Norwich Western Link

Environmental Statement

Chapter 3: Description of Scheme

Appendix 3.1: Outline Construction Environmental Management Plan (OCEMP)

Sub Appendix 3.1A: Outline Soil Management Plan

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Glossary of Abbreviations and Defined Terms

Term	Definition
SMP	Soil Management Plan
FCD	Field Capacity Days
AAR	Average Annual Rainfall

1 Introduction

1.1 Introduction to Scheme and Report

1.1.1 Norfolk County Council (hereafter referred to as the ‘Applicant’) is seeking planning permission for the Norwich Western Link (hereafter referred to as the ‘Proposed Scheme’) located approximately 10.0km to the north-west of the city of Norwich.

1.1.2 The Proposed Scheme comprises the construction, operation, and maintenance of an approximately 6 kilometres long dual-carriageway road. This road will connect the A1067 Fakenham Road and the A47, with a dualled section of the A1067 to the existing A1270 roundabout.

1.1.3 The Proposed Scheme predominantly passes through agricultural land with woodland and hedgerow boundaries. It also crosses the river Wensum and its flood plain. Both environments comprise substantial topsoil and subsoil resources.

1.1.4 Soil is a non-renewable resource and therefore care must be taken throughout all handling, stockpiling and reinstatement to safeguard soils on site. Without implementing suitable soil handling practices, soils are prone to degradation which leads to numerous environmental impacts both on and off-site, such as:

- Soil erosion (loss of a resource);
- Carbon release (disturbance of organic rich soils);
- Loss of soil organic matter leading to a decline in soil and poor soil structure;
- Soil compaction leading to loss of soil structure and waterlogging, restricting aeration and rooting potential;
- Sedimentation of water features, reducing biological productivity and habitat quality;

- Loss of soil biological activity; and
- Visual impact of slope failure or soil erosion.

1.1.5 To ensure that potential impacts on soil resources are minimised an Outline Soil Management Plan (SMP) has been produced. This is considered best practice for Environmental Impact Assessments **(Ref.1)**.

1.1.6 The Outline SMP provides guidance for the development of the Final SMP which will be completed by the appointed Principal Contractor.

1.2 Aims

1.2.1 The purpose of this Outline SMP is to summarise the approach for correct soil handling procedures during construction and to advise on soil reinstatement for agricultural land and the floodplain area within the Proposed Scheme. This includes describing the following:

- Soil handling methods (stripping, stockpiling and reinstatement).
- Required monitoring procedures during stockpiling.
- Roles and responsibilities suitable for monitoring soil during the construction phase.
- Suitable methods for restoration of land to its former use.

1.2.2 It should be noted that this Outline SMP does not consider human health and controlled water risk assessment associated with potentially contaminated soils. These concerns are discussed in the **Environmental Statement: Chapter 13 (Geology and Soils)** (Document Reference: 3.13.00)**.**

1.2.3 This SMP does not cover the management of soils for environmental bunds. This is to be covered in the Final SMP, which will be completed by the appointed Principal Contractor.

1.2.4 This SMP provides an outline only which will be developed and refined for the final SMP for the construction phase.

1.3 Reference material

Soil Information

1.3.1 A Soil Resource Survey **(Ref.2)** and a Soil Depth Survey **(Ref.3)** for the river Wensum floodplain area were carried out in November 2022, by Reading Agricultural Consultants (RAC) and WSP respectively. In addition to this, an Agricultural Land Classification (ALC) survey **(Ref.4)** for the remainder of the Proposed Scheme was undertaken in December 2022 by RAC. The data from these three survey reports has been reviewed to inform this Outline SMP and should be used in conjunction with the Outline SMP to inform the Final SMP.

Design Information

1.3.2 The following design information has been reviewed to assess likely impacts on soil resources: General Arrangement Diagrams (Document Reference 2.03.00) and EDB - Temporary works platform for the Viaduct Construction (Appendix 3.2 Plans Document Reference 3.03.02).

2 Site Soil Resources

2.1 Soil Types

2.1.1 Agricultural land quality within the Proposed Scheme is primarily classified as Grade 2, Subgrade 3a and Subgrade 3b. Land within the river Wensum floodplain is restricted to Grade 4. A map with grade locations is provided within the ALC report **(Ref.4)**.

2.1.2 There are three main soil types within the Proposed Scheme boundary. Soil profile 1 is the most prevalent, soil profile 2 is found in the south-west and soil profile 3 is dominant within the river Wensum floodplain area. These soil profiles are summarised below, but further information is provided in the ALC and Soil Resource Survey report (**Ref.4**; **Ref.2**).

Soil Profile 1

- Topsoil: Loamy sand or sandy loam; slight to moderate stone content (5-25% by volume); friable with coarse granular to fine subangular blocky structure.
- Upper subsoil: Loamy sand or sandy loam; slight to moderate stone content (5-20%); friable with coarse granular to fine subangular blocky structure.
- Lower subsoil: loamy sand, sandy clay loam, sandy loam or sand; slight to moderate stone content (2%-25%); single grain to coarse granular structure where the texture is sand or loamy sand, and a coarse granular to medium subangular structure where the texture is sandy loam or sandy clay loam.

Soil Profile 2

- Topsoil: sandy clay loam or sandy loam; slight stone content (7%-14%); friable with medium subangular blocky structure.

- Upper subsoil: sandy clay loam or sandy clay; slight to very slight stone content (3%-12%); friable to firm consistency with a medium subangular blocky structure.
- Lower subsoil: mostly comprises sandy clay with some recordings of clay, sandy clay loam, sandy loam, or loamy sand; slight to moderate stone content (2-20%); friable to firm consistency with a medium subangular blocky structure.
- Lower subsoils at 2 observations within this profile differ and comprise firm clay. This clay is poorly structured and restricts the downward drainage of water through the soil profile.

