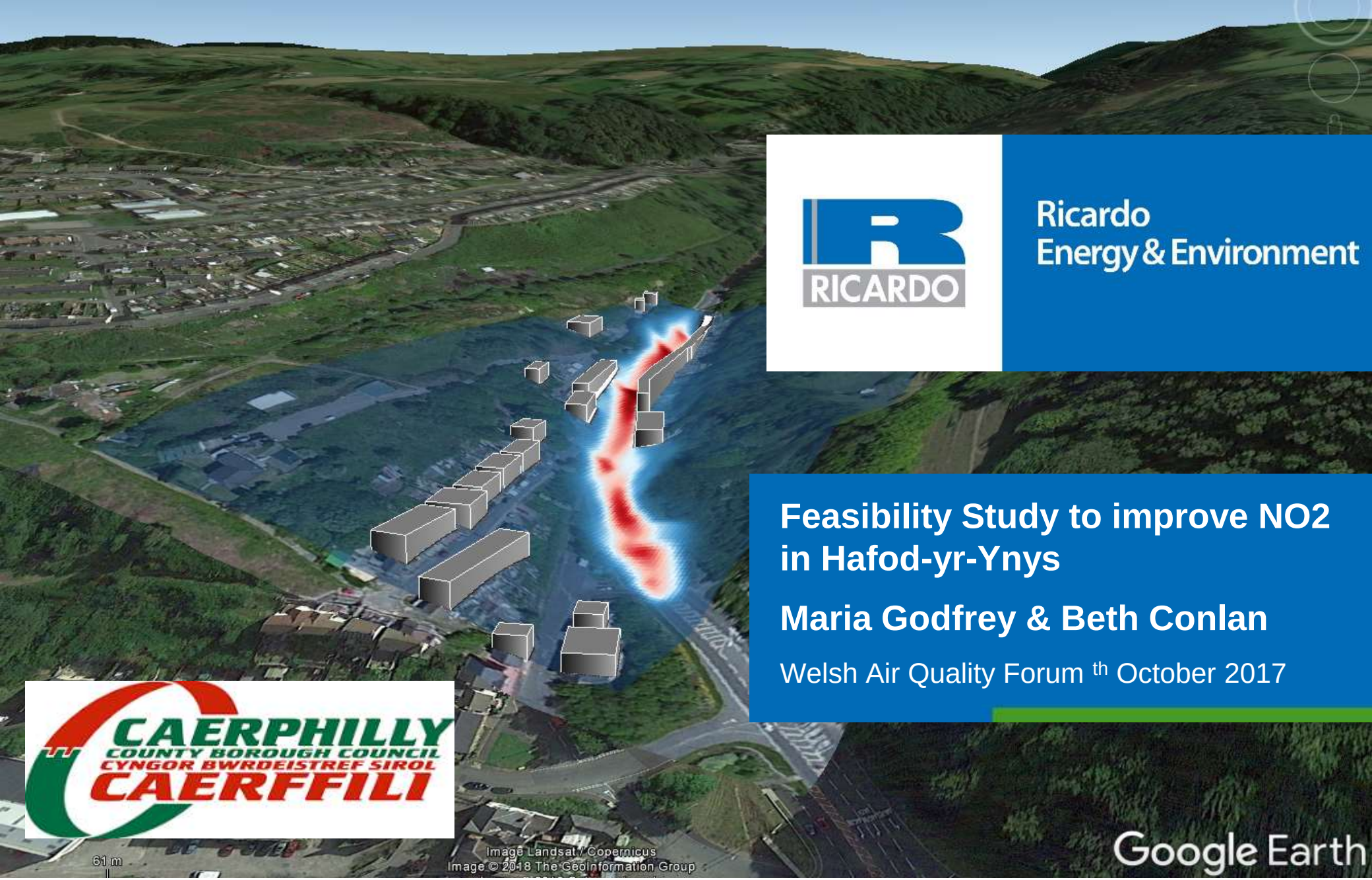


Ricardo Energy & Environment

Feasibility Study to improve NO2 in Hafod-yr-Ynys

Maria Godfrey & Beth Conlan

Welsh Air Quality Forum th October 2017

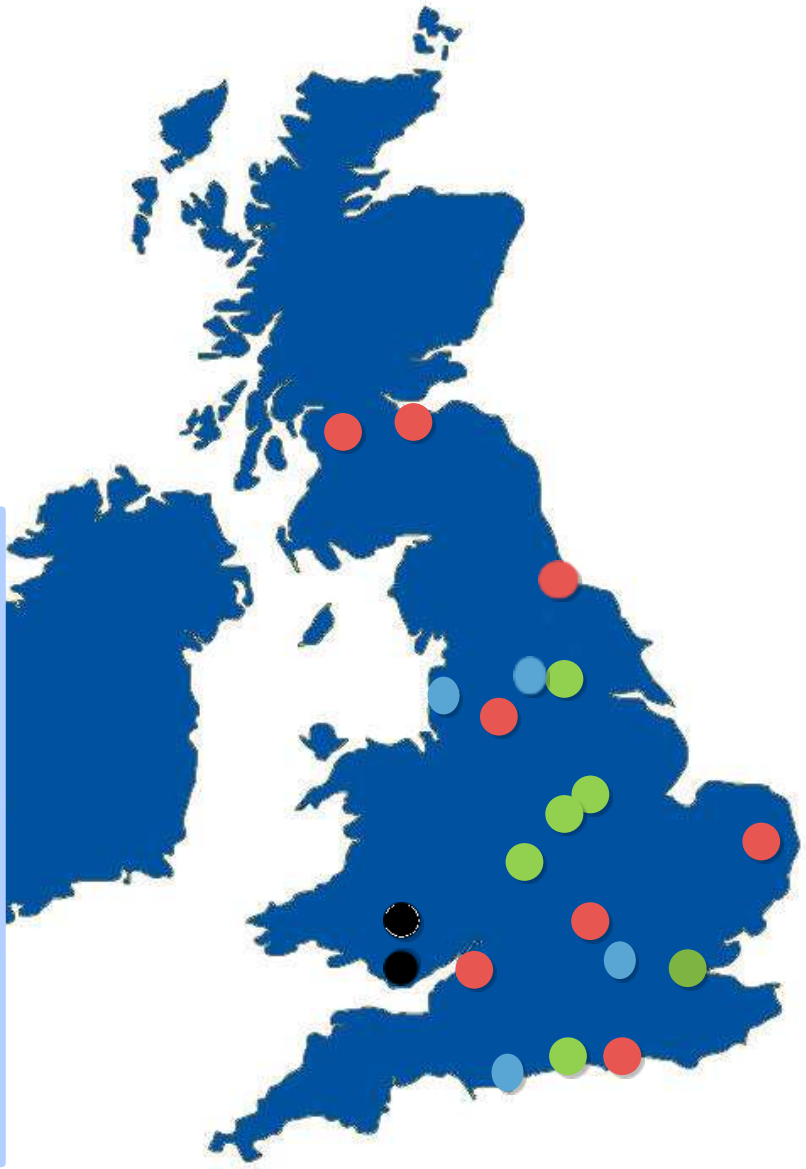
Feasibility Studies in the UK

Clean Air Zones – 1st group

- Leeds
- Nottingham
- Derby
- Birmingham
- Southampton
- London

Clean Air Zones – 2nd group

- 23 LAs including
- Newcastle
- Bristol & Bath
- Manchester
- Glasgow
- Edinburgh



