



# CMT (Testing) Limited

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## **The Landfill Regulations in relation to off site disposal of contaminated 'soil' What are the requirements?, How do things work in practice?, What do we need to know?**

### Introduction

The subject of disposal of 'waste' to landfill is highly topical and is controlled by the 'Landfill Directive' (European Council Directive 1999/31/EC) implemented in the UK by the Landfill (England and Wales) Regulations 2002 (as amended).

The overall objectives of the above legislation are to reduce, as far as practicable, the quantity and adverse effects of landfill disposal on the environment and human health by ensuring that waste is suitably identified, treated and disposed of in a controlled manner to an appropriately authorised/licensed landfill site. The philosophy promotes recycling, recovery and re-use as primary options over disposal to landfill.

### Significance of recent developments

Late 2007 saw two particular requirements come into force under the Landfill Directive/Landfill Regulations. (England and Wales), namely:

- the banning of non-hazardous liquids to landfill;
- the need for treating all non-hazardous waste before landfill disposal.

With measures already in place, this means that specified wastes, including all liquids, can no longer be disposed of to landfill and *all* wastes intended for landfill **must** receive prior treatment. Options for treatment (which include basic sorting and source segregation), exist for most wastes and exemptions to this requirement are limited, therefore, to:

- inert wastes where treatment is not technically possible;
- wastes where viable treatment would not reduce the quality or the hazard(s) posed to human health or the environment.

### Aims of this article

Wastes arise under numerous circumstances and in various forms. The intention of this article is to provide summary guidance, explanation and information for scenarios relating to the development of potentially contaminated sites, (or similar circumstances) where the **off-site disposal of waste (potentially contaminated) soil to landfill** is an issue.

### Ground contamination investigation and its relation to waste assessment

For 'brownfield sites', the current UK Defra/EA Framework requires a 'risk based' methodology to determine the 'contamination status' of the site prior to



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development and the corresponding phased approach (Desk Study, Intrusive Investigation etc.), yields information to this end. Fortunately, as we will see, this information also has value with respect to the assessment of waste contaminated 'soil' and today's requirements for its off-site disposal to landfill.

Before moving to these requirements, it should be noted that, in situations where contaminated soil has been identified (or becomes evident during a development), the appraisal of remedial measures should, amongst other things, consider the basic Government policy of applying the following preferential hierarchy to the management of waste:

## Reduction of the waste generated



## Re-use



## Recovery/recycling



## Disposal

i.e. managing the development to keep the amount of 'waste soil' to a minimum (**reduction**); due consideration to **re-use** (re-distribution) of soil on site (this will need the necessary authorisation); treatment to facilitate reclamation/**recovery**; failing the above, either on-site **disposal** (with necessary authorisation) or off-site **disposal** to landfill (the focus of this article).

If, having followed the above hierarchy, off-site disposal of soil is needed, the first requirement is to determine whether our waste soil is hazardous or non-hazardous. Of significance here, is that soils identified as contaminated by the **risk based** site investigation process **can** be non-hazardous under the regulatory framework for classification of a waste as hazardous or non-hazardous, as the latter process is **hazard based**.

## Pre-treatment

With respect to waste destined for landfill, 'treatment' is defined by a 'three point test'. To qualify as treated, all three of the following points must be met:



the obvious choice

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- the waste must be subjected to a physical, thermal, chemical or biological process;
- the process must change the characteristics of the waste
- it must do this in order to:

reduce the volume of waste,  
or, reduce its hazardous nature,  
or facilitate its handling,  
or enhance its recovery.

It is incumbent on waste producers or holders to either treat their waste and provide written details of the treatment applied to it for subsequent holders, or ensure that the waste will receive treatment by a subsequent holder prior to landfill. Waste producers/holders do not have to treat the waste themselves, a suitable contractor can be engaged to this end.

For waste contaminated soil, the ground contamination site investigation should have identified any sub-areas of significant contamination, areas of lesser/slight contamination and relatively 'clean' areas. As source separation/segregation qualifies as a treatment, management of soils earmarked for excavation should focus on this approach. Once soils have been separated, further segregation of contaminants and recoverable/reclaimable materials can be carried out in order to maximise the re-use of soil and reduce the quantity of waste soil for off-site disposal.

