3.2 Lickey End AQMA - Bromsgrove District Council

Date of Detailed Assessment: 30.01.2001 (Stage 3 Local Air Quality Review and Assessment)
Date of Declaration: 26.07.2001
Date of Further Assessment: September 2002 (Stage 4 Air Quality Review and Assessment)

Figure 3-4 Current plan of Lickey End AQMA

The Lickey End AQMA comprises approximately 29 residential properties along four roads emanating from the Junction 1 M42 gyratory, 2km north-northeast of Bromsgrove Town Centre. Additionally there is a slip road exiting onto the eastbound M42 below and a further slip road for westbound traffic exiting the Motorway to join the gyratory. The motorway under-passes beneath the gyratory and continues onto join the M5 at junction 4a.

The A38 Birmingham Road connects the gyratory with Junction 4 of the M5 to the northwest and continues around Bromsgrove from the south-western arm of the gyratory. The town centre is accessible from a filter lane set of traffic lights going south beyond the AQMA. The A38 continues onto the Sideslow gyratory connecting with the A448 to Redditch. From here the A38 continues south-westwards around the main suburban and Town Centre areas of Bromsgrove onto Junction 5 of the M5 at Wychbold, and then Droitwich and Worcester City beyond.

The B4096 Old Birmingham Road exits from the northeast arm of the J1 M42 gyratory. This connects to the village of Lickey and the popular Lickey Hills Country Park.

The B4096 Alcester Road exits the J1 M42 gyratory to the southeast. This is a comparably quieter road connecting to the small village of Burcot, HMP Brockhill and Redditch beyond.

The current area of the AQMA incorporates the residential dwellings and associated gardens, the Forest Harvester PH, Paul Matty Sports Car showroom and the gyratory itself. However, it should be noted the annual average air quality objective does not apply to residential garden areas or commercial properties and the one hour average does not apply to this locality (Defra, 2009).

3.2.1 Prevailing Conditions

AM peak traffic time site observations of the Lickey End AQMA were undertaken in 2012 and 2013 to characterise existing conditions and identify issues in order to inform the focus of potential measures within the action plan. Photos from the site walkovers are included at the end of this section.

The A38 Birmingham Road at Lickey End is the major route for traffic travelling between Bromsgrove and the busy urban centre of Birmingham and surrounding suburbs and further afield via the M5 Junction 4a and the M42. Unsurprisingly the southern A38 arm of the gyratory is one of the busiest and congested stretches of road in Bromsgrove district. Additionally this route becomes heavily congested during occasions of serious road traffic incidents on the M5.

There are residential properties on either side of the A38 Birmingham Road south of the gyratory. On the west side are 7 semi-detached properties within the AQMA situated between 10 and 31m from the roadside and screened by tall vegetation at the entrance to the side road. On the eastern side are a row of 5 terraced properties all approximately 9m from the roadside.

Closer to the gyratory on the eastern side of the carriageway is the Forest Harvester public house which is accessible from both the A38 and the B4096 Alcester Road. A pedestrian pelican crossing is situated on the A38 approximately at the boundary of the AQMA and the access to Barnsley Hall Road. Continuing south of the AQMA on the eastern side of Birmingham Road are further residential properties which continue up to and beyond the busy cut through junction of School Road, separated only by an Esso petrol station just south of the AQMA boundary.

On the western side of the carriageway Barnsley Hall Road connects to Birmingham Road just south of the pedestrian crossing and the AQMA boundary. Detached residential properties set back from the A38 continue on until the private Mount School at the junction where Birmingham Road diverts from the A38 via a filter lane and continues towards the town centre.

The length of the AQMA can be traversed comfortably in 5 to 10 minutes' walk by an average person depending on the number of pauses for traffic. Relatively few pedestrians were observed in the AQMA during peak time site walkovers but several pauses in traffic caused by pedestrians utilising the crossing at the southern boundary were noted particularly around 9am. The character of the AQMA does not meet the description of a location requiring assessment against any short term (i.e. 1 hour for NO_2) air quality standards, as outlined in LAQM.TG(09).

