UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

Former Kempston Hardwick Brickworks and adjoining land, Bedford

Appendix I – Soil Management Plan

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UNIVERSAL DESTINATIONS & EXPERIENCES

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1 INTRODUCTION

1.1.1. This Soil Management Plan sets out the soil-management measures relevant to the CEMP Works within the CEMP Land, including stripping methods, handling, segregation, stockpiling and any temporary soil treatment associated with the CEMP Works.

1.1.2. This Appendix is limited to soil-management matters only. It does not set out controls relating to retained vegetation, protected habitats, ecological exclusion zones, tree and hedgerow protection, public safety, haul-route control, or wider earthworks / logistics management, which are addressed separately in the CEMP Main Body and the relevant ecological / traffic / plant / layout appendices and submissions.

1.1.3. Matters relating to geotechnical and geo-environmental issues, management of waste soils, contamination controls and public safety are outside the scope of this Appendix and are addressed elsewhere in the CEMP Main Body.

2 SITE SOIL RESOURCES

2.1 GENERAL

2.1.1. There are 3 soil profiles on the Order Land:

- Soil Profile 1: Topsoil 1 over Subsoil 1 – comprising heavy textured, non-calcareous soils;
- Soil Profile 2: Topsoil 2 over Subsoil 2 – comprising medium textured, non-calcareous soils; and
- Soil Profile 3: Subsoil 3 – no topsoil, just heavy textured, very calcareous subsoil.

2.1.2. Where the soils are to be stripped, the topsoils and subsoils should be stripped/excavated and stored separately from each other.

2.2 SITE TOPSOILS

2.2.1. Topsoil 1 was found to have the following characteristics:

- Heavy (clay dominant) soil texture;
- Low stone content, including occasional stones up to 250mm in size;
- Poor to moderately developed soil structure;
- Slightly acid to alkaline soil reaction;
- Non-calcareous; and
- Non-saline.

2.2.2. As Topsoil 1 is susceptible to structural damage, handling and storage will be managed to prevent further degradation and support recovery prior to reuse (see **Section 6**).

2.2.3. Topsoil 2 was characterised as:

- Medium soil texture;
- Low stone content, including occasional stones up to 80mm in size;
- Moderately developed soil structure;
- Slightly acid to slightly alkaline soil reaction;
- Non-calcareous; and
- Non-saline.

2.2.4. Topsoil 2 will be handled and stored to maintain its structure and prevent cross-contamination (see **Section 6**). Laboratory testing indicates variability in organic matter and/or major nutrient status across sampled areas.

2.2.5. Topsoil for re-use shall be tested and stored separate to the remaining surplus topsoil. Due to the volumes of surplus topsoil, the long-term strategy will be to remove surplus topsoil off CEMP Land over the course of the CEMP Works.

2.3 SITE SUBSOIL

2.3.1. Subsoil 1 and Subsoil 3 both have a heavy (clay-dominant) soil texture with moderately developed structures and alkaline to strongly alkaline soil reactions. This soil type is moisture retentive, slow draining and any damage to the structure of this soil (e.g. by compaction) will further reduce its drainage potential.

2.3.2. Subsoil 1 is non-calcareous whereas Subsoil 3 is moderate to very calcareous. Subsoil 2 is medium in texture with a moderately developed structure and slightly alkaline to strongly alkaline soil reaction.

2.3.3. Following CEMP Works, any areas of soil that have been compacted by trafficking or handling will be loosened as required (e.g. by ripping/subsoiling) as part of ground preparation prior to reuse or stabilisation of soils within the CEMP Land.

3 SOIL SUITABILITY

3.1.1. No permanent planting or landscape reinstatement forms part of the CEMP Works. Accordingly, this Appendix does not set out planting-environment or habitat-establishment requirements, which will be addressed through future endorsed submissions where relevant.

4 IMPACTS ON SOILS BY CONSTRUCTION ACTIVITIES

4.1 DEGRADATION OF SOILS

4.1.1. Soil is a vulnerable and non-renewable resource and therefore care must be taken throughout all handling, transporting, stockpiling, cultivating and planting activities to ensure that the soil resources of the CEMP land are protected and conserved. The CEMP land soils are clay-based and are particularly vulnerable to physical degradation during intensive CEMP Works activities such as stripping, storage and respreading.

4.1.2. Soils with damaged structures display reduced aeration and drainage characteristics and increased risk of waterlogging and anaerobism (oxygen depletion).

