



November 2019

# **Clays Farm, North End Road, Yapton, BN18 0DT**

## **Soil Resource Plan**

**Prepared on behalf of Domusea Developments Ltd**

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# 1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Domusea Developments Ltd to develop an Soil Resource Plan (SRP) for the purpose of confirming the soil types and volumes present at the site, and setting out the basic principles of soil handling and storage of soils from the proposed area of built development at Clays Farm, Yapton.
- 1.2 Outline planning application Y/62/18/OUT for 33 residential dwellings, access, landscaping and associated works (with some matters reserved) was refused in June 2019 for the following reason:

*“The proposal results in a loss of high grade agricultural land in conflict with policies SO DM1 of the Arun Local Plan, H1 of the Yapton Neighbourhood Development Plan and paragraph 170 of the National Planning Policy Framework.”*

- 1.3 RAC prepared a report in July 2019<sup>1</sup> to address this reason for refusal. The conclusions of that report are:

*“The land at Clays Farm, Yapton, extends to 1.7ha, of which 1.5ha is permanent pasture grazed by horses, and 0.2ha includes the curtilage of a barn and stables.*

*The site has been grazed with horses since its acquisition in 1978, prior to which it was occupied by a garden centre. The site has not therefore been in agricultural production for over 40 years.*

*A detailed ALC survey has been undertaken on behalf of the former MAFF of land to the west and east of North End Road, including Clays Farm. The survey has classified all this land as Grade 2, which is very good quality agricultural land.*

*The reason for refusal indicates that the proposal will result in the loss of high grade agricultural land, with the Report to Committee stating that the site is classified as excellent quality Grade 1 land. It is apparent therefore that, whilst the site is BMV land, the Committee did not have the definitive ALC information available in making its decision. In terms of paragraphs 170 and 171 of the NPPF, it is apparent that:*

- there has been no agricultural production associated with this site for over 40 years, and that the inherent quality of the land does not provide any economic or other benefit that needs to be recognised by planning decisions;*

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<sup>1</sup> **Reading Agricultural Consultants Ltd (2019), Appraisal of Agricultural Land Quality at Clays Farm, North End Road, Yapton, BN18 0DT.**

- *the development of 1.5ha of land that has not been in agricultural use for over 40 years is not a significant development of agricultural land;*
- *there are no opportunities to use areas of poorer quality land to those of a higher quality around Yapton.*

*Both Policy SO DM1 of the adopted Arun Local Plan and Policy E1 of the YNP (assumed to be the policy intended to be referenced in the reason for refusal), there is a requirement to demonstrate that the need for the development outweighs the need to protect BMV agricultural land. This is a balance that lies outside the scope of this appraisal, other than to note that it was undertaken in the Report to Committee on application Y/62/18/OUT, as well as on the neighbouring sites to the north and south of Clays Farm, both of which also involved Grade 2 land that was not in agricultural production and provided little or no economic benefit associated with the presence of BMV land. In all cases, the balancing exercises concluding that the need for development outweighed the need to protect BMV agricultural land.”*

- 1.4 The July 2019 RAC report accompanies the resubmitted application. Arun District Council has also asked for the submission of a soil resource plan, in line with Policy SO DM1:

*“Where development is permitted it should, as far as is possible, use the lowest grade of land suitable for that development. Development will not be permitted unless:*

- d) the applicant has submitted sustainability and options appraisals, mitigation measures, and a soil resources plan for the development site;*
- e) site appraisal documents submitted by the applicant must demonstrate that consideration has been given to DEFRA’s Soil Strategy for England;*
- [...] and*
- g) the applicant has submitted a comprehensive soil resources plan for the development site which demonstrates that care will be taken to preserve the soil resource, such that it can be incorporated into a Productive Green Environment following development.”*

### **Purpose of the Soil Resource Plan**

- 1.5 The SRP outlines a suitable strategy and procedures for stripping, storing and reinstating soils throughout the construction of the proposed development. Adherence to the SRP will ensure that the physical soil properties are maintained throughout construction, such that undisturbed and reinstated soil profiles will be able to support healthy root growth and successful plant establishment.

1.6 The SRP will also be used to:

- accurately record the existing soil resources that are to be used in the construction of the proposed development. This will then be used to provide a specification for the reinstatement of soil profiles in the construction period; and
- identify the volume of each type of soil that will be available for re-use in the detailed design of the proposed development, including gardens, landscape buffers and LEAP.

1.7 The preparation of this SRP has relied on:

- detailed soil survey data obtained on behalf of the former Ministry of Agriculture, Fisheries and Food (MAFF) in a survey undertaken in 1998<sup>2</sup>;
- Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites<sup>3</sup> which provides details and best practice guidance on the handling, storage and reinstatement of soil resources; and
- MAFF (2000) Good Practice Guide for Handling Soils, Sheets 1 to 4<sup>4,5,6,7</sup> which provide advice on soil stripping, the formation of soil storage mounds, and soil replacement operations using excavators and dump trucks (attached as Appendix 1).

## 2 Soil Resources and Agricultural Land Classification

2.1 A detailed Agricultural Land Classification (ALC) and soil resources survey was carried out by the Farming and Rural Conservation Agency (FRCA) on behalf of MAFF in 1998 at an observation density of approximately one per hectare across land surrounding the site.

2.2 The survey involved augering into the soil to a depth of 1.2m, or any impenetrable layer, at 16 locations in the immediate vicinity of the site. The approximate locations of the auger bores and the soil pits, and the soil auger logs are contained within the FRCA report attached to the July 2019 RAC report.

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<sup>2</sup> **FRCA (1998).** *Arun District Local Plan – Objector Sites, Land at Yapton, West Sussex (Including Objector Sites 10293 (viii & ix) and 10127, Agricultural Land Classification.*

<sup>3</sup> **Defra (2009).** *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*

<sup>4</sup> **MAFF (2000).** *Good Practice Guide for Handling Soils. Sheet 1: Soil Stripping with Excavators and Dump Trucks*

<sup>5</sup> **MAFF (2000).** *Good Practice Guide for Handling Soils. Sheet 2: Building Soil Storage Mounds with Excavators and Dump Trucks.*

<sup>6</sup> **MAFF (2000).** *Good Practice Guide for Handling Soils. Sheet 3: Excavation of Soil Storage Mounds with Excavators and Dump Trucks*

<sup>7</sup> **MAFF (2000).** *Good Practice Guide for Handling Soils. Sheet 4: Soil Replacement with Excavators and Dump Trucks*

- 2.3 All of the area surrounding the site has been classified as ALC Grade 2, very good quality agricultural land. The agricultural use of the soils is limited slightly by a minor susceptibility to droughtiness.

#### **Topsoil**

- 2.4 The topsoil resource surrounding the site has consistently been identified as medium silty clay loam, which is non-calcareous and stoneless to very slightly stony. The topsoil thickness ranges from 250mm to 340mm, with an average depth of 300mm.
- 2.5 Within the total site area of 1.67ha, it is estimated that the area of the site proposed for built development (dwellings, curtilages and roads) extends to approximately 1.2ha. Based on an average depth of 300mm, the estimated potential recoverable volume of topsoil is 3,600m<sup>3</sup>.

#### **Subsoil**

- 2.6 There is one identified upper subsoil type which also comprises medium silty clay loam and is predominantly stoneless. The average depth of the upper subsoil from ground level is 640mm (the upper subsoil horizon is around 300mm-390mm thick beneath the topsoil). Lower subsoil horizons have similar characteristics but also include heavy silty clay loam textures, and extend to a full 1,200mm depth from the soil surface. Although they show some evidence of wetness (most of the lower subsoils are mottled), this is due to groundwater: the profiles are porous and permeable throughout, of Wetness Class (WC) I. The upper and lower subsoil resources are compatible and if required to be stripped, for example from the foundations of the dwellings, could be stripped together to a uniform depth, without causing a significant reduction in the quality of the upper subsoil.

### **3 Landscape design and soil suitability**

- 3.1 The topsoil resource stripped from the area of built development is to be utilised on site in the detailed design of residential gardens, landscape buffers and the LEAP area in the south-west of the site.
- 3.2 The site has been under permanent grass for approximately forty years. The soils are therefore proven to be well suited to this purpose and are appropriate for re-seeding with grass for gardens and open space.
- 3.3 A suitable soil profile for reinstatement should utilise as much of the displaced topsoil resource as is possible. Profiles comprising 900mm of subsoil material beneath 300mm of topsoil should be achievable throughout all garden and tree planting areas.

- 3.4 The soil resource is inherently freely draining which, provided the structure is maintained through good working practices, should result in fewer potential complications with tree and grass establishment than might be expected with a heavier and/or less well drained subsoil, although close monitoring for signs of vegetation failure will be necessary.

## **4 Soil Management Strategy**

- 4.1 The following soil management strategy is based on best practice guidance contained within Defra's Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, MAFF's Soil Handling Guide and industry experience.

### **Good practice for handling soils**

- 4.2 Inevitably, soil structural quality will be disrupted by handling or trafficking. There are three principal objectives when stripping, handling and storing soils:
- the avoidance of unnecessary damage to all three soil layers (topsoil, upper subsoil and lower subsoil), especially by compaction and smearing;
  - the maintenance of a reasonable degree of fissuring, and hence aerobic conditions, in stored soils, especially topsoil; and
  - the reasonable replication of the original permeability of the soil profile when the materials are replaced.
- 4.3 All soil material to be re-used, for whatever purpose, will be handled only under appropriate conditions, when in a dry and friable state, which is when they are least susceptible to damage by compaction and smearing, and according to the following rainfall criteria:
- if there is very light rain or drizzle, handling can proceed for up to four hours unless the soils are already in too moist a state (determined by field tests);
  - if there is normal rain, handling will cease if the rain has not stopped in 15 minutes;
  - if there is heavy rain (as from intense showers, slow-moving depressions) handling will stop immediately;
  - after rainfall has ceased, field tests will be applied to determine when handling may re-start.
- 4.4 The field tests used to determine the suitability of handling should be applied to soils from at least five locations in each area to be assessed. Records of all tests will be kept.
- 4.5 The soils should be assessed as follows:

|                                                                                                                                                                                                 |                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| If the soil sample is wet, films of water are visible on the surfaces of grains and aggregates and/or when a soil sample is squeezed in the hand and it readily deforms into a cohesive "ball". | NO HANDLING<br><br>It should be noted that some soils will be permanently in this condition (e.g. alluvial clays), and these materials should be improved by drying or stabilising. Alternatively, other soils may be used. |
| If peat soils are dry and brittle (i.e. when water is not squeezed out under moderate hard pressure)                                                                                            | NO HANDLING                                                                                                                                                                                                                 |
| Peds (structures) break up/crumble readily when squeezed in the hand rather than forming into a ball                                                                                            | HANDLING OK                                                                                                                                                                                                                 |
| If the sample is moist, there is a slight dampness when squeezed between the fingers but it does not significantly change colour (darken) on further wetting                                    | NO HANDLING BY DOZERS BUT MAY BE HANDLED BY TRACKED EXCAVATORS IF CONSISTENCY TEST (See 4.6) IS PASSED                                                                                                                      |
| If the sample is dry and brittle it will look dry and change colour (darken) if water is added                                                                                                  | HANDLING OK IF CONSISTENCY TEST (See 4.6) IS PASSED                                                                                                                                                                         |

4.6 The consistency of the soil should also be assessed, using the following methodology:

Attempt to mould a soil sample into a ball by hand:

|                                                                                           |                 |
|-------------------------------------------------------------------------------------------|-----------------|
| Impossible to mould a soil sample into a ball by hand because the soil is too hard (dry)  | HANDLING OK     |
| Impossible to mould a soil sample into a ball by hand because the soil is too loose (dry) | HANDLING OK     |
| Impossible to mould a soil sample into a ball by hand because the soil is too loose (wet) | HANDLING NOT OK |
| Possible to mould a soil sample into a ball by hand                                       | GO TO 4.7       |

4.7 If a ball can be formed by hand, attempt to roll it into a thread of 3mm diameter:

|                                              |             |
|----------------------------------------------|-------------|
| Impossible to roll the ball into a thread of | HANDLING OK |
|----------------------------------------------|-------------|

|                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand; the soil crumbles or disintegrates        |                                                                                                                                                                                                                                                                                                                                            |
| Possible to roll the ball into a thread of 3mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand | <p><b>NO HANDLING</b></p> <p>Soils with a plasticity of greater than 1 x plastic limit (i.e. soils which fail this test) could still be usable as engineering soils. So this test should only be applied to soils that are to be retained for green infrastructure uses, not as a general criterion of when excavation may take place.</p> |

### **Soil stripping**

- 4.8 There is considered to be one soil type to be stripped from the site.
- 4.9 Any standing crop or bulky vegetation will normally be cut and removed before stripping. If under grass, the grass should be cut as short as possible and any arisings should be carted away.
- 4.10 The stripped topsoil and any stripped subsoil resources should be stored in separate bunds within the site, the locations and volumes of which must be recorded. Haul routes and storage areas will first be stripped of topsoil. The principal objective is to avoid trafficking of materials by wheeled vehicles.
- 4.11 Plant of appropriate size for the operation will be used to strip the soils and place them into storage bunds as appropriate, as recommended in the Good Practice Guide for Handling Soils (Sheet 1)<sup>4</sup>. Plant will include tracked excavators and dumpers.

