

Bath CAZ - HGV Outer Exemption Zones

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Introduction

As part of the ongoing commission from Bath and North-East Somerset Council (B&NES) to assess impacts of the implemented Clean Air Zone (CAZ), and possible changes to it, Jacobs have been asked to assess the impact of charging Euro 6 N3 HGVs (weighing over 12 tonnes). Firstly, the number of vehicles that it would affect and secondly, as B&NES wish only to target 'through' trips primarily, to define an area within which Euro 6 N3 HGVs could be exempt from the restriction.

B&NES have requested that Jacobs consider what the exemptions area would be, if it is identified on the basis of making areas exempt if they have no viable alternative route avoiding the CAZ¹, or would have to divert onto a route that would mean an increase in journey time of over 20 minutes in order to avoid the CAZ. This Technical Note sets out the methodology used to consider such HGV routing options and the resulting area of Bath outside the CAZ where exemptions may be granted for Euro 6 N3 HGVs either delivering to the Bath area (i.e. local deliveries) or from the Bath area (i.e. local businesses). It then provides the results of this process in terms of an associated cordoned area for the exemption.

Methodology

Routes

The following long-distance routes have been identified as key HGV routes that may be diverted if a restriction on Euro 6 N3 HGVs was brought in as part of the CAZ:

- Bath to/from M4 East
- Bath to/from M4 West
- Bath to/from Bristol city centre
- Bath to/from M5 South
- Bath to/from Poole

There will also be some settlements in the environs beyond Bath where a Euro 6 N3 HGV charge on the route through the CAZ could require a long diversion to avoid if both trip ends are within these settlements. It is knowledge of these that also need to be considered in determining where the outer bounds of the exemption boundary should be. Therefore, in addition to the long-distance routes, the following short distance routes

¹ Where this document refers to entering or passing through the CAZ, this is taken to be synonymous with passing through the charging scheme area for the proposed charge.

have been identified as key routes that may be diverted if a restriction on Euro 6 N3 HGVs was brought in as part of the CAZ:

- Batheaston to/from Radstock
- Batheaston to/from Timsbury
- Batheaston to/from Peasedown St John
- Box to/from Radstock
- Box to/from Timsbury
- Box to/from Peasedown St John
- Bathampton to/from Radstock
- Bathampton to/from Timsbury
- Bathampton to/from Peasedown St John
- Bathampton to/from Corston
- Bathampton to/from Saltford
- Saltford to/from Freshford
- Corston to/from Freshford

These routes cover a range of movements across Bath that would normally use the A36/A367/A4 via the CAZ and do not have many suitable alternative routes. Most routes are south-west to north-east or south-east to west movements.

In order to carry out this analysis, a suitable threshold was required for the additional journey time beyond which it was deemed that a route had no suitable alternative. Based on best judgement and the suitability of the resulting associated exemption area, 20 minutes was used as the threshold.

Data Sources

The Road Lords route planner² was used as the primary source for determining HGV routing. Road Lords allows the user to identify routes based on the following vehicle weights: 3.5t, 7.5t, 12t and 40t. It was noted that for each weight, standard dimensions and axles counts were assumed¹. Google Maps was then used as a secondary source of routing. However, Google Maps³ does not have any HGV functionality and hence will not pick up any height or weight restrictions. For this reason, it was used as a sensibility check.

Due to the works being undertaken on Cleveland Bridge in Bath, there is currently a width restriction limiting its use by HGVs. However, the present update to Road Lords only assumes an 18t weight limit and hence continues to regard Cleveland Bridge as a viable route for HGVs up to 18t. Therefore, it is only the 40t weight class that Road Lords will divert away from Cleveland Bridge. Given that currently any restrictions on Cleveland Bridge are temporary, this analysis has assumed that all HGVs driving through the CAZ are permitted to use Cleveland Bridge.