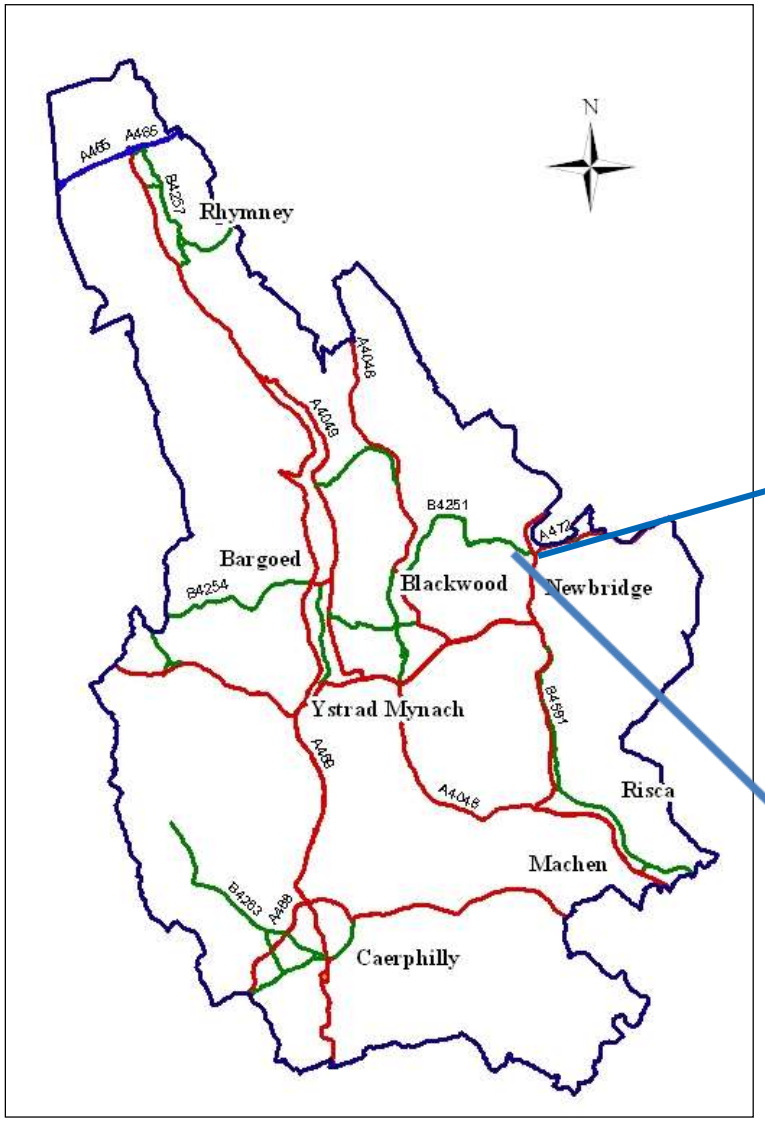
Clean Air Zones – 3rd group

33 LAs including
- Liverpool
- Oxford
- Portsmouth
- Bradford
- Reading
- Leicester
- Stoke on Trent

Wales

- Cardiff
- Caerphilly

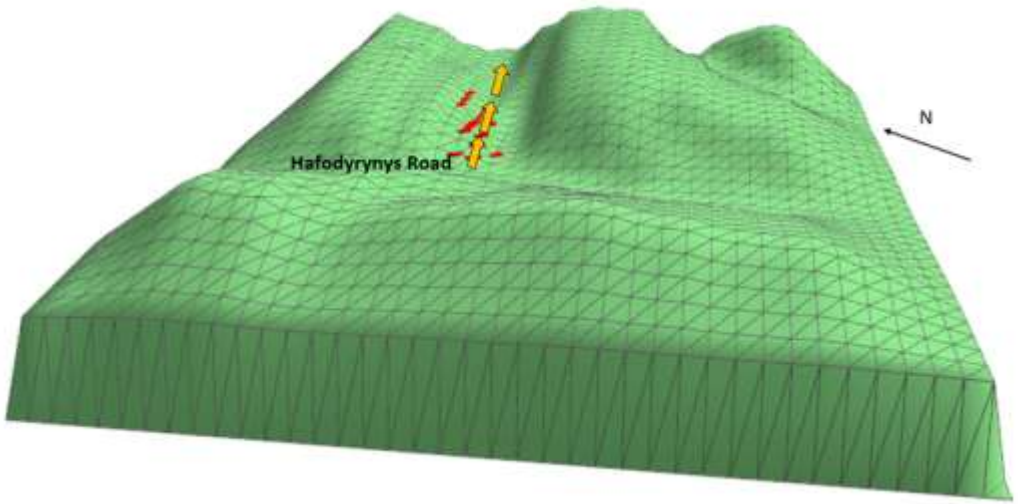
Hafod-yr-Ynys



Geometry

Steep sided valley

Street canyon

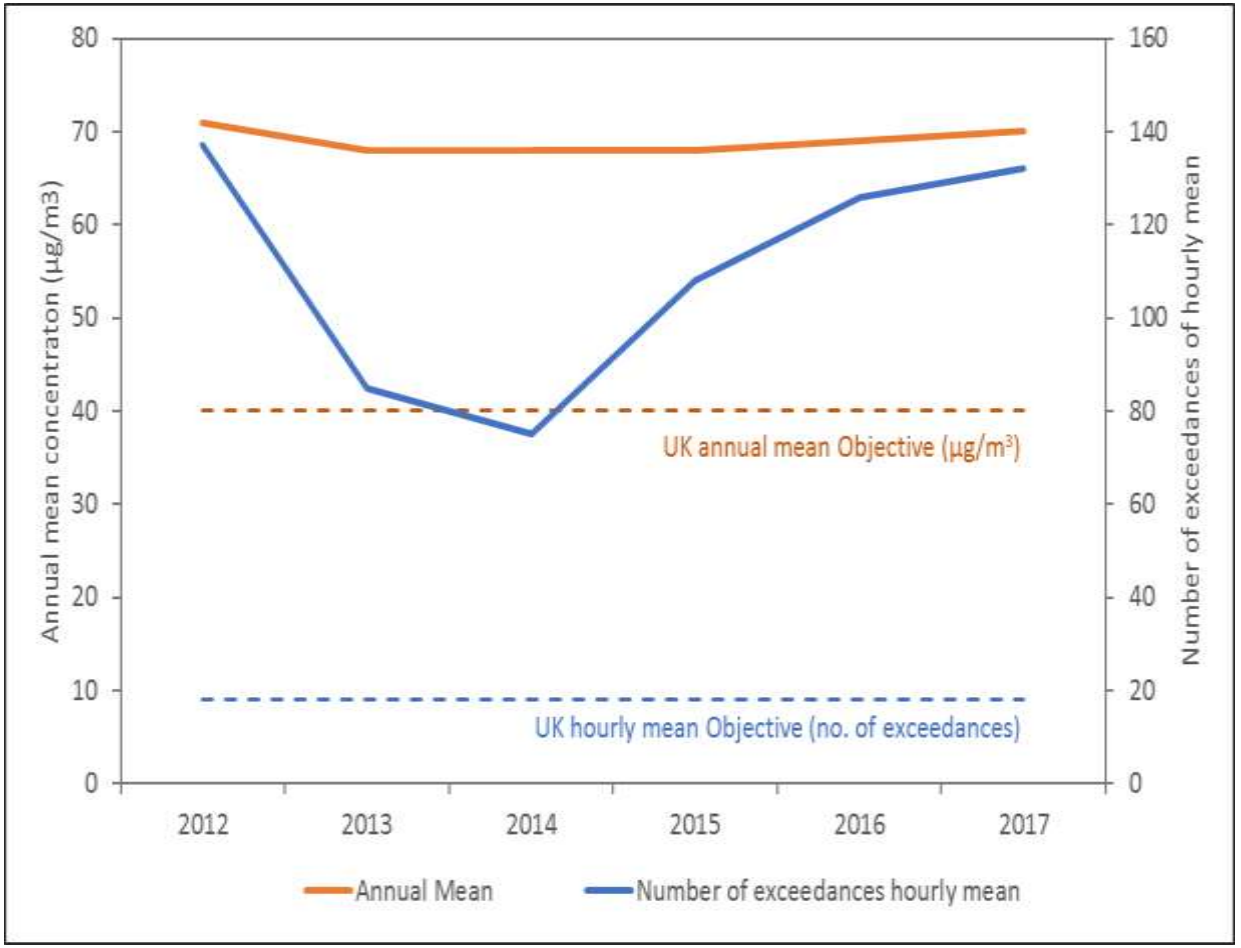


Ministerial direction

- Undertake as part of the UK plan for tackling roadside NO2 in 2017, a feasibility study, in accordance with HM Treasury Green Book, to identify the option **which will deliver compliance** with legal limits for NO2 in the area ***in the shortest possible time***.
- Initial scoping proposals – 31st March 2018
- Initial Plan - 30th September 2018
  - The case for change
  - Identifying, exploring and developing options