4.2 THE POTENTIAL IMPACTS OF SOIL DEGRADATION

4.2.1. CEMP Works activities have the potential to damage soils. These include soil compaction caused by trafficking of plant or vehicles, mixing different qualities of soil during handling and storage, including subsoil with topsoil.

4.2.2. Failure to protect soils when in-situ and during intensive soil handling (stripping, storage and reinstatement of soil profiles after the CEMP Works phase) can lead to their degradation with negative environmental impacts both within and outside CEMP land, such as:

- Soil erosion;
- Loss of soil carbon;
- Loss of soil organic matter leading to loss of nutrients and a decline in soil fertility;
- Soil compaction leading to loss of soil structure and permeability to water (waterlogging) and restricted aeration and rooting potential;
- Loss of soil biological activity;
- Poor re-establishment of vegetation; and
- Visual impact of slope failure or soil erosion (bare soil surfaces).

4.2.3. Measures are provided in this Soil Management Plan to ensure, as far as is practicable, that the soils may be stripped, handled and stored appropriately to retain and improve their quality where necessary, so that they can be re-used for future landscape construction purposes.

5 SOIL MANAGEMENT PRACTICES

5.1 OUTLINE SOIL MANAGEMENT MEASURES

5.1.1. This section highlights the necessary measures to protect in-situ soils prior to soil handling, as well as the sequential treatments for the recovery, storage and re-use of the existing topsoil resource in areas where the topsoils will be stripped to maintain, as far as practicable, their soil quality and viability. It also highlights the necessary treatments for new planting in areas where the topsoils are to remain in-situ.

5.2 GENERAL SOIL HANDLING

5.2.1. Soil physical degradation will be avoided during all phases of soil handling (e.g. stripping and storage). Soil handling operations should ideally be carried out when the soil is dry and non-plastic (friable) in consistency.

5.2.2. The soils (topsoils and subsoils) should not be unnecessarily compacted by trampling or trafficking by CEMP Works machinery. If, during the course of the earthworks, the soil is structurally damaged, it should be suitably cultivated to relieve the compaction and restore the structure prior to any planting, seeding or turfing.

5.3 PROTECTION MEASURES FOR SOILS THAT REMAIN IN-SITU

5.3.1. During the CEMP Works, any areas where soils are to remain in-situ will be designated as Soil Protection Areas and protected from unnecessary trafficking, excavation, stockpiling, material storage and plant parking. Soil Protection Areas will be clearly identified on the Contractor's working drawings / site controls and managed so as to minimise avoidable soil compaction and structural damage.

5.3.2. Mobile plant and vehicles will be managed to ensure they do not traffic across these areas and cause damage to the soils.

5.3.3. Controls relating to retained vegetation, tree and hedgerow protection, and ecological exclusion areas are addressed separately through **Section O** of the CEMP Main Body and the relevant ecological / vegetation plans and submissions.

5.4 SURFACE PREPARATION BEFORE SOIL STRIPPING

5.4.1. Where vegetation or other surface material has already been cleared under the relevant ecological, vegetation-removal and arboricultural controls, topsoil stripping will be undertaken so as to minimise the inclusion of non-soil material within the stripped soil resource. Any residual non-soil surface material that would materially affect soil quality will be removed before stripping begins.

5.4.2. This Appendix does not set out vegetation-clearance or retained-vegetation controls, which are addressed separately through **Section O** of the CEMP Main Body and the relevant ecological / vegetation plans and submissions.

5.5 TOPSOIL STRIPPING

5.5.1. Topsoil 1 and Topsoil 2 will be stripped and stored separately and not intermixed.

5.5.2. Stripping should be carried out whilst the soil is non-plastic and stored using the dry method for soil stockpiling (**Figure 5-1**); a non-plastic soil is dry and 'crumbly' in appearance and not wet/overly moist to the touch.

5.5.3. Where sustained heavy rainfall (e.g. >10mm in 24 hours) occurs during topsoil stripping and the soil becomes 'plastic' in consistency, topsoil handling will, where practicable, be suspended until the topsoil has returned to a dry, non-plastic state. If CEMP Works programme constraints require the topsoil strip to be carried out whilst the topsoil is plastic in consistency, the alternative 'wet method' for topsoil stockpiling should be used (**Figure 5-2**). Non-plastic and plastic topsoil should not be stockpiled together.

5.5.4. As a guide to soil plasticity, a representative hand sample will be taken (pick out any stones or roots/vegetation) and will be rolled it into a thin thread (approximately 6mm diameter) between the palms. If the soil can then be rolled into a thread, then the soil will be determined to be too plastic for safe handling and should be stockpiled using the 'wet stockpiling method'.

