## 1MCo4 Main Works - Contract Lot S2

# Stability Risk Assessment - Eastern Mound - Ruislip Northern Sustainable Placement S2

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### 1 Introduction

### Introduction to High Speed 2

- 1.1.1 Phase One of HS2 will provide dedicated high speed rail services between London, Birmingham and the West Midlands. It will extend for approximately 230km (143 miles). Just north of Lichfield, high speed trains will join the West Coast Main Line for journeys to and from Manchester, the North West and Scotland.
- Phase One of HS2 is the first phase of a new high speed railway network proposed by the Government to connect major cities in Britain. It will bring significant benefits for inter-urban rail travellers through increased capacity and improved connectivity between London, the Midlands and the North. It will release capacity on the existing rail network between London, Birmingham and the West Midlands and so provide opportunities to improve existing commuter, regional passenger and freight services.
- 1.1.3 HS2 have employed Skanska Costain Strabag (SCS) as Main Works Civils Contractor for the S2 lot for Phase One of the HS2 scheme. Lot S2 extends from the western end of the proposed Old Oak Common Station and includes tunnels, shafts, a large crossover box excavation, portal structures, cuttings and embankments.

### 1.2 Report Context

- This Stability Risk Assessment (SRA) report has been prepared for the Eastern Mound of the Ruislip North Sustainable Placement (from herein referred to as the 'EM RNSP') to support the Environmental Permit application in line with the requirements of the EU Landfill Directive (1193/31/EC). The site was originally identified as an area to accommodate sustainable placement for Phase 1 of the High Speed 2 project, and provisions were included within the High Speed Rail (London West Midlands) Act 2017. Sustainable placement is the onsite placement for disposal of surplus excavated material to avoid causing environmental effects that would otherwise be associated with the offsite disposal of that material.
- 1.2.2 The report should be read in conjunction with the following drawings:
  - 001-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711011 Site location regional
  - 002-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711012 Site location local
  - oo4-1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711014 Site topography
  - 005-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711015 Proposed landfill geometry
  - oo6-1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711016 Location of geological Section
  - oo7-1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711017 Exploratory hole location plan
  - 008-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712021 Cross Sections A and B

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- 009-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712022 Cross Sections C and D
- 010-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712024 Geological cross section through the site
- 011-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712025 Geological cross section through Copthall
- o12-1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-712o26 Conceptual site model
- 1.2.3 The EM RNSP is located on Newyears Green Lane in Harefield, Uxbridge. The site location is shown on Drawing 1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711011 and is located at National Grid Reference TQ 07330 88304. EM RNSP will receive inert soils excavated from the nearby Copthall Tunnel (shown on Drawing 1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711011), which is to be constructed as part of Phase 1 of the High Speed 2 rail scheme. The form of construction of the tunnel is 'cut and cover'. No tunnel boring machine will be used in its construction. The excavated material will primarily comprise London Clay.
- The EM RNSP area will comprise two main mounds as shown on Drawing 1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711015. The maximum height of the mounds are around 22m and the slope angles vary between 1V:4H to 1V:10H as shown on Drawings 1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711015, 1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-712021 and 1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-712022. Site drainage will be controlled by a series of shallow swales around the perimeter of the mounds as shown on Drawing 005-1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711015.
- 1.2.5 This report will form part of a suite of documents that together will be submitted to the Environment Agency as part of an application for a waste permit. The format of this report has been prepared in accordance with the associated Environment Agency template [1].

### 1.3 Conceptual Stability Site Model

- 1.3.1 The Conceptual Site Model (CSM) relating to the six components as outlined within the Environment Agency R&D Technical Report P1-385/TR2 are presented in the following sections.
- 1.3.2 As the landfill is for the disposal of inert soils only, there will be no leachate or gas generation and therefore these will not be discussed further as part of the CSM.
- 1.3.3 A schematic representation of the CSM is shown on Drawing 012-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712026.

### **Basal Sub-Grade Model**

### Geological Review

1.3.4 The 1:50,000 geological map sheet [8] for the site has been reviewed and is summarised below.

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- 1.3.5 Within the site boundary there are no superficial deposits indicated to be present.

  Immediately to the west of the site artificial ground is indicated to be present, specifically 'infilled ground; excavations that have been wholly filled with waste'. The area of artificial ground corresponds with the location of the historic landfill adjacent to the site.
- 1.3.6 The bedrock beneath the site is indicated to be Harwich and London Clay of the Thames Group. Underlying the Harwich and London Clay Formations is the Upnor and Reading Formations of the Lambeth Group which outcrops at lower levels to the east of the site.
- 1.3.7 On the vertical section, the Lambeth Group is indicated to be up to 28m in thickness and to lie unconformably over the Seaford and Newhaven Formations of the White Chalk Subgroup.

  The Seaford and Newhaven Formations are indicated to be 50m in thickness.
- 1.3.8 The geological map provides the following descriptions for the materials:
  - Harwich and London Clay Formations (Thames Group): Clay, grey weathering to brown, stiff; thin beds of glauconitic sand and pebbles at base.
  - Upnor and Reading Formations (Lambeth Group): Clay, silty with beds of sand; gravel at base, locally cemented.
  - Seaford and Newhaven Formations: Chalk, soft, sporadic nodular flint beds; brown and phosphatic in upper part.
- 1.3.9 There are no faults indicated to be present in the vicinity of the site.

### Ground investigation

1.3.10 Intrusive ground investigation has been undertaken at the site. The exploratory hole locations are shown on Drawing 007-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711017. The investigation comprised four boreholes and the exploratory hole logs are included in Appendix A. Note only one of the boreholes is within the site boundary, with the remaining three holes located between 15m and 18om away. A summary of the encountered ground conditions is presented in Table 1 below.

Table 1 - Summary of encountered ground conditions

| Exploratory<br>Hole | Topsoil /<br>Made<br>Ground | Clay<br>Deposits | London<br>Clay<br>(Thames<br>Group) | Harwich<br>Formation<br>(Thames<br>Group) | Lambeth<br>Group | Seaford and<br>Newhaven<br>Formations |
|---------------------|-----------------------------|------------------|-------------------------------------|---|------------------|---------------------------------------|
| ML024-RC012         | o-o.5m                      | 0.5-2m           | 2-17.5m                             | 17.52-18.5m                               | 18.5-33.5m       | 33.5->35m                             |
| ML025-RC048         | o-o.3m                      | 0.3-1.2M         | 1.2-2.2M                            | 2.2-4.2M                                  | 4.2-20.2M        | 20.2->21.7M                           |
| ML025-<br>RC049     | o-o.3m                      | 0.3-1.7m         | -                                   | 1.7-3.8m                                  | 3.8-19.4m        | 19.4->21.5m                           |

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| ML025-RC051 | o-o.4m o.4 | -2.1m 2.1-9.5m | 9.5-11.7m | 11.7-29.1 | 29.1->31m |
|-------------|------------|----------------|-----------|-----------|-----------|
|-------------|------------|----------------|-----------|-----------|-----------|

- 1.3.11 As only one of the boreholes is located within the site boundary, the conceptual model for the basal subgrade will be based on the published geological information and all four boreholes in the area, to provide a broader understanding of the ground conditions in the vicinity of the site.
- 1.3.12 A cross section through the site showing the encountered ground conditions is shown on o1o-1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-712024 and the location of the section is shown on Drawing oo6-1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711016.

### Topsoil and Made Ground

- 1.3.13 Topsoil was encountered in MLo25-RCo48, MLo25-RCo49 and MLo25-RCo51 to a depth of 0.3 to 0.4mbgl. This stratum was typically described as grass over soft brown slightly sandy slightly gravelly clay, with gravels subangular to rounded fine to coarse flint.
- 1.3.14 Made Ground was only encountered in MLo24-RCo12. This was described as brown and grey slightly sandy gravelly clay, with gravels angular to sub rounded fine to coarse flint and brick. From review of the site history completed as part of the ESSD [2] the site appears to be predominantly greenfield. MLo24-RCo12 is located on the far southern edge of the site near an access point into the site from Newyears Green Lane. It is therefore anticipated that the source of the made ground is likely to be related to works associated with this access point, or with the adjacent industrial premises.

### **Clay Deposits**

- 1.3.15 Clay deposits were encountered in all holes beneath the topsoil and are referred to as 'superficial deposits' on the exploratory hole logs included in Appendix A. The thickness of the Clay Deposits encountered varied between o.9m and 1.7m. It was typically described as soft light brown / yellow mottled grey slightly sandy slightly gravelly clay with sand being fine to coarse, and gravel as subangular and sub rounded fine to coarse flint.
- 1.3.16 The geological classification of this material is unclear. It considered likely to either be alluvium or weathered London Clay. Based on the grading of the material and visual appearance, it appears similar to the London Clay. However, the descriptions indicate the material contains some flint gravel which is unlikely to be present within the London Clay. As the classification is unclear, the engineering parameters will be derived based on the available information and this material will be referred to as 'Clay Deposits'

### **London Clay (Thames Group)**

- 1.3.17 The Thames Group comprises the London Clay overlying the Harwich Formation.
- 1.3.18 The London Clay was encountered in three of the exploratory holes at depths ranging from 1.2mbgl to 2.1mbgl. The thicknesses of this strata range from 2m to 15.5m. This stratum is

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typically described as stiff to very stiff fissured dark brown mottled orangish brown locally grey slightly sandy clay with occasional pockets of gypsum crystals, shell fragments and thin laminae of claystone. The fissures are noted as extremely closely to very closely spaced, planar and smooth.

- London Clay was not encountered in MLo25-RCo49, although the underlying Harwich Formation was encountered. This broadly corresponds with the geological map which indicates that the Thames Group is absent in the lower parts of the site and MLo25-RCo49 is located near the boundary of the Thames Group in a lower area.
- 1.3.20 No residual shear surfaces were identified within the London Clay from the ground investigation. The site is relatively flat with the general fall of the land <5° (see Drawing 004-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711014). On this basis, residual shear surfaces are unlikely to be present within the London Clay.

### **Harwich Formation (Thames Group)**

1.3.21 The Harwich Formation was encountered in all exploratory holes at depths ranging from 2.2mbgl to 17.5mbgl. The thicknesses of this strata range from 0.9m to 2.2m. This stratum is typically described as stiff brown or grey mottled orangish brown locally grey slightly sandy clay with occasional pockets of shell fragments. Gravels are noted in some locations as subsurrounded and medium flint; claystones and weathered pyrite are also noted in MLo25-RCo49.

### Reading Formation (Lambeth Group)

- 1.3.22 The Lambeth Group comprises the Reading Formation overlying the Upnor Formation.
- 1.3.23 This stratum was encountered in all exploratory holes to a maximum depth of 33.5mbgl. It is typically described as stiff to very stiff fissured dark yellowish brown slightly sandy clay with rare fragments of lignite. The sand is generally fine and medium and the fissures are extremely closely to very closely spaced, mainly planar and smooth. In some locations, it is interbedded with brown to orangish brown sand or silt that is locally slightly gravelly.

### **Upnor Formation (Lambeth Group)**

1.3.24 This stratum was encountered in all exploratory holes to a maximum depth of 33.45mbgl. It is typically described as dark grey slightly gravelly clay. It is also noted as a sand in some locations (ML-25-RCo48). The sand is glauconitic, fine to coarse and the gravel is angular to round fine to medium flint. Some fissures are noted, these are extremely closely to very closely spaced, planar, smooth.

### Seaford and Newhaven Formations

1.3.25 The Seaford and Newhaven Formations were encountered in all exploratory holes to an unproven depth. It is typically described as very weak to weak high density white chalk with occasional thin beds of nodular flint. Fractures are very closely to medium spaced, planar,

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smooth. In some shallower locations (MLo25-RCo49 and MLo24-RCo12) it is described as a structureless chalk composed of slightly gravelly silty sand. MLo25-RCo51 notes extremely weak to weak siltstone with frequent chalk and flint clasts.

### Groundwater

- 1.3.26 A detailed review of the site hydrogeology has been undertaken as part of the Hydrogeological Risk Assessment [4]. In summary, the Seaford and Newhaven Formations are classified by the Environment Agency (EA) as a Principal aquifer, whereas the Lambeth Group and the Harwich Formation are Secondary A aquifers.
- 1.3.27 Groundwater level monitoring has been performed from January 2017 to May 2017 and the results are presented within the Hydrogeological Risk Assessment [4]. A summary of the monitoring data is provided in Table 2 below. All of the response zones were within the base of the Lambeth Group, just above the horizon of the chalk. In summary, the piezometric pressures were typically monitored at around 39mOD across the site.

|           | _      | _         |          |            |               |
|-----------|--------|-----------|----------|------------|---------------|
| Table 2 - | Summan | / of arou | ndwateri | monitoring | ı information |

| Hole        | Ground Level mOD | Response Zone<br>mOD / mbgl | Average<br>mOD / mbgl | Highest<br>mOD / mbgl | Lowest<br>mOD / mbgl |
|-------------|------------------|-----------------------------|-----------------------|-----------------------|----------------------|
| ML024-RC012 | 61.9             | 28.9 – 31.9<br>30 - 33      | 37.5 / 24.3           | 23.0 / 38.9           | 37.0 / 24.9          |
| ML025-RC048 | 54.8             | 41.9 - 45.9<br>16 – 20      | 39.4 / 15.3           | 40.0 / 14.8           | 39.2 / 15.6          |
| ML025-RC049 | 51.2             | 32.2 – 37.2<br>14 – 19      | 37.9 / 13.3           | 38.7 / 12.5           | 37.6 / 13.7          |
| ML025-RC051 | 60.0             | 31 - 41<br>19 - 29          | 39.9 / 20.0           | 40.6 / 19.3           | 39.3 / 20.6          |

### **Existing topography**

1.3.28 The existing site topography is shown on Drawing 004-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711014. The site is generally relatively flat with an approximate elevation of between 47mAOD and 62mAOD with gentle slopes (generally less than 5°).

### Conceptual model

- 1.3.29 Based on the information outlined in the above sections, the proposed conceptual model for the basal subgrade is as follows and is shown on Drawing o12-1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-712026:
  - o to 1.5mbgl Clay Deposits
  - 1.5 to 15.5mbgl London Clay (Thames Group)

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- 15.5 to 17.5mbgl Harwich Formation (Thames Group)
- 17.5mbgl to 3ombgl Lambeth Group
- '>3ombql Seaford and Newhaven Formations
- 1.3.30 It should be noted that the Lambeth Group will be treated as a single material for the stability risk assessment and not separated between the Upnor and Reading Formations. The material is present at depth and is unlikely to have a significant impact on the results of the stability calculations. In addition, based on the review of the material descriptions and geotechnical test data (as discussed in Section 2.5), they are likely to exhibit similar engineering properties.
- 1.3.31 In the lower parts of the site, the London Clay is likely to be relatively thin or absent. As the London Clay generally exhibits lower undrained shear strength than the underlying Harwich Formation (see Section 2.5), accounting for a larger thickness of London Clay in the conceptual model is considered to be conservative for the stability risk assessment. In regard to drained strength parameters, the design values are proposed to be the same for both the London Clay and Harwich formation.
- 1.3.32 The topsoil and subsoil will be stripped from the footprint of the landfill prior to its construction.
- 1.3.33 In regard to the groundwater level, based on the monitoring information this indicates groundwater level is at some depth below the landfill at >10bgl. However, this is based on monitoring within installations at the base of the Lambeth Group. The underlying chalk is anticipated to be under draining the overlying superficial deposits and therefore there is potential for porewater pressures to be present within the overlying Thames Group. For design purposes, a design groundwater level of 1mbgl will be conservatively assumed.

### Side Slopes Sub-Grade Model

1.3.34 The CSM for the side slopes sub-grade is as per the basal sub-grade model described above.

### **Basal Lining System Model**

- 1.3.35 The use of basal and side slope liners was considered and discussed with the Environment Agency. While the waste material will comprise predominantly inert London Clay, and the underlying material comprises low permeability London Clay, an artificially enhanced geological barrier was required in order to comply with relevant landfill construction guidance. The London Clay used to construct the liner will be from the same source as the London Clay which forms the majority of the waste mass, but the liner will undergo additional testing and inspection measures as part of the CQA process to demonstrate its suitability to perform as a liner.
- 1.3.36 For the purpose of the stability risk assessment the barrier material will have the same geotechnical properties as that of the underlying material and the waste material. As such this

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basal lining system will be assessed as part of the Waste Mass Model (Sections 1.3.38 to 1.3.47).

### Side Slope Lining System Model

1.3.37 As per the above for basal lining system.

### **Waste Mass Model**

- 1.3.38 The waste mass will comprise inert soils from the Copthall Tunnel which is located approximately 750m to the southwest of the site. The location of the tunnel is at National Grid Reference TQ 0649 8750 and is shown on Drawing 002-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711012.
- 1.3.39 Intrusive ground investigation has been undertaken at the location of the Copthall Tunnel. A long section through the tunnel has been produced showing the rail level, existing topography and ground investigation information and is shown on Drawing 011-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712025.
- 1.3.40 As can be seen from the long section, the vast majority of the soils excavated from the tunnel will be within London Clay. At the base of the tunnel, the Harwich Formation is likely to be encountered.
- 1.3.41 Made ground and topsoil are anticipated to be present to shallow depth above the London Clay, however, these materials will not be disposed of within the landfill.
- For the waste mass model, this will be assumed to be London Clay. Although there will be some material from the Harwich Formation within the waste mass, this will only comprise a relatively small quantity. In addition, the Harwich Formation will likely exhibit similar strength and stiffness parameters to the London Clay (see Section 2.5).
- 1.3.43 The maximum permanent angle of the waste mass will be 1V:4H. It is proposed to construct the landfill mounds by bringing up mounds approximately level. There will therefore not be any temporary slope angles steeper than 1V:4H.
- 1.3.44 As the waste mass will comprise London Clay which is a low permeability material, the majority of surface water will run off the landfill slopes and there is unlikely to be infiltration of surface water in to the waste mass. For the purpose of the stability calculations, an r<sub>u</sub> value of o.1 will be assumed which is considered to be conservative based on the low permeability of the waste mass.
- 1.3.45 As the landfill mounds are to be constructed at a relatively steep angle of up to 1V:4H, the earthworks specification will be relatively stringent in terms of the compaction requirements. The earthworks specification will be similar to that of a standard engineered earthwork (such as a highway embankment) rather than a landfill. The earthworks specification will require the waste material to be placed in thin layers and compacted with appropriate earthworks plant

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to ensure the material is well compacted. This is primarily required for stability purposes, but will also limit the internal settlement and potential for surface water infiltration.

### **Capping System Model**

- 1.3.46 As the waste is to comprise inert soils only there is no capping system to the landfill.
- 1.3.47 The landfill mounds will be landscaped which will include the placement of topsoil and subsoil on the landfill slopes. As the topsoil and subsoil is not integral to the performance of the landfill, the stability of the topsoil and subsoil has not been considered as part of the stability risk assessment.

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### 2 Stability risk assessment

### 2.1 Risk Screening

### **Basal Sub-Grade Screening**

- 2.1.1 The more complex geotechnical risks relating to the basal sub-grade requiring detailed analyses are as follows:
  - Impact on slope stability: The basal sub-grade may impact on the stability of the landfill if the critical slips surfaces pass through the sub-grade. In particular, this is likely to be the case in the undrained conditions when larger deep-seated slips are typically critical and may pass in to the underlying basal sub-grade.
  - Preferential failure plane through the Clay Deposits: The Clay Deposits have a slightly lower undrained shear strength than the overlying waste and underlying London Clay.
     As such this has the potential to be a preferential failure plan for the deeper undrained failure surfaces.
  - Settlement of the landfill: The properties of the basal sub-grade will determine the
    settlement of the landfill mounds. Although the risks posed by settlement to the
    landfill are considered to be relatively low, it is considered necessary to have some
    understanding the potential settlement of the landfill to inform post construction
    monitoring.
- 2.1.2 The simple geotechnical risks relating to the basal sub-grade which do not require detailed analyses are as follows:
  - Dissolution features: There is the potential for dissolution features to form and collapse within the chalk of the Seaford and Newhaven Formations. The risks posed by dissolution to the safe operation of the landfill are not considered to require complex analyses based on the following:
    - The chalk is confined and thus will remain saturated. The presence of saturated groundwater conditions minimises the risk of collapse, as dissolution features are less stable where unsaturated.
    - The top of the chalk layer is at least 19m (or greater) below the ground surface. There will be some spread of the load applied from the mound through the overlying material, reducing the load applied to the chalk.
    - As the chalk is overlain by 19m of material, should there be any of collapse of voids within the chalk, these may not propagate to the ground surface depending on the size of the void due to bulking effects.
  - Strength characteristics of Lambeth Formation and Seaford and Newhaven

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Formations: As these materials are present at significant depth, greater than 17.5mbgl in the conceptual model, it is not considered necessary to assess their strength characteristics in detail. This is on the basis that the critical slope slips will be driven by the landfill mound and the shallow underlying ground conditions.

- Residual shear surfaces within the London Clay: No residual shear surfaces were
  identified within the London Clay from the ground investigation. The site is relatively
  flat with the general fall of the land <5° (see Drawing 004-1MC04-SCJ\_SDH-LS-DGASS05\_SL07-711014). On this basis, residual shear surface are unlikely to be present
  within the London Clay.</li>
- Soft or unsuitable ground in the mound formation: The topsoil and subsoil will be stripped from the mound formation. Prior to the placement of any material, the formation will be inspected and any soft or unsuitable ground will be excavated and replaced.
- Adjacent gas main utility: There is an existing buried gas main within the site near the western boundary (see Drawing 1MCo4-SCJ\_SDH-LS-DGA-SSo5\_SLo7-711014). Any future maintenance access to the gas main could include excavations to expose the main and such excavations could impact on the stability of the landfill. As such, the toe of the landfill slopes have been positioned a safe offset from the gas main alignment. There is a 25m wide easement around the gas main (12.5m either side) and in addition to this, an 8m wide construction corridor has been allowed for between the edge of the easement and the toe of the slopes (as illustrated on Drawing 1MCo4-SCJ\_SDH-LS-DSE-SSo5\_SLo7-71201). As such, the gas main is approximately 20m from the toe of the landfill and therefore any shallow excavations to expose the main are not anticipated to have any significant impact on the stability of the landfill. This also allows for safe construction of the landfill without risk of damage to the gas main.
- Effects of perimeter drainage: The swales around the perimeter of the mounds have the potential to impact on the global stability of the adjacent mound slopes. However, the proposed swales are offset a short distance from the toe of the mound, are less than 0.5m deep and have 1:3 side slopes as shown on Drawing 008-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712021 and 712022. As such these shallow swales don't have any impact on the stability of the adjacent mounds and do not require any further consideration.

### Side Slopes Sub-Grade Screening

2.1.3 The risk screening relating to the side slopes sub-grade is as per the basal sub-grade discussed above.

### **Basal Lining System Screening**

2.1.4 The risk screening relating to the basal lining system is as per the Waste Mass Screening discussed below.

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### **Side Slope Lining System Screening**

2.1.5 The risk screening relating to side slope lining System is as per the Waste Mass Screening discussed below.

### **Waste Mass Screening**

- 2.1.6 The more complex geotechnical risks relating to the waste mass requiring detailed analyses are as follows:
  - Slope stability: The stability of the landfill will primarily be driven by the geometry and properties of the waste mass. As the majority of the waste mass will be London Clay, it will be necessary to consider both drained and undrained conditions.
  - Internal settlement: The properties of the waste mass will determine the internal settlement of the landfill mound. Although the risks posed by internal settlement to the landfill are considered to be relatively low, it is considered necessary to have some understanding the potential settlement of the landfill to inform post construction monitoring.
- 2.1.7 The simple geotechnical risks relating to the waste mass which do not require detailed analyses are as follows:
  - Preferential slips surfaces: Where there are interfaces between different fill types and geotextiles, there is the potential for these to form preferential slip surfaces. As there is no capping to the landfill and the basal subgrade material comprises the same material as the waste mass, there are no preferential slip surfaces present.
  - Topsoil stability: It is proposed to topsoil and landscape the landfill mound. As the topsoil is not integral part of the landfill structure, it is not considered necessary to consider the stability of the topsoil as part of this assessment.

### **Capping System Screening**

2.1.8 As the landfill is for inert material only, no capping system is proposed.

### 2.2 Lifecycle Phases

2.2.1 Regarding potential lifecycle phases of the landfill, for the Stability Risk Assessment it is only considered necessary to assess the landfill in the as built condition. This is based on the following effects during and post construction:

### **During construction**

- The waste mass will comprise inert wastes only and therefore there will be no daily cover or temporary capping.
- There are no cells or particular zoning to the landfill, it will be a single homogeneous mound.

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• The slope heights will be at their greatest at the end of construction.

#### Post construction

- The waste mass will comprise inert wastes only and therefore there will be no leachate or gas generation.
- The formation will consolidate under the additional load which will result in an increase in the undrained shear strength.
- As the settlement of the formation and internal settlement occurs, this may result in a small reduction in the slope angles
- The landfill will be inspected and monitored (see Section 3)

Based on the above, the as built condition is considered to be most critical. No other life cycle phases will be considered as part of this assessment.

Due to the size of the mounds, during their construction there is likely to be some phasing of the earthworks to allow better quality in smaller working areas i.e. protection to soil formations, surface water control, silt management etc. As such there may be some small intermediate temporary slopes to allow this phasing but these will not exceed the finished profile of the mounds and fill will be benched into any intermediate slopes to ensure there are no potential preferential failures surfaces. As such further consideration of these small intermediate temporary slopes is not considered necessary as part of this assessment.

### 2.3 Data Summary

2.3.1 A summary of the data used to inform this Stability Risk Assessment is listed below.

### Published data

• 1:50,000 Geological Map.

### Site specific data

- Four boreholes as summarised in Section 1.3.10.
- Associated geotechnical laboratory testing including bulk unit weight, Atterberg Limits, undrained triaxial tests, particle size distribution and shear box tests. The results of the laboratory testing are presented on Figures 1 to 19.
- Groundwater monitoring data as summarised in Section 1.3.26.

### Assumed data

2.3.2 The ground investigation data from the Copthall Tunnel has been used as part of this Stability Risk Assessment to supplement the site specific data. As this larger data set is available it is considered prudent to review this data to provide greater confidence in the site specific data. The Copthall Tunnel is located approximately 750m to the south and has the same geological

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setting and therefore is considered to be relevant to the ground conditions at the site. In addition, as the Copthall Tunnel will be the source of the waste mass, the data will also be used to determine parameters for the waste. The data available from the Copthall Tunnel includes:

- 57no. boreholes.
- 68no. windowless sample holes.
- 37no. trial pits.
- Associated geotechnical laboratory testing including bulk unit weight, Atterberg Limits, undrained triaxial tests, particle size distribution and shear box tests. The results of the laboratory testing are presented on Figures 1 to 19.