- Final Plan – 30th June 2019
  - Detail the preferred option with a full business case
- **WelTAG Five Cases Model** used as follows:
  - **Strategic case**: the case for change, fit with policies and well-being objectives
  - **Transport case:** does the proposal offer good public value for money and maximise contribution to the well-being goals?
  - **Financial case:** is the proposed spend affordable?
  - **Commercial case:** how can the scheme be procured? Is it commercially viable?
  - **Management case:** is the scheme achievable? Can it be delivered?

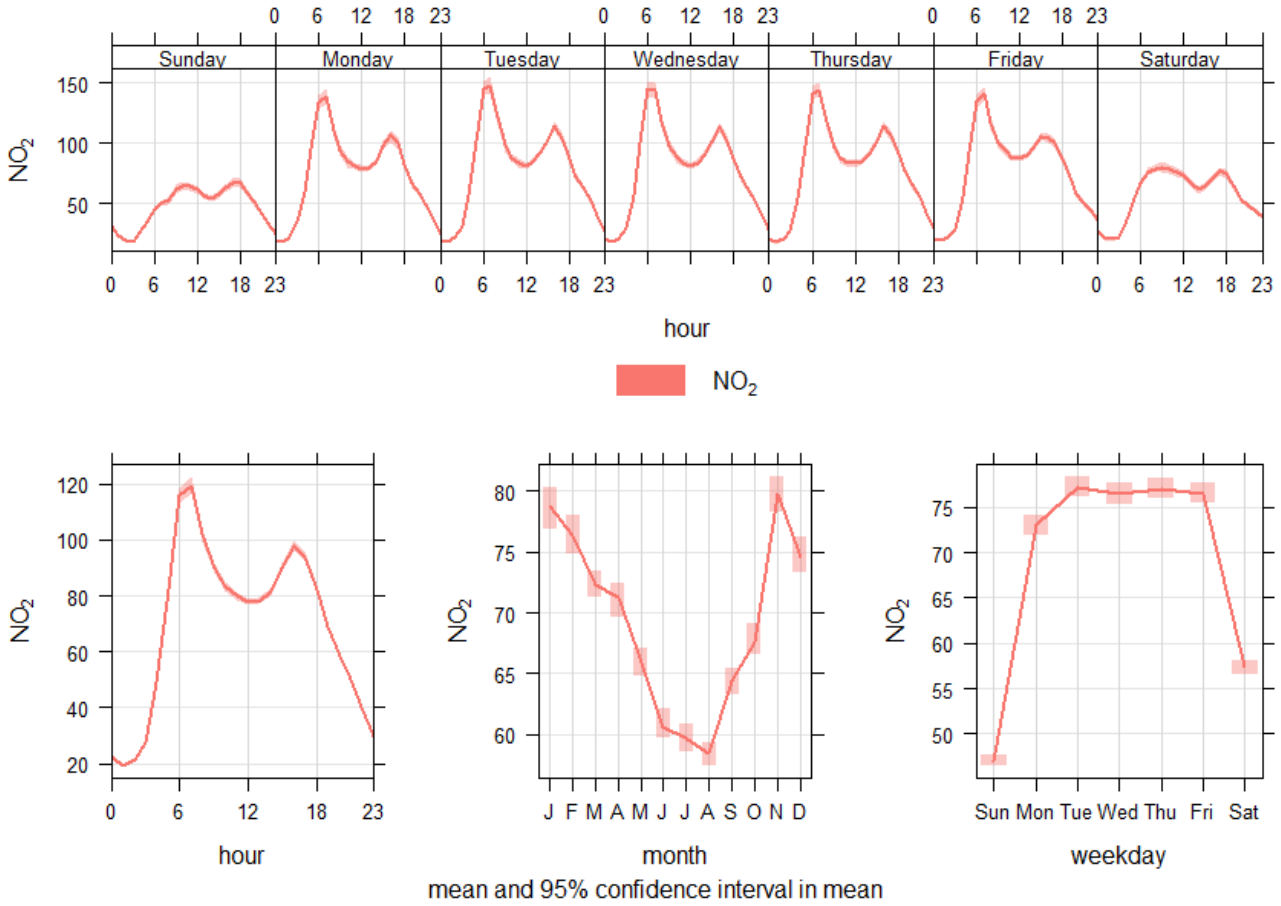
Air Quality today

- Annual mean fluctuates just 3 µg/m^3
- Hourly limit value highest in 2012 (137) and 2017 (132) and the lowest in 2014 (75) when roadworks impeded traffic flows



