

Clean Up

Contaminated Land News

November 2011

INTRODUCTION

It is inevitable that a new government wants to stamp their mark on policy and it is well documented that this government intends to change the planning system. There has been a recent consultation on The National Planning Policy Framework in which it is proposed to reduce the amount of supporting guidance associated with planning policy including guidance on contaminated land matters. Under the government's 'red tape challenge' initiative views have been sought on changing a range of environmental regulations for example the Environmental Damage Regulations and the Contaminated Land Regulations under Part 2A of the Environment Protection Act.

However without guidance and clarification on policy, technical procedures and regulations, the views and interpretation applied by developers, operators and their advisors and those who regulate development and operational activities will inevitably vary.

So whilst it appears that some existing guidance may be pushed aside new guidance documents continue to be published. The Environment Agency is consulting on revised Groundwater Protection: Principles and Practice documents setting out their position regarding a range of activities and they have updated their guidance on the treatment of waste.

Government departments Defra and DCLG have re-established a working group, the Land Forum to look at a range of issues associated with the development and management of land including contaminated land. Where government and regulators work together with key organisations in the sector to reform guidance this may lead to better decision making at the outset.

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MJCA

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LAND AHOY!



The inaugural meeting of the newly established Land Forum took place in July 2011. Developed from The National Brownfield Forum, established by DCLG and Defra, the [Land Forum](#) comes in the wake of a new government and their proposed policy changes that will affect the way land is assessed and managed. The Land Forum draws together personnel from key government departments, public bodies and a range of organisations involved with the assessment of land notably Defra, DCLG, the Environment Agency, Local Government Association (LGA), Specialist in Land Condition Register (SiLC), The Homes and Communities Agency (HCA), Environmental Protection UK (EPUK), The Soil and Groundwater Technology Association (SAGTA), the Home Builders Federation (HBF), the Land Trust, the Strategic Forum for Construction & UK Contractors Group, Association of Geotechnical Specialists (AGS), Environmental Industries Commission (EIC), Society of Brownfield Risk Assessment (SoBRA), Environmental Law Association and Contaminated Land: Applications In Real Environments (CL:AIRE) who are the secretariat of the Land Forum.

The aim of the Land Forum is to promote the sustainable use of land and provide a strategic overview of current and future land use to assist in the development of future policy and legislation. It is intended that the Land Forum support the development, dissemination and adoption of best practice by regulators, practitioners and problem-owners, through opportunities to be involved in working technical groups. For example assisting government on Part 2A Statutory Guidance or working with the Land Trust on understanding and quantifying the true societal costs of leaving land un-restored and supporting CL:AIRE is assessing the possibilities for a greater degree of self, or co-regulation in the sector in the areas of environmental permitting and planning.

EA GP3 GUIDANCE



Whilst the government is in the process of reducing planning guidance that will affect how contaminated land is managed, the Environment Agency (EA) continues to issue more guidance for consultation. They have issued a series of revised documents for [Groundwater Protection: Principles and Practice](#), referred to as GP3. These documents describe how the EA manage and protect groundwater. The EA recently revised part 4 of GP3 to clarify their position statements covering a broad range of activities for example land contamination, solid waste management and the discharge of liquid effluents into the ground, together with statements on specific activities such as mining pollution, cemetery developments and burial of animal carcasses. There are two guidance documents for consultation issued under Part 5 of GP3: Interpreting the landfill location position statement and Selecting compliance points for the use in contaminated land risk assessments. The deadline for comments on the consultation is 23 December 2011.

The EA's position is to apply a tiered risk based and precautionary approach to development with the aim to avoid siting potentially polluting activities in the most sensitive locations from a groundwater protection perspective. The EA expect land developers and site operators to take responsibility for appropriate assessments during planning, construction, operation and decommissioning activities by providing adequate information to support these activities and to comply with good practice for example as set out in CLR11: Model Procedures for the Management of Land Contamination and to apply a risk based approach to achieve sustainable remediation goals. If necessary the EA will use their powers to stop the development of unacceptable potentially polluting activities.

The EA state that they will object to a number of development and operational activities located in a groundwater Source Protection Zone 1, for example oil exploration and shale gas extraction, underground storage of hazardous substances, proposed landfill sites, trade effluent discharges to groundwater and new cemeteries.