5.5.5. Any stones, waste or non-topsoil materials (>50mm) should be removed from areas to be stripped prior to topsoil stripping.

5.5.6. Topsoil will be stripped, transported and stockpiled using appropriate plant and vehicles in accordance with the designated working areas and stockpile arrangements for the CEMP Works. Handling will be managed to minimise compaction and cross-contamination, and to maintain segregation between Topsoil 1 and Topsoil 2.

5.5.7. This operation should be monitored to ensure that the topsoil is recovered without the inclusion of other soils (subsoil or made ground) or wastes as cross contamination with other soil could significantly degrade the quality of the topsoil.

5.6 DEPTH OF TOPSOIL STRIP

5.6.1. The depth of strip should be set as per the table below to enable the majority of the topsoil to be recovered without the inclusion of significant quantities of subsoil:

Table 5-1 – Topsoil Strip Depths

Zone	Topsoil 1 Depth of Strip (mm)	Topsoil 2 Depth of Strip (mm)
West Gateway Zone	300	300
Core Zone	300	300

5.6.2. When using an excavator to strip the topsoil, the colour difference between the topsoil and subsoil can be seen by the machine operator carrying out the soil strip to ensure some discretion can be made.

5.7 TOPSOIL STOCKPILE

5.7.1. **Appendix I(1) – Topsoil Phasing Plan** shows the topsoil phasing strategy.

5.7.2. Once stripped, Topsoil 1 and Topsoil 2 will be stored separately until they are required for landscape purposes and not intermixed. It may be beneficial to sign post each stockpile, stating which topsoil it contains, to help reduce the risk of cross contamination.

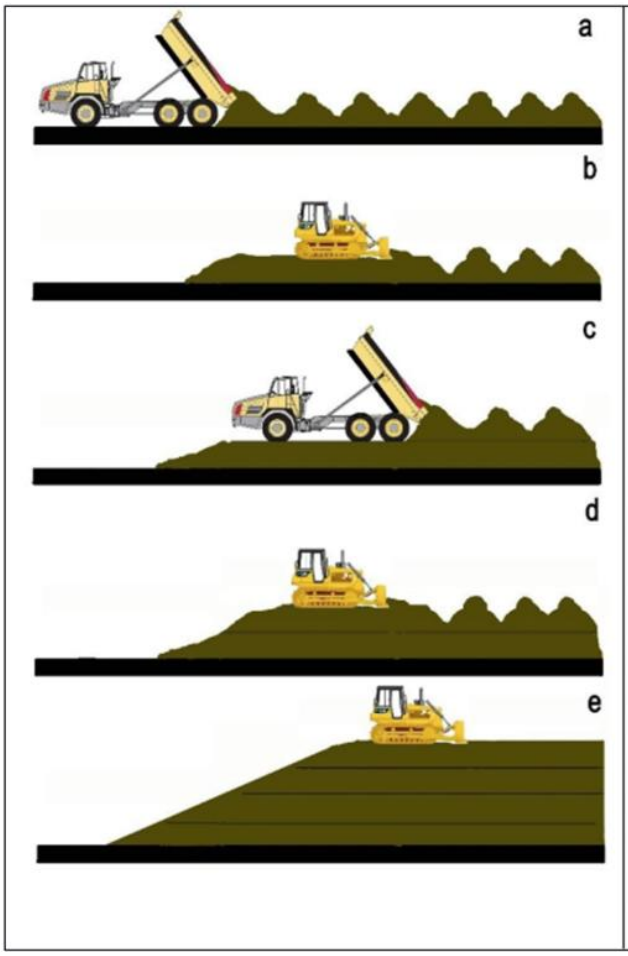
5.7.3. The topsoil should ideally be stored in an area(s) of the CEMP land where it will not interfere with other CEMP land operations so that it can be left undisturbed during other CEMP Works activities.

5.7.4. The areas used for stockpiling topsoil will be prepared in advance so that the stripped soil resource can be stored separately, safely and without avoidable contamination.

5.7.5. A layer of straw will be placed onto the ground before the stripped topsoil is placed in order to demarcate the boundary between the existing 'in-situ' topsoil and the stockpiled topsoil. This will provide a useful 'visual marker' when the stockpiled topsoil is removed and will ensure the original topsoil is not removed.

5.7.6. The topsoils will be transported to the storage area in a dump truck and be 'loose tipped' in a series of heaps, starting at the furthest point and working back towards the storage area access. There are two options for stockpiling the topsoils depending on their plasticity (dependent on soil moisture status). These are referred to here as dry soil stockpiling and wet soil stockpiling. The Dry Soil Stockpiling Method is illustrated below in **Figure 5-1**.

