HAFOD QUARRY LANDFILL, WREXHAM. PERMIT NO. PP3139GB

AIR QUALITY MONITORING INTERIM SUMMARY REPORT JULY/AUGUST

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Table of Contents

List of Tables

List of Figures

List of Appendices

Record of updates to report

Date	**Issues and Updates**
16 September 2025	Issued

EXECUTIVE SUMMARY

The operator of Hafod Landfill, Wrexham is jointly funding an air quality monitoring network with Wrexham County Borough Council's Public Protection Department, that currently includes the monitoring of Hydrogen Sulphide on site and in the community. The aim is to gather quantitative data regarding the concentration of Hydrogen Sulphide in air. At this stage, the monitoring includes diffusion tubes that provide averaged concentrations over a defined period and logged real-time measurements that record average readings every 15 minutes based on readings taken every 10 seconds. Regular off-site and on-site odour surveys are also undertaken and complaints recorded and evaluated. This monitoring is being undertaken at the request of the Scrutiny Committee and is not part of the Site Environmental Permit requirements.

The quantitative results from the diffusion tubes are compared against health-based criteria developed by health agencies in the USA (see references 1 and 2). These criteria are primarily for assessment of chronic risks. The real-time data gathered by AQMesh pods is not compared against health criteria as the pods require further calibration and so the data is considered to be qualitative at this stage. The manufacturer has provided a detailed statement regarding the ongoing complex process of calibration in Appendix 4 of this report.

The monitoring undertaken to date shows that:

- the concentration of Hydrogen Sulphide recorded by the diffusion tubes on-site and in the community falls below relevant health criteria. The lowest health criteria value is 1ppb and the highest concentration detected at the tubes 0.26ppb. Geotechnology understands that Public Health Wales (PHW) has evaluated some of the previous data and concluded that the data suggests the long-term (lifetime) health risk is low and that they do not need to be informed of the results unless the data shows concentrations routinely above exposure standards, which is not the current case.
- odours are infrequently detected during olfactory monitoring at many monitoring positions, either on-site or off-site by both Enovert staff and members of Wrexham's Public Protection team.
- odours are most often detected on the adjacent industrial estate and are typically described as being associated with the handling of compost and chemicals. Such odours are not typical of a landfill.
- odours thought to be associated with the degradation of waste at the landfill are typically found only in very close proximity to the site entrance and permit boundary and along the immediately adjacent public highway (Bangor Road and New Hall Lane). There are no residential properties in these areas.
- boundary odour monitoring undertaken by Public Protection Officers from Wrexham Council has led them to conclude that there is no statutory odour nuisance relating to the landfill. The Officer concluded that the monitoring outcome reflects the current low numbers in community odour complaints.
- the data reported by the AQMesh pods on-site and off-site shares several similarities and is also considered to be influenced by changes in humidity. This aspect of the monitoring programme is currently regarded as providing a qualitative indication of the potential presence of Hydrogen Sulphide, but efforts are ongoing with the manufacturer to improve this position whilst recognising the limits of detection and accuracy of the instrumentation i.e. such pods can only provide an indication of the presence of Hydrogen Sulphide above about 5ppb.

- when the on-site Hydrogen Sulphide concentration data reported by the pods is combined with the on-site measurements of wind direction, the data appears to show Hydrogen Sulphide being detected when the wind is blowing towards and from the site. This is unexpected and the reason for this is unclear. The data could be indicating multiple sources in the area. As a consequence, additional pods will be utilised to gain more background Hydrogen Sulphide readings in both upwind and downwind locations.

Such different lines of evidence indicate that the risks to human health are low and that there are potentially multiple sources of odour in the locality. Based on the available odour monitoring, these odours do not appear persistent.

1 INTRODUCTION

The operator of Hafod Landfill, Wrexham is jointly funding an air quality monitoring network with Wrexham County Borough Council's Public Protection Department. The network currently includes the monitoring of Hydrogen Sulphide on site and in the community. The aim is to gather quantitative data regarding the concentration of Hydrogen Sulphide in air.

At this stage, the monitoring includes diffusion tubes that provide averaged concentrations over a defined period, logged real-time measurements that record average readings every 15 minutes based on readings taken every 10 seconds and odour observations. The monitoring started in March 2025.

1.1 Scope

The operator of Hafod Landfill, Enovert North Ltd. has requested Geotechnology Ltd to evaluate the monitoring data gathered. This independent report, therefore, brings together the data gathered and compares the observed concentrations against published health criteria.

The report presents initial datasets gathered from AQMesh pods that have yet to be calibrated. Until this process is satisfactorily completed, we suggest that this data should not be compared against numerical thresholds or statistically analysed to avoid misinterpretation and to ensure all parties are aware of the limitations of the instrumentation.

2 HYDROGEN SULPHIDE

Landfill gas is typically dominated by methane and carbon dioxide which are odourless. 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 (chemical formulae H_2S).

Human noses can smell very small amounts of hydrogen sulphide, even at levels that are below health guideline values. Whilst recognising that there are potentially a wide range of compounds that can give rise to odours and potentially several sources may generate odorous compounds, environmental monitoring often uses hydrogen sulphide as a surrogate for the potential presence of odour that could be from landfill gas as the dominant gases are odourless. This is because hydrogen sulphide can be measured down to low concentrations and is often the dominant sulphurous compound present in landfill gas.

Hydrogen sulphide detectable in the air can come from a range of natural and man-made sources. This is because the gas is produced when bacteria naturally break organic matter such as plant and animal material. This can often happen in stagnant waters and in a range of waste materials where there is a low oxygen content. This can include environments such as waterlogged fields, compost heaps and wetlands.

Detectable levels of Hydrogen Sulphide can also be produced from a varied range of human, agricultural and industrial activities. This can include some landfills, drains and sewers, septic systems, waste and wastewater management facilities, animal manure/slurry spreading and some farming practices. Certain industrial activities may also release hydrogen sulphide.

3 PASSIVE DIFFUSION TUBE MONITORING

3.1 Monitoring Positions

At this stage, passive diffusion tubes monitoring Hydrogen Sulphide have been set at the on-site and off-site locations positions indicated in Appendix 5.

The aim of the tubes is to provide an indication of the long-term concentration of Hydrogen Sulphide in air. In this context, 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 ~2-2.2m above ground level. The suitability of the current positions will be reviewed as the programme develops.

Each diffusion tube comprises a small black tube that is open at one end to allow air to diffuse into it. Any Hydrogen Sulphide in the air is subsequently trapped onto an absorbent within the tube. At the end of the exposure period, the diffusion tubes are carefully removed, sealed and returned to the accredited laboratory for testing to determine the long-term indicative concentration. The term exposure period is used to define the sampling period when air was able to diffuse into the tubes before being sealed and returned to the laboratory. Such exposure periods are approximately 4 weeks.

The laboratory providing the tubes and undertaking the analysis is Gradko International which is a UKAS accredited testing laboratory (No. 2187). The test certificate providing the analytical results for the latest exposure period is provided in Appendix 1.

3.2 Review of Hydrogen Sulphide Results

The results of the Hydrogen Sulphide diffusion tube monitoring are summarised in Table 3-1.