### **Depth of soil stripping**

- 4.12 The full thickness of the topsoil horizon should be stripped before any subsoil stripping occurs. Each layer should be stripped to its natural thickness, identified by colour, avoiding incorporation of subsoil material into the removed topsoil.
- 4.13 The thickness of topsoil across land surrounding the site ranges from 250mm to 340mm, and the topsoil resource could be stripped uniformly to 300mm without incorporating notable volumes of upper subsoil material.
- 4.14 There is one subsoil type at the site, comprising upper and lower subsoil horizons, although both layers are compatible. Where subsoil is to be stripped, it can be stripped as one resource.

### **Topsoil stockpiling**

- 4.15 Topsoil must be stockpiled when in an appropriate condition as determined by the field tests for moisture and consistency described above in paragraphs 4.5 to 4.7. This will ensure the soil is less prone to damage and compaction and will also facilitate re-spreading where applicable.
- 4.16 Topsoil stockpiles are proposed to have a maximum height of 3m and a gradient of 1 in 3 to allow for maintenance by mowing rather than strimming. Stockpiles must be located away from areas that may be at risk of flooding or ponding.
- 4.17 Appropriate plant, such as tracked excavators and dump trucks, can be used to construct the soil mounds as required as recommended in the Good Practice Guide for Handling Soils (Sheet 2)<sup>5</sup>. The dump trucks should travel to the storage area within the haul routes. The trucks should back-tip the transported soil starting at the furthest point from the access. Excavators and dozers can then be used to progressively shape and firm the mounds.
- 4.18 Any subsoil stockpiles may be up to 5m in height, with a side gradient of 1 in 3.
- 4.19 Any stockpiles in place for more than 6 months will be grassed down, normally with a low-maintenance mix unless otherwise agreed, and kept in a tidy and weed-free condition.
- 4.20 Locations will be monitored for signs of ponding. If that occurs, temporary drainage measures will be immediately put in place.
- 4.21 The locations and footprints of each stockpile shall be recorded accurately on a plan of not less than 1:2,500 scale.
- 4.22 The approximate volume and nature of each type (topsoil and subsoil) of the stored materials will be recorded.

### **Subsoil preparation**

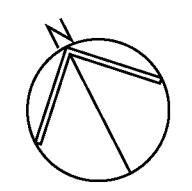
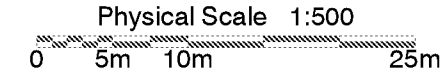
- 4.23 Soil placement will occur once the areas to be reinstated to gardens and green infrastructure are dry and clear of debris.
- 4.24 To ensure successful establishment of grass and trees, the subsoil must be uncompacted and well aerated in order to avoid waterlogging and the development of anaerobic conditions. If significant rainfall occurs during the replacement operation, work must be suspended and not restarted until the weather forecast is expected to be dry for at least one full day.
- 4.25 Any re-instated subsoil should be loose-tipped into the receiving area and spread using appropriate plant. Any debris that may have been incorporated into the subsoil resource should be removed.

### **Topsoil re-spreading**

- 4.26 Topsoil should also be taken out of stockpiles when in a dry and friable condition, and loose-tipped onto the prepared subsoil, to a depth of 300mm (plus up to 20% to allow for settlement).
- 4.27 Following topsoil resspreading, the soil profiles should be decompacted if required and larger clods broken up prior to the soil being seeded or trees being planted.
- 4.28 Tree and grass establishment must be monitored subsequent to planting. At the first signs of failure, the soil profiles will be examined in order to identify any drainage or compaction issues, and a strategy to ameliorate these issues will be developed.



NOTES:  
Dimensions to be checked on-site before commencing work, any discrepancies shall be reported to Curtis Leeves Technical Ltd. immediately.  
Do not scale from these drawings except for planning purposes. Use figured dimensions only.  
Where applicable this drawing is to be read in conjunction with other consultants' drawings.  
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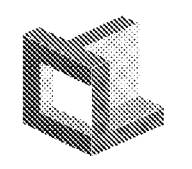
- 10no. Type 1 - 2B / 4P - 92 sq.m. No Garage
  - 9no. Type 2 - 3B / 4P - 101 sq.m. No Garage
  - 12no. Type 3 - 4B / 6P - 124 sq.m. With Garage
  - 2no. Type 5 - 4B / 7P - 155 sq.m. With Garage
- SITE AREA 1.67 Hectares  
DENSITY 19.8 Units per Hectare

- Existing Trees to Remain
- Indicative New Tree Planting

P03 Shading, Plot Nos etc. added 08.06.17

P02 Layout amended to suit possible future links to sites to the North & South 04.06.17

| rev    | description | date |
|--------|-------------|------|
| status | FOR COMMENT |      |



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|                                      |                            |                    |                    |
|--------------------------------------|----------------------------|--------------------|--------------------|
| client<br><b>Domusea Limited</b>     |                            |                    |                    |
| project<br><b>Clays Farm Yapton</b>  |                            |                    |                    |
| title<br><b>Proposed Site Layout</b> |                            |                    |                    |
| date<br><b>May 2018</b>              | scale @ A3<br><b>1:500</b> | drawn<br><b>IW</b> | chkd<br><b>MRL</b> |
| project no.<br><b>1827</b>           | drawing no.<br><b>101</b>  | rev<br><b>P03</b>  |                    |

## **Appendix 1:** Good Practice Guide for Handling Soils, Sheets 1 to 4



# **GOOD PRACTICE GUIDE FOR HANDLING SOILS**

## **Sheet 1:**

### **Soil Stripping with Excavators and Dump Trucks**

**Issued by the Farming and Rural Conservation Agency, Cambridge**

**April 2000**

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v04/00

## MAFF FOREWORD

Standards of restoration of minerals and waste sites have steadily improved in recent years, with operators increasingly aware of their environmental responsibilities. The industry is putting forward more imaginative restoration concepts to a variety of afteruses, and is more aware than ever that it will be judged on the standard of that restoration, and the sustainability of the development.

Sustainable mineral development means balancing economic, environmental and social needs, whilst using resources wisely. The UK Strategy for Sustainable Development recognises the importance of safeguarding agricultural land to meet the needs of future generations, and minimising the loss of soils to new development\*.

Improved restoration standards have sometimes enabled planning permission to be given for best and most versatile agricultural land to be worked for minerals, on the basis that it can be restored in a way that safeguards its long-term agricultural potential\*\*. Inherent in these high standards of restoration is the requirement to handle soils in such a way that damage to their structure is minimised. It is the aim of this Guide to provide comprehensive advice on soil handling "Good Practice" to operators, soil moving contractors, consultants and planning authorities.

The Guide is in the form of 15 Sheets giving advice on soil stripping, the forming and taking down of soil storage mounds, and soil replacement operations using excavators, earth scrapers or bulldozers. There are also four Guidance Sheets on remedial works involving the removal of stones and damaging materials, and decompaction during the replacement operations.

This document should be cited as MAFF (2000), Good Practice Guide for Handling Soils (version 04/00). FRCA, Cambridge.

**Any views expressed in the guidance are those of the consultant and do not necessarily represent the view of the Ministry of Agriculture, Fisheries and Food.**

\*(DETR, A Better Quality of Life, May 1999, paragraphs 6.66 and 8.50)

\*\*MPG7 (November 1996, paragraph 3).

### Acknowledgements

The Guide was written and prepared by Dr R N Humphries of Humphries Rowell Associates, Charnwood House, Loughborough, LE11 3NP, UK. The art work was by R Shenton of H J Banks & Co.

## **SHEET 1     SOIL STRIPPING WITH EXCAVATORS & DUMP TRUCKS**

The purpose of this Guidance Sheet is to provide a model method for best practice where excavators and dump trucks are to be used to strip soil. This Guidance Sheet comprises 6 pages of text, 3 figures and a user response form.

The model method may need to be modified according to site conditions or requirements of the Planning Authority. Where this is the case, deviation from the model should be recorded with reasons. The guidance does not specify the type, size or model of equipment, but this should have been agreed as part of the planning conditions or as a reserved matter. The machines should be of a kind which will cause the minimum compaction whilst being operationally efficient (eg wide tracked), and must be well maintained at all times.

Persons involved in the handling of soils, overburden etc., and in the construction or removal of mounds or tips, must comply with the Health and Safety at Work Etc. Act 1974 and its relevant statutory provisions, and in particular those aspects which relate to the construction and removal of tips, mounds and similar structures. This requirement takes preference over any suggested practice in the Sheets.

The user of these guidelines is solely responsible for all liabilities that might arise. No liabilities are accepted for any losses of any kind arising from the use of this guidance.

This soil handling method uses back-acting excavators in combination with dump trucks (articulated or rigid bodied). An excavator is used to strip soil and load it into dump trucks for transportation to replacement areas or to storage.

The soil handling method can affect the agricultural quality of the restoration through severe soil deformation (compression and smearing). This is primarily caused through trafficking, the effects of which increases with increasing soil wetness.

The advantage of this model method, if correctly carried out, is that it should avoid severe deformation of the soil as trafficking is minimised. Consequently, there should be no need for decompaction treatment during the operation.

The key operational points to ensure avoidance of severe soil deformation are as follows:

- (i) To minimise compaction:
  - the dump trucks must only operate on the 'basal'/non-soil layer, and their wheels must not on any circumstances run on to the soil layer(s).
  - the excavator should only operate on the topsoil layer.
  - the adoption of a bed/strip system avoids the need for the trucks to travel on the soil layers.
  - the machines are to only work when ground conditions enable their maximum operating efficiency.
  - if compaction is caused then measures are required to treat it (see Sheets 18 & 19).
- (ii) To minimise soil wetness and re-wetting:
  - the soil layers should have a moisture content below their lower plastic limit\*. Moisture content should be assessed by oven drying\* of samples taken from representative locations and mid/lower points of each soil horizon. [\*Or as required in the planning conditions.]
  - the bed/strip system provides a basis to regulate the exposure of lower soil layers to periods of rain and a means of maintaining soil moisture contents. The soil profile within the active strip should be stripped to the basal layer before rainfall occurs and before stripping is suspended.

- measures are required to protect the face of the soil layer from ponding of water and maintain the basal layer in a condition capable of supporting dump trucks.
- the area to be stripped is to be protected from in-flow of water, ponding etc. Wet sites should be drained in advance.
- the maintenance of a transpiring crop is important, and an appropriate cropping regime should be established for the year of soil stripping. Before stripping, excess vegetation should be removed; in the case of grassland it should be cut or grazed short and arable crops should have been harvested.