During AM Peak traffic observations it was noted traffic moving north towards the gyratory was heavy but generally moving although occasionally queued from beyond the entrance to the Esso garage, further south of the AQMA boundary. Traffic was observed to contain a mixture of cars, LGVs and HGVs.

Congestion in the opposite direction is generally attributed to the narrowing of the road from two lanes to one just after the entrance to The Forest Harvester PH which causes a bottle neck effect. Generally traffic in this direction was heavy and slow moving at all times from the gyratory to beyond School Lane to the south. The traffic was noted to move more speedily on approach to the filter lane and exit for Bromsgrove Town Centre and beyond.

Lickey End First School is accessed from the busy turning of School Lane south of the AQMA. A number of coaches and buses were observed exiting this busy turning heading South on A38. There is a filter lane on northern approach to School Lane. Turning into or exiting School Lane was observed to generally require a driver in the constant stream of slow moving traffic travelling south to give way.

A nursery school and an emergency vehicle station are situated in Barnsley Hall Road which joins the A38 going north to the gyratory just south of the AQMA boundary. Traffic turning into this road exiting the gyratory was not observed to be an issue as the carriageway is sufficiently wide enough for another car to pass on inside of a vehicle waiting to turn. However there is not enough space to allow LGVs or HGVs to pass a stationary vehicle. Similarly traffic exiting from this side road onto the A38 going north to the gyratory is not considered to be an issue from observations. Traffic attempting to turn right out of Barnsley Hall Road is considered to be problematic as this potentially holds up other traffic in both directions.

Similarly traffic turning right into the Harvester PH car park from a northerly direction was observed to cause congestion behind the turning vehicles. A few vehicles were also observed using the car park as a cut through to Alcester Road.

Vehicles exiting right from the Esso garage towards the gyratory were notably few but were observed to also cause congestion to vehicles in both directions.

There are two lanes on approach to a set of traffic lights on either arm of the A38 Birmingham Road onto the gyratory. On the gyratory itself are a number of lanes and cross hatch markings to keep exits clear however it was noted the restriction on exit to B4096 Alcester Road was being ignored by drivers heading southwards towards Bromsgrove via the A38. The lane markings for exit onto the B4096 northwards and the slip road onto the M42 for eastward bound traffic appears to cause confusion to some drivers noticed from a few incidents.

From the gyratory going north on the A38 Birmingham Road there are no residential dwellings on the western side for some distance beyond the boundary of the AQMA. There are 4 properties on the eastern side of the carriageway adjacent to the approach to the gyratory. Notably these are relatively set back from the carriageway, being approximately 18m at the closest point. Traffic exiting this arm onto the gyratory was generally observed to be moving fast although busy and majority of vehicles were heading south onto A38. Mainly cars but some LGVs and HGVs were observed.

The two slip roads to and from the M42 are continuously busy. Traffic was moving on the M42 freely at time of site observations.

There are two bus stops within the AQMA on either arm of the A38 Birmingham Road, one going north opposite aforementioned houses and the other going south is situated outside the Forest Harvester PH. Both are pull-in lay-bys and therefore are not considered to contribute significantly to congestion. Routes are for 183 and 202. However, further along Birmingham Road just south of the Esso garage is another stop on the north bound side of the carriageway which is a painted road marking in a single lane and therefore has potential to cause congestion a short distance south of the AQMA.

The B4096 Old Birmingham Road is a popular cut through from Rednal and Longbridge areas to Lickey End for commuter traffic travelling into and out of Birmingham. The minimal traffic observed exiting this junction was estimated at 60% heading towards Bromsgrove and 40% joining the M42 eastbound. There are residential properties on the western side of this road immediately after the exit from the gyratory and continue up the hill into Lickey. On the western side of the road there are 6 semi-detached properties the closest of which is only 4-5m from the roadside.

On the eastern side of the road residential properties line the road after the Paul Massey Sports Cars establishment. Four of these detached and semi-detached properties are within the AQMA. They are approximately 10m set back from the roadside with garden areas and hedges, some substantial, in front.