Appended to Part 4 of GP3 is a useful summary of key legislation. In particular this summary identifies the way in which EU directives have been transposed into domestic legislation. There is a useful summary on the objectives of the Water Framework Directive (WFD) and how this relates to groundwater. The Water Framework Directive (WFD, 2000/60/EC) and its daughter Groundwater Directive (2006/118/EC) consider a wider range of potential pollutants and refer to them as hazardous substances or non hazardous pollutants. This terminology is used in the Environmental Permitting Regulations (EPR) (2010) where there is a requirement to prevent inputs from hazardous substances and to avoid pollution from non-hazardous pollutants. One of the consultation documents in Part 5 of GP3 'Selecting compliance points for use in land contamination risk assessment' discusses the principle of source-pathway-receptor linkage and applying a risk based assessment. It is suggested that the compliance point may be the receptor or a point along the pathway nearer the contamination or in the source itself. However, the guidance provides some upper limits on the distance to the compliance point, set at 50m for hazardous substances having an impact on groundwater quality or a maximum of 250m for non-hazardous pollutants unless there are physical constraints on the ability to use the groundwater resource. The guidance should lead to greater consistency nationally when determining remedial goals to protect surface and groundwater resources and follows a similar format as set out in the EPR.

LOOKING FOR CLUES

The use of advanced diagnostic techniques and forensic analysis in evaluating contaminated sites has gained wider acceptance for both characterising the contamination and assessing the risks such contaminants may represent.

When assessing the risk from contaminated soil to human health the assumption that the total amount of contaminant measured in a soil sample is actually bioavailable may grossly overestimate the level of exposure, thereby influencing risk assessment and ultimately remediation decisions that may lead to significant remediation costs for companies.



The Physiologically Based Extraction Test (PBET) is a bioaccessibility test which has gained wider acceptance for assessing risk, particularly for sensitive land use such as gardens and allotments. This is an in-vitro extraction test that imitates the physicochemical conditions of the human gastro-intestinal stomach and small intestine compartments. This test has been applied typically to assess the bioaccessibility of metals such as arsenic and lead. Recently researchers at the University of Reading have developed a new method of testing soil that more accurately replicates the body's processes when it ingests pollutants from soil through the colon which accounts for approximately 80% of the transit time through the human digestive tract. The test includes the addition of an eight-hour carbohydrate-rich fed state medium typical of the contents of the colon which have the potential to promote desorption of organic pollutants. Researchers found this new colon-extended PBET (CE-PBET) suitable to assess the bioaccessibility of soil-bound polyaromatic hydrocarbons (PAH).

Both organic and inorganic forms of contaminants are affected by adsorption, partitioning and/or chemical bonding. By formulating a detailed understanding of the contaminant and soil chemistry, this can lead to a more informed decision regarding the behaviour of contaminants and therefore the potential 'harm' to a receptor. Greater certainty can be gained to support the results of PBET when other lines of evidence are assessed for example assessing mineral forms by X-ray diffraction (XRD), X-ray absorption spectroscopy (XAS) and establishing redox conditions; together with understanding contaminant behaviour linked to the soil parameters, for example the effects of pH, organic carbon, or total carbonate (alkalinity).

Forensic analytical techniques for hydrocarbons can include simple confirmation of fuel types by carbon banding, estimating the age of a product sample by characterising weathering profiles or by analysing for specific dyes and markers that may have been used in these products over time. Such assessments are useful tools in identifying not only the source of contaminants which could lead to identifying the possible polluter but they also can be applied to assess the likely effectiveness of remediation technologies. For example, it is possible to determine if PAH originate from a fuel or solid source such as coal, based on 'double ratio plots' of certain PAH and thereby to evaluate the potential application of bioremediation as a feasible remediation technique.

More complex diagnostic tools such as microbiological analysis can be applied to assess whether suitable microbes are present that will lead to biodegradation activity or to confirm that bioremediation is progressing in the manner expected. Compound specific isotope analysis (CSIA) can assist in characterising the biodegradation profiles of hydrocarbons and to quantify degradation rates.

Senior MJCA personnel have applied a range of such techniques to understand contaminant behaviour, assess potential polluters and provide data in support of the application of sustainable remedial solutions.

TREATMENT OF WASTE TO LANDFILL



The aim of the Landfill Directive as applied by the Environmental Permitting (England and Wales) Regulations 2010 is ultimately to reduce our reliance on landfill. Landfill usage rates continue to reduce and fewer new landfills are being constructed. The rising cost of landfill tax and the introduction of legal requirements that enforce the waste hierarchy together with corporate and individual responsibilities have led to real progress on the policy of waste reduction. The introduction of initiatives such as the [CL:AIRE Definition of Waste: Development Industry Code of Practice](#), Site Waste Management Plans and advances in remediation technologies have also led to less waste being sent to landfill during site development.

However the EA clearly believe more can be achieved and have published draft guidance entitled 'Treatment of waste for landfill' that is intended to help both waste producers and waste management companies to assess their responsibilities. The guidance document consists of two parts:

- Part A: sets out the regulatory framework and responsibilities.
- Part B: provides practical examples of how to treat waste based on the experiences of waste producers and waste managers.