# 2.4 Justification for Modelling Approach and Software Slope stability

- 2.4.1 For undrained soil conditions, the stability of the slope will be assessed using Bishop's method. The slope stability analysis will be undertaken using Oasys Slope with variably inclined interslice forces of 2D circular slips. It is proposed to analyse three cross sections through the southern mound (A-C) and one through the northern mound (D) to ensure the variation in slope angles and geometry is assessed. The location of the sections are shown on Drawing 005-1MC04-SCJ\_SDH-LS-DGA-SS05\_SL07-711015 and the sections themselves are shown on 008-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712021 and 009-1MC04-SCJ\_SDH-LS-DSE-SS05\_SL07-712022.
- 2.4.2 Sections A-AA, B-BB and C-CC pass through the highest point of the larger southern mound. The domed shape of the mound means that the highest part of the mound only occurs over a relatively short distance, and it is considered that analysis of the sections though the highest point is unduly conservative.
- 2.4.3 As can be seen in Sketch o1 included in Appendix B1, the peak of the mound is 66.8mOD. The slope of the upper 4m to 5m of the mounds is more gradual, before dropping away more steeply from around 62mOD.
- 2.4.4 Based on the above, for the slope profiles to be more representative and take some account for the 3D geometry of the mounds, the sections used in the analyses have been 'flattened' by 2m to model the 'averaged' height of the top of the mound.
- 2.4.5 To assess the potential for a preferential failure plane through the Clay Deposits, a sensitivity analysis will be undertaken for a wedge type failure. This will also be analysed in Oasys Slope using the Janbu method. The failure surface will be defined to be a wedge of similar geometry to the circular slip identified as having the lowest factor of safety, but modified to pass through the lower strength Clay Deposits.

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- 2.4.6 For drained soil conditions the stability of the slope will be assessed using infinite slope theory. This approach is considered to be appropriate due to relatively long length of the slopes up to 22m in height. It also conservatively ignores any beneficial effects associated with circular slips, toe effects or 3D effects on the side of the slip surface. Drained conditions will be assessed for the range of slope angles present, including the steepest proposed angle of 1V:4H.
- 2.4.7 As an additional robustness measure, the steepest section from the mound (Section B-BB) will be analysed in Oasys Slope under drained conditions.
- 2.4.8 The Sustainable Placement Area mounds are more similar to standard engineered earthworks than to landfills. There are no particular additional failure mechanisms, such as interfaces within a capping system. On this basis, the slope stability of the landfill will be assessed as a whole, rather than considering elements individually.

#### Settlement

- 2.4.9 Settlement of the landfill formation will be assessed using Oasys Pdisp which is based on elastic settlement theory. To simplify the non-uniform geometry of the mounds, these will be simplified to a two-dimensional sections which are then extrapolated in to the third dimensions to form a linear type embankment. This approach is considered to be conservative as the 3D loading effects where the fill height reduces in all directions away from the top of the mounds will be ignored. The rigid boundary will be assumed to be the horizon of the Seaford and Newhaven Formations at 30mbgl in the conceptual model.
- 2.4.10 Section B-BB will be analysed as this section has the greatest loaded area.
- For the internal settlement of the landfill mounds, this will be estimated based on the approach recommended outlined in Earthworks: A Guide by Trenter [5].

# 2.5 Justification of Geotechnical Parameters Selected for Analyses

2.5.1 In the following sections of this report, the data available from the site and also the nearby Copthall Tunnel will be set out and analysed. On the plots of the geotechnical test data (Figures 1 to 19), the site specific data is shown in red and the data from the Copthall Tunnel is shown in grey/black. In addition, as the Copthall Tunnel will be the source of the waste mass, this data will also be used to determine parameters for the waste.

# Parameters Selected for Basal Sub-Grade Analyses Clay Deposits

### Classification

2.5.2 Four Atterberg Limit and Particle Size Distribution (PSD) tests were undertaken on samples of the Clay Deposits. The Atterberg limit test results are presented in Figure 1 and indicate the

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plastic limit varies between 17% and 22% and liquid limits between 69% and 88%. The results of the PSD grading analysis are shown on Figure 3. These indicate the materials is a slightly sandy slightly gravelly silty clay which corresponds with the log descriptions.

2.5.3 No bulk unit testing was undertaken on the Clay Deposits. Based on the guidance in BS8002 [6], a density of 15kN/m3 to 19kN/m3 is recommended for low strength clay. On this basis, a value of 17kN/m3 is recommended for design.

### Strength

No strength testing has been undertaken on the Clay Deposits. In regard to the undrained strength, the material is described as being of soft consistency which equates to a material of undrained shear strength of 20kPa to 40kPa in accordance with Trenter [5]. On this basis, a value of 30kPa is recommended for design. For the drained strength parameters, this can be correlated from the plasticity index in accordance with the equation stated in BS8002 [6]. Assuming a characteristic plasticity index value of 60%, this equates to a  $\Phi$  'critical = 20°. The equation does not account for dilation effects and peak values.

### Stiffness

For the stiffness (Young's Modulus), this can be correlated from the undrained shear strength. Based on the guidance by M.A. Stroud [7], a correlation of  $E' = 200C_0$  is recommended for high plasticity clays. This equates to a value of  $E' = 6000kN/m^2$ .

### **London Clay (Thames Group)**

### Classification

- 2.5.6 Classification tests including PSD, Atterberg limit, natural moisture content and bulk unit weight have been carried out in the London Clay. The bulk unit weight of the samples is presented in Figure 4 and typically ranged between 18.6 and 20.6kN/m³. This is in agreement with Ciria C76o which suggests 18 to 19kN/m³ for firm stiff clay. A unit weight of 19.5kN/m³ is therefore suggested for design for the London Clay.
- 2.5.7 The Atterberg limit test results are presented in Figure 5 and suggest the plastic limit of the London Clay to lie between 17 and 34% and liquid limits between 48 and 85% with the majority of samples lying between 60 to 75%. Figure 6 shows the plasticity chart for London Clay and confirms the high to very high plasticity of the clay.
- 2.5.8 The results of particle size distribution tests in the London Clay are shown in Figure 7. Disregarding MLo25-TPo79 which contains claystones and cobbles, these show the London Clay to have a gravel content of less than 5%. The clay could be described as sandy, and over the top 15 metres with a sand content which tends to be less than 20%, most of which is fine sand. The sand content increases with depth, with the base of the London Clay containing a band of between 10 and 45% sand. The London Clay samples were very silty (20-40% silt) and 30-63% clay.

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### Strength

- 2.5.9 SPTs 'N' values show an increasing trend with depth, predominantly ranging from 9 to 38 as shown on Figure 8. A characteristic relationship of N=10+1.6z is recommended where z is measured from below the top of the London Clay stratum. The triaxial undrained shear strength test result also shows an increasing trend with depth as shown on Figure 9. The values typically vary between 45 kPa and 200kPa.
- 2.5.10 Stroud [7] recommends a relationship of cu = 4.5N (where N is the SPT value), however, considering the agreement of the SPT-derived and triaxial undrained shear strength values a correlation factor of 4N is more appropriate as shown in Figure 9. A characteristic approximation of the undrained shear strength with depth based on this plot would give cu = 40+6.5z.
- 2.5.11 Direct shear box tests have been conducted on London Clay samples to understand the effective strength behaviour of the clay. Figure 10 presents the peak strength (and residual where derived) of the direct shear box tests conducted in London Clay.
- 2.5.12 A characteristic approximation of the drained shear strength for London Clay based on this plot would give  $\Phi$  'peak = 25°. An effective constant volume angle of shearing resistance for the London Clay of  $\Phi$  'critical = 20° is recommended in BS8002 [6] considering a conservative plasticity index of 60%.

### Stiffness

- Typical correlations between E' and  $c_0$  have been derived from back analysis of case histories within the London Clay in central London. For settlement analysis, a relationship of E' = 300cu is recommended for design.
- The permeability of the London Clay is discussed in the Hydrogeological Risk Assessment report [4].

### Harwich Formation (Thames Group)

### Classification

- 2.5.15 Classification tests including PSD, Atterberg limit, natural moisture content and bulk unit weight tests have been carried out on the Harwich formation. The bulk unit weight of the samples is presented in Figure 11 and typically ranged between 19.3 and 22.4kN/m³. A unit weight of 2okN/m³ is suggested for design.
- 2.5.16 The Atterberg limit test results are presented in Figure 12 and suggest the plastic limit of the material to lie between 10% and 21% and liquid limits between 37 and 48%. However, one sample presented plastic and liquid limit of 50% and 100% respectively but the reason for this outlier is unclear. Figure 13 shows the plasticity chart for the Harwich Formation and confirms the intermediate plasticity of the clay owing to its sandy nature.

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The results of particle size distribution tests in the Harwich Formation are shown in Figure 14. The results indicate the material is typically a slightly sandy slightly gravelly silty clay. The sand content is predominantly fine grained. The gravel content is more commonly low at less than 5%. In three samples the gravel content is slightly higher up to 25%.

### Strength

- 2.5.18 4No SPTs were carried out within the Harwich Formation with 'N' values ranging from 20 to 38 and one encountering refusal as shown on Figure 15. According to Stroud [7] and considering the low plasticity of the material a relationship of cu = 5.5. 'N' (where N is the SPT value) is recommended. This is in agreement with the results of the four triaxial undrained shear strength tests as shown in Figure 16. There is no apparent evidence of increasing strength with depth. A characteristic approximation of the undrained shear strength based on this plot would give cu=130kPa
- 2.5.19 Direct shear box tests have been conducted on Harwich Formation samples to understand the effective strength behaviour of the clay. Figure 17 presents the peak strength of the direct shear box tests conducted in the Harwich Formation. A characteristic approximation of the drained shear strength based on this plot would give  $\Phi'_{peak} = 25^{\circ}$  for the Harwich Formation.

### Stiffness

- 2.5.20 It is conservatively considered that for the stiffness design values similar correlations as for the London Clay stratum should be used for the Harwich Formation.
- The permeability of the Harwich Formation is discussed in the Hydrogeological Risk Assessment report [4].

# Lambeth Group (Upnor and Reading Formations) Stiffness

- 2.5.22 As the Upnor and Reading Formation is present at a depth of 17.5mbgl within the conceptual ground model used for design, its strength parameters are not anticipated to be relevant to the slope stability analysis. On this basis, only information relevant to the derivation of stiffness parameters will be presented to inform the settlement analysis.
- 2.5.23 A plot of the SPT values within the Lambeth Group is shown on Figure 18. The plot show data relative to the top of ground level. It is considered that this is more appropriate than plotting data in relation to elevation or top of Lambeth Group to better reflect the influence of the overburden pressure on strength. A characteristic approximation of the SPT profile would be 15+1.5z. According to Stroud (1989) a relationship of cu = 4.0N (where N is the SPT value) is recommended considering the upper bound plasticity of the highly variable clay. This would equate to cu = 60+6z where z is measured from the ground surface. This corresponds with the results of triaxial testing as shown on Figure 19.

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2.5.24 It is recommended that for the stiffness design values the same correlations as for the London Clay stratum should be used of E' = 300cu.

2.5.25 The permeability of the Lambeth Group is discussed in the Hydrogeological Risk Assessment report [4].

### Summary of geotechnical design parameters

| St              | ratum                | Bulk unit<br>weight<br>γ (kN/m³) | Angle of shearing resistance φ (°) | Cohesion<br>c' (kPa) | Undrained Shear<br>Strength<br>c <sub>u</sub> (kPa) | Soil Stiffness<br>Profile<br>${E'}_v$ (MPa) |
|-----------------|----------------------|----------------------------------|------------------------------------|----------------------|---|---|
| Clay            | Deposits             | 17                               | 20 (Peak)                          | o                    | 30  | 6,000                                       |
| Thames<br>Group | London Clay          | 19.5                             | 25 (Peak)<br>20 (Critical State)   | 0                    | 40+6.5Z <sup>1</sup>                                | 300 Cu                                      |
| Соор            | Harwich<br>Formation | 20                               | 25                                 |                      | 130   |   |
| Lamb            | eth Group            | -                                | -                                  | -                    | 60+6z²  | 300 Cu                                      |

#### Notes

Design groundwater level has been assumed as 1m below existing ground level (see Section 1.3.33) An  $r_0$  value of 0.1 has been assumed for design for the waste mass (see Section 1.3.44)

### Parameters Selected for Side Slopes Sub-Grade Analyses

2.5.26 The parameters for the side slope sub-grade will be as per the basal sub-grade as outlined above.

### Parameters Selected for Basal Liner Analyses

2.5.27 Assessed as part of the waste mass analysis.

### Parameters Selected for Side Slopes Liner Analyses

2.5.28 Assessed as part of the waste mass analysis.

### **Parameters Selected for Waste Analyses**

2.5.29 The waste mass will predominantly comprise London Clay sourced from the Copthall Tunnel.

A small volume of the Harwich Formation may also be encountered at the base of the tunnel and therefore will also form a small volume of the slope mass. Based on the information

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<sup>&</sup>lt;sup>1</sup>z is the depth from top of the strata

<sup>&</sup>lt;sup>2</sup> z is the depth below the ground surface

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presented in Section 2.5 relating to the London Clay, the following parameters will be assumed:

- Bulk unit weight, γ' = 19.5kN/m3
- Peak angle of shearing resistance, φ = 25°
- Cohesion, c' = o kPa
- In regard to the undrained shear strength, the data from the Copthall Tunnel indicates this increases with depth for the London Clay. The material at the horizon of the London Clay typically has an undrained shear strength of 4okPa. As described in Section 2.5, the design profile for increase in strength has shown to be 6.5kPa per meter. In the deepest parts of the tunnel, the depth below the horizon of the London Clay will be some 18m and therefore the undrained strength of the clay will be up to some 155kPa. The undrained shear strength of the waste material is likely to vary quite significantly. At this stage, no particular zoning of the fill proposed. To model the waste mass as a whole, a conservative design undrained shear strength value of 5okPa is proposed for design purposes. However, it is likely that in reality a reasonable proportion of the waste mass will have an undrained strength higher than this.
- 2.5.31 In addition, the construction specification for the landfill will have controls on the minimum strength of clay to be placed in the mound which will prevent low strength material being used in its construction.

### **Parameters Selected for Capping Analyses**

2.5.32 As the landfill is for inert material only, no capping system is proposed.

### 2.6 Selection of Appropriate Factors of Safety

- 2.6.1 For the stability risk assessment, the analysis will be undertaken in accordance with Eurocode 7: Geotechnical design (BS EN 1997-1). The design will therefore be based on achieving an overdesign factor greater than or equal to 1.0. This approach is considered to be appropriate on the basis that:
  - There is site based ground investigation data available supported by a much larger ground investigation for the High Speed 2 scheme. This gives confidence in the derived geotechnical parameters and conceptual site model.
  - The Sustainable Placement Area mounds are similar to standard engineered earthworks. There are no particular additional failure mechanisms, such as interfaces within a capping system. Eurocode 7 is considered appropriate to use as the industry standard for earthworks.
  - There are no exceptional risks which justify a higher factor of safety to be applied, such as highly sensitive receptors or release of hazardous waste materials.

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2.6.2 The partial factors applied to geotechnical material parameters as defined in the UK National Annex (NA+A1:2014 to BS EN 1997-1:2004+A1:2013) are reproduced in Table 3 below.

Table 3 - Summary of partial factors applied to material parameters in accordance with BS EN 1997

| Soil parameter               | Set |                          |
|------------------------------|-----|--------------------------|
|                              | Mı  | M2                       |
| Angle of shearing resistance | 1.0 | 1.25 (Applied to tan φ') |
| Undrained shear strength     | 1.0 | 1.4                      |
| Weight density               | 1.0 | 1.0                      |

- As under design approach 1 combination 1, the partial factor applied to soil parameters (set M1) are all equal to 1.0, this will not be critical. Externally applied loads would be factored under combination 1, however, there are no external loads such as those associated with roads or buildings which are required to be modelled in the stability analysis. As design approach 1 combination 2 (partial factor set M2) will be critical, only the results from this combination will be presented and discussed in this report.
- 2.6.4 For the settlement analysis, this is a serviceability limit state check and therefore no partial factors will be applied. There are also no particular settlement limits for the landfill mounds.

### Factor of Safety for Basal Sub-Grade

2.6.5 The analysis of the basal sub-grade will be undertaken in accordance with Eurocode 7 (BS EN 1997-1) as discussed above.

### Factor of Safety for Side Slopes Sub-Grade

2.6.6 The analysis of the side slopes sub-grade will be undertaken in accordance with Eurocode 7 (BS EN 1997-1) as discussed above.

### Factor of Safety for Basal Lining System

2.6.7 As per those of the waste mass.

### Factor of Safety for Side Slope Lining System

2.6.8 As per those of the waste mass.

### **Factor of Safety for Waste Mass**

2.6.9 The analysis of the waste mass will be undertaken in accordance with Eurocode 7 (BS EN 1997-1) as discussed above.

### **Factor of Safety for Capping System**

2.6.10 As the landfill is for inert material only, no capping system is proposed.

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### 2.7 Analyses

### Slope stability

2.7.1 For drained conditions using infinite slope theory, the results for various slope angles present are given in Table 4 below.

Table 4 - Summary of over design factors for various slope angles assuming infinite slope theory under drained conditions

| Slope Angle | Over Design Factor (DA1/C2) |
|-------------|-----------------------------|
| 1:4         | 1.3                         |
| 1:5         | 1.7                         |
| 1:8         | 2.7                         |
| 1:10        | 3.4                         |

2.7.2 For drained conditions, the results for the steepest sections of the mound are presented in Table 5 below:

Table 5 - Summary of over design factors from Oasys Slope under drained conditions

| Section     | Over Design Factor (DA1/C2) |
|-------------|-----------------------------|
| B-BB (east) | 1.3                         |

2.7.3 For undrained conditions, the results are presented in Table 6 below.

Table 6 - Summary of over design factors for undrained conditions

| Section                | Over Design Factor (DA1/C2) |
|------------------------|-----------------------------|
| A-AA (south)           | 1.6                         |
| A-AA (north)           | 1.1                         |
| B-BB (west)            | 1.5                         |
| B-BB (east) - circular | 1.0                         |
| B-BB (east) - wedge    | 1.0                         |
| C-CC (west)            | 2.9                         |
| C-CC (east)            | 2.3                         |

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| D-DD (south) | 1.2 |
|--------------|-----|
| D-DD (north) | 1.3 |

- 2.7.4 As discussed in Section 2.4.2, due to the domed shape of the mounds the height of sections used in the analysis has been 'flattened' by 2m to be more representative of the 3D geometry of the mounds. The results show that all analysed sections have over design factors of 1.0 or greater.
- 2.7.5 The slope stability analysis completed is a 2D analysis and therefore does not take in to account any beneficial effects from the resistance provided on the sides of the slip mass. This assumption is generally more appropriate for drained conditions where shallow slips are generally critical. In this instance, for undrained conditions the critical slip is deep (approximately 14m below surface level) and therefore the side effects are likely to be of significant benefit.
- 2.7.6 In addition to this, all of the above is based on a characteristic undrained shear strength of the waste of 50kPa. This is considered to be conservative as the undrained shear strength of the London Clay from the Copthall Tunnel has been estimated to increase linearly with depth from 40kPa to around 155kPa. On this basis, the stability of the slope is considered to be acceptable.
- 2.7.7 The slope stability calculations are presented in Appendix B as detailed below:
  - Appendix B1 Drained conditions
  - Appendix B2 Undrained conditions
  - Appendix B<sub>3</sub> Wedge analysis

### Settlement analysis

- 2.7.8 In regard to the formation settlement, for the eastern mound, the maximum settlement at the centre of the mound has been calculated as 300mm. The amount of settlement reduces towards the toe of the slopes. The analysis also indicates some heave of the ground adjacent to the mounds of less than 50mm. In regard to the internal settlement of the fill, this has been estimated as 350mm, based on the maximum internal fill height of 17m.
- 2.7.9 A summary of the predicted settlement for the mound is presented in Table 8 below.

Table 7 - Summary of predicted settlement

| Formation settlement | Internal settlement | Total settlement |
|----------------------|---------------------|------------------|
| 300mm                | 350mm               | 650mm            |

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2.7.10 The calculation data from the Oasys PDisp analysis are presented in Appendix C1. The calculations for the internal settlement analysis are presented in Appendix C2.

### **Basal Sub-Grade Analyses**

2.7.11 The analysis of the basal sub-grade is covered by the analysis presented in Section 2.7 above.

### Side Slopes Sub-Grade Analyses

2.7.12 The analysis of the side slope sub-grade is covered by the analysis presented in Section 2.7 above.

### **Basal Liner Analyses**

2.7.13 The analysis of the basal liner is covered by the analysis presented in Section 2.7 above.

### **Side Slopes Liner Analyses**

2.7.14 The analysis of the side slope liner is covered by the analysis presented in Section 2.7 above.

### **Waste Analyses**

2.7.15 The analysis of the waste mass is covered by the analysis presented in Section 2.7 above.

### **Capping Analyses**

2.7.16 As the landfill is for inert material only, no capping system is proposed.

### 2.8 Assessment

- 2.8.1 The results of the analysis have been assessed and are discussed below. As per the modelling approach for the slope stability (see Section 2.4), the assessment considers the landfill as a whole rather than elements individually. There are some limitations to the analytical approach undertaken for the slope stability analysis which are as follows:
  - Circular slips: The slope analysis undertaken is based on circular shape slips. A
    sensitivity analysis has been undertaken on Section B-BB of a wedge type failure
    passing through the lower strength Clay Deposits. This indicated that the circular slip
    overdesign factor is the same as the wedge failure passing through the lower strength
    Clay Deposits. As such, this sensitivity check has shown that the failure mechanisms
    are very similar.
  - Infinite slope theory: The infinite slope theory approach for the drained analysis is based on an infinitely long linear slope failure. This clearly is not the case, however, this approach is conservative as any end effects are ignored which would increase the over design factor, albeit only marginally.
  - 2D analysis: For the slope stability assessment in undertaken in Oasys Slope, 2D sections have been analysed. This approach does not account for side effects on the slip surfaces, as such this approach is considered to be conservative.

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2.8.2 There are also some uncertainties regarding some of the input data in the analysis which are as follows:

- Future groundwater level: The potential future groundwater level over the life span of the landfill is difficult to predict. Based on the monitoring undertaken to date, this indicates that groundwater level was within the Lambeth Group which is anticipated to be as a result of under-draining of the superficial deposits by the chalk. A limitation of this monitoring was that no water monitoring of potential groundwater levels within the London Clay was undertaken. Due to uncertainties regarding potential future groundwater changes and the absences of monitoring within the London Clay, a design groundwater level of 1mbgl has been conservatively assumed.
- Porewater pressures in waste mass: There is the potential for there to be porewater pressures within the waste mass. The waste mass will predominantly comprise well compacted London Clay and will therefore be highly impermeable. On this basis, the potential infiltration of surface water in to the waste mass is anticipated to be highly limited and the majority of surface water will run off the ground surface. In the analyses, to account for some infiltration of surface water and percolation towards the base and sides of the mound, an r<sub>u</sub> value of 0.1 has been assumed. This approach is considered to be reasonable, especially for the relatively shallow slips that are the more critical in terms of stability using drained strength parameters.
- Geological origin of Clay Deposits: The geological origin of the Clay Deposits is unclear. It anticipated the material is either Alluvium or weathered London Clay. However, the geotechnical engineering parameters has been derived based on the available factual information and therefore the geological origin of this material is not anticipated to have any impact on the stability analysis.
- 2.8.3 In regard to the overall risk of the landfill, this is considered to be relatively low. The waste mass is inert London Clay from the nearby Copthall Tunnel and its engineering properties are well understood. The landfill will be constructed in accordance with an earthworks specification to ensure the waste is well compacted. Ground investigation data is available for both the landfill site and the Copthall Tunnel. The landfill mounds are therefore considered to be more standard engineered earthworks rather than traditional landfills

### **Basal Sub-Grade Assessment**

2.8.4 The assessment of the basal sub-grade is covered above.

### **Side Slopes Sub-Grade Assessment**

2.8.5 The assessment of the side slope sub-grade is covered above.

#### **Basal Liner Assessment**

2.8.6 The assessment of the basal liner is covered above.

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### **Side Slopes Liner Assessment**

2.8.7 The assessment of the side slope liner is covered above.

### **Waste Assessment**

2.8.8 The assessment of the waste mass is covered above.

### **Capping Assessment**

2.8.9 As the landfill is for inert material only, no capping system is proposed.

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Revision: Co2

### 3 Monitoring

### 3.1 The Risk Based Monitoring Scheme

- 3.1.1 A risk screen exercise has been completed and is presented in Section 2.1. The results of this risk screen have been reflected in the geotechnical assessment completed but also the proposed monitoring scheme.
- 3.1.2 The primary risk is considered to be slope stability. This risk has been mitigated through the ground investigation and geotechnical assessment as presented in this report. In addition, the geotechnical properties of the waste material comprising London Clay sourced from the Copthall Tunnel are well understood. This risk will be further mitigated through the construction drawings, construction specification and CQA plan to ensure the assumptions made as part this Stability Risk Assessment are reflected in the construction works.
- 3.1.3 The residual risk associated with slope stability is considered to be low and an extensive monitoring scheme is not considered to be appropriate. The monitoring scheme proposed is outlined in the following sections.

### **Basal Sub-Grade Monitoring**

3.1.4 As the landfill is for inert soils only there will be no leachate or gas generation. On this basis, no groundwater or gas monitoring within the basal sub-grade is proposed.

### Side Slopes Sub-Grade Monitoring

- 3.1.5 As the landfill is for inert soils only there will be no leachate or gas generation. On this basis, no groundwater or gas monitoring within the side slopes sub-grade is proposed.
- 3.1.6 The visual inspections as described for Waste Mass Monitoring below shall extend a minimum of 5m from the toe of the side slopes (including along the gas main utility corridor) in order to identify any potential ground movements adjacent to the landfill.

### **Basal Lining System Monitoring**

3.1.7 Since the basal lining system will comprise an artificially established geological barrier formed from the same material as the waste mass the monitoring requirements for the Waste Mass Monitoring as described below will apply.

### **Side Slope Lining System Monitoring**

3.1.8 Since the side slope lining system will comprise an artificially established geological barrier formed from the same material as the waste mass the monitoring requirements for the Waste Mass Monitoring as described below will apply.

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### **Waste Mass Monitoring**

3.1.9 Visual and topographical monitoring of the mounds is proposed and will continue until the landfill license is surrendered. A summary of the monitoring proposed is presented in Table 8 below and discussed further in the following sections of this report.

Table 8 - Schedule of proposed monitoring scheme

| Phase                      | Monitoring           | Frequency                    | Output  |
|----------------------------|----------------------|------------------------------|---|
| During construction        | Visual inspection    | 2 weeks                      | Inspection record and photographs   |
|                            | Topographical survey | Yearly                       | Survey drawings at a scale of not less than 1:1250 and interim volume calculations                            |
| Completion of construction | Visual<br>inspection | Single<br>baseline<br>survey | Inspection record and photographs   |
|                            | Topographical survey | Single<br>baseline<br>survey | Survey drawings at a scale of not less than 1:1250 and final volume calculations                              |
| Post construction          | Visual<br>inspection | Quarterly                    | Inspection record and photographs, to include review against baseline and any other post construction surveys |
| Surrender of permit        | Visual inspection    | Final survey                 | Inspection record and photographs   |
|                            | Topographical survey | Final survey                 | Survey drawings at a scale of not less than 1:1250  |

3.1.10 For topographical surveys, plan positions of ground features will be determined to within 1m and spot levels to 0.01m will be taken at a density to allow adequate representation of the true landform. Survey drawings will be produced at a scale of not less than 1:1250 and will include all ground features, roads, structures, boundaries, monitoring points and an indication of the surrounding landform.