On the southbound arm of the B4096, Alcester Road, 90% of traffic was observed to be cars heading south. Minimal traffic was observed heading down this road. However a few vehicles were observed using the Forest Harvester car park as a drive through short cut.

There are double yellow lines at the entrance/exit on each arm of the B4096 leading away from the gyratory for approximately 20m. No vehicles were seen ignoring the parking restrictions during the site walkovers. It is noted there are no prominent traffic restrictions on either approach to the gyratory on the A38 or around the gyratory itself. Double yellow lines were noted on the A38 Birmingham Road terminating just before the Esso petrol station south of the current AQMA boundary.

No drop offs of supplies to either of the commercial properties (The Forest Harvester and Paul Massey Sports Cars) within the AQMA were observed to cause any traffic issues during the site walkovers.

Photo1: Traffic exiting School Lane causes pause in slow moving traffic heading S into Bromsgrove. Looking NE on A38 south.

Photo 2: Continuous traffic heading towards Bromsgrove on A38 S just S of AQMA

Photo 3: Looking NE on A38 S to Forest Harvester Inn and adjacent properties within AQMA. Continuous slow moving traffic heading into Bromsgrove.

Photo 4: Looking SE on A38S to converging traffic adjacent to residential properties within AQMA.

Photo 5: Slow moving traffic exiting gyratory heading S onto A38. Looking E from A38

Photo 6: Vehicle exiting right from Barnsley Hall Road causing pause to traffic heading S on A38.

Photo 7: General AM Peak traffic flows on A38 S just south of AQMA boundary.

3.2.2 Summary of Further Assessment

Further assessment of Lickey End was undertaken within the Stage 4 Air Quality Review and Assessment report (Casella Stanger, 2002). Detailed dispersion modelling was undertaken to predict concentrations of NO_2 and NOx in 2002 and 2005 at 409 property facades and utilised traffic data and background tools from 2002.

The locations of 16 properties where NO_2 exceedences of 36 µg/m^3 were predicted for 2005 were shown in plan form. However it is noted that only 7 of those sites shown were residential dwellings. Worse predicted locations were adjacent to the M42 eastbound slip road which is comparable with Long Term Trends identified below.

3.2.3 Source Apportionment Data

Additional modelling was undertaken within the Stage 4 assessment to provide NOx source apportionment for 38 receptors in the area of the Lickey End site where predicted concentrations were above 36 µg/m^3 for 2005. The percentage contribution from each vehicle class identified in the report is shown below in Table 3-5.

Table 3-5 Percentage contribution of NOx in 2005 in Lickey End AQMA

Percentage contribution of NOx of Local Sources				
Vehicle Class	Cars	LGV	HGV	Bus
Mean NOx %	30	10	58	3
Min NOx %	27	8	52	2
Max NOx %	31	12	63	5

Please note the above table does not include regional or local background sources of NOx and therefore does not demonstrate the proportions of total NOx or NO_2. It is only a representation of vehicle class contributions as percentage of the local sources element of Total NOx and the size of this element is not specifically defined within the Stage 4 report.

3.2.4 Air Quality Improvement Required.

The requirements for improvement identified in the Stage 4 assessment are detailed in Table 3-6 below.