Soil Profile 3 (dominant within the river Wensum floodplain area)

- Topsoil: heavy clay loam or sandy clay loam, with one recording of clay; organic (laboratory analysis confirming 9.2% - 22.7% organic matter); slightly stony (0-5%); friable with medium subangular blocky structure.
- Upper subsoil: loamy peat, with one recording of peaty loam; organic (laboratory confirming 12.0% - 36.7% organic matter); stoneless; peaty subsoils within the site are semi-fibrous, and the plant matter observed readily breaks down.
- Lower subsoil (where loamy peat is not observed to the full depth of the soil profile): medium sandy loam or loamy sand; moderately stony (up to 25%).

2.2 Soil Considerations

2.2.1 The soil horizons have been placed into resilience categories based on the approach shown in Table 1 that considers soil textures within the Proposed Scheme (**Ref.5**). However, risk is also affected by the Soil Wetness Class, local climate, and soil structure (**Ref.5**). Therefore, these factors should also be considered when developing the final SMP.

2.2.2 The resilience categories for each soil horizon are presented in Appendix A. These should be used in conjunction with the ALC survey points map (found in the ALC report) (**Ref.4**), to appropriately manage soils in line with their resilience.

2.2.3 The resilience categories indicate soil sensitivity to structural damage (Table 1). Soils with a higher sand content are more resilient to disturbance whereas soils with a higher clay or organic content are more vulnerable to damage during handling.

2.2.4 It is important that damage is minimised by following the best practice guidance within this Outline SMP and close attention should be paid to the guidance for soil moisture conditions for handling.

2.2.5 The organic heavy clays and peaty loams present at the river Wensum floodplain area (soil profile 3) are particularly susceptible to deformation during handling and may be continuously saturated at some locations.

Table 2-1 Soil resilience based on textural class (taken from the Institute of Quarrying (2021) (Ref.5) and references Askew, 2020 within).

Risk to Soil Structure Damage During Handling when in a Dry Condition	**Soil Texture Class (top & sub soil)**
High Resistance - Low Risk	Sand, loamy sand, sandy loam, sandy silt loam
Medium Resistance Moderate Risk (<27% clay content)	Medium silty clay loam, medium clay loam, sandy clay load
Low resistance High Risk (>27% clay content)	Silt loam, heavy silt clay loam, heavy clay loam, sandy clay, silty clay, clay: organic matter mineral, peaty soils, peat.

3 Soil Management During Construction

3.1 Main Principles

3.1.1 The main threats to soils during construction are trafficking by vehicles/plant, and incorrect handling. These can both cause damage to soil structure through compaction and smearing (deformation). Deformation effects soil functions and the suitability for reuse within the Proposed Scheme which can increase costs of reinstatement. The risk of deformation increases with increasing Field Capacity Days (FCD) and Average Annual Rainfall (AAR), along with lighter soil textures. The resilience categories assigned to the soil profiles in Appendix A indicate the level of risk depending on the soil textures present. FCD and AAR should also be considered when developing the final SMP.

3.1.2 All soil handling and storage procedures should conform to the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (**Ref.6**) and / or the Good Practice Guide for Handling Soils in Mineral Workings (**Ref.5**). This Outline SMP is informed by both.

3.2 Good Practice Measures

3.2.1 The following good practice measures should be considered to minimise the risk of damage to soil structure:

- A suitably qualified soil expert should be appointed by the Principal Contractor to oversee all soil management good practice measures stipulated in this Outline SMP; (**Ref.1**; **Ref.6**)
- Trafficking and storage will be minimized on topsoil and reinstated soil and only when soil conditions are suitable (i.e., dry and/or non-plastic);
- Consideration of use of 'trackway' system at temporary works zones for vehicles, to reduce excavation and protect soils;

- Direct movement of soil should occur between the areas being stripped/reinstated to/from designated stockpiles, where practicable (minimising handling and/or ad hoc storage);
- Soil handling to be avoided when the soil moisture content is above the lower plastic limit (see soil wetness section);
- No mixing of topsoil with subsoil, or of soil with other materials (unless planned and part of a soil ameliorating strategy);
- Store soil only in designated soil storage areas;
- Stockpiles should not be compacted, but instead gently consolidated;
- Plant and machinery should only work when ground/soil surface conditions enable their maximum operating efficiency and be maintained in a safe and efficient working condition;
- Detailed daily records to be maintained, detailing operations undertaken and site and soil conditions; and
- Ground should be suitably prepared prior to the reinstatement of soil and an appropriate aftercare plan in place.

3.2.2 For each stockpile, a plan should be kept and maintained detailing:

- Material type (topsoil or subsoil) (informed by ALC and Soil Resource Survey Reports);
- Date/time when soil was stockpiled and weather conditions;
- Volume of material;
- Stockpile location; and
- Source location of material.

3.2.3 The Principal Contractor will be responsible for ensuring that records of site and soil conditions are kept, and that a detailed stockpile plan is created and maintained.

3.3 Soil Moisture Conditions for Handling

3.3.1 Handling soils at appropriate moisture levels avoids damage to soil structure (compaction and smearing) therefore adhering to the moisture conditions for handling is extremely important.

3.3.2 Following the Institute of Quarrying guidance (**Ref.5**), the Proposed Scheme is based in climatic zone 2. This means that the preferred handling times are between Early-July and Mid-October, when the climatic zone wetness estimates, clay proportion and depth of soil horizon are considered for all soil profiles. However, soil wetness should always be assessed by a qualified soil scientist/person prior to handling.

3.3.3 Removal of excess vegetation, soil stripping, reinstatement and post-reinstatement cultivation should not commence if the moisture of the soil (either in situ or in stockpiles) is above its lower plastic limit.

3.3.4 The plastic limit is to be determined using the following test (**Ref.5**):

- Form a small (~30mm diameter) ball of soil between the palms;
- Roll the ball to form a thread approximately 3mm in diameter;
- If the 3mm diameter thread cannot be formed without crumbling or breaking up, the moisture content is below the lower plastic limit and works can commence; and
- If a 3mm diameter thread can be formed without crumbling, moisture content is above the lower plastic limit and the works cannot commence.

3.3.5 If the works are interrupted by a rainfall event (e.g. >10mm in 24 hours) (**Ref.7**) soil handling should be suspended and should not recommence until soil moisture content is retested and falls below the plastic limit (**Ref.5**). The plastic limit is stipulated in BS 1377-2:1990) (**Ref.8**).