***Mixing of hazardous soil with non-hazardous to reduce the hazardous quality is not an acceptable practice.***

Landfill disposal - advantage of 'prior awareness' and corresponding planning at the site investigation stage

Where off-site disposal is going to arise, awareness of the requirements/procedure under the Landfill Regs. means that the phased ground contamination investigation can consider and include acquisition of the necessary information and documentation with respect to such disposal. This, we will see, helps the developer in terms of time and cost via avoidance of 'future' analytical requirements with attendant delays to disposal operations.

### **Determining whether waste soil is hazardous or non-hazardous**

Essentially, this is the 'first element' of ***Level 1 – full basic characterisation***, in the overall hierarchy concerning landfill disposal of our waste 'soil'. The process involves use of the **Hazardous Waste Directive (HWD, Council Directive 91/689/EC)** and the **Revised European Waste Catalogue (EWC 2002)**. This has nothing to do with Waste Acceptance Criteria (WAC) Testing, a separate issue (addressed later), concerning actual acceptance of waste at particular 'categories' of landfill.



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The determination involves six progressive steps and may involve basic physicochemical tests to establish flammable, explosive, oxidising and other characteristics. The process culminates in identification of wastes in terms of one of the following three types of entry in the EWC:

*Absolute Entries* – marked with an asterisk in the catalogue, these are deemed hazardous whatever their actual composition or concentration of dangerous components;

*Mirror entries* – these cover wastes that may or may not be hazardous depending on whether dangerous components are present at or above certain thresholds. Such wastes are documented by paired/linked entries (hence mirror), the hazardous entry marked with an asterisk, the potential non-hazardous entry with no asterisk.

*Non-hazardous entries* – if an EWC waste listing does not have an asterisk it is non-hazardous. If it is part of a mirror entry, an assessment must be made to establish which entry (hazardous or non-hazardous.) applies.

The EWC 2002 describes the necessary steps to achieve identification of wastes in accordance with the catalogue and the required order when considering the catalogue's listed entries. As the focus of the EWC classification is not the activity that may have given rise to contamination of the soil (i.e. construction & demolition as the *activity*), it follows that "excavated contaminated soil" *will* be a mirror entry (soils and stones containing dangerous substances), and *may* be a hazardous waste if significant contaminants are present at particular concentration. Our contaminated soil will now require an assessment to establish whether it is hazardous or not. This is done by a 'two stage' process:

1. identification of contaminants that are, or are likely to be, present in the soil and listing of these;
2. sampling and relevant chemical analysis to confirm actual presence and concentration of contaminants.

In almost all circumstances concerning excavated contaminated soil for off-site disposal, it will be necessary to address stage 2.

### Use of Ground Contamination information

The Phase I Desk Study/Site Walkover will have examined the history of the development site and its environs, with specific regard to the potential nature and likely presence of contaminants in soils on or underlying the site, arising from past and present uses and activities both on and in proximity to the site. The advantage in terms of off-site disposal during remediation, is that information from the Phase I study can be used to produce the list of 'substances'/contaminants required by stage 1. A key distinction at stage 1 is that, for disposal purposes, it is necessary to list potential contaminants from a

**standpoint of *hazard*, rather than that of *risk* to sensitive receptors via the 'source - pathway-target' linkage as considered during the site investigation procedure.**



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Having produced the hazard based 'stage 1 list', attention can be given to the sampling and analysis necessary for the corresponding waste characterisation process. Here it is likely that, in most circumstances, analyses carried out for the Phase II Intrusive Ground Contamination Investigation will prove useable to this end. (Bear in mind, however, that it is still advisable to carry out further analysis of the soil following excavation to support/enhance existing Phase I & II site investigation data).

It is important to note that, in the above scenario, contaminant specific issues may still arise when identification of particular compounds proves necessary for adequate characterisation. To clarify this, analyses carried out for ground contamination investigations tend to provide 'collective total' concentrations for certain species of contaminant, rather than concentrations of particular compounds actually present (e.g. total lead, total sulphate, as opposed to concentration of the specific form, lead nitrate, lead acetate, sodium sulphate etc.).

