

September 2019

Carrington Lane Recreation Site - gas monitoring summary

Table 1 below summarises the ground gas levels to date expressed as % (v/v). The gases shown are methane and carbon dioxide only.

Table 1 Ground gas summary

Date	Gas well GW.01		Gas well GW.02		Gas well GW.03		Gas well GW.04		Gas well GW.05	
	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide
08.02.16	28.9	9.1	35.3	12.5	0.0	3.6	0.1	6.8	0.0	14.4
23.02.16	27.6	10.3	35.9	11.5	0.0	4.1	0.0	6.4	0.0	13.1
08.03.16	23.8	12.6	36.4	10.8	0.0	4.8	0.8	7.8	0.0	13.1
21.03.16	21.1	10.8	0.2	0.1	0.1	4.7	0.0	9.1	0.1	13.0
05.04.16	22.7	11.0	0.1	0.1	0.1	5.0	0.0	13.4	0.1	7.6
19.04.16	20.5	11.2	0.0	0.1	0.0	5.3	0.0	8.6	0.0	14.1
31.05.16	27.4	10.1	0.2	0.1	0.0	5.9	0.0	9.6	0.1	11.2
31.08.16	8.2	9.7	0.1	0.1	0.0	5.2	0.0	7.4	0.0	4.5
01.12.16	16.3	6.0	29.1	13.3	0.1	4.3	0.0	7.7	0.0	14.3
30.12.16	15.0	13.0	26.7	13.5						
06.02.17	18.2	3.6	30.6	10.3						
11.05.17	15.8	14.3	30.9	13.2	0.0	3.5	0.0	6.7	0.0	7.3
10.08.17	8.7	17.6	0.1	0.1	0.0	4.9	0.0	6.9	0.0	6.4
21.12.17	8.3	11.4	0.1	4.4	0.0	4.3	0.0	11.6	0.0	14.2
23.03.18	18.6	12.5	0.2	0.1	0.0	4.7	0.0	10.9	0.0	12.9
10.07.18	14.9	14.8	25.0	15.2	0.0	17.6	0.0	9.9	0.0	11.1

Table 1 (Cont.) Ground gas summary

Date	Gas well GW.01		Gas well GW.02		Gas well GW.03		Gas well GW.04		Gas well GW.05	
	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide	Methane	Carbon dioxide
30.10.18	8.0	17.2	22.0	16.8	0.0	4.0	0.0	11.5	0.0	13.1
08.02.19	9.9	12.7	21.1	6.5	0.0	4.4	0.0	9.5	0.0	12.5
12.06.19	9.9	16.6	19.7	11.9	0.0	3.8	0.0	9.5	0.0	11.9
18.09.19	1.7	1.8	20.8	17.3	0.0	8.9	0.0	10.8	0.0	4.3

The highest concentration of each gas recorded within each well has been highlighted in bold type.

Through reference to Table 1 above the following is noted:

- **Gas well GW.01** is still producing methane with a measured concentration of 1.7% on this occasion which has decreased significantly since last reported in June 2019. This concentration is the lowest since monitoring began.

The carbon dioxide concentration has also decreased since last reported; however as with methane until such time that it stabilises at this low concentration it is not possible to draw any conclusion regarding whether or not it is about to cease gassing.

As on previous occasions there was no measureable gas flow through the well.

- **Gas well GW.02** continues to produce methane with a measured concentration of 20.8% on this occasion which has increased slightly since last reported in June 2019 at 19.7%. This well has intermittently produced potentially significant quantities of methane, consequently there continues to be little evidence to suggest that methane gas generation is slowing down here.

The carbon dioxide concentration of 17.3% on this occasion is also higher than that which was last reported in June 2019 of 11.9%, and is the highest concentration recorded in this well to-date. Again the concentration of both gases has fluctuated greatly over the last 2 years, and therefore it is difficult to identify any trend.

As on previous occasions there was no measureable gas flow through the well.

- **Gas well GW.03** still appears to be no longer producing methane.

The carbon dioxide concentration of 8.9% is higher than recorded previously here in June 2019, at 3.8%. It was previously presumed that due to the low and stable carbon dioxide concentration over the last two years that the buried waste could be close to finishing degrading within this area. However; due to the sudden increase in the carbon dioxide concentration it is presumed that the waste is still degrading.

As on previous occasions there was no measureable gas flow through the well.

- **Gas well GW.04** also still appears to be no longer producing methane.