3.3.6 Peaty soils should only be handled if water is not squeezed out when moderate pressure between hands is applied **(Ref.1)**.

3.3.7 The Principal Contractor should appoint an expert who is suitably experienced and competent in carrying out such soil moisture tests.

3.4 Preparatory Works

3.4.1 Before any work on site involving vehicles commences the Construction Contractor(s) should:

- Ensure to mark, and signpost the following areas within the Proposed Scheme:
  - The undisturbed areas where no construction activities will take place (here soil will not be stripped or trafficked for purposes other than planting, cultivation, and vegetation maintenance);
  - Tree protection zones;
  - Areas from which soils will be stripped;
  - Locations of topsoil and subsoil stockpiles; and
  - Haul routes (which will be stripped of soil before establishment of the haul road surface).
- Remove scrub vegetation (following any seasonal ecological constraints and mitigation requirements) in the areas requiring stripping;
- surface vegetation can be removed by scarification and raking, desiccation with herbicide or blading off; and
- Remove other vegetation present, so that it is not incorporated into the soil strip. If applicable, cut the grass/crop to ground level.

3.5 Stripping

3.5.1 The depth of required topsoil or subsoil strip can be informed by the ALC survey (**Ref.4**) soil resource survey (**Ref.2**) and soil depth survey (**Ref.3**). Soil horizons should be stripped sequentially in the order they are present – topsoil to upper subsoil horizons, to lower subsoil horizons.

3.5.2 Subsoils of high to medium resilience may not need stripping underneath haul routes if careful management and consideration of alternative methodologies (e.g. 'trackway') is applied. If they are of low resilience it is advised to strip to a more resilient layer and ensure proper decompaction is carried out following the construction stage.

3.5.3 Subsoils should only be stripped if they are being re-used or are of low resilience to reduce compaction. Areas which are going to be used for subsoil storage should have the topsoil stripped to avoid mixing.

3.5.4 Topsoil must be stripped before any subsoil destined for reuse is stripped to reduce the risk of mixing the horizons.

3.5.5 Where practicable, vehicles will be tracked to reduce compaction and stripping should be carried out in the driest conditions possible.

3.5.6 Key points for consideration in the final SMP to minimise soil compaction, and maximise readiness for re-use include:

- Integrating all soil stripping, moving, storage and reuse/reinstatement operations into the enabling works programme;
- Ensuring dump trucks only operate on the "basal"/non-soil layer and that the wheels do not travel on the soil layer;
- Ensuring the excavator only operates on the topsoil layer;
- Only working plant and machinery when ground conditions allow maximum efficiency;
- Stripping when the moisture content of the soil is below the lower plastic limit. If it cannot be avoided, provision needs to be made for remediation of soil texture prior or following reinstatement. This will add cost and time to the Proposed Scheme;

- Ceasing operation during prolonged periods of rainfall (e.g. >10mm in 24 hours) (**Ref.7**). and only recommencing if the forecast predicts no further rainfall for a day and soil moisture conditions are suitable;
- Ensuring the lower soil layers are not left exposed to rainfall. Achieved by always stripping to the basal layer before rainfall occurs and/or before stripping is suspended;
- Protecting the soil and the basal layer from ponding of water by diverting water inflow away from it;
- Not working when there is standing water on the soil surface or the basal layer;
- Not mixing topsoil with subsoil and soil with other construction materials; and
- Storing topsoil on topsoil and subsoil on subsoil or on the basal layer.

Topsoil Stripping method

3.5.7 The stripping method should follow the method within the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (**Ref.6**) that also includes illustrations of best practice guidance. This method is summarised below.

3.5.8 Prior to commencement, the width of each strip should be determined by looking at the length of the excavator less the stand-off to operate. Using the reach of the excavator to its full potential before moving it, reduces the number of areas subject to the weight of the standing plant.

3.5.9 Following this, remove surface vegetation by blading off, by scarification and raking (not less than two weeks before stripping commences to reduce the likelihood of anaerobic conditions forming during storage). If the above method is not viable, the careful application of a suitable non-residual herbicide may be necessary.

3.5.10 The transport vehicle should run on the basal layer under subsoil if subsoil is also to be stripped**.** If only topsoil is to be stripped, the vehicle can run on the subsoil layer.

3.5.11 Stripping should be undertaken by the excavator standing on the surface of the topsoil, digging the topsoil to its maximum depth (topsoil thickness ranges between 0.1 – 0.8 metres within the Site Boundary) and loading into site or off-site transport vehicles.

Subsoil Stripping Method

3.5.12 Where subsoils are being re-used or are of low resilience, the soil layers above the basal/formation layer should be removed in sequential strips that can be up to 6m wide (the reach of a 360° excavator). Using an excavator bucket with teeth is preferable to achieve desired outcome.

3.5.13 Where there is a cover of topsoil, that layer is removed first before stripping subsoil to the specified depth.

3.5.14 The soil transport vehicle should run on the layer beneath the required subsoil stripping depth.

3.6 Soil Storage

3.6.1 Standard practice is for topsoil stockpiles to be no more than 3m in height and 5m for subsoil stockpiles (**Ref.9**). However, CIRIA guidance stipulates soil mounds no higher than 2m for peat or soils (**Ref.10**). If peaty loam soils must be excavated, it is recommended that a 2m maximum height is adhered to for these soil stockpiles.

3.6.2 After being stripped, soil units should be stored in stockpiles close to their source and stockpiles should be in areas where they will not be disturbed during construction activities.

3.6.3 Soil stripping, storage and reinstatement should be integrated into the enabling works programme by the Principal Contractor.

Stockpile Locations

3.6.4 Stockpiles should be located on medium or high resilience soils away from ditches or watercourses to reduce the impact on controlled waters. This will include temporary storage of materials at a minimum distance of 10m from any watercourses and 50m from any watercourse identified on Ordnance Survey 50,000 scale mapping **(Ref.10)**.

3.6.5 Stockpiles should be located away from trees, hedge lines and existing/future excavations. This avoids repeated handling/transfer of soil, reducing potential for degradation of the soil structure.