### **During Construction**

- During construction of the mounds regular visual monitoring of the mounds will be undertaken. As the RSP mounds will be an active construction site, it is likely that any issues with the mounds will be identified quickly, however, to formalise the process and ensure all areas of the RSP mounds are inspected it is proposed that a visual site walkover will be undertaken by a suitably experience engineer of the whole site every two weeks. The results of each survey will be formally recorded as part of the CQA, including any problems identified and the remedial actions taken. The key aspects to be assessed by the visual inspections will include:
  - Any evidence of ground movements which could include:

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- Formation of tension cracks
- Slumping of the ground in the slopes
- Heave of the ground around the toe of the slope
- Any small or shallow slips
- Proper surface water control to ensure no areas of the site are becoming wet
- No overly steepened temporary slopes
- General compliance with the earthworks specification and construction drawings
- 3.1.12 The record of the visual inspection will include:
  - Details of the walkover (e.g. date, time, weathered, attendees)
  - Summary of progress and works completed to date
  - Any issues identified and immediate actions. This may include additional monitoring or engagement with designers if required
  - Photographs

### Completion of construction

- 3.1.13 On completion of the RSP mounds construction, it is proposed that a visual inspection of the RSP areas will be completed. The purpose of this will be to ensure the RSP mounds have been constructed in accordance with the construction information and to form a baseline for future monitoring.
- 3.1.14 A final topographical survey of the restored surface will also be completed to ensure the RSP mounds have been constructed in accordance with the construction information and to form a baseline.

### Post construction

- 3.1.15 Following completion of construction, the visual inspections will be continued on a quarterly basis until the landfill license is surrendered, or the need for further monitoring ceases as agreed with the Environment Agency.
- 3.1.16 Further topographical surveys are not considered necessary post construction as the visual inspections are considered sufficient. Should the visual inspections identify any potential concerns with the landfill, the need for any further topographical or other forms of monitoring will be reviewed.

### Surrender of permit

3.1.17 Prior to surrender of the permit, a final visual inspection and topographical survey will be completed.

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Revision: Co2

### **Capping System Monitoring**

3.1.18 As the landfill is for inert material only, no capping system is proposed.

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Revision: Co2

### 3.2 References

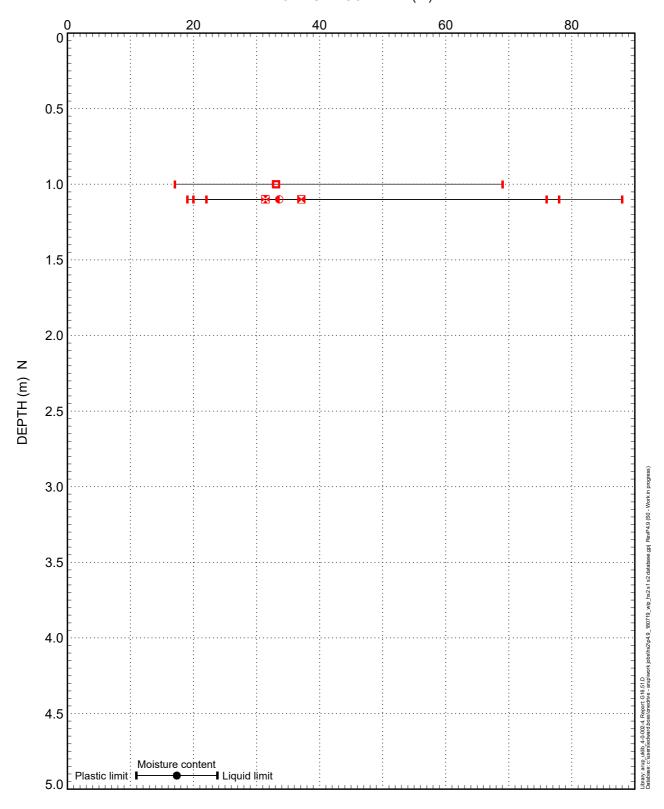
- 1. Environmental Agency (2010) Environmental Permitting application for a landfill permit, Stability Risk Assessment, Version 1, March
- Arup (2020) Environmental Setting and Site Design Report (ESSD) Eastern Mound -Ruislip Northern Sustainable Placement S2, 1MC04-SCJ\_SDH-EV-REP-SS05\_SL07-000005
- 3. British Geological Survey, Engineering Geology Viewer, Accessed August 2018 [http://mapapps.bgs.ac.uk/engineeringgeology/home.html]
- 4. Arup (2020) Hydrogeological Risk Assessment (HRA) Eastern Mound Ruislip Northern Sustainable Placement S2, Doc. Ref. 1MC04-SCJ\_SDH-GT-REP-SS05\_SL07-000036
- 5. Trenter, N.A. (2001) Earthworks: A guide.
- 6. BS8002:2015 Code of practice for Earth retaining structures.
- 7. Stroud, M.A. (1988) The standard penetration test its application and interpretation.
- 8. BGS (2005) 1:50,000 Series, Sheet 255, Beaconsfield.

 ${\tt Document\ no.:\ 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001}$ 

Revision: Co1

### **Figures**

### MOISTURE CONTENT (%)



Nothern SPA

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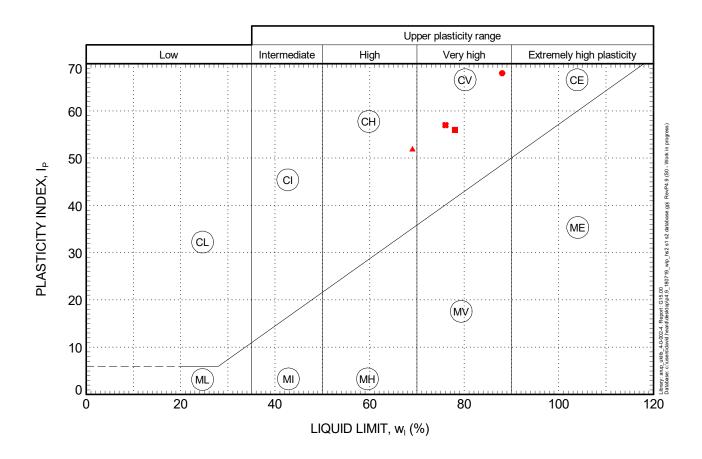
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ML025-RC049

ML025-RC051

HS2 ATTERBERG LIMITS SUPERFICIAL DEPOSITS -COHESIVE

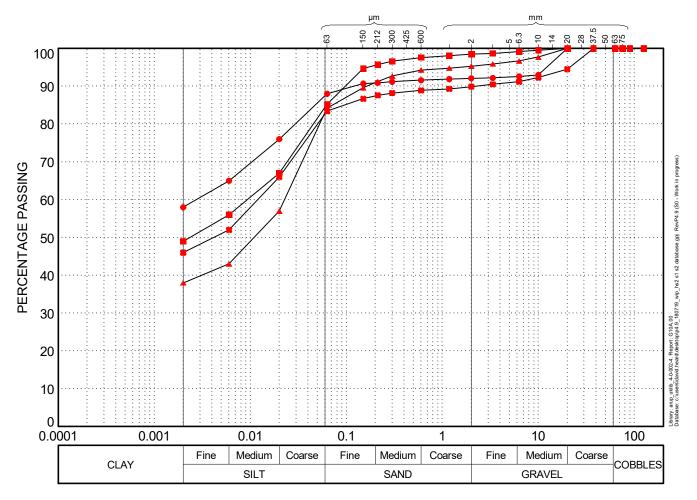
FIGURE 1



- Northern SPA ML024-RC012, 60.8mOD ML025-RC048, 53.7mOD ML025-RC049, 50.2mOD

- ▲ ML025-RC049, 50.∠IIIOD ML025-RC051, 58.9mOD

HS<sub>2</sub> **PLASTICITY CHART CLAY DEPOSITS** 



PARTICLE SIZE (mm)

Northern SPA

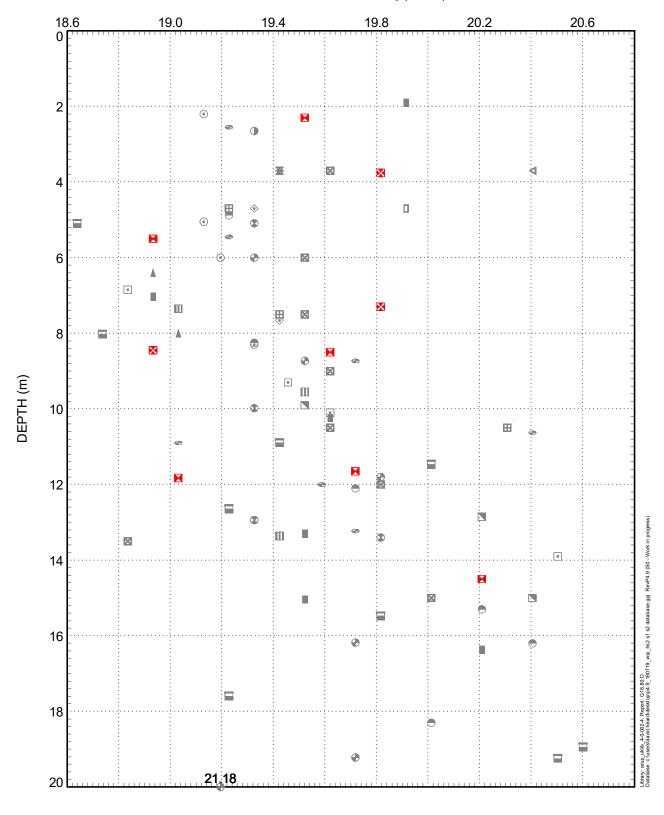
ML024-RC012, 60.8mOD

ML025-RC048, 53.7mOD ML025-RC049, 50.2mOD

▲ ML025-RC049, 50.∠11000 ■ ML025-RC051, 58.9mOD

PARTICLE SIZE DISTRIBUTION **CLAY DEPOSITS** 

## BULK UNIT WEIGHT, $\gamma_b$ (kN/m<sup>3</sup>)



■ Northern SPA
■ Copthall Cutting
■ ML025-CP008

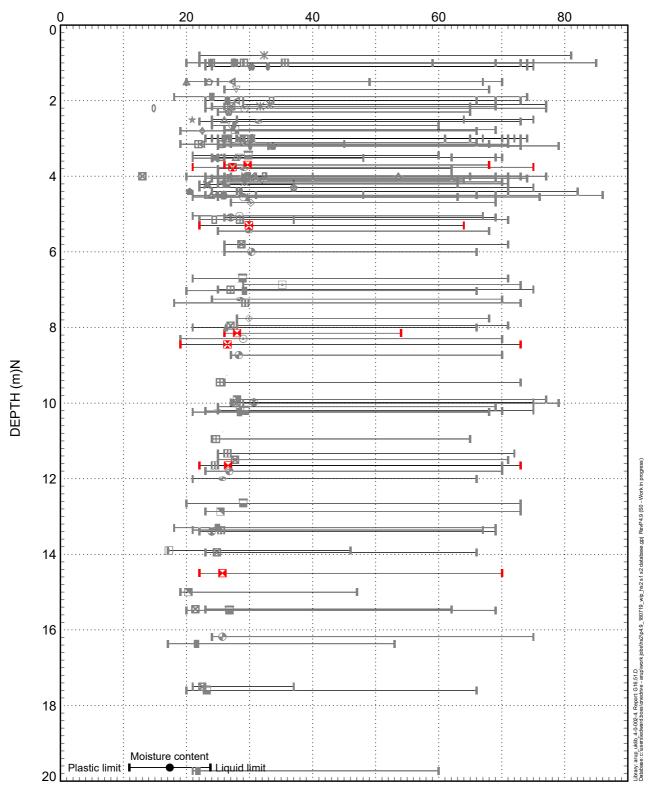
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■ ML025-CP115
■ ML025-CP121
■ ML025-CP122
■ ML024-RC007
■ ML024-RC012 ML024-RC012
■ ML025-RC002 ● ML025-RC021 ML025-RC030 ▲ ML025-RC031 III ML025-RC032 ● ML025-RC033 ■ ML025-RC034

Northern SPA

 ML025-RC030
 ML025-RC037
 ML025-RC037a
 ML025-RC051
 ML025-RC052 ML025-RC051
ML025-RC052
ML025-RC053

> HS<sub>2</sub> **BULK UNIT WEIGHT LONDON CLAY FORMATION**

### MOISTURE CONTENT (%)



Northern SPA ■ ML025-RC002 ⊙ ML025-RC021 ML025-RC030ML025-RC031 ML025-RC032 ML025-RC032 ML025-RC033 ML025-RC034 ■ ML025-RC034

◆ ML025-RC036▼ ML025-RC037◆ ML025-RC037 ML025-RC036 ML025-RC037a ML025-RC051ML025-RC052

ML023-RC032

■ ML024-WS007

■ ML024-WS008 ■ ML024-WS029 ■ ML025-WS015

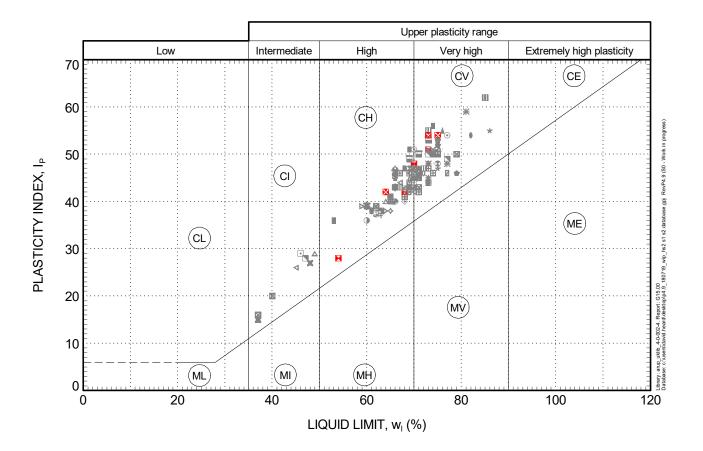
■ ML025-WS143

 $\nabla$ 

ML025-WS016 ML025-WS144ML025-WS148 ML025-WS149 ML025-WS150 △ ML024-TP114

₩ ML025-TP051
 ◄ ML025-TP052
 ☐ ML025-TP054
 ☒ ML025-TP055
 ◑ ML025-TP057
 ☒ ML025-TP058
 ➤ ML025-TP062
 ★ ML025-TP062
 ★ ML025-TP078

★ ML025-TP078 ML025-TP082ML025-TP083 HS<sub>2</sub> **ATTERBERG LIMITS LONDON CLAY FORMATION** 



Copthall Cutting ML025-CP008 ML025-CP114 Ħ ML025-CP115 ML025-CP121 ML025-CP122 ML024-RC007 ML024-RC012 ML025-RC002 ML025-RC021 ML025-RC030 ML025-RC031 ML025-RC032 ML025-RC033

Northern SPA

- ML025-RC033

  ML025-RC034

  ML025-RC036

  ML025-RC037

  ML025-RC037

  ML025-RC051

  ML025-RC051

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  ML024-WS008

  ML024-WS015

  ML025-WS015

  ML025-WS016

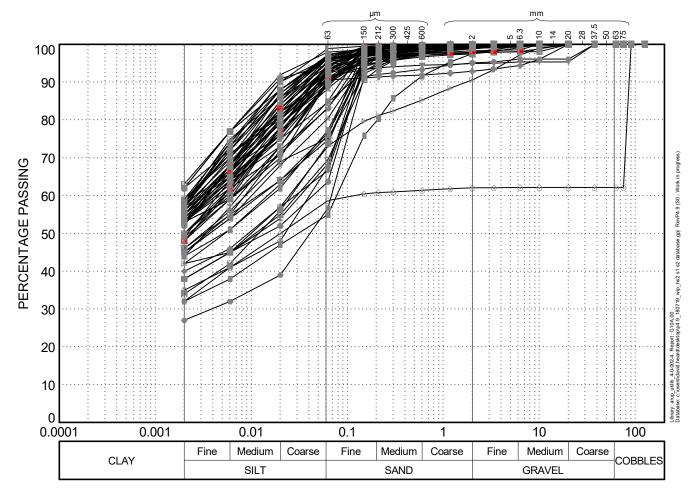
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  ML025-WS144

- ML025-WS144

- ML025-WS148 ML025-WS149
- $\overline{\Psi}$
- ML025-WS150 ML024-TP114
- ML025-TP051
- \(\frac{1}{2}\) ML025-TP052
- ML025-TP054 ML025-TP055
- Û ML025-TP056
- ML025-TP057
- ML025-TP058 ML025-TP060
- ΔØΧΔ ML025-TP062
- \* ML025-TP078
- ML025-TP079
- ML025-TP082
- ML025-TP083

HS<sub>2</sub> **PLASTICITY CHART LONDON CLAY FORMATION** 



### PARTICLE SIZE (mm)

| Northern SPA  |
|---|
| ■ Copthall Cutting  |
| <ul> <li>ML025-CP008, 50.6mOD</li> </ul>  |
| ■ ML025-CP114, 52.3mOD  |
| ▲ ML025-CP115, 48.2mOD  |
| <b>ML</b> 025-CP121, 52.9mOD  |
| <ul><li>ML025-CP121, 48.9mOD</li></ul>  |
| ▼ ML025-CP122, 60.1mOD  |
| ♣ ML025-CP122, 52.6mOD  |
| ■ ML024-RC012, 50.2mOD  |
| ◀ ML025-RC002, 61.1mOD  |
| ► ML025-RC002, 54.6mOD  |
| ■ ML025-RC002, 48.4mOD  |
| <ul><li>ML025-RC021, 54.3mOD</li></ul>  |
| ● ML025-RC030, 57.1mOD  |
| ◆ ML025-RC031, 53.1mOD  |
| ■ ML025-RC032, 60.2mOD  |
| ♠ ML025-RC032, 49.6mOD  |
| ◆ ML025-RC032, 47.8mOD  ML025-RC032, 47.8mD  ML0 |
| ML025-RC033, 59.4mOD  |
| • ML025-RC033, 57.2mOD  |
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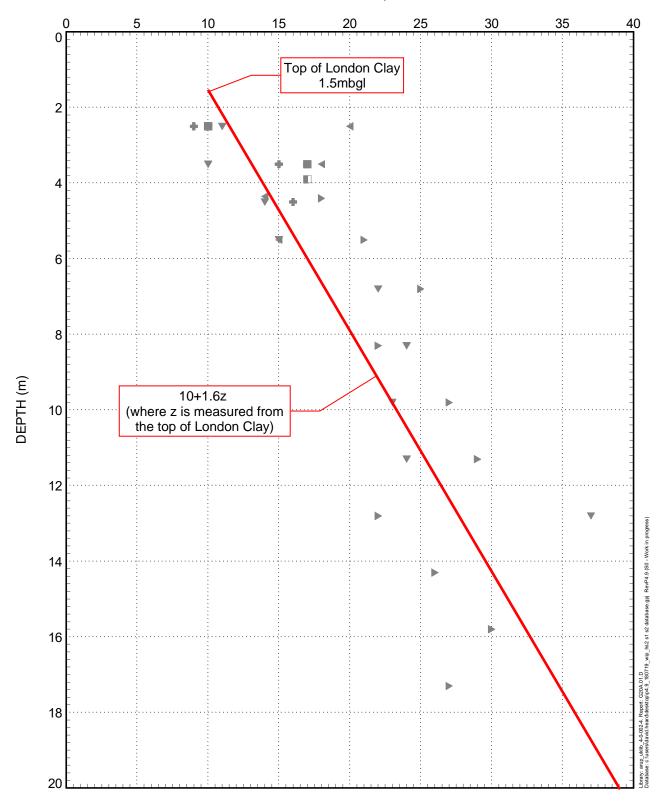
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 ML025-RC052, 47.9mOD
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ML025-RC034, 58.4mOD

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 ML025-TP083, 63.5mOD
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 ML025-TP083, 63.5mOD

HS2
PARTICLE SIZE DISTRIBUTION
LONDON CLAY FORMATION

### SPT N VALUE, N

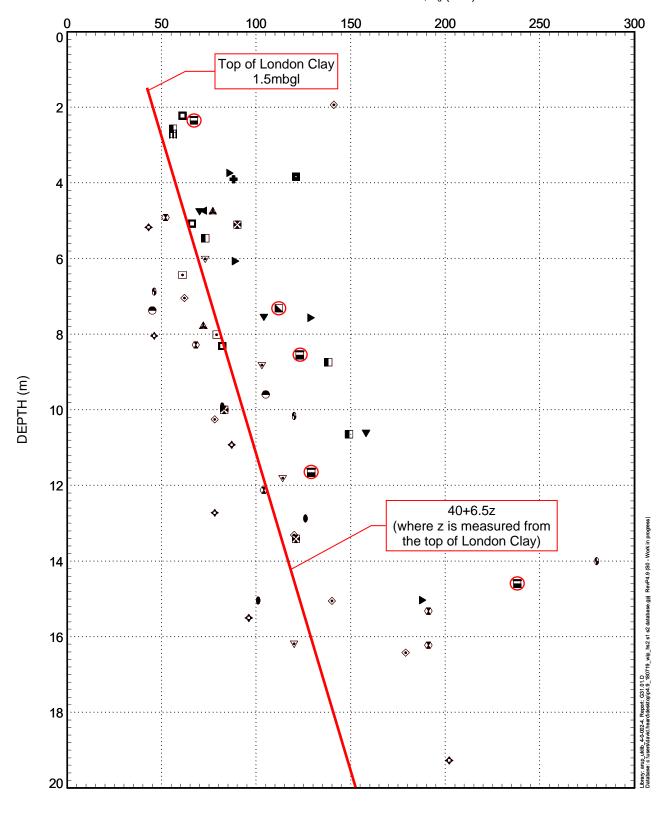


- Copthall Cutting

- Coptnall Cuttin
   ML025-CP008
   ML025-CP114
   ML025-CP115
   ML025-CP121
   ML025-CP122
   ML025-RC033

HS<sub>2</sub> STANDARD PENETRATION TESTS **LONDON CLAY FORMATION** 

# UNDRAINED SHEAR STRENGTH, $c_u$ (kPa)





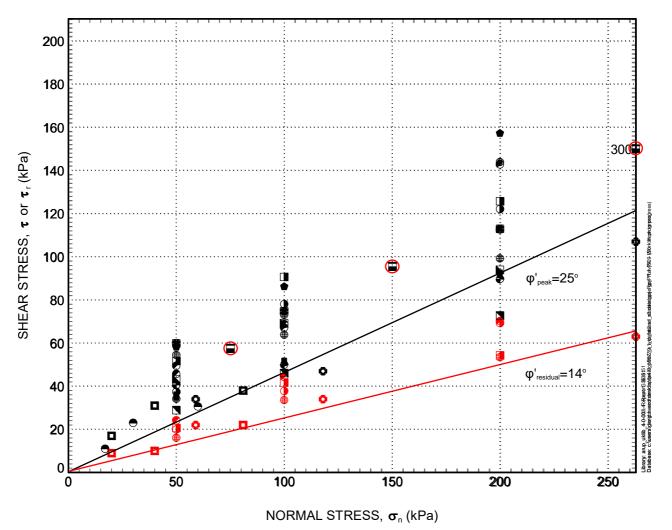
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♦ ML025-RC034

O Northern SPA

▼ ML025-RC036 ● ML025-RC037 ▲ ML025-RC037a ■ ML025-RC051 ● ML025-RC052 Φ ML025-RC053

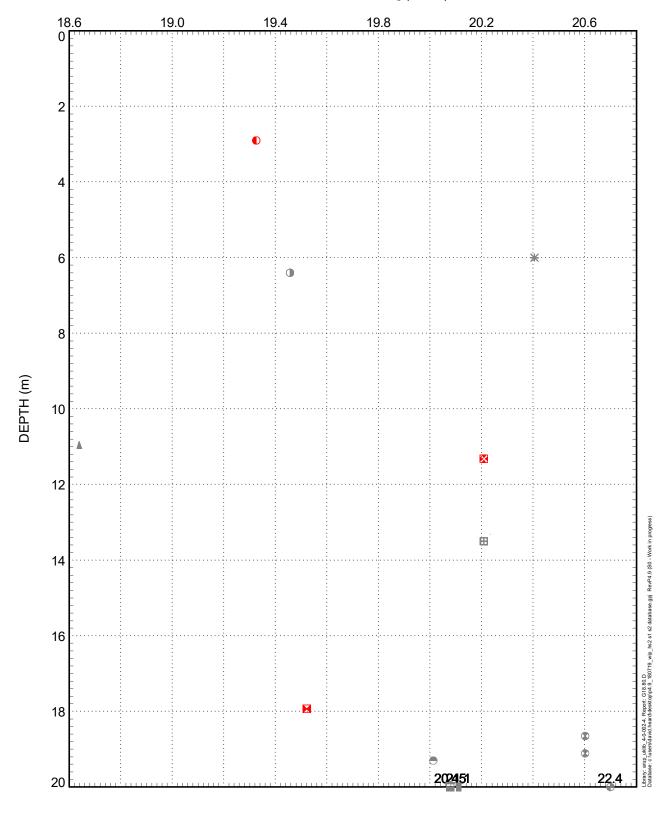
> HS2 TRIAXIAL UNDRAINED SHEAR STRENGTH LONDON CLAY FORMATION



Northern SPA
Peak
Residual
ML025-CP008
ML025-CP122
ML025-RC020
ML025-RC031
ML025-RC031
ML025-RC034
ML025-RC034
ML025-RC036
ML025-TP019
ML025-TP019
ML025-TP050
ML025-TP058
ML025-TP058
ML024-RC012

HS2 SHEAR BOX TESTS LONDON CLAY FORMATION

## BULK UNIT WEIGHT, $\gamma_b$ (kN/m<sup>3</sup>)



Northern SPA

■ Copthall Cutting

■ ML025-CP008

★ ML025-CP114

■ ML024-RC007

■ ML024-RC012

■ ML025-RC002

Φ ML025-RC030

■ ML025-RC031 ML025-RC031

ML025-RC031

ML025-RC034

ML025-RC036

ML025-RC036

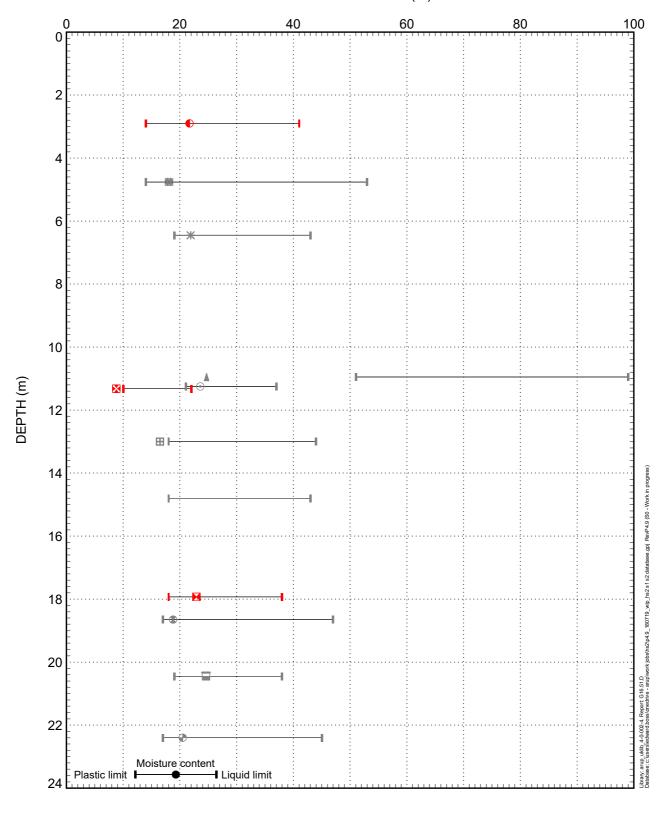
ML025-RC051

ML025-RC053

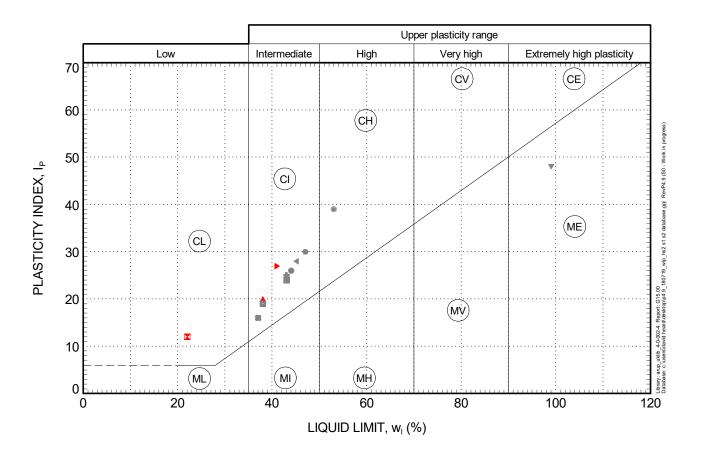
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HS<sub>2</sub> **BULK UNIT WEIGHT HARWICH FORMATION** 