The carbon dioxide concentration of 10.8% has also marginally increased than previously recorded here in June 2019, at 3.5%.

It is again difficult to draw any firm conclusion other than the fact that it appears that the buried waste here still appears to be degrading.

As on previous occasions there was no measureable gas flow through the well.

- **Gas well GW.05** also still appears to be no longer producing methane.

The carbon dioxide concentration of 4.3% has decreased significantly since the 11.9% reported in June 2019; however as there have been many fluctuations over the past 2 years, it is similarly difficult to draw any conclusion other than the fact that it also still appears that the waste buried here is degrading.

As on previous occasions there was no measureable gas flow through the well.

On the previous assessment carbon monoxide was detected within gas well GW.01 and hydrogen sulphide was detected in gas well GW.02. These were not recorded on this occasion.

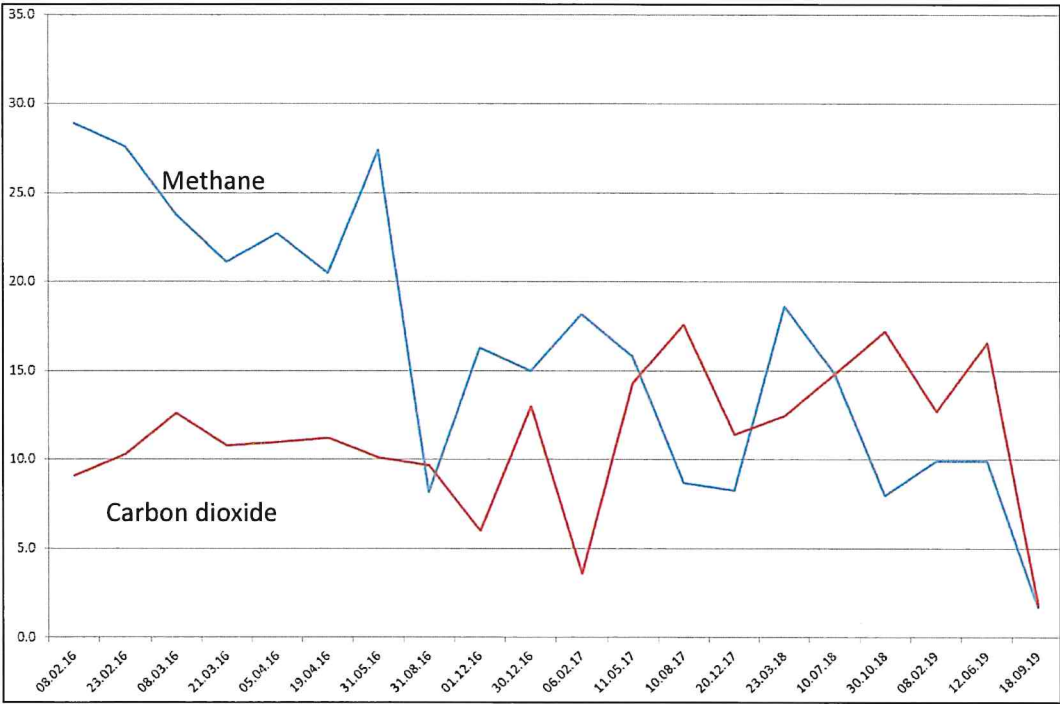
Through reference to available meteorological data, there had been a number of potentially significant falls in atmospheric pressure during the month leading up to the monitoring assessment, as well as in the preceding two months, as detailed in Table 2 below.

Table 2 Potentially significant atmospheric pressure falls throughout the preceding quarter