In view of this, it may be necessary when using Phase II site investigation analyses, to conduct:

- further assessment using the Phase I Desk Study information or other relevant inputs in order to identify which particular compounds and substances are likely to be present;
- carry out additional analyses to qualify matters (e.g. speciation where feasible);

If matters cannot be resolved by the above, collective total analyses should be used and the 'worst case scenario' applied. 'Worst case' involves assumption of the presence of the most hazardous compound (i.e. with the lowest hazardous waste threshold) derived from any of the corresponding collective total analytical parameters identified by the Phase II analyses.

**Note.** in the worst case scenario, the 'worst' chemical form assumed must be able to exist in the environment that the soil was sampled from. So, if the worst case compound is known to break down in soil, the scenario is not appropriate for the assessment.

In most cases there will be adequate information for assessment of the soil. If not, other possibilities include testing the excavated soil for hazardous properties or adopting the precautionary principle.

## Summary of the Precautionary Principle

If, in the course of assessment, it becomes evident that our waste soil contains substances that are not on the Approved Supply List (ASL) or Safety Data Sheets or similar information is not available, further testing may be necessary to resolve the question of whether such substances are hazardous. In these circumstances, or when we have reason to believe that the soil may be hazardous, 'holder' must determine if the mirror entry soil is hazardous.

Tests should be done to decide whether the soil has hazardous properties. In some instances, relatively low cost tests can be used to this end – pH for irritant/corrosive and flashpoint tests for flammable properties for example. Otherwise, suitable test methods are identified by the HWD/EC Directive on Dangerous Substances and Appendix C of the EA's TG WM2 Document.



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***It is not acceptable for the holder to assume a waste soil to be hazardous or non-hazardous, without analysis or assessment of the soil using information from approved sources.***

## Assessment of the presence of dangerous substances via analysis

Where analysis of the mirror entry excavated/contaminated soil *has been completed*, assessment can be made as to whether the soil contains dangerous substances. The preferred means of establishing this is to use the hazard classification given by the Approved Supply List (ASL). This provides hazard information and classification for the more common chemicals. *It is not necessary to conduct tests for all chemicals listed in the ASL, only those that may be expected to be present on the basis of the site investigation or other inputs.*

Alternatively, if the contaminant is not listed in the ASL, the hazard classification determination can be achieved via information from Safety Data Sheets (or other 'recognised' data) used in accordance with methods given in the Approved Classification & Labelling Guide.

## The next step – does our soil have hazardous characteristics H1 to H14?

We have seen that our waste contaminated soil is going to be a mirror entry. To be confirmed as hazardous, it must contain dangerous substances at or above published 'threshold concentrations' and/or exhibit a defined hazardous property (i.e. properties H1 to H14 identified in HWD Annex III and in EA publications). Two methods are available to establish this:

Calculation method – this involves identification of the hazardous contaminants in the soil and comparison of their concentrations with the corresponding 'thresholds' to see if the soil has any of the hazardous properties in question. If the soil contains one or more substances at or in excess of a threshold concentration for any of the hazardous properties H1 to H14, the soil is classed as the **Hazardous mirror entry**. If, on the other hand, concentrations of dangerous

substance(s) identified within the soil are all below the hazardous property thresholds, the classification will be a **Non-hazardous mirror entry**.

Testing approach – testing is relevant where certain physical properties of the waste soil need to be considered/examined (oxidising, flammable, irritant/corrosive characteristics for example) or when contamination issues are particularly complex. Test results are compared to 'Risk Phrases' (referenced by 'R' numbers), 'Hazards' and 'Hazardous Waste Threshold Limits', (these may be found in the EA's TG WM2 publication including details of when physical testing is necessary). **Note.** for hazards H4, H5, H6, H8 & H14 the component concentrations must be added to show the total concentration of contaminants with that hazard.



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## Waste Acceptance Procedures

So, we should now know whether our waste soil is hazardous or non-hazardous. What now?, well, basically, the next step towards disposal is the consideration of the appropriate classification of landfill facility for our soil and any further requirements with respect to its acceptance.

