Study of Ambient Air Quality at Brafferton

Summary

This summary provides the preliminary results from the study of ambient air quality in the vicinity of Aycliffe Quarry Landfill, near Brafferton. Monitoring has been carried out by the Environment Agency's Ambient Air Monitoring Team (in National Monitoring) on behalf of the North East Area. This summary considers data collected between 21 June 2024 and 26 September 2024 (98 days), with monitoring ongoing after this date.

The pollutants being monitored were hydrogen sulphide (H_2S), methane (CH_4), sulphur dioxide (SO_2), and particulate matter, including Total Suspended Particulate (TSP), PM_{10} and $PM_{2.5}$.

The absolute values of the collected data have associated uncertainties in the monitoring process, but this is minimised by QA/QC measures. This should be considered when assessing the results of these comparisons.

The UK Air Quality Strategy (AQS)[1] guidelines provide health-based limits for $PM_{10,}$ $PM_{2.5}$ and SO_2 in ambient air and sets out policy options to further improve air quality in the UK.

There is no health standard for methane in ambient air. The average methane concentration over the monitoring period was 1.8 mg/m^3, which is above the Northern Hemisphere background concentration[2] of ~1.31 mg/m^3.

In the absence of an Air Quality Standard (AQS) objective, the hydrogen sulphide (H_2S) data was compared with the World Health Organisation (WHO) guidelines[3] for both human health and odour annoyance (Table 1.1).

Table 1.1 Impact summary of H_2S compliance with the WHO guidelines for Europe 2000[(1)].

Pollutant	Averaging Time	Guidance Limit	Percentage of Time Exceeding the Guidance Limit
H_2S	24-hr (midnight-midnight)	150 µg/m^3	0
	30-min	7 µg/m^3	0.7

Tables 1.2 and 1.3 summarise the extent of likely compliance/exceedance for each of the species with respect to the Air Quality Strategy (AQS) objectives and the environmental target[4] for $PM_{2.5}$ at the MMF monitoring site. Table 1.4 summarises the extent of likely compliance, where appropriate, with other standards.

A projected compliance ratio ≤1 indicates compliance, whilst a value >1 indicates non-compliance.

Table 1.2 Impact summary for short-term air quality objectives.

Pollutant	Averaging Time	AQS	Standard	Maximum Concentration	Permitted Exceedance (A)	Measured Exceedance	Extrapolated Exceedance* (B)	Projected Compliance Ratio (B/A)
PM_{10}	24-hr (midnight-midnight)	2000	50µg/m^3	39.2µg/m^3	35/year	0	0	0.00

SO_2	15-min	2000	266µg/m^3	3.7µg/m^3	35/year	0	0	0.00
	1-hr	2000	350µg/m^3	3.7µg/m^3	24/year	0	0	0.00
	24-hr (midnight midnight)	2000	125µg/m^3	1.6µg/m^3	3/year	0	0	0.00

* Extrapolated from effective monitoring period

Table 1.3 Impact summary for long-term air quality objectives.

Pollutant	Averaging Time	AQS	UK Environment Act▲	Standard (A) (µg/m^3)	Measurement* (B) (µg/m^3)	Projected Compliance Ratio (B/A)
PM_{10}	Year	2000	-	40	10.5	0.26
$PM_{2.5}$	Year	2007	-	25	5.9	0.24
$PM_{2.5}$	Year	-	2023	10	5.9	0.59

▲ Environmental Targets (Fine Particulate Matter) (England) Regulations 2023, as required by UK Environment Act 2021. To be met by 2040.

* Extrapolated from effective monitoring period

Table 1.3 Impact summary for other relevant$^{\Delta}$, long-term standards.

Pollutant	Averaging Time	Standard	Standard (A) (µg/m^3)	Measurement* (B) (µg/m^3)	Projected Compliance Ratio (B/A)
SO_2	Year	2000 AQS	20	0.8	0.04

∆ Provisional AQS objectives, proposed AQS objectives and 2000 NAQS objectives for the protection of vegetation and ecosystems.
◊The areas where the UK vegetation and ecosystem air quality objectives apply are based on the monitoring criteria for the vegetation and ecosystems limit values set under the 1st Air Quality Directive

1. More than 20km from an agglomeration (i.e. an area with a population of more than 250,000);
2. More than 5km away from industrial sources regulated under Part A of the Environment Act 1990 (and/or Part A1 sites under PPC regulations);
3. More than 5km away from motorways
4. More than 5km away from built up areas of more than 5000 people

*Extrapolated from effective monitoring period

Comparing the collected data with the World Health Organisation (WHO) guidelines showed that H_2S was within health limits, with a maximum 24-hour average H_2S concentration of 2.9 µg/m^3 over the monitoring period. Comparison of the H_2S data with the WHO guideline for odour annoyance of 7 µg/m^3 (as 30-minute average concentrations) indicated that the air quality at the monitoring site was above the guideline value for 0.7% during the monitoring period.

Comparing the collected data from the monitoring site with the AQS objectives showed that the monitoring location was subject to concentrations of PM_{10}, $PM_{2.5}$ and SO_2 that were likely to meet their respective AQS objectives.

It is worth noting that the assumption has been made that the conditions during the monitoring period were representative of a typical year. These calculations do not consider changes in weather conditions or changes to local sources that might occur outside of the monitoring period.

References

1. Department of the Environment (January 2000), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, (HMSO)
2. Department for Business, Energy and Industrial Strategy. 2021. Long-Term Atmospheric Measurement and Interpretation of Radiatively Active Trace Gases, Annual Report (Oct 2020 – Sept 2021). Retrieved from Long-Term Atmospheric Measurement and Interpretation of Radiatively Active Trace Gases: annual report 2021 (publishing.service.gov.uk) [Accessed 11 December 2023]
3. World Health Organisation (2000), WHO Air Quality Guidelines for Europe
4. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023