Leeds Clean Air Zone – Summary of Transport Modelling (v3 19/12/17)

1. This note provide a summary of the approach taken to forecast future year traffic levels for use in the air quality modelling.

2. Leeds City Council uses a computer transport model to forecast future traffic conditions. In the past this has been used to help support business cases for major transport schemes and to assess the impact of the Site Allocations Plan.

3. The model covers the whole of Leeds District, together with neighbouring local authorities and national road and rail links. Seven time periods, representing an average weekday, are modelled covering three hours during the morning peak period, three in the evening peak period and an average inter peak hour.

4. The model includes both roads and public transport (bus and rail) and can also model park and ride.

5. Cars, light goods vehicles (LGVs) and heavy goods vehicles (HGVs) are included as separate user classes within the model and the model can forecast route choices by these vehicles in response to changes in the highway network. Buses are also modelled as fixed flows, representing existing bus routes.

6. The model has recently been updated to a new 2015 Base Year. Tests have been undertaken to ensure that the model represents an acceptable match against observed traffic levels and journey times (see Appendix A : Local Model Validation Report).

7. For the Clean Air Zone (CAZ) modelling the 2015 Base Model was modified to separate out cars, LGVs and HGVs into compliant and non-compliant vehicles.

8. Future year traffic levels in 2020 and 2022 were forecast based on assumptions about the overall level of traffic and development growth in Leeds. This included adding in planned new developments and Department for Transport (DfT) forecasts[1].

9. A number of transport interventions were also added to the model, representing schemes either delivered since the 2015 Base Year or planned to be completed by 2020. The principal schemes are listed in Table 1 below.

10. The resulting level of local traffic growth (in veh-kms) between 2015 and 2020 is 8.7%, with LGVs traffic rising by 14.2% and HGV by 4.0%. This represents a continuation of previous trends in traffic levels, with LGVs rising much faster than general traffic – see Figure 1.

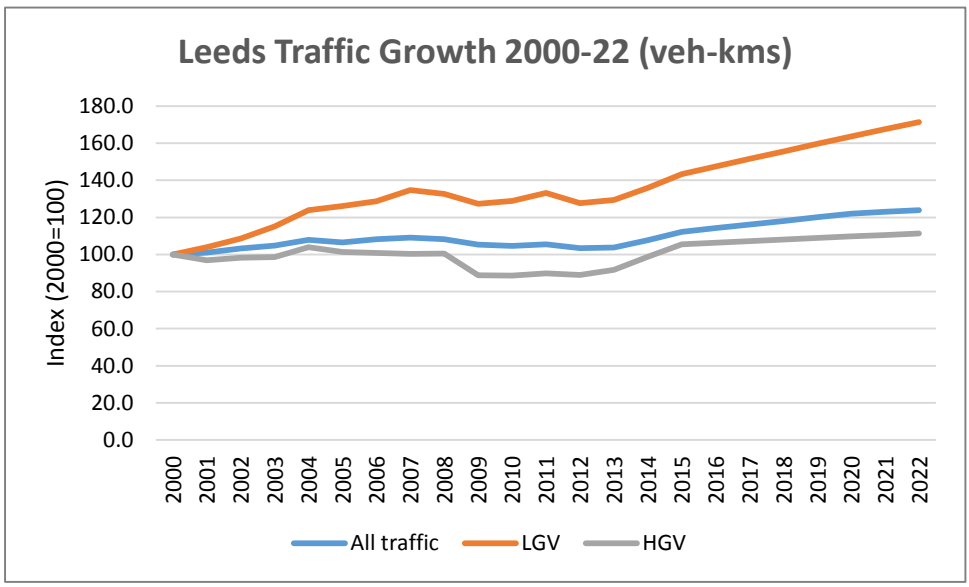
11. Although traffic levels since 2008 have fallen or remained static, there is evidence that growth has returned, with traffic volumes rising since the low point around 2011. This reflects evidence from the National Travel Survey that indicates that during the recession and the subsequent period of high fuel prices West Yorkshire residents made fewer journeys, but that this trend has now reversed.

[1] NTEM 7.0 (Tempro)

Table 1 : Principal Schemes Coded in 2020 Do Minimum scenario

Scheme	Notes
Seacroft Hospital development	Signalisation of priority junction
Victoria Gate	New access arrangement to multi-storey car park
Rodley Roundabout	New junction layout and signalisation
Manston Lane Link Road	New link road from M1 J46 to Manston Lane
Horsforth Roundabout	New Signalised Roundabout
M1 Jn 45 improvement	Improvement to existing junction
M1 Jn 39-42 Smart motorway	Smart motorway with additional lanes
Aire Valley (Temple Green)	New Park & Ride Site
Apperley Bridge Station	New Park & Ride Site and rail station
Kirkstall Forge Station	New Park & Ride Site and rail station

Figure 1 : Historic and forecast traffic growth (veh-kms)



12. For more information of the model forecasting process see Appendix B : Forecasting Methodology and Results.

13. The future year forecasts have included assumptions about how the vehicle fleet will change in terms of compliant and non-compliant vehicles. This is based on national forecasts and further testing is planned to test sensitivities around this, for example in terms of the trends in the proportion of diesel cars being purchased.

