CTP Air Quality Data

General /Intro

CBC has an obligation to monitor air pollution levels around the borough. Allied to this, there is a requirement to submit an annual status report (ASR) to DEFRA that details monitored levels and actions taken to reduce pollution levels. The report on 2018 activity was submitted in early August 2019 and feedback has been received from DEFRA approving the report and offering limited comments. These reports are available on the CBC website.
https://www.cheltenham.gov.uk/downloads/download/693/air_quality_reports
The Public Protection department is now working towards revising the current air quality management area from covering the whole of the borough to the 'worst affected area', which is a corridor of the A4019 Swindon Rd / Poole Way / High Street. This project is likely to take around 12 months.

This report presents the results of monitoring of pollution levels around the town, in relation to CTP Ph.4. Some of this data requires interpretation, but as far as possible, I have avoided speculation beyond the empirical data available.

Current Monitoring Strategy

Monitoring and reporting is usually carried out over a calendar year. Data from monitoring sites covers a familiar annual pattern, with the highest levels arising in January / February, then dropping during the summer months, reaching their lowest point in August when traffic levels are at their lowest. Levels then rise steadily through the autumn to the late winter peak. Short term levels can also be considerably affected by weather conditions – cold, foggy mid-winter mornings increase car use and stop pollution dispersing effectively and in summer months fine, warm weather brings winds from the continent that may carry industrial pollution or fine particulates from as far away as the Sahara. This variability in short term levels means that to acquire valid data on changes or trends in pollution levels, monitoring has to take place over a period of at least a year. Even when monitoring over that period there will be "Good" years and "Bad" years. When data is available for the years 2019 and beyond, it may be that 2018 saw unusually low pollution levels, due to prolonged warm weather in the summer.

In Cheltenham, an assessment of sources of air pollution and previous monitoring has identified nitrous oxides (NOx) as the "pollutant of concern". This led to a monitoring approach taken by CBC and approved by DEFRA, that concentrates on measuring levels of NOx using diffusion tubes, currently sited at 27 sites around the town. The location of monitoring points has varied over the 26 years that this monitoring has been carried out, and in July 2018, 7 new sites were installed to try and assess the impact of CTP Phase 4 on the air quality of the local area. Three of these locations had previously been in use, but were discontinued at the end of 2016. Monitoring is carried out using passive diffusion tubes which are relatively cheap and reliable. Results from the tubes are subject to a bias adjustment to improve accuracy. The annual bias adjustment factor is calculated comparing data from 3 tubes with a continuous monitor, positioned at the corner of St George's Street and Swindon Road. The typical bias adjustment is within +/- 5%. The full data set is available through the Council's website. It should be noted that for the purposes of this report a bias adjustment factor for the 12 months from July 2018 – June 2019 was calculated to ensure the accuracy of 2019 data. This methodology is not to the appropriate DEFRA standard, as it does not reflect a calendar year of figures, but uses an identical methodology to the standard.

Since January 2018 CBC has been using a limited number of "low cost" monitoring systems called Mesh Pods. These are installed on lamp posts at (currently) 9 locations around the town. Some of these were located in order to further examine the effect of the CTP phase 4. There have been

issues with reliability in some of these units, in particular with monitoring of NO2 levels, and one unit was stolen, however the monitoring of particulates has been reliable and some discussion is contained below.

In considering the levels of pollution detected by these monitoring techniques, we need to be mindful of the legal limits on pollution levels. The limits for pollutants likely to be under scrutiny in Cheltenham are as follows:

Pollutant	Annual Average	Short-term limit
NO2	40ug/m3	200ug/m3, measured over 1 hour, not to be exceeded more than 18x per year
PM10	40ug/m3	50ug/m3, measured over 24 hours, not to be exceeded more than 35x per year

If levels consistently arise that are in excess of these levels, the Council will be required to declare an AQMA in the affected area. Short term NO2 levels are monitored by the continuous monitor station at Swindon Rd / St Georges Street, and no exceedances of this level have ever been detected. Research has shown that short-term breaches are usually linked to an annual average over 60ug/m3, but this figure is not exceeded at any monitored location in Cheltenham.

Results from diffusion NOx tubes

The results pertinent to a consideration of the impact of CTP phase 4 are mostly presented in Table * attached. This table shows the annual level of NO2 at each diffusion tube monitoring site for the years 2014, 2015, 2016, 2017, 2018. It also shows the calculated level for the 12 month period July 2017 – June 2018 (i.e. the 12 months before CTP Ph.4) and 12 months July 2018 – June 2019 (i.e. the first 12 months post-implementation). The data have been adjusted using the bias adjustment factors reported to Defra in the relevant ASR. The July 2018 – June 2019 data has been adjusted using a calculated figure, as described above. As can be seen, bias adjustments are generally tiny, but should always be included to demonstrate the accuracy and validity of data.

In the table, annual results over 40ug/m3 are highlighted in pink. Results within 10% of the 40ug/m3 limit are highlighted in yellow. These “near miss” sites are required to be considered further in the ASR reports submitted to DEFRA, in some cases in Cheltenham levels are rising and in some they are falling.

In very general terms, there has been a slow, steady decline in NO2 levels over the last 10 years, as can be seen by the figures in the row “Ave of long term sites”, which calculates the average annual level recorded at 16 sites that have operated continuously between 2014 and now. This analysis has found a 7.5% drop in average levels across that period. This is largely attributed to improvements in the emissions from HGVs and buses, along with modal shift away from domestic vehicle use.

