

Withyhedge landfill site hydrogen sulphide monitoring survey

Weekly Report

Authors	Louisa Kramer
Compilation date	03 October 2024
Customer	Pembrokeshire County Council
Approved by	Nick Rand
Copyright	Ricardo
EULA	http://ee.ricardo.com/cms/eula/

Contract reference	ED19193121	Report reference	Week 38
--------------------	------------	------------------	---------

1 INTRODUCTION

This report is run on a weekly basis and provided to Pembrokeshire County Council. It shows a weekly summary for the period Monday September 16 to Sunday September 22 2024 of up to date provisional monitoring data of hydrogen sulphide (H₂S) for the site and presents a simple summary of the current concentrations and comparison to WHO guidelines. The report provides:

- a summary table
- a time series plot
- a time variation plot
- a box and whisker plot
- polar map plots

2 MONITORING STATION

The location of the monitoring site is shown in Figure 1 below.

Figure 1: Location of the monitoring site.



3 DATA DESCRIPTION

Data contained within this report are managed by Ricardo and stored in a dedicated, secure database. The data undergo the same QAQC procedures ('ratification') as Defra's national network (AURN). Data are ratified in discrete time blocks according to a regular schedule of audits and calibrations. As a result, data at different times of the year may be 'provisional' (yet to undergo the QAQC process) or 'ratified'. The data presented here are provisional pending final ratification.

H₂S concentrations are measured at the monitoring site via UV fluorescence using a Teledyne Model T101 H₂S analyser. The lower limit of detection of the instrument is < 0.4 ppb. Measurements are recorded every 5 minutes and averaged to 30 minute and 24-hourly concentrations for comparison against limit values.

H₂S concentrations are presented in both parts per billion (ppb) and in mass units (µg m⁻³). The conversion factor is calculated at a temperature of 20 °C and pressure of 1013mb.

3.1 RELEVANT POLLUTION LIMIT VALUES

The World Health Organisation (WHO) has proposed the following guidelines for ambient H₂S.

- 150 µg m⁻³ as a 24-hour average for the protection of human health.
- 7 µg m⁻³ as a 30-minute average designed to avoid substantial complaints about odour annoyance.

4 SUMMARY STATISTICS

The table below presented below shows summary statistics for the most recent week of measurements. The concentrations are provided in ppb (and µg m⁻³ in parentheses). Please note, these data are provisional and subject to change.