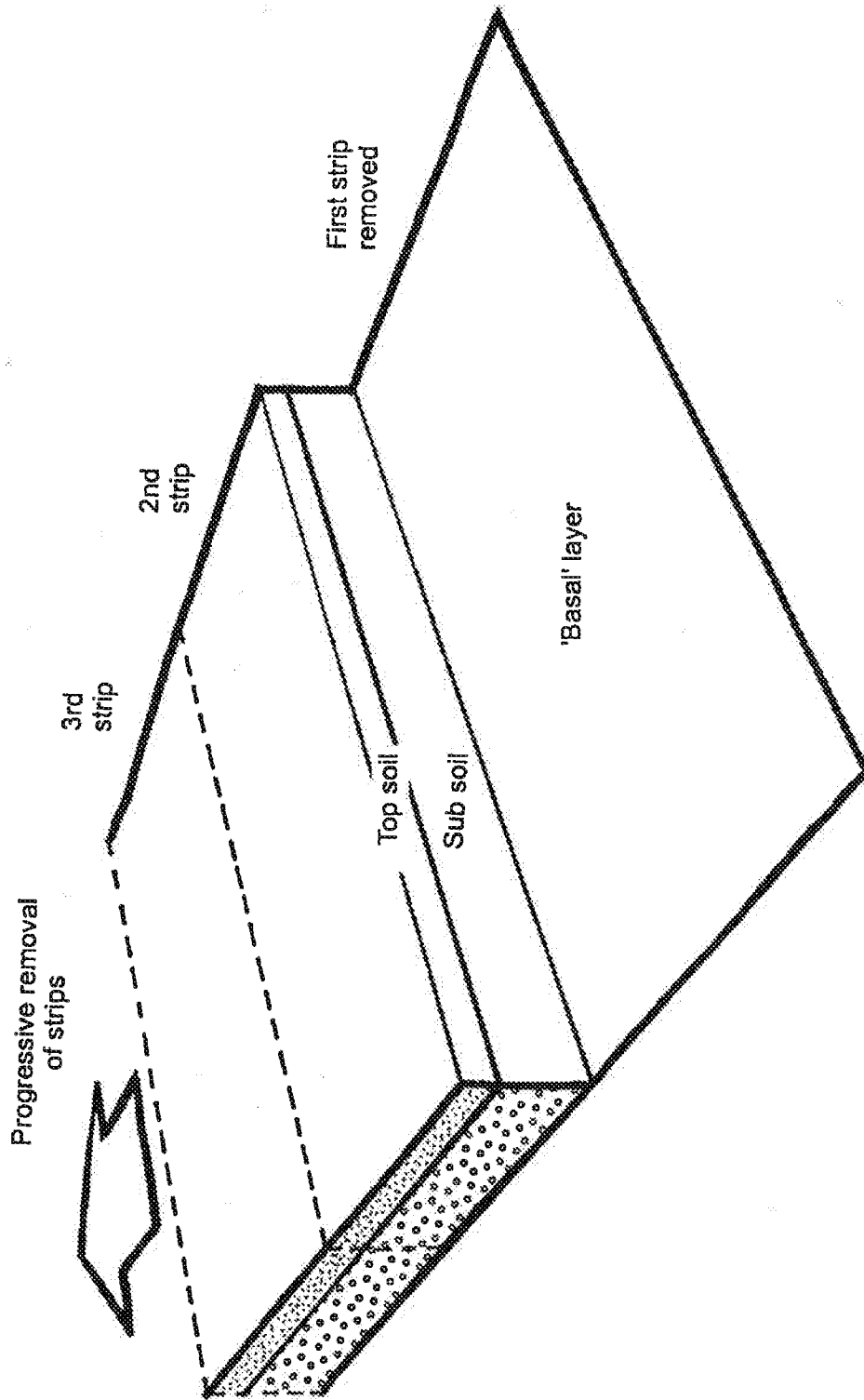
#### The Stripping Operation:

- 1.1 The area to be stripped is to be protected from in-flow of water, ponding etc. Wet sites should be drained in advance.
- 1.2 Soil stripping operations should not start until the required soil moisture levels are reached (as determined by the agreed method), and should be suspended as soon as the water content returns to these levels. Prior to work commencing a Meteorological Office forecast should be obtained which gives reasonable confidence of soil stripping proceeding without interruptions from rainfall events. If significant rainfall occurs during operations, the stripping must be suspended, and where the soil profile has been disturbed it should be removed to base level. Stripping must not restart unless the weather forecast is expected to be dry for at least a full day.

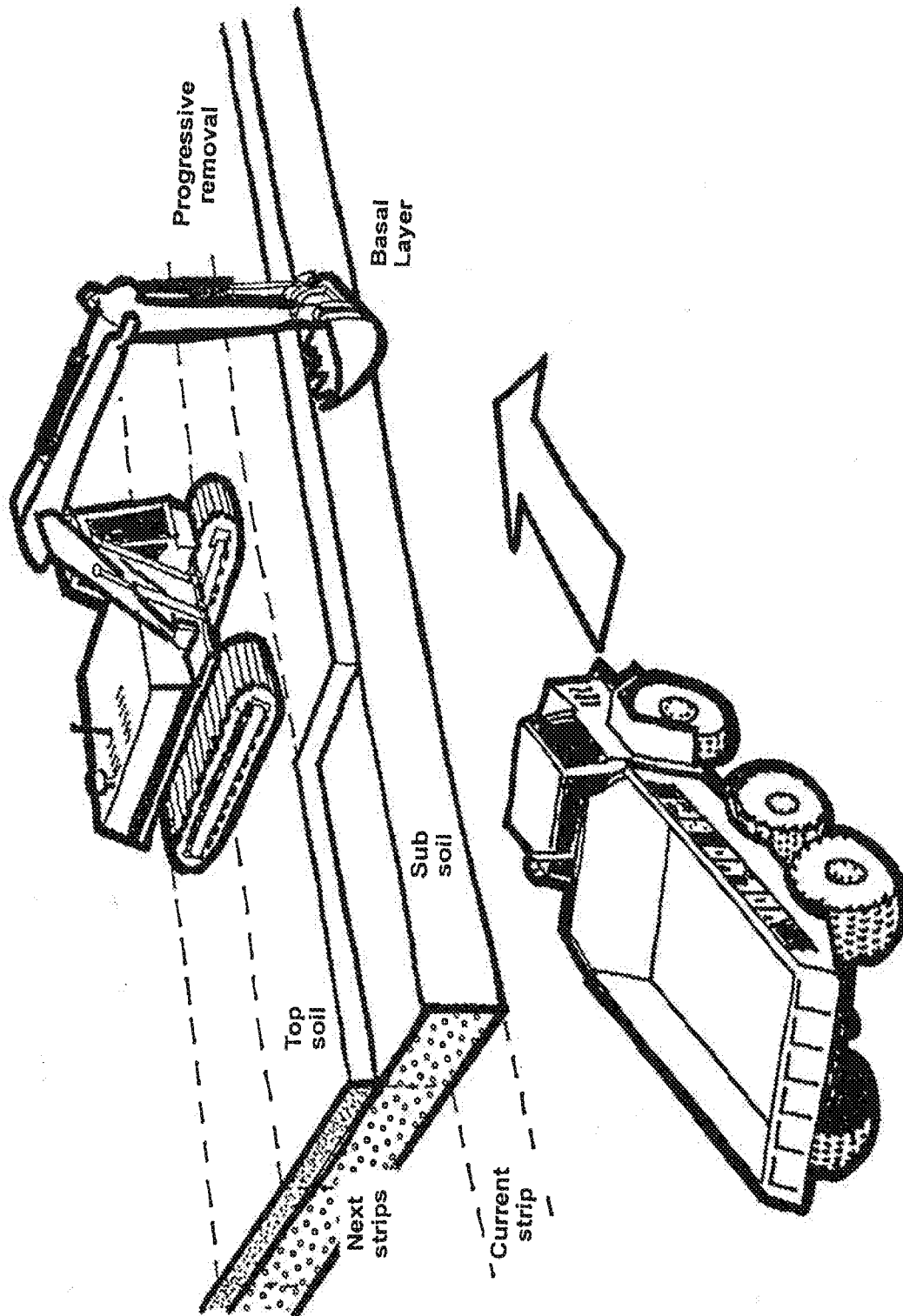
- 1.3 All machines must be in a safe and efficient working condition at all times.  
The machines are to only work when ground conditions enable their maximum operating efficiency. The operation is to be suspended before traction becomes a problem or the integrity of the basal layer and haul routes fail.
- 1.4 The operation should follow a detailed stripping plan showing soil units to be stripped, haul routes 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.
- 1.5 Within each soil unit the soil layers above the base/formation layer are to be stripped in sequential strips with the topsoil layer stripped first, followed by the subsoil layers; each layer stripped to its natural thickness without incorporating material from the lower layers. The next strip is not started until the current strip is completely stripped to the basal layer. This is often referred to as the 'bed or strip system'. The system involves the progressive stripping of the soil in strips (Figure 1.1). Where there is a gradient to the site, the main axis of the soil strips should be along the main axis of the slope.
- 1.6 The haul routes and soil storage areas must be defined, and should be stripped first in a similar manner.
- 1.7 The excavator is only to work on the topsoil layer; the dump trucks are only to travel on the basal/formation layer.
- 1.8 Stripping is to be undertaken by the excavator standing on the surface of the topsoil and digging the topsoil to its maximum depth, and it loading into dump trucks. Generally a bucket with teeth is preferable to one without. The dump trucks draw alongside the exposed soil profile, standing and travelling only on the basal layer (Figure 1.2).

- 1.9 The initial strip width and axis should be demarcated. Strip width is determined by the length of the excavator boom less the stand-off to operate; typically about 3-4m. Effective boom length can also reduce with profile depths greater than 1m; at 1.5m effective reach of standard boom may result in 2m wide strips.
- 1.10 Topsoil should be recovered to the full width of the strip without contamination with subsoil (not more than 20% of the lower horizon should be exposed at the layer junction within the strip). The thickness and identification of the horizon junction must be verified before and during stripping. The full thickness of the topsoil horizon should be stripped progressively along the strip before subsoil horizons are started (Figure 1.2).
- 1.11 The upper subsoil in the current strip is to be stripped and monitored in the same manner. The final 25cm of the subsoil layer should be left as a step to protect the adjacent topsoil layer from local collapses. The process is to be repeated for the lower subsoil and any other lower layer to be recovered as a soil material (Figure 1.3).
- 1.12 On completion of the strip, the procedures are repeated sequentially for each subsequent strip until the area is completely stripped.
- 1.13 Where the soils are to be directly replaced without storage in mounds, the initial strip of the upper horizons will have to be stored temporarily to release the lowest layer and enable the sequential movement of materials. The stored initial soil material would normally be placed on the lower layer removed from the final strip at the end of the programme or on partially completed profiles if rain interrupted the operation.

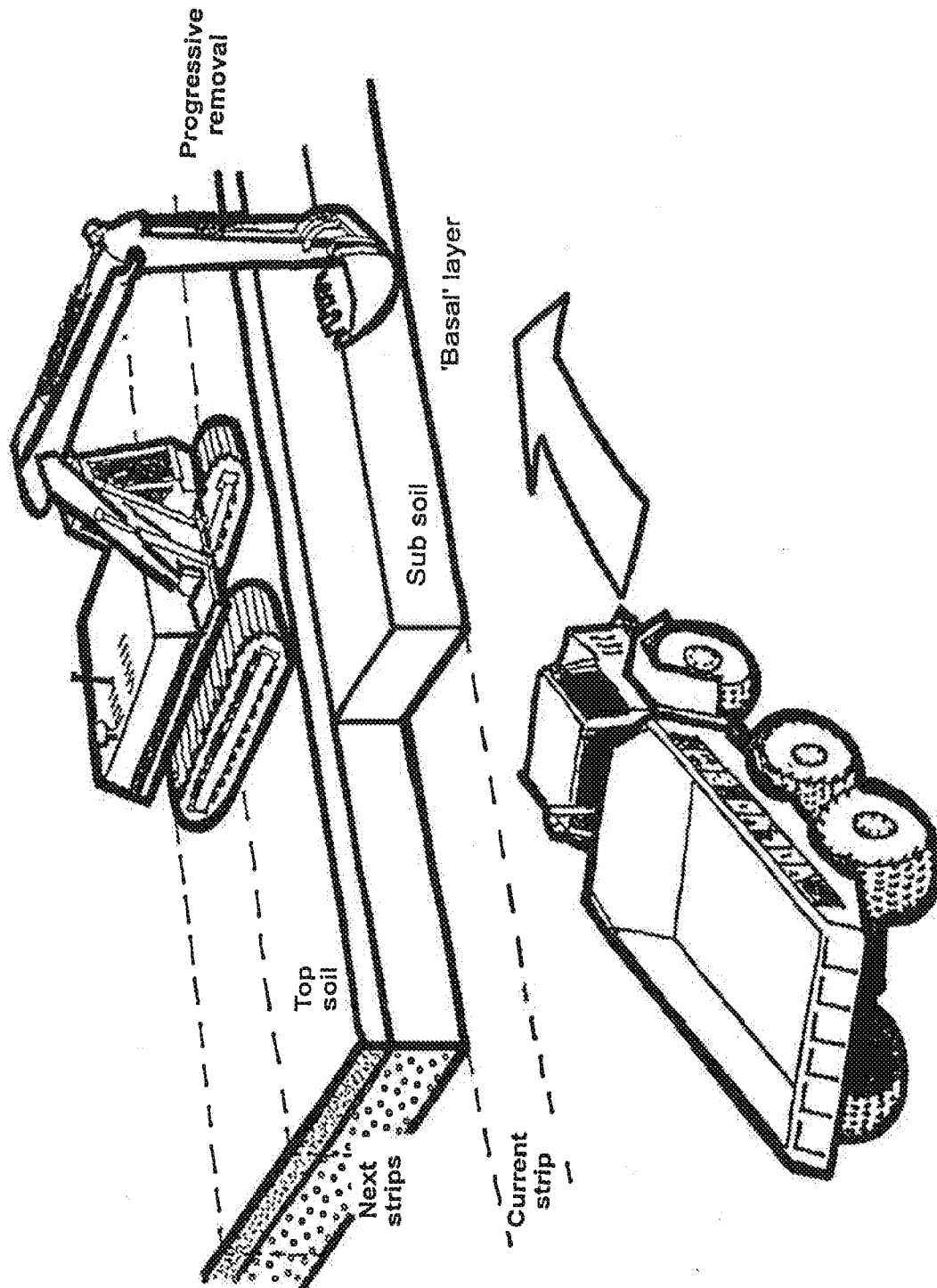
- 1.14 Where the stripping operation is likely to be interrupted by rain or there is likely to be over-night rain remove any exposed subsoil down to the basal layer before suspending operations. Make provisions to protect base of current or next strip from ponding/runoff by sumps and grips, and also clean and level the basal layer. At the start of each day ensure there is no ponding in the current strip or operating areas, and the basal layer is to level with no ruts.