To date, the monitoring has been continuous apart from a few days at the end of each exposure period, presumably when the tubes are being switched. Attempts should be made to avoid this re-occurring at the end of future exposure periods.

Table 3-1 Hydrogen Sulphide (ppb) results from Diffusion Tubes

2025 Exposure Periods				
Position	**14 April-22 April**	**25 April-27 May**	**30 May-30 Jun**	**30 Jun-1 Aug**
On-site Tubes				
Western Bund	<0.25	<0.06	<0.07	<0.06
NW Lagoon	<0.25	0.13	<0.07	<0.06
Site entrance	<0.25	<0.06	<0.07	<0.06
Restoration area	<0.25	<0.06	0.11	0.08
Off-site Tubes				
Bangor Road1	<0.25	<0.06	<0.06	<0.06
Brickworks	<0.25	0.12	<0.06	<0.06
New Hall Lane	<0.25	<0.06	0.26	<0.06
Ruabon	<0.25	<0.06	<0.06	<0.06
Ind Est	<0.25	<0.06	<0.06	<0.06
Community Centre	<0.25	0.21	<0.07	<0.06
Additional off-site tubes				
				17 Jul–1 Aug
Bangor Road 2				<0.13
Ruabon Road				<0.13

Comparison of the indicative concentrations detected since April 2025 with the health-based evaluation criteria in Table 3-2 indicates that they all fall well below the guidance values for intermediate/lifetime exposure at all monitoring positions, either on-site or off-site.

Table 3-2 Referenced health-based guidance values

(Values taken from references 1 and 2)

	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)

The on-site concentrations are also several orders of magnitude below the workplace exposure limit of 5000 ppb for an 8-hour time-weighted average reference period (Ref 3).

The data suggests that the indicative ambient levels either on-site or off-site do not pose a long-term risk and comparison with the exposure criteria helps place the concentration levels detected into context.

4 FIXED INSTRUMENTATION

Diffusion tubes provide an indication of the average concentration over the exposure period. The tubes cannot, however, provide any information on short-term changes or spikes in the concentration of hydrogen sulphide.

4.1 AQMesh Pods

To try and address this aspect, the operator has installed four real-time monitoring pods on-site. The Council also has a pod off-site at the community centre in Johnstown. This off-site pod is managed by Wrexham Council who provide the data digitally.

The suitability of the current positions will be reviewed as the monitoring programme develops. Summary details of the pods located are provided in Table 4-1.

Table 4-1 Details of on-site AQMesh Pods

Location	Position on	AQMesh Pod serial number	Monitoring details	Active Sensors
On-site Pods				
Site entrance	Blue dot 3	2450609	Started 2/3/2025	H_2S, Temperature, Humidity, NO_2
Lagoon	Blue dot 2	2450630	Started 2/3/2025	H_2S, Temperature, Humidity, NO_2
Western Bund	Blue dot 1	2451044	Started 10/3/2025	H_2S, Temperature, Humidity, wind speed, wind direction, NO_2
Southern Cap	Blue dot 4	2450627	Started 6/3/25	H_2S, Temperature, Humidity, NO_2
Off-site Pod				
Community	Yellow dot 6	2450621	Started 6/3/25	H_2S, Temperature, Humidity,

At each position, an AQMesh pod has been mounted on a steel pole, or similar, approximately 2m above surrounding ground level. Each pod is about the size of a football.

4.2 Real-Time Results

The mobile AQMesh pods are battery powered and provide an estimate of the concentration of Hydrogen Sulphide present using electrical sensors. The pods work by generating an electrical output which varies with the amount of Hydrogen Sulphide gas present. Such electrochemical sensors are, however, sometimes susceptible to interference and require site specific calibration.

Interference can be from multiple conditions found in the ambient environment including temperature, humidity and cross-gas effects. Following consultation with the manufacturer, the Hydrogen Sulphide data reported by all pods is suspected to be influenced by humidity. This is based on close examination of the data which reveals a repeating daily pattern, as illustrated in Figure 4-1. As there are no known on-site or off-site activities that have such diurnal variations, with the landfill gas management system operational 24/7, these variations are suspected to be a consequence of variations in humidity. During these periods, the reported concentration of Hydrogen Sulphide is zero around mid-day with peak values reported each night/early morning. As this is clearly apparent at all pods, at times, this leads to a longer-term spikey pattern that is evident in the longer-term datasets shown in Figure 4-2 and

4-3. As a consequence, caution should be taken when evaluating the absolute values reported and also changes in reported concentration.

The reader should also note that the logged data provided from the community logger combines 15-minute data between 6 March and 20 May, 10-minute data between 20 May and 31 May and 30-minute data since 1 June.