# MOISTURE CONTENT (%)



HS2 ATTERBERG LIMITS HARWICH FORMATION

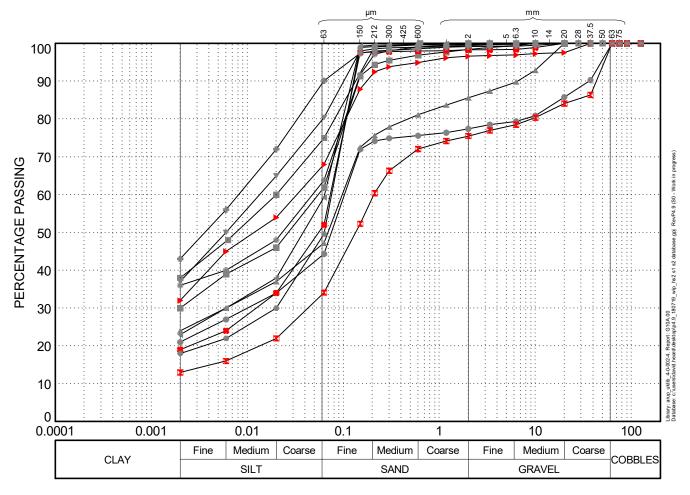


- Northern SPA

- Copthall Cutting
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  ML024-RC012, 44.0mOD
  ML025-RC021, 48.2mOD
- ML025-RC030, 48.5mOD ML025-RC031, 46.7mOD
- ML025-RC033, 45.2mOD ML025-RC034, 44.7mOD ML025-RC036, 45.9mOD

- ML025-RC048, 51.9mOD ML025-RC051, 48.7mOD ML024-WS016, 40.5mOD

HS<sub>2</sub> **PLASTICITY CHART** HARWICH FORMATION



PARTICLE SIZE (mm)

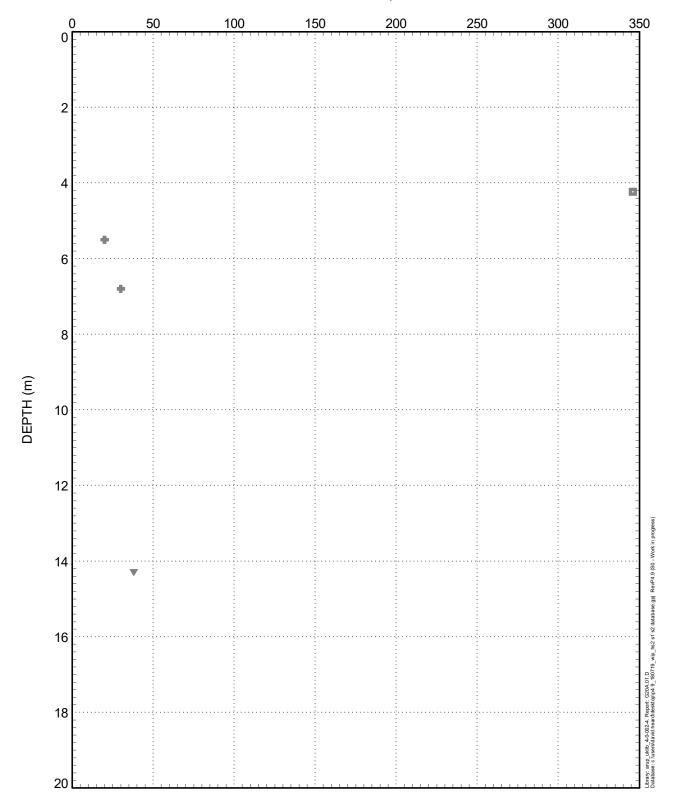
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Northern SPA

ML025-RC034, 44.5mOD ML025-RC048, 51.9mOD ML025-RC051, 48.7mOD ML024-WS016, 40.5mOD

PARTICLE SIZE DISTRIBUTION HARWICH FORMATION

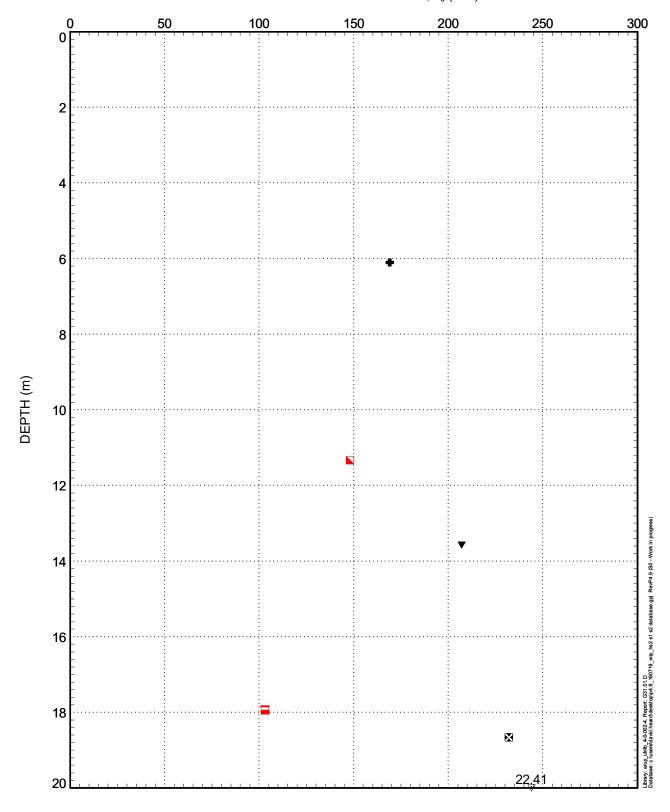
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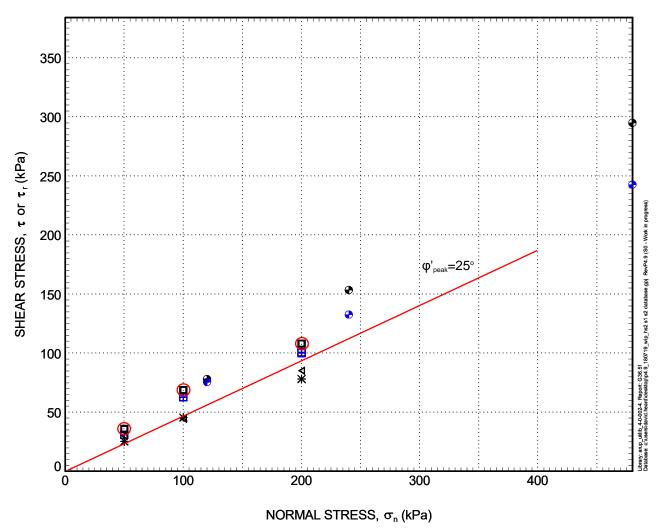
HS<sub>2</sub> STANDARD PENETRATION TESTS **HARWICH FORMATION** 

### UNDRAINED SHEAR STRENGTH, c<sub>u</sub> (kPa)



Northern SPA
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■ ML025-CP008
★ ML025-CP114
■ ML024-RC012
Φ ML025-RC030
• ML025-RC036
☑ ML025-RC051

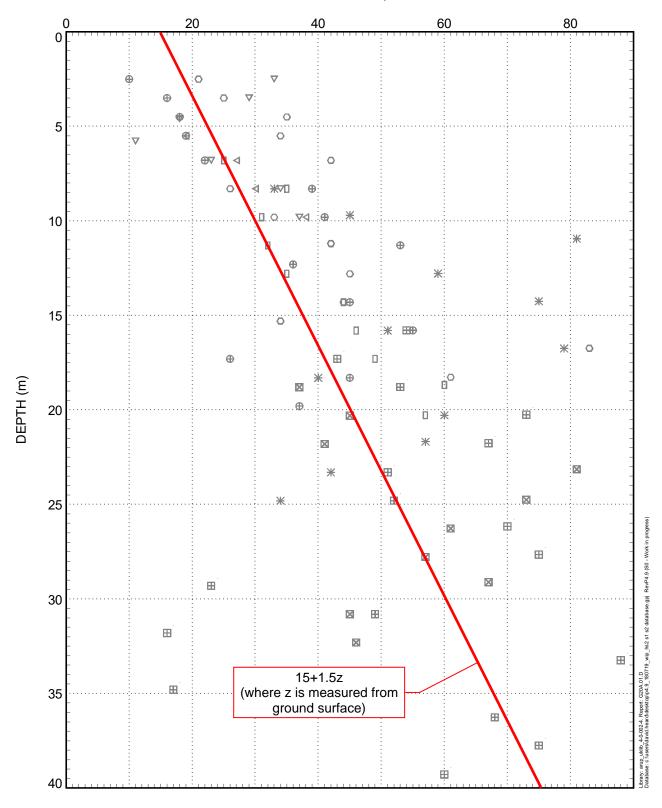
HS<sub>2</sub> TRIAXIAL UNDRAINED SHEAR **STRENGTH HARWICH FORMATION** 



Northern SPA
■ Peak
■ Residual
■ ML025-CP008
★ ML025-CP114
◄ ML025-CP115
♠ ML025-RC036
■ ML025-RC049

HS2 SHEAR BOX TESTS HARWICH FORMATION

## SPT N VALUE, N



- Copthall Cutting

- © Copthall Cuttin

  © ML024-CP004

  ML024-CP006

  ▼ ML024-CP007

  ML025-CP008

  Ж ML025-CP114

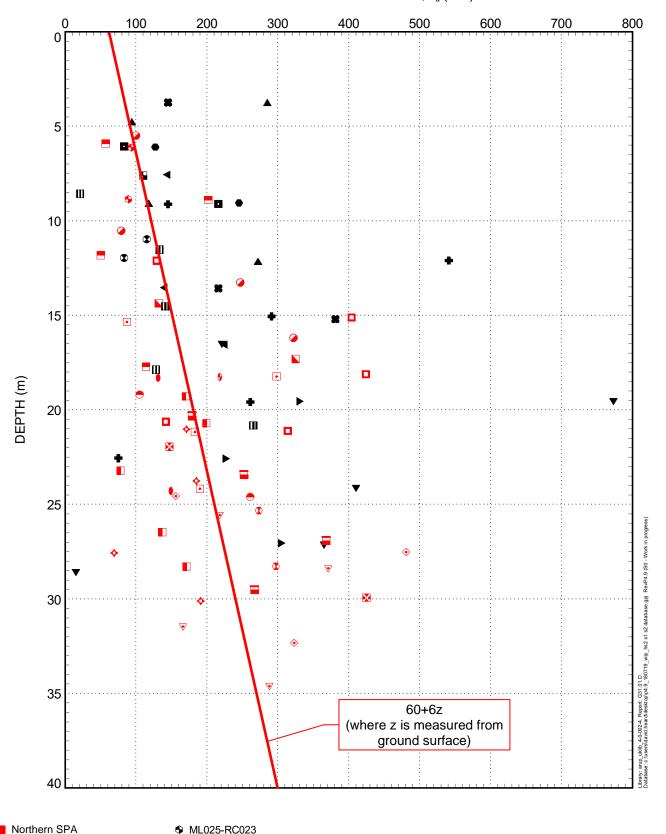
  ML025-CP115

  ML025-CP121

  ML025-CP122

HS<sub>2</sub> STANDARD PENETRATION TESTS **LAMBETH GROUP** 

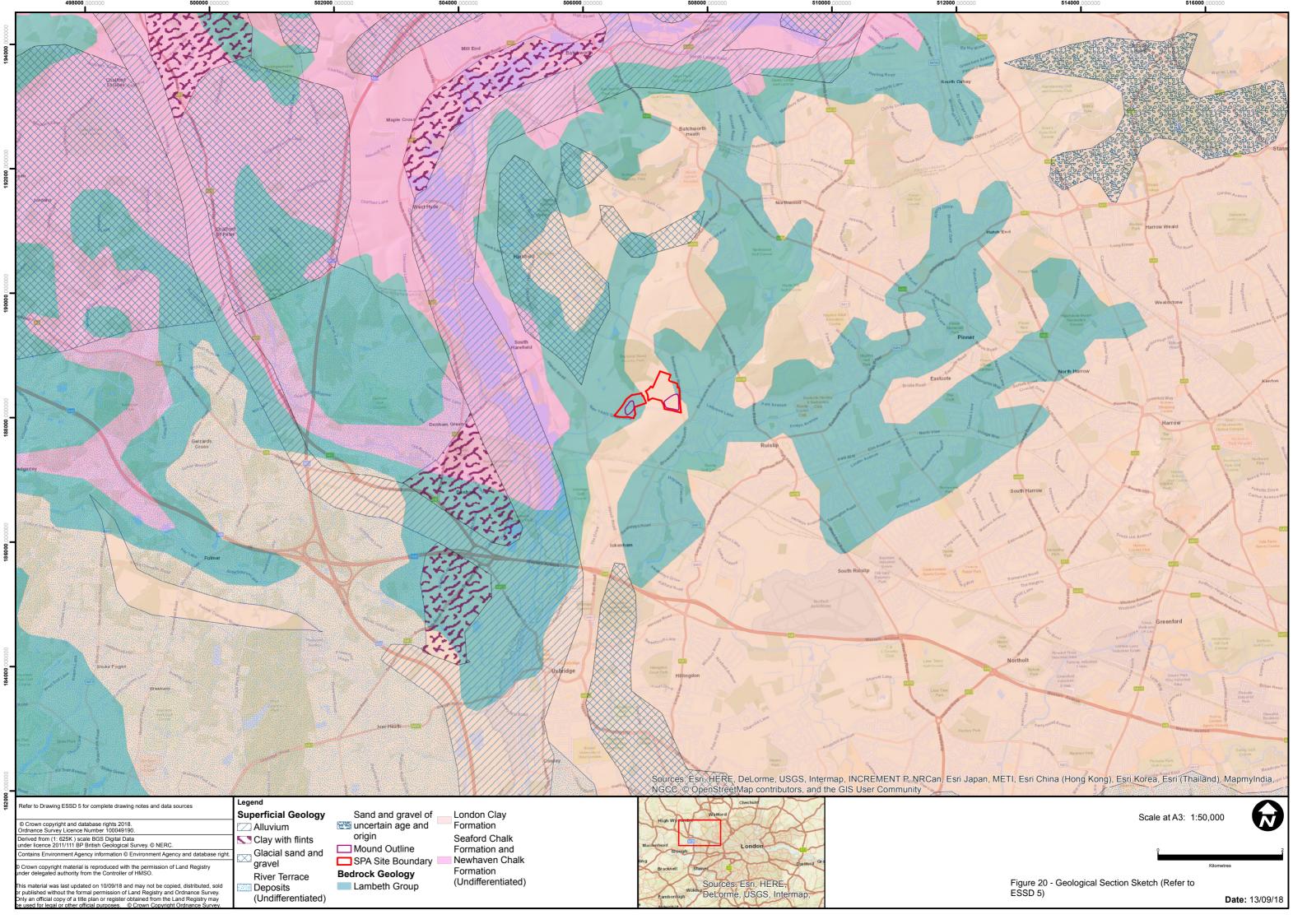
# UNDRAINED SHEAR STRENGTH, $c_u$ (kPa)



■ Copthall Cutting
■ ML024-CP004
■ ML024-CP006
■ ML024-CP008
■ ML025-CP114
■ ML025-CP115
■ ML025-CP122
■ ML024-RC005
■ ML024-RC005
■ ML024-RC007
■ ML024-RC007
■ ML024-RC007

ML025-RC023
 ML025-RC030
 ML025-RC031
 ML025-RC033
 ML025-RC033
 ML025-RC034
 ML025-RC036
 ML025-RC048
 ML025-RC048
 ML025-RC051
 ML025-RC051
 ML025-RC052
 ML025-RC053

HS2 TRIAXIAL UNDRAINED SHEAR STRENGTH LAMBETH GROUP



Document Title: Stability Risk Assessment - Eastern Mound - Ruislip Northern Sustainable Placement S2

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

# Appendix A – Exploratory hole logs

Equipment Comacchio MC450P

**Drill Fluid** Crew/Vessel **Dates Drilled** 

TS/WG

Polymer DS60/Pure-Bore

Start 05/01/2017 End 10/01/2017 **Borehole Diameter** 146mm to 34.95m

04/01/2017

**Casing Diameter** 200mm to 1.30m

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 E 188149.39 N 61.88 m OD

Logged by Compiled by Checked by CJ/MCM NJB 11/12/2017

21/02/2017

|       |        | Ena<br>Water      | 10/01/201         |          |        |         | /01/20.      | 1                     | 2/2017 11/12/2017  |              | 1     |          |
|-------|--------|-------------------|-------------------|----------|--------|---------|--------------|-----------------------|--|--------------|-------|----------|
| Date  | Casing | Water<br>Depth    | Sample            | /Core Re | covery | _       | SPT<br>Blows | Fracture<br>Spacing   |  | Depth        |       |          |
| &     | Depth  | (111)             | Depth (m)         | Тур      | No.    |         | /N           | mm                    | Description of Strata  | (Thick-      | Level | Legend   |
| Time  | (m)    | (Flush<br>Return) |                   | TCR      | SCR    |         | Core<br>Size | (Min, Avg, Max)<br>Or | Door prior of Greata   | ness)        |       |          |
|       |        | % ′               | From T            | o %      | %      | %       | (mm)         | Result                |  | (m)          | m OD  | ~~~~     |
| 05/01 |        |                   | -                 |          |        |         |              |                       | MADE GROUND: Brown and grey slightly sandy gravelly clay. Gravel is angular to | <u>†</u>     |       |          |
|       |        |                   | -                 |          |        |         |              |                       | subrounded fine to coarse flint and  | ţ            |       |          |
|       |        |                   | - 0.20<br>- 0.20  | B<br>D   | 1 2    |         |              |                       | brick.<br>[MADE GROUND - CLAY]   | (0.50)       |       |          |
|       |        |                   | 0.20              | ٦        | _      |         |              |                       | [MADE GROUND - CLAY]   | ł            |       |          |
|       |        |                   | <u>-</u>          |          |        |         |              |                       |  | 0.50         | 61.38 |          |
|       |        |                   |                   |          |        |         |              |                       | Soft light brown mottled grey slightly   | T 0.30       | 61.36 |          |
|       |        |                   | 0.00-1.           | 20 PIT   |        |         |              |                       | sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular and | Ŧ            |       |          |
|       |        |                   | 0.70              | В        | 3      |         |              |                       | subrounded mainly fine and medium flint.                                       | ļ.           |       |          |
|       |        |                   | 0.70              | D        | 4      |         |              |                       | [SUPERFICIAL DEPOSITS - COHESIVE - CLAY]                                       | (0.70)       |       |          |
|       |        |                   | <del>-</del><br>- |          |        |         |              |                       |  | ‡            |       |          |
|       |        |                   | -                 |          |        |         |              |                       |  | <b>F</b>     |       |          |
|       |        |                   | 1.10              | В        | 5      |         |              |                       |  | 1            |       |          |
|       |        |                   | 1.10              | D        | 6      | $\perp$ | 1            |                       | Stiff brown mottled orangish brown and   | 1.20         | 60.68 |          |
|       |        |                   | -                 |          |        |         |              |                       | light grey slightly sandy slightly   | ţ            |       |          |
|       |        |                   | -                 |          |        |         |              |                       | gravelly CLAY with subangular and subrounded claystone nodules (<60mm).        | t            |       |          |
|       |        | (100)             | 1.20-2.0          | 00 100   | 1      |         |              |                       | Gravel is subangular and subrounded fine to coarse flint and possibly chalk.   | (0.80)       |       |          |
|       |        | (100)             | 1.20-2.0          | ,,   100 | 1      |         |              |                       | [SUPERFICIAL DEPOSITS - COHESIVE - CLAY]                                       | [ (0.80)     |       |          |
|       |        |                   | 1.70-2.0          | 00 C     | 7      |         |              |                       |  | Ŧ            |       |          |
|       |        |                   | - 1.70-2.         | ,,       | ′      |         |              |                       |  | F            |       |          |
|       |        |                   | -                 |          |        |         |              |                       |  | ‡            |       |          |
|       |        |                   |                   |          |        |         |              |                       |  | 2.00         | 59.88 |          |
|       |        |                   | -                 |          |        |         |              |                       | Stiff fissured laminated dark brown mottled orangish brown locally grey        | ‡            |       |          |
|       |        |                   | -                 |          |        |         |              |                       | (gleyed) CLAY with occasional pockets (<8                                      | ţ            |       |          |
|       |        |                   | 2.30-2.0          | 50 C     | 8      |         |              |                       | x 6mm) of gypsum crystals and rare shell fragments (<20mm). Occasional thin    | ţ            |       |          |
|       |        |                   |                   |          |        |         |              |                       | laminae of orangish brown clay with  | t            |       |          |
|       |        |                   | <u>-</u> _        |          |        |         |              |                       | possible weathered pyrite. Thin laminae, 0-40 degs (parallel to fissures),     | L            |       |          |
|       |        |                   | -                 |          |        |         |              |                       | extremely closely spaced, planar and   | F            |       |          |
|       |        |                   | <u>-</u>          |          |        |         |              |                       | undulating. Fissures (SET 1) are 0-40 degs, extremely closely to very closely  | Ŧ            |       |          |
|       |        | (100)             | 2.00-3.           | 50 100   |        |         |              |                       | spaced, undulating, rough to smooth,   | F            |       |          |
|       |        |                   | -                 |          |        |         |              |                       | (very tight), clean with occasional orangish brown silt veneer and locally     | ‡            |       |          |
|       |        |                   | -                 |          |        |         |              |                       | with bluish grey silt veneer (gleyed).   | ‡            |       |          |
|       |        |                   | <del>-</del>      |          |        |         |              |                       | [LONDON CLAY FORMATION A3 - CLAY] 2.50m to 3.50m; (firm to stiff) possibly     | <u> </u>     |       |          |
|       |        |                   | <u> </u>          |          |        |         |              |                       | DI.  | ‡            |       |          |
|       |        |                   | <u>-</u>          |          | 1      |         |              |                       |  | ‡            |       |          |
|       |        |                   | <del>-</del>      |          | 1      |         |              |                       |  | ţ            |       |          |
|       |        |                   | <del>-</del><br>- |          | 1      |         |              |                       |  | ‡            |       | <u> </u> |
|       |        |                   | -                 |          | +      | 1       | 1            |                       |  | <b>t</b>     |       |          |
|       |        |                   | -                 |          |        |         |              |                       |  | t            |       |          |
|       |        |                   | 3.70-4.0          | 00 C     | 9      |         |              |                       |  | (3.50)       |       |          |
|       |        |                   |                   |          |        |         |              |                       |  | t,           |       |          |
|       |        |                   | <u> </u>          |          | 1      |         |              |                       |  | F            |       |          |
|       |        |                   | _                 |          | 1      |         |              |                       |  | F            |       |          |
|       |        |                   |                   |          | 1      |         |              |                       |  | F            |       |          |
|       |        | (100)             | 3.50-5.0          | 00 100   | 1      |         |              |                       |  | ‡            |       |          |
|       |        | (100)             | - 3.30-3.0        | ,,   100 | 1      |         |              |                       |  | F            |       |          |
|       |        |                   | <del>-</del>      |          | 1      |         |              |                       |  | ‡            |       |          |
|       |        |                   | <u>-</u>          |          |        |         |              |                       |  | L            |       |          |
|       |        |                   | -                 |          | 1      |         |              |                       |  | t            |       |          |
|       |        |                   | <u>-</u>          |          | 1      |         |              |                       |  | t            |       |          |
|       |        |                   | <u> </u>          |          |        |         |              |                       |  | t            |       |          |
|       |        |                   | <u> </u>          |          |        |         |              |                       |  | ł            |       |          |
|       |        |                   | -                 |          |        |         |              |                       |  | <del> </del> |       | <u> </u> |
|       |        |                   |                   |          |        |         |              |                       |  |              |       |          |
| Domar |        |                   |                   |          | -      |         |              |                       |  |              |       |          |

Remarks 1 (See notes & keysheets)

- Initially a PAS128 survey was undertaken. Prior to boring, a Cable Avoidance Tool (CAT) survey was performed to check for services. A service pit was hand-dug to 1.20m and rescanned using a CAT. Services were not located.
- See separate sheet for installation.
- Groundwater not encountered during drilling due to use of fluid flush.