Table 3-6 Air Quality Improvements Required in 2004 in Lickey End AQMA

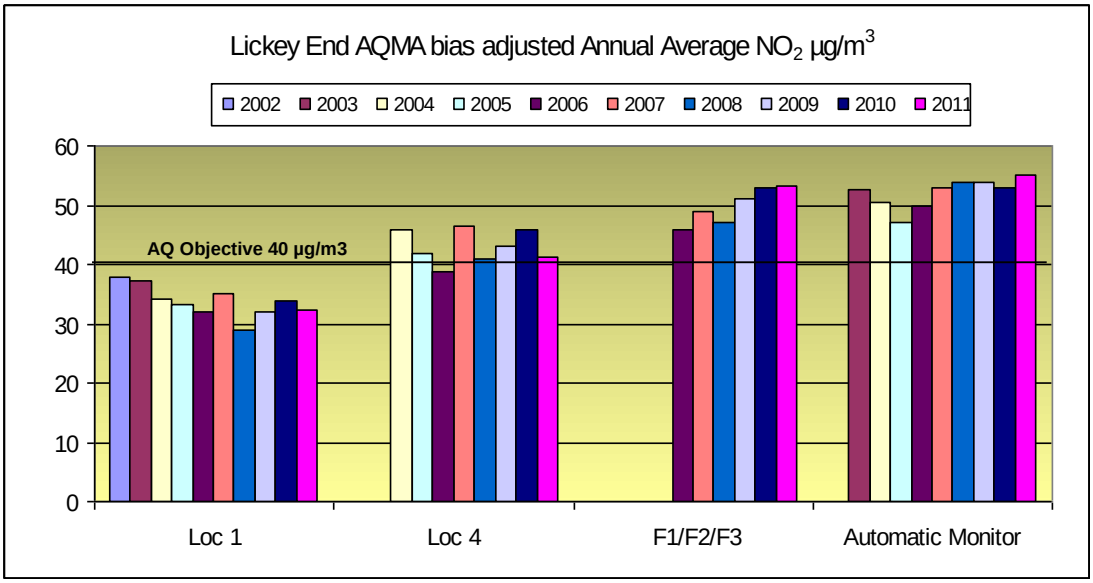
	NO_2 (µg/m^3)	**NOx (µg/m^3)**
Lickey End Max. 2005 predicted concentration	41.6	115.4
Annual mean Air Quality Objective	40.0	107.2
Reduction in NOx required		**8.2**

3.2.5 Long term local trends in NO_2

As part of the AQAP process data has been collated from previous BDC yearly progress reports and screening assessments to produce meaningful picture of long term trends in monitoring results of nitrogen dioxide in Lickey End.

The graph below depicts these long term trends from bias adjusted annual average results of NO_2.

Figure 3-5 Bias adjusted annual average NO2 results from monitoring 2002 - 2011 Lickey End AQMA



Loc 1 – 3a Alcester Road; Loc 4 – 288 Birmingham Road; F1/F2/F3 and Automatic Monitor – Gyratory roadside

It should be noted the position of the Automatic Monitor and F1/F2/F3 do not represent relevant receptor locations. The data requires further adjustment to provide relevant exposure at the façade of the nearest residential currently occupied residential dwelling, 1 Old Birmingham Road, 29m away from the monitoring location. There is a potential residential property only 15m away; however this has been unoccupied as a dwelling for some years and is part of the Paul Massey Sports Car concern. However consideration should be given to this more proximal property being brought back into residential use in the future when making spatial adjustments to monitored data.

Accordingly the measured data for the Automatic Monitoring and location F1/F2/F3 has been adjusted back from the roadside position using the calculator tool provided by Defra. Two sets of figures have been calculated for each set of data to reflect levels at the façade of both the nearest potential receptor (nr) at 8.5m from roadside and the nearest current occupied property at 1 Old Birmingham Road (1OBR) at 14m from roadside. An average of data from two local background monitoring positions, BG3 Finstall Primary School and BG4 Charford Primary School, were used in the calculation tool. The results are presented in Table 3-7 below and presented graphically in the graph below. Data from Location 4 – 288 Birmingham Road, 75m away from gyratory on the A38 south, is included for comparison.