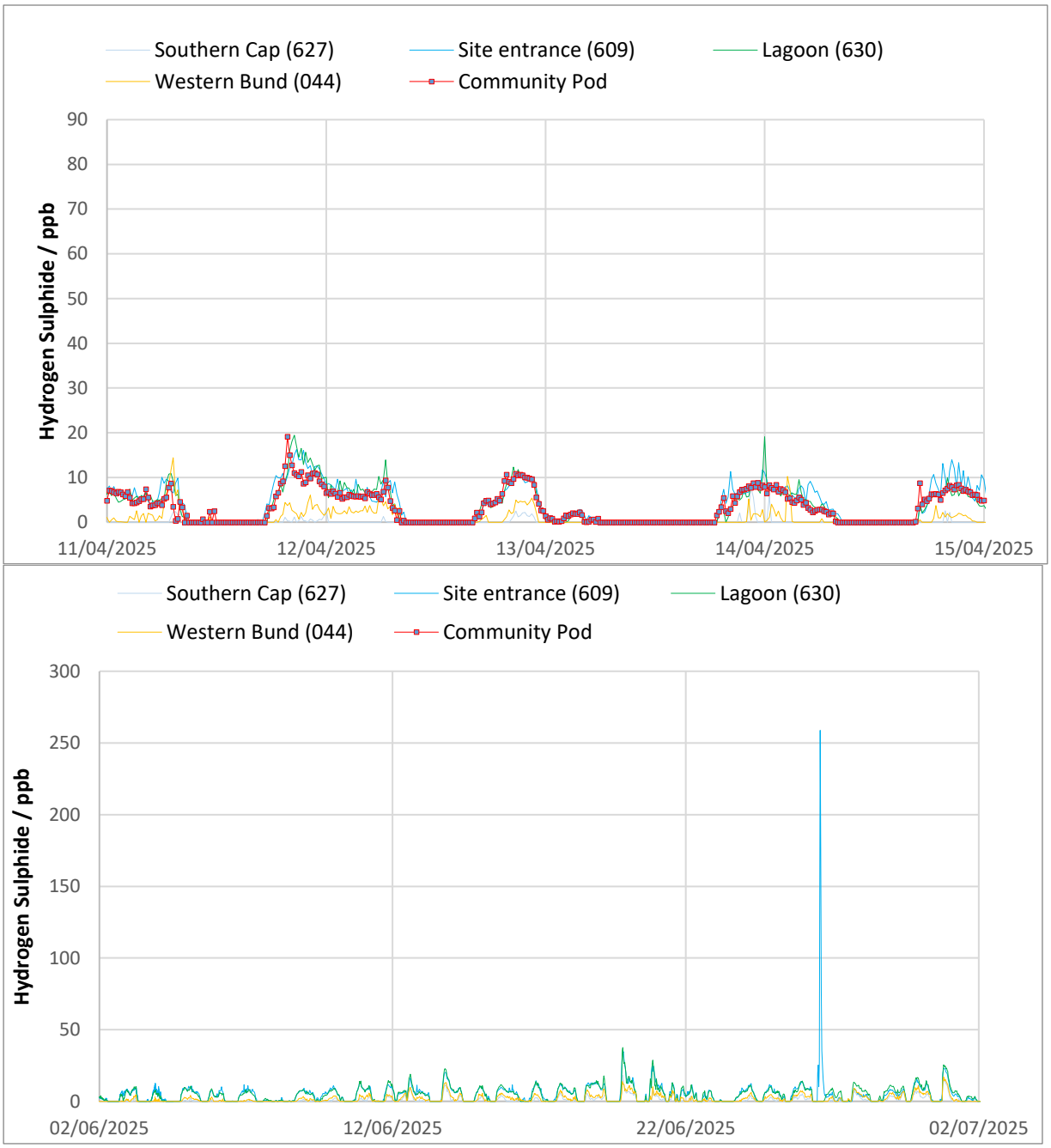


Figure 4-1 Close evaluation Hydrogen Sulphide (ppb) data from all on-site AQMesh Pods