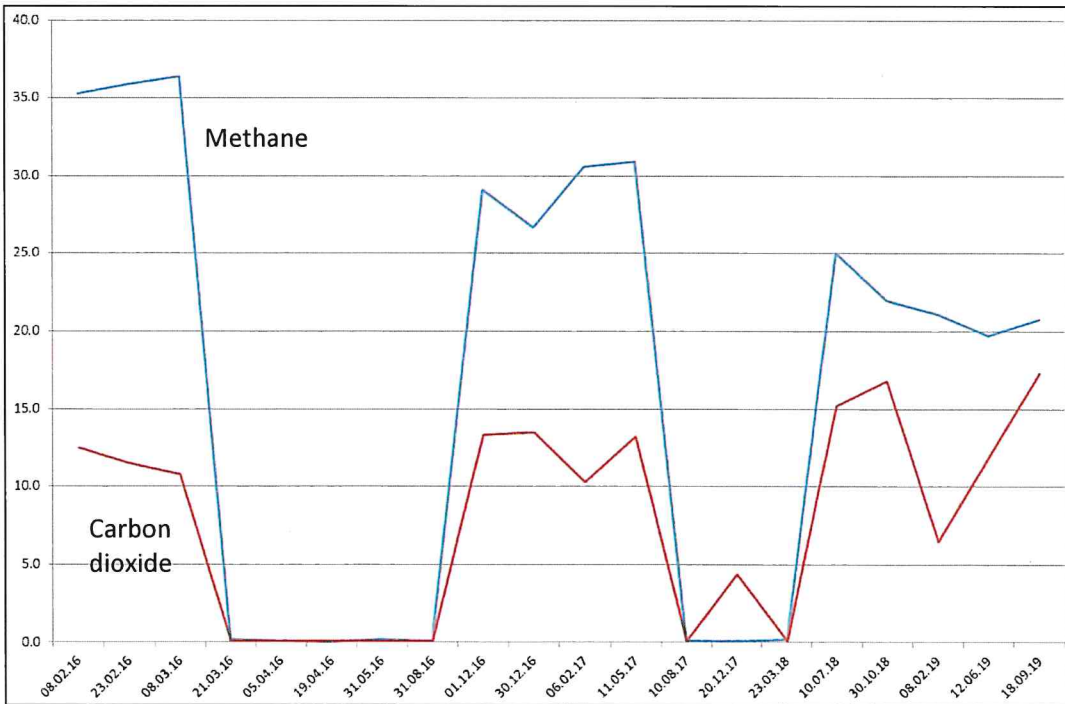
Date	Details	Pressure range
18 th June 2019	a pressure fall of 7mb in 21 hours	1017 - 1010
23 rd June 2019	a pressure fall of 6mb in 18 hours	1020 - 1014
28 th June 2019	a pressure fall of 6mb in 18 hours	1027 - 1021
29 th June 2019	a pressure fall of 9mb in 18 hours	1020 - 1011
4 th July 2019	a pressure fall of 5mb in 9 hours	1027 - 1022
5 th July 2019	a pressure fall of 6mb in 21 hours	1022 - 1016
17 th July 2019	a pressure fall of 4mb in 21 hours	1017 - 1013
20 th July 2019	a pressure fall of 4mb in 6 hours	1009 - 1005
23 rd July 2019	a pressure fall of 8mb in 18 hours	1021 - 1013
30 th July 2019	a pressure fall of 4mb in 6 hours	1007 - 1003
4 th August 2019	a pressure fall of 5mb in 18 hours	1016 - 1011
6 th August 2019	a pressure fall of 5mb in 18 hours	1010 - 1005
9 th August 2019	a pressure fall of 7mb in 18 hours	1006 - 999
14 th August 2019	a pressure fall of 9mb in 18 hours	1017 - 1008
16 th August 2019	a pressure fall of 12mb in 21 hours	1017 - 1005
27 th August 2019	a pressure fall of 4mb in 15 hours	1016 - 1012
31 st August 2019	a pressure fall of 6mb in 12 hours	1016 - 1010
6 th September 2019	a pressure fall of 6mb in 21 hours	1027 - 1021
8 th September 2019	a pressure fall of 7mb in 21 hours	1027 - 1020
9 th September 2019	a pressure fall of 8mb in 15 hours	1018 - 1010
14 th September 2019	a pressure fall of 7mb in 21 hours	1035 – 1028
15 th September 2019	a pressure fall of 5mb in 9 hours	1028 - 1023

The concentration profile for methane and carbon dioxide reported so far, at each of the gas wells, have also been reproduced below in Graphs 1 - 5.