3.6.6 Each source area should have its own stockpile location, with topsoils and subsoils stockpiled separately.

Forming the Stockpiles

3.6.7 Dimensions of the stockpiles may be adjusted but the angle of repose shall not exceed 1 in 2 (25^{o}) even if seeded and regularly maintained.

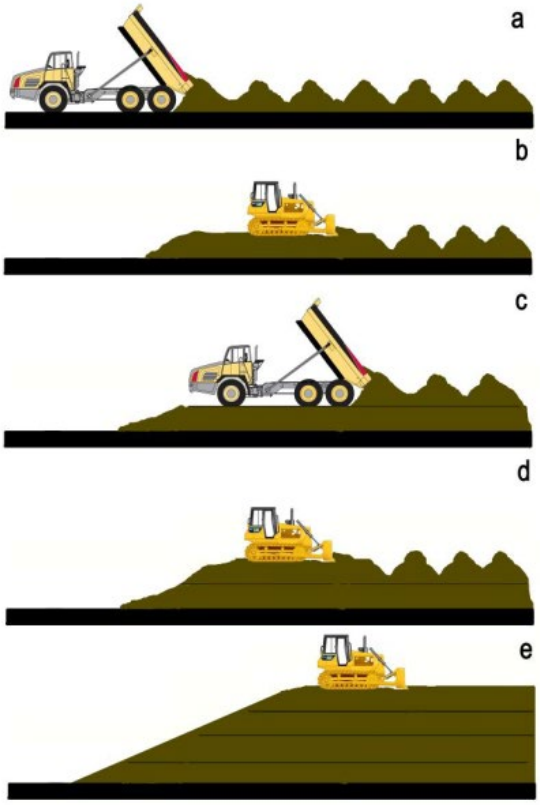
3.6.8 Each stockpile shall be clearly marked and labelled with the source area and material type and these labels kept up to date.

3.6.9 The dry and wet stockpiling methods from the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (**Ref.6**) are summarised below and shown in figures 3-1 and 3-2 below:

Dry soil stockpiling method

- Loose tip heaps of soil from a dump truck starting at the furthest point in the storage area, working towards the access point;
- A tracked excavator or dozer then levels the heaps and firms the surface to enable a second layer to be added;
- Repeat until the stockpile has reached the desired height; and
- With a tracked excavator or dozer, compact and re-grade the sides and top of the stockpile to a smooth gradient to reduce infiltration and the likelihood of ponding.

Figure 3-1 Dry stockpiling method from the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009)

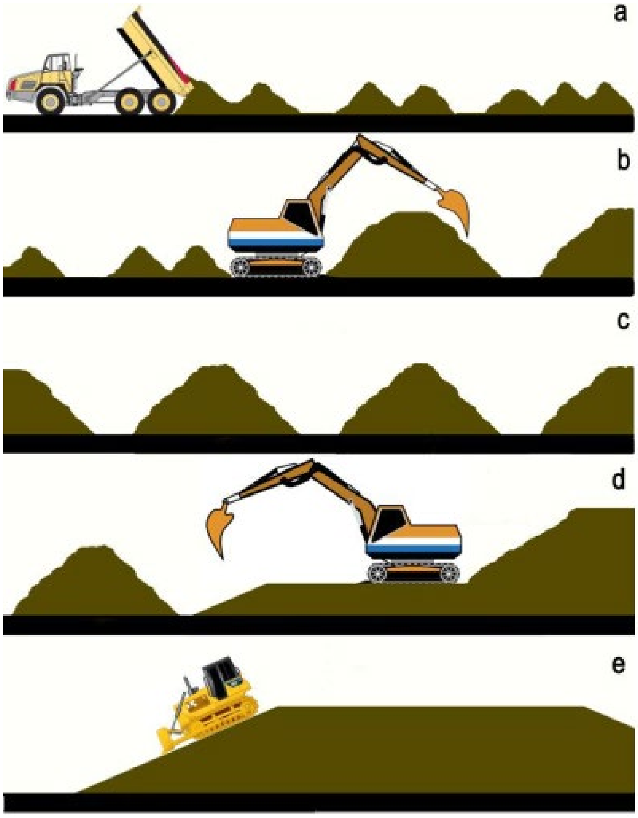


Wet soil stockpiling method

- This is only to be used in a worst-case scenario where the construction programme or prevailing weather conditions prevent dry stockpiling (**Ref.6**). This method poses a higher risk of damage to soil.
- Tip soil into a line of heaps to form a “windrow”, start at the furthest point, finish at the access point;
- Space windrows sufficiently apart so a tracked dozer or excavator can move between them to heap the soil up to 2m maximum;
- No machinery should traverse the windrow to avoid compaction and subsequent structural damage to the soil;
- Once the soil has reached a non-plastic consistency, which often takes many weeks, combine the windrows to form larger stockpiles using a tracked excavator; and

- Regrade and compact the sides and top of the stockpile using a tracked excavator or dozer, to prevent ponding and infiltration.

Figure 3-2 Wet stockpiling method from the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009)



Maintenance of Stockpiles During Storage

3.6.10 Seeding is advised if soils are to be kept for over six months or over winter (**Ref.6**). In these events, stockpiles should be seeded with a suitable grass mix to protect against soil erosion, minimise nutrient loss and maintain its biological activity. The grass should be cut two to three times a year and removed completely before reinstatement of soil.

3.7 Peaty Loam/Loamy Peat Soil Management

3.7.1 Due to their low resilience, and potentially high-water content, it is recommended that the soils with a high organic content (peaty loam/loamy peat) soils within the river Wensum floodplain area are dealt with in line with the SEPA hierarchy: Avoid/minimise excavation → re-use on site → recycle → dispose (**Ref.11**) as far as practicable.

3.7.2 If soils with a high organic content must be excavated, where intended for reuse, it is recommended that they be stored in line with best practice guidance for peat storage. This states that storage time should be minimised as far as practically possible (**Ref.12**); soil mounds should be no higher than 2m and with stable banking (**Ref.10**); stockpiles should be kept wet (to reduce potential for desiccation/oxidation (**Ref.13**) and bare soils with a high organic content should be protected from wind and water erosion (**Ref.12**). Stockpiles should also be covered with tarpaulin to prevent oxidisation and erosion (**Ref.13**).

