

Methane Emissions Survey Sheet –

Site	Tata Shotton Landfill	Date	12/06/2024	Time	in: 11:10 out: 14:10
Instrument	Gazomat Inspectra TDL (Serial No.: 2421011)	Test gas reading	-	Time	-
Next Calibration due		Background reading	1.8ppm 2.4ppm	Time	11:10 12:17
Weather conditions:	South Westerly light to moderate winds, light rain and overcast. Low pressure. Approx. 12-14°C.			Atm. Press.	
Survey Undertaken by:	Victoria Griffin, Stuart Ross & Mostyn Wall				

General comments / observations

Survey Results				
Point ref.	Time	Methane Reading	Feature and / or Grid Reference	Description / Comment
BH02	12:00	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Tight fitting black push on cap
BH12	12:03	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Tight fitting orange bung – well tap in closed position.
BH01	12:08	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Tight fitting orange bung – well tap in closed position.
BH11	12:13	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Tight fitting orange bung – well tap in closed position. Well not labelled.
L4	12:31	1%	-	Leachate chimney, comprising grey perforated slotted casing with wooden “lid”. Well not labelled.
BH09	12:38	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Orange bung, which was loose at time of inspection – well tap in closed position.
L5	13:01	90ppm	-	Leachate chimney, comprising grey perforated slotted casing with wooden “lid”. Well not labelled.
BH14	13:46	4.8ppm	-	Gas monitoring tube within raised steel casing. Tight fitting orange bung – well tap in closed position.
BH08	13:52	1.92ppm (Background)	-	Gas monitoring tube within raised steel casing. Monitoring reading taken from exterior of casing. Well cap could not be removed.
BH13	11:57	1.8ppm		Measured inside and outside well
Leachate well 5	12:09	4ppm	-	Measured at base of well
Leachate well 5		14ppm	-	Top of leachate well
2A	12:15	1.7ppm	CW1	Base of well. Well was locked
1A	12:24	1.8ppm	-	Borehole not labelled. Top of well lid was loose
Well	12:33	49.8ppm	Pumping room	Marked well on map
Leachate well 6	12:40	2.0ppm	-	Base of well

Survey Results				
Point ref.	Time	Methane Reading	Feature and / or Grid Reference	Description / Comment
Leachate well 6		7.2ppm	-	Top of well head
Leachate well 6	12:42	38.7ppm, 128ppm	-	Measured with lid off
BH15	12:49	1.9ppm	-	Base of well
BH15		19ppm	-	Measured at top of wellhead
L4 Leachate well	13:13	0.8% Gas	-	Measured from well bore perforation
L2 Leachate well	13:47	121ppm	-	Side of well (perforations).
L2 Leachate well		1.2% Gas	-	Measured with lid off – down borehole
L1 Leachate well	13:50	30ppm	-	Measured from well bore perforation
L1 Leachate well		526ppm	-	Measured with lid off - down borehole
GWO/3A		0.4% Gas	-	Top of locked lid. Locked gas monitoring well
-	-	2.4 ppm	-	Top of soil between L3 and GWO
L3 Leachate well	13:59	123ppm	-	Measured at well base
L3 Leachate well		899ppm	-	Inside of well

Findings/Recommendations

The engineering background and current status of the Landfill as reported by the Operator is as follows:

- The landfill comprises 4 Cells, namely Cell 0, Cell 1, Cell 2 and Cell 3 /4.
- Shotton Landfill Risk Assessment Factual Report (Ref: SL/ENV/R/S12845/2/00/R), dated 16 August 2000, states that there are no available records of the initial construction of the landfill, but the cell base is expected to be 4.5 to 5mAOD and it is likely that the cell walls were constructed from materials not specifically design for landfill containment, e.g., slag and sandy earth. The report summarises the known and assumed construction of the landfill as follows:
 - Cell 0 is the oldest cell and not clay lined. It is not known if clay bunds exists in the cell or between Cell 1 and Cell 0. Cell 0 was completed and capped with a geotechnical clay (low permeability 10^{-9} m/s) in two phases in October /November 1998 and March /April 1999. The capping covered the outer bunds and sea wall to ground level and the marsh.
 - Cell 1 is the next oldest cell and is not clay lined, again it is not known if clay bunds exist within the cell.
 - Cells 2 and 3 /4 comprises internal bunds, approx. 40m wide by 80-100m long, constructed from homogenous sandy materials. Cell 2 was lined with a 1m thick clay base and sides in 1996.
 - Cell 3 /4 was made into one cell by removal of the internal bund. A 1m thick geotechnical clay basal layer was only applied to the Cell 3 area.
- Two phases of capping in Cell 1 (August /October 1997 & August 1998) and a single phase of capping in Cell 2 (June 2001) have been reported to NRW. The capping comprised 1.0m of clay, overlain with 1.0m of soil on landfill and 0.3m of soil on battered sides. However, the Parsons Brinckernhoff Drawing Ref: Landfill Location Showing Monitoring Boreholes, (Figure 2 of HRA) dated September 2015 shows that Cell 0 is the only cell to have been finished and restored.