Road Lords also assumes no weight limit exists on the A420 via Wick, however a 7.5t weight limit (except for access) currently exists to deter traffic diverted from the restrictions on Cleveland Bridge. However, with Cleveland Bridge works completed and open with no restrictions, the scenario assumed in Road Lords for this part of the A420 will be true i.e. no temporary 7.5t restriction.

In addition to the routing analysis undertaken using Road Lords and Google, local knowledge of Bath and its surrounding areas has also been applied, with regards to road suitability. This is particularly the case to the

² <https://dispatcher.roadlords.com/route-planner>

³ <https://www.google.co.uk/maps>

north of Bath itself, where roads such as Lansdown Road and Lansdown Lane are steep and not suitable for large HGVs. At the top of Lansdown Lane there is a 1.8m width restriction/7.5t weight restriction, at the top of Weston Lane there is a 7.5t weight restriction, and Lansdown Road has a 3.5t weight restriction just to the south of Granville Road.

Step-by-Step Process

Long Distance Trips

The following steps were taken to help decide the exemption area for long distance trips.

1. First, a neutral time of day was used (10:00-15:00) to plot journeys, to avoid excessive delays which may cause some routes to show adversely long journey times. Accidents and road closures were also noted and where they occurred, a new time was chosen to plot routes.
2. Seven trip-ends were chosen to initially represent areas of Bath outside of the CAZ. These are shown below in **Table 1**.

Table 1: Initial trip-end locations in Bath.

	Area	Location
NW	Combe Park	Royal United Hospital, off Combe Park
N	Lansdown	Royal High School Bath, off Lansdown Road
NE	Camden	Morrisons, London Road
SE	Claverton Down	University of Bath, Convocation Avenue
S (inner)	Bear Flat	Beechen Cliff School, Kipling Avenue
S (outer)	Odd Down	Sainsbury's, Frome Road
SW	Oldfield Park	Co-op Food, Shaftesbury Road

1. Areas of Bath that would **not** be affected by a Euro 6 N3 restriction were confirmed, that is the areas where journeys would not be routed through the CAZ. For example, any M4 East trips to/from the very north of Bath would use the A420 and hence would not be affected by a Euro 6 N3 restriction in the CAZ area. Therefore, these areas were discounted for M4 East trips.
2. Next, the areas of Bath where the quickest route **would** be via central Bath and through the CAZ were identified. For example, the quickest routes for most trips between M4 East and SE, S and SW Bath would be via the CAZ.
3. For these routes, Road Lords was used to calculate the fastest journey times for 12t vehicles (which it will permit over Cleveland Bridge).
4. Next, the vehicle weight on Road Lords was altered to 40t (which it will **not** permit over Cleveland Bridge), and the alternative route noted. It was necessary here on occasion to force Road Lords to use routes that avoided the CAZ area and known to be 'HGV-friendly'. The journey time for this alternative route was noted, and the difference between it and the fastest route (via the CAZ).
5. If differences were over 20 minutes, an area around the Bath trip-ends shown in Table 1 was defined by moving the Bath trip-end away from the city centre until the difference in journey time fell below 20 minutes.
6. Google Maps was used as a secondary source of journey times to serve as a sensibility check.
7. Output areas were then drawn based on additional journey times of over 20 minutes.

Short Distance Trips

The following steps were taken to help decide the exemption area for short-distance trips. These steps were used for the short-distance O-D pairings listed earlier:

1. Again, a neutral time of day was used (10:00-15:00) to plot journeys so as to avoid excessive delays which may cause some routes to show adversely long journey times. Accidents and road closures were also noted and where they occurred, a new time was chosen to plot routes.
2. For the short distance routes identified, Road Lords was used to calculate the fastest journey times for 12t vehicles (which it will permit over Cleveland Bridge).
3. Next, the vehicle weight on Road Lords was altered to 40t (which it will **not** permit over Cleveland Bridge), and the alternative route noted. It was necessary here on occasion to force Road Lords to use routes that avoided the CAZ area and known to be 'HGV-friendly'. The journey time for this alternative route was noted, and in particular the difference between it and the fastest route (via the CAZ).
4. Google Maps was used as a secondary source of journey times to serve as a sensibility check.
5. If the alternative route was over 20 minutes, one or both trip ends were deemed to be within the proposed exemption area.