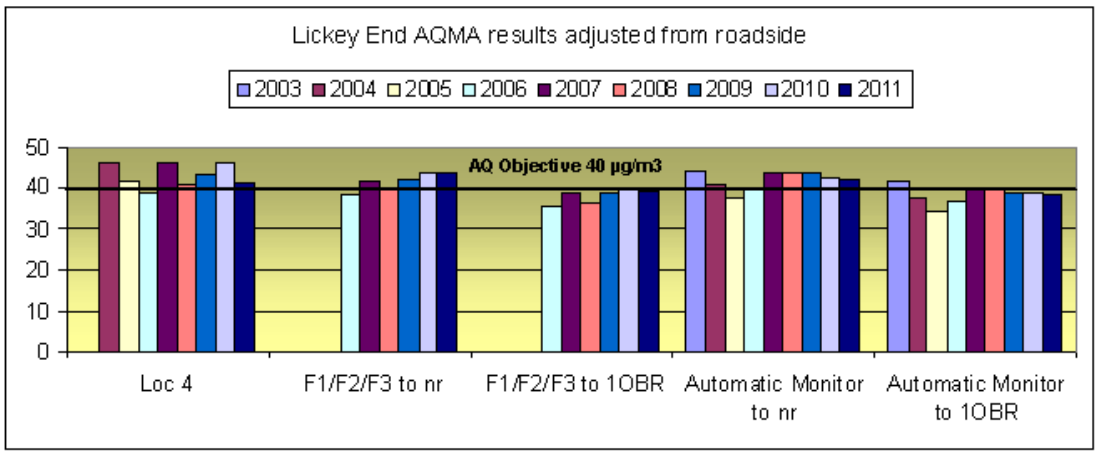
Table 3-7 Lickey End monitoring data recalculated to nearest relevant exposure (nre)

Year	F1/F2/F3 to nr	F1/F2/F3 to 1OBR	Auto Monitor to nr	Auto Monitor to 1OBR	Loc 4
2003			**44.4**	**41.6**	
2004			**41.1**	37.9	**45.7**
2005			37.8	34.6	**41.9**
2006	**45.9**	38.5	**40.3**	37.0	38.8
2007	**41.7**	38.8	**43.5**	**40.2**	**46.5**
2008	39.6	36.6	**43.3**	39.6	**41**

2009	**42.4**	38.9	**43.3**	39.6	**43**
2010	**43.6**	39.8	**42.5**	38.9	**46**
2011	**43.3**	39.3	**42.1**	38.4	**41.2**

Exceedences are presented in bold; highest recorded/recalculated figures for each year are presented in red bold. Nr = Nearest potential receptor. 1OBR = 1 Old Birmingham Road

Figure 3-6 Readjusted monitoring results Lickey End AQMA



The data indicates in four of the last eight years the highest measured figures at relevant exposure are at Location 4 – 288 Birmingham Road. Adjusted measurements demonstrate the levels of NO_2 are higher at the façade of Location 4 than 1 Old Birmingham Road in every year and there have been no exceedences at the façade of the latter property since 2007. A number of exceedences are indicated at the façade of the nearest property which had it been occupied as a residential dwelling would be representative of relevant exposure.

3.2.6 Comment on Further Assessment

Clearly the data within the Stage 4 report is now 11 years old and may not be representative of the situation in the present day. Furthermore the modelling included traffic data for both directions of the M42 either side of the gyratory. Whilst the inclusion of this is not considered incorrect it is unclear from the report if the difference in height to the roadside sources on the M42 which is tens of metres (exact height to be confirmed by HA) has been considered within the assessment. Since NO_2 is heavier than air it will tend to sink and be more concentrated at ground level. Guidance on this matter was sought from the available technical guidance and Defra in February 2013. LAQM helpdesk advised:

'Unfortunately there is no prescriptive guidance on appropriate assumptions to make with regards to variation of pollutant concentrations with height due to the complex and site specific wind effects within street canyons. The variation in pollution levels will be dependent on location, traffic, layout, background and meteorology… but particularly in street canyons, it is possible that concentrations at elevated locations may be similar to those at ground level. This can result from reduced dispersion in a canyon and also because some HGVs and buses have raised exhausts.'

However as the M42 is a wide six lane carriageway below the gyratory it is not considered to meet the description of a street canyon. Furthermore, consideration could be given to the underpass acting as a confined space trapping emissions. No doubt emissions from traffic below the gyratory will be contributing to total emissions

affecting the air quality above but possibly not at the levels below on the M42. Thus, whilst the traffic data from the M42 cannot be dismissed the percentage of sources contributing to poor air quality apportioned to the various vehicle types is possibly being skewed by this traffic data and not wholly representative of the actual situation. The outcomes of the Stage 4 report led to the assertion in the following 2004 AQAP that the dominant source of NOx emissions in the AQMA are from HGVs on the M42. In light of the considerations above this conclusion which has formed the basis of many actions in the previous AQAP may have been erroneous.