**Figure 1.1 Soil stripping with excavators and dump trucks:**  
**The bed system**



**Figure 1.2 Stripping with excavators and dump trucks:**  
**Removal of top soil from a strip**



**Figure 1.3 Stripping with excavators and dump trucks:  
Removal of sub soil from a strip**

**SHEET 1**

Version: 04/00

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## **GOOD PRACTICE GUIDE FOR HANDLING SOILS**

### **Sheet 2:**

### **Building Soil Storage Mounds with Excavators and Dump Trucks**

**Issued by the Farming and Rural Conservation Agency, Cambridge**

**April 2000**

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## MAFF FOREWORD

Standards of restoration of minerals and waste sites have steadily improved in recent years, with operators increasingly aware of their environmental responsibilities. The industry is putting forward more imaginative restoration concepts to a variety of afteruses, and is more aware than ever that it will be judged on the standard of that restoration, and the sustainability of the development.

Sustainable mineral development means balancing economic, environmental and social needs, whilst using resources wisely. The UK Strategy for Sustainable Development recognises the importance of safeguarding agricultural land to meet the needs of future generations, and minimising the loss of soils to new development\*.

Improved restoration standards have sometimes enabled planning permission to be given for best and most versatile agricultural land to be worked for minerals, on the basis that it can be restored in a way that safeguards its long-term agricultural potential\*\*. Inherent in these high standards of restoration is the requirement to handle soils in such a way that damage to their structure is minimised. It is the aim of this Guide to provide comprehensive advice on soil handling "Good Practice" to operators, soil moving contractors, consultants and planning authorities.

The Guide is in the form of 15 Sheets giving advice on soil stripping, the forming and taking down of soil storage mounds, and soil replacement operations using excavators, earth scrapers or bulldozers. There are also four Guidance Sheets on remedial works involving the removal of stones and damaging materials, and decompaction during the replacement operations.

This document should be cited as MAFF (2000), Good Practice Guide for Handling Soils (version 04/00). FRCA, Cambridge.

**Any views expressed in the guidance are those of the consultants and do not necessarily represent the view of the Ministry of Agriculture, Fisheries and Food.**

\*(DETR, A Better Quality of Life, May 1999, paragraphs 6.66 and 8.50)

\*\*MPG7 (November 1996, paragraph 3).

### Acknowledgements

The Guide was written and prepared by Dr R N Humphries of Humphries Rowell Associates, Charnwood House, Loughborough, LE11 3NP, UK. The art work was by R Shenton of H J Banks & Co.

April 2000

## **SHEET 2     BUILDING SOIL STORAGE MOUNDS WITH EXCAVATORS & DUMP TRUCKS**

The purpose of this Guidance Sheet is to provide a model method for best practice where excavators and dump trucks are to be used to build soil storage mounds. This Guidance Sheet comprises 5 pages of text, 2 figures and a user response form.

The model may need to be modified according to site conditions or requirements of the Planning Authority. Where this is the case, deviation from the model should be recorded with reasons. The guidance does not specify the type, size or model of equipment, but this should have been agreed as part of the planning conditions or as a reserved matter. The machines should be of a kind which will cause the minimum compaction whilst being operationally efficient (eg wide tracked), and must be well maintained at all times.

Persons involved in the handling of soils, overburden etc., and in the construction or removal of mounds or tips, must comply with the Health and Safety at Work Etc. Act 1974 and its relevant statutory provisions, and in particular those aspects which relate to the construction and removal of tips, mounds and similar structures. This requirement takes preference over any suggested practice in the Sheets.

The user of these guidelines is solely responsible for all liabilities that might arise. No liabilities are accepted for any losses of any kind arising from the use of this guidance.

This soil handling method uses back-acting excavators to build the storage mound in combination with dump trucks (articulated or rigid bodied) to transport the soil.

The soil handling method can affect the agricultural quality of the restoration through severe soil deformation (compression and smearing). This is primarily caused through trafficking, the effects of which increases with increasing soil wetness.

The advantage of this model method, if correctly carried out, is that it should minimise severe deformation of the soil as trafficking is minimised. However, compaction due to trafficking will be unavoidable in mounds where the height of the mound exceeds the effective reach of the excavator boom and the trucks have to travel on mounded soil. Such compaction will need treatment during the excavation operation (see Sheets 3 and 18).

The key operational points to minimise the degree and extent of severe soil compaction (and for the effective treatment of compaction) are as follows:

- (i) To minimise compaction:
  - strip in advance the soil to basal layer along haul routes and the operational footprint of the storage mound.
  - dump trucks are only to stand and travel on the basal layer (unless raising the next level in multi-tier mounds).
  - the machines are to only work when ground or soil surface conditions enable their maximum operating efficiency.
  - single-tier mounds are preferred to multi-tier mounds as it avoids the need for trafficking on the soil being stored.
  - raise the soil using only the excavator and maximise the mound height before trucks allowed to access upper surface.
  - in the raising of multi-tier mounds, trafficking is to be confined to the upper surface of the lower tier. [This layer will require decompaction on excavation of the mound. Sheets 3 & 18]
- (ii) To minimise the wetting of soils:
  - site soil mounds in dry locations and protect from run-off from adjacent areas. Drain if a wet location.

raise the soil mound to maximum height progressively along the axis of the mound, and shape the mound as it is being built to shed water and whenever stripping is suspended.

measures are required to protect the face of the soil layer from ponding of water and maintain the basal layer in a condition capable of supporting dump trucks.

### The Storage Operation

- 2.1 The mounds should be sited on dry ground, not in hollows and should not disrupt local surface drainage. Where necessary mounds should be protected from run-off/ponding by a cut-off ditch which is linked to appropriate water discharge facilities. Where the storage mound is in a hollow due to the removal of surface soils, measures should be undertaken to ensure that water is not able to pond within the storage area.
- 2.2 All machines must be in a safe and efficient working condition at all times. The machines are to only work when ground conditions enable their maximum operating efficiency. The operation is to be suspended before traction becomes a problem or the integrity of the basal layer and haul routes fails; haul routes must be maintained.
- 2.3 The operation should follow a detailed soil stripping/storage plan showing soil units to be stripped and stored, haul routes and the phasing of vehicle movements. The soil units should be defined within the site with information to distinguish types and layers, with information about ranges of thickness. Detailed daily records should be kept of operations undertaken, and site and soil conditions.

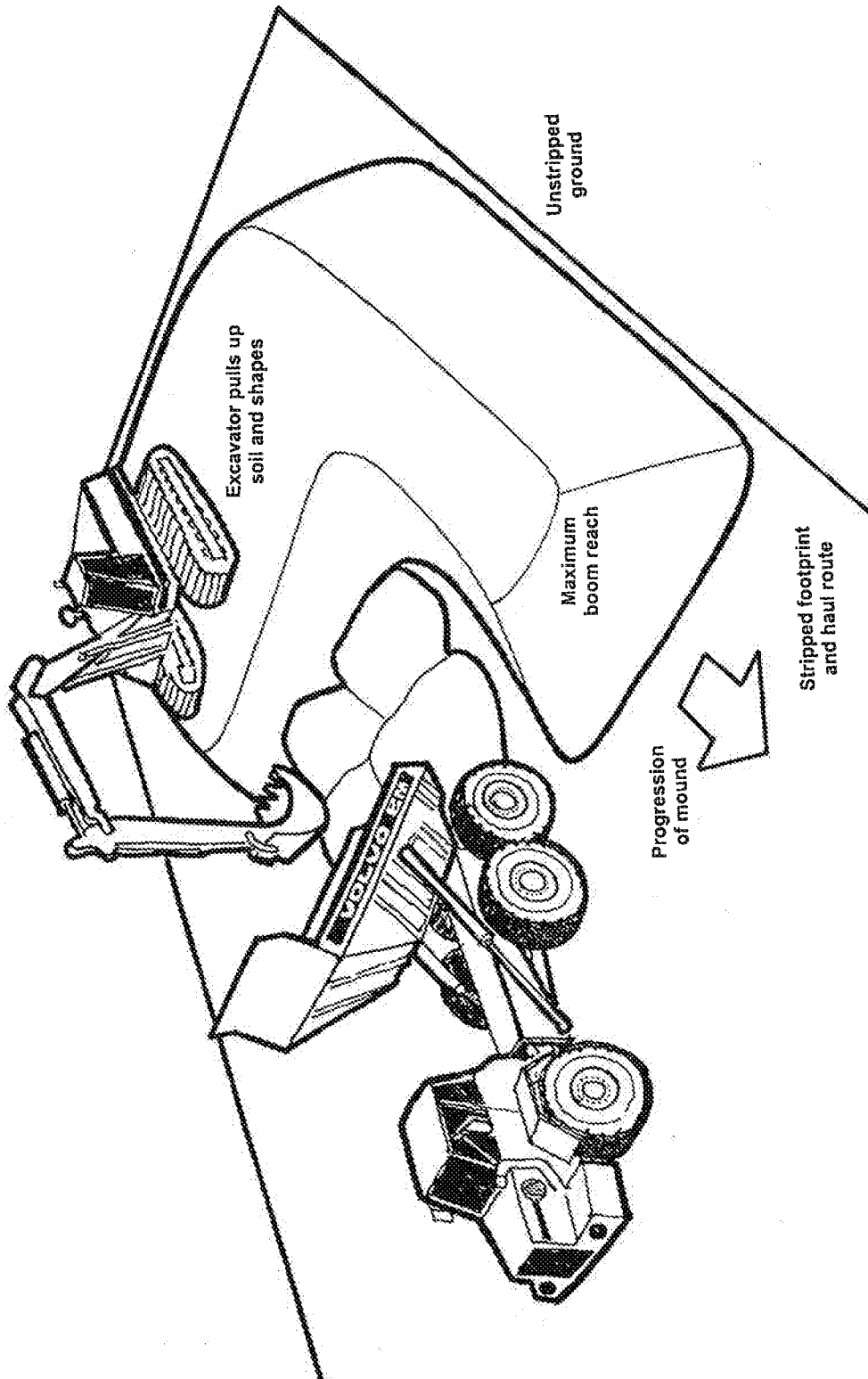
- 2.4 Remove topsoil and subsoil to basal layer from the haul routes, footprint of the storage mound and any other operating area in advance; adopting the practices outlined in Sheet 1. These soils should be stored in their respective mounds.
- 2.5 The dump trucks must only travel within the haul route and operational areas. The trucks should enter the storage area, reverse and back-tip the soil load starting at the furthest point of the mound from the point of access. The back-acting excavator pulls up the soil into a mound of the required dimensions. The excavator operates by standing on the mound (Figure 2.1). The excavator bucket can be used to shape and firm the sides as the mound is progressively formed to promote the shedding of rain; particularly at the end of each day, but also on the onset of rain during the day. This should include any exposed incomplete surfaces.
- 2.6 The process is repeated with the tipping of soil against the forming mound, and without wheels traversing onto previously tipped material. The operation continues progressively along the main axis of the mound.
- 2.7 Without the trucks rising onto the soil mound, the maximum possible height is related to the boom reach of the excavator (typically 3-4m).
- 2.8 To raise the mound higher, the trucks will have to travel on the upper surface of the mounded soils. In this case the mound should be raised to its maximum height (Figure 2.2). A ramp will have to be provided for the trucks to rise onto the surface of the first tier, which should be capable of trafficking without difficulty. The next tier would be formed repeating the process described above. If further tiers are required, the process would be repeated.
- 2.9 Any exposed edges/surfaces should be shaped using the excavator bucket on the onset of rain during the day. All surfaces should be shaped to shed water

at the end of the day. The final outer surface should be progressively shaped using the excavator bucket to promote the shedding of rain.

