Please see Annex SW8 for supporting information, and the “Introduction” for Health and Safety considerations and advice on the use of the guidance.

1. Is all soil accounted for
   a. has any soil gone to unplanned locations
   b. is traffic following defined haul roads and agreed soil handling practices

2. Are the bunds being formed in an appropriate manner
   a. are they stable and in accordance with the planning conditions i.e. location/shape
   b. are they receiving the correct soil
   c. is soil arriving in a suitable condition
   d. are bunds being kept separate

3. Has sufficient space been allocated for soil storage
   a. what remaining capacity is there for storage
   b. does the quantity of soil recovered correspond to that planned
   c. is there any variation
   d. does this have any repercussions for future stripping or future restoration activities
   e. if there are problems, is there anything that can be done about it

4. What management of the bunds is evident
   a. is traffic being kept off
   b. is the surface vegetated and being maintained
   c. does the site plan correctly identify the soil by type and have the actual quantities been surveyed and recorded
   d. are the surrounding land uses / activities a threat to the soil resource in store

5. Have other specific storage areas been identified
   a. for soil-forming materials
   b. for imported soil
   c. for minerals storage area
   d. for daily cover of waste operations
For more detailed information see:

- Preventing the Spread of Plant and Animal Diseases – A Practical Guide (MAFF 1991 PB0486)
- Good Practice Guide for Handling Soils (MAFF April 2000)

Cross references:

- AP 8, 10
- SW 4
- RN 4
1. Is all soil accounted for

a. has any soil gone to unplanned locations
   If restoration is taking place on the site, operators should not store soil unless it is essential. However, on many sites, immediate replacement is not always practical and soil has to be stored. All movements should be in accordance with an overall agreed plan, otherwise records and future decisions relating to soil may be misguided. If soil is noted as being wrongly placed, then the operator should be questioned, as the consequences of their action may not have been fully considered.

b. is traffic following defined haul roads and agreed soil handling practices
   The haul roads and soil storage areas must be defined and should be stripped of soil first. All work should be planned and carried out without staff or equipment going onto surrounding land. This is important to minimise soil disturbance and also to prevent any plant and animal diseases in the soil from being spread. Further guidance is given in the booklet Preventing the Spread of Plant and Animal Diseases – A Practical Guide (MAFF 1991 PB0486). As well as ensuring the correct routes are available to reach the soil storage areas, the techniques to off-load the soil and return to the stripping area should also be acceptable.

2. Are the bunds being formed in an appropriate manner

a. are they stable and in accordance with the planning conditions i.e. location/shape
   Management of bunds can be relevant to soil health. A dry clay or heavy clay loam or silty clay loam subsoil will often enter a bund at an overall density 15-20% less than its density before excavation. Some consolidation may be necessary to ensure stability of the bund. Some operators seek to specifically compact the top and sides of the bund in order to reduce the quantity of water infiltration and to maintain the soil in a dry condition. However, sealing a bund of wet soil will exclude transfer of moisture and oxygen forming anaerobic conditions which will cause the death of many beneficial soil microbes. The magnitude of the compacting and consolidating forces will depend on the height of the storage bund and the length of time the soil is stored. The effect of these forces will depend on the texture, density and moisture content of the soil within it. Bunds should therefore be constructed with dry and friable soil and dry ground conditions, preferably to no more than 3 metres in height with side slopes of either 1:1½ on inside slopes or 1:3 on the outer slopes to ensure stability. Good Practice Guide for Handling Soils (MAFF April 2000) provides further information.

b. are they receiving the correct soil
   The operation should follow a detailed stripping plan showing soil units to be stripped, haul roads and the phasing of vehicle movements. The soil units should be defined on the site with information to distinguish types and layers, and ranges of thickness. Detailed daily records should be kept of operations undertaken, and
site and soil conditions. Topsoil, subsoil and any other soil-forming material should be stored separately. Also, different soil types should be stored separately e.g. sandy soil separate from clay soil. Before the operator builds subsoil storage bunds, they should remove the topsoil from the area which the bund will occupy. Topsoil and subsoil should be removed from areas used for storing other materials (e.g. overburden or mineral).

c. is the soil arriving in a suitable condition
A wet soil is likely to suffer more in a stockpile than a dry and friable soil. A wet clay is not only considerably heavier than a dry clay, thereby increasing the load on all soil below it, but also has a lower shear strength and is thus less able to resist any applied load. A wet sandy soil is more likely to move and pack more closely in storage than a dry sandy soil.

d. are bunds being kept separate
A visual check can confirm that the soil types are being stored in separate bunds and that there is no overlap of soil at the base. Where a bund contains more than one soil type, these should be separated by a readily identifiable boundary, such as a layer of straw, sand or a membrane. The check should confirm that any instability of one bund would not affect adjacent bunds.