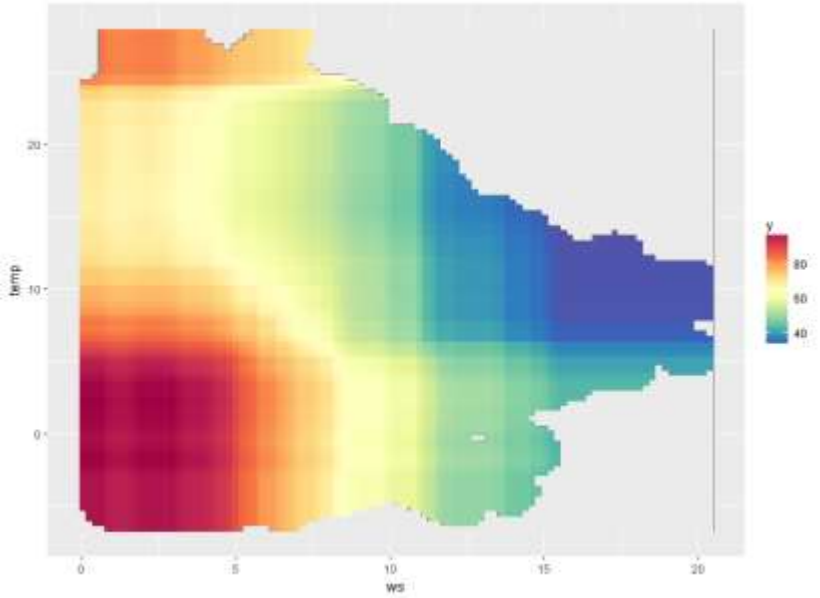
Seasonal trends - annual

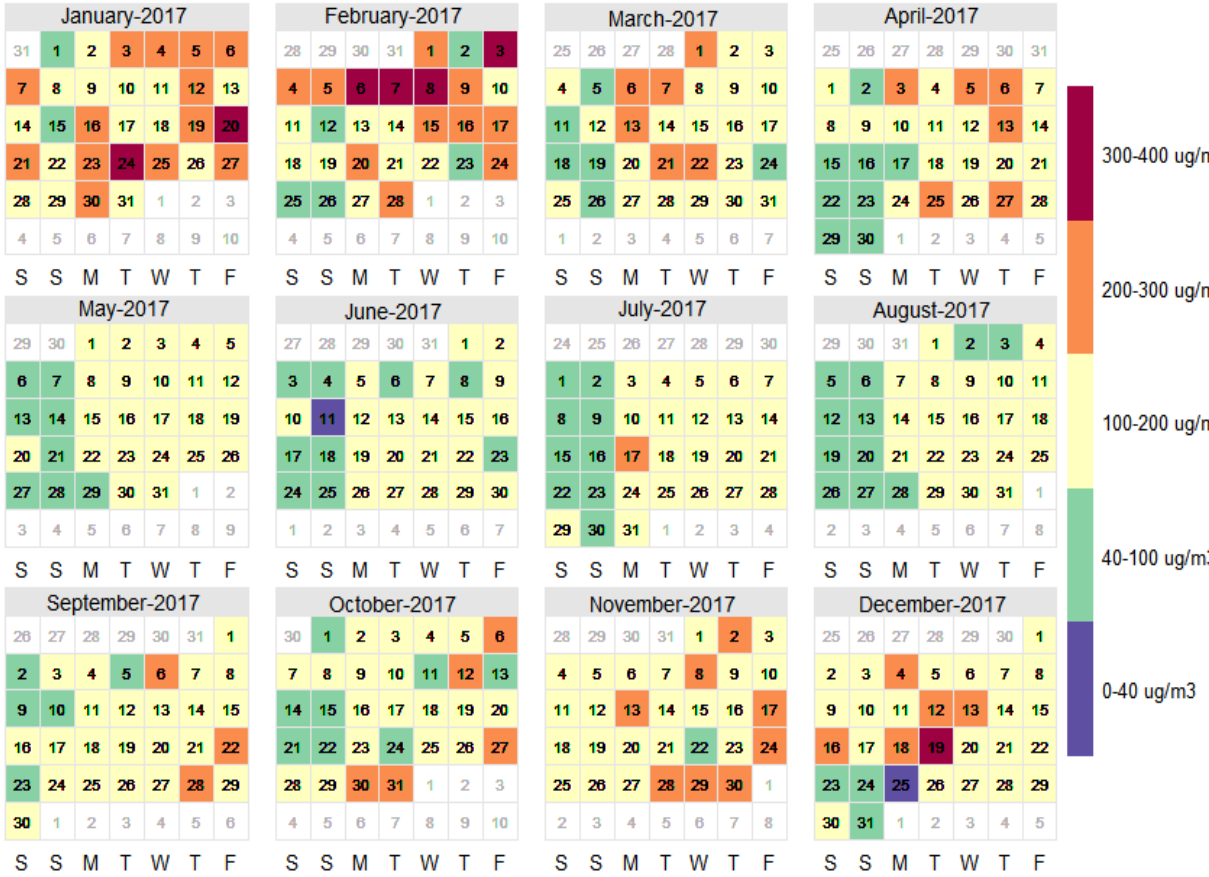
- Typical diurnal patterns – am peak highest during weekday
- Highest in winter