This issue is reflected within the Long Term Trend data above. Whilst the highest recorded levels of NO_2 are at the roadside location on the gyratory, these are not significantly higher than those recorded at Location 4 – 288 Birmingham Road, which is situated 75m away from the gyratory, when the data is appropriately spatially adjusted to the façade of the nearest property. The results are in fact lower than Location 4 in four of last eight years. Furthermore when considering the proximity of Location 1 - 3a Alcester Road to the motorway in comparison to Location 4 it is noted measured results are much lower. This further implies the M42 is not as influencing a source of emissions at Lickey End AQMA as considered in earlier reports and the focus of mitigating actions should be on more localised sources at the gyratory ground level.

It is considered necessary for up to date modelling utilising current data and tools to be undertaken to provide more relevant source apportionment and required NOx reduction information to better inform future updates to this action plan. This would likely benefit from measured data from additional monitoring positions in the AQMA particularly along the A38 Birmingham Road (south) vicinity.

Summary of progress of actions identified or implemented to date

As mentioned in the above section an Air Quality Action Plan was produced by BDC in October 2004. A number of options and measurements were identified within the plan to improve air quality within the AQMA. An update on these options and measurements were regularly produced for annual Progress Reports for Defra and local Air Quality Task Group. The most recent update in 2010 is included in full detail as Appendix 1 to this report. A brief description of the actions and progress to date is summarised below in Table 3-8.

Table 3-8 Summary of options targeted in 2004 Lickey End AQAP

Action ID	Description	Outcome to Date
Option 1	Restrict speeds on M42 to 50mph	No changes proposed by Highways Agency
Option 2	Reduction in traffic flows on M42	No measures identified that would enable action
Option 3	Reduction in HDV flows on M42	No measures identified that would enable action. M42 J1 does not qualify for Ramp Metering
Option 4	Reduction in overall background levels	Ongoing, see measurements below
Option 5	Introduction of Tolls	No plans to introduce tolls in this vicinity.
Option 6	Improvements to J1 M42	Box markings completed at J1 in 2008
Option 7	Removal of the M42 J1 slip roads	No changes proposed as could lead to worsening situation on local roads
Option 8	Improved layout/signing on M42 J1 westbound – M5 J4A to reduce collisions &	Road Safety Audit was expected for autumn 2009. Further improvements to be implemented 2009/10

Action ID	Description	Outcome to Date
	congestion	
Measurement 1	Coordinate AQAP with LTP	Relevant action plan measures incorporated within LTP3
Measurement 2	Improve public transport facilities & develop Quality Partnership with providers	Bromsgrove Railway Station rebuilding programme progressed in 2011. A detailed public transport assessment for town centre was undertaken by WCC in 2007.
Measurement 3	Develop a Council Travel Plan in accordance with LTP	Work suspended due to restructuring of Council through shared services project with RBC and formation of WRS
Measurement 4	Encourage uptake of Employer & School Travel Plans	50% of County's schools reported to have travel plans in place by 2007. LTP2 proposed 100% by 2010
Measurement 5	Improve cycling & walking facilities within Bromsgrove & encourage take up	14% increase in cycling in 2001 – 2006. Increases of 33 – 37% in cycling after intro of Travel Plans
Measurement 6	Develop Freight Quality Partnerships	Countywide Freight Quality Partnership includes a Lorry Route Map
Measurement 7	Ensure AQ is considered as part of planning process	Ongoing. Occurs as part of planning process. Countywide Air Quality Planning Protocol adopted in 2009
Measurement 8	Improve sustainable transport links serving new developments	Ongoing. Occurs as part of planning process.
Measurement 9	Develop supplementary planning guidance on air quality assessments	Countywide Air Quality Planning Protocol adopted in 2009
Measurement 10	Develop a local air quality strategy	Countywide Air Quality Strategy adopted in February 2009
Measurement 11	Continue local monitoring	Ongoing
Measurement 12	Action Plan & annual progress reports available on Council website	Documents are available on BDC website. Last three annual reports available on new WRS website from Autumn 2012.
Measurement 13	Promote profile of air quality	Launch of Countywide Air Quality Strategy in February 2009

3.2.7 Actions identified from Local Transport Programme 3 (LTP3):

A number of actions have been identified within the County Councils transport strategy as having a potential impact on Lickey End AQMA. The LTP3 scheme code, brief description and current status as provided by WCC in February 2013 is shown in Table 3-9.