- A CQA lining report for Cell 3 /4, dated December 1998, reports the placement of a 1.0m compacted clay basal liner covered by a 0.3m sacrificial clay protection layer (to minimise desiccation of liner) in the Cell 3 area. Extension of the lining works to the Cell 4 area are proposed but not included in the CQA report. No further engineering construction details are provided.
- As of 2015 based on the Parsons Brinckernhoff Drawing Ref: *Landfill Location Showing Monitoring Boreholes, (Figure 2 of HRA) dated September 2015*, Cell 0 is the only cell to have been finished and restored at this time. No information has been presented by the Operator to indicate otherwise.
- Based on annual void space returns the proposed finished level of the landfill is expected to be 12.5mAOD. The 2023 annual return, based on a May 2023 survey, reported available void space in Cells, 1 & 2 (combined) and 3 /4, to be 19,102m³ and 45.938m³ respectively. The report confirms that the waste deposited the previous year was all inert construction waste. General waste has not been deposited at the landfill since 2018.
- Anecdotal information provided by the Operator, suggests that proposals to utilise Cell 3 /4 have been suspended. It is also reported that the Cell historically retained surface water, however more recently the ability of the Cell to hold water has ceased suggesting the integrity of the clay layer in Cell 3 has been compromised. Cell 3 /4 should not be used until the integrity of the liner can be confirmed and a CQA validation has been accepted by NRW.

The principal findings of the inspection and associated methane emission survey are as follows:

- It was difficult to differentiate between Cell 1 and Cell 2 during the survey as there was no apparent demarcation between the cells. Waste deposited in Cell 1 and Cell 2 appears to be uncovered, with evidence of waste material, including but not limited to circuit board fragments, plastics and masonry materials visible across the surface. There were a number of areas with evidence of apparent vegetation stress. Deposition of waste appears ad-hoc with no apparent capping in place.
- Observations suggest that tipping is active immediately to the east of the access track onto Cell 1. However, an operational plan of where waste is to be deposited was not available during the survey.
- Cell 0 had significant methane readings from leachate wells 4, 3, 2 and 1. Gas was measured from the perforations on the exposed pipe and from the lids of the well. Gas monitoring well, GW0/3A, in Cell 0 was locked but methane was recorded escaping from the well bore. The methane emissions survey and gas monitoring data show that landfill gas is being produced from Cell 0. However, the rates and total amount of landfill gas emissions cannot be directly measured from our survey.
- Leachate wells had exposed perforated well casing above the surface of the landfill. Lids of the leachate wells were made from wood and some were ill fitting. The exposed perforations allow landfill gas to escape into the atmosphere.
- Away from monitoring wells and leachate chimneys, fugitive emissions were not picked up during the survey.
- The labelling of the wells could be improved. A reporting system and /or accurate plan of detailing well nomenclature and the monitoring requirements such a frequency and type of monitoring/sampling and reporting could not be provided by the Operator at the time of the site visit. Whilst it is acknowledged that current operatives are likely to be aware of the locations, a change in personnel and /or third-party contractors may result in errors in monitoring and reporting.
- Element /Initial are contracted to provide external support for some elements of the required monitoring and sampling. However, there was uncertainty regarding roles and responsibilities for management and day to day landfill monitoring requirements.

Actions

The following actions are required by the stated dates. They are duplicated in the CAR form.

- All wells must be clearly labelled by 31 December 2024.

- Operator to provide NRW with an up to date and comprehensive plan of well locations and documented monitoring programme and monitoring procedure including a clear definition of roles and responsibilities by 31 December 2024.
- The operator should ensure that waste is capped as soon as practicable to minimise leachate generation and associated environmental impacts. An up to date plan of capping to date which includes the current extent of capping should be provided to NRW by 31 December 2024.
- The accessibility, integrity and construction of the wells should be suitable for the monitoring and sampling requirements as stated on the permit. An assessment of each location should be undertaken and where necessary improvements made by 31 December 2024.
- A tipping /operational plan, which includes proposal for capping in accordance with the requirements of the permit is to be provided to NRW by 31 December 2024.