Seasonal trends - hourly

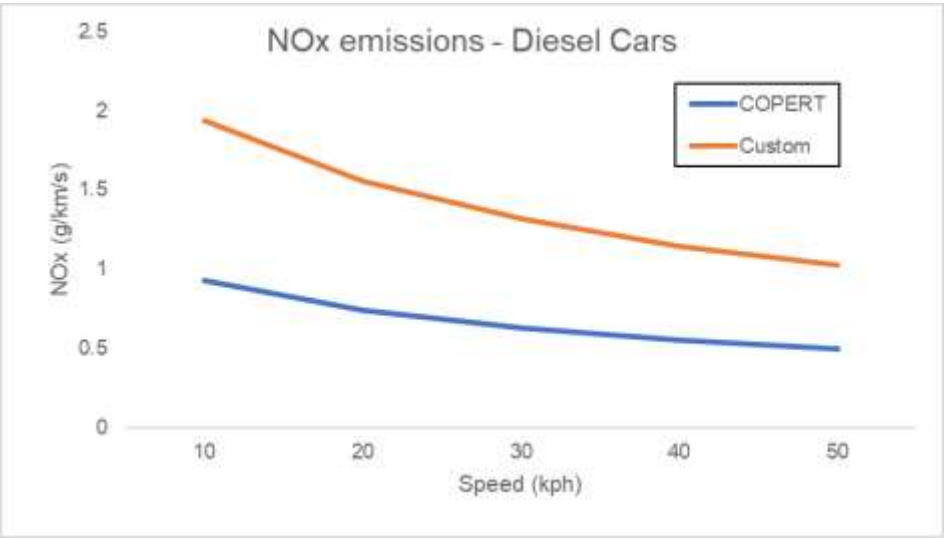
- The key influencing factor for exceedances of the objectives is clearly seasonal.
- The drivers for this are likely a combination of meteorology (low temperatures, temperature inversions, wind speeds) and seasonal emissions sources (cold starts, domestic heating).

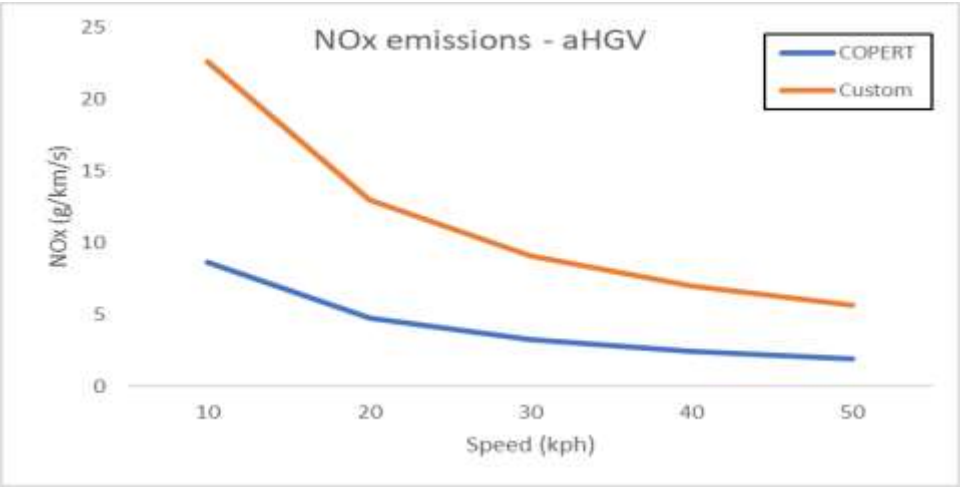




Emission factors – use of OPUS measurements

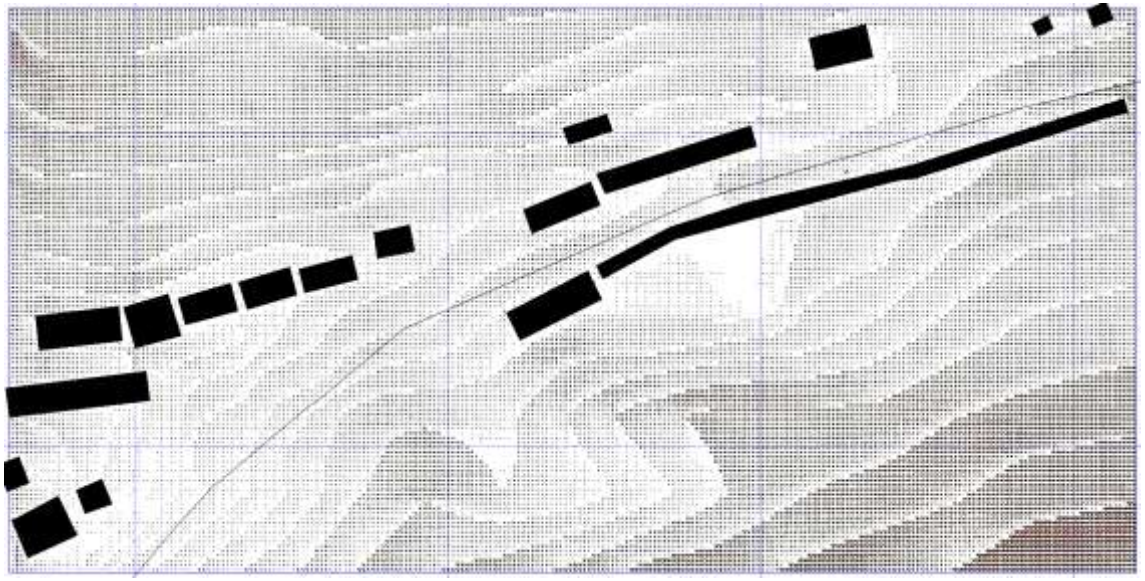
- Steep terrain not reflected in COPERT emission factors
- Substantial differences especially at low speed





Dispersion modelling

- Typical gaussian dispersion models not appropriate
- USEPA GRAL/GRAMM Computational Fluid Dynamics model
- 9x11km at 1.5m resolution
- 200 height points to build the terrain model
- Use of Meteorology model for the terrain – wind field with westerly boundary conditions