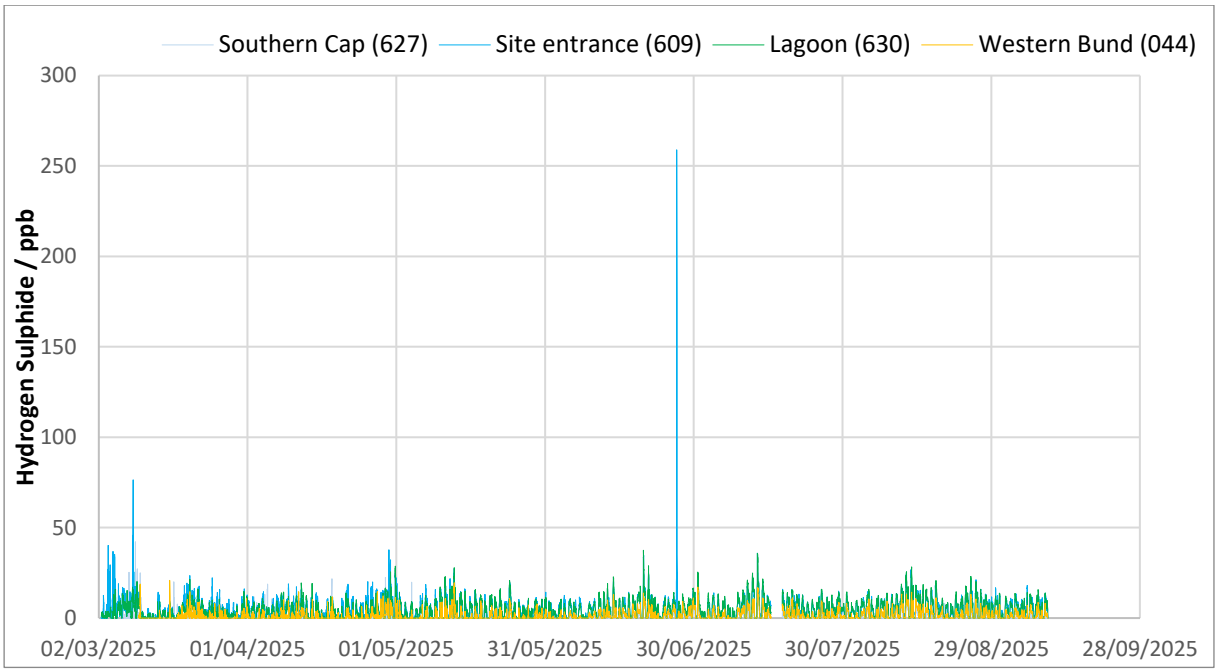


Figure 4-2 Hydrogen Sulphide (ppb) data from all on-site AQMesh Pods

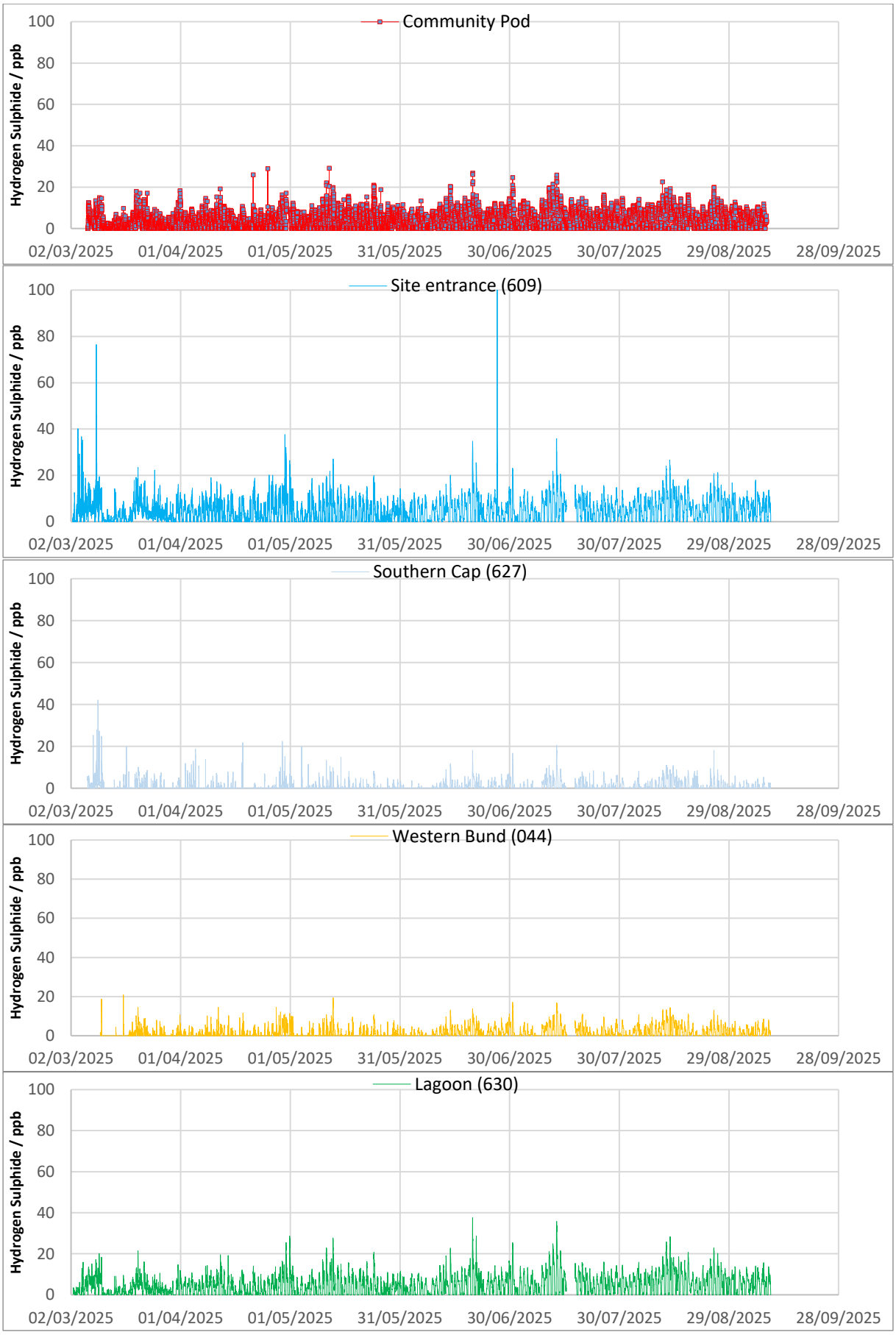


Figure 4-3 Hydrogen Sulphide detected at each of the pods

According to the manufacturers Specification, accuracy should be ~25% i.e. +/-1ppb above 5ppb. Below 5ppm the accuracy will be lower so 5ppb is therefore considered the practical limit of detection. However, at this stage, the pods have not yet been calibrated. For all determinants, but especially for gases such as Hydrogen Sulphide, range is key to enable a meaningful analysis. As the diffusion tubes are reporting <1ppb this data cannot be used to inform calibration and so an "event" of sufficient duration and concentration is required to enable the potential range in concentrations to be observed. This would then allow an assessment of correlation and therefore calibration. Similar issues are apparent at another landfill that Geotechnology is assisting with monitoring. At this other site, comparison of the results reported by an AQMesh pod with several other analytical techniques (diffusion tubes, Jerome and Teledyne analyser) reveals that the data from the pods is routinely over-estimating ambient air concentrations of Hydrogen Sulphide.

As shown by the summary statistics in Table 4-2, between about 60 and 90% of the datasets from each pod are <5ppb. Consequently, caution should be taken when drawing conclusions about absolute and average values reported by the instrument given the predominance of the lower accuracy low levels being detected. At this stage, the results are best regarded as providing a qualitative indication of the potential presence of Hydrogen Sulphide. Improvements in accuracy can only be achieved through calibration to provide traceability for the data. As a consequence, the data being gathered is principally considered most suited to assessing comparative changes above about 5ppb.

Efforts to better calibrate the pods such that the absolute concentrations being reported are considered more representative of real-world concentrations will continue to be evaluated with the manufacturer. This calibration process, involving close collaboration between the operator, Council and manufacturer is ongoing and should be complete in coming weeks. A brief outline of the works ongoing is detailed by the manufacturer in the note provided in Appendix 4. The reader should still note that the accuracy after calibration will still be ~25% i.e. +/-1ppb above 5ppb.

Table 4-2 Summary statistics for whole dataset at each pod

Pod	Min	Max	95%ile	Average	Count	<1ppb	%<1ppb	<5ppb	%<5ppb
Community	0.00	29.16	10.77	3.69	13508	4943	37%	8902	66%
Entrance	0.00	258.85	12.59	4.37	18262	6263	34%	11113	61%
Cell 1 capping	0.00	42.05	4.64	0.77	13189	10607	80%	12608	96%
NW Lagoon	0.00	37.47	12.46	4.03	13556	5237	39%	8668	64%
Western bund	0.00	20.83	5.97	1.20	12850	8975	70%	11903	93%

In this context, the data illustrated in Figure 4-3 suggests that all the pods show very similar temporal variation. On-site pods 609 at the site entrance and pod 630 at the lagoon also have similar reported concentrations to the community pod with the two pods further south on site (pods 044 and 627) tending to have lower concentrations. The precise cause of these variations and similarities is unclear. The similarity in the response pattern at each pod could potentially be considered to indicate that there is a process affecting all pods, such as variation in humidity. The reason that there are similarities between the absolute concentrations recorded by the community pod and the two on-site northern pods is also unclear as dispersion processes would be expected to cause absolute concentrations to vary with distance.

To aid evaluation of this latter aspect, the site operates a site weather station and pod 044 is also fitted with a wind sensor. This latter instrument indicates that during the latest monitoring

interval, a light breeze was predominantly from the southwest and southeast, as shown in Figure 4-4.

As the AQmesh pod 044 records wind direction and Hydrogen Sulphide concentration simultaneously a combined polar plot can be generated showing how Hydrogen Sulphide concentrations vary with wind direction, as shown in Figure 4-5. This plot shows the highest and average Hydrogen Sulphide concentration associated with each compass direction and the overall mean for the monitoring interval. This reveals that Hydrogen Sulphide is being reported irrespective of wind direction. The reason for this is unclear and unexpected and is primarily considered to be due to the dominance of values <5ppb. This also highlights the need to calibrate the pods and why, at this stage, the data should not be relied upon for quantitative assessments.

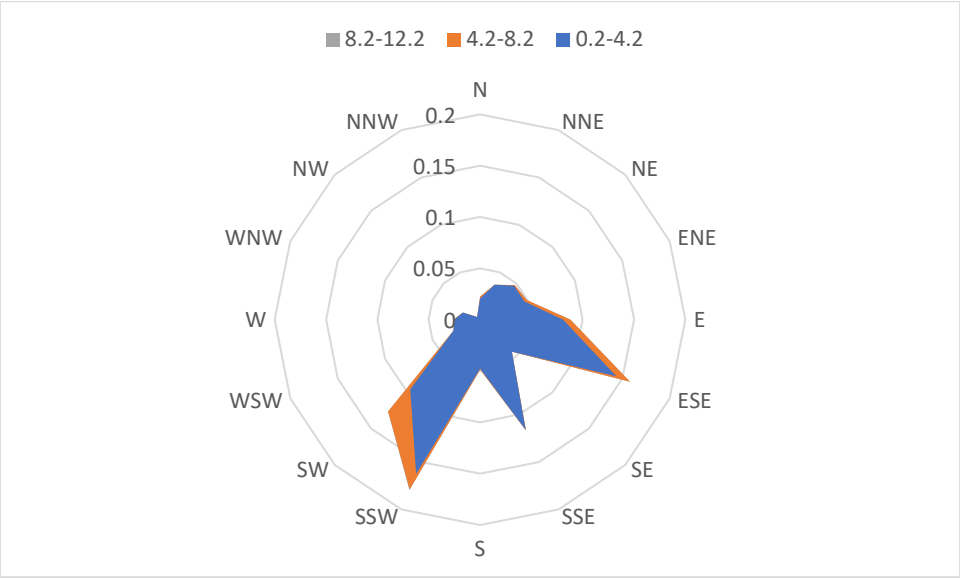


Figure 4-4 Wind speed (m/s) and direction from at AQMesh pod on western bund (044) between 17 August and 9 September 2025