3.7.3 Highly organic materials can have adverse impacts on waterbodies if sedimentation from stockpiles occurs. Therefore, the storage location(s) should have negligible ecological/environmental value and be an adequate buffer from sensitive waterbodies and habitats (**Ref.12**).

3.7.4 The Final SMP will detail how the soils with a high organic content will be managed and stored within the limits of the Proposed Scheme.

4 Soil Reinstatement

4.1 General Methods to be Used Within Restoration

4.1.1 All methods should align with the guidance on handling and soil moisture content that have been discussed so far in this Outline SMP.

4.1.2 Soil horizons should be reinstated sequentially in the order they were removed – lower subsoil horizons, to upper subsoil horizons, to topsoil. This will be ensured by following best practice for stockpiling which includes clear labelling of stockpiles and soil textures, avoiding horizons being mixed.

4.2 Excavation of Soil Stockpiles

4.2.1 The method to be followed for the excavation of soil stockpiles is taken from the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (**Ref.6**) and explained below.

Stockpile Excavation Method

4.2.2 Dump trucks should enter on the basal layer (if topsoil and subsoil are stripped) or subsoil (if only topsoil was stripped). If a back-acting excavator is used, it should stand on top of the stockpile to load the dump truck. The stockpile should be dug to the base before moving progressively back along its axis.

4.2.3 If a front-loading machine is used, any exposed edges or surface of the stockpile should be shaped to reduce the pooling of water at the onset of rain and end of each day.

4.3 Preparation of the Base Layer

4.3.1 Areas where stockpiles, haul routes and other high traffic are located will require decompaction before soil reinstatement. The substrate should be decompacted to reduce flood risk and promote plant root growth. For decompaction, a wing-tine ripper is recommended. This includes ripping subsoils in agricultural areas to return them to their ALC grade and not introduce a wetness limitation.

4.3.2 Large stones and debris should also be removed from the area before reinstatement.

4.4 Soil Reinstatement

4.4.1 All horizons should be reinstated in the same order as they were before disturbance (avoiding mixing of textures where possible) and to the same depth of horizon. Where practicable, all land should be reinstated to the standards of the baseline ALC grade (prior to disturbance), the limiting factors of each grade can be found in the Ministry of Agriculture, Fisheries and Food (MAFF) (1988) revised guidelines and criteria for grading the quality of agricultural land (**Ref.14**).

4.4.2 Reinstatement should take place when the soil is below the plastic limit, if it rains more than 10mm in 24 hours it is advised to suspend reinstatement until the soil is below the plastic limit (**Ref.10**). Soil is not advised to be reinstated when the ground is frozen or in other adverse weather conditions.

4.4.3 To return soils to an area the loose tipping method is recommended as this allows minimal disturbance to the soils structure. This method is described below (**Ref.6**).

Loose Tipping Method

4.4.4 Loosen the receiving group using a wing-tine ripper, with a toothed bucket (which avoids excessive smearing) and load the stockpiled soil in to dump trucks to transport and discharge the soil into the desired location.

4.4.5 The soil should be reinstated in strips based on the reach of the excavator. An excavator should be used to spread the soil to the desired thickness. If replacing both subsoil and topsoil, all subsoil should be laid then all topsoil. Topsoil should be laid without the excavator travelling on the newly placed subsoil.

4.4.6 Agricultural topsoil can be mounded to a maximum of 400mm if required, providing the landowner/farmer agrees and the soil meets suitability criteria for reuse.

4.4.7 All reinstated topsoil should be cultivated to its full depth to reduce compaction and increase aeration. Cultivation should remove the presence of any large, compacted lumps. Cultivation can be achieved through using appropriate tillage equipment (e.g., a power harrow or chisel plough) to break down soil aggregates to a fine tilth (**Ref.6**). For seeding, a maximum aggregate size of 10mm is recommended.

4.4.8 If any undesirable materials (such as stones or fill over 50mm in any dimension) are present, it is recommended to remove them by raking or picking.

4.5 Aftercare of Reinstated Soils

4.5.1 The addition of fertiliser for improving nutrient levels in the soil is advised if soils are stockpiled for more than six months due to the leaching of nutrients. The amount of nutrients to be added can be informed by collecting and analysing samples taken from stockpiles soil to assess their nutrient requirements for the desired habitat end-use.

4.5.2 After reinstatement, soils tend to self-compact and settle, especially those with low resilience. It can take between one to three years for their structures to stabilise. This can lead to waterlogging and anaerobic conditions, which can contribute to erosion and flooding, but can also lead to negative impacts on root function and plant health (**Ref.6**).

4.5.3 To avoid the negative impacts above reinstatement should be inspected by a competent soil expert and an aftercare plan developed to help the successful reinstatement of the soils. For example, keeping livestock off reinstated grassland in the winter will reduce the likelihood of compaction due to the soils structure being unstable.

4.6 Peaty Soil Reinstatement

4.6.1 The reinstatement of peaty soils should be suited to its intended end use.

4.6.2 The identification of receiving areas on site (such as voids or sunken areas) that could keep the peaty soil wet long-term, is preferable (**Ref.13**). With the restoration of semi-natural wetland/peatland vegetation being most desirable (**Ref.1**). For this, peaty soils should be reinstated within a wide landform, with shallow surface gradients, where it is possible to maintain high water table levels. Once reinstated, a suitable ground cover for the intended land use should be created to protect the surface (**Ref.1**).

4.6.3 If an area that can keep the peat wet long-term is not available on site, then it should be re-used in a way that best utilises its available qualities (**Ref.13**).

4.6.4 In all cases, the planned re-use of the peaty soils should be discussed with the local planning authority (**Ref.13**).

5 Soil Reuse and Disposal

5.1.1 In the event that there is a soil surplus from construction activities, all suitable (chemically/physically suitable and asbestos free) material will be beneficially reused on site through measures put in place through the Materials Management Plan (MMP) that will be produced by the Principal Contractor. An Outline MMP has been produced as part of the Environmental Statement and included as an appendix to the Outline Construction Environmental Management Plan.

