Air Quality Monitoring Summary Report 1

Exposure Period: 5 February – 1 March 2024

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Scope

The operator of Withyhedge Landfill is implementing a series of measures agreed with NRW to address odours emanating from the site, including re-profiling, capping and additional landfill gas extraction. Alongside these measures, the operator is funding a scheme of air quality monitoring in the communities surrounding the site and also within the site.

Geotechnology Limited has initially positioned a series of Hydrogen Sulphide diffusion tubes at sensitive community locations around the site to monitor concentrations averaged over a defined period. The scope of the monitoring is increasing, with the later introduction of diffusion tubes for volatile organics as well as instantaneous measurements gathered at various points within the community and on site.

The concentrations recorded by the diffusion tubes are obtained by the laboratory analysis of the tubes and this is undertaken by the manufacturer. The data reported by the manufacturer on laboratory certificates is shared with the operator, NRW and Pembrokeshire Council as soon as it becomes available.

The monitoring programme is primarily aimed at gathering quantitative data to provide lines of evidence to help assess risks from the exposure to off-site air quality that is impacted by the landfill.

Monitoring

Landfill gas is typically dominated by methane and carbon dioxide. Numerous other compounds may however also be present and some of these can be detected as odour. Such compounds are often sulphur based and can include hydrogen sulphide. As hydrogen sulphide can give rise to odour and can be readily measured it is being used as a surrogate for the potential presence of landfill gas, whilst recognising that there are a wide range of compounds and sources that can also generate odorous compounds like hydrogen sulphide.

Up to the beginning of March, air quality monitoring comprised an array of hydrogen sulphide diffusion tubes though in March these were supplemented with Volatile Organic Compound (VOC) diffusion tubes. The array comprises ten off-site locations at various compass directions around Withyhedge Landfill with a further seven on-site, as shown on Figures 1 and 2. The tubes are positioned to take into account the need for free air movement, safety during maintenance and consideration of potential damage, theft or vandalism. In most cases they are positioned ~2-2.5m above ground level. The suitability of the current positions will be reviewed as the programme develops.

The first set of Hydrogen Sulphide tubes in the community were deployed on 5 February 2024 and replaced with new tubes on 1 March. This period, when air is able to diffuse into the tubes, is termed the exposure period. The on-site tubes were exposed between the 8 February and 1 March 2024. The data from 5 Feb – 1 Mar exposure period is presented in this summary. During this period wastes were being removed from the crest of the site, gas wells were being drilled into the waste mass and temporary capping of the west facing flank was in progress.

On 8 March 2024, VOC tubes were placed at the same community monitoring positions and also on site. These will be taken down for analysis during early April. This data will be presented in the next summary report, though on 14 March 2024, the two sets of cable ties holding the two sets of diffusion tubes in place at D1 (adjacent farm at Spittal Cross) were found to have been cut and the tubes removed.

Figure 1 & 2 reference	Location Description	Tube position
Community monitoring locations		
D1	Spittal Cross cross-roads west of Spittal	Street furniture
D2	Spittal School	Lamp post
D3	Corner of spring gardens and Castle Rise, Spittal	Lamp post
D4	Cross-roads of B4329 and Spring Gardens East of Spittal	Street furniture
D5	B4329 between Scolton and Bethlehem	Street furniture
D6	B4329 at Bethlehem	Lamp post
D7	On road heading west out of Poyston Cross	Lamp post
D8	Adjacent properties at Poyston Water	Lamp post
D9	Rudbaxton Water Bridge	Northern side of bridge
D10	Adjacent Corner Piece Inn	Lamp post
On-site monitoring locations		
Access ramp (WL1)	Eastern side of access ramp	Metal post
Fence posts (WL2)	Fence post close to edge of permanent capping	Fence post
Litter skids (WL3)	Metal post close to edge of permanent capping	Metal post
Field fence post (WL4)	Fence post west of temporary capping	Fence post
CCTV tower (WL5)	Metal post south of active Cell 8	Metal post
IBC cell 8 (WL6)	Metal post west of active Cell 8	Metal post
Cell 7 IBC corner (WL7)	Metal post south of Cell 7	Metal post