The table includes results for new, or re-activated monitoring points at St James Square, St Gregory’s Church, St Georges Street, St Paul’s Road, St Luke’s (College Rd), and Princess Elizabeth Way (North and South). These monitoring points were either established or re-started as they were on routes likely to be used by traffic diverting from Boots’ corner, either in the immediate vicinity of the restriction, or in the wider town. Measured levels at “new” sites in operation since August 2018 are all in compliance with the 40ug/m3 limit with the exception of the site at Princess Elizabeth Way (North), where the initial 12 months of results suggest a slight exceedance. This site has already been identified as needing further investigation and is subject to more detailed modelling in a

detailed assessment being carried out for the purposes of the AQMA review. Comparison of longer term data, between 2014 and 2018/19 has shown a slight increase in pollution in St George's Street and St Paul's Road, and a decrease in College Rd.

The table allows a comparison of pollution levels at town-wide sites before and after the CTP Ph.4 was implemented. There is no consistent, simple, town-wide trend in this data. Some sites have seen marginal increases, some marginal decreases. The only consistency is in the very small changes identified at the majority of sites.

Sites with decreasing levels:
The sites seeing the largest decreases are in general close to the trial restriction where traffic has considerably reduced (rear of Muni Offices, & Portland Street). The level at Clarence Parade is likely to have dropped considerably, but cannot be reported, as the monitoring tube has been removed every month since August 2018, despite our officers making it hard to remove. This consistent removal is unlikely to happen by accident, or due to natural causes (magpies etc.)

Sites with increasing levels:
The sites showing increases include 2 Gloucester Road, the co-location site in St Georges Street and Winchcombe Street. Of these, the level at 2 Gloucester Road is consistent with levels since 2015, and 2014 would appear to be an unusually low level. The co-located tubes have shown an increase of around 2%, however they still fall well below the 40ug/m3 limit. This increase is perhaps not surprising as they are sited at a junction that has seen considerable increases in traffic flow, however signal timings to the junction were changed in December (?) 2018, which has eased traffic somewhat since then, so the longer term change is likely to be less than that measured thus far. The site at Winchcombe Street has shown the largest increase between 2017-18 and 2018-19. This result seems a little odd, as the monitoring point is located at a junction of an East-West 2-way road and a southbound (only) road, which may have been expected to change the least due to a northbound road closure. Levels at this site warrant further investigation, and it has been earmarked for the re-deployment of monitoring equipment, expected by the end of 2019.

Bucking the trend?
Further analysis of short and longer-term changes in average levels has shown an increase in pollution level across sites 1-20 of 1% between 2017/18 and 2018/19 against a decrease of 4.8% between 2014 and 2018/19. This could be summarised as "bucking the trend" of a steadily decreasing pollution level, however, I would caution against reaching this conclusion from a dataset based on a relatively short period, immediately after significant changes to the road network and using a limited number of monitoring points.

Mesh pod data
Mesh pods have been installed and produced results in accordance with this table:

Location	Installation Date	NO2 ave June 18 – July19	PM10 ave June 18 – July 19
Gloucester Road School	January 2018	39.9	5.2
A40 GCHQ	April 2018	34.6	11.5
422 High Street	January 2018	NA	9.0
St Gregorys Church	September 2018	21.4	15.1
Boots Corner	December 2018	28.0	14.5
Clarence Square	December 2018	32.9	10.6
Pittville Circus Road	December 2018	26.4	17.1
College Road	December 2018	NA	20.6
Montpellier Terrace	December 2018	NA (stolen)	NA

Some of these stations have suffered reliability issues, possibly due to problems with their installation position (they run on solar panels). The pod at Montpellier Terrace was stolen in June 2019 and may have previously been damaged by vandalism or attempted theft.

Of the reliable data obtained, the site outside Gloucester Road School has been most reliable. This site was selected as the school is one of few in the town sited on a busy, congested main road. The unit has reported an NO2 level for 2018 of 35.5ug/m3, within legal limits. The running average for 12 months to end June 2019 is 39.9ug/m3. Provisional results from the detailed assessment mentioned above suggest that the school will lie just outside a revised AQMA, which would appear to be confirmed by this result.

The 5 pods installed in December 2018 were specifically located to try and assess the impact of CTP Ph.4. As can be seen above, the levels of NO2 and PM10 at these sites all lie well within national limits. There is no data available from before the implementation of CTP Ph.4 to draw conclusions on trends, or changes caused by traffic changes.

Boots Corner Archived data

Monitoring of pollution levels at Boots corner was carried out from 1993 until 2009. The site was discontinued as there is scant residential property in the immediate vicinity, and guidance on monitoring describes relevant exposure as being homes, rather than shops or leisure areas. The data from 1993 to 2009 is presented as graph 1. This demonstrates the fluctuation in annual levels typical of many sites, and a 1993-2009 average level of 40.8 ug/m3. The level to date for 2019 (from the mesh pod operating at the site) is 33.8ug/m3 (12 month running average 33.5 ug/m3). This is a clear improvement in the level at this town centre location.

Conclusions:

The conclusion from the data considered above is that the CTP Ph.4 has made very little difference, either positive or negative to air pollution levels across the town. This is probably not surprising, as the scheme was not explicitly designed as a project to improve air quality. In some areas, closest to the trial restrictions, there have been incidental improvements in air quality. In likely diversion routes around the town centre, there may have been some small increase in pollution, but all monitored sites are still well within legal limits. In areas more distant from the town centre one area has been identified from monitoring as need ing further investigation (Princess Elizabeth Way North), but there is insufficient data to attribute this to changes to the town centre traffic circulation.