Results

Long Distance Trips

M4 East: All trip ends to/from the south part of Bath required a diversion with an additional 20+ minutes in journey time. Hence the southern part of Bath was included within the exemption zone. HGV trip ends to/from the north part of the city can theoretically use the A420 and either Lansdown Road or Lansdown Lane. However, these roads involve steep gradients and are not particularly suitable for HGVs. The most suitable route for HGVs travelling from M4 East (via M4 junction 18) may still be via the A46(T) and A4 into Bath and the CAZ, and then out again heading north. For this reason, the northern part of Bath was wholly included within the exemption zone.

M4 West: Accessibility to the M4 West is generally better than for M4 East due to a greater range of route options to get to M4 junction 19 (A4/A4174, A431/A4174 or A420/A4174). The only area of Bath that showed an additional 20+ minute diversion was the University of Bath. However, this had already been included as part of the zone for M4 East.

Bristol City Centre: Analysis of this route was effectively picked up as part of the short-distance route analysis below.

M5 South: It was decided this was effectively repeating the M4 West analysis, as the preferred route for HGVs bound for M5 South would be to travel via the M4 (Junctions 18 or 19).

Poole: For analysis of trips between Bath and the south, there were no Bath trip-ends that forced a diversion of 20+ minutes.

Short Distance Trips

Table 2 shows the results from the local route analysis of selected settlements surrounding Bath. It shows the additional journey time (in minutes) that would occur if HGVs were diverted away from the CAZ, according to the Road Lords route planner. For O-D pairs where the fastest route does not pass through the CAZ, 0 minutes is shown. From this, it can be seen that villages such as Corston, Peasedown St John, Freshford and Bathampton had multiple routes that required a 20+ minute diversion.

Table 2: Additional journey time (minutes) between villages surrounding Bath, caused by diversion away from the CAZ.

To/ From	Batheaston	Bathampton	Box	Radstock	Timsbury	Peasedown St John	Corston	Saltford	Freshford
Batheaston	-	9	0	12	16	22	8	2	18
Bathampton	7	-	5	11	19	19	36	28	0
Box	0	7	-	15	15	23	9	2	14
Radstock	8	9	12	-	0	0	0	0	0
Timsbury	15	19	10	0	-	0	0	0	11
Peasedown St John	22	18	19	0	0	-	0	0	9
Corston	5	34	5	0	0	0	-	0	42
Saltford	1	28	1	0	0	0	0	-	38
Freshford	15	0	11	0	12	6	44	38	-

Areas for Inclusion/Exclusion

Include Based on Long Distance Trips

1. **Bath southern suburbs:** Analysis of the southern area of Bath revealed an increase in journey time of greater than 20-minutes for trips to/from M4 East, and hence the southern suburbs of Bath were included within the cordon. In the case of the University of Bath (due to local access-only weight restrictions and the University's geographic location), there were actually no suitable routes that avoided the CAZ.
2. **Bath northern suburbs:** Despite access generally being better for northern suburbs (access is possible via A431 and A420), these areas were included within the cordon due to steep gradients on some access roads (Lansdown Lane and Lansdown Road for example) meaning the most *suitable* HGV routes between northern suburbs and most locations may still be via the CAZ.