Figure 5-1 - Dry Soil Stockpiling Method



The process requires the topsoil to be transported to the storage area in a dump truck, and 'loose tipped' in a line of heaps to form a windrow (a).

Once the heaps cover the storage area, a tracked dozer (e.g. D6 Caterpillar or tracked excavator) should level the heaps to form a level, stable platform for dump trucks to travel across to tip a second layer of topsoil (b and c). This sequence should be repeated until the maximum stockpile height is achieved (d).

Assuming that the topsoil is reasonably dry and non-plastic during the stripping and storage operation, it will be heaped to a maximum of 6.0 metres (health and safety permitting).

To protect from wet weather, once the final height is achieved, the excavator or blade should re-grade the sides and top of the stockpile to firm the surface by tracking across it to form a smooth gradient. The aim is to seal in the dry topsoil and reduce rainfall infiltration (e).

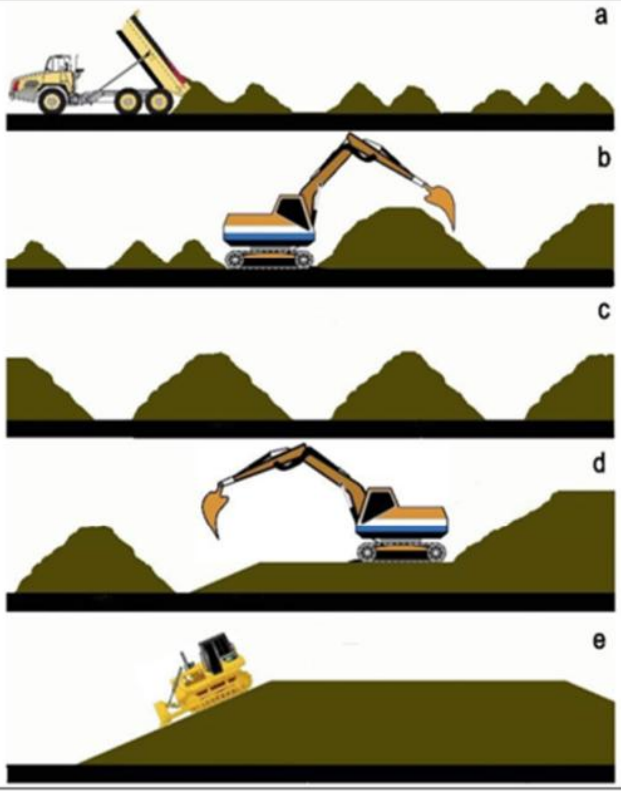
If the topsoil is to be stored for more than 3 months, a quick germinating fescue/clover seed mix should be sown over the sides and top of the stockpile to stabilise the surface and reduce the risk of erosion.

Once the stockpile has been completed the area should be cordoned off with secure fencing to prevent any disturbance or contamination by other construction activities.

5.7.7. The Wet Soil Stockpiling Method is illustrated below (**Figure 5-2**); the wet soils are tipped for temporary storage as windrows until the topsoil has dried out. This technique will minimise the amount of compaction caused by stockpiling as well as maximising the surface area of the stockpile to enable the soil to dry out and become non-plastic.

5.7.8. The reconditioning operation will be timed to suit prevailing weather and ground conditions, to allow the topsoil to dry to a friable condition before further handling or re-forming stockpiles.

Figure 5-2 - Wet Soil Stockpiling Method



The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a).

Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2.5m (b). To avoid compaction no machinery, even tracked plant, traverses the windrow.

Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), (c) the windrows can be combined to form a larger stockpile(s) with a maximum height of 6.0m, using a tracked excavator (d).

The surface of the stockpile should be re-graded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.

5.8 REINSTATEMENT

5.8.1. No permanent topsoil reinstatement or planting is proposed as part of the CEMP Works. Areas disturbed by the CEMP Works will remain under construction control until taken over by subsequent works delivered under a future endorsed CEMP. This Appendix therefore does not set out permanent planting, habitat creation or landscape establishment requirements.

6 TOPSOIL MOVEMENT, STORAGE AND HAUL ROUTES

6.1.1. **Appendix I(1) – Topsoil Phasing Plan**, provides supporting indicative information on phasing of the CEMP Works. The controlling soil-handling requirements are those set out in this Appendix. Actual sequencing and stockpile locations may be refined during delivery within the parameters of the CEMP and the designated working areas, provided the controlling soil management requirements continue to be met.