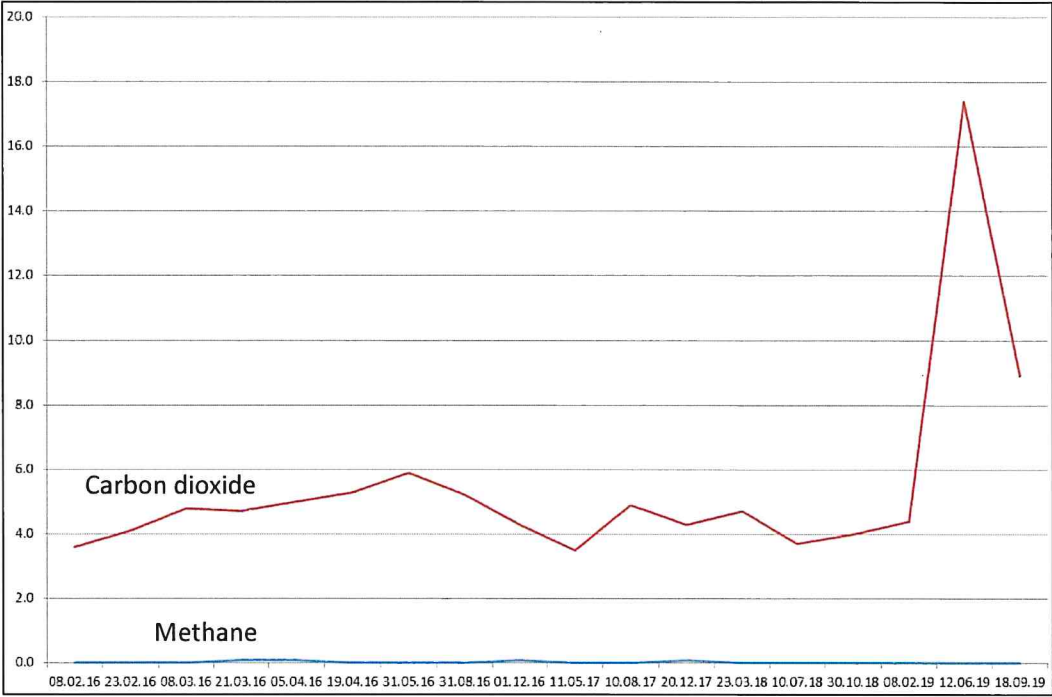
Graph 1 Gas concentration profiles at gas well GW.01



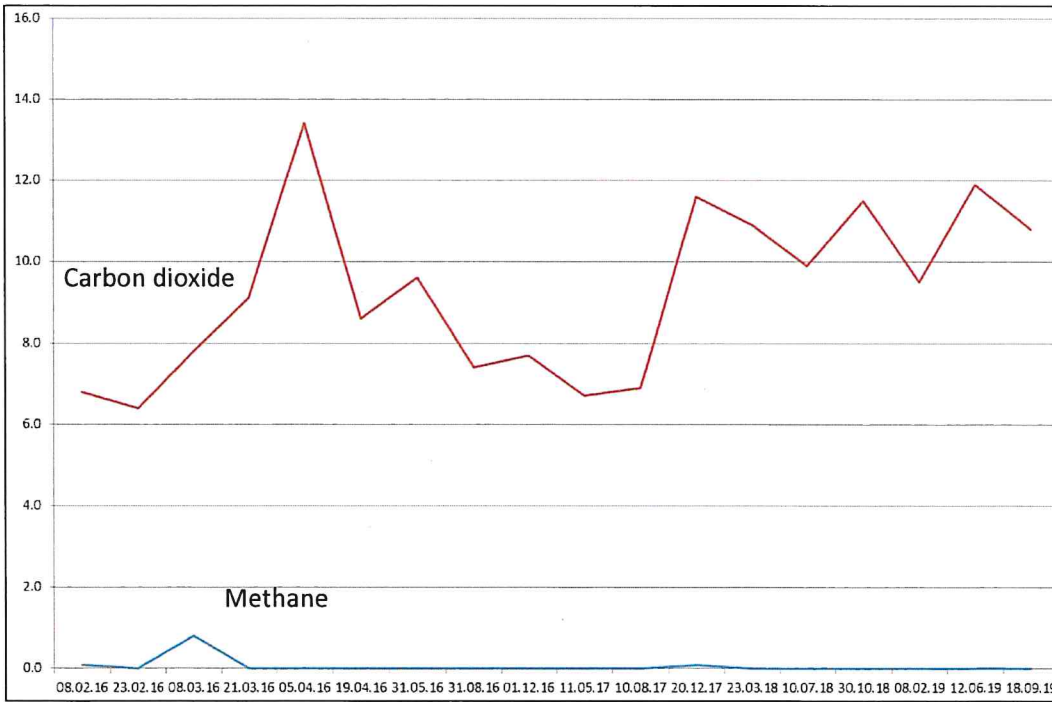
Graph 2 Gas concentration profiles at gas well GW.02