Short list of measures

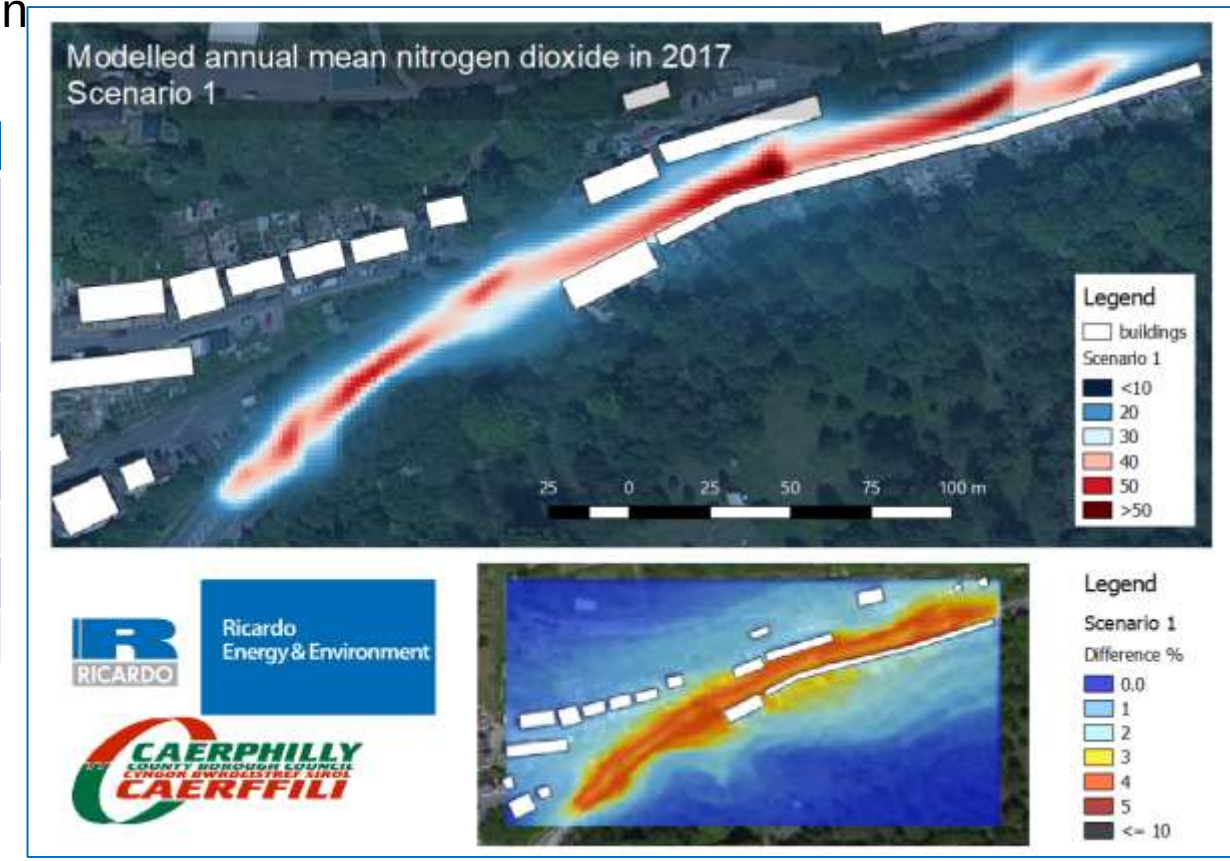
- The WelTAG stage 1 long list of 30 measures appraised for Effectiveness, Timescales and Deliverability

Scenario number and description of potential measure to improve air quality
1 - Change Signal Timings at Crumlin Junction
2 - Signalise the A472/B4471 as a Priority Junction and introduce an eastbound queue detector
7 - Reclassify National Speed Limit to 50mph on the A472 Hafod-yr-Ynys Road
11 - Demolish Dwellings at Woodside Terrace and Re-align Road
13 - Peak Hour HGV Bans
15 - Emissions Barrier
20 - Rear Access to Properties and Install NO_2 Filtration
26 - Clean Air Zone / Low Emission Zone
27 - Air Quality Public Information Campaign
28 - Bypass

Signal timings at Crumlin junction

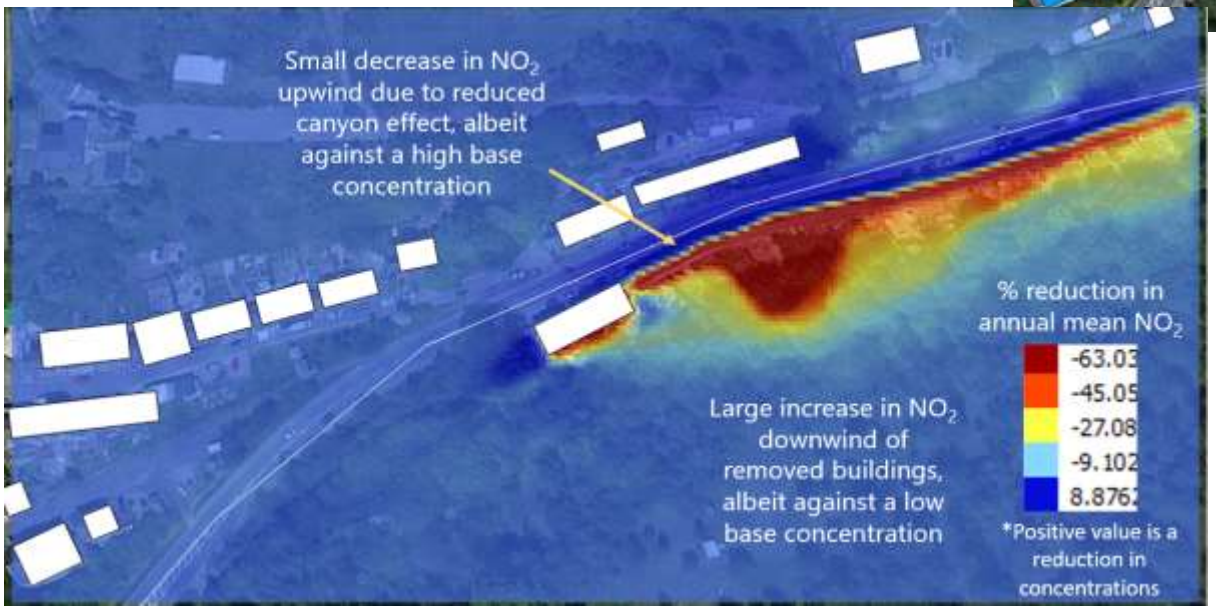
- No change in overall traffic volume
- Removal of traffic am peak queue up the hill
- 1-4 µg/m^3 decrease
- £1-2m spent in 2015 to improve the junction
- Same impact at Swyffryd junction

Site	Modelled NO_2 (µg m^{-3})	
	Baseline (no measure)	Scenario 1
CCBC48	57.9	55.1
CCBC60	36.9	35.1
CCBC83	68.9	65.6
CCBC79	53.6	51.0
Auto Site	64.3	61.2
Façade 1	86.7	82.5
Façade 2	96.2	91.5



Demolition of residential housing

- For this screening assessment scenario of removal of housing on Woodside Terrace
- No changes to emissions
- 8% reduction to houses north of Woodside Terrace
- Indication that all houses southside to be removed to be effective