Table 1. Monitoring positions

Figure 1. Community monitoring positions D1- D10

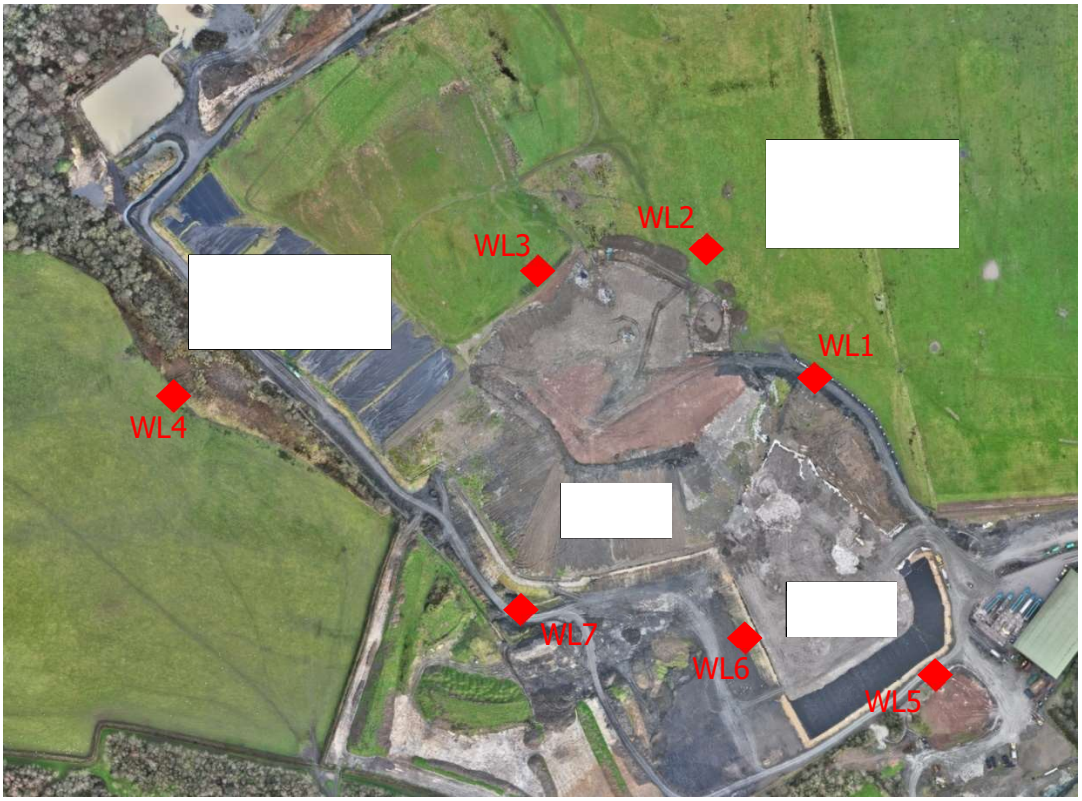

Figure 2. On-site monitoring positions

The weather station located at Withyhedge Landfill continuously gathers wind direction and strength data. Between 2 February and 1 March the prevailing wind was from the west-north-west / north-west, as shown in Figure 3.