3. Has sufficient space been allocated for soil storage

a. what remaining capacity is there for storage
Ongoing checks should be undertaken to ensure the soil is being placed as planned, in the location and to the dimensions agreed in the planning permission.

b. does the quantity of soil recovered correspond to that planned
Variations in soil depths are often encountered across a site. The stripping programme includes the volume of soil intended to be moved and surveys of the completed soil bunds will confirm the quantities recovered. An ongoing audit of the differing available resources is advisable for long-term and complicated sites.

c. is there any variation
The variations may be due to poor stripping techniques that have diluted or mixed some layers, or through poor recognition of the differing soil types. Conversely, in some instances additional soil may be recovered through good handling. Irrespective of the handling techniques, the soil encountered may not have matched the soil surveys undertaken prior to site operations, possibly through auger borings encountering unrepresentative layers (a particular difficulty with some soil types over chalks and limestone, which vary in depth considerably). The variance could be caused by a number of human decisions in the field, such as identification of the subsoil as a mineral and cessation of soil stripping, or due to difficulties encountered in particular areas, due perhaps to waterlogging or unsuitable ground conditions.
d. does this have any repercussions for future stripping or future restoration activities
   The experience from the initial stripping should be considered against future phases. The actual results of soil depths recovered should be examined against the soil surveys, to estimate future soil recovery. The soil handling techniques may need changing or improving. The site personnel may need additional supervision or training.

e. if there are problems, is there anything that can be done about it
   Once soil has been lost it cannot be recovered. However, with good audit techniques, future decisions on recovering additional soil-forming materials through selective extraction of the overburden can be made. The annual audit should focus the attention on whether there may be a need to amend target restoration depths or even the extent of some after-uses. The keeping of comprehensive records will ensure decisions are based on accurate information.

4. What management of the bunds is evident

a. is traffic being kept off
   To encourage good practice, survey vehicles should be kept from driving and parking on the soil bunds. The creation of any tracks encourages other vehicles. The only vehicular access required should be for maintenance, such as cutting and spraying.

b. is the surface vegetated and being maintained
   Evaporation seldom dries soil beyond a depth of 30cm, so drying of soil within the outer metre of a soil bund depends upon the moisture extracted by plant roots. The effects of plant roots cannot reach the inner core of soil. However, the healthier outer metre will continue to act as a reservoir for beneficial micro-organisms and earthworms, that will help restore soil structure following replacement. The establishment of a healthy sward also assists in preventing dust nuisance, creates more stability for the soil and becomes a clear marker if any unauthorised soil movements are occurring from the bund.

c. does the site plan correctly identify the soil by type and have the actual quantities been surveyed and recorded
   When the soil stripping operations have been completed, the site personnel should ensure that records and plans are updated, and detail where soil has come from and where it is stored, including quantities and soil type.

d. are the surrounding land uses / activities a threat to the soil resource in store
   A check should be made to ensure that drainage arrangements, mineral excavation and other engineering works are not a potential or actual threat to the soil resources through contamination, erosion, slippage or flooding.
5. Have other specific storage areas been identified

a. for soil-forming materials
   It is important to keep site personnel fully informed as to the difference between soil storage and the likely other storage areas that may be encountered on the site. Soil-forming materials, by their nature, will be recovered from the overburden normally in the course of the extraction process. These materials will require separate storage, but in a location that may require the incremental addition of suitable materials. Care will be required to ensure that the material can be transported to the designated storage area without compromising the quality of the other soil resources. Larger vehicles normally associated with overburden or mineral extraction, rather than soil handling, may transport the soil-forming material.

b. for imported soil
   Imported soil may be of unknown quality, and may arrive on site in various quantities. Interim storage must be available to allow for the suitability of the material to be assessed and be located near the site access, separate from known soil resources.

c. for minerals storage area
   The mineral storage areas need to be accessible throughout the life of the site and throughout each season. This material may be subject to all-year-round movement for processing and loading on to sales transport. This area should therefore be sited away from soil storage areas.

d. for daily cover of waste operations
   Soil or soil-forming material should not be taken out of storage and used as daily cover to prevent wind blow from a landfill site. Separate sources of material should be identified for such use.