5.1.2 If excavated materials are unsuitable for reuse, such as contaminated soils or hazardous materials (not soils i.e., anthropogenic material) this will be removed off-site and disposed in accordance with an agreed Materials Management Plan (MMP). The Principal Contractor will follow appropriate legislative requirements and best practice. The material would be appropriately classified prior to transport to a suitably licenced landfill /treatment centre.

5.1.3 The landowner / occupier will be engaged where any off-site disposal is required. In such instances, disposal will be undertaken in accordance with waste management regulations (England and Wales). Further detail is provided in **Chapter 14 – Materials Assets and Waste** (Document Reference 3.14.00).

6 Reference List

- **Ref 1**: Institute of Environmental Management and Assessment (IEMA) (2022). A New Perspective on Land and Soil in Environmental Impact Assessment. February 2022.
- **Ref 2**: Reading Agricultural Consultants (2023). Norwich Western Link: River Wensum Floodplain Soil Resource Survey.
- **Ref 3**: WSP (2022). Norwich Western Link Soil Depth Probing Survey.
- **Ref 4**: Reading Agricultural Consultants (2023). Norwich Western Link: Agricultural Land Classification and Soil Resources.
- **Ref 5**: Institute of Quarrying (2021). Good Practice Guide for Handling Soils in Mineral Workings [Accessed June 2022].
- **Ref 6**: Defra (2009). Code of practice for the sustainable use of soils on construction sites [Accessed January 2022].
- **Ref.7**: BS 3882:2015. Specification for Topsoil.
- **Ref.8**: BS 1377-2:1990 (incorporating Amendment No. 1:1996) Methods of test for soils for civil engineering purposes – Part 2: Classification tests.
- **Ref.9**: Natural England (2022). Planning and aftercare advice for reclaiming land to agricultural use [Accessed February 2022].
- **Ref.10**: CIRIA (2006). Control of water pollution from linear construction projects: technical guidance. Publication C648; Construction Industry Research and Information Association, London.
- **Ref.11**:SEPA (2017). Developments on Peat and Off-Site Uses of Waste Peat [Accessed May 2023].
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- **Ref.13:** Broads Authority (2021). Guide to understanding and addressing the impact of new developments on peat soil [Accessed June 2022].

- **Ref.14**: Ministry of Agriculture, Fisheries and Food (MAFF) (1988). Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land [Accessed July 2022].

Appendix A Soil resilience categories

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
1	T	33	1	SCL	Medium
Pit 1	T	58	2	SCL	Medium
Pit 1	T	120	3	SC	Low
2	T	29	1	SCL	Medium
2	T	70	2	SC	Low
2	T	120	3	SC	Low
3	T	29	1	SCL	Medium
3	T	53	2	mSL	High
3	T	80	3	LmS	High
3	T	120	4	SC	Low
4	T	29	1	SCL	Medium
4	T	53	2	SC	Low
4	T	80	3	SC	Low
4	T	120	4	LmS	High
5	T	30	1	SCL	Medium
5	T	58	2	SCL	Medium
5	T	120	3	C	Low
6	T	34	1	mSL	High
6	T	65	2	SC	Low
6	T	120	3	SC	Low
7	T	30	1	SCL	Medium
7	T	60	2	SC	Low
7	T	120	3	SC	Low
8	T	32	1	mSL	High
8	T	60	2	C	Low
8	T	88	3	SC	Low
8	T	120	4	SCL	Medium
9	T	34	1	mSL	High
9	T	66	2	SCL	Medium
9	T	120	3	SC	Low
10	T	32	1	mCL	Medium
10	T	68	2	SCL	Medium
10	T	120	3	C	Low
11	T	28	1	SCL	Medium
11	T	50	2	SCL	Medium
11	T	64	3	SCL	Medium
11	T	120	4	C	Low
12	T	28	1	SCL	Medium
12	T	78	2	SCL	Medium