Scale 1:25



**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML024-RC012 (1 of 9)

Equipment Comacchio MC450P

Drill Fluid

Crew/Vessel Dates Drilled

Polymer DS60/Pure-Bore TS/WG

Start 05/01/2017 End 10/01/2017

**Borehole Diameter** 146mm to 34.95m

**Casing Diameter** 200mm to 1.30m

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 E 188149.39 N 61.88 m OD

Logged by Compiled by Checked by

| CJ/MCM     | Jm         | NJB        |
|------------|------------|------------|
| 04/01/2017 | 21/02/2017 | 11/12/2017 |

|     |              | Water         | San               | nple/Co | re Rec | overy    |          | ŞPT                         | Fracture                       |   | Depth            |       |          |
|-----|--------------|---------------|-------------------|---------|--------|----------|----------|-----------------------------|--------------------------------|---|------------------|-------|----------|
| &   | Casing Depth | (m)<br>(Flush | Depth             | (m)     | Туре   |          | DOD      | Blows<br>/N<br>Core<br>Size | Spacing<br>mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-<br>ness) | Level | Lege     |
| ime | (m)          | Return)       | From              | То      | %      | SCR<br>% | KQD<br>% | Size<br>(mm)                | or<br>Result                   |   | (m)              | m OD  |          |
|     |              |               | -                 |         |        |          |          |                             |                                | Stiff mottled CLAY as previous sheet.   |                  |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | Ŧ                |       |          |
|     |              |               | _                 |         |        |          |          |                             |                                |   | F                |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                |   | ł                |       |          |
|     |              |               | _<br>_ 5.50-      | -5.80   | С      | 10       |          |                             |                                |   | 5.50             | 56.38 |          |
|     |              |               |                   |         |        |          |          |                             |                                | Very stiff fissured dark brown mottled  | 1                |       | _        |
|     |              |               | <u>.</u>          |         |        |          |          |                             |                                | orangish brown locally grey (gleyed)<br>slightly sandy CLAY with occasional                             | ţ                |       |          |
|     |              | (100)         | 5.00-             | -6.50   | 100    |          |          |                             |                                | <pre>pockets (&lt;6 x 3mm) of gypsum crystals and<br/>rare shell fragments (&lt;20mm). Occasional</pre> | ţ.               |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | thin laminae of claystone. Fissures (SET  | ‡                |       |          |
|     |              |               | _                 |         |        |          |          |                             |                                | <ol> <li>are 0-20 degs, extremely closely to<br/>very closely spaced, planar locally</li> </ol>         | ‡                |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                | undulating, smooth occasionally rough, (very tight), occasionally polished                              | ‡                |       | _        |
|     |              |               | -                 |         |        |          |          |                             |                                | locally with slickensides, mainly with orangish brown staining or silt veneer.                          | Ī                |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                | Fissures (SET 2) are 70-90 degs, spacing  | F                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | not determined locally very closely spaced, planar, smooth, (very tight),                               | Ŧ                |       | -        |
|     |              |               | _                 |         |        |          |          |                             |                                | polished locally with slickensides, with orangish brown staining.                                       | F                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | [LONDON CLAY FORMATION A3 - CLAY]   | ŧ                |       |          |
|     |              |               | <u>.</u>          |         |        |          |          |                             |                                | 6.40m to 8.15m; (firm to stiff) possibly DI. Driller notes dropped core.                                | ţ                |       | _        |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | ‡                |       | _        |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | ‡                |       |          |
|     |              |               | <del>-</del>      |         |        |          |          |                             |                                |   | <b>-</b>         |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | ‡                |       |          |
|     |              | (100)         | 6.50-             | 8.00    | 80     |          |          |                             |                                |   | ŧ.               |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                |   | <del>[</del>     |       | -        |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | Ł                |       | _        |
|     |              |               | <u>.</u>          |         |        |          |          |                             |                                |   | <u> </u>         |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                | 7.70m to 8.00m; assumed zone of core  | (4.40)           |       |          |
|     |              |               | <del>-</del><br>- |         |        |          |          |                             |                                | loss.   | ‡                |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                |   | Ŧ                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | F                |       |          |
|     |              |               |                   |         |        |          |          |                             |                                |   | ŧ                |       | _        |
|     |              |               | 8.15-             | 8.35    | С      | 11       |          |                             |                                |   | <u>t</u>         |       | _        |
|     |              |               | -<br>-            |         |        |          |          |                             |                                |   | ‡                |       |          |
|     |              |               | -<br>- 8.50-      |         | С      | 12       |          |                             |                                |   | ‡                |       | -        |
|     |              |               | -                 |         |        | 12       |          |                             |                                |   | <b>F</b>         |       |          |
|     |              | (100)         | 8.00-             | 9.30    | 100    |          |          |                             |                                |   | Ŧ                |       |          |
|     |              |               | -<br>-<br>-       |         |        |          |          |                             |                                |   | F                |       |          |
|     |              |               | -                 |         |        |          |          |                             |                                |   | t                |       |          |
|     |              |               | <u>-</u>          |         |        |          |          |                             |                                | 9.00m to 9.03m; orangish brown claystone.   | L                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | Stiff fissured becoming indistinctly  | ‡                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | fissured dark brownish grey CLAY,<br>becoming silty with occasional partings                            | ‡                |       |          |
|     |              |               | <del>-</del><br>- |         | -      |          |          |                             |                                | of silt. Fissures (SET 1) are 0-30 degs,  | F                |       | <u> </u> |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | extremely closely to very closely spaced occasionally closely spaced, planar,                           | Ŧ                |       |          |
|     |              |               | -<br><br>-        |         |        |          |          |                             |                                | smooth, (very tight), locally polished with slickensides, clean. Fissures (SET                          | F                |       | -        |
|     |              |               | -                 |         |        |          |          |                             |                                | 2) are 70-90 degs, spacing not  | ţ                |       | _        |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | determined, planar, smooth, (very tight), frequently polished. Fissures (SET 3) are                     | ‡                |       |          |
|     |              |               | <u>-</u><br>-     |         |        |          |          |                             |                                | 30-60 degs, mainly localised and very closely to closely spaced, planar,                                | ţ                |       |          |
|     |              |               | -<br>-            |         |        |          |          |                             |                                | smooth, (very tight), frequently polished   | 9.90             | 51.98 |          |
|     |              |               | _                 |         |        |          |          |                             |                                | occasionally with slickensides.<br>[LONDON CLAY FORMATION A2 - CLAY]                                    | H                |       | -        |

(See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

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Figure No. ML024-RC012 (2 of 9)

Equipment Comacchio MC450P

Drill Fluid Crew/Vessel Polymer DS60/Pure-Bore

TS/WG

Start 05/01/2017 End 10/01/2017 **Dates Drilled** 

**Borehole Diameter** 146mm to 34.95m **Casing Diameter** 200mm to 1.30m BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 **E** 188149.39 N 61.88 m OD

Logged by CJ/MCM 04/01/2017 Compiled by Checked by NJB

jm 21/02/2017 11/12/2017

| _          |              | Water                  | Sam              | ple/Co | re Rec   | overy    |            | _ŞPT                 | Fracture                       |   | Depth                    |       |        |
|------------|--------------|------------------------|------------------|--------|----------|----------|------------|----------------------|--------------------------------|---|--------------------------|-------|--------|
| Date<br>_& | Casing Depth | Depth<br>(m)<br>(Flush | Depth (          | (m)    | Туре     |          | !<br> <br> | Blows<br>/N<br>Core  | Spacing<br>mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-<br>ness)         | Level | Legend |
| Time       | (m)          | Return)                | From             | То     | TCR<br>% | SCR<br>% | RQD<br>%   | Core<br>Size<br>(mm) | or<br>Result                   |   | (m)                      | m OD  |        |
|            |              | (100)                  | 9.30-            | 10.80  | 83       |          |            | ,                    |                                | 9.90m to 10.30m; fissures frequently polished with slickensides. Below 10.30m; indistinctly fissured.   | (0.65)                   |       |        |
|            |              |                        | _                |        |          |          |            |                      |                                | Assumed zone of core loss. Driller notes  | 10.55                    | 51.33 |        |
| 05/01      |              |                        | -<br>-           |        |          |          |            |                      |                                | liner failed. [ - NO CORE RECOVERY]   | <u> </u>                 |       |        |
| 06/01      | 1.30         |                        | <u>-</u>         |        |          |          |            |                      |                                |   | (0.80)                   |       |        |
|            |              |                        | -                |        |          |          |            |                      |                                |   | 11.35                    | 50.53 |        |
|            |              | (100)                  | <br>- 10.80-:    | 12.30  | 63       |          |            |                      |                                | Very stiff indistinctly fissured<br>laminated dark grey locally slightly<br>sandy CLAY with partings of silt or fine  | <u> </u>                 |       |        |
|            |              |                        | 11.65-           | 11.83  | С        | 13       |            |                      |                                | sand and occasionally with greenish black possibly carbonaceous elongate pockets (<40 x 5mm). Sand is mainly fine and   | ‡<br>+                   |       |        |
|            |              |                        | 11.83-           | 12.06  | С        | 14       |            |                      |                                | medium. Thin laminae of clay, 0-20 degs,<br>extremely closely spaced, planar with<br>partings of silt and fine sand. Fissures<br>(SET 1) are 0-20 degs, spacing not         |                          |       |        |
| 06/01      | 1.30         |                        | -<br>-<br>-      |        |          |          |            |                      |                                | determined, planar, smooth, (very tight),<br>clean or with occasional polishing and<br>locally with slickensides. Fissures (SET<br>2) are 70-90 degs, probably very closely | <del> </del><br> -<br> - |       |        |
| 09/01      | 1.30         | GL                     | -                |        |          |          |            |                      |                                | to closely spaced, planar, smooth, (very tight), clean or with occasional polishing and locally with slickensides.  | <u> </u>                 |       |        |
|            |              |                        |                  |        |          |          |            |                      |                                | [LONDON CLAY FORMATION A2 - CLAY]   | -<br> -<br> -            |       |        |
|            |              |                        | -<br>-<br>-<br>- |        |          |          |            |                      |                                |   | <u> </u>                 |       |        |
|            |              | (100)                  | 12.30-           | 13.80  | 100      |          |            |                      |                                |   | <u>-</u><br>-            |       |        |
|            |              |                        | -                |        |          |          |            |                      |                                |   | <u> </u>                 |       |        |
|            |              |                        | -<br>-<br>-      |        |          |          |            |                      |                                |   | <u> </u>                 |       |        |
|            |              |                        |                  |        |          |          |            |                      |                                |   | <u> </u>                 |       |        |
|            |              |                        | -                |        |          |          |            |                      |                                |   | <u>†</u><br> -           |       |        |
|            |              |                        | -<br>-<br>-      |        |          |          |            |                      |                                |   |                          |       |        |
|            |              |                        | 14.50-           | 14.80  | С        | 15       |            |                      |                                |   | (6.17)                   |       |        |
|            |              | (100)                  | 13.80-           |        |          |          |            |                      |                                |   | }<br>-<br>-              |       |        |
|            |              |                        | 14.80-           | 15.06  | С        | 16       |            |                      |                                |   | <u>†</u>                 |       |        |
| Pomar      |              |                        | _                |        |          |          | <u> </u>   |                      |                                |   | <u> </u>                 |       |        |

Remarks

(See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML024-RC012 (3 of 9)

Equipment Comacchio MC450P

Drill Fluid Crew/Vessel Dates Drilled Polymer DS60/Pure-Bore

TS/WG

Start 05/01/2017 End 10/01/2017

**Borehole Diameter** 146mm to 34.95m **Casing Diameter** 200mm to 1.30m

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 E 188149.39 N 61.88 m OD

Logged by Compiled by Checked by CJ/MCM jm

| 04/01/2017 | 21/02/2017 | 11/12/2017 |
|------------|------------|------------|
|            |            |            |

|     |        | End<br>Water  | 10/01/   | male (O | - P-     | <b>-</b> > + c | 04/      | CDT                  |                     | 2/2017 11/12/2017   | 1                |        | _        |
|-----|--------|---------------|----------|---------|----------|----------------|----------|----------------------|---------------------|---|------------------|--------|----------|
| ate | Casing | Depth         | Sai      | nple/Co |          | T i            |          | SPT<br>Blows<br>/N   | Fracture<br>Spacing |   | Depth            | Lavial |          |
| &   | Depth  | (m)<br>(Flush | Depth    | (m)     | Туре     |                |          |                      | mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-<br>ness) | Level  | Leç      |
| ime | (m)    | Return)       | From     | To      | TCR<br>% | SCR<br>%       | RQD<br>% | Core<br>Size<br>(mm) | or<br>Result        |   | (m)              | m OD   |          |
|     |        | 70            |          |         |          | ,,             | ,,,      | ()                   |                     | Very stiff dark grey CLAY as previous   | ()               | 02     |          |
|     |        |               | -        |         |          |                |          |                      |                     | sheet.  | ţ                |        | F        |
|     |        |               | _        |         |          |                |          |                      |                     |   | ţ                |        | -        |
|     |        |               | _        |         |          |                |          |                      |                     |   | †                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     |   | Ŧ                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | F                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     |   | ‡                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     |   | ‡                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | ‡                |        | H        |
|     |        |               |          |         |          |                |          |                      |                     |   | ‡                |        | L        |
|     |        |               | _        |         |          |                |          |                      |                     |   | L                |        |          |
|     |        | (100)         | 15.30    | -16.80  | 100      |                |          |                      |                     |   | İ                |        |          |
|     |        |               |          |         |          |                |          |                      |                     |   | ł                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | Ŧ                |        | _        |
|     |        |               | Ī        |         |          |                |          |                      |                     |   | Ŧ                |        |          |
|     |        |               |          |         |          |                |          |                      |                     |   | Ŧ                |        |          |
|     |        |               |          |         |          |                |          |                      |                     |   | <b>F</b>         |        | H        |
|     |        |               |          |         |          |                |          |                      |                     |   | ‡                |        | L        |
|     |        |               | -        |         |          |                |          |                      | NA                  |   | ‡                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     |   | t                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | İ                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | $\vdash$         |        | L        |
|     |        |               | Ī        |         |          |                |          |                      |                     |   | Ŧ                |        |          |
|     |        |               | 17 25    | -17.52  | С        | 17             |          |                      |                     | At 17.25m; thin lamina of shell fragments   | Ŧ                |        | Г        |
|     |        |               | - 17.25  | -17.52  |          | Ι,             |          |                      |                     | (<60mm).  | Ŧ                |        | -        |
|     |        |               | =        |         |          |                |          |                      |                     |   | ‡                |        |          |
|     |        |               |          |         |          |                |          |                      |                     |   | 17.52            | 44.36  |          |
|     |        | (100)         | 16.80    | -18.30  | 100      |                |          |                      |                     | Stiff dark grey slightly sandy CLAY with occasional shell fragments (<60mm). Sand           | 7                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     | is mainly fine.   | ‡                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     | [HARWICH FORMATION - CLAY]  | <b>†</b>         |        |          |
|     |        |               |          |         | _        |                |          |                      |                     | 17.88m to 17.93m; thin bed of dark grey   | İ                |        |          |
|     |        |               | 17.93    | -18.13  | С        | 18             |          |                      |                     | siltstone. At 17.93m; slightly gravelly.  | (0.93)           |        |          |
|     |        |               | _        |         |          |                |          |                      |                     |   | ł                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     | Very stiff friable fissured greenish grey to bluish grey mottled yellowish green            | †                |        |          |
|     |        |               | <u> </u> |         |          |                |          |                      |                     | and whitish grey silty CLAY with  | ١ <del>٢</del>   |        |          |
|     |        |               | -        |         |          |                |          |                      |                     | /occasional subrounded white calcrete nodules (<40 x 20mm). All fissures                    | \ <del>{</del>   |        |          |
|     |        |               |          |         |          |                |          |                      |                     | frequently polished with slickensides, with greenish grey and yellowish green               | 18.45            | 43.43  | E        |
|     |        |               | _        |         |          |                |          |                      |                     | mottling and silt veneer. Fissures (SET   | F                |        | Ľ        |
|     |        | (100)         | 18.30    | -19.05  | 100      |                |          |                      |                     | <ol> <li>are 0-30 degs, extremely closely to<br/>very closely spaced, planar and</li> </ol> | ‡                |        | ×        |
|     |        | (100)         | _ 10.50  | 17.03   | 1        |                |          |                      |                     | undulating, smooth, (very tight).   | ‡                |        | k        |
|     |        |               | -        |         |          |                |          |                      |                     | Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely          | ‡                |        | -        |
|     |        |               | _        |         |          |                |          |                      |                     | to very closely spaced, planar and  | (1.00)           |        | ×        |
|     |        |               | _        |         |          |                |          |                      |                     | undulating, smooth, (very tight). Fissures (SET 3) are 30-60 degs, very                     | <u> </u>         |        | k        |
|     |        |               |          |         |          |                |          |                      |                     | closely to closely spaced, planar,  | t                |        | H        |
|     |        |               | _        |         |          |                |          |                      |                     | <pre>smooth, (very tight). [LOWER MOTTLED CLAY - CLAY]</pre>                                | £                |        | ×        |
|     |        |               | -        |         |          |                |          |                      |                     | 18.45m to 18.60m; with greenish grey  | F                |        | Ľ        |
|     |        | (100)         | 19.05    | -19.80  | 100      |                |          |                      |                     | infilled burrows.<br>18.50m to 18.90m; with lenses of grey                                  | 19.45            | 42.43  | Ļ        |
|     |        | .=,           | <u></u>  |         |          |                |          |                      |                     | sandy clay (<90 x 90mm).  | <u></u>          | / -3   | Ê        |
|     |        |               | ‡        |         |          |                |          |                      |                     | \ 18.90m to 19.45m; with frequent calcrete nodules.   | /‡               |        | $\vdash$ |
|     |        |               | <u> </u> |         |          |                |          |                      |                     | At 19.30m; with purplish red mottling.  | ` <b>t</b>       |        | L        |
|     |        |               |          |         |          |                |          |                      |                     | Very stiff locally friable fissured   | t                |        |          |
|     |        |               | -        |         |          |                |          |                      |                     | yellowish green mottled purplish red,   | t                |        |          |
|     |        |               | _        |         |          |                |          |                      |                     | grey and white locally slightly sandy CLAY with occasional subrounded and                   | Ł                |        |          |
|     |        |               |          |         |          |                |          | I                    |                     | rounded white calcrete nodules (<65 x   | Γ                |        |          |

(See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML024-RC012 (4 of 9)

Equipment Comacchio MC450P

Drill Fluid

TS/WG

Crew/Vessel Dates Drilled Start 05/01/2017 End 10/01/2017

Polymer DS60/Pure-Bore

Logged by CJ/MCM 04/01/2017 Compiled by Checked by NJB 21/02/2017 11/12/2017

**Casing Diameter** 

200mm to 1.30m

**Borehole Diameter** 

146mm to 34.95m

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 E 188149.39 N 61.88 m OD

| Date & Casing Depth (m) | 'I (M)             | repth (m) Frush eturn) % Fr | Sample/Cor<br>Depth (m)<br>rom To              | Type<br>TCR<br>% |     | RQD<br>% | SPT<br>Blows<br>/N<br>Core<br>Size<br>(mm) | Fracture<br>Spacing<br>mm<br>(Min,Avg,Max)<br>or<br>Result | Description of Strata   | Depth<br>(Thick-<br>ness)<br>(m) | Level<br>m OD | Legend                                |
|-------------------------|--------------------|-----------------------------|--|------------------|-----|----------|--|--|---|----------------------------------|---------------|---------------------------------------|
| & Depth                 | (filush<br>Return) | (m)   Ilush   Sturn)   Fr   | rom To   | TCR<br>%         | SCR |          | /N<br>Core<br>Size                         | mm<br>(Min,Avg,Max)<br>Or                                  | Description of Strata   | (Thick-<br>ness)                 |               | Legend                                |
|                         | Return)            | -rusn<br>eturn) Fr          | rom To   | %                |     |          | Size                                       | or   | Description of Strata   |                                  | m OD          |                                       |
|                         | %                  | % Fr                        |  | %                |     |          | (mm)                                       |  |   | (m)                              | m 0D          |                                       |
|                         | (100)              | <u>-</u>                    | 0.30-20.60                                     | C                |     |          |  |  |   | (111)                            | III OD        |                                       |
|                         |                    | -<br>-<br>-                 | 9.80-21.30                                     |                  | 19  |          |  |  | 40mm) and occasional worm burrows (<4mm). All fissures with occasional polishing with slickensides, with yellowish green and purplish red mottling and silt veneer. Fissures (SET 1) are 0-30 degs, extremely closely to very closely spaced, planar and undulating, smooth, (very tight). Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely to very closely spaced, planar and undulating, smooth, (very tight). Fissures (SET 3) are 30-60 degs, very  | (1.85)                           |               |                                       |
| 9/01 1.30               | GT.                | Ė                           | 0.95-21.25                                     | С                | 20  |          |  |  | closely to closely spaced, planar, smooth, (very tight). [LOWER MOTTLED CLAY - CLAY] 19.80m to 19.90m; (firm to stiff), DI.   | _                                |               |                                       |
| 9/01 1.30               | GL                 | GT -                        |  |                  |     |          |  |  |   | 21.30                            | 40.58         |                                       |
| 0/01 1.30               | (100)              |                             | 1.30-22.80                                     | 100              |     |          |  |  | Very stiff indistinctly fissured greenish brown mottled greenish grey silty CLAY with frequent pockets (<30 x 20mm) of greenish grey clayey silt and sandy silt and locally with worm burrows. Fissures (SET 1) are 0-20 degs, spacing not determined, planar, smooth, (very tight), rarely polished with slickensides, with greenish brown and greenish grey mottling and silt veneer. Fissures (SET 2) are 70-90 degs, spacing not determined, undulating, rough, (very tight), rarely polished, with greenish grey silt veneer. [LOWER MOTTLED CLAY - CLAY] Top (21.30m) to 21.45m; locally distinctly fissured, locally mottled purplish red and yellow. 22.45m to base (22.80m); very thin laminae with partings of silt, 0 degs, extremely closely spaced, planar, occasionally discontinuous and locally in pockets.   | . (1.50)                         | 39.08         | × × × × × × × × × × × × × × × × × × × |
|                         | (100)              | 100) - 2                    | 3.42-23.75<br>2.80-24.30<br>3.90-24.21<br>4.30 | 100              | 22  |          |  |  | Very stiff fissured locally indistinctly fissured brown to dark reddish brown mottled bluish grey, yellowish green and locally purplish red slightly sandy CLAY. Sand is fine to coarse. Occasional subrounded and rounded white calcrete nodules (<25 x 20mm), locally with worm burrows (<5mm). Fissures (SET 1) are 0-30 degs, extremely closely to very closely occasionally closely spaced, planar locally undulating, smooth, (very tight), frequently polished with slickensides, with bluish grey and yellowish green mottling and silt veneer, locally with calcrete veneer. Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced rarely very closely spaced, undulating, rough and smooth, (very tight), rarely polished, frequently with greenish grey silt veneer. Fissures (SET 3) are 30-60 degs, very closely to closely spaced, planar, smooth, (very tight), frequently polished with slickensides, with bluish grey and yellowish green mottling and silt veneer.  [LOWER MOTTLED CLAY - CLAY] 23.05m to 23.20m; very stiff indistinctly fissured yellowish brown to brown mottled greenish grey silty clay with frequent pockets (<30 x 40mm) of greenish grey clayey silt. 24.30m to 24.75m; prominent fissures (SET 2). |                                  | 36.88         |                                       |

Remarks (See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML024-RC012 (5 of 9)

Equipment Comacchio MC450P

Drill Fluid

Polymer DS60/Pure-Bore

TS/WG

Crew/Vessel Dates Drilled Start 05/01/2017 End 10/01/2017 **Borehole Diameter** 146mm to 34.95m **Casing Diameter** 200mm to 1.30m

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 **E** 188149.39 N 61.88 m OD

Logged by Compiled by Checked by

| CJ/MCM     | Jm         | NJB        |
|------------|------------|------------|
| 04/01/2017 | 21/02/2017 | 11/12/2017 |

|           |                 | Water                  | 10/01/2       |             | P:       |          | 3-1/     | 01/201               |                               | 2/201/ 11/12/201/   |                    |                  |       | 1          |
|-----------|-----------------|------------------------|---------------|-------------|----------|----------|----------|----------------------|-------------------------------|---|--------------------|------------------|-------|------------|
| Date<br>& | Casing<br>Depth | Depth<br>(m)           | San<br>Depth  | nple/Co     | re Rec   | T -      | l<br>I   | SPT<br>Blows<br>/N   | mm                            | Description o   | of Strata          | Depth<br>(Thick- | Level | Legen      |
| Time      | (m)             | (Flush<br>Return)<br>% | From          | (III)<br>To | TCR<br>% | SCR<br>% | RQD<br>% | Core<br>Size<br>(mm) | (Min,Avg,Max)<br>or<br>Result | Description   | , Clutu            | ness)<br>(m)     | m OD  |            |
|           |                 | (100)                  | 24.30-        | -25.80      | 100      |          |          | <u> </u>             |                               | brown mottled greenish  | grey CLAY.         | 25.00            | 36.88 |            |
|           |                 | (200)                  |               |             |          |          |          |                      |                               | Fissures (SET 1) are 0-   | 20 degs, very      |                  | 55155 |            |
|           |                 |                        | _             |             |          |          |          |                      |                               | <pre>closely to closely space<br/>smooth, (very tight), c</pre> |                    | (0.50)           |       |            |
|           |                 |                        | Ī             |             |          |          |          |                      |                               | occasionally polished w   |                    | (0.30)           |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | [LOWER MOTTLED CLAY - C   | LAY]               | <u> </u>         |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               |   |                    | _25.50           | 36.38 |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | Very stiff indistinctly   |                    | <u> </u>         |       | l —        |
|           |                 |                        |               |             |          |          |          |                      |                               | laminated yellowish bro<br>mottled greenish grey s              |                    | 1                |       |            |
|           |                 |                        | <u> </u>      |             |          |          |          |                      |                               | CLAY. Thin laminae of c   | lay and silt, 0    | F                |       | L -        |
|           |                 |                        |               |             |          |          |          |                      |                               | degs, extremely closely<br>Fissures (SET 2) are 70              |                    | ļ l              |       | _          |
|           |                 |                        |               |             |          |          |          |                      |                               | not determined possibly   | extremely closely  | <u> </u>         |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               | <pre>spaced, undulating, rou with greenish grey silt</pre>      |                    |                  |       | -          |
|           |                 |                        | _             |             |          |          |          |                      |                               | [LOWER MOTTLED CLAY - C   | LAY]               | <u> </u>         |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               | 25.80m to 26.30m; local sandy clay, very thin b                 |                    | <u> </u>         |       | _          |
|           |                 |                        | -             |             |          |          |          |                      |                               | and occasional pockets  |                    | (1.70)           |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | silty sand. Sand is fin   | e and medium.      | ļ                |       |            |
|           |                 |                        | _<br>26.50-   | -26.67      | С        | 23       |          |                      |                               |   |                    | L                |       |            |
|           |                 | (100)                  | 25.80-        | -27.30      | 100      |          |          |                      |                               |   |                    | ŀ                |       |            |
|           |                 |                        | [             |             |          |          |          |                      |                               |   |                    | <u> </u>         |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               |   |                    | ļ .              |       |            |
|           |                 |                        |               |             |          |          |          |                      |                               |   |                    | <u> </u>         |       |            |
|           |                 |                        | 26.90-        | -27.20      | С        | 24       |          |                      |                               |   |                    | <u> </u>         |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               |   |                    | _                |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               |   |                    | [                |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | TT  |                    | 27.20            | 34.68 |            |
|           |                 |                        |               |             |          |          |          |                      |                               | Very stiff indistinctly<br>laminated reddish brown              |                    | <u> </u>         |       | -          |
|           |                 |                        | -             |             |          |          |          |                      |                               | grey CLAY. Thin laminae   | of clay and silt,  | <u> </u>         |       |            |
|           |                 |                        | Ł             |             |          |          |          |                      |                               | <pre>0 degs, extremely close<br/>Fissures (SET 1) are 0-</pre>  |                    | L                |       |            |
|           |                 |                        |               |             |          |          |          |                      |                               | not determined, planar,   | smooth, (very      | -                |       | -          |
|           |                 |                        | Ī             |             |          |          |          |                      |                               | tight), polished or wit<br>[LOWER MOTTLED CLAY - C              |                    | [                |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | [20,21, 101122 0211   |                    | <b>.</b>         |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               |   |                    | (1.30)           |       |            |
|           |                 |                        |               |             |          |          |          |                      |                               |   |                    | <u> </u>         |       | <u> </u>   |
|           |                 | (100)                  | _<br>- 27.30- | -28 80      | 100      |          |          |                      |                               |   |                    |                  |       |            |
|           |                 | (100)                  | - 27.30       | 20.00       | 1        |          |          |                      |                               |   |                    | -                |       |            |
|           |                 |                        | _             |             |          |          |          |                      |                               |   |                    | [                |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | Very stiff indistinctly   | fissured           | <u> </u>         |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | /laminated yellowish bro<br>greenish grey silty CLA             |                    | <u> </u>         |       |            |
|           |                 |                        | L             |             |          |          |          |                      |                               | clay and silt, 0 degs,  | extremely closely  | _28.50           | 33.38 |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | spaced, planar. Fissure   | s (SET 2) are      | <u> </u>         |       | <b>k</b> — |
|           |                 |                        | _             |             |          |          |          |                      |                               | 70-90 degs, spacing not undulating, rough, (ver                 | y tight), with     | ł l              |       | ×          |
|           |                 |                        | L             |             |          |          |          |                      |                               | greenish grey silt vene   | er.                | (0.55)           |       | ×          |
|           |                 |                        | -             |             | 1        |          |          |                      |                               | [LOWER MOTTLED CLAY - C<br>28.63m to 28.85m; with               |                    | (0.65)           |       | r —        |
|           |                 |                        | -             |             |          |          |          |                      |                               | spaced very thin beds o   |                    | <b>‡</b>         |       | ×          |
|           |                 |                        | _             |             |          |          |          |                      |                               | clay.   |                    | <b> </b>         |       | ľ          |
|           |                 |                        | ŀ             |             |          |          |          |                      |                               | Stiff fissured thinly l   |                    | <u> </u>         |       | <u> </u>   |
|           |                 |                        | -             |             |          |          |          |                      |                               | thinly bedded reddish be<br>greenish grey locally s             |                    | 29.15            | 32.73 |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | CLAY. Sand is fine. Thi   | n laminae and very | F I              |       | <u> </u>   |
|           |                 |                        | _             |             |          |          |          |                      |                               | thin beds of clay and s   | ilt, 0 degs,       | ţ l              |       |            |
|           |                 |                        | 29.50-        | -29.80      | С        | 25       |          |                      |                               | extremely closely space<br>Fissures (SET 1) are 0-              |                    | <u>L</u>         |       | I —        |
|           |                 | (100)                  | 28.80-        |             |          |          |          |                      |                               | closely to very closely   | spaced, planar     | ŀ                |       | <u> </u>   |
|           |                 |                        | -             |             |          |          |          |                      |                               | locally undulating, smo<br>locally polished occasi              |                    | Į į              |       |            |
|           |                 |                        | <u> </u>      |             |          |          |          |                      |                               | slickensides, occasiona   | lly with silt      | (1.15)           |       | l —        |
|           |                 |                        | <u> </u>      |             |          |          |          |                      |                               | veneer. Fissures (SET 2 spacing not determined                  |                    | ţ l              |       |            |
|           |                 |                        | -             |             |          |          |          |                      |                               | closely to very closely   |                    | <b> </b>         |       |            |
|           |                 |                        | _ 30.00-      | -30.30      | C        | 26       |          |                      |                               | undulating locally plan<br>smooth, (very tight), w              | ar, rough to       | <b>-</b>         |       | $\vdash =$ |
|           |                 |                        |               |             |          |          |          |                      |                               |   |                    |                  |       |            |