Include Based on Short Distance Trips

3. **Bathampton:** Included given its close proximity to Bath and the fact journeys between it and villages such as Saltford and Corston would require long detours of well over 20 minutes.
4. **Batheaston and Bathford:** Included within the cordon due to their proximity to Bath and increases in journey times of over 20-minutes to/from villages to the south of Bath, such as Peasedown St John.
5. **Corston and Newton St Loe (including Bath Spa University):** Included within the cordon due to an increase in journey times of over 20-minutes to/from villages to the northeast and southeast of Bath, such as Bathampton and Freshford.
6. **Peasedown St John:** Included within the cordon due to an increase in journey times of over 20-minutes to/from villages to the northeast of Bath, such as Box and Batheaston.
7. **Freshford and Limpley Stoke:** Included within the cordon due to increases in journey times of well over 20-minutes to/from villages to the west of Bath, such as Corston and Saltford. While alternative routes taking less than an additional 20-minutes did exist (via Winsley and Bradford-on-Avon), these involved passing underneath the low (4.1m) railway bridge on Winsley Hill, which was deemed unsuitable for HGVs (see notes below).

Exclude

8. **Saltford:** Not included within the cordon due to alternative routes via A4/A4174/A420. The only routes studied that showed 20+ minute diversions were Saltford to/from Bathampton and Freshford, both of which were already included within the exemption zone.

Exemption Area

Based on these areas to include and exclude, an initial exemption area was drawn up by hand. For practical reasons it was decided to refine the area so it was based on postcode sectors to define the exemption area. The postcode sectors shown in **Table 3** are the recommended postcodes to include within the exemption area. The refined area based on postcodes is in geographical terms larger than the initially drawn-up area, however the additional area is almost all rural in nature and therefore would not be much larger in terms of population. The additional areas include environs of Bath to the north, west and south, including parts of BA1 8, BA1 9, BA2 7, BA2 8 and BS2 9.

Table 3: Postcode sectors to include

Included Postcodes										
BA1 postcodes	BA1 0	BA1 1	BA1 2	BA1 3	BA1 4	BA1 5	BA1 6	BA1 7	BA1 8	BA1 9
BA2 postcodes	BA2 1	BA2 2	BA2 3	BA2 4	BA2 5	BA2 6	BA2 7	BA2 8	BA2 9	

Figure 1 shows the proposed Euro 6 N3 HGVs exemption area identified, taking into consideration the routing analysis described, local knowledge of Bath and its surrounding areas, and postcode sectors. The CAZ boundary and postcode sectors are shown for reference, while the numbered points 1-8 refer to the numbered reasons for inclusion and exclusion discussed above.

