Ultrafine Particles in the Vicinity of Gatwick.

1. As reported to the steering group in June 2012 airports have been identified as a significant source of ultrafine particulate pollution[1,2] i.e. particles that are under 0.1 µm in aerodynamic diameter, and that a large proportion of these particles are generated during take-off with the resulting 'spike' in ultrafine particles detected at least 600 m from the airport based on studies at Los Angeles Airport (LAX).

2. As research over the past 10 to 15 years has continually indicated that the finer combustion derived particle fractions, including particles under 0.1 µm in (aerodynamic) diameter, tend to have the biggest biological effects it was agreed that any further work in this area would be reported back to the steering group.

3. During 2018 no further measurements were made on airport at Gatwick, although Heathrow began short term on and off airport monitoring of ultrafine particles in 2016 which continued in 2018.

4. However, following a successful research bid by King's College and Imperial College in 2017 measurements of ultrafine particle concentrations in the vicinity of Gatwick begun in June 2018, initially at the RG1 site for three months and then at the RG3 site to the SW of the airport for three months. Following discussions with the research groups Reigate and Banstead along with Leicester University agreed to joint fund work for a further six months until early July 2019. While a final provisional data set is likely to be available in early August 2019, some of the initial findings are shown in Table 1.

Site	Distance from Source.	Data Capture (%)	Mean Particle Count (Particles / cm^3)	Geometric Mean Diameter (nm)
London – Background (Honor Oak)	n/a	96 %	4,497	57
RG1 Horley	350 m A23 / 610 m Airport	94 %	9,431	52
London – Marylebone Road	1.5 m	70 %	11,591	46
RG1 Horley (Southerly winds only)	As above	As above	16,641	39

Table 1: Mean Particle Number Concentrations 25th January to 22nd April 2019.

5. Table 1 indicates that particle number concentrations at the RG1 site on the Horley Gardens Estate are at least double those seen at the background site in London, while the geometric mean particle diameter at RG1 is also smaller.