(See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML024-RC012 (6 of 9)

Equipment Comacchio MC450P

Drill Fluid Crew/Vessel Dates Drilled

TS/WG

Start 05/01/2017 End 10/01/2017

Polymer DS60/Pure-Bore

Logged by CJ/MCM 04/01/2017 Compiled by Checked by NJB

**Borehole Diameter** 

146mm to 34.95m

21/02/2017 11/12/2017

**Casing Diameter** 

200mm to 1.30m

BOREHOLE No.ML024-RC012

507319.36 E

Coordinates (National Grid) Ground Level 188149.39 N 61.88 m OD

|           |              | End<br>Water             | 10/01/         |         | P           |        | 01/ | 01/201             | _                        | 2/2017 11/12/2017   | ·                |        |        |
|-----------|--------------|--------------------------|----------------|---------|-------------|--------|-----|--------------------|--------------------------|---|------------------|--------|--------|
| Date      | Casing       | Depth                    | Sa             | mple/Co | Т           | T i    |     | SPT<br>Blows       | Fracture<br>Spacing      |   | Depth            | Lavial |        |
| &<br>Time | Depth<br>(m) | (m)<br>(Flush<br>Return) | Depth          | ` ,     | Type<br>TCR | SCR    |     | /N<br>Core<br>Size | mm<br>(Min,Avg,Max<br>Or | Description of Strata   | (Thick-<br>ness) | Level  | Legen  |
|           | ` '          | % ′                      | From           | То      | %           | %      | %   | (mm)               | Result                   |   | (m)              | m OD   |        |
|           |              |                          | <b>-</b>       |         |             |        |     |                    |                          | silt veneer. [LOWER MOTTLED CLAY - CLAY]  | -                |        |        |
|           |              |                          | <b>-</b><br>-  |         |             |        |     |                    |                          |   | -                |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | Very stiff indistinctly fissured laminated yellowish brown to brown               | 30.30            | 31.58  |        |
|           |              |                          | -              |         |             |        |     |                    |                          | mottled greenish grey CLAY. Thin laminae of clay and silt, 0-20 degs, extremely   | -                |        |        |
|           |              |                          | _              |         |             |        |     |                    |                          | closely spaced, planar. Fissures (SET 1)  | (0.45)           |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | are 0-20 degs, spacing not determined, planar, smooth to rough, (very tight),     | ļ                |        |        |
|           |              |                          | F              |         |             |        |     |                    |                          | occasionally with polishing and silt veneer. Fissures (SET 2) are 70-90 degs,     | 30.75            | 31.13  |        |
|           |              |                          | Ē              |         |             |        |     |                    |                          | spacing not determined, planar and  | 50.73            | 31.13  | ×      |
|           |              |                          |                |         |             |        |     |                    |                          | undulating, smooth to rough, (very tight), locally polished and with partial      |                  |        | ×      |
|           |              | (100)                    | 31.00          | -31.80  | EW          | 1      |     |                    |                          | greenish grey silt veneer.<br>  [LOWER MOTTLED CLAY - CLAY]                       | (0.55)           |        | ×      |
|           |              | (100)                    | 31.00          |         | EW          | 2      |     |                    |                          |   |                  |        |        |
|           |              |                          | 31.00<br>31.00 |         | EW<br>EW    | 3<br>4 |     |                    |                          | Very stiff indistinctly fissured dark brownish grey to brown mottled bluish       | L                |        | ×      |
|           |              |                          | <u> </u>       |         |             |        |     |                    |                          | grey silty CLAY. Fissures (SET 1) are   | 31.30            | 30.58  |        |
|           |              |                          | -              |         |             |        |     |                    |                          | 0-20 degs, very closely to closely spaced, planar, smooth, (very tight),          | <u> </u>         |        |        |
|           |              |                          | _              |         |             |        |     |                    |                          | clean, locally polished with slickensides. Fissures (SET 2) are 70-90             | <u> </u> -       |        |        |
|           |              |                          | <b> </b>       |         |             |        |     |                    |                          | degs, spacing not determined, planar,   | ‡                |        | l —    |
|           |              |                          | -              |         |             |        |     |                    |                          | smooth, (very tight), occasionally with polishing and with silt veneer.           |                  |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | [LOWER MOTTLED CLAY - CLAY] To 31.00m; slightly sandy, cemented.                  | (1.15)           |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | 31.00m to 31.30m; prominent fissure (SET  | (1113)           |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | 2), 90 degs.  | -                |        |        |
|           |              |                          | <b>-</b><br>-  |         |             |        |     |                    |                          | Stiff locally very stiff fissured laminated greenish brown mottled bluish         | +                |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | grey CLAY. Possibly glauconitic.  | <b> </b>         |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | Occasional very thin beds and pockets of silty fine sand. Locally with subrounded | ļ                |        |        |
|           |              |                          | <b>F</b>       |         |             |        |     |                    |                          | and rounded calcrete nodules and worm burrows (<4mm). All fissures with bluish    | 32.45            | 29.43  | ÷0 0   |
|           |              | (100)                    | 31.80          | -33.30  | 63          |        |     |                    |                          | grey mottling and silt veneer. Fissures   | (0.30)           |        | .°°. o |
|           |              |                          |                |         |             |        |     |                    |                          | (SET 1) are 0-30 degs, extremely closely to very closely spaced, planar, smooth,  | [                |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    |                          | (very tight), frequently polished with slickensides. Fissures (SET 2) are 70-90   | 32.75            | 29.13  | 0      |
|           |              |                          | _              |         |             |        |     |                    |                          | degs, spacing not determined possibly   | _                |        |        |
|           |              |                          | _              |         |             |        |     |                    |                          | extremely closely to very closely spaced, planar to undulating, smooth to rough,  | _<br>_(0.55)     |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | (very tight), occasionally polished.    Fissures (SET 3) are 30-60 degs, probably | -                |        |        |
|           |              |                          | -              |         |             |        |     |                    |                          | closely spaced, planar, smooth, (very   |                  |        |        |
|           |              |                          | <b>F</b>       |         |             |        |     |                    |                          | tight), frequently polished with slickensides.                                    | 33.30            | 28.58  |        |
|           |              |                          | F              |         |             |        |     |                    |                          | [UPNOR FORMATION - CLAY] 31.30m to 31.50m; silty.                                 | (0.15)<br>33.45  | 28.43  | .×<br> |
|           |              | (100)                    | L 32 20        | -33.80  | 100         | 70     | 0   |                    |                          | 31.70m to 31.95m; thinly interbedded silty fine sand and sandy clay, with         | -                |        |        |
|           |              | (100)                    | [ 33.30        | -33.60  | 1           | ,,,    |     |                    | L                        | pockets (<60 x 30mm) of silty fine sand.  | E                |        | H      |
|           |              |                          | _              |         |             |        |     |                    | 20,<br>95,               | Dark brown silty sandy locally clayey   | <u> </u>         |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    | 230                      | angular and subangular fine to coarse GRAVEL and COBBLE of black flint with       | <u> </u>         |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    | l                        | cortex and occasional red flint. Sand is  | <u> </u>         |        |        |
|           |              |                          | _              |         |             |        |     |                    | NI                       |   | -                |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    | 30,                      | Assumed zone of core loss.  | (1.50)           |        |        |
|           |              |                          | F              |         |             |        |     |                    | 95,                      | [ - NO CORE RECOVERY]   | ļ `              |        |        |
|           |              | (100)                    | 33.80          | -34.95  | 96          | 38     | 10  |                    | 160                      | Approximate boundary  | <b>F</b>         |        |        |
|           |              |                          | E              |         |             |        |     |                    | NI                       | Greenish grey very silty gravelly SAND, possibly glauconitic locally clayey.      | <u> </u>         |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    |                          | Gravel is angular and subangular fine to coarse rinded flint and chalk. Sand is   | F                |        |        |
|           |              |                          |                |         |             |        |     |                    |                          | fine.   |                  |        |        |
|           |              |                          | <u> </u>       |         |             |        |     |                    | >250                     | [UPNOR FORMATION - SAND]  | <u> </u>         |        |        |
| 0/01      | 1.30         | 0.80                     | <u> </u>       |         |             |        |     |                    | NT                       | Weak medium density locally high to very  | 24 05            | 26 02  |        |
|           |              |                          | <u>L</u>       |         | -           |        |     |                    | NI<br>/                  | high density light brownish white CHALK. Fractures (SET 1) are 5-20 degs, very    | 34.95            | 26.93  | H      |
|           |              |                          |                |         | 1           | I      | 1   | 1                  | ı —                      | \closely to medium spaced, planar to /  |                  | l      |        |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML024-RC012 (7 of 9)

Equipment Comacchio MC450P

Drill Fluid Crew/Vessel Dates Drilled Polymer DS60/Pure-Bore

TS/WG

Start 05/01/2017 End 10/01/2017

**Borehole Diameter** 

146mm to 34.95m

**Casing Diameter** 

200mm to 1.30m

11/12/2017

BOREHOLE No.ML024-RC012

Coordinates (National Grid) Ground Level

507319.36 **E** 188149.39 N 61.88 m OD

Logged by CJ/MCM 04/01/2017 Compiled by Checked by jm 21/02/2017 NJB

|     |        | Water        | Sample/Co         | re Rec | overy |   | _SPT        | Fracture      |   | Depth        |       |       |
|-----|--------|--------------|-------------------|--------|-------|---|-------------|---------------|---|--------------|-------|-------|
|     | Casing | Depth<br>(m) |                   | Туре   | No.   |   | Blows<br>/N | Spacing<br>mm |   | (Thick-      | Level | Legen |
| &   | Depth  | (Flush       | Depth (m)         |        |       |   | Core        | (Min,Avg,Max) | Description of Strata   | ness)        |       |       |
| ime | (m)    | Return)      |                   |        | SCR   |   | Size        | or            |   |              |       |       |
|     |        | % ´          | From To           | %      | %     | % | (mm)        | Result        |   | (m)          | m OD  |       |
|     |        |              |                   |        |       |   |             |               | undulating, smooth to rough, (partly open                                   | ļ <u> </u>   |       |       |
|     |        |              | -                 |        |       |   |             |               | to wide), with grey and brown or  | ł l          |       |       |
|     |        |              |                   |        |       |   |             |               | occasionally greenish grey silty fine                                       | 1 1          |       |       |
|     |        |              | _                 |        |       |   |             |               | sand infill, occasional brown staining,                                     | -            |       |       |
|     |        |              |                   |        |       |   |             |               | rarely clean. Fractures (SET 2) are 70-90                                   | lt           |       |       |
|     |        |              | Ī                 |        |       |   |             |               | degs, spacing not determined locally  | İt l         |       |       |
|     |        |              | Ī                 |        |       |   |             |               | extremely closely to very closely spaced,                                   | Į l          |       |       |
|     |        |              | <del>-</del>      |        |       |   |             |               | planar occasionally undulating, smooth to                                   | -            |       |       |
|     |        |              |                   |        |       |   |             |               | rough, (very tight to wide), with either                                    | I            |       |       |
|     |        |              | -                 |        |       |   |             |               | brown fine sand or greenish grey silty                                      | <b>-</b>     |       |       |
|     |        |              | <u> </u>          |        |       |   |             |               | fine sand infill, occasionally clean. Fractures (SET 3) are 40-60 degs,     | ŧ l          |       |       |
|     |        |              | <u>[</u>          |        |       |   |             |               | probably very closely to closely spaced,                                    | Γ Ι          |       |       |
|     |        |              | +                 |        |       |   |             |               | planar occasionally undulating, smooth to                                   | ł l          |       |       |
|     |        |              | =                 |        |       |   |             |               | rough, (very tight to wide), mainly with                                    | † I          |       |       |
|     |        |              | <u>_</u>          |        |       |   |             |               | either brown sand or greenish grey silty                                    | Į I          |       |       |
|     |        |              | -                 |        |       |   |             |               | sand infill, rarely clean. [CIRIA Grade:                                    | +            |       |       |
|     |        |              | Ī                 |        |       |   |             |               | C4/C5]  | İ I          |       |       |
|     |        |              | <br><del>-</del>  |        |       |   |             |               | [SEAFORD CHALK - CHALK]   | ļ. l         |       |       |
|     |        |              | -                 |        |       |   |             |               | 33.92m to 34.07m; Non Intact chalk with                                     | †            |       | I     |
|     |        |              | <b>[</b>          |        |       |   |             |               | light greenish grey sandy matrix  | Į l          |       |       |
|     |        |              | }                 | 1      |       |   |             |               | 34.25m to 34.35m; breccia zone comprising of angular chalk fragments within | <del> </del> |       | I     |
|     |        |              | <u>t</u> _        | 1      |       |   |             |               | greenish grey silty fine sandstone  | <u>t</u>     |       | 1     |
|     |        |              | _                 |        |       |   |             |               | matrix.   | ₽ I          |       |       |
|     |        |              | -                 | 1      |       |   |             |               | 34.35m to 34.60m; Non Intact chalk.   | +            |       |       |
|     |        |              | Ī                 | 1      |       |   |             |               | Below 34.45m; with pockets and infill of                                    | t l          |       |       |
|     |        |              | F                 | 1      |       |   |             |               | light greenish grey sandy matrix.   | <b>∤</b> ∣   |       |       |
|     |        |              | -                 | 1      |       |   |             |               | 34.85m to 34.95m; Non Intact chalk.   | † l          |       |       |
|     |        |              |                   |        |       |   |             |               |   | 1            |       |       |
|     |        |              | -                 |        |       |   |             |               | End of Borehole   | <b>-</b>     |       |       |
|     |        |              | <u> </u>          |        |       |   |             |               |   | <u> </u>     |       |       |
|     |        |              | [                 |        |       |   |             |               |   | Į l          |       |       |
|     |        |              | +                 |        |       |   |             |               |   | ł l          |       |       |
|     |        |              | <u> </u>          |        |       |   |             |               |   | t l          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | +            |       |       |
|     |        |              |                   |        |       |   |             |               |   | ł l          |       |       |
|     |        |              |                   |        |       |   |             |               |   | Į            |       |       |
|     |        |              | <u> </u>          |        |       |   |             |               |   | <b>-</b>     |       |       |
|     |        |              | Ī                 |        |       |   |             |               |   | İ I          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | ļ l          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | +            |       |       |
|     |        |              | Ī                 |        |       |   |             |               |   | Γ Ι          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | +            |       |       |
|     |        |              |                   |        |       |   |             |               |   | İ l          |       |       |
|     |        |              | Ĺ                 |        |       |   |             |               |   | I I          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | +            |       |       |
|     |        |              | Ī                 |        |       |   |             |               |   | Į l          |       |       |
|     |        |              | +                 |        |       |   |             |               |   | ł l          |       |       |
|     |        |              | -                 | 1      |       |   |             |               |   | Ţ            |       |       |
|     |        |              | -                 |        |       |   |             |               |   | +            |       |       |
|     |        |              | ţ                 | 1      |       |   |             |               |   | t l          |       | 1     |
|     |        |              | <del> </del>      |        |       |   |             |               |   | <b>⊢</b> ∣   |       |       |
|     |        |              | -                 |        |       |   |             |               |   | † l          |       |       |
|     |        |              | Į.                | 1      |       |   |             |               |   | Į l          |       | 1     |
|     |        |              | ļ                 | 1      |       |   |             |               |   | +            |       | 1     |
|     |        |              | <u> </u>          |        |       |   |             |               |   | t l          |       |       |
|     |        |              | ]<br><del>-</del> |        |       |   |             |               |   | ļ .          |       |       |
|     |        |              | }                 | 1      |       |   |             |               |   | <del> </del> |       |       |
|     |        |              | L                 |        |       |   |             |               |   | L I          |       |       |
|     |        |              | }                 | 1      |       |   |             |               |   | <del> </del> |       | l     |
|     |        |              | <u>t</u>          |        |       |   |             |               |   | t l          |       |       |
|     |        |              | Ē                 |        |       |   |             |               |   | Į l          |       |       |
|     |        |              | -                 |        |       |   |             |               |   | <del> </del> |       |       |
|     |        |              | Ī                 | 1      |       |   |             |               |   | ţ I          |       | l     |
|     |        |              | <u>_</u>          |        |       |   |             |               |   | <b>.</b>     |       |       |
|     |        |              | }                 |        |       |   |             |               |   | † l          |       |       |
|     |        |              | <u> </u>          |        |       |   |             |               |   | [            |       |       |
|     |        |              | }                 | 1      |       |   |             |               |   | <b>+</b>     |       | l     |
|     |        |              | <b>-</b>          | 1      |       |   |             |               |   | † l          |       | 1     |
|     |        |              | Ľ                 | 1      |       |   |             |               |   | ţ l          |       | ĺ     |
|     |        |              | ļ                 | 1      |       |   |             |               |   | <b>.</b>     |       |       |
|     |        |              | }                 | 1      |       |   |             |               |   | <del> </del> |       |       |
|     |        |              | <u> </u>          | 1      |       |   |             |               |   | ţ l          |       |       |
|     |        |              | <u>L</u>          | 1      |       |   |             |               |   | <b>⊢</b> ∣   |       |       |
|     |        |              |                   |        |       |   |             |               |   |              |       |       |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML024-RC012 (8 of 9)

Drilling Method Rotary Cored **Borehole Diameter Casing Diameter BOREHOLE NaML024-RC012** 146mm to 34.95m Coordinates (National Grid) Ground Level Equipment 507319.36 E Comacchio MC450P 188149.39 N 61.88 m OD Polymer DS60/Pure-Bore Logged by CJ/MCM Crew/Vessel Compiled by Checked by TS/WG **Dates Drilled** Start 05/01/2017 NJB jm End 10/01/2017 04/01/2017 21/02/2017 11/12/2017 Installation Level Water Strata **Installation Details** Strata Details Depth (m) m OD **Strikes** Depth (m) Concrete MADE GROUND 0.50 Instrumentation: 0.50 61.38 Bentonite 50mm slotted CLAY section (SL) from 30.00 to 33.00m 10.55 No Recovery 11.35 CLAY 18.45 Silty CLAY 19.45 CLAY 21.30 Silty CLAY 22.80 CLAY 28.50 Silty CLAY 29.15 CLAY 30.00 31.88 Gravel backfill 30.75 31.30 Silty CLAY SL=30.00-33.00m CLAY 32.45 33.00 Silty sandy cobbly GRAVEL 28.88 Bentonite No Recovery 33.45 Silty gravelly SAND CHALK Base of Hole 34.95 26.93 34.95 Remarks (See notes & keysheets) ☑ Water Strike ▼ Water Rise DEFRA cover. Pipe diameter  $50\,\mathrm{mm}$  to  $33.00\,\mathrm{m}$ , installed on 11/01/2017. Not to Scale Project Contract No. G160015U WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Figure No. ML024-RC012 (9 of 9) 13/12/2017 309/05

Equipment Hanjin DB 10

**Drill Fluid** Crew/Vessel Polymer DS60/Pure-Bore

12/01/2017

CJ/ZI

End

**Dates Drilled** Start 11/01/2017 **Borehole Diameter** 146mm to 21.70m **Casing Diameter** 175mm to 2.20m

**BOREHOLE No.ML025-RC048** 

Coordinates (National Grid) Ground Level

506935.59 E 188350.64 N 54.76 m OD

Logged by Compiled by Checked by CJ/AU ASC/WFL jm 11/01/2017 02/03/2017 21/06/2017

|           |              | Ena<br>Water             | 12/01/2      |                | VCore Peopvery SDT Factors |        |     |                    |                          |   |                  |       |       |
|-----------|--------------|--------------------------|--------------|----------------|----------------------------|--------|-----|--------------------|--------------------------|---|------------------|-------|-------|
|           | Casing       | Water<br>Depth           | ) Gampic, GG |                | ore Recovery               |        | _   | SPT<br>Blows       | Fracture<br>Spacing      |   | Depth            | ١     | L     |
| &<br>Time | Depth<br>(m) | (m)<br>(Flush<br>Return) | Depth        | (m)            | Type                       | No.    | RQD | /N<br>Core<br>Size | mm<br>(Min,Avg,Max<br>Or | Description of Strata   | (Thick-<br>ness) | Level | Legen |
|           | (,           | %                        | From         | То             | %                          | %      | %   | (mm)               | Result                   |   | (m)              | m OD  |       |
| 11/01     |              |                          | 0.10         |                | B<br>D                     | 1 2    |     |                    |                          | TOPSOIL: Grass over (very soft) brown slightly sandy slightly gravelly clay. Gravel is subangular and subrounded fine and medium flint.  [TOPSOIL - CLAY]   | (0.30)           | 54.46 |       |
|           |              |                          | 0.00-        | -1.20          | PIT<br>B<br>D              | 3<br>4 |     |                    |                          | Soft fissured light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine and medium flint. Fissures (SET 1) are 0 degs, extremely closely to very closely spaced, undulating, smooth.  [SUPERFICIAL DEPOSITS - COHESIVE - CLAY]  | (0.90)           |       |       |
|           |              |                          | 1.10<br>1.10 |                | B<br>D                     | 5<br>6 |     |                    |                          |   | 1.20             | 53.56 |       |
|           |              | (100)                    |              | -1.82<br>-2.20 | C<br>95                    | 7      |     |                    |                          | Firm to stiff locally fissured brown mottled orangish brown and bluish grey (gleyed) slightly sandy CLAY, locally sandy. Locally with black organic staining (<1 x lmm), frequent roots and rootlets (<2mm). Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced, planar and undulating, rough occasionally smooth, (very tight). Fissures (SET 3) are 40-60 degs, extremely closely spaced, planar, smooth, (very tight), polished. [LONDON CLAY FORMATION A2 - CLAY] 1.40m to 1.82m; fissured. 1.82m to 1.92m; thickly laminated brown mottled orangish brown sand. Sand is | (1.00)           | 52.56 |       |
|           |              | (100)                    | 2.20-        | -3.70          | 93                         |        |     |                    |                          | fine. 1.92m to 2.15m; sandy with black organic staining possibly lignite.  Soft to firm brown mottled bluish grey and grey slightly sandy slightly gravelly CLAY with frequent roots and rootlets (<1mm). Gravel is subrounded and rounded fine and medium white flint and orangish brown weathered pyrite.  [HARWICH FORMATION - CLAY]   | (0.50)           | 52.06 |       |
|           |              |                          | 2.90-        | -3.10          | С                          | 8      |     |                    |                          | Greyish brown mottled orangish brown slightly gravelly clayey SAND, locally slightly sandy clay. Rare reddish brown claystone (<40mm) and abundant shell fragments (<40 x 25mm). Sand is fine to coarse. Gravel is well rounded fine and medium brown flint. [HARWICH FORMATION - SAND] At 2.90m; slightly gravelly slightly sandy clay.  | (1.50)           |       |       |
|           |              | (100)                    |              | -5.20<br>-4.78 | 83<br>C                    | 9      |     |                    |                          | Firm to stiff fissured grey mottled orangish brown and locally brown silty CLAY with occasional calcrete nodules (<40 x 20mm), occasional black organic staining possibly lignite (<2 x 2mm), rare black leaf imprints (<20 x 10mm). Locally with pockets (<100 x 90mm) of sand. Fissures (SET 1) are 0-20 degs, extremely closely spaced, planar and undulating, rough, (very tight). Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced, planar, smooth occasionally   | 4.20             | 50.56 | x     |

Remarks 1 (See notes & keysheets)

- Initially a PAS128 survey was undertaken. Prior to boring, a Cable Avoidance Tool (CAT) survey was performed to check for services. A service pit was hand-dug to 1.20m and rescanned using a CAT. Services were not located.
- See separate sheet for installation.
- Groundwater not encountered during drilling due to use of fluid flush.