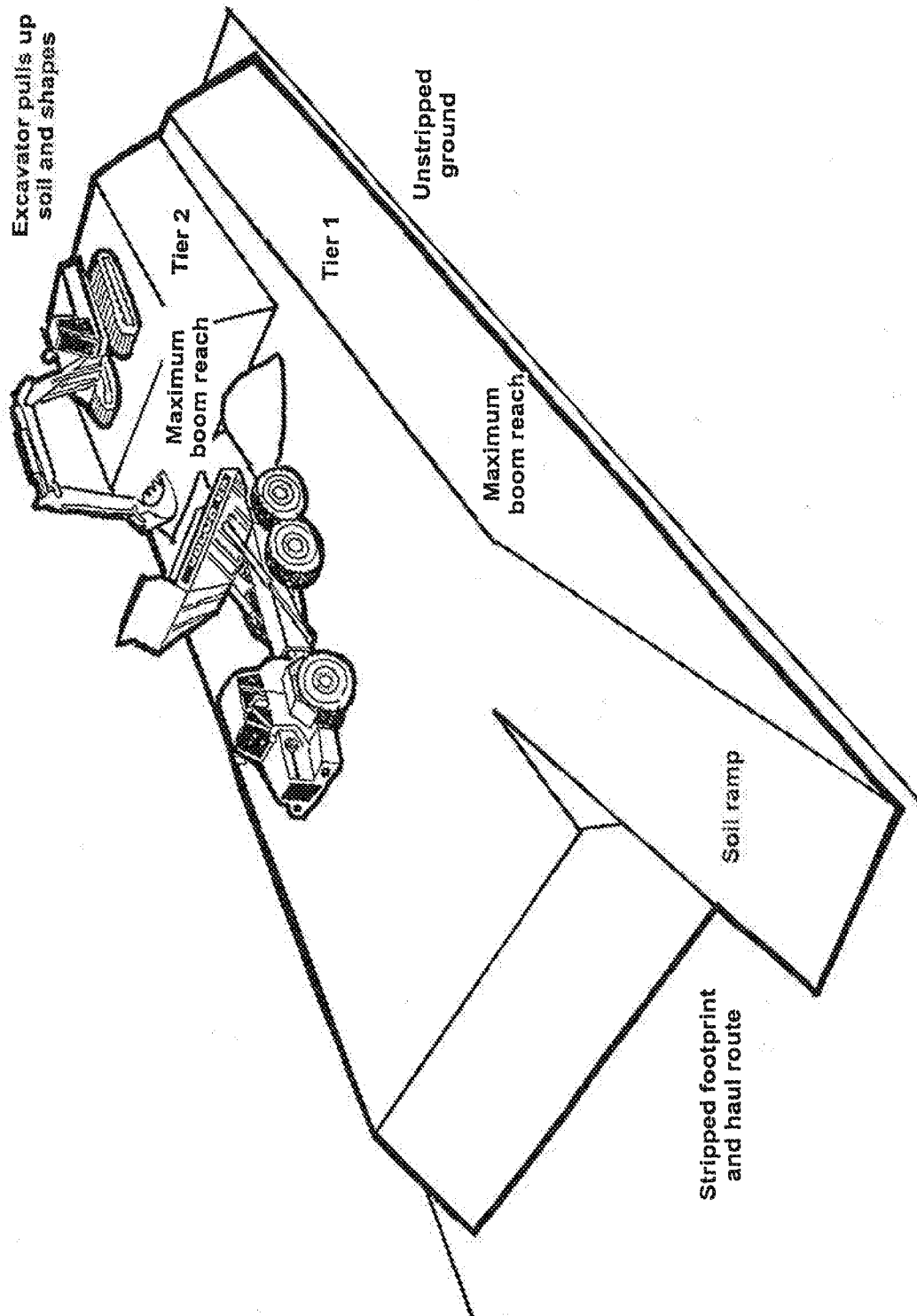
- 2.10 Work should stop in wet conditions with measures undertaken to prevent ponding at the base of the mound and on the basal layer. At the start of each day ensure there is no ponding on the basal layers and operating areas.

#### Operational Variations

- 2.11 If front loading machines are to be used to excavate multi-tier mounds (Sheet 3), then the compacted inter-tier layer must be sequentially decompacted at the building stage by the method described in Sheet 18.



**Figure 2.1 Soil storage mound construction with excavators and dump trucks:**  
**Single tier mound**



**Figure 2.2 Soil storage mound construction with excavators and dump trucks:  
Multi-tier mound**

**SHEET 2**

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## **GOOD PRACTICE GUIDE FOR HANDLING SOILS**

### **Sheet 3:**

### **Excavation of Soil Storage Mounds with Excavators and Dump Trucks**

**Issued by the Farming and Rural Conservation Agency, Cambridge**

**April 2000**

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## MAFF FOREWORD

Standards of restoration of minerals and waste sites have steadily improved in recent years, with operators increasingly aware of their environmental responsibilities. The industry is putting forward more imaginative restoration concepts to a variety of afteruses, and is more aware than ever that it will be judged on the standard of that restoration, and the sustainability of the development.

Sustainable mineral development means balancing economic, environmental and social needs, whilst using resources wisely. The UK Strategy for Sustainable Development recognises the importance of safeguarding agricultural land to meet the needs of future generations, and minimising the loss of soils to new development\*.

Improved restoration standards have sometimes enabled planning permission to be given for best and most versatile agricultural land to be worked for minerals, on the basis that it can be restored in a way that safeguards its long-term agricultural potential\*\*. Inherent in these high standards of restoration is the requirement to handle soils in such a way that damage to their structure is minimised. It is the aim of this Guide to provide comprehensive advice on soil handling "Good Practice" to operators, soil moving contractors, consultants and planning authorities.

The Guide is in the form of 15 Sheets giving advice on soil stripping, the forming and taking down of soil storage mounds, and soil replacement operations using excavators, earth scrapers or bulldozers. There are also four Guidance Sheets on remedial works involving the removal of stones and damaging materials, and decompaction during the replacement operations.

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### Acknowledgements

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### **SHEET 3      EXCAVATION OF SOIL STORAGE MOUNDS WITH EXCAVATORS & DUMP TRUCKS**

The purpose of this Guidance Sheet is to provide a model method for best practice where excavators and dump trucks are used to excavate soil storage mounds. This Guidance Sheet comprises 4 pages of text, 3 figures and a user response form.

The model may need to be modified according to site conditions or requirements of the Planning Authority. Where this is the case, deviation from the model should be recorded with reasons. The guidance does not specify the type, size or model of equipment, but this should have been agreed as part of the planning conditions or as a reserved matter. The machines should be of a kind which will cause the minimum compaction whilst being operationally efficient (eg wide tracked), and must be well maintained at all times.

Persons involved in the handling of soils, overburden etc., and in the construction or removal of mounds or tips, must comply with the Health and Safety at Work Etc. Act 1974 and its relevant statutory provisions, and in particular those aspects which relate to the construction and removal of tips, mounds and similar structures. This requirement takes preference over any suggested practice in the Sheets.

The user of these guidelines is solely responsible for all liabilities that might arise. No liabilities are accepted for any losses of any kind arising from the use of this guidance.

This soil handling method uses back-acting excavators to load the soil in to dump trucks (articulated or rigid bodied) for transport to the replacement areas.

The soil handling method can affect the agricultural quality of the restoration through severe soil deformation (compression and smearing). This is primarily caused through trafficking, the effects of which increases with increasing soil wetness.

The advantage of this model method, if correctly carried out, is that it should avoid severe deformation of the soil as trafficking is minimised. However, where the soil has been stored in multi-tier mounds there will be a need for decompaction treatment during the excavation operation (see below and Sheet 18).

The key operational points to ensure avoidance of severe soil deformation are as follows:

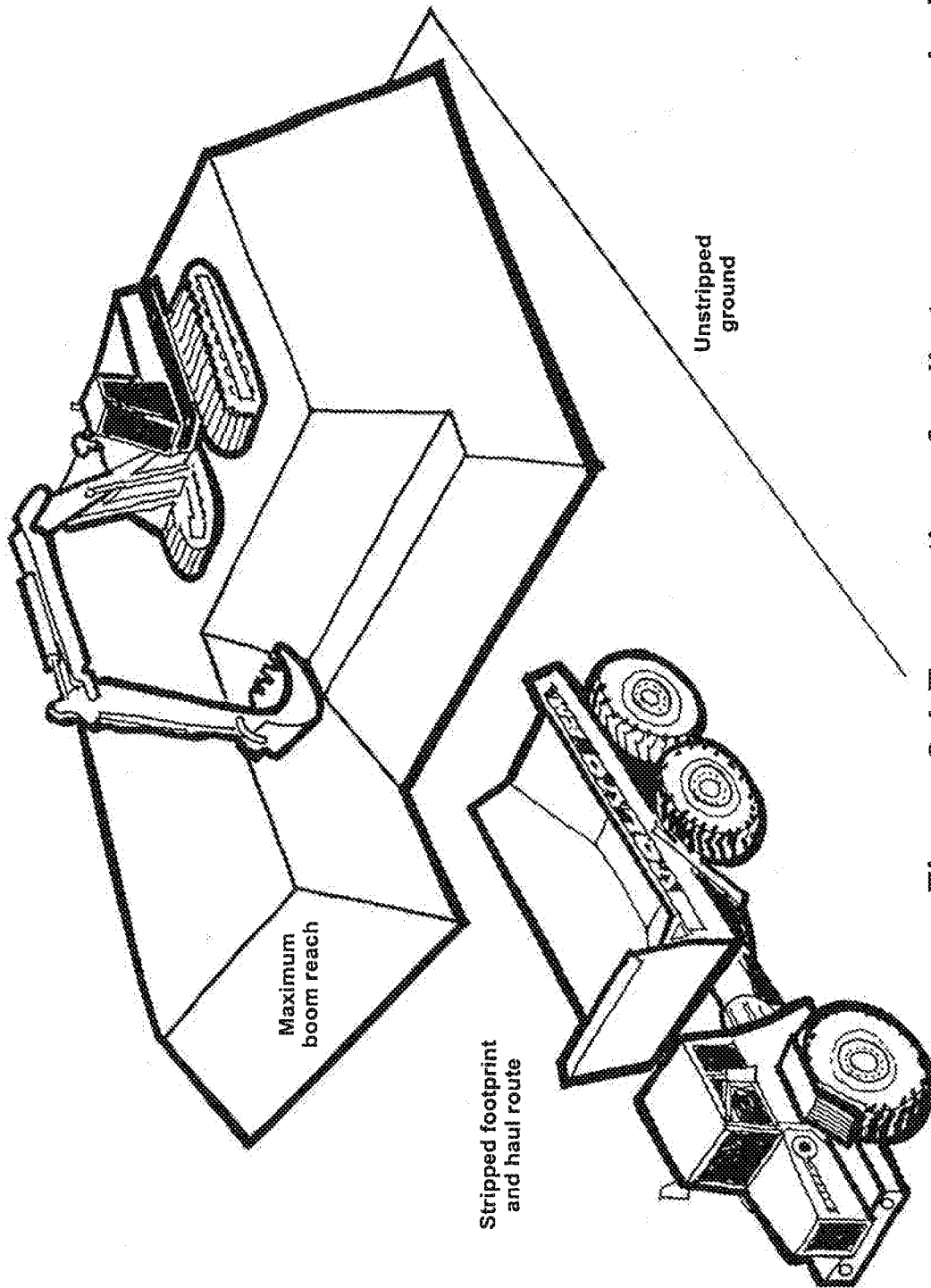
- (i) To minimise compaction:
  - the dump trucks must only operate on the 'basal'/non-soil layer, and their wheels must not on any circumstances run on to the soil in store.
  - the excavator should only operate on the soil mound.
  - the machines are to only work when ground conditions enable their maximum operating efficiency.
  - when excavating the multi-tier mounds, excavate tier by tier starting with the uppermost, trafficking is to be confined to the upper surface of the next tier.
  - if compaction has been caused then measures are required to treat it before it is loaded into the trucks (see below and Sheet 18).
- (ii) To minimise soil wetness and rewetting:
  - the mound should be shaped to shed water before rainfall occurs and whenever replacement is suspended.
  - measures are required to protect the face of the soil layer from ponding of water and maintain the basal layer in a condition capable of supporting dump trucks.