Table 3-9 LTP3 actions impacting Lickey End AQMA.

LTP3 Scheme	Description of Improvements	Current Status
BR1 - Bromsgrove New Station Scheme	Indirect: Will allow longer trains to call at station, increased public transport capacity, increase to 350 car parking spaces	Public consultation underway. Programme date for opening 17th May 2015.

BR2 - Bromsgrove Eastern Bypass Enhancement Scheme (including AQMA remediation)	Directly Linked to AQMA: A package of enhancement measures, including major junction improvements and measures to improve accessibility to the railway. Integrated with other schemes in Bromsgrove	One of options for Bromsgrove Transport Package. No decision on what package will entail.
BR4 - Bromsgrove Traffic and Parking Management Study	Indirect: Study would identify where to focus investment to improve the operation of the local transport network.	One of options for Bromsgrove Transport Package. No decision on what package will entail.
BR5 - Bromsgrove Minor Transport Improvements Scheme	Indirect: Minor complimentary transport improvements to enhance safety, accessibility, information and travel choice.	One of options for Bromsgrove Transport Package. No decision on what package will entail.

3.2.8 Summary of key issues identified from review for consideration within actions

Issue LE1 - AQMA boundary needs redrawing to exclude rear residential garden areas and motorway areas not representative of relevant exposure locations. Should be undertaken following revised detailed dispersion modelling to take into consideration any other required amendments.

Issue LE2 - The southern A38 arm of the gyratory is one of the busiest and congested stretches of road in Bromsgrove. This route comes under increasing pressure during occasions of serious road traffic incidents on the M5.

Issue LE3 - Pedestrian crossing on A38 south causes pause to traffic flow...

Issue LE4 -Narrowing of carriageway from two lanes to one causes bottleneck to traffic flowing into Bromsgrove atop of A38 Birmingham Road south.

Issue LE5 - School Lane is busy junction further south of the AQMA can cause pauses in traffic in either direction.

Issue LE6 - Traffic exiting right from Barnsley Hall Road causes pause in traffic flow in both directions.

Issue LE7 - Traffic turning right into Harvester from A38 south causes pause in traffic flow.

Issue LE8 - Vehicles exiting northwards from Esso garage causes pause in traffic flow in both directions.

Issue LE9 - Lane markings on approach to B4096 north and the M42 access slip road appear to cause some confusion to drivers.

Issue LE10 - Painted bus marking going north on A38 Birmingham Road south has potential to cause congestion a short distance south of the AQMA.

Issue LE11 - No visible restrictions on gyratory with exception of Box markings sometimes ignored.

Issue LE12 - Long term local trend data indicates highest levels of NO_2 at current relevant exposure on A38 Birmingham Road south. Relevant exposure at current commercial property could be issues if brought back into residential use. Consideration for working with planning and developers to avoid this situation.

Issue LE13 - Further assessment based on traffic data, modelling and tools over 11 years ago. A new further assessment should be provided utilising up to date data and tools to give more appropriate source apportionment and reductions required with careful consideration of change in elevation to M42 sources in modelling.

Issue LE14 - Additional monitoring points are required to provide better data from residential properties within and just beyond the current boundary.

Issue LE15 - A number of options have been identified in previous action plan specifically aimed at changes to M42 traffic flows. Most have been unachievable and remain unactioned. Bias adjusted long term local trend data suggests there has not been any significant improvement in NO_2 levels since production of previous AQAP, although spatially adjusted Automatic Monitor data suggests marginal downward trend in last 5 years. Previous emphasis on actioning sources from M42 maybe misguided.