Scale 1:25



**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC048 (1 of 6)

Equipment Hanjin DB 10

Drill Fluid Crew/Vessel Dates Drilled Polymer DS60/Pure-Bore

CJ/ZI

Water

Start 11/01/2017 End 12/01/2017

**Borehole Diameter** 146mm to 21.70m **Casing Diameter** 

175mm to 2.20m

**BOREHOLE No.ML025-RC048** 

Coordinates (National Grid) Ground Level

506935.59 **E** 188350.64 N 54.76 m OD

Logged by CJ/AU Compiled by Checked by

ASC/WFL 21/06/2017 jm 11/01/2017 02/03/2017

| <b>\</b> | Ci           | Water<br>Depth | Sai                             | mple/Co        | re Rec   | overy |          | SPT<br>Blows | Fracture            |   | Depth                 |       |       |
|----------|--------------|----------------|---------------------------------|----------------|----------|-------|----------|--------------|---------------------|---|-----------------------|-------|-------|
| &        | Casing Depth | (ṁ)<br>(Flush  | Depth                           | (m)            |          | No.   |          | /N<br>Core   | mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-<br>ness)      | Level | Leger |
| ime      | (m)          | Return)<br>%   | From                            | То             | %        | %     | RQD<br>% | Size<br>(mm) | or<br>Result        |   | (m)                   | m OD  |       |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     | 40-60 degs, extremely closely spaced, planar, smooth, (very tight), polished with slickensides, with grey silt veneer.  |                       |       | *<br> |
|          |              |                | -<br>-<br>-<br>-<br>-<br>-<br>- |                |          |       |          |              |                     | [LOWER MOTTLED CLAY - CLAY] Top (4.20m) to 4.48m; grey mottled brown with pockets (<100 x 90mm) of sand, possibly burrows. 4.95m to 5.20m; assumed zone of core loss.   | 5.40                  | 49.36 | ×     |
|          |              | (100)          |                                 | -6.70<br>-6.20 | 100<br>C | 10    |          |              |                     | Stiff to very stiff fissured mottled orangish brown, bluish grey, and reddish grey slightly sandy CLAY, locally clayey silt. Occasional calcrete nodules (<40 x 25mm). Sand is mainly fine. Fissures (SET 1) are 0-20 degs, extremely closely | ‡<br>†<br>†<br>•<br>• |       |       |
|          |              |                | -<br>-<br>-<br>-                |                |          |       |          |              |                     | spaced, planar, rough and smooth, (very tight). Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced, planar and undulating,   | <u> </u>              |       |       |
|          |              |                | <del>-</del><br>-<br>-          |                |          |       |          |              |                     | rough and smooth, (very tight), polished with slickensides, with silt veneer. Fissures (SET 3) are 40-60 degs,  | ŧ                     |       |       |
|          |              |                | <u>-</u><br>-<br>-<br>-         |                |          |       |          |              |                     | extremely closely to very closely spaced,<br>planar and undulating, smooth, (very<br>tight), polished with slickensides, with   | <del> </del>          |       |       |
|          |              |                | <u>-</u>                        |                |          |       |          |              |                     | silt veneer.<br>[LOWER MOTTLED CLAY - CLAY]   | ‡                     |       | _     |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     |   | _                     |       |       |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     | 7.20m to 7.90m; with occasional calcrete  | <u> </u>              |       |       |
|          |              | (100)          | 6 70                            | -8.20          | 100      |       |          |              |                     | nodules.  | Ī                     |       |       |
|          |              | (100)          |                                 | -7.70          | C        | 11    |          |              |                     |   | (4.45)                |       | _     |
|          |              |                | •<br>•<br>=<br>•                |                |          |       |          |              |                     |   |                       |       |       |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     | 7.90m to 8.15m; bluish grey mottled orangish brown with abundant calcrete nodules.  |                       |       | _     |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     |   | <u> </u>              |       | _     |
|          |              |                | =<br>-<br>-                     |                |          |       |          |              |                     |   | <u> </u>              |       | _     |
|          |              |                | <del>-</del><br><del></del><br> |                |          |       |          |              |                     |   | <u> </u>              |       |       |
|          |              |                | =<br>=<br>=                     |                |          |       |          |              |                     |   | ‡                     |       |       |
|          |              | (100)          |                                 | -9.15<br>-9.70 | C<br>100 | 12    |          |              |                     |   | <u> </u>              |       |       |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     |   | <u> </u>              |       |       |
|          |              |                | =<br>-<br>-                     |                |          |       |          |              |                     | 9.30m to 9.70m; bluish grey mottled orangish brown clayey silt.   | <u> </u>              |       | _     |
|          |              |                | -<br>-<br><br>-                 |                |          |       |          |              |                     |   | -                     |       |       |
|          |              |                | -<br>-<br>-<br>-                |                |          |       |          |              |                     |   | <u> </u>              |       | _     |
|          |              |                | -<br>-<br>-                     |                |          |       |          |              |                     | Stiff to very stiff fissured reddish  | 9.85                  | 44.91 |       |
|          |              |                |                                 |                |          |       |          |              | <u> </u>            | brown mottled bluish grey silty CLAY.<br>Fissures (SET 1) are 0-20 degs, extremely  | <u> </u>              |       |       |

(See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC048 (2 of 6)

Equipment Hanjin DB 10

Drill Fluid Crew/Vessel Polymer DS60/Pure-Bore

CJ/ZI

Logged by Compiled by Start 11/01/2017 Fnd 12/01/2017 CJ/AU 11/01/2017 jm 02/03/2017

**Borehole Diameter** 

146mm to 21.70m

**Casing Diameter BOREHOLE No.ML025-RC048** 175mm to 2.20m

Coordinates (National Grid) Ground Level

Checked by

506935.59 **E** 188350.64 N 54.76 m OD

| Crew/     | Vessel<br>Drilled | CJ/ZI<br>Start         | 11/01/2017                  |                |          | Log<br>CJ/ | ged by               | Com  | piled by Checked by ASC/WFL   |  |                           |       |                                 |
|-----------|-------------------|------------------------|-----------------------------|----------------|----------|------------|----------------------|--|---|--|---------------------------|-------|---------------------------------|
| Dutes     | Dillica           | End                    | 12/01/2017                  |                |          |            | 01/201               |  | 3/2017 21/06/2017   |  |                           |       |                                 |
| Date<br>& | Casing<br>Depth   | (m)                    | Sample/Co                   | re Rec<br>Type | T .      |            | SPT<br>Blows<br>/N   | Fracture<br>Spacing<br>mm<br>(Min,Avg,Max) | Description of  | of Strata  | Depth<br>(Thick-<br>ness) | Level | Legen                           |
| Time      | (m)               | (Flush<br>Return)<br>% | From To                     | TCR<br>%       | SCR<br>% | RQD<br>%   | Core<br>Size<br>(mm) | or<br>Result                               |   |  | (m)                       | m OD  |                                 |
|           |                   | (100)                  | 9.70-11.20<br>— 10.50-10.80 |                | 13       |            |                      | NA   | closely to very closely smooth and rough, (very Fissures (SET 2) are 7 not determined possibly spaced, planar and und (very tight). Fissures degs, extremely closely spaced, planar and und (very tight), polished [LOWER MOTTLED CLAY - (10.80m to 10.95m; lamin mottled brown clayey si | y tight), polished.  -90 degs, spacing y extremely closely lating, rough, (SET 3) are 40-60 y to very closely lating, smooth, with slickensides.  CLAY]  mated bluish grey | —(1.35)                   |       | ×<br>×<br>×<br>×<br>×<br>×<br>× |
|           |                   |                        |                             |                |          |            |                      |  | of white and bluish greextremely closely space  Stiff fissured bluish of brown locally mottled by sandy CLAY with rare ro (< mm) on fissure surfa   | grey and orangish plack slightly poots and rootlets are rare   | 11.20                     | 43.56 | xxx                             |
|           |                   | (100)                  | 11.80-12.10                 |                | 14       |            |                      |  | ferricrete nodules. Fis 70-90 degs, spacing not possibly extremely clos closely spaced, planar, (very tight). Fissures degs, extremely closel spaced, planar, smooth polished with slickens silt veneer. [LOWER MOTTLED CLAY - C  | t determined sely to very , smooth and rough, (SET 3) are 40-60 y to very closely , (very tight), ides, with grey  | (0.85)                    | 42.71 |                                 |
|           |                   |                        | -<br>-                      |                |          |            |                      |  | Very stiff fissured red<br>bluish grey CLAY. Fissu<br>70-90 degs, spacing not<br>possibly extremely clos<br>planar, rough, (very ti<br>(SET 3) are 40-60 degs,<br>to very closely spaced,<br>(very tight), polished<br>[LOWER MOTTLED CLAY - (  | ures (SET 2) are<br>t determined<br>sely spaced,<br>ight). Fissures<br>, extremely closely<br>, planar, smooth,<br>with slickensides.                                      | 12.70                     | 42.06 |                                 |
|           |                   | (100)                  | 12.70-14.20                 | 100            |          |            |                      |  | Stiff fissured brown to<br>CLAY. Fissures (SET 1)<br>extremely closely space<br>(very tight). Fissures<br>degs, spacing not deter<br>extremely closely space<br>(very tight).<br>[LOWER MOTTLED CLAY - (<br>At base; abundant black<br>at contact with sand.                              | are 0-20 degs,<br>ed, planar, smooth,<br>(SET 2) are 70-90<br>rmined possibly<br>ed, planar, smooth,   | (0.30)<br>_13.00          | 41.76 | × ×                             |
|           |                   |                        |                             |                |          |            |                      |  | Brown to orangish brown<br>grey SAND, locally slig<br>Abundant black possibly<br>is fine to coarse.<br>[ANY SAND UNIT (E.G. CH<br>SAND]   | ghtly gravelly. y glauconite. Sand   | (1.40)                    |       |                                 |
|           |                   |                        |                             |                |          |            |                      |  | (Firm) fissured laminate mottled bluish grey and Fissures (SET 1) are 0: closely spacing, planatight). Fissures (SET 2: spacing not determined closely spaced, planaright). Thin laminae of SET 1 fissures.  [LOWER MOTTLED CLAY - 0: closely fissures.]                                  | d black CLAY.  20 degs, extremely r, smooth, (very 2) are 70-90 degs, possibly extremely , smooth, (very f clay, parallel to CLAY]   | (0.32)                    | 40.36 |                                 |
| Pomar     |                   | (100)                  | 14.20-15.70                 | 93             |          |            |                      |  | Brown to orangish brown<br>grey SAND, locally slig<br>Abundant black possibly   | ghtly gravelly.  |                           |       |                                 |

Remarks (See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC048 (3 of 6)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

Crew/Vessel Dates Drilled Start 11/01/2017 End 12/01/2017

CJ/ZI

**Casing Diameter** 

175mm to 2.20m

**Borehole Diameter** 

146mm to 21.70m

506935.59 E

Coordinates (National Grid) Ground Level 188350.64 N 54.76 m OD

**BOREHOLE No.ML025-RC048** 

Logged by CJ/AU 11/01/2017 Compiled by Checked by ASC/WFL 02/03/2017 21/06/2017

|       |              | Ena            | 12/01/2                     | 2017   |                |             | 11/      | 01/201               | 17 02/0       | 3/2017 21/06/2017   |                                    |                |       |
|-------|--------------|----------------|-----------------------------|--------|----------------|-------------|----------|----------------------|---------------|---|------------------------------------|----------------|-------|
| Doto  | Cocina       | Water<br>Depth | epth Blows Snacing          |        |                | Depth       |          |                      |               |   |                                    |                |       |
| &     | Casing Depth | (ṁ)<br>(Flush  | Depth                       | (m)    | Туре           |             |          | Blows<br>/N<br>Core  | (Min,Avg,Max) | Description of Strata   | (Thick-<br>ness)                   | Level          | Legen |
| Time  | (m)          | Return)        | From                        | То     | TCR            | SCR<br>%    | RQD<br>% | Core<br>Size<br>(mm) | or<br>Result  |   | (m)                                | m OD           |       |
|       |              |                | 15.27                       |        | EW             | 1           |          |                      |               | is fine to coarse.<br>[ANY SAND UNIT (E.G. CHANNEL SANDS) -<br>SAND]  |                                    |                |       |
| L1/01 | 2.20         | GL             | -                           |        |                |             |          |                      |               |   | -                                  |                |       |
| 2/01  | 2.20         | 4.70           | -<br>-<br>-                 |        |                |             |          |                      |               |   | <u> </u>                           |                |       |
|       |              | (100)          | 15.70                       | -17.20 | 93             |             |          |                      |               |   | (2.78)                             |                |       |
|       |              |                | -                           |        |                |             |          |                      |               | Below 16.73m; orangish brown and grey.  |                                    |                |       |
|       |              |                | - 17.00<br>- 17.00          |        | EW<br>EW       | 1<br>5      |          |                      |               |   | -                                  |                |       |
|       |              | (100)          | -                           | -18.00 |                | 15          |          |                      |               | Stiff fissured brown and grey mottled black slightly sandy CLAY. Sand is fine and medium. Fissures (SET 3) are 40-60 degs, extremely closely to very closely spaced, planar, smooth, (very tight). [LOWER MOTTLED CLAY - CLAY]  | 17.50                              | 37.26          |       |
|       |              | (100)          | 18.00<br>- 18.00<br>- 18.00 |        | EW<br>EW<br>EW | 2<br>3<br>4 |          |                      |               | Brown to orangish brown, bluish grey and grey SAND, locally slightly gravelly to gravelly. Abundant black possibly glauconite. Sand is fine to coarse. [UPNOR FORMATION - SAND]  Stiff fissured grey and brown mottled  | 18.20<br>(0.15)<br>18.35<br>(0.20) | 36.56<br>36.41 |       |
|       |              |                |                             |        |                |             |          |                      |               | black sandy CLAY. Fissures (SET 1) are 0-20 degs, extremely closely spaced, planar, smooth, (very tight), polished. [UPNOR FORMATION - CLAY]  | 18.55<br>(0.15)<br>18.70           | 36.21<br>36.06 | 0 0   |
|       |              | (100)          | 18.70                       | -20.20 | 100            |             |          |                      |               | Very stiff fissured dark brown mottled bluish grey and brown slightly gravelly to gravelly CLAY with pockets (<100 x 80 x 30mm) of fine to coarse sand. Gravel is subangular to well rounded fine and medium reddish pink flint. Fissures (SET 1) are 0-20 degs, extremely closely spaced, planar and undulating, rough, (very tight).  [UPNOR FORMATION] | 19.30                              | 35.46          |       |
|       |              | (100)          | _ 18.70.                    | -20.20 | 100            |             |          |                      |               | Brown to orangish brown, bluish grey and grey SAND, locally slightly gravelly to gravelly. Abundant black possibly glauconite. Sand is fine to coarse.  [UPNOR FORMATION - SAND]  | 19.70<br>(0.25)                    | 35.06          |       |
|       |              |                | -                           |        |                |             |          |                      |               | Stiff dark greyish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to rounded fine and medium flint.  | 19.95                              | 34.81          |       |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC048 (4 of 6)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

CJ/ZI

Crew/Vessel Dates Drilled Start 11/01/2017 End 12/01/2017 **Borehole Diameter** 146mm to 21.70m **Casing Diameter** 

175mm to 2.20m

**BOREHOLE No.ML025-RC048** 

Coordinates (National Grid) Ground Level

506935.59 **E** 188350.64 N 54.76 m OD

Logged by CJ/AU 11/01/2017 Compiled by Checked by ASC/WFL 21/06/2017 jm 02/03/2017

|           |                 | ши                | 12/01/2   |         |          |          |          | 01/20.       |                               | 5/201/ 21/00/201/  |               |        |   |
|-----------|-----------------|-------------------|-----------|---------|----------|----------|----------|--------------|-------------------------------|--|---------------|--------|---|
| Data      | Casina          | Water<br>Depth    | Sar       | nple/Co | re Rec   | overy    |          | SPT<br>Blows | Fracture                      |  | Depth         |        |   |
| Date<br>& | Casing<br>Depth | (ṁ)               | Depth (m) |         | Туре     | No.      |          | /N mm        | mm                            | Description of Strata  | (Thick-       | Level  | Legend  |
| Time      | (m)             | (Flush<br>Return) | From      | To      | TCR<br>% | SCR<br>% | RQD<br>% | Size         | (Min,Avg,Max)<br>or<br>Result | ·  | ness)         | m OD   |   |
|           |                 | %                 | FIOIII    | 10      | /6       | /0       | /0       | (mm)         | resuit                        | [UPNOR FORMATION - CLAY]   | (m)<br>(0.25) | III OD |   |
|           |                 |                   | _         |         |          |          |          |              |                               |  | /t            |        |   |
|           |                 |                   | _         |         |          |          |          |              |                               | Stiff bluish grey mottled brown slightly gravelly sandy CLAY. Sand is fine to        | 20.20         | 34.56  |   |
|           |                 |                   | 20.30     | -20.60  | С        | 16       |          |              |                               | coarse. Gravel is angular to rounded fine   and medium flint.                        | <b>t</b>      |        |   |
|           |                 | (100)             | 20.20     | -20.72  | 100      | 0        | 0        |              | NA                            | [UPNOR FORMATION - CLAY]   | (0.50)        |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | Stiff greenish brown slightly gravelly   | <u> </u>      |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | sandy CLAY. Sand is fine to coarse.  Gravel is angular to well rounded fine to       | 20.70         | 34.06  |   |
|           |                 |                   |           |         |          |          |          |              |                               | coarse flint.  | 20.70         | 34.06  |   |
|           |                 |                   | -         |         |          |          |          |              |                               | [UPNOR FORMATION - CLAY]   | 4             |        | 11,11,11  |
|           |                 |                   | -         |         |          |          |          |              |                               | Structureless CHALK composed of light  | ,, ,,,        |        |   |
|           |                 |                   | -         |         |          |          |          |              | 10,<br>70,                    | grey slightly gravelly silty SAND. Gravel   is very weak medium density rounded fine | <u>(0.60)</u> |        | <del>                                      </del> |
|           |                 | (100)             | 20 72     | -21.70  | 100      | 47       | 31       |              | 230                           | to coarse. [CIRIA Grade: Dm]. [SEAFORD CHALK - CHALK]                                | ‡             |        |   |
|           |                 | (100)             | - 20.72   | 21.70   | 100      | - 7      | ] ]_     |              |                               |  | <b>!</b>      |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | Very weak and weak medium to high density off white CHALK with light grey wispy      | 21.30         | 33.46  |   |
|           |                 |                   |           |         |          |          |          |              | 90,                           | marl. Occasional flint nodular. Fractures (SET 1) are 5-20 degs, very closely to     | (0.40)        |        |   |
|           |                 |                   | F         |         |          |          |          |              | -,                            | closely spaced, planar, smooth, (partly  | -(0.40)       |        | וה'יה'יה  |
| 12/01     | 2.20            | GL                | Ī         |         |          |          |          |              | 310                           | open to moderately wide), with brown sand and silt infill (<10mm), occasional brown  | 21.70         | 33.06  |   |
|           |                 |                   |           |         |          |          |          |              |                               | staining. Fractures (SET 2) are 80 degs,   | F             |        |   |
|           |                 |                   | [         |         |          |          |          |              |                               | locally extremely closely spaced, planar, smooth, (very tight to moderately wide),   | F             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | with brown and grey staining and locally sand infill (<4mm). Fractures (SET 3) are   | F             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | 60 degs, spacing not determined, planar  | F             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | and undulating, smooth to rough, (very tight to moderately wide) with brown          | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | staining or sand infill (<5mm). [CIRIA   | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | Grade: C4].<br>  [SEAFORD CHALK - CHALK]   | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | 21.00m to 21.20m; Non Intact chalk   | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | (probably DI due to flint). At 21.10m; flint nodular, black.                         | F             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | Very weak medium to high density cream   | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | CHALK. Fractures (SET 1) are 0 degs,   | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | spacing not determined, planar, smooth, (open), with grey silt infill (<1mm).        | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | Fractures (SET 2) are 80 degs, possibly  | ‡             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | extremely closely spaced, planar, smooth, (very tight), with brown and grey          | F             |        |   |
|           |                 |                   | -         |         |          |          |          |              |                               | staining. [CIRIA Grade: possibly B3]. [SEAFORD CHALK - CHALK]                        | ‡             |        |   |
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Remarks (See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC048 (5 of 6)

Drilling Method Rotary Cored **Borehole Diameter Casing Diameter BOREHOLE NaML025-RC048** 146mm to 21.70m Coordinates (National Grid) Ground Level 506935.59 E Equipment Hanjin DB 10 188350.64 N 54.76 m OD Polymer DS60/Pure-Bore Crew/Vessel Logged by Compiled by Checked by CJ/ZI **Dates Drilled** Start 11/01/2017 ASC/WFL CJ/AU jm End 12/01/2017 11/01/2017 02/03/2017 21/06/2017 Installation Level Water Strata Strata Details **Installation Details** Depth (m) m OD **Strikes** Depth (m) Concrete TOPSOIL 0.30 Instrumentation: 0.50 54.26 50mm slotted CLAY Bentonite section (SL) from 16.00 to 20.00m 2.70 Clayey SAND 4.20 Silty CLAY 5.40 CLAY 9.85 Silty CLAY 11.20 CLAY 12.70 Silty CLAY 13.00 SAND 14.40 CLAY 14.72 SAND 16.00 38.76 Gravel backfill 17.50 CLAY SL=16.00-20.00m SAND Sandy CLAY Gravelly CLAY 19.30 SAND Sandy CLAY 20.00 34.76 Bentonite 20.20 CHALK 21.70 33.06 21.70 Base of Hole Remarks (See notes & keysheets) ☑ Water Strike ▼ Water Rise Flush lockable stopcock box cover. Pipe diameter  $50\,\mathrm{mm}$  to  $20.00\,\mathrm{m}$ , installed on 16/01/2017. Not to Scale Project Contract No. G160015U WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Figure No. ML025-RC048 (6 of 6) 13/12/2017

309/05

Drilling MethodRotary Cored **Borehole Diameter** 146mm to 21.70m

**Casing Diameter** 175mm to 2.20m

**BOREHOLE NoML025-RC048** 

Coordinates (National Grid) Ground Level

506935.59 **E** 188350.64 N 54.76 m OD

Crew/Vessel CJ/ZI

Equipment

Dates Drilled Start 11/01/2017 Fnd 12/01/2017

Hanjin DB 10

Logged by CJ/AU 11/01/2017 Compiled by Checked by jm 02/03/2017 ASC/WFL 21/06/2017

|                | End               | 12/0 | 01/2017 |              |        | 11/01/            | 2017    | 02/03/2017 | 21/06/2017 |          |               |                         |
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Remarks (See notes & keysheets)

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Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC048 (1 of 5)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter BOREHOLE NoML025-RC048** 146mm to 21.70m 175mm to 2.20m 506935.59 E Equipment Coordinates (National Grid) Ground Level Hanjin DB 10 188350.64 N 54.76 m OD

Compiled by

jm 02/03/2017

Checked by

ASC/WFL 21/06/2017

Logged by CJ/AU 11/01/2017

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| Discon.<br>Ref | Depth      | Туре | Dip °   | Aper         | Infill | Roug              | hness | Description           | l en              | end      |
| Ref            | (m)        |      | (Deg)   | ture<br>(mm) |        | Inter-<br>mediate | Small | Description           | m OD              | ena      |
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Remarks (See notes & keysheets)

Crew/Vessel

**Dates Drilled** 

CJ/ZI

Start 11/01/2017 End 12/01/2017

Scale 1:25

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Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC048 (2 of 5)

Drilling Method Rotary Cored

Equipment Hanjin DB 10

Borehole Diameter 146mm to 21.70m 175mm to 2.20m Coordinates 506935.59 E

 Crew/Vessel Dates Drilled
 CJ/ZI
 Logged by Compiled by CJ/AU jm ASC/WFL 11/01/2017
 Checked by Jm ASC/WFL 11/01/2017

 
 Coordinates (National Grid)
 506935.59 188350.64
 E

 Ground Level
 54.76
 m OD

|                | End  | 12/0 | 01/2017  |              |        | 11/01/            | 2017  | 02/03/2017 | 21/06/2017 |          |          |          |
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Remarks (See notes & keysheets)

Scale 1:25

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Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC048 (3 of 5)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter** 146mm to 21.70m

175mm to 2.20m

**BOREHOLE NoML025-RC048** 

Coordinates (National Grid) Ground Level 506935.59 **E** 188350.64 N 54.76 m OD

Crew/Vessel CJ/ZI

Equipment

Start 11/01/2017 End 12/01/2017 **Dates Drilled** 

Hanjin DB 10

Logged by CJ/AU 11/01/2017 Compiled by Checked by ASC/WFL 21/06/2017 02/03/2017

|                | End                    | 12/0 | 01/2017 |              |        | 11/01/            | 2017  | 02/03/2017 21/06/2017 |         |                   |
|----------------|------------------------|------|---------|--------------|--------|-------------------|-------|-----------------------|---------|-------------------|
|                |                        |      |         |              |        | Roug              | hness |                       |         |                   |
| Discon.<br>Ref | Depth                  | Туре | Dip °   | Aper<br>ture | Infill |                   |       | Desc                  | ription | Legend            |
| 1.01           | (m)                    |      | (Deg)   | (mm)         |        | Inter-<br>mediate | Small |                       |         | m OD              |
| -              |                        |      |         |              |        |                   |       |                       |         | - 100 100 100 Per |
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Remarks (See notes & keysheets)

Scale 1:25

Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC048 (4 of 5)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter** 146mm to 21.70m 175mm to 2.20m Equipment

Hanjin DB 10

**BOREHOLE NoML025-RC048** 

Coordinates (National Grid) Ground Level 506935.59 E 188350.64 N 54.76 m OD

Logged by CJ/AU 11/01/2017 Crew/Vessel CJ/ZI Compiled by Checked by Start 11/01/2017 End 12/01/2017 jm 02/03/2017 ASC/WFL 21/06/2017 **Dates Drilled** 

| Discon.   | Depth   | Туре           | Dip °   | Aper   | Infill  | Rougi  | hness  | Description  | Legend |
|---|---|----------------|---|--|---|--|--|--|--------|
| Ref   | (m)   |                | (Deg)   | ture<br>(mm)   |   | Inter-<br>mediate  | Small  |  | m OD   |
|   | 20.20   |                |   |  |   |  |  | 20.20 m - Top of rock.   |        |
| 3 3 1 2 1 1 1 1 2 1 2 2 1 2 2 1 2 | - 20.72-20.76<br>- 20.76-20.84<br>- 20.80<br>- 20.80-20.94<br>- 20.85<br>- 20.94<br>- 20.94-21.05<br>- 20.97<br>- 21.10-21.20<br>- 21.20-21.32<br>- 21.20-21.61<br>- 21.61<br>- 21.61-21.70 | 58588858558558 | 45<br>60<br>20<br>80<br>10<br>5<br>20<br>10<br>80<br>80<br>80<br>80<br>80<br>80<br>80 | MW VT MW O VT MW VT MW VT MW VT VT VT MW VT VT VT VT | <5mm <5mm <1mm <6mm <2mm <10mm <5mm <4mm <1mm | P1<br>P1<br>P1<br>P1<br>P1<br>P1<br>P1<br>P1<br>P1<br>P1 | SN RO SN SN SN SN SN SN SN SN SN SN SN SN SN | With sand infill. Planar to undulating. With brown staining. With sand infill. With sand infill. With sand infill. With sand infill. With brown and grey silt infill. With brown sand infill. With brown sand infill. With brown sand infill. With brown sand infill. With brown sand infill. With brown staining. With soft grey silt infill. With brown sand infill. With brown sand grey staining. With grey silt infill. With brown and grey staining. With grey silt infill. With brown and grey staining.  End of Borehole |        |

Remarks (See notes & keysheets)

Scale 1:25

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Project

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No.