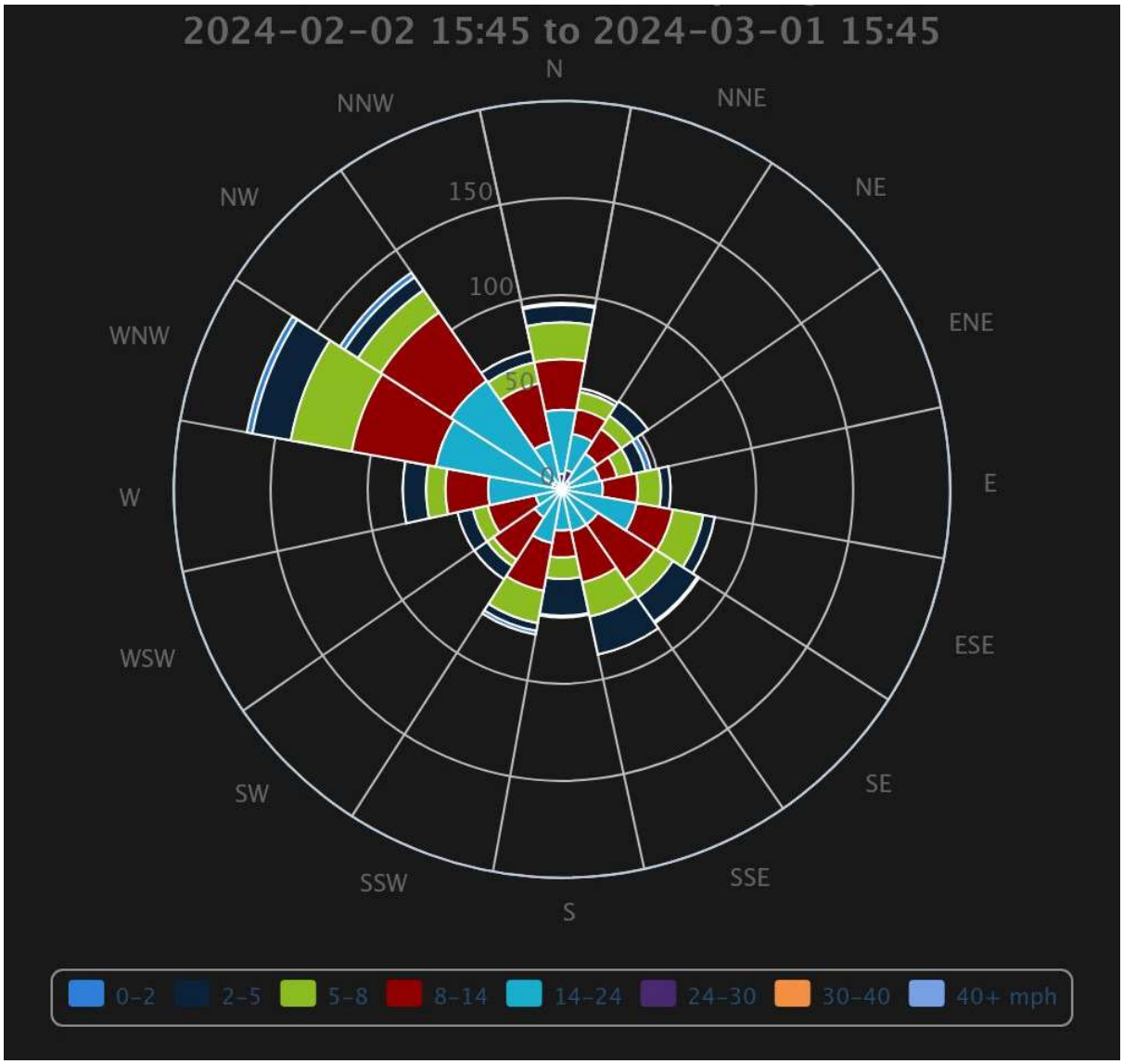

Figure 3. Wind-rose showing direction and speed

Analytical Testing

At the end of the exposure period, the diffusion tubes were carefully removed, sealed and returned to the accredited laboratory for testing. Analysis has been performed at Gradko International which is a UKAS accredited testing laboratory (No. 2187). The test certificates providing the analytical results for this exposure period are provided in Attachment 1.

Results

The average concentration of hydrogen sulphide measured in each diffusion tube during the exposure period was below the limit of detection (less than 0.08ppb part per billion), with the exception of D9 at Rudbaxton Bridge, which was 0.1ppb. Comparison of this concentration with the health-based evaluation criteria in Table 2 indicates that the concentrations fall below these guidance values for intermediate / lifetime exposure.

	Intermediate exposure criteria (up to 1 year)	**Lifetime exposure criteria**
Hydrogen Sulphide concentration	20 ppb (30 µg/m^3)	1 ppb (2 µg/m^3)
Values taken from references 1 and 2		

Table 2. Referenced health based guidance values

Higher concentrations of hydrogen sulphide were reported from the tubes exposed on site. The values ranged from 0.29ppb to 2.04ppb. These concentrations are below the workplace exposure limit of 5000 ppb for an 8-hour time-weighted average reference period (Ref 3).

Summary

The recorded concentrations of hydrogen sulphide (measured at each diffusion tube placed within surrounding communities) averaged 0.1ppb or less over the exposure period (5 Feb – 1 Mar). However, the instantaneous concentration over the exposure period would have risen and fallen throughout the period. The time integrated average concentrations are lower than the lifetime exposure criteria. As further data for hydrogen sulphide and other substances, together with instantaneous measurements becomes available this assessment will be updated.

The next summary is planned for late April/early May following receipt of laboratory data from the next exposure period. The next summary will also include data gathered using a Jerome Hydrogen Sulphide analyser which provides instantaneous concentration data.

References

Ref 1. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), Toxicological profile for Hydrogen Sulphide, 2006.

Ref 2. U.S. Environmental Protection Agency Reference Concentration for Hydrogen Sulphide.

Ref 3. EH40/2005 Workplace exposure limits (Fourth Edition 2020)

Attachment 1. Laboratory Test Certificates