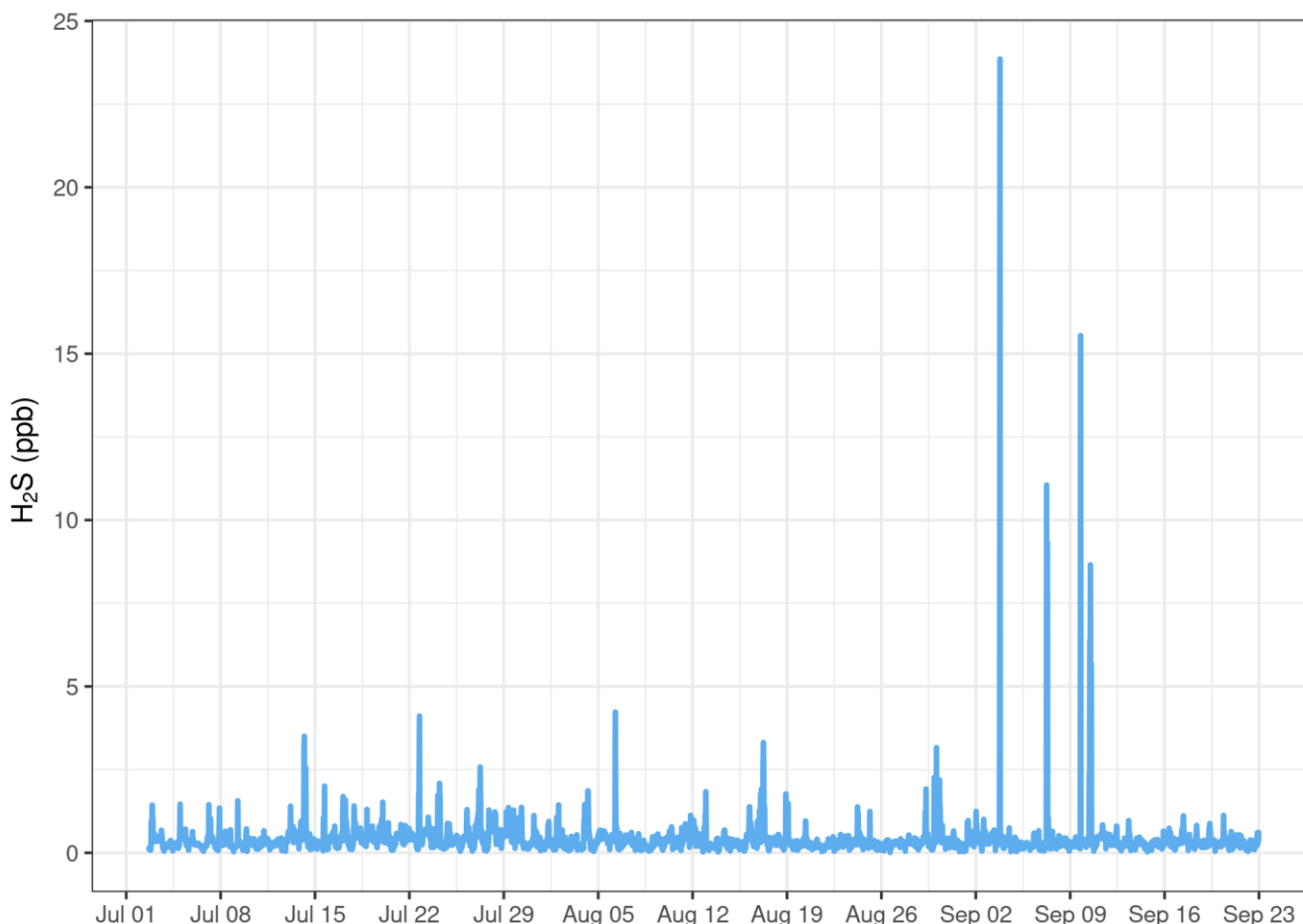
Table 1: Summary statistics for H₂S

Site	Data capture	30-minute averages			24-hour averages		Exceedances	
		Mean	Max	Min	Max	Min	30-min avg	24-hr avg
Spittal	100%	0.32 (0.46)	1.13 (1.59)	0.04 (0.06)	0.42 (0.59)	0.25 (0.36)	0	0

5 TIME SERIES PLOT

The data provided in the time series plot in Figure 2 shows 30-minute averaged data, appended to include the most recent week (week beginning 16/09/2024).