Peak hour HGV ban

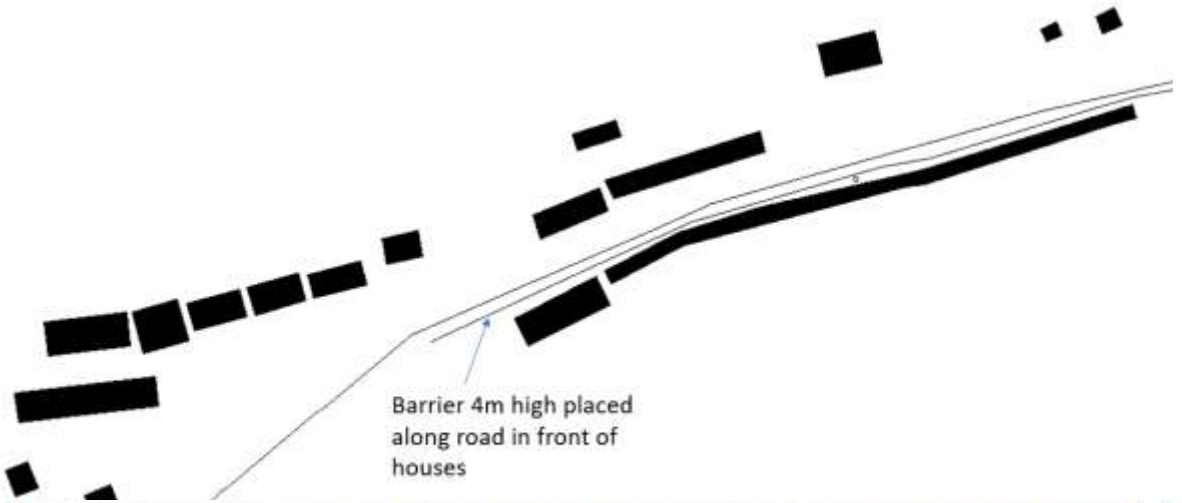
- Peak hour HGV account for 35% of total HGV
- Assume 50% displacement; 50% to interpeak
- Impact is positive but only just
- Could be more effective if packaged up with other traffic management measures
- Move to Stage 3 assessment
- Wider impacts to be assessed….

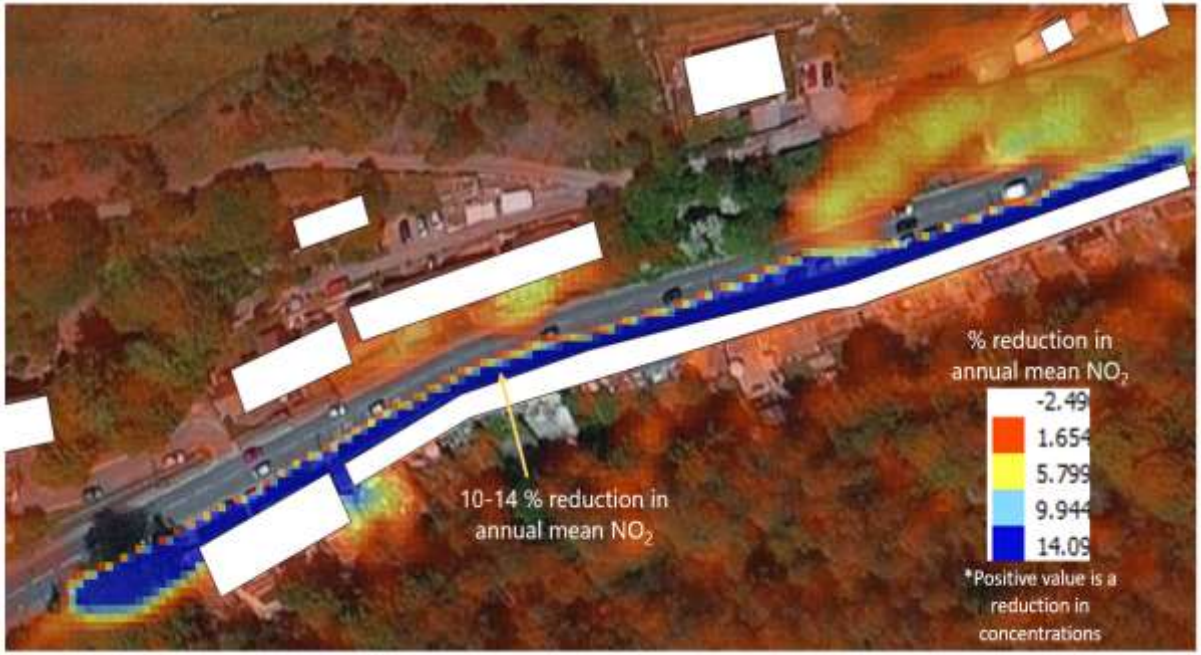
Site	Modelled NO_2 (µg m^{-3})	
	Baseline (no measure)	Scenario 13
CCBC48	57.9	55.7
CCBC60	36.9	35.5
CCBC83	68.9	66.3
CCBC79	53.6	51.6
Auto Site	64.3	61.9
Façade 1	86.7	83.4
Façade 2	96.2	92.5

Barrier

- Brings closer to compliance ~12% reduction
- Engineering constraints
- Pavement and emergency access
- Visual amenity