ML025-RC048 (5 of 5)

13/12/2017

Equipment Hanjin DB 10

**Drill Fluid** Polymer DS60/Pure-Bore

Crew/Vessel **Dates Drilled** 

CJ/ZI Start 17/01/2017 End 18/01/2017

**Borehole Diameter** 146mm to 21.50m **Casing Diameter** 175mm to 2.70m

BOREHOLE No.ML025-RC049

Coordinates (National Grid) Ground Level

506885.88 **E** 188198.58 N 51.23 m OD

| Logged by  | Compiled by | Checked by |
|------------|-------------|------------|
| CJ/MCM     | jw          | ASC/WFL    |
| 18/01/2017 | 09/02/2017  | 21/06/2017 |

| ate      | Casing | Water<br>Depth | Sam                        | nple/Co |               |            | _   | SPT<br>Blows | Fracture<br>Spacing |  | Depth            | l     | l.                         |
|----------|--------|----------------|----------------------------|---------|---------------|------------|-----|--------------|---------------------|--|------------------|-------|----------------------------|
| &<br>ime | Depth  | (m)<br>(Flush  | Depth                      | (m)     | Туре          | No.<br>SCR | DOD | /N<br>Core   | mm<br>(Min,Avg,Max) | Description of Strata  | (Thick-<br>ness) | Level | Lege                       |
| me       | (m)    | Return)<br>%   | From                       | То      | %             | %          | %   | Size<br>(mm) | or<br>Result        |  | (m)              | m OD  |                            |
| /01      |        |                | - 0.20<br>- 0.20           |         | В             | 1 2        |     |              |                     | TOPSOIL: Very soft brown slightly sandy slightly gravelly clay. Sand is fine to coarse, gravel is subangular to rounded fine to coarse flint.  [TOPSOIL - LONDON CLAY C]  Soft light brown mottled grey slightly   | (0.30)           | 50.93 |                            |
|          |        |                | 0.00-<br>0.60<br>- 0.60    | 1.20    | PIT<br>B<br>D | 3<br>4     |     |              |                     | sandy slightly gravelly CLAY. Gravel is angular to rounded fine and medium flint. [ - LONDON CLAY C]   | (0.90)           |       |                            |
|          |        |                | - 1.00<br>1.00             |         | B<br>D        | 5<br>6     |     |              |                     |  |                  | 50.03 |                            |
|          |        |                | -                          |         |               |            |     |              |                     | Soft to firm laminated orangish brown mottled with grey slightly gravelly CLAY. Gravel is angular to subrounded fine and medium flint. Thin laminae, orangish brown and light grey, 0-10 degs.   | (0.45)           | 50.03 |                            |
|          |        |                | 1.80-                      | 2.10    | С             | 7          |     |              |                     | [ - LONDON CLAY C]  Stiff to very stiff fissured dark brown mottled bluish grey silty CLAY.  Occasional subrounded to rounded nodules  | 1.65             | 49.58 | ×                          |
|          |        | (100)          | 1.20-                      |         | 100<br>C      | 8          |     |              |                     | <pre>(&lt;50 x 35mm) and frequent fine sand partings. Frequent shell fragments. Locally with black organic staining and decomposed roots (&lt;4mm). Fissures (SET 1) are 0-20 degs, spacing not determined, planar, rough, (very tight), with bluish grey staining (gleying). Fissures (SET 2) are 70-90 degs, spacing not determined,</pre>               | (1.05)           |       | ×<br>×<br>×<br>×<br>-<br>× |
|          |        |                | -<br>-<br>-<br>-<br>-<br>- |         |               |            |     |              |                     | undulating, rough, (very tight), with<br>bluish grey staining (gleying) or silt<br>veneer.<br>[ - LONDON CLAY C]<br>Below 2.10m; becoming indistinctly<br>laminated.<br>At 2.56m; pocket (<60 x 50mm) of orangish  | 2.70             | 48.53 | ×<br>×<br>×<br>×<br>×      |
|          |        | (100)          | 2.70-                      | 3.50    | 100           |            |     |              |                     | brown clayey silt.  Stiff brown locally grey clayey SILT with pockets (<45 x 3mm) of grey clayey silt and occasional shell fragments.  To 2.85m; firm to stiff orangish brown slightly gravelly clay. Gravel is subangular to rounded, fine to coarse of flint.  Below 3.35m; sandy silt partings, 0-20  | (1.05)           |       | ×<br>×<br>×<br>×<br>×      |
|          |        |                |                            |         |               |            |     |              |                     | degs, extremely closely spaced, planar and undulating.  Stiff to very stiff fissured yellowish   | 3.75             | 47.48 | ×<br>×<br>×                |
|          |        | (100)          | 3.50-                      | 5.00    | 100           |            |     |              |                     | brown mottled greenish grey slightly sandy CLAY with occasional calcrete nodules (<4 x 2mm) and frequent black organic staining. Locally with lenses (<70 x 20mm) of clayey silt. Fissures (SET 2) are 70-90 degs, extremely closely spaced, undulating, smooth to rough, (very tight), locally polished, mottled yellowish brown or greenish grey or with | (1.05)           |       |                            |
|          |        |                | 4.50-                      | 4.76    | С             | 9          |     |              |                     | yellowish brown of greenish grey of with<br>silt veneer. Fissures (SET 3) are 30-60<br>degs, extremely closely to closely<br>spaced, planar, smooth, (very tight),<br>occasionally polished with slickensides,<br>mottled yellowish brown or greenish grey<br>or with silt veneer.<br>[ - LONDON CLAY C]   | 4.80             | 46.43 |                            |
|          |        |                | <u> </u>                   |         |               |            |     |              |                     | Very stiff friable fissured yellowish brown to orangish brown mottled purplish red and greenish grey silty CLAY. Locally   | <u></u>          |       | *<br><br>*                 |

Remarks 1 (See notes & keysheets)

Scale 1:25

- Initially a PAS128 survey was undertaken. Prior to boring, a Cable Avoidance Tool (CAT) survey was performed to check for services. A service pit was hand-dug to 1.20m and rescanned using a CAT. Services were not located. Groundwater not encountered during drilling due to use of fluid flush. See separate sheet for installation.

14/12/2017

**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC049 (1 of 6)

Equipment Hanjin DB 10

Drill Fluid Crew/Vessel Dates Drilled Polymer DS60/Pure-Bore

CJ/ZI

Start 17/01/2017 End 18/01/2017

146mm to 21.50m

**Borehole Diameter Casing Diameter** 175mm to 2.70m

**BOREHOLE No.ML025-RC049** 

Coordinates (National Grid) Ground Level

506885.88 E 188198.58 N 51.23 m OD

Logged by CJ/MCM 18/01/2017 Compiled by Checked by ASC/WFL 09/02/2017 21/06/2017

|      |                             | Ena<br>Water      | 18/01/              |                      |       |     |          | 01/201 | _                     | 2/2017 21/06/2017   |         |       | _                                     |
|------|-----------------------------|-------------------|---------------------|----------------------|-------|-----|----------|--------|-----------------------|---|---------|-------|---------------------------------------|
| )ata | to Casing Depth Blows   Spa |                   | Fracture<br>Spacing |                      | Depth |     |          |        |                       |   |         |       |                                       |
| &    | Depth                       | (ṁ)               | Depth               | (m)                  | Туре  | No. |          | /N     | mm                    | Description of Strata   | (Thick- | Level | Leger                                 |
| ime  | (m)                         | (Flush<br>Return) |                     | . ,                  |       | SCR |          | Core   | (Min, Avg, Max)<br>Or | besorption of other   | ness)   | 00    |                                       |
|      |                             | (100)             |                     | To<br>-5.70<br>-6.50 | C 90  | 10  | <u>%</u> | (mm)   | Result                | with occasional burrows. Sand is fine to coarse. Fissures (SET 1) are 0-30 degs, extremely closely to very closely spaced, planar to undulating, smooth, (very tight), occasionally polished with slickensides, mottled greenish grey or yellowish brown or silt veneer. Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely to very closely spaced, undulating, smooth, (very tight), occasionally polished with slickensides, mottled greenish grey, yellowish brown or purplish red or silt veneer locally with calcrete veneer. Fissures (SET 3) are 30-60 degs, very closely to closely spaced, planar, smooth, (very tight), polished occasionally with slickensides, mottled yellowish brown greenish grey or purplish red or silt veneer.  [ - LONDON CLAY C] 5.00m to 5.10m; soft to firm (possibly DI). 5.95m to 6.05m; with frequent subrounded | (m)     | m OD  | x x x x x x x x x x x x x x x x x x x |
|      |                             | (100)             | 6.50                | -8.00                | 100   |     |          |        |                       | and rounded calcrete nodules (<40mm x 30mm). 6.35m to 6.50m; assumed zone of core loss.  7.30m to 7.40m; with frequent subrounded and rounded calcrete nodules (<40mm x 30mm).  | 7.45    | 43.78 | xxxxxxxx                              |
|      |                             |                   | 7.50                | -7.80                | С     | 11  |          |        |                       | Interbedded stiff to very stiff indistinctly fissured locally fissured brown mottled greenish grey slightly sandy CLAY with greenish grey silty sand with frequent pockets (<70 x 30mm) of greenish grey sandy silt. Sand is mainly fine. Fissures (SET 2) are 70-90 degs, spacing not determined, undulating, rough, (very tight), with greenish grey silt veneer.  [ - LONDON CLAY C] 8.00m to 8.20m; fissured (set 2).   |         |       |                                       |
|      |                             | (100)             | 8.00                | -9.50                | 100   |     |          |        |                       | 8.20m to 8.75m; indistinctly laminated greenish grey fine and medium sand.  8.75m to 9.10m; fissured (set 2).   | (1.65)  |       |                                       |
|      |                             |                   | 9.00                | -9.30                | С     | 12  |          |        |                       | Very stiff fissured dark brown mottled<br>bluish grey yellowish brown and purplish<br>red CLAY with burrows. Fissures (SET 1)<br>are 0-30 degs, extremely closely to very   | 9.10    | 42.13 |                                       |
| mar  |                             |                   | -                   |                      |       |     |          |        | NA                    | closely spaced, planar, smooth, (very tight), with bluish grey silt veneer. Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced, planar to undulating, (very tight), occasionally polished, mainly with bluish grey silt veneer. Fissures (SET 3) are 30-60 degs, spacing not determined, planar, smooth, (very tight), polished with slickensides.  [ - LONDON CLAY C]   | 9.80    | 41.43 | ×                                     |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 14/12/2017 **Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC049 (2 of 6)

Equipment Hanjin DB 10

Drill Fluid

Crew/Vessel Dates Drilled

Polymer DS60/Pure-Bore CJ/ZI

Start 17/01/2017 End 18/01/2017

**Borehole Diameter Casing Diameter** 

146mm to 21.50m

175mm to 2.70m

**BOREHOLE No.ML025-RC049** Coordinates (National Grid) Ground Level

506885.88 E 188198.58 N 51.23 m OD

Logged by CJ/MCM 18/01/2017 Compiled by Checked by ASC/WFL 21/06/2017 jw 09/02/2017

|        |                 | Water                  | San                       | nple/Co | re Rec   | overy    |          | _SPT                | Fracture                      | ·   | Depth   |       |                 |
|--------|-----------------|------------------------|---------------------------|---------|----------|----------|----------|---------------------|-------------------------------|---|---|-------|-----------------|
| &      | Casing<br>Depth | Depth<br>(m)<br>(Flush | Depth                     | (m)     | Туре     |          |          | Blows<br>/N<br>Core | Spacing<br>mm<br>(Min,Avg,Max | Description of Strata   | (Thick-<br>ness)  | Level | Legend          |
| Time   | (m)             | Return)                | From                      | То      | TCR<br>% | SCR<br>% | RQD<br>% | Size<br>(mm)        | or<br>Result                  |   | (m)   | m OD  |                 |
|        |                 | (100)                  | 9.50-                     | -11.00  |          | 13       |          |                     |                               | 9.50m to 9.70m; firm to stiff (possibly DI).  Very stiff fissured dark brown to yellowish brown mottled greenish grey yellowish green silty CLAY with occasional calcrete nodules (<40 x 25mm) and burrows. Fissures (SET 1) are 0-30 degs, extremely closely to very closely spaced, planar locally undulating, smooth, (very tight), locally polished with slickensides, mottled greenish grey or silt veneer. Fissures (SET 2) are 70-90 degs, spacing not determined possibly extremely closely spaced, planar  | (1.20)  |       | x x x x x x x x |
| 17/01  | 2.70            | (100)                  | 11.00-                    | -12.50  | 100      |          |          |                     |                               | possibly extremely closely spaced, planar to undulating, smooth, (very tight), occasional polishing, rare slickensides, with greenish grey or yellowish green silt veneer locally with calcrete veneer.  [ - LONDON CLAY C] Below 10.50m; clay.  Thinly interlaminated to medium interbedded indistinctly fissured locally fissured very stiff brown mottled yellowish brown and greenish grey slightly sandy CLAY, reddish brown to light brown slightly silty to silty SAND and reddish brown clayey SILT. Sand is fine and medium. Thin laminae of silty clay and clayey silt, 0 degs, extremely closely spaced, planar, with rare calcrete nodules. Fissures (SET 2) are 80-90 degs, spacing not determined, planar, smooth, (very tight), with yellowish brown staining.  11.00m to 11.95m; fissured (set 2).  11.95m to 12.40m; silty to very silty sand. |   | 40.23 |                 |
| 18/01  | 2.70            | 2.15                   |                           |         |          |          |          |                     |                               | 12.65m to 12.70m; weakly cemented silty clay. 12.70m to 13.10m; silty to very silty sand.   |   |       |                 |
|        |                 | (100)                  | 12.50-<br>13.25-<br>13.40 |         |          | 14       |          |                     |                               | 13.65m to 14.00m; clay with indistinct partings of silt, 0 degs, extremely closely spaced, planar.  | (4.50)  |       |                 |
|        |                 |                        | -                         |         |          |          |          |                     |                               | 14.00m to 14.15m; clayey silt.  14.15m to 14.30m; silty sand with pockets (<20 x 6mm) of clay.  14.30m to 14.70m; slightly silty sand.  | •<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>• |       |                 |
| Remark |                 | (100)                  | _ 14.00-                  | -15.50  | 90       |          |          |                     |                               | 14.70m to 15.05m; thinly laminated clayey silt, 0 degs.   |   |       |                 |

(See notes & keysheets)

Scale 1:25

UGRO 14/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC049 (3 of 6)

Equipment Hanjin DB 10

Drill Fluid

CJ/ZI

Crew/Vessel Dates Drilled Start 17/01/2017 End 18/01/2017

Polymer DS60/Pure-Bore

Logged by CJ/MCM 18/01/2017 Compiled by Checked by ASC/WFL 21/06/2017 jw 09/02/2017

**Casing Diameter** 

175mm to 2.70m

**Borehole Diameter** 

146mm to 21.50m

**BOREHOLE No.ML025-RC049** 

Coordinates (National Grid) Ground Level

506885.88 E 188198.58 N 51.23 m OD

| End            | 18/01/2017  |  |   | 18/      | 01/201  | L7 09/0   | 2/2017 21/06/2017  |   |  |   |  |
|----------------|---|--|---|----------|---|---|--|---|--|---|--|
| Water<br>Depth | Sample/C  | ore Rec  | overy   |          | SPT   | Fracture  |  |   | Depth  |   |  |
| (m)            | Depth (m)   | Туре   | No.   |          |   |   | Description o  | of Strata   | (Thick-  | Level   | Legen  |
|                |   | TCR<br>%   | SCR<br>%  | RQD<br>% | Size<br>(mm)  | or<br>Result  | ·  |   | (m)  | m OD  |  |
|                | -   |  |   |          |   |   | <pre>silt, 0 degs, extremely planar.</pre>   | closely spaced,   |  |   |  |
|                | -<br>-<br>-<br>-<br>-<br>16.00  | EW<br>EW   | 1 3   |          |   |   | greenish grey locally palightly sandy CLAY loc<br>Occasional calcrete nod<br>Fissures (SET 1) are 0-<br>closely to closely spacesmooth, (very tight), was silt veneer. Sand is fill 2) are 70-90 degs, spacepossibly extremely clos  | ourplish red cally silty. dules (<12 x 6mm). 30 degs, very ced, planar, with bluish grey cne. Fissures (SET cing not determined cely to very  |  |   |  |
| (100)          |   |  |   |          |   |   | rough, (very tight) wit<br>silt veneer and occasio<br>brown staining.<br>[ - LONDON CLAY C]<br>Very stiff fissured dar<br>bluish grey and orangis  | ch bluish green mal yellowish ck brown mottled sh brown slightly  | 16.45  | 34.78   |  |
|                | 16.70   | EW   | 2 5   |          |   |   | degs, very closely to or<br>planar, smooth, (very to<br>occasionally polished we<br>and locally greenish gr<br>Fissures (SET 2) are 70<br>not determined, planar   | closely spaced,<br>right),<br>rith slickensides<br>rey silt veneer.<br>1-90 degs, spacing<br>to undulating,   |  | 34.23   |  |
| (100)          | 17.00-18.5  | ) 100<br>EW  | 4   |          |   |   | orangish brown staining silt veneer. [ - LONDON CLAY C] 16.85m to 17.00m; assum loss. Approximate boundary Thinly interbedded to m very stiff fissured greenottled greenish grey cand very stiff indisting greenish brown mottled sandy CLAY possibly gla Occasional pockets (<60  | medium interbedded<br>medium interbedded<br>menish brown<br>or bluish grey CLAY<br>metly fissured<br>greenish grey<br>muconitic.  | (0.90)   | 33.33   |  |
|                | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |  |   |          |   |   | calcrete nodules (<15 x rootlets (<1mm). Fissur 0-30 degs, very closely smooth, (very tight), c polished with slickensibluish grey or greenish veneer. Fissures (SET 2 spacing not determined closely to very closely undulating, rough, (ver  | c 10mm). Occasional res (SET 1) are r spaced, planar, occasionally des, mottled n grey or silt r) are 70-90 degs, possibly extremely r spaced, ry tight), with  | 18.70  | 32.53   |  |
| (100)          | -   |  |   | 17       |   | NI >50 NI   | or greenish grey veneer [ - LONDON CLAY C] 17.30m to 17.75m; indis sandy clay with sand po 17.80m to 17.90m; occas fragments (<20mm) of li Dark brown slightly gra Gravel is subangular an to coarse gravel of red Below 18.50m; becoming  Very stiff fissured gre greenish grey and yello orange slightly gravell possibly glauconitic. B | stinctly fissured ckets. sional angular gnite.  avelly clayey SAND. and subrounded fine if lint. stiff sandy clay. senish mottled cwish brown mottled by sandy CLAY selow 19.00m gravel car coarse black  | (0.10)   |   |  |
|                | (100)   | Water Depth (m) (Flush Return) (Return) | Nater Depth (m) (Flush Return)   Depth (m) (Flush Return)   From To   TCR % | Nater    | Nater Depth (m) (Flush Return)   Depth (m) (Flush Return)   To   To   Scr   RQD | Sample/Core   Service | Nater  | Sample/Core Recovery   Depth (m)   Type   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   SCR   RQD   No.   Prom   To   To   To   To   To   To   To | Sample/Core Recovery   SPT   Spacing   Spaci | Sample/Core Recovery   SFT   Spating model   Description of Strata   Depth (Thick power   Depth (m)   Tork   SCR   ROD   Strate   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata   Depth (Thick power   Description of Strata | SampleCore Recovery   Sept |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 14/12/2017 **Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC049 (4 of 6)

Equipment Hanjin DB 10

Drill Fluid Crew/Vessel

CJ/ZI

**Dates Drilled** Start 17/01/2017 Fnd 18/01/2017

Polymer DS60/Pure-Bore

Logged by CJ/MCM 18/01/2017 Compiled by Checked by ASC/WFL 21/06/2017

**Casing Diameter** 

175mm to 2.70m

**Borehole Diameter** 

146mm to 21.50m

**BOREHOLE No.ML025-RC049** 

506885.88 E

Coordinates (National Grid) Ground Level 188198.58 N 51.23 m OD

|                   | End 18/01/2017         |                   |           |             |          | 18/      | 01/201                             | 7 09/0                   | 2/2017 21/06/2017  |                           |       |        |
|-------------------|------------------------|-------------------|-----------|-------------|----------|----------|------------------------------------|--------------------------|--|---------------------------|-------|--------|
| Date<br>&<br>Time | Casing<br>Depth<br>(m) | (Flush<br>Return) | Depth (m) | Type<br>TCR | No.      | RQD      | SPT<br>Blows<br>/N<br>Core<br>Size | mm<br>(Min,Avg,Max<br>Or | Description of Strata  | Depth<br>(Thick-<br>ness) |       | Legend |
| &                 | Depth<br>(m)           | (ṁ)<br>(Flush     | From To   | TCR<br>%    | SCR<br>% | <u>%</u> | Core Size (mm)                     | mm<br>(Min, Avg, Max     | Very weak low density white CHALK with occasional orange staining. Non Intact. [CIRIA Grade: not determined].  Very weak locally high density becoming low density white CHALK locally stained orangish brown. Occasional thin beds of nodular flint. Fractures (SET 1) are 0-10 degs, possibly very closely to medium spaced, planar, smooth, (very tight to partly open), with orangish brown staining and locally comminuted chalk veneer. Fractures (SET 2) are 70-90 degs, spacing not determined, planar occasionally undulating, smooth, (very tight), clean, locally with orangish brown staining. [CIRIA Grade: possibly B3].  19.50m to 19.68m; Non Intact chalk. 20.25m to 20.30m; flint nodular (<50 x 25mm) with greyish white cortex (<2mm). At 20.40m; flint nodular (<30 x 20mm) with greyish white cortex (<2mm).  At 20.50m; flint nodular (<30 x 20mm) with greyish white cortex (<2mm).  21.15m to 21.50m; Non Intact chalk with orangish brown staining. 21.20m to 21.50m; closely spaced very thin beds of thinly laminated orangish brown and white chalk, horizontal, planar.  End of Borehole | (Thick-                   | 29.73 | Legend |
| Remai             |                        |                   | -         |             |          |          |                                    |                          |  |                           |       |        |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 14/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC049 (5 of 6)

Drilling Method Rotary Cored **Borehole Diameter Casing Diameter BOREHOLE NaML025-RC049** 146mm to 21.50m Coordinates (National Grid) Ground Level 506885.88 **E** Equipment Hanjin DB 10 188198.58 N 51.23 m OD Polymer DS60/Pure-Bore Crew/Vessel Logged by Compiled by Checked by CJ/ZI **Dates Drilled** Start 17/01/2017 CJ/MCM ASC/WFL 09/02/2017 End 18/01/2017 18/01/2017 21/06/2017 Installation Level Water Strata **Installation Details** Strata Details Depth (m) m OD **Strikes** Depth (m) Concrete TOPSOIL 0.30 Instrumentation: 0.50 50.73 50mm slotted CLAY Bentonite section (SL) from 14.00 to 19.00m Silty CLAY 2.70 Clayey SILT 3.75 CLAY 4.80 Silty CLAY 7.45 CLAY 9.80 Silty CLAY 11.00 Sandy CLAY 14.00 37.23 Flush cover Gravel backfill 15.50 CLAY SL=14.00-19.00m 17.00 Sandy CLAY 17.90 Clayey SAND 18.70 19.00 32.23 Sandy CLAY Bentonite 19.35 CHALK 21.50 29.73 21.50 Base of Hole Remarks (See notes & keysheets) ☑ Water Strike ▼ Water Rise DEFRA cover. Pipe diameter  $50\,\mathrm{mm}$  to  $19.00\,\mathrm{m}$ , installed on 19/01/2017. Not to Scale Project Contract No. G160015U WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Figure No. ML025-RC049 (6 of 6) 14/12/2017

309/05

Equipment Hanjin DB 10

**Drill Fluid** Crew/Vessel

Polymer DS60/Pure-Bore CJ/ZI **Dates Drilled** 

Start 04/01/2017

**Borehole Diameter** 146mm to 31.00m **Casing Diameter** 

175mm to 2.60m

BOREHOLE No.ML025-RC051

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Logged by Compiled by Checked by

CJ/GDF NJB 10/01/2017 11/12/2017 04/01/2017

| 7   |   |   |  |
|---|---|---|--|
| tion of Strata  | Depth<br>(Thick-  | Level   | Leger  |
| ion or otrata   | ness)<br>(m)  | m OD  |  |
| r (soft) brown slightly<br>welly clay. Gravel is<br>bunded fine to coarse   | - (0.40)  |   |  |
| ottled grey slightly relly CLAY. Sand is avel is subangular and coarse flint. Sand is ITS - COHESIVE - CLAY]  | 0.40  | 59.58   |  |
|   | 1.20  | 58.78   |  |
| sh brown locally slightly gravelly CLAY Gravel is subrounded and medium dark grey,  | (0.25)<br>1.45  |   |  |
| n brown flint. ITS - COHESIVE - CLAY] re loss.  | (0.55)  |   |  |
| RY]   | _ 2.00  | 57.98   |  |
| sh brown locally slightly gravelly CLAY state is subrounded and medium dark grey, brown flint.  ITS - COHESIVE - CLAY   | (0.10)<br>2.10  | 57.88   |  |
| cinctly fissured brown brown and locally grey (i) slightly sandy CLAY bangular and subrounded a clay lithorelicts.  | _   |   |  |
| ional pockets (<5 x<br>ite. Rare to occasional<br>n).<br>FION A2 - CLAY]  | (1.90)  |   |  |
| sumed zone of core  | -<br>-<br>-<br>-  |   |  |
|   |   |   |  |
| indistinctly ark brown mottled i) and dark yellowish dy silty CLAY. Rare to ey to black and agments (<85 x 10mm) of ad rare roots (<2mm). lightly sandy silt, 0-5 csely to closely crown. FION A2 - CLAY] to firm (possibly | 4.00  | 55.98   | xxxxxx   |
|   | ly silty CLAY. Rare to my to black and my to black and gments (<85 x 10mm) of d rare roots (<2mm). dishtly sandy silt, 0-5 sely to closely mrown. TION A2 - CLAY] to firm (possibly | ly silty CLAY. Rare to ey to black and egments (<85 x 10mm) of eld rare roots (<2mm)ightly sandy silt, 0-5 sely to closely zrown. CION A2 - CLAY] | y silty CLAY. Rare to y to black and gments (<85 x 10mm) of d rare roots (<2mm)ightly sandy silt, 0-5 ssely to closely rown. IION A2 - CLAY] to firm (possibly |

Remarks <sub>1</sub> (See notes & keysheets)

- Initially a PAS128 survey was undertaken. Prior to boring, a Cable Avoidance Tool (CAT) survey was performed to check for services. A service pit was hand-dug to 1.20m and rescanned using a CAT. Services were not located. See separate sheet for installation.

  Groundwater not encountered during drilling due to use of fluid flush.

Scale 1:25



**Project** 

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No.

G160015U

Figure No. ML025-RC051 (1 of 8)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

Crew/Vessel Dates Drilled

CJ/ZI

Start 04/01/2017 End 06/01/2017

**Borehole Diameter Casing Diameter** 146mm to 31.00m

175mm to 2.60m

**BOREHOLE No.ML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 **E** 188653.51 N 59.98 m OD

Compiled by Checked by jm NJB

Logged by CJ/GDF 04/01/2017 10/01/2017 11/12/2017

|          |                 | Matar          |              |         |          |          | _        |              | 1  |   |                  |       | _          |  |  |