14. A number of CAZ options have been tested. In each case the transport model was modified to apply a charge to relevant non-compliant vehicles travelling within the CAZ boundary. These were based on the planned charges for the Ultra Low Emission Zone (ULEZ) in London – see Table 2.

Table 2 – Modelled daily charge for travel within CAZ

2020	Car/taxi	LGV	HGV/Bus
Daily charge	£12.50	£12.50	£100.00

15. An assumption was also made that a proportion of non-compliant vehicles would be replaced by their owners to a cleaner vehicle in response to the introduction of the CAZ. This was based upon information supplied by DEFRA (Table 3) and produced the compliance levels in Table 4.

Table 3 – Assumed proportion of non-compliant trips being replaced in 2020 (%)

2020	Car	LGV	HGV
Replacing vehicle	65.0	70.0	87.0

Table 4 – Modelled compliance levels in 2020 (%)

2020	Car	LGV	HGV
Within CAZ	91.7	88.2	97.4
Outside CAZ	76.4	60.7	80.3

16. Further sensitivity tests are planned to see how changes to these assumptions would affect the results.

17. The transport model forecasts how traffic will respond to the charges applied to travel within the CAZ. Where non-compliant vehicles are passing through the CAZ and there is an alternative route that allows them to avoid the charge, the model forecasts the volumes of traffic doing this and the resulting changes in congestion. This may, in turn result in other trips re-routing onto other routes.

18. The outputs from each of the modelled weekday time periods were combined together using factors from local traffic surveys to derive estimates of annual average daily traffic levels (AADT) for each of the modelled CAZ tests. This is the average amount of traffic on an average day (including weekends and holidays). This information was used as an input to the air quality modelling.

19. In addition, the model outputs have been used to understand the likely levels of re-routing that could occur with each of the CAZ options. This is summarised below.

20. The summary contains the results of the model tests for 2020 along with a further assessment of conditions in 2022 with the City Centre Package (CCP) in place.

21. The CCP is a major proposed transport scheme for Leeds city centre that would include the closure of City Square to general traffic, a reallocation of roadspace within the South Bank

area and the provision of additional orbital capacity on the Inner Ring Road at Armley Gyratory and on the M621 (delivered by Highways England). The principal impact of the scheme in terms of traffic is to increase traffic levels on the IRR and M621 and reduce levels within the city centre.

22. Full details of the traffic displacement effects of the five CAZ options are included in Appendices C to G.

Summary of modelled trip diversion by CAZ option 2020

Inner Ring Road CAZ B

- The major impact of the IRR CAZ B is to divert non-compliant vehicles away from the IRR onto the minor road network and into highly populated residential areas.
- Overall traffic levels on the roads to the north and west of the city centre are only forecast change marginally, however, the rise in HGVs is forecast at 70-170%. The change in non-compliant vehicles is forecast to be several times greater than this.
- Within the CAZ, overall traffic volumes are not forecast to change, but the reduction in HGVs is forecast at around 15% on the IRR. Non-compliant HGVs are forecast to fall by over 90%.

Inner Ring Road CAZ C

- The major impact of the IRR CAZ C is to divert non-compliant vehicles away from the IRR onto the minor road network and into highly populated residential areas.
- Overall traffic levels on the roads to the north and west of the city centre are forecast to increase by 10-20%, however, the rise in LGVs is forecast at 90-270% and HGVs at 60-160%. The change in non-compliant vehicles is forecast to be several times greater than this.
- Within the CAZ, overall traffic volumes are forecast to fall only modestly (1-3%) on the IRR, but the reduction in LGVs is forecast at 20-30% and HGVs by 8-17%. Non-compliant LGVs and HGVs are forecast to fall by over 90%.

Outer Ring Road CAZ B

- An ORR CAZ B would avoid the significant level of traffic diversion associated with an IRR CAZ, in particular there would be no diversion of non-compliant vehicles from the IRR onto unsuitable minor roads to the north and west of the city centre.
- Outside the ORR, the model tests indicate that there would be some diversion of both compliant and non-compliant vehicles, although the volumes concerned are significantly less than with an IRR CAZ – between 5% and 14% additional HGVs on routes to the south west of the A6110.

- However, given that the A6110 would not be within the CAZ it is considered that this level of diversion is unlikely to occur in practise.

Outer Ring Road CAZ C

- An ORR CAZ C would avoid the significant level of traffic re-assignment associated with an IRR CAZ, in particular there would be no diversion of non-compliant vehicles from the IRR onto unsuitable minor roads to the north and west of the city centre.