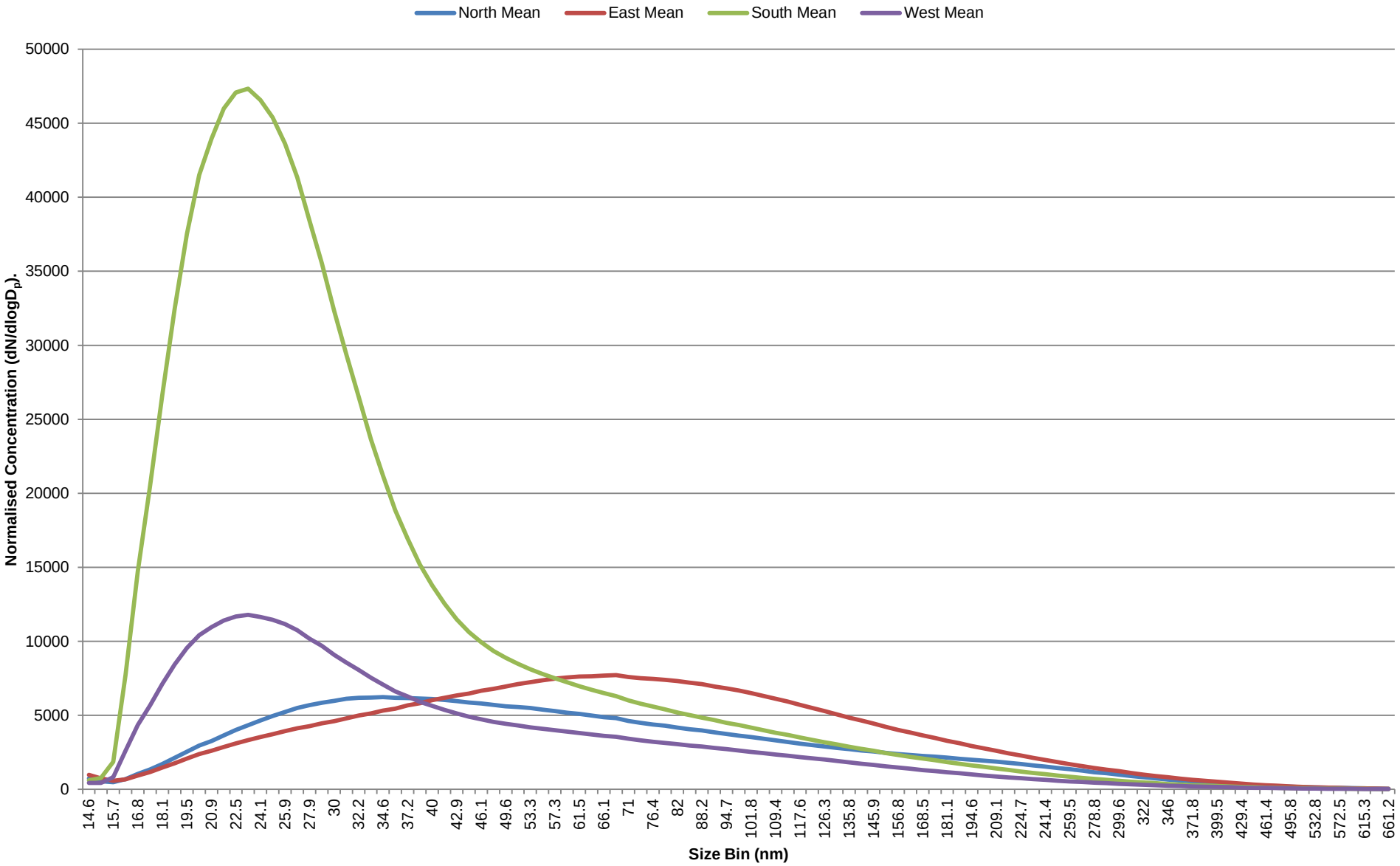
6. However, particle number concentrations at RG1 on average are slightly lower than those measured at Marylebone Road in London, although it is worth noting that the Marylebone Road site is only 1.5 m from the road edge compared to 350 m at RG1 or 610 m from the airport itself. Also as the RG1 monitor is located towards the centre of the Horley Gardens Estate a number of residential premises are also far closer to the airport e.g. RG2(6) and RB59, than the RG1 site.

7. In addition to counting the number of particles in the atmosphere the equipment[3] also gives a size distribution for the particles in the range 14 to 661 nm (1 nm = 0.001 µm or 0.000001 mm). As shown in Table 1 the particle size on average at RG1 is smaller than that at the London background site, but slightly larger than those measured on Marylebone Road.

8. However the average particle size and number varies quite markedly depending on the wind direction at RG1 (Figure 1), with a significant increase in particle number and reduction in particle size when winds are from the airport.

[1] Atmospheric Environment 45 (2011) pp.6526 – 6533.
[2] Atmospheric Environment 50 (2012) pp.328 – 337.
[3] TSI SMPS 3080 with DMA 3081, and TSI CPC 3775.

Figure 1: Particle Size Distribution by Wind Direction (Jan to April 2019).



Abbreviations and Definitions.

m^3	cubic metre.
mg	milligram (1 thousandth of a gram).
ng	nanogram (1 billionth of a gram).
ng/m^3	nanogram(s) per cubic metre
ng m^{-3}	nanogram(s) per cubic metre, This scientifically is the correct form to use rather than ng/m^3, though either can be used.
nm	nanometre (1 billionth of a metre or 1 millionth of a millimetre)
PM	Particulate Matter.
PM_{10}	Essentially particles under 10 µm in diameter. Officially defined as the size fraction below 10µm in aerodynamic diameter, which has a cut off point at 50% of the particles which are 10µm in aerodynamic diameter.
$PM_{2.5}$	Essentially particles under 2.5 µm in diameter.
µg	microgram (1 millionth of a gram).
$µg/m^3$	microgram(s) per cubic metre
µg m^{-3}	microgram(s) per cubic metre, This scientifically is the correct form to use rather than $µg/m^3$, though either can be used.
µm	micrometre (1 millionth of a metre or 1 thousandth of a millimetre)