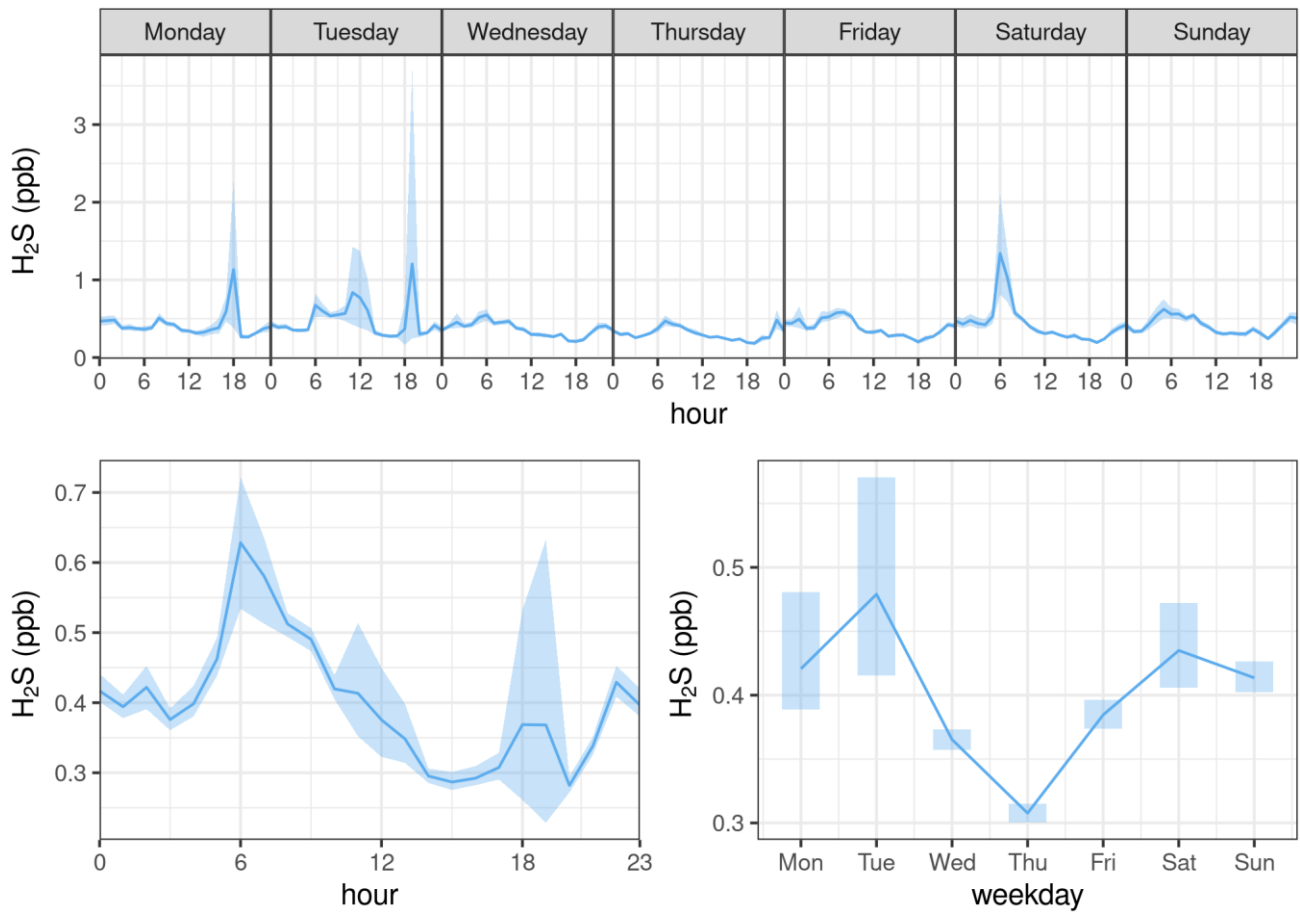
Figure 2: Time series plot of 30-minute averaged H₂S concentrations.



6 TIME VARIATION PLOT

The plots in Figure 3 show how the concentrations measured up to the current reporting period vary over different time intervals, based on the 5 minute data. The topmost frame shows the concentrations as they vary by hour of the day and day of the week. The hour of the day variation is summarised on its own in the lower left pane and the variation by day of the week is shown in the lower right pane. These plots often help explain variations in concentrations according to the emissions activity associated with them.