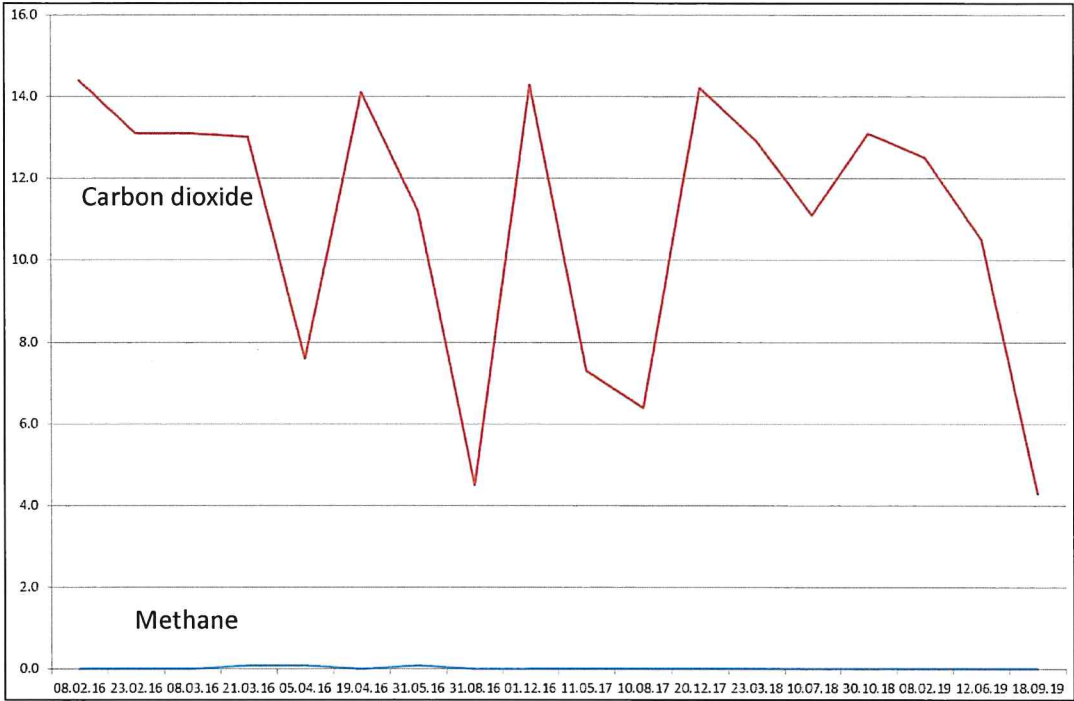
Graph 3 Gas concentration profiles at gas well GW.03