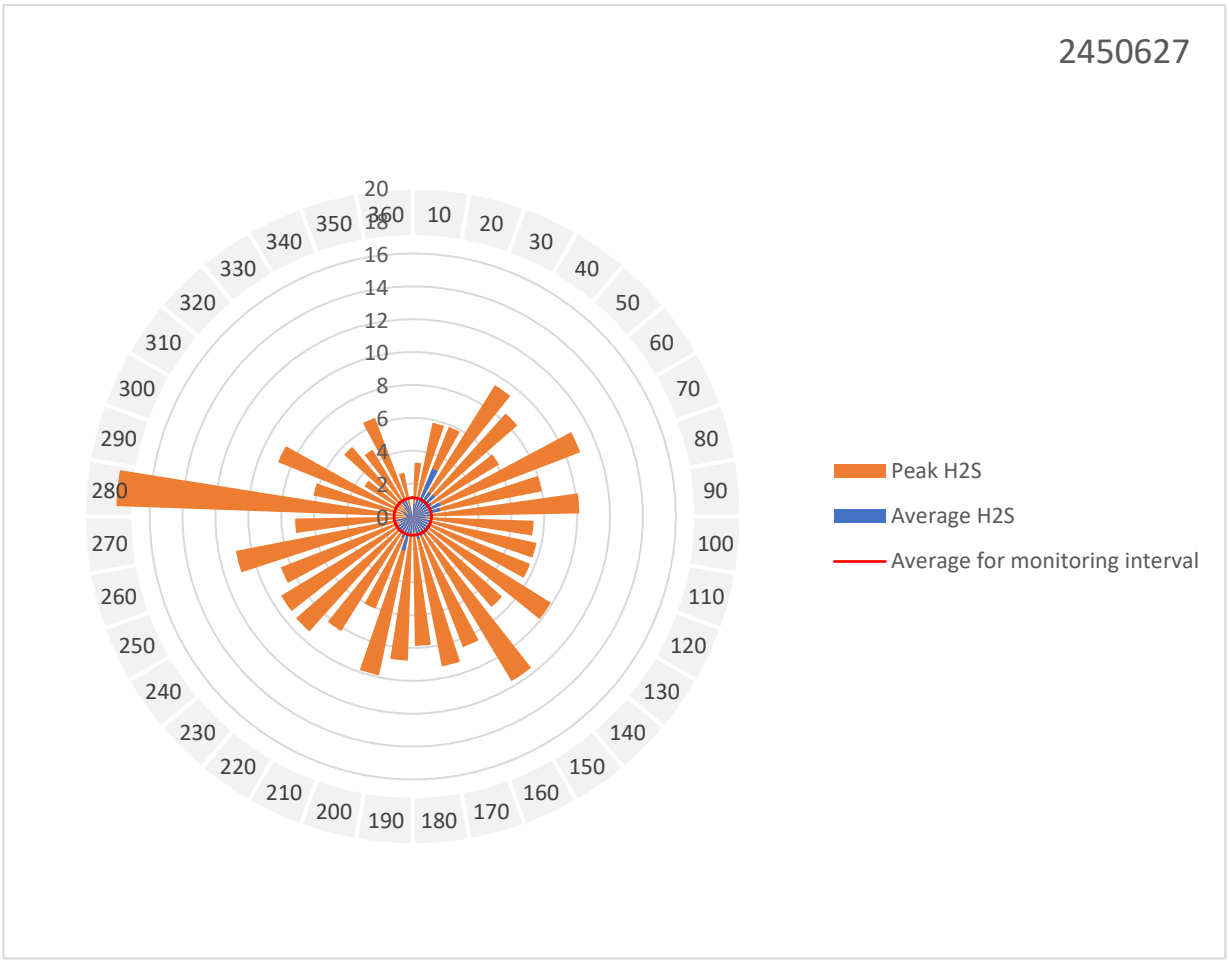


Figure 4-5 Variation of Hydrogen Sulphide concentration with direction the wind was blowing from at Western Bund (pod 044) between 14 July and 9 September 2025

5 ODOUR SURVEYS AND COMPLAINTS

5.1 Complaints

The total number of complaints received by the site during 2025 is graphically shown in Figure 5-1. This is the raw data with no attempt made in this report to apportion each individual complaint to a specific potential cause or geographic area.

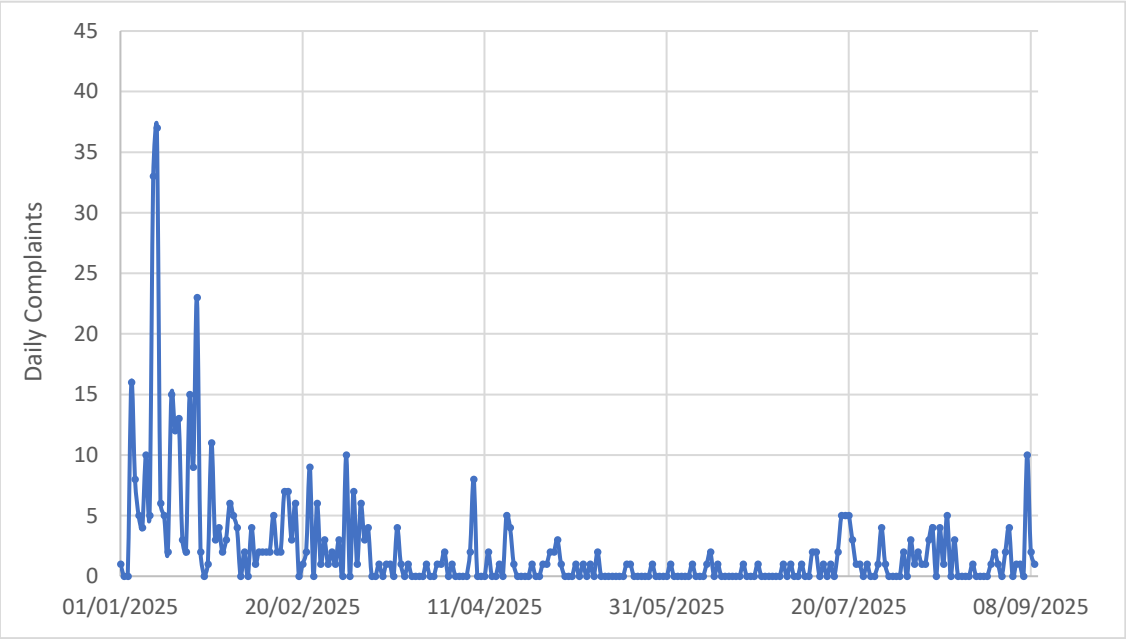


Figure 5-1 Daily complaints record

Complaints may be made for a number of reasons, and whilst they should not be a substitute for monitoring, they can provide a valuable indicator of potential off-site impacts as part of a multiple line of evidence approach.

In this context, it is evident that the total number of complaints has reduced significantly compared to the start of the year.

5.2 Odour Surveys by Enovert

In accordance with the requirements of the Permit and documented management system, personnel from Enovert are alert to changes in site conditions, including odours, and complaints. In addition to this continuous on-site awareness, regular sniff testing is undertaken on-site and off-site with the results documented in daily sniff testing reports when the site is operational. The results of these surveys are summarised in this report.