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
12	T	100	3	mSL	High
12	T	120	4	mSL	High
13	T	32	1	mSL	High
13	T	71	2	mSL	High
13	T	120	3	LmS	High
14	T	33	1	LmS	High
14	T	80	2	LmS	High
14	T	120	3	LmS	High
15	T	30	1	mSL	High
15	T	55	2	mSL	High
15	T	65	3	mSL	High
15	T	120	4	LmS	High
16	T	32	1	mSL	High
16	T	50	2	LmS	High
16	T	120	3	LmS	High
17	T	33	1	mSL	High
17	T	50	2	mSL	High
17	T	120	3	SCL	Medium
18	T	33	1	mSL	High
18	T	68	2	mSL	High
18	T	120	3	SCL	Medium
19	T	33	1	mSL	High
19	T	63	2	mSL	High
19	T	120	3	SC	Low
20	T	30	1	mSL	High
20	T	80	2	LmS	High
20	T	120	3	LmS	High
21	T	34	1	mSL	High
21	T	60	2	LmS	High
21	T	98	3	LmS	High
21	T	120	4	mSL	High
22	T	31	1	mSL	High
22	T	80	2	LmS	High
22	T	120	3	LmS	High
23	T	33	1	mSL	High
23	T	60	2	LmS	High
23	T	120	3	LmS	High
24	T	32	1	mSL	High
24	T	84	2	mSL	High
24	T	120	3	LmS	High
25	T	33	1	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
25	T	80	2	LmS	High
25	T	120	3	LmS	High
26	T	33	1	LmS	High
26	T	55	2	LmS	High
26	T	120	3	LmS	High
27	T	35	1	LmS	High
27	T	50	2	LmS	High
27	T	95	3	LmS	High
27	T	120	4	LmS	High
28	T	35	1	LmS	High
28	T	60	2	LmS	High
28	T	65	3	LmS	High
28	T	120	4	LmS	High
29	T	35	1	LmS	High
29	T	50	2	LmS	High
29	T	120	3	LmS	High
30	T	32	1	LmS	High
30	T	52	2	LmS	High
30	T	120	3	LmS	High
31	T	36	1	LmS	High
31	T	50	2	LmS	High
31	T	60	3	LmS	High
31	T	120	4	mSL	High
32	T	34	1	LmS	High
32	T	60	2	LmS	High
32	T	98	3	LmS	High
32	T	120	4	SCL	Medium
33	T	35	1	LmS	High
33	T	56	2	LmS	High
33	T	120	3	LmS	High
34	T	35	1	LmS	High
34	T	56	2	LmS	High
34	T	120	3	LmS	High
35	T	35	1	LmS	High
Pit 2	T	60	2	LmS	High
Pit 2	T	120	3	LmS	High
36	T	35	1	LmS	High
36	T	58	2	LmS	High
36	T	120	3	LmS	High
37	T	36	1	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
37	T	70	2	LmS	High
37	T	83	3	LmS	High
37	T	120	4	LmS	High
38	T	34	1	LmS	High
38	T	56	2	LmS	High
38	T	120	3	LmS	High
39	T	34	1	SCL	Medium
39	T	62	2	SCL	Medium
39	T	120	3	SCL	Medium
40	T	35	1	LmS	High
40	T	60	2	LmS	High
40	T	120	3	LmS	High
41	T	34	1	LmS	High
41	T	70	2	LmS	High
41	T	120	3	LmS	High
42	T	32	1	LmS	High
42	T	55	2	LmS	High
42	T	65	3	LmS	High
42	T	120	4	LmS	High
43	T	32	1	LmS	High
43	T	120	2	LmS	High
44	T	36	1	mSL	High
44	T	74	2	LmS	High
44	T	120	3	LmS	High
45	T	36	1	LmS	High
45	T	54	2	LmS	High
45	T	74	3	LmS	High
45	T	120	4	mS	High
46	T	35	1	LmS	High
46	T	70	2	LmS	High
46	T	120	3	LmS	High
47	T	34	1	mSL	High
47	T	52	2	LmS	High
47	T	120	3	LmS	High
48	T	35	1	mSL	High
48	T	58	2	LmS	High
48	T	80	3	LmS	High
48	T	120	4	LmS	High
49	T	33	1	mSL	High
49	T	60	2	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
49	T	66	3	LmS	High
49	T	120	4	SCL	Medium
50	T	34	1	mSL	High
50	T	60	2	LmS	High
50	T	120	3	SCL	Medium
51	T	35	1	mSL	High
51	T	75	2	LmS	Medium
51	T	120	3	SCL	Medium
52	T	35	1	mSL	High
52	T	60	2	LmS	High
52	T	120	3	LmS	High
53	T	34	1	mSL	High
53	T	60	2	LmS	High
53	T	120	3	SCL	Medium
54	T	34	1	mSL	High
54	T	72	2	LmS	High
54	T	120	3	LmS	High
55	T	33	1	mSL	High
55	T	50	2	LmS	High
55	T	60	3	LmS	High
55	T	120	4	LmS	High
56	T	34	1	mSL	High
56	T	60	2	LmS	High
56	T	120	3	LmS	High
57	T	30	1	mSL	High
57	T	54	2	LmS	High
57	T	70	3	LmS	High
57	T	120	4	LmS	High
58	T	30	1	LmS	High
58	T	40	2	LmS	High
58	T	70	3	LmS	High
58	T	120	4	LmS	High
59	T	34	1	LmS	High
59	T	55	2	LmS	High
59	T	82	3	LmS	High
59	T	120	4	mSL	High
60	T	32	1	LmS	High
60	T	50	2	LmS	High
60	T	120	3	LmS	High
61	T	35	1	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
61	T	52	2	LmS	High
61	T	120	3	LmS	High
62	T	35	1	LmS	High
62	T	55	2	LmS	High
62	T	120	3	LmS	High
63	T	30	1	LmS	High
63	T	50	2	LmS	High
63	T	120	3	LmS	High
64	T	30	1	LmS	High
64	T	56	2	LmS	High
64	T	120	3	LmS	High
65	T	34	1	LmS	High
65	T	67	2	LmS	High
65	T	120	3	SCL	Medium
66	T	32	1	LmS	High
66	T	72	2	LmS	High
66	T	120	3	mSL	High
67	T	34	1	LmS	High
67	T	62	2	LmS	High
67	T	120	3	LmS	High
68	T	35	1	LmS	High
Pit 3	T	70	2	LmS	High
Pit 3	T	120	3	LmS	High
69	T	33	1	LmS	High
69	T	78	2	LmS	High
69	T	120	3	mS	High
70	T	33	1	LmS	High
70	T	70	2	LmS	High
70	T	120	3	mS	High
71	T	36	1	LmS	High
71	T	72	2	LmS	High
71	T	120	3	LmS	High
72	T	33	1	LmS	High
72	T	50	2	LmS	High
72	T	120	3	LmS	High
73	T	33	1	LmS	High
73	T	60	2	LmS	High
73	T	110	3	LmS	High
73	T	120	4	Ms	High
74	T	36	1	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
74	T	58	2	LmS	High
74	T	80	3	mSL	High
74	T	120	4	mSL	High
75	T	34	1	LmS	High
75	T	76	2	LmS	High
75	T	120	3	mS	High
76	T	33	1	LmS	High
76	T	80	2	LmS	High
76	T	120	3	mSL	High
77	T	33	1	LmS	High
77	T	62	2	LmS	High
77	T	120	3	LmS	High
78	T	33	1	LmS	High
78	T	70	2	LmS	High
78	T	106	3	LmS	High
78	T	120	4	SCL	Medium
79	T	34	1	LmS	High
79	T	60	2	LmS	High
79	T	86	3	LmS	High
79	T	120	4	LmS	High
80	T	34	1	LmS	High
80	T	40	2	LmS	High
80	T	120	3	LmS	High
81	T	34	1	LmS	High
81	T	60	2	LmS	High
81	T	120	3	LmS	High
82	T	34	1	LmS	High
82	T	60	2	LmS	High
82	T	85	3	LmS	High
82	T	120	4	LmS	High
83	T	33	1	LmS	High
83	T	65	2	LmS	High
83	T	120	3	SC	Low
84	T	31	1	LmS	High
84	T	56	2	LmS	High
84	T	110	3	LmS	High
84	T	120	4	mS	High
85	T	32	1	LmS	High
85	T	50	2	LmS	High
85	T	72	3	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
85	T	120	4	SCL	Medium
86	T	34	1	LmS	High
86	T	56	2	LmS	High
86	T	87	3	LmS	High
86	T	120	4	mS	High
87	T	34	1	LmS	High
87	T	65	2	LmS	High
87	T	93	3	LmS	High
87	T	120	4	mSL	High
88	T	30	1	LmS	High
88	T	50	2	LmS	High
88	T	120	3	LmS	High
89	T	32	1	LmS	High
89	T	45	2	LmS	High
89	T	120	3	LmS	High
90	T	34	1	LmS	High
90	T	64	2	LmS	High
90	T	120	3	SCL	Medium
91	T	33	1	LmS	High
91	T	52	2	LmS	High
91	T	120	3	SCL	Medium
92	T	36	1	LmS	High
Pit 4	T	60	2	LmS	High
Pit 4	T	90	3	LmS	High
Pit 4	T	120	4	mS	High
93	T	32	1	LmS	High
93	T	40	2	LmS	High
93	T	120	3	LmS	High
94	T	32	1	LmS	High
94	T	60	2	LmS	High
94	T	82	3	LmS	High
94	T	109	4	LmS	High
94	T	120	5	mS	High
95	T	30	1	ohCL	Low
95	T	45	2	hCL	Low
95	T	55	3	LmS	High
95	T	120	4	LmS	High
96	T	33	1	ohCL	Low
96	T	70	2	PL	Low
96	T	105	3	PL	Low