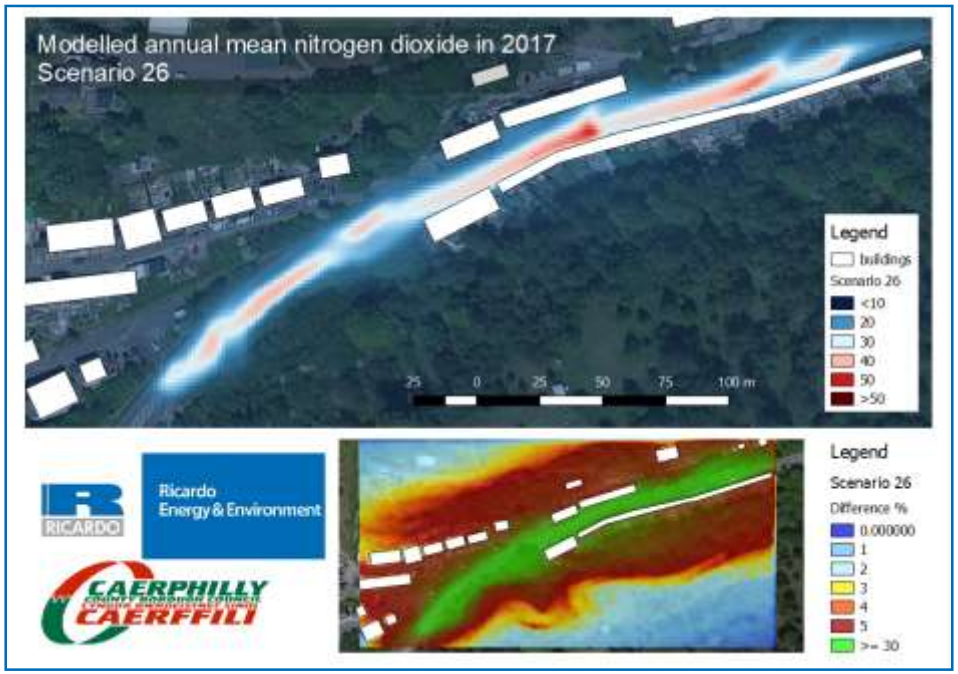
- Screened out on feasibility





Class D Clean Air Zone

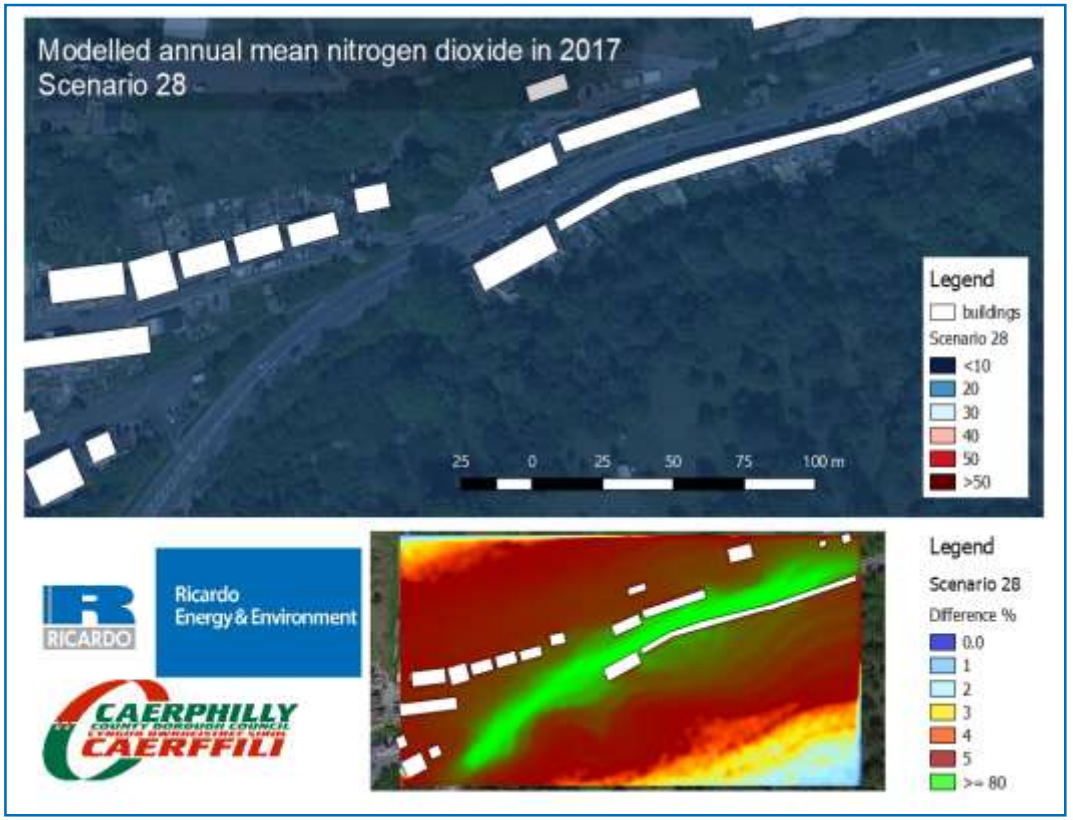
- Effective but not into compliance based on 2017
- Excess emissions due to gradient
- May bring forward compliance from 2029 to earlier year
- Deliverability with charging to be considered in Stage 3



Site	Modelled NO_2 (µg m^{-3})	
	Baseline (no measure)	Scenario 26
CCBC48	57.9	40.9
CCBC60	36.9	26.3
CCBC83	68.9	48.8
CCBC79	53.6	37.9
Auto Site	64.3	45.5
Façade 1	86.7	61.2
Façade 2	96.2	67.8

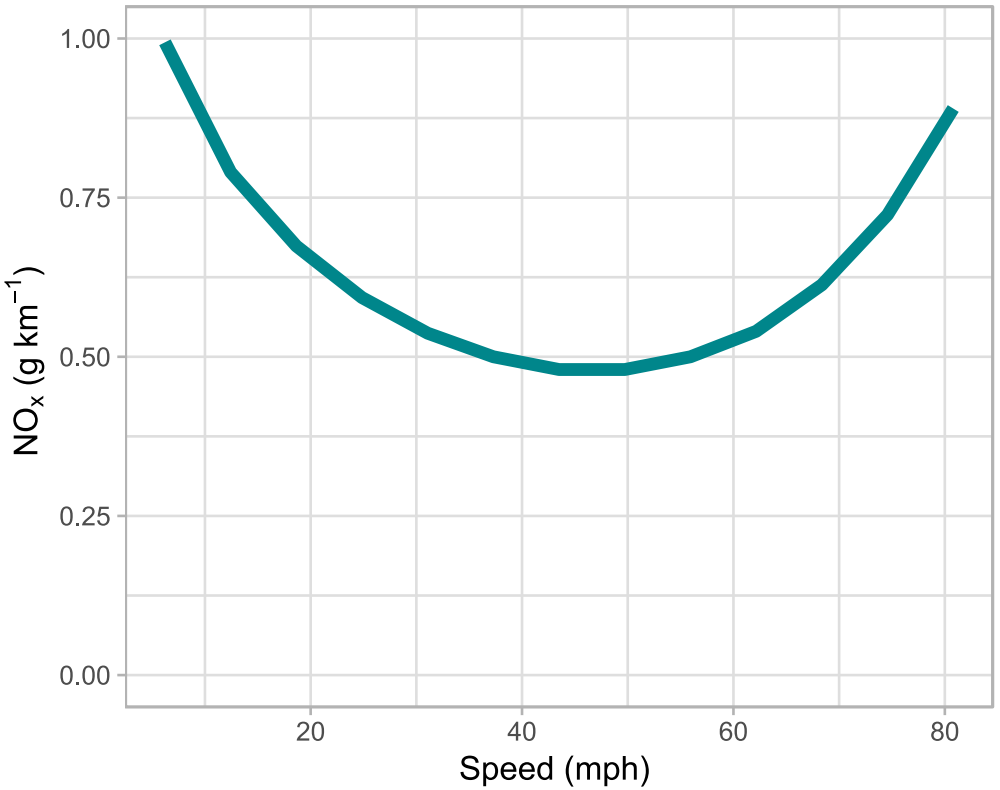
Bypass

- Brings to below current background levels
- Highly effective
- Timescales likely to be late 2020's and unlikely to bring forward compliance
- Displacement of emissions into other communities



Speed limit changes

- Suggestion to reclassify the national speed limit at the top of the hill to 50 mph
- Screened out as negligible number of vehicles over 50 mph
- Further suggestion to consider 30 mph from bottom to top of hill
- To be considered further in Stage 3



Speed-emission curve for Euro 5 diesel cars

Measures going forward

Change Signal Timings at Crumlin Junction	✓
Signalise the A472/B4471 as a Priority Junction and introduce an eastbound queue detector	✓
Reclassify National Speed Limit to 50mph on the A472 Hafod-yr-Ynys Road	✓
Demolish Dwellings at Woodside Terrace and Re-align Road	✓
Peak Hour HGV Bans	✓
Emissions Barrier	✗
Rear Access to Properties and Install NO_2 Filtration	✗
Clean Air Zone / Low Emission Zone	✓
Air Quality Public Information Campaign	✓
Bypass	✗

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