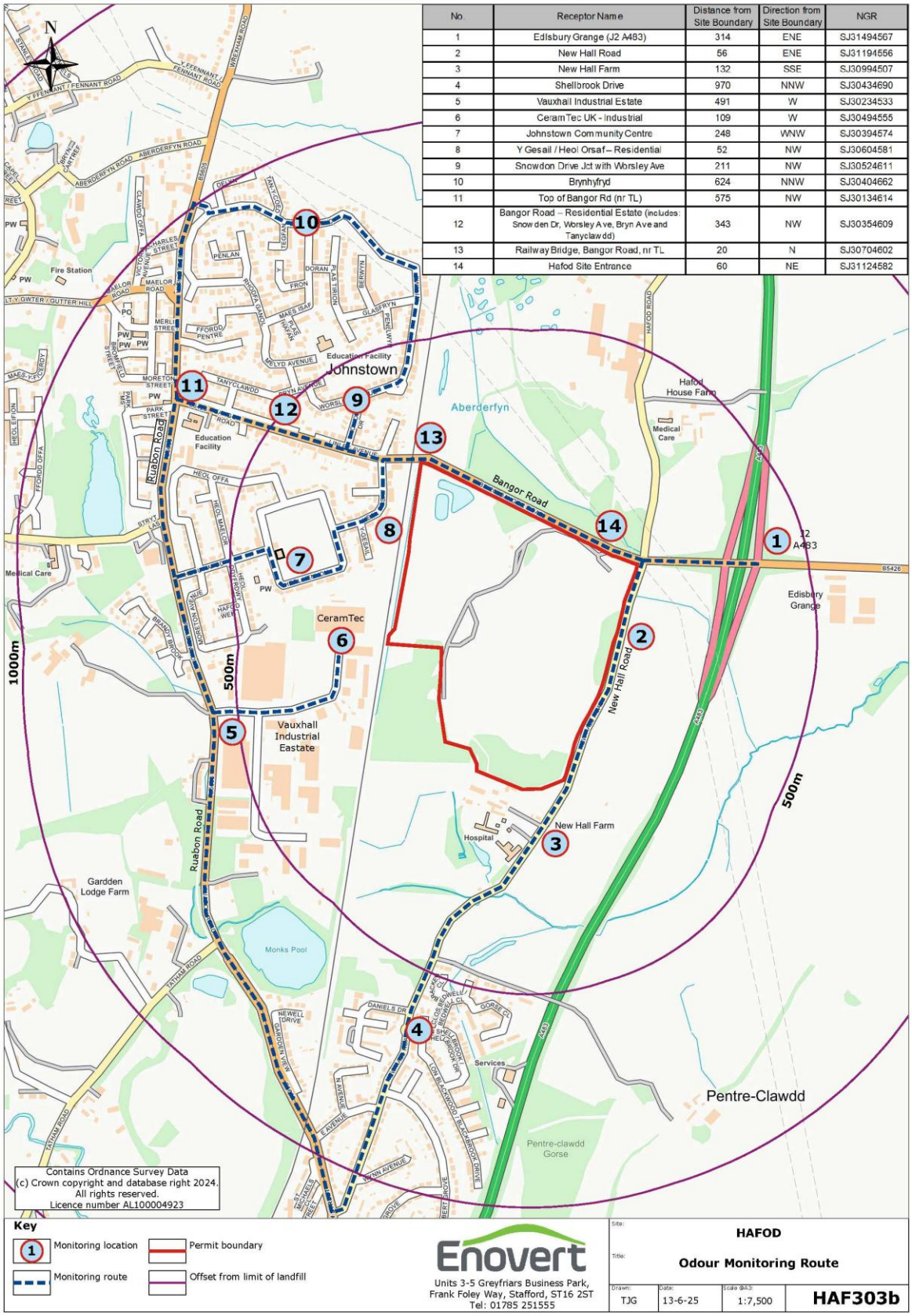
5.2.1 Off-site Monitoring

This monitoring comprises personnel repeatedly visiting the off-site positions listed below:

- Junction 2 - A483 slip road/Edisbury Grange
- New Hall Lane

- New Hall Farm
- Bangor Road Railway Bridge
- Shellbrook Drive
- Vauxhall Industrial Estate 1
- Vauxhal Industrial Estate 2
- Johnstown Community Centre
- Y Gesail/Heol Orsaf
- Snowdon jct. Worsley
- Brynhyfryd
- Bangor Road (Linley Drive, etc)
- Top of Bangor Road (nr TL)
- Hafod Site Entrance

These positions are shown on the route highlighted on Figure 5-2.



No.	Receptor Name	Distance from Site Boundary	Direction from Site Boundary	NGR
1	Edisbury Grange (J2 A483)	314	ENE	SJ31494567
2	New Hall Road	56	ENE	SJ31194556
3	New Hall Farm	132	SSE	SJ30994507
4	Shellbrook Drive	970	NNW	SJ30434690
5	Vauxhall Industrial Estate	491	W	SJ30234533
6	CeramTec UK - Industrial	109	W	SJ30494555
7	Johnstown Community Centre	248	WNW	SJ30394574
8	Y Gesail / Heol Orsaf– Residential	52	NW	SJ30604581
9	Snowdon Drive Jct with Worsley Ave	211	NW	SJ30524611
10	Brynhyfryd	624	NNW	SJ30404662
11	Top of Bangor Rd (nr TL)	575	NW	SJ30134614
12	Bangor Road – Residential Estate (includes: Snowden Dr, Worsley Ave, Bryn Ave and Tanyclawdd)	343	NW	SJ30354609
13	Railway Bridge, Bangor Road, nr TL	20	N	SJ30704602
14	Hafod Site Entrance	60	NE	SJ31124582

Figure 5-2 Off-site odour Monitoring Route

At each position, an assessment is made regarding any odour that may be present and its apparent nature/source. To assist with this assessment the odour intensity and persistence is rated according to the scoring system summarised in Table 5-1.

Table 5-1 Odour Intensity Ratings

Numeric Ranking	Odour Description	Colour Code
0	No Odour	
1	Faint & Intermittent	
2	Faint & Continuous	
3	Strong & Intermittent	
4	Strong & Continuous	
5	Very Strong & Intermittent	
6	Very Strong & Continuous	

Appendix 2 summarises the observations recorded during sniff since May with the latest results presented in Table 5-2. Where an odour has been recorded, this is also summarised in Table 5-3.

Review of this latter table indicates that a small number of odour types have been identified. Therefore, these are identified in Table 5-2 with the following abbreviations:

- Waste (W)
- Burning (B)
- Co (Compost)
- Chemical (Ch)
- Agricultural (Ag)

During the monitoring period:

- odours are rarely perceptible with no odours ever detected at most positions
- when an odour is detected, a relatively small range of potential sources are identified
- odours are most often detected on the adjacent industrial estate and are typically described as being associated with the handling of compost and chemicals
- odours thought to be associated with the degradation of waste at the landfill were found only in close proximity to the site - immediately adjacent to the site entrance/Permit boundary and the immediately adjacent highway. There are no residential properties in these areas.

These latest observations are very similar to the previous monitoring period as shown by the data in Appendix 2.

