

# Perception, reality and new opportunities

**Simon Talbot**, managing director of **Ground-Gas Solutions** explains the attraction of landfill sites and explores their proposed uses and associated risks of development.

Former landfill sites are an under-utilised resource that is, rightly, attracting increased attention. Originally, little thought was given to where waste should be tipped and the nearest marginal land beyond the edge of communities was often selected; the 'dust heaps' as portrayed in Dickens's novel *Our Mutual Friend*. These were largely composed of the waste ash from domestic coal fires, collected and tipped by the 'dustmen'.

Following the 1952 Great Smog, when an estimated 4,000 people died and 100,000 became ill, there were efforts to reduce air pollution. The Clean Air Acts of 1956 and 1968 significantly reduced the number of coal fires in urban areas with the result that the organic content of the municipal waste was significantly increased, from a minor constituent in the 1940s to 67% or more, by weight, by the 1980s.

With increasing consumerism, local authorities, faced with a significant growth in the amount of domestic refuse, accelerated the 'reclamation' of clay pits, quarries and low lying land. These sites, once on the perimeter of our towns and cities, have been subsequently surrounded by the growth of the urban area and now often form a necklace of neglected waste land separating the older parts of communities from the newer suburbs and housing estates.

## Loscoe legacy

However, the Loscoe disaster of 1986 caused a sea change in perception. The risks of explosion or asphyxiation from migrating landfill gas became an issue to be actively managed. In addition, many sites 'reclaimed' by landfilling for sports fields and recreational use were found to suffer from differential settlement and increasingly became un-useable and neglected.

At best, some of these former landfills have become informal recreation areas, providing valuable green spaces for wildlife. Others have attracted antisocial behaviour and fly-tipping; further exacerbated deprivation and social exclusion in the surrounding communities. Twenty five years on from Loscoe, local authorities are still dealing with the legacy of problem landfill sites, created in the 1960s, 70s and early 80s, that present an



**Manchester city centre skyline taken from Queen's Road former landfill. Photo copyright Ground-Gas Solutions**

ongoing hazard to existing development.

With regard to new development on former landfills the difficulty has been two fold; accurately quantifying the risks to development, and secondly, designing cost-effective remedial designs that are economically viable. Geotechnical risk and soil contamination are both relatively well understood and easily characterised by site investigation. Once quantified, they can be effectively managed by ground-treatments and cover systems. However, landfill gas is much more difficult to accurately measure and characterise; it is not a constant but is generated at varying rates that change over time and it migrates in response to changing environmental factors.

The inherent uncertainty in quantifying the risk associated with landfill gas has been managed in a number of ways in guidance documents and by regulators:-

- sensitive end uses, such as residential development, have been discouraged on actively gassing sites;
- worst case conditions are estimated from extended monitoring periods of a few

months to several years;

- generic systems of risk characterisation, based on past experience and conservative assumptions have been developed for designing systems of protection.

The result has been reluctance by developers to commit to former landfill sites when extended monitoring periods end with uncertainty or over-designed and expensive protection systems. Therefore, there has been a tendency for former landfills only to be considered for the less sensitive commercial and warehousing type uses.

But this hasn't stopped recent (pre-2008 economic crash) residential developments from being constructed on former landfills when the locations and ground conditions have been favourable and the cost of extended monitoring investigations, quantitative risk assessments and protection systems were covered.

This was accomplished on one site by careful investigation and site zoning. Zones for private residential housing and for managed apartments were identified and separated by ground-gas barriers and venting

trenches to prevent gas migration from one to the other.”

The managed apartments were located on the actively gassing part of the former landfill.

However, the rate of gas generation was low and modelling demonstrated it would be adequately managed by a combination of ventilated sub-floor voids and gas-proof membranes. Other key elements of the project were the verification and validation of the gas protection measures during the construction and a long term gas protection management plan.

Other managed residential properties have been successfully built on actively gassing former landfills by the inclusion of fully ventilated under-croft car-parking. In effect, the buildings were built on stilts above the ground, with only the communal entrance halls and lift-shafts constructed at ground level. These were fully tanked and, again, were subject to detailed verification inspections during construction.

With the advent of improved ground-gas monitoring techniques, such as continuous monitoring, landfill gas regimes can be more accurately characterised within shorter

timescales than has been possible hitherto.

The real risks associated with landfill gas on a particular site now can be assessed and appropriate design solutions can be provided. From carrying out continuous monitoring on many dozens of development sites, I estimate that the traditional ground-gas monitoring (‘spot monitoring’) approach coupled with a conservative interpretation to account for uncertainty, overestimates the ground-gas hazard in 80% of cases and under-estimates the hazard in the remaining 20%.

This latter circumstance, while undesirable, should not be a significant problem when the designed gas protection systems have in-built redundancy (multiple layers of protection).

Real problems may occur when the protection measures rely on gas-proof membranes that have been poorly fitted or damaged during construction and have not been subject to third party verification.

Improved monitoring techniques and better characterisation of gas regimes on former landfill sites will allow more sites to be safely developed. However, this also needs to be coupled with better installation of ground-gas protection systems by accredited installers, backed up by third

party verification and validation. Finally, in these times of austerity and budgetary cuts, there may be new opportunities for innovative local authorities to capitalise on their former landfill sites. The statutory inspection strategies, carried out by local authorities under Part 2A, were designed to identify the worst contaminated sites that pose unacceptable risks to health or the environment.

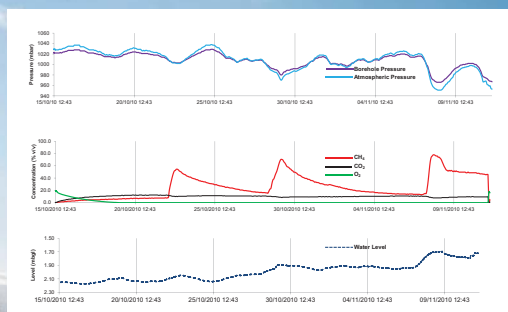
The prioritisation process focused a lot of effort on former landfill sites due to the potential risks associated with contaminating wastes and landfill gas. However, these prioritised lists, by default, will also have identified those former landfill sites that are least likely to pose a risk. Sites falling into this second category, arguably, are most suitable for redevelopment. Given that many former landfill sites are in local authority ownership, the low-risk sites could be sold off to provide a valuable source of revenue to the public purse and new development opportunities for the private sector.

**Simon Talbot**  
**Managing Director**  
**Ground-Gas Solutions**

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**CALL NOW ON:** 0161 232 7465  
**E-MAIL:** [info@ground-gassolutions.co.uk](mailto:info@ground-gassolutions.co.uk)  
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