### Landfill classifications & Waste Acceptance Criteria (WAC)

There are three classifications of landfill in the UK:

- Hazardous landfills
- Non-hazardous landfills
- Inert landfills

As an additional disposal facility, cells for disposal of stable non-reactive hazardous waste can be prepared within non-hazardous landfills.

Under Waste Acceptance Procedures all wastes for landfill disposal will require the relevant basic characterisation information (see appendix) which now includes written confirmation (to those receiving the waste), of whether it has been treated or not.

The main concern of the WAC is the protection of groundwater. It is therefore, necessary to examine the characteristics of a potential landfill waste in terms of leaching behaviour in relation to waters passing through a landfill and the potential for contamination of ground waters or the wider environment. WAC are presented in three ways:

- i) listed wastes acceptable without testing
- ii) leaching limit 'trigger' levels for relevant parameters
- iii) values for other tests carried out on the solid waste (trigger levels for PAH's, BTEX, PCB's and mineral oil set for inert waste with triggers levels for LOI and TOC in general)

For our waste soil, we are only concerned with ii) & iii). Waste Acceptance Criteria (WAC) testing applies to:

- Inert waste
- stable non-reactive waste for disposal in prepared cells within non-hazardous landfills
- hazardous waste

Corresponding WAC tests should be carried out on the actual waste in the condition in which it is to go to landfill

Waste can only be accepted at the above landfill facilities if it meets the respective WAC limit values.



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**At present, there are no WAC for non-hazardous wastes.** If our soil has been demonstrated to be non-hazardous, it does not need WAC testing and may be disposed of to a non-hazardous landfill.

If our waste soil has been shown to be hazardous, landfill disposal will be either to prepared cells in a non-hazardous landfill as Stable Non-Reactive Hazardous waste, or to hazardous landfill. In each case corresponding WAC tests are required and the waste must meet the respective limit values in order to be accepted. If limit values are exceeded, it may be necessary to subject the soil to further treatment followed by re-testing, or give consideration to another means of disposal.

If we consider our waste soil to be inert, testing must show that the inert WAC limit values have been achieved. Inert waste can also be accepted at non-hazardous landfills provided that the inert WAC limit values are met.

**Note.** particular landfill operators may require additional testing in addition to the above.

## Additional summary points

- Suitable characterisation of waste soil is essential in meeting our 'Duty of Care' with respect to the Hazardous Waste and Landfill Directive/Regulations;
- Pre-treatment of waste is a mandatory requirement and may actually give rise to re-use of our soil rather than off-site disposal;
- Treatment of waste soil may lead to disposal of soil initially deemed to be hazardous, as a non-hazardous waste.

The latter two have a positive impact on the environment, benefit the developer in terms of cost and are in direct line with the overall objectives of the Landfill Directive/Regulations.

It is hoped that the above has brought some overall clarity to the subject. A single article cannot, however, cover all scenarios and eventualities. For further advice and guidance please contact our Chemistry Department. **CMT (Testing) Ltd. offer a full service including ground contamination investigation, chemical analyses for characterisation purposes and WAC testing**, results of the latter being presented in an easy read-off format incorporating corresponding 'trigger'/limit values.



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## Appendix

Information required as part of Level 1 Basic Characterisation (as applicable to waste 'soil'):

- Source and origin of the waste soil
- Information on the circumstances giving rise to the waste
- Details of the waste treatment applied to the soil or a statement giving reason(s) why treatment is not deemed necessary
- Data concerning composition of the waste soil (i.e. analytical results for relevant parameters) and, where available and appropriate, other characteristics including leaching behaviour if relevant
- Details of the general appearance of the waste soil (e.g. colour, consistency, smell and other characteristics)
- The relevant code for the waste soil under the European Waste Catalogue (EWC)
- For hazardous waste – details of the properties classifying the soil as hazardous (Hazardous Waste Directive 91/689/EEC, Annex III)
- Information showing that the waste soil does not come under any exclusions (i.e. is not prohibited under regulation 9)
- The classification of landfill at which the waste soil may be accepted
- Consideration of whether the waste soil could be recycled or recovered