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
96	T	120	4	LmS	High
97	T	35	1	ohCL	Low
97	T	62	2	PL	Low
97	T	70	3	mSL	High
97	T	120	4	LmS	High
98	T	25	1	ohCL	Low
98	T	100	2	PL	Low
98	T	120	3	PL	Low
99	T	7	1	oLmS	Medium
99	T	15	2	LmS	High
99	T	120	3	LmS	High
100	T	30	1	LmS	High
100	T	120	2	LmS	High
101	T	20	1	Oscl	Low
101	T	40	2	SCL	Medium
101	T	120	3	LmS	High
102	T	25	1	ohCL	Low
102	T	70	2	ohCL	Low
102	T	100	3	LP	Low
102	T	120	4	mSL	High
103	T	30	1	oSCL	Low
103	T	35	2	SCL	Medium
103	T	120	3	LmS	High
104	T	23	1	oSCL	Low
104	T	80	2	PL	Low
104	T	120	3	LmS	High
105	T	24	1	oSCL	Low
105	T	50	2	PL	Low
105	T	60	3	omSL	Medium
105	T	120	4	LmS	High
106	T	25	1	oLmS	Medium
106	T	30	2	LmS	High
106	T	120	3	LmS	High
107	T	22	1	ohCL	Low
107	T	80	2	LP	Low
107	T	120	3	LP	Low
108	T	25	1	ohCL	Low
108	T	50	2	LP	Low
108	T	63	3	LP	Low
108	T	120	4	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
109	T	24	1	ohCL	Low
109	T	80	2	LP	Low
109	T	120	3	LmS	High
110	T	22	1	ohCL	Low
110	T	45	2	LP	Low
110	T	60	3	mSL	High
110	T	120	4	LmS	High
111	T	23	1	ohCL	Low
111	T	50	2	LP	Low
111	T	120	3	LmS	High
112	T	25	1	SCL	Medium
112	T	65	2	SCL	Medium
112	T	85	3	SC	Low
112	T	120	4	SC	Low
113	T	40	1	oSCL	Low
113	T	120	2	SCL	Medium
114	T	30	1	oLmS	Medium
114	T	50	2	LmS	High
114	T	120	3	LmS	High
115	T	22	1	ohCL	Low
Pit 5	T	60	2	LP	Low
Pit 5	T	120	3	PL	Low
116	T	20	1	ohCL	Low
116	T	110	2	PL	Low
116	T	120	3	LmS	High
117	T	25	1	ohCL	Low
117	T	80	2	ohCL	Low
117	T	120	3	PL	Low
118	T	23	1	ohCL	Low
118	T	120	2	PL	Low
119	T	25	1	ohCL	Low
119	T	80	2	PL	Low
119	T	90	3	LmS	High
119	T	120	4	LmS	High
Pit 6	T	20	1	oSCL	Low
Pit 6	T	52	2	PL	Low
Pit 6	T	60	3	mSL	High
Pit 6	T	120	4	LmS	High
120	T	35	1	mSL	High
120	T	53	2	LmS	High

Sample number	Topsoil (T)	Depth bgl	Soil Horizon	Soil texture	Resilience
120	T	120	3	LmS	High
121	T	32	1	LmS	High
121	T	60	2	LmS	High
121	T	82	3	LmS	High
121	T	120	4	LmS	High
122	T	30	1	LmS	High
122	T	60	2	LmS	High
122	T	120	3	LmS	High
123	T	30	1	mSL	High
123	T	120	2	mSL	High
124	T	33	1	mSL	High
Pit 7	T	57	2	LmS	High
Pit 7	T	120	3	LmS	High
125	T	35	1	LmS	High
125	T	62	2	LmS	High
125	T	120	3	LmS	High
Pit 8	T	35	1	LmS	High
Pit 8	T	62	2	LmS	High
Pit 8	T	120	3	LmS	High
126	T	35	1	LmS	High
126	T	65	2	LmS	High
126	T	120	3	LmS	High
127	T	34	1	mSL	High
127	T	60	2	LmS	High
127	T	120	3	LmS	High
128	T	35	1	LmS	High
128	T	66	2	LmS	High
128	T	120	3	LmS	High
129	T	30	1	mSL	High
129	T	62	2	mSL	High
129	T	102	3	SC	Low
129	T	120	4	SCL	Medium
130	T	34	1	LmS	High
130	T	72	2	LmS	High
130	T	120	3	LmS	High