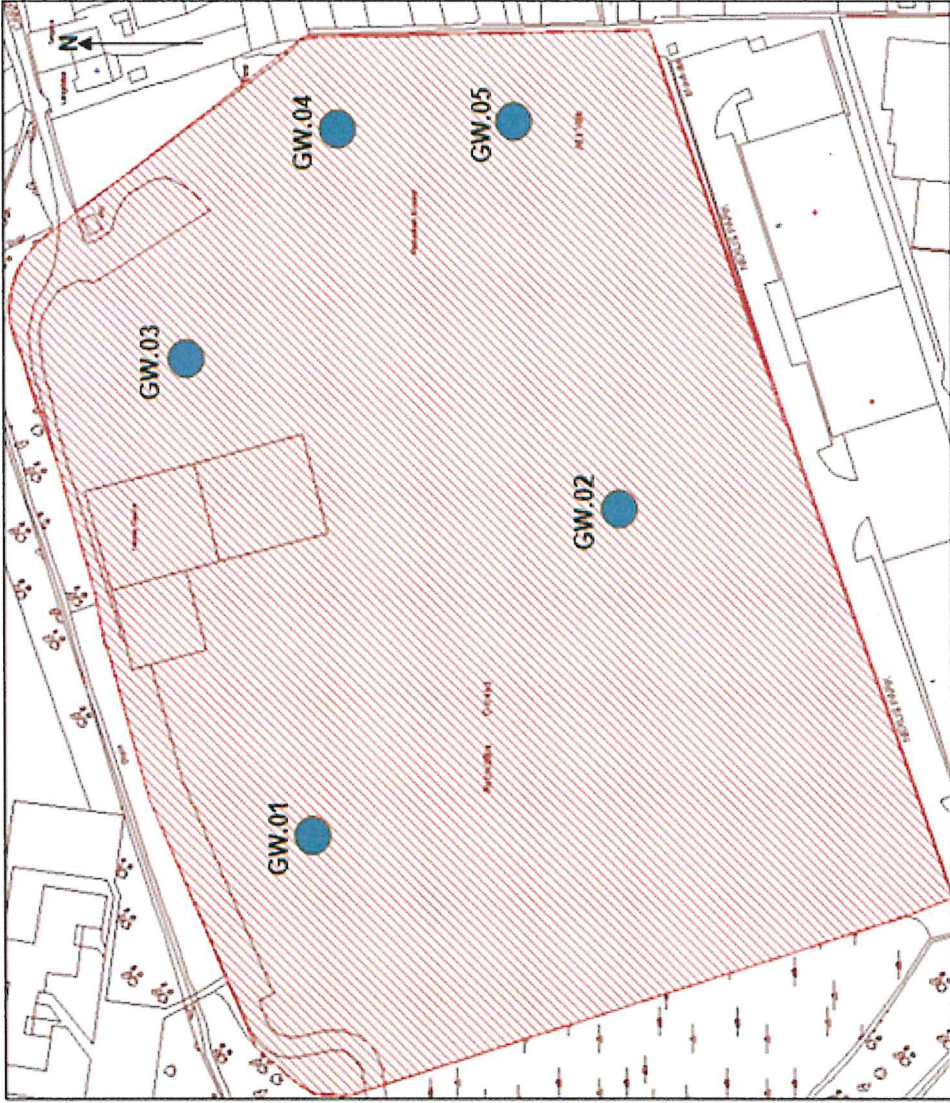


Graph 4 Gas concentration profiles at gas well GW.04



Graph 5 Gas concentration profiles at gas well GW.05





● Gas well

CARRINGTON RECREATION GROUND

GAS WELL MONITORING EXPLANATION

It is difficult to give any definitive answer regarding the hazard potential of the situation, as most of the guidance relates to the problems associated with these gases coming up into buildings.

All I can say is that methane can be explosive when present in oxygen at a concentration of between 5% and 15%. Hence, if you are producing methane within this concentration range then there is a potential fire/explosion risk. Having said this, in outside environments the potential for fire or explosion is lower than it is for methane within buildings due to the fact that the wind can disperse it quite effectively, although it should still be considered a hazard requiring appropriate management in all environments.

With regards to carbon dioxide, this can become harmful in an environment when it is present at concentrations greater than 10%, which although possible to attain inside a building, is unlikely to be achieved outside of a building due to a plentiful supply of oxygen in the air (and wind dispersion).

As a consequence, you are aiming to see zero methane within the wells, whereas the concentration of carbon dioxide (for hazard reasons) is not so important. Its importance is more to do with telling us about the status of waste decomposition rather than anything else. More specifically, when the waste degrades it starts off producing carbon dioxide, then begins producing methane instead of carbon dioxide. The methane production increases rapidly all the while the waste is actively decomposing, but then the concentration starts to fall when decomposition starts to slow down. As it does so, the carbon dioxide concentration starts to increase. Then when the waste decomposition is much closer to completion the carbon dioxide concentration itself starts to fall. Eventually these should both reach zero when waste decomposition is complete.

So..... if we report a high methane concentration and a low carbon dioxide concentration then this tells us that waste decomposition is still very much happening. If the carbon dioxide concentration starts to become greater than the methane concentration, then the waste decomposition is slowing down. Then when they are both near enough zero the process is complete.

One of the biggest concerns therefore is when these two gases find their way into buildings. At the moment there are no buildings on the recreation ground and so this isn't much of a concern in that area, however, we are finding the greatest gas concentrations in the area that is closest to the school. At this moment in time we do not know if these gases are migrating underground towards the school, and therefore do not know if there is any potential for these to enter the school. One way to do so, would be to install another gas well in the car park area between the recreation ground and the school in order to see if it is migrating in this direction - and if so, to what degree.

The length of time that it takes for waste to degrade (and gassing to cease) is dependent upon quite a number variables, such as the nature of the waste, the ground conditions, the presence of groundwater, etc. etc. As a rule of thumb, it is realistic to think that a waste site can be gassing for 100 years.

Dr Adrian J Whittle MEnvSc. Tech.IoA

Principal Environmental Consultant
Apple Environmental Limited
Unit 3 Estevan Farm
Stoney Lane
Medstead, Alton
Hampshire GU34 5EL

Tel: 01420 563377 / 07881 627165

Email: adrian@appleenvironmental.co.uk

Web: www.appleenvironmental.co.uk