## The Excavation Operation

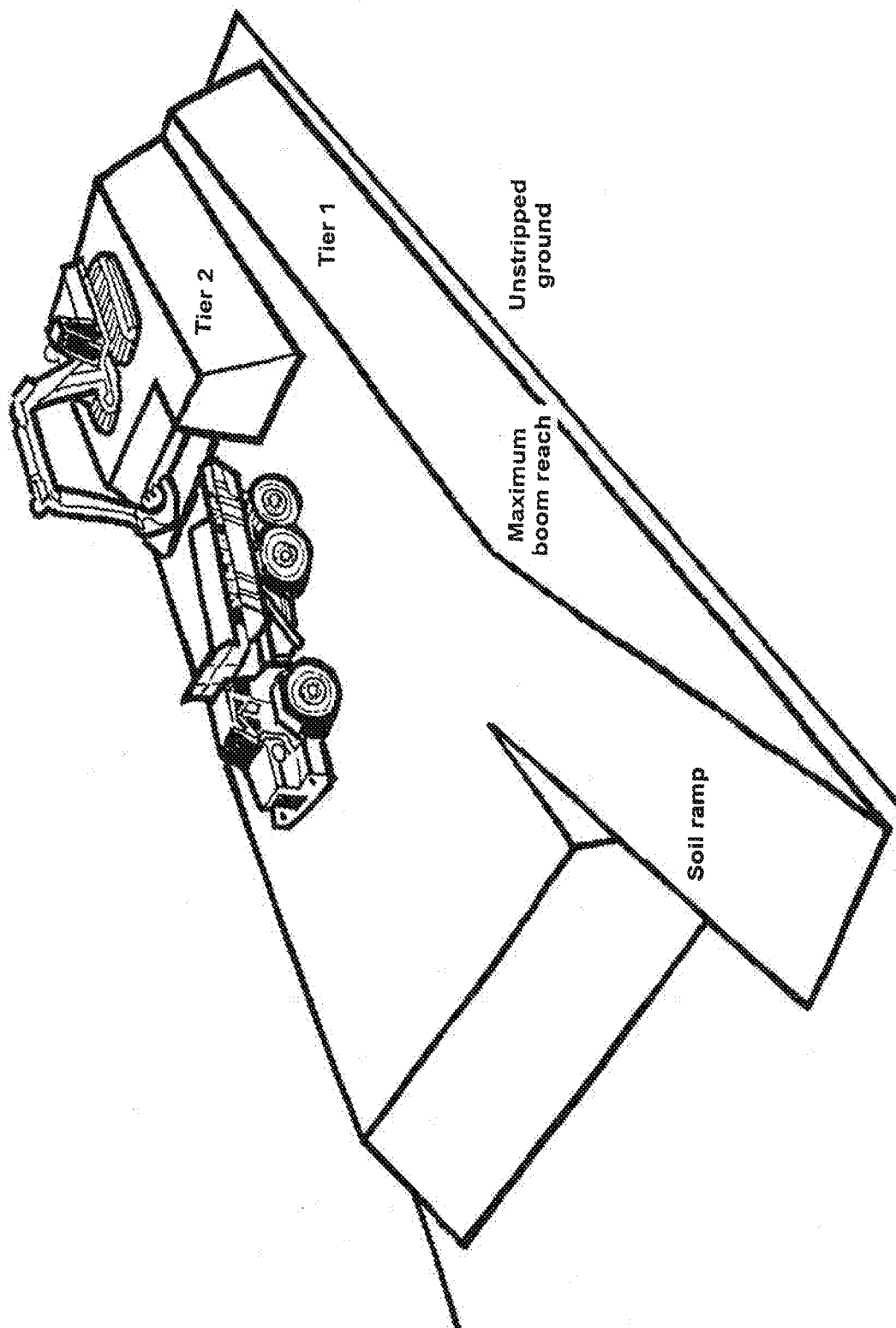
- 3.1 The dump trucks are to travel only on haul routes and in operational area, and both must be maintained. In the case of single tier mounds they must only operate on the basal layer. Detailed daily records should be kept of operations undertaken, and site and soil conditions.
- 3.2 The trucks should enter the storage area and draw alongside the active excavation face. If back-acting excavators are used, they will need to stand on top of the mound to load trucks (Figure 3.1). The mound is to be dug to the base before moving progressively back along its axis.
- 3.3 With multi-tier mounds, the soil should be excavated tier by tier starting with the uppermost tier. This will necessitate the running of the trucks on the stored soil. Excavation should be in the same height of tiers as originally built so that the same surfaces are used for trafficking to minimise further compaction (Figure 3.2). Having removed an upper tier the trafficked layer must be decompacted. This can be achieved by progressively digging the surface as described on Sheet 18 in advance of loading the next layer. It is essential that the digging is effective and this needs to be systematically tested before soil is loaded. The process is repeated for each soil tier.
- 3.4 Any exposed edges/surfaces should be shaped on the onset of rain during the day. All surfaces should be shaped to shed water at the end of each day.
- 3.5 Work should stop in wet conditions with measures undertaken to prevent ponding at the base of the mound and on the basal layer. At the start of each day ensure there is no ponding on the basal layer and operating areas.

### Operational Variations

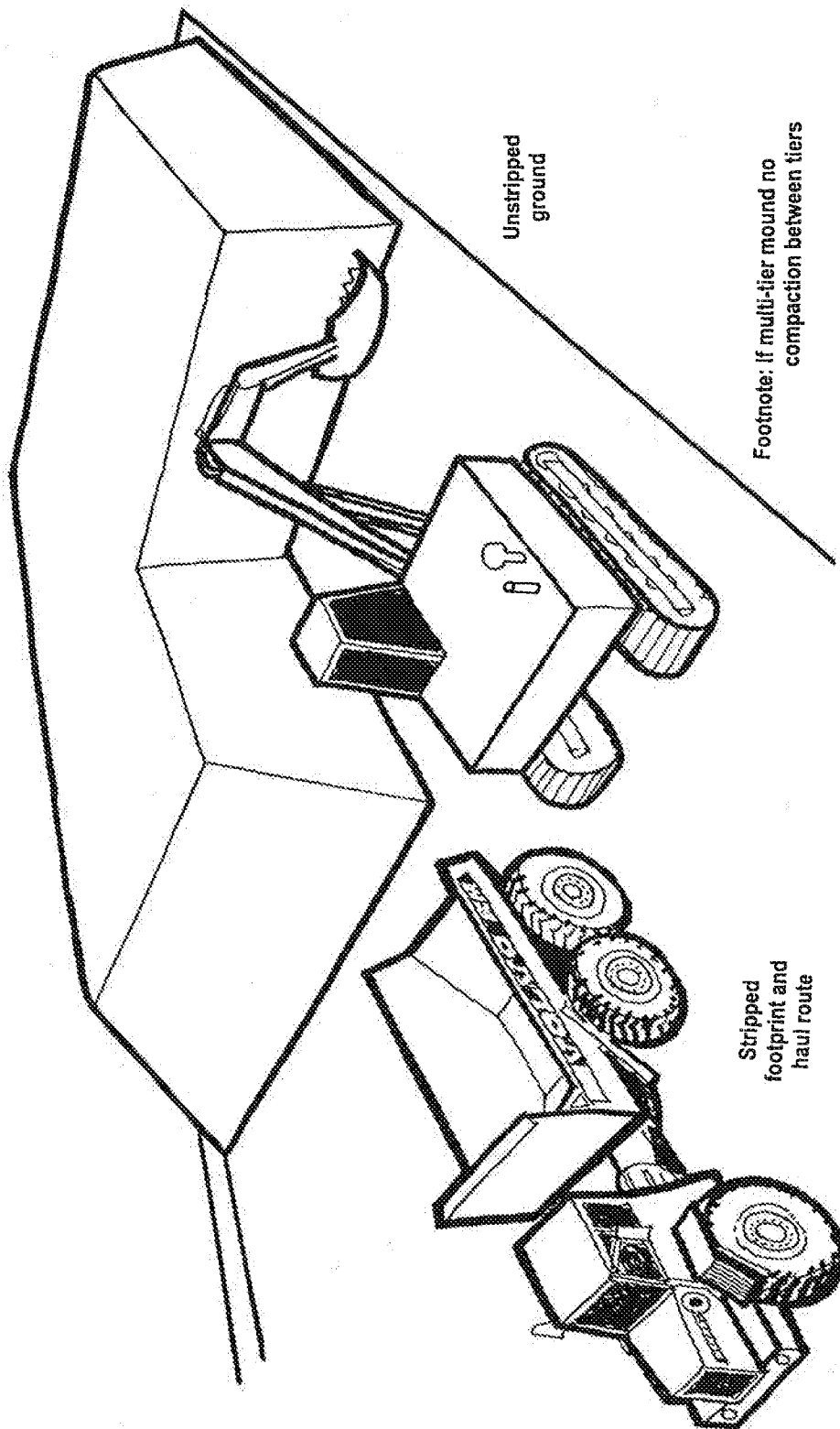
- 3.6 Front loading machines may be used to excavate single tier soil mounds provided that they only operate on the basal layer with the dump trucks (Figure 3.3).
- 3.7 Front loading machines are only to be used for multi-tier mounds if the compacted inter-tier layer has been decompacted at the building stage.



**Figure 3.1 Excavation of soil storage mound with  
excavators and dump trucks:  
Single tier mound**



**Figure 3.2 Excavation of soil storage mound with  
excavators and dump trucks:  
Multi-tier mounds**



Footnote: If multi-tier mound no compaction between tiers

**Figure 3.3 Excavation of soil storage mounds with front loading shovels and dump trucks: Single and multi-tier mounds**

### SHEET 3

Version: 04/00

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## **GOOD PRACTICE GUIDE FOR HANDLING SOILS**

### **Sheet 4:**

### **Soil Replacement with Excavators and Dump Trucks**

**Issued by the Farming and Rural Conservation Agency, Cambridge**

**April 2000**

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## MAFF FOREWORD

Standards of restoration of minerals and waste sites have steadily improved in recent years, with operators increasingly aware of their environmental responsibilities. The industry is putting forward more imaginative restoration concepts to a variety of afteruses, and is more aware than ever that it will be judged on the standard of that restoration, and the sustainability of the development.

Sustainable mineral development means balancing economic, environmental and social needs, whilst using resources wisely. The UK Strategy for Sustainable Development recognises the importance of safeguarding agricultural land to meet the needs of future generations, and minimising the loss of soils to new development\*.

Improved restoration standards have sometimes enabled planning permission to be given for best and most versatile agricultural land to be worked for minerals, on the basis that it can be restored in a way that safeguards its long-term agricultural potential\*\*. Inherent in these high standards of restoration is the requirement to handle soils in such a way that damage to their structure is minimised. It is the aim of this Guide to provide comprehensive advice on soil handling "Good Practice" to operators, soil moving contractors, consultants and planning authorities.

The Guide is in the form of 15 Sheets giving advice on soil stripping, the forming and taking down of soil storage mounds, and soil replacement operations using excavators, earth scrapers or bulldozers. There are also four Guidance Sheets on remedial works involving the removal of stones and damaging materials, and decompaction during the replacement operations.