- Outside the ORR, the model tests indicate that there would be some diversion of both compliant and non-compliant vehicles, although the volumes concerned are significantly less than with an IRR CAZ – between 9% and 20% additional LGVs and between 5% and 13% additional HGVs on routes to the south west of the A6110.

- However, given that the A6110 would not be within the CAZ it is considered that this level of diversion is unlikely to occur in practise.

Outer Ring Road CAZ D

- In summary, an ORR CAZ D would avoid the significant level of traffic re-assignment associated with an IRR CAZ, in particular there would be no diversion of non-compliant vehicles from the IRR onto unsuitable minor roads to the north and west of the city centre.

- Outside the ORR, the model tests indicate that there would be some diversion of both compliant and non-compliant vehicles, although the volumes concerned are significantly less than with an IRR CAZ – between 6% and 18% additional LGVs and between 5% and 10% additional HGVs on routes to the south west of the A6110. In combination with some additional cars, this results in an overall traffic increase of between 5% and 9%.

- However, given that the A6110 would not be within the CAZ it is considered that this level of diversion is unlikely to occur in practise.

Summary of modelled trip diversion by CAZ option 2022 with City Centre Package

Inner Ring Road CAZ B

- In summary, the impact of the City Centre Package (CCP) alongside the IRR CAZ B is to continue divert non-compliant vehicles away from the IRR onto the minor road network and through highly populated residential areas. Although trends in levels of compliance are partly balanced against increased traffic levels, the impact remains substantial.

- Traffic levels within the City Centre are forecast to reduce significantly, however, this results in additional traffic on both the M621 and western IRR, in particular A643 Ingram Distributor which is forecast to attract an additional 39% traffic (compared with the 2022 DM) , together with more LGVs and HGVs. The volume of non-compliant HGVs, however, is forecast to fall by around 90%.

- The M621 is not part of the IRR CAZ, consequently the CCP impact here not only increases the overall volume of traffic (by 16% between Jn 2 and 2a) but the fall in non-

compliant HGVs is markedly less – 20% fewer compared with the 2022 DM – while non-compliant LGVs are forecast to increase by 13%.

Inner Ring Road CAZ C

- In summary, the impact of the City Centre Package (CCP) alongside the IRR CAZ is to continue divert non-compliant vehicles away from the IRR onto the minor road network and through highly populated residential areas. Although trends in levels of compliance are balanced against increased traffic levels and the effect of the CCP, the impact remains substantial.

- Traffic levels within the City Centre are forecast to reduce significantly, however, this results in additional traffic on both the M621 and western IRR, in particular A643 Ingram Distributor which is forecast to attract an additional 38% traffic (compared with the 2022 DM) , together with more LGVs and HGVs. The volume of non-compliant LGVs/HGVs, however, is forecast to fall by around 90%.

- The M621 is not part of the IRR CAZ, consequently the CCP impact here not only increases the overall volume of traffic (by 16% between Jn 2 and 2a) but the fall in non-compliant vehicles is markedly less – 4% fewer LGV and 20% fewer HGV (compared with the 2022 DM).

Outer Ring Road CAZ B

- In summary, the impact of the City Centre Package (CCP) alongside the ORR CAZ B is marginal on the minor road network to the north and west of the city centre.

- Traffic levels within the City Centre are forecast to reduce significantly, however, this results in additional traffic on both the M621 and western IRR, in particular A643 Ingram Distributor which is forecast to attract an additional 39% traffic (compared with the 2022 DM) , together with more LGVs and HGVs. The volume of non-compliant HGVs, however, is forecast to fall by around 80%.

- Traffic levels on A58 Wellington St, M621 Jn 2-2a and East Street are forecast to rise by around 15%, although the volumes of non-compliant HGVs is forecast to fall by 85% to 90%.

Outer Ring Road CAZ C

- A test of this option with the CCP has not been carried out, however, the results are expected to be similar to that for the ORR CAZ B in terms of overall traffic levels. The volume of non-compliant vehicles is anticipated to fall significantly on both the IRR and M621.

Outer Ring Road CAZ D

- A test of this option with the CCP has not been carried out, however, the results are expected to be similar to that for the ORR CAZ B in terms of overall traffic levels. The volume of non-compliant vehicles is anticipated to fall significantly on both the IRR and M621.

Appendix A

Local Model Validation Report: Highway Assignment Transport Model Car, LGV and HGV

Appendix B

Forecasting Methodology and Results

Appendix C

Summary of Traffic Changes Arising from IRR CAZ B 2020 and 2022

Appendix D

Summary of Traffic Changes Arising from IRR CAZ C in 2020 and 2022

Appendix E

Summary of Traffic Changes Arising from ORR CAZ B in 2020 and 2022

Appendix F

Summary of Traffic Changes Arising from ORR CAZ C in 2020

Appendix G

Summary of Traffic Changes Arising from ORR CAZ D in 2020