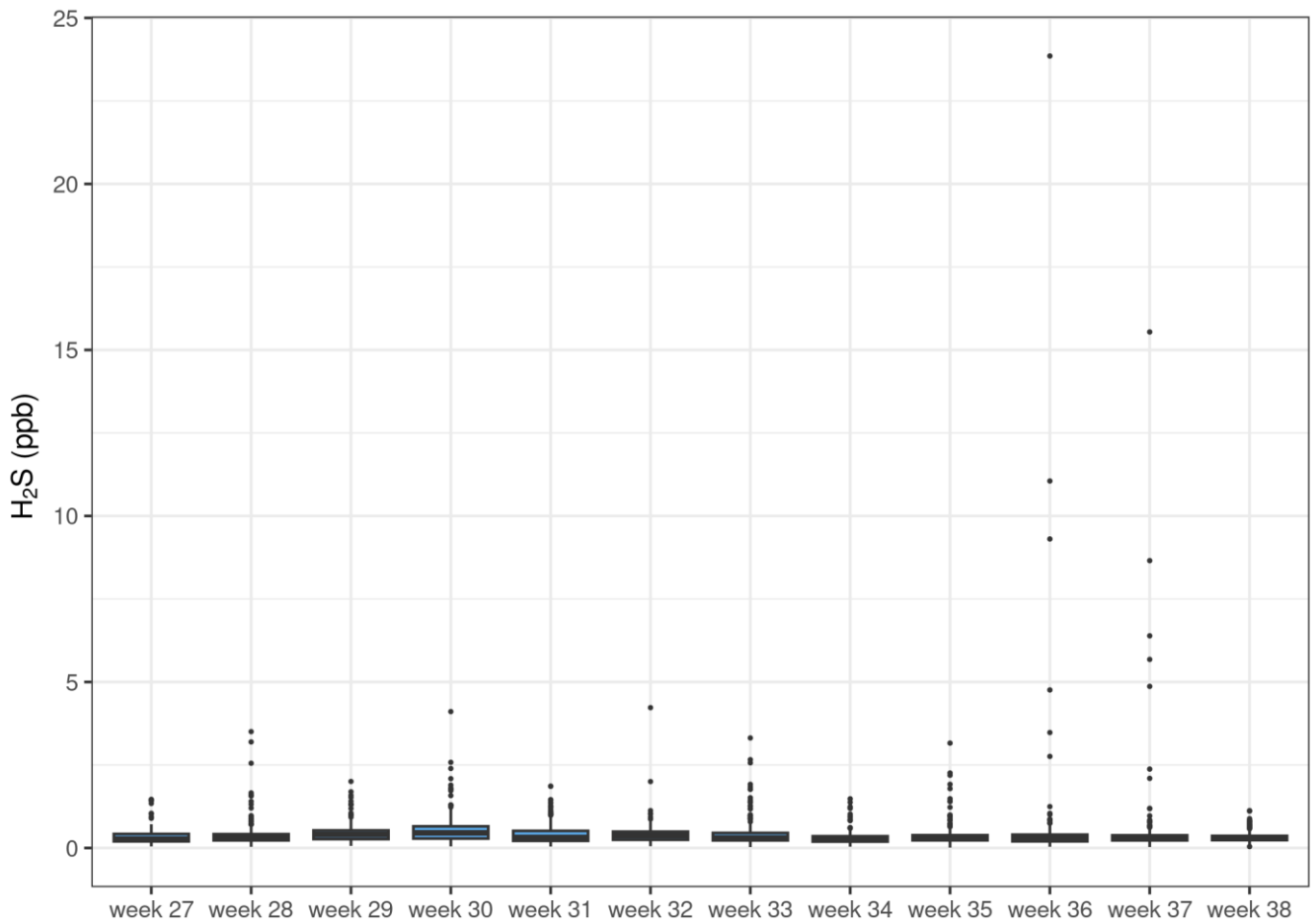
Figure 3: Variation in H₂S concentrations over different time periods.



7 BOX AND WHISKER PLOT

Figure 4 is a box and whisker plots to show the distribution in the 30-minute averaged H₂S concentrations. The boxes demarcate the lower quartile, median and upper quartile. The whiskers extend to the maximum and minimum values within median \pm 1.5 times interquartile range (IQR). Values outside the median \pm 1.5 times IQR are generally considered as outliers. This plot will be updated each week to show the variation on a weekly time basis.

Figure 4: Weekly variation in H₂S concentrations.