All waste must be treated before it is disposed of at landfill and the EA has set out the 'three-point test' with which a treatment option must comply to meet the definition of treatment under the Landfill Directive:

1. It must be a physical, thermal, chemical or biological process including sorting and segregation.
2. It must change the characteristics of the waste.
3. It must do so in order to:
 - a. reduce its volume; or
 - b. reduce its hazardous nature; or
 - c. facilitate its handling; or
 - d. enhance its recovery.

Landfill operators accepting waste will have to rely on others for the information to allow them to be confident that the waste has been treated appropriately.

The draft guidance document provides a number of examples for common waste streams including waste generated by commercial and industrial operations, construction and demolition activities and contaminated soil generated by site development. The draft guidance includes a table with examples of waste entries from the List of Wastes Regulations (2005) to illustrate how these codes can help to identify the technical possibilities for treating each waste type.

ASSESSING LAND GAS AND VAPOUR

There is no one specific guidance document relating to ground gas measurement methods, risk assessment and gas protection measures. Several documents were published in the early 1990s to provide guidance for new developments, some of which have been revised recently. Guidance on undertaking land gas risk assessment for methane and carbon dioxide gases is provided by the Construction Industry Research and Information Association (CIRIA), Report C665 “Assessing Risks Posed by Hazardous Ground Gases to Buildings” (2007). The guidance consolidates the requirement for good practice in site investigation, the collection of relevant data and monitoring programmes in the context of a risk based approach to gas contaminated ground.

The commonly applied semi-quantitative method is referred to as the modified Wilson and Card Classification based on an earlier method of the CIRIA publication R149 (1995). The modified Wilson and Card Classification assess the measured gas concentrations and flow rates in the monitoring wells to define a characteristic situation for the site. The value calculated is known as the Site Gas Screening Value (SGSV) determined by applying the worse case scenario based on the maximum gas concentration and flow rates measured across the entire site during the monitoring period and a ‘Characteristic Situation’ is determined setting out the level of gas protection measures.

This method of characterisation relies on spot sampling and often applying a limited data set to calculate the SGSV. With advances in technology there are now instruments that can be placed in monitoring wells to provide continuous monitoring data for up to 30 days recording the concentration of methane and carbon dioxide land gases, total volatile organic compounds (VOC) and atmospheric pressure. Using data sets obtained by continuous monitoring provides the opportunity to apply statistics to the data sets which when supported with other lines of evidence can lead to a greater understanding of the land gas regime and which in turn can lead to a cost effective approach to meet legislative requirements.

Whilst the assessment of the risk to new and existing buildings from gasses such as methane and carbon dioxide is well established and widely accepted by both developers and regulators, assessing the risks of vapour intrusion to indoor air posed by VOCs associated with petroleum hydrocarbon and chlorinated solvents can be relatively complex requiring the use of multiple lines of evidence to reach decisions based on professional judgment. The VOC Handbook (C682) produced by CIRIA in 2009 provides guidance on methods for investigating, assessing and managing risks to human health from VOC, specifically via the inhalation of vapours although more detailed UK guidance relating to mitigating the risks associated with vapour intrusion of VOC is yet to be published.

The [Energy Institute's Soil Waste Groundwater Group](#) published a report ‘Introductory guidance on petroleum hydrocarbon soil vapour assessment’ in 2011. This document focuses on the benefits of sampling and analysing VOC rather than simply relying on applying risk models for VOC that typically are conservative. The most commonly applied model developed by Johnson and Ettinger assumes no degradation or source decay of hydrocarbons over time and so overestimates the risk in most circumstances. The guidance document makes the point that risk based indoor air target concentrations for some key VOCs are very low and monitoring in indoor environments needs to take account of other

possible sources for example from consumer products as they may also be used in these buildings. Consequently the reliable measurement of soil vapour VOC concentrations can provide more valuable information particularly in understanding further the volatilisation, biodegradation and dilution process that may be occurring prior to intrusion into buildings.

There is a need for high quality data to assess human health risk via vapour intrusion pathways and there are a wide variety of soil vapour sampling methods and variable ground conditions which if not understood may lead to bias and variability in the results. The guidance document summarises the key considerations in designing a soil vapour sampling programme, including scoping considerations, geological characterisation, equipment contamination, sorption losses, sampling and handling considerations and choosing laboratories with the capabilities to perform the relevant analysis.

This Energy Institute document essentially highlights the various challenges and the need for more detailed guidance. The good news is that both the Energy Institute and CIRIA are working on new guidance and due are to publish further documents in the future.

CONTACT US

Please contact [Kevin Eaton](#) for more information on any of the issues raised in this newsletter, or on any other Contaminated Land issues.

ABOUT MJCA

MJCA provides independent advice on environmental issues to the public and private sectors. Delivering our services to high technical standards and commercial awareness enable us to provide practical, cost effective advice and sustainable solutions. Further information regarding our services can be found on our website www.mjca.co.uk

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