Table 5-2 Odour observations between 7 July and 28 August

Date	Day	1) Junction 2 - A483 slip road	2) New Hall Lane	3) New Hall Farm	4) Shellbrook Drive	5) Vauxhall Industrial Estate	6) Ceram Tec UK	7) Johnstown Community Centre	8) Y Gesail/ Heol Orsaf	9) Snowdon jct Worsley	10) Brynhyfryd	11) Top of Bangor Road (nr TL)	12) Bangor Road (Linley Drive, etc)	13) Railway Bridge, Bangor Road, nr TL	14) Hafod Site Entrance
07/07/2025	Mon	0	2W	0	0	0	0	0	0	0	0	0	0	0	0
08/07/2025	Tue	0	1W	0	0	0	0	0	0	0	0	0	0	0	0
09/07/2025	Wed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/07/2025	Thu	No monitoring													
11/07/2025	Fri	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
12/07/2025	Sat														
13/07/2025	Sun														
14/07/2025	Mon	0	1W	0	0	0	0	0	0	0	0	0	0	0	0
15/07/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16/07/2025	Wed	0	0	0	0	1Co,	0	0	0	0	0	1Ag	0	0	0
17/07/2025	Thu	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18/07/2025	Fri	0	0	0	0	1Co	0	0	0	0	0	0	0	0	2W
19/07/2025	Sat														
20/07/2025	Sun														
21/07/2025	Mon	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
22/07/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23/07/2025	Wed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24/07/2025	Thu	0	0	2Ag	0	0	0	0	0	0	0	0	0	0	0
25/07/2025	Fri	No monitoring													
26/07/2025	Sat														
27/07/2025	Sun														
28/07/2025	Mon	0	0	2Ag	0	0	0	0	0	0	0	0	0	0	0
29/07/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
30/07/2025	Wed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31/07/2025	Thu	0	0	0	0	2Ch	0	0	0	0	0	0	0	0	0
01/08/2025	Fri	0	1W	0	0	0	0	0	0	0	0	0	0	0	0
02/08/2025	Sat														
03/08/2025	Sun														
04/08/2025	Mon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/08/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/08/2025	Wed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/08/2025	Thu	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/08/2025	Fri	0	0	0	0	1Co	1Co	0	0	0	0	0	0	0	0
09/08/2025	Sat														

Date	Day	1) Junction 2 - A483 slip road	2) New Hall Lane	3) New Hall Farm	4) Shellbrook Drive	5) Vauxhall Industrial Estate	6) Ceram Tec UK	7) Johnstown Community Centre	8) Y Gesail/ Heol Orsaf	9) Snowdon jct Worsley	10) Brynhyfryd	11) Top of Bangor Road (nr TL)	12) Bangor Road (Linley Drive, etc)	13) Railway Bridge, Bangor Road, nr TL	14) Hafod Site Entrance
10/08/2025	Sun														
11/08/2025	Mon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/08/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
13/08/2025	Wed	0	0	0	0	2Ch	1Ch	1Ch	0	0	0	0	0	0	0
14/08/2025	Thu	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
15/08/2025	Fri	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16/08/2025	Sat														
17/08/2025	Sun														
18/08/2025	Mon	0	0	0	0	1Ch	1Co	0	0	0	0	0	0	0	0
19/08/2025	Tue	0	0	0	0	1Ch	1Ch	0	0	0	0	0	0	0	0
20/08/2025	Wed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21/08/2025	Thu	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22/08/2025	Fri	0	0	0	0	1Ch	1Ch	0	0	0	0	0	0	0	0
23/08/2025	Sat														
24/08/2025	Sun														
25/08/2025	Mon	No monitoring													
26/08/2025	Tue	0	0	0	0	0	0	0	0	0	0	0	0	0	1W
27/08/2025	Wed	0	0	0	0	1Ch	0	0	0	0	0	0	0	0	0
28/08/2025	Thu	0	0	0	0	2Ch	2Ch	1Ch	0	0	0	0	0	0	0
29/08/2025	Fri	No monitoring													

Table 5-3 Summary of detectable odour observations between 7 July and 28 August

Date	Position	Rating	Comments from Enovert personnel	Abbreviation	Type of area
07/07/2025	New Hall Lane	2	Landfill gas odour for 10m section near Green Tank on NHL	W	Not residential – public highway
08/07/2025	New Hall Lane	1	Very faint landfill gas odour on small section 10m of NHL	W	
11/07/2025	Hafod Site Entrance	1	Slight landfill gas at main gates	W	Not residential – public highway
14/07/2025	New Hall Lane	1	Waste odour for the first 20mtr	W	Not residential – public highway
16/07/2025	Vauxhall Industrial Estate	1	Sweet compost smell	Co	Not residential – industrial
	Vauxhall Ind. Estate	1	Composty smell	Co	Not residential – industrial
	Top of Bangor Road (nr TL)	1	Farming smell	Ag	Residential
18/07/2025	Hafod Site Entrance	2	Landfill gas odour just at the gates	W	Not residential – public highway
	Vauxhall Industrial Estate	1	Compost like smell	Co	Not residential – industrial
21/07/2025	Hafod Site Entrance	1	Gassy smell	W	Not residential – public highway
24/07/2025	New Hall Farm	2	Cow muck	Ag	Agricultural/ Residential
28/07/2025	New Hall Farm	2	Cow muck	Ag	Agricultural/ Residential
29/07/2025	Hafod Site Entrance	1	Fresh waste smell at the gate and going past the waiting wagons	W	Not residential – public highway
31/07/2025	Vauxhall Industrial Estate	2	Plastic odour	Ch	Not residential – industrial
01/08/2025	New Hall Lane	1	Faint waste odour halfway down New Hall Lane, in line with tipping	W	Not residential – public highway
08/08/2025	Vauxhall Industrial Estate	1	Compost like smell	Co	Not residential – industrial
	Vauxhall Ind. Estate	1	As above	Co	Not residential – industrial
12/08/2025	Hafod Site Entrance	1	Smell of waste from the queuing wagons	W	Not residential – public highway

Date	Position	Rating	Comments from Enovert personnel	Abbreviation	Type of area
13/08/2025	Vauxhall Industrial Estate	2	Strong smell of chemicals	Ch	Not residential – industrial
	Vauxhall Ind. Estate	1	Same chemical smell but not as strong	Ch	Not residential – industrial
	Johnstown Community Centre	1	Picked up a faint smell on the estate	Ch	Residential
14/08/2025	Hafod Site Entrance	1	Light smell of waste from the queuing wagons.	W	Not residential – public highway
18/08/2025	Vauxhall Industrial Estate	1	Earthy odour	Co	Not residential – industrial
19/08/2025	Vauxhall Industrial Estate	1	Smell of old cooking oil	Ch	Not residential – industrial
	Vauxhall Ind. Estate	1	Smell of old cooking oil	Ch	Not residential – industrial
22/08/2025	Vauxhall Industrial Estate	1	Smell of old cooking oil	Ch	Not residential – industrial
	Vauxhall Ind. Estate	1	Smell of old cooking oil	Ch	Not residential – industrial
26/08/2025	Hafod Site Entrance	1	Slight waste odour	W	Not residential – public highway
27/08/2025	Vauxhall Industrial Estate	1	Slight chemical smell	Ch	Not residential – industrial
28/08/2025	Vauxhall Industrial Estate	2	Very strong chemical/glue odour	Ch	Not residential – industrial
	Vauxhall Ind. Estate	2	Same as above but not as strong.	Ch	Not residential – industrial
	Johnstown Community Centre	1	Picking up the same odour that was on the Vauxhall ind est. but not as strong	Ch	Residential

5.2.2 On-site observations

Using the same methodology, such odour surveys have also been completed on-site since 2 June 2025. These surveys have been undertaken during the morning at the positions identified on Figure 5-3 with the results summarised in Appendix 3.