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### Acknowledgements

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## **SHEET 4     SOIL REPLACEMENT WITH EXCAVATOR & DUMP TRUCK**

The purpose of this Guidance Sheet is to provide a model method for best practice where soils are to be replaced by excavators and dump trucks. This Guidance Sheet comprises 7 pages of text, 4 figures and a user response form.

The model may need to be modified according to site conditions or requirements of the Planning Authority. Where this is the case, deviation from the model should be recorded with reasons. The guidance does not specify the type, size or model of equipment, but this should have been agreed as part of the planning conditions or as a reserved matter. The machines should be of a kind which will cause the minimum compaction whilst being operationally efficient (eg wide tracked), and must be well maintained at all times.

Persons involved in the handling of soils, overburden etc., and in the construction or removal of mounds or tips, must comply with the Health and Safety at Work Etc. Act 1974 and its relevant statutory provisions, and in particular those aspects which relate to the construction and removal of tips, mounds and similar structures. This requirement takes preference over any suggested practice in the Sheets.

The user of these guidelines is solely responsible for all liabilities that might arise. No liabilities are accepted for any losses of any kind arising from the use of this guidance.

This soil handling method uses back-acting excavators in combination with dump trucks (articulated or rigid bodied). An excavator is used to spread the soil tipped from dump trucks used for transportation to replacement areas.

The soil handling method can affect the agricultural quality of the restoration through severe soil deformation (compression and smearing). This is primarily caused through trafficking, the effects of which increases with increasing soil wetness.

The advantage of this model method, if correctly carried out, is that it should avoid severe deformation of the soil as trafficking is minimised. Consequently, there should normally be no need for decompaction treatment during the replacement operation, unless the soils are in a compacted state following stripping or storage. Where compaction occurs at replacement this will need treatment during the replacement process. Also where required, it will be necessary to integrate the removal of stones or damaging materials with the replacement process. Both decompaction and removal of materials are covered in separate Guidance Sheets (16-19).

The early installation of under drainage is strongly recommended. Where required this should either be undertaken sequentially during the replacement of the soils or in the early aftercare period. Until drains are installed it is recommended that the restored land is sown and managed as grassland.

The key operational points to ensure avoidance of severe soil deformation are as follows:

- (i) To minimise compaction:
  - the dump trucks must only operate on the 'basal'/non-soil layer, and their wheels must not on any circumstances run on to the soil layer(s).
  - the excavator must only operate on the basal layer.
  - the adoption of a bed/strip system avoids the need for the trucks and excavator to travel on the soil layers.
  - the machines are to only work when ground conditions enable their maximum operating efficiency.
  - if compaction has been caused, then measures are required to treat it (see Sheets 18 & 19).

- (ii) To minimise soil wetness and rewetting:
- the bed/strip system provides a basis to regulate the exposure of lower soil layers to periods of rain and a means of maintaining soil moisture contents. The soil profile within the active strip should be completed to the topsoil layer before rainfall occurs and before replacement is suspended.
  - measures are required to protect the face of the soil layer from ponding of water and maintain the basal layer in a condition capable of supporting dump trucks.

#### The Replacement Operation

- 4.1 The area to be restored is to be protected from in-flow of water, ponding etc. Wet sites must be drained in advance. Before the operation starts the basal layer should be to level and clean.
- 4.2 Prior to commencing operations a Meteorological Office forecast should be obtained which gives reasonable confidence of soil replacement proceeding without interruptions from rainfall events. If significant rainfall occurs during operations, the replacement must be suspended, and where the soil profile has been started it should be replaced to topsoil level. Replacement must not restart unless the weather forecast is expected to be dry for at least a full day.
- 4.3 All machines must be in a safe and efficient working condition at all times. The machines are to only work when ground conditions enable their maximum operating efficiency. The operation should only be carried out when the basal layer supports the machinery without ruts or is capable of repair/maintenance. The operation is to be suspended before traction becomes a problem or the integrity of the basal layer and haul routes fails.

- 4.4 The operation should follow a detailed replacement plan showing soil units to be replaced, haul routes and the phasing of vehicle movements. The soil units should be defined on the site with information to distinguish types and layers, and thickness. Detailed daily records should be kept of operations undertaken (including the removal of stones and other damaging materials, and the results of any assessment of the need for additional decompaction and effectiveness of decompaction work undertaken), and site and soil conditions.
- 4.5 The excavator and dump trucks are only to stand, work and travel on the basal/formation layer.
- 4.6 The soil layers above the base/formation layer are to be replaced in sequential strips with the subsoil layer(s) replaced first, followed by the topsoil layer; each layer being replaced to the specified thickness. The next strip is not to be started until the profile in the current strip is completed. This is often referred to as the 'bed or strip system'. The system involves the progressive sequential laying of the materials in strips across the area to be restored (Figure 4.1).
- 4.7 The initial strip width and axis is to be demarcated. Strip width is determined by excavator boom length less the stand-off to operate; typically about 5-8m. Effective boom length can also reduce with profile heights greater than 1m; at 1.5m the effective reach of the standard boom may result in only 2m wide strips. A wide bucket with a blade and not teeth should be used to spread the soil.
- 4.8 Reverse dump truck up to edge of the current strip and tip the lowest layer (subsoil) soil, without the wheels riding onto the strip (Figure 4.1). The dump truck should not drive away until all the soil is deposited within the strip without spillage over the basal layer; this may require assistance from the excavator to 'dig away' some of the tipped soil (Figure 4.2). The excavator is to spread the tipped soil to full thickness by digging, and the pushing and

pulling action of bucket. Each load of soil should be spread following tipping, before another is tipped. Should the spread soil comprise of large blocks (>300mm), normally these should be broken down by using the excavator bucket to 'slice' the blocks into smaller pieces (see Sheet 18) before the next load is spread. The process is repeated from left to right until the strip is completely covered with the required depth of the soil layer (Figure 4.3). Alternatively, decompaction by ripping should be undertaken once the strip is complete (see Sheet 19). Decompaction work must be completed before the next soil layer is placed.

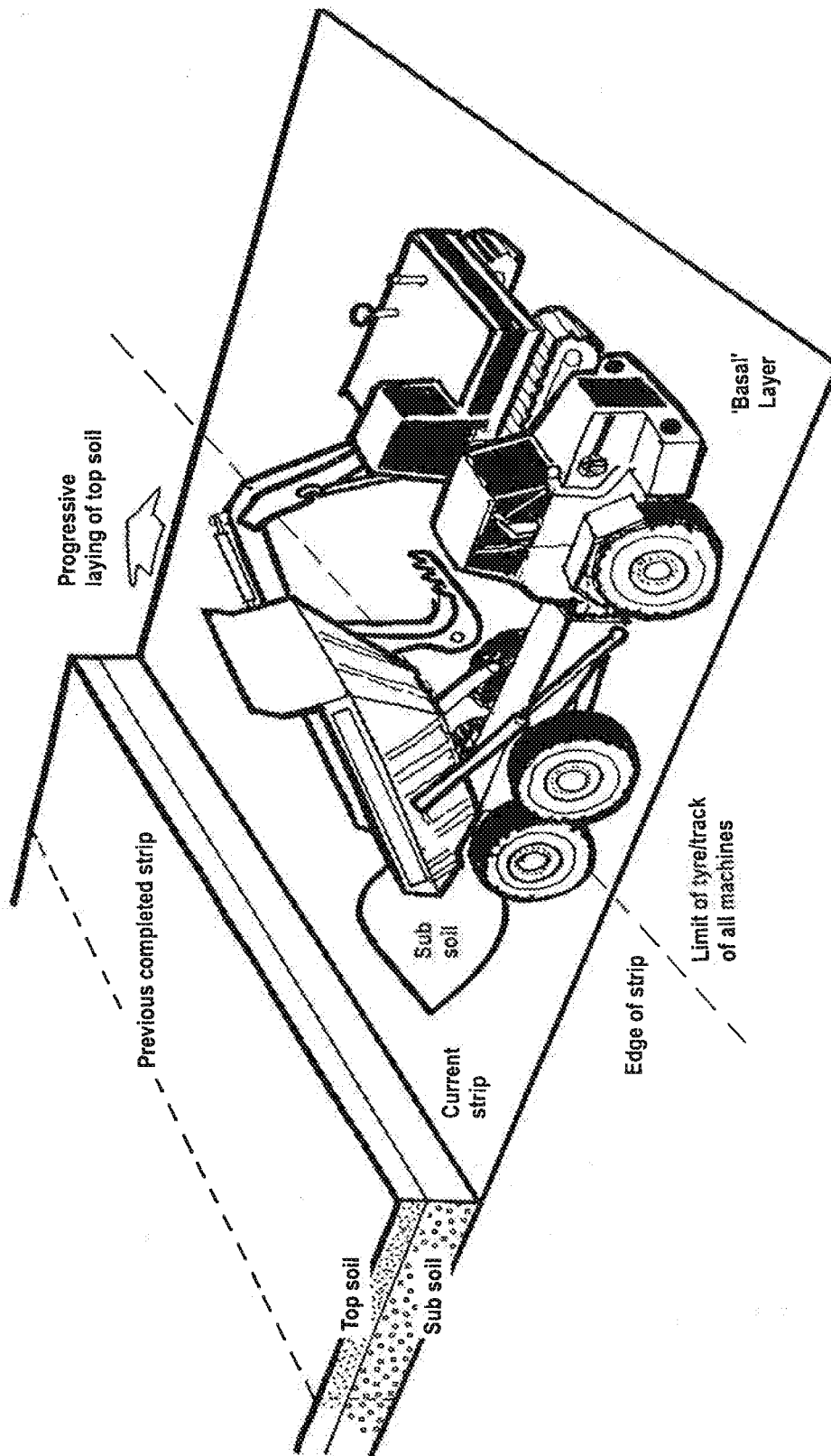
- 4.9 Level boards and soil pits should be used to verify soil thickness in each strip and overall levels. Allowances (ie. a bulking factor) should be made for any settlement that may take place of the replaced loose soil.
- 4.10 Where stones are to be removed as part of the replacement process, normally the method described in Sheet 16 should be used once the strip is complete. An alternative method and one suited to removing potentially damaging materials (eg wire ropes) is described in Sheet 17. These operations must be completed before the next soil layer is placed.
- 4.11 On completion of the lowest (subsoil) layer, repeat the process spreading the next layer (subsoil/topsoil) (Figure 4.4). Tip the soil by reversing to the outer edge of strip/soil previously laid, but without the truck wheels riding onto the already placed layer. The soil is to be spread by the excavator to full thickness by digging, and the pushing and pulling action of bucket described above, and undertaking any necessary decompaction work and removal of stones if using Sheets 16 to 19. Repeat the process progressively (left to right) along the strip and undertake any removal of damaging materials or decompaction. Level boards should be used to verify soil thickness in strip and overall levels.
- 4.12 Where the profile is made up of further soil layers (subsoil/topsoil) the process outlined above should be repeated on completion of the strip.

- 4.13 On completion of topsoil layer the processes outlined above should be repeated for the next strips until the area to be restored is completed. Before the operation starts the basal layer should be to level and clean.
- 4.14 At the end of each day the current strip must be completed if rain is forecast. If during a day it is evident that a full strip cannot be completed, then only start part of a strip; this too must be completed.
- 4.15 At the end of each day, or during the day if interrupted by rain, make provisions to protect base of restored strip from ponding/runoff by sumps and grips, and also clean and level the basal layer. At the start of each day ensure there is no ponding in the current strip or operating areas, and the basal layer is to level with no ruts.