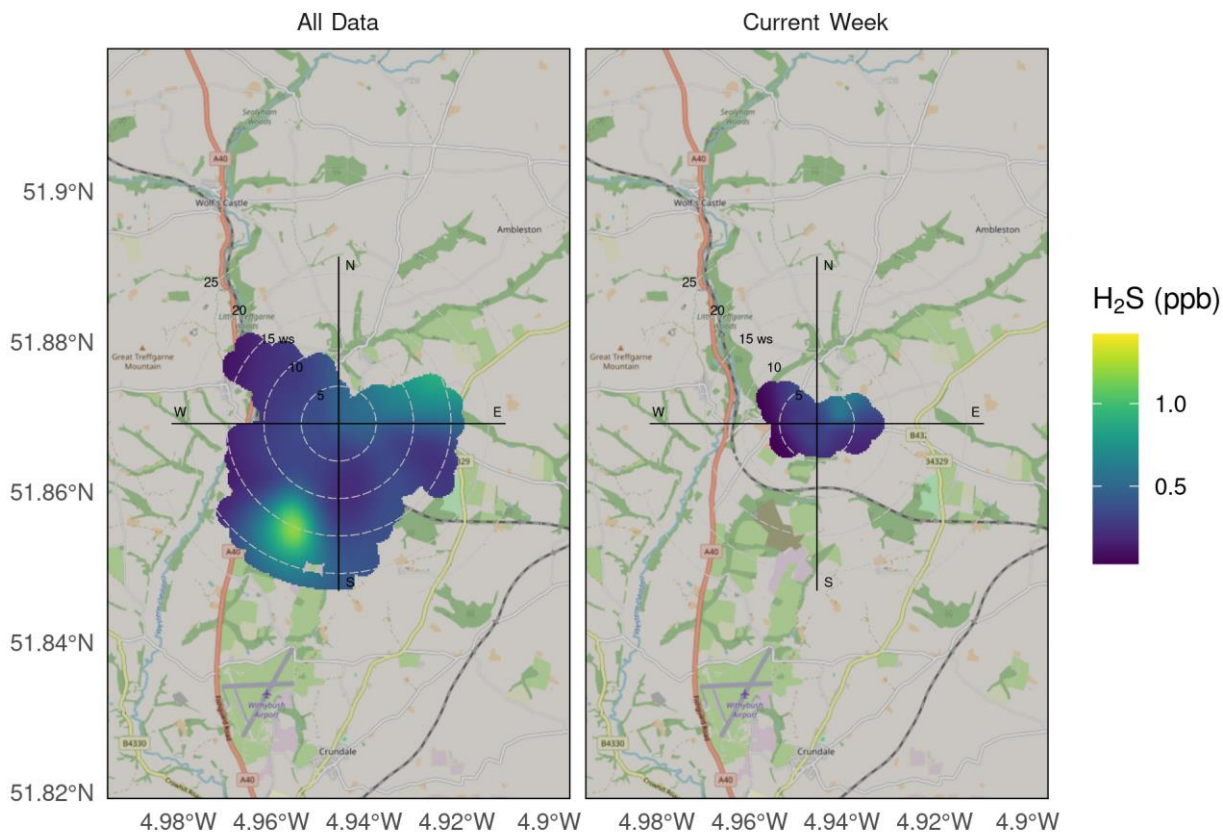
8 POLAR PLOT MAP

The maps below in Figure 5 show polar plots superimposed on a map to help understand the relative strength and direction of sources. Each plot is calculated from the 5 minute data. Two plots are provided, one shows the polar map using the data from the current reporting period, the second shows the polar map for all data measured from the start of the measurement campaign. The plot can be interpreted as follows:

- The distance from the plot origin shows the wind speed.
- The vertical and horizontal axes of the polar plots give you an indication of the wind direction, in a similar way as a wind rose or a compass would, with the cardinal points N (North), S (South), W (West) and E (East) being displayed. The circular dashed rings give you an indication of the wind speed. This starts at zero (0 m/s) at the “bullseye” central point, and slowly increases outwards in all directions.
- Wind Direction – Gives you a better idea of the direction where the potential air pollution source is coming from.
- Wind Speed – Gives you a better understanding of where this air pollution source is located: if very close to your monitoring location or if it comes from further way.
- Polar plots also display different colours. The green and yellow colours of the surface corresponds to higher concentrations whereas the blue colours correspond to lower pollutant concentrations.

When using the below map, please note that the region covered by the individual polar markers is not significant – the radial axes represent wind speed, not distance from the measurement site.

Figure 5: Polar map of H₂S for all data (right) and current week (left).



Name	Nick Rand
Address	Ricardo, Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom
Telephone	01235 753257
Email	nick.rand@ricardo.com