These surveys indicate that no persistent landfill odours have been detected on site which supports the lack of their detection off-site.

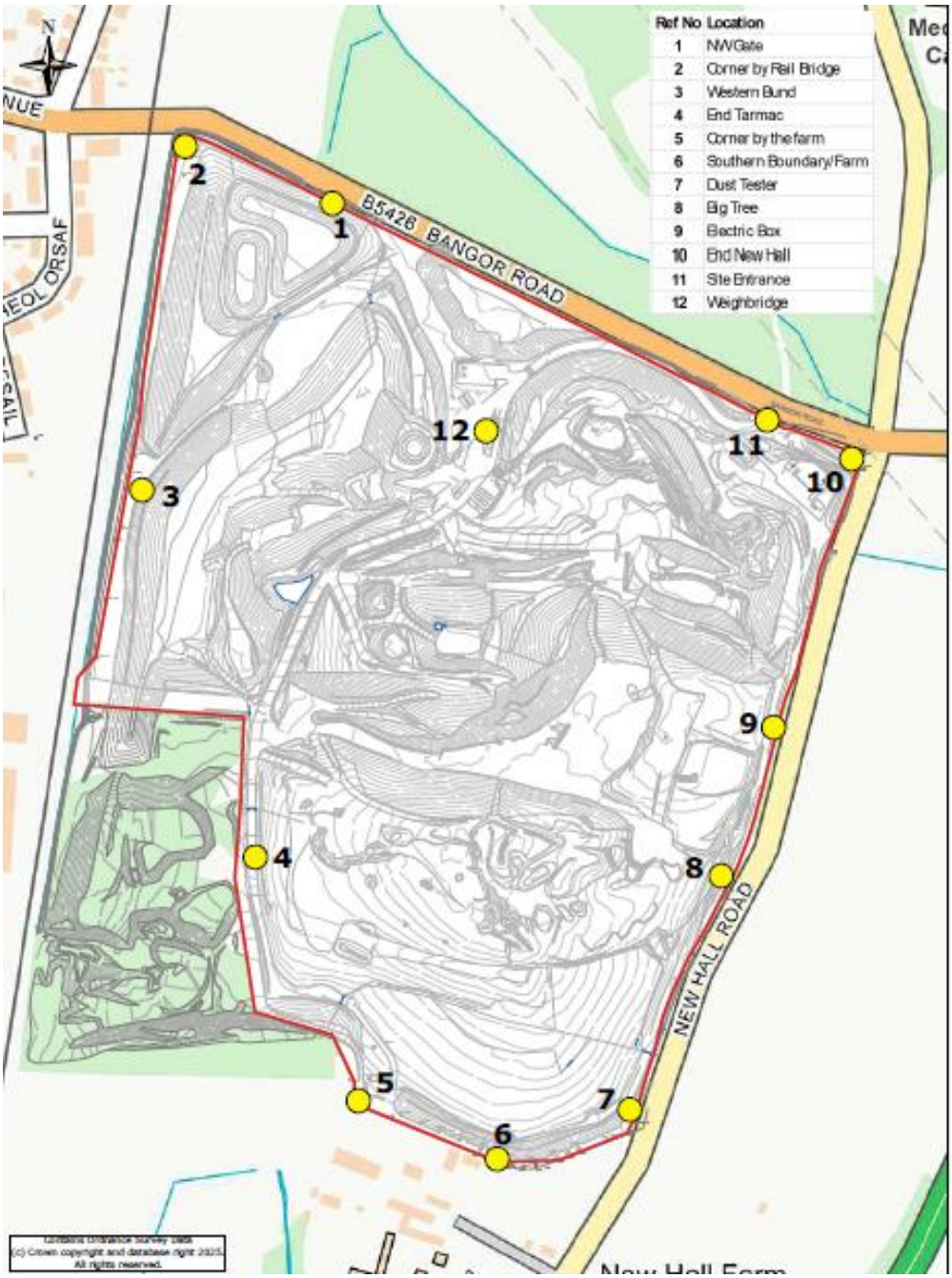


Figure 5-3 On-site odour survey positions

5.3 Odour Surveys by Wrexham Council

Public Protection Officers from Wrexham CBC have also undertaken assessments of off-site odours around the landfill site.

This monitoring data presented below was collected Monday-Friday between 14 July and 15 August 2025. The monitoring was undertaken at different times of day at the same positions described in Section 5.2 and shown on Figure 5-2 using the same ratings provided in Table 5-1. The results of this monitoring are summarised in Table 5-4.

Table 5-4 Summary of Wrexham CBC Odour Monitoring

Location (See Figure 5-2)	Number of occasions odour recorded	Number of occasions odour NOT recorded	Odour intensity recorded (see Table 5-1)	Type of area
1	1	21	2	Non residential
2	13	9	3-4	Non residential
3	12	10	3-4	Residential / Agricultural
4	0	22	0	Residential
5	2	20	1	Industrial
6	0	22	0	Industrial
7	0	22	0	Residential
8	1	21	3	Residential
9	2	20	1	Residential
10	0	22	0	Residential
11	0	22	0	Residential
12	1	21	1	Residential
13	4	18	2	Non residential - highway
14	9	13	3-4	Non residential - highway

Based on the results, the Public Protection Officer concluded that no statutory odour nuisance currently exists relating to the Hafod landfill site. This is due to the infrequency of landfill odour detection, the odour level and the area where odour was detected. The Officer concluded that the monitoring outcome reflects the current low numbers in community odour complaints.

6 SUMMARY

6.1 Monitoring Data

Frequent odour assessments suggest odours associated with the degradation of waste have been infrequently detected around the perimeter of the site and that several different types of odours are perceptible in the wider community. Some of these odours could contain Hydrogen Sulphide.

The Public Protection Officer from Wrexham Council has concluded that the odours detected do not pose a statutory nuisance. The total number of complaints has fallen considerably during 2025.

The recorded concentrations of hydrogen sulphide measured at each diffusion tube have remained well below the lifetime exposure criteria value of 1ppb, both on-site and around the community since April 2025. Public Health Wales (PHW) has previously indicated that at such levels the long-term (lifetime) health risk is low and that they do not need to be informed of the results unless the data shows concentrations routinely above exposure standards, which is not the current case.

Perimeter monitoring using the AQMesh pods indicates that Hydrogen Sulphide is sometimes detectable within the Permit boundary. The qualitative data reported by the pods is sometimes subject to interference and efforts to improve data quality are ongoing through discussions with the manufacturer.

6.2 Recommendations

- Continue to liaise with manufacturer of pods to better understand observed variations and improve data quality through pod calibration. This should result in more confidence in the accuracy of the data above about 5ppb.
- Continue to undertake routine survey of identified key gas management infrastructure and active cell.

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)