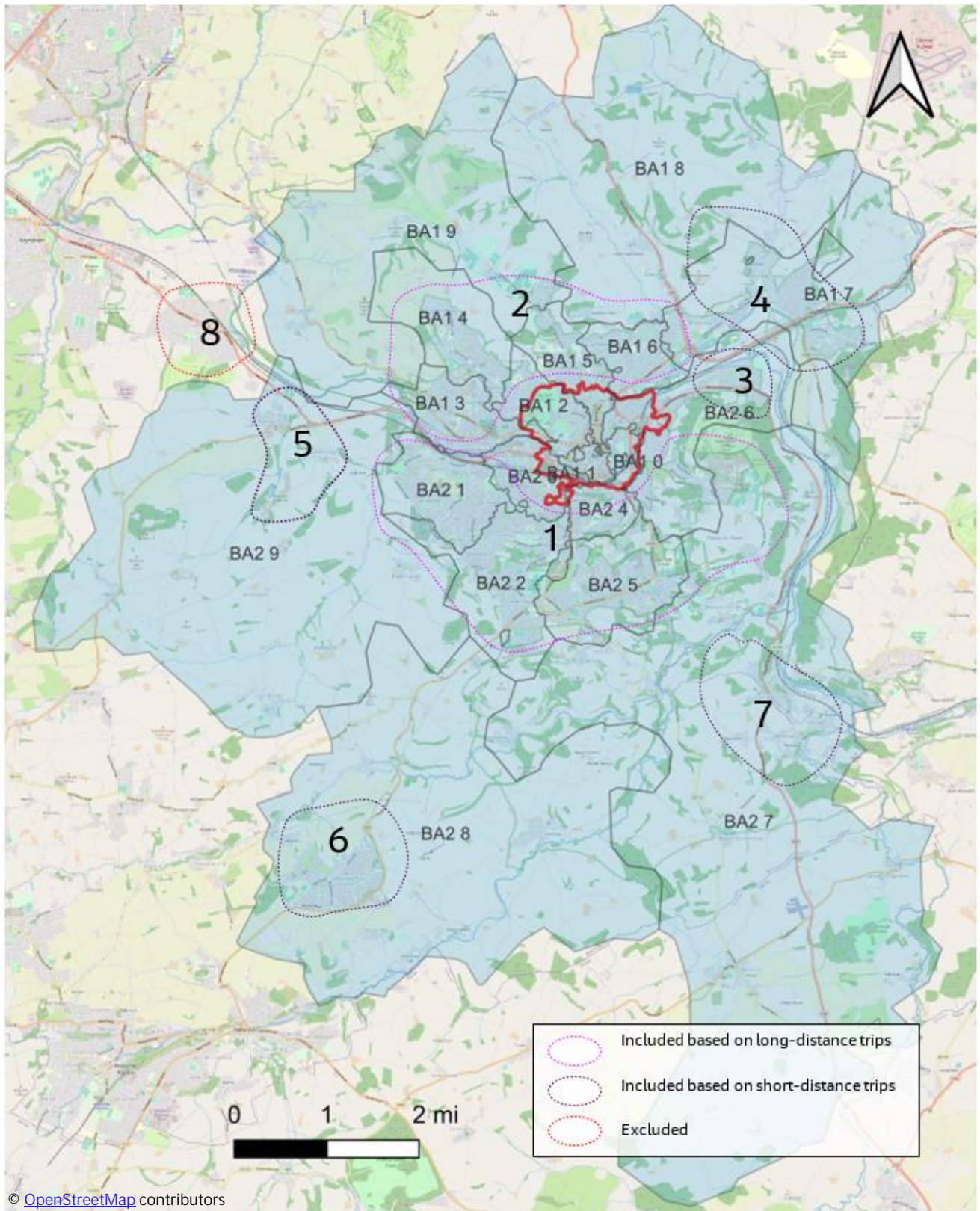


Figure 1: A suggested exemption area based on postcode sectors

Notes

1. The following routes have been identified as unsuitable for large HGVs and have been avoided when determining alternative routes. Note this list was compiled from local knowledge of the area and is non-exhaustive.
 - Lansdown Lane (steep gradient)
 - Lansdown Road (steep gradient)
 - B3108 Winsley Hill (4.1m/13'9" height restriction on railway bridge)
 - Bradford-on-Avon Town Bridge (18t weight restriction)
 - Coalash Lane (3.9m/12'9" height restriction on railway bridge)
2. This Technical Note does not take into consideration the *implementation* of any charge relating to Euro 6 N3 HGVs, and expressly the viability or feasibility of the enforcement mechanism used to differentiate between trips deemed 'through' and those having a valid case for exemption.
3. As postcodes refer to address points rather than areas, creating polygons of postcode sectors requires an estimation process. Boundaries for individual postcodes (e.g. BA2 9AV) are created using a Thiessen/Voronoi process, which computes a non-unique set of non-overlapping polygons, containing addresses from a common postcode. Postcodes with the same sector, i.e. the same postcode area, postcode district and first number of the inward code (e.g. BA2 9 or BA21 5) are then merged to create polygons for postcode sectors. Hence postcode sector polygons displayed on a map are notional and should be used for indicative purposes only. The only absolute method for determining whether or not an address is within the exemption area is to compare the target address's postcode with the list/table of included postcode sectors.

ⁱ Weight 3.5t, Length 6.5m, Width 2.2m, Height 2.9m, Axles 2
Weight 7.5t, Length 12m, Width 2.5m, Height 3.5m, Axles 2
Weight 12t, Length 12m, Width 2.5m, Height 3.5m, Axles 3
Weight 40t, Length 20m, Width 3m, Height 4m, Axles 6