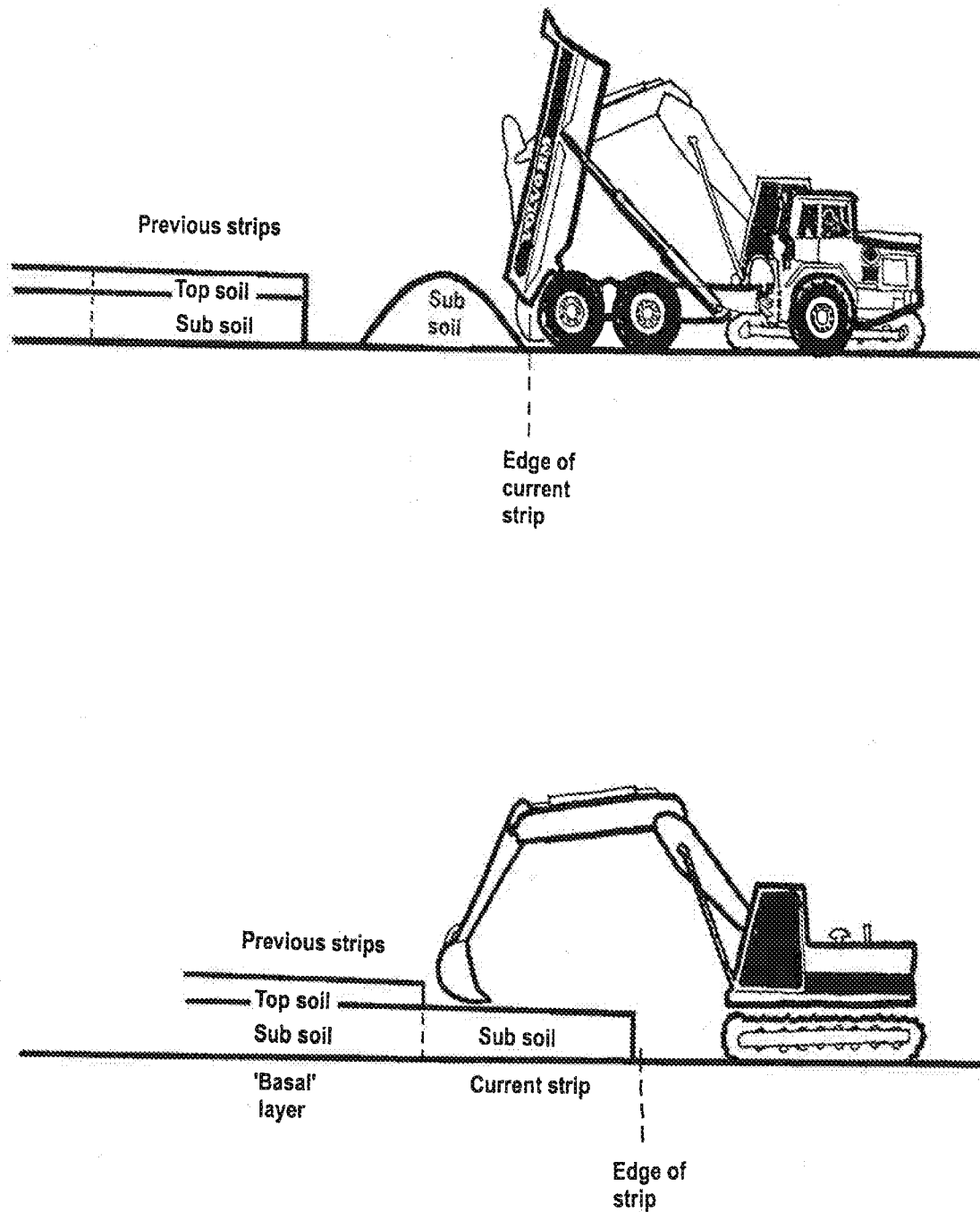
#### Operational Variations

- 4.16 When the replaced soil profiles reach about 0.6-1m in height it may not be possible to discharge the load from some dump trucks directly onto the previously placed layers because of the height of the dump truck body. The preferred solution is to tip the soil against the partially completed profile as heaps without the dump trucks rising onto or reversing into the placed material. The soil material is then lifted by the excavator onto the profile. It is considered preferable to accept some limited soil losses rather than to contaminate the topsoil with overburden. The loss of topsoil is minimised if the basal/ formation layer is kept to level and clean.
- 4.16 If the basal/formation layer is to be decompacted, before any soil material is placed, each strip is to be firstly decompacted before the subsoil layer is replaced using either methods described in Sheets 18 or 19. The basal layer must only be decompacted in the strip required for soil replacement, and must

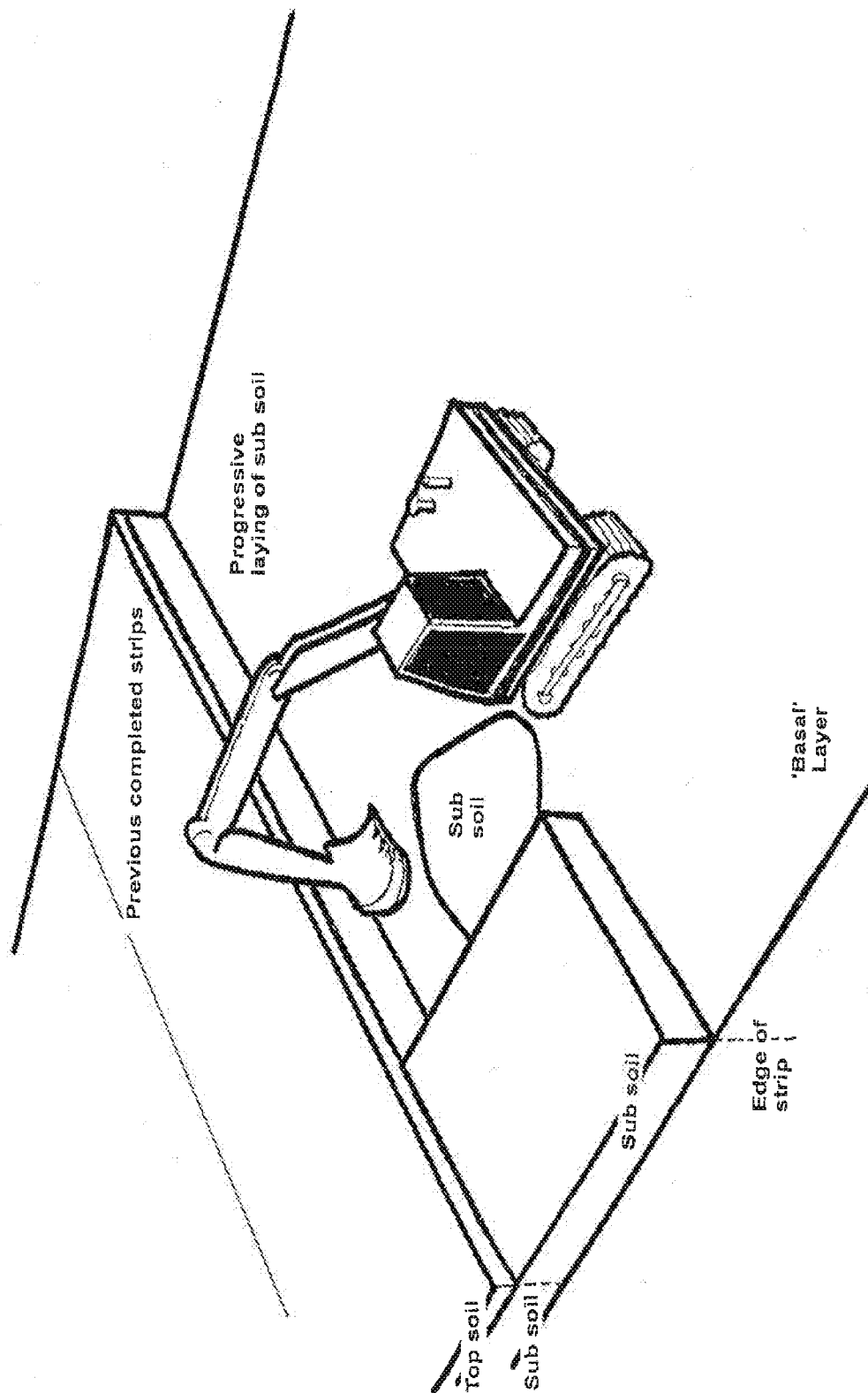
only be prepared on the day of soil placement. During this process it may be necessary to use Sheets 16 or 17 for the removal of stones or damaging materials from the decompacted basal layer.



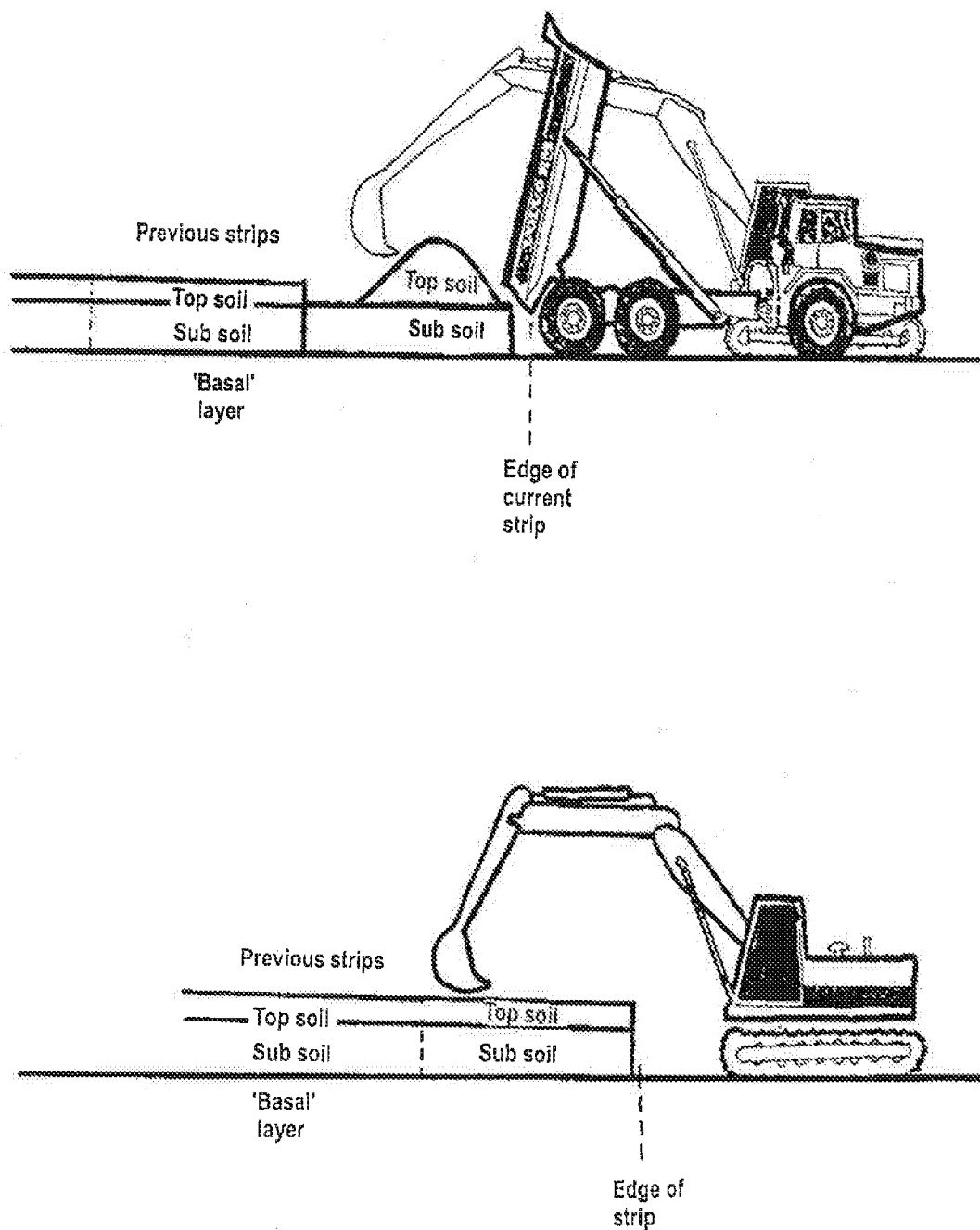
**Figure 4.1 Soil replacement with excavators and dump trucks:  
Sub soil layer**



**Figure 4.2 Soil replacement with  
excavators - dump trucks  
Sub soil layer**



**Figure 4.3 Soil replacement with excavators and dump trucks:**  
**Sub soil progressively laid**



**Figure 4.4 Soil replacement with excavators and dump trucks:**  
**Top soil layer**

## SHEET 4

Version: 04/00

### FEEDBACK

It would be most helpful in assessing access to this Guidance, the use made of it and its further development if the following could be completed and returned to the FRCA:

Organisation   
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Is the Guidance to be used generally or for specific site/works?

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If specific site – please identify

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How was the Guidance obtained?

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When was the Guidance obtained?

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Please provide any helpful comment/experience which may benefit the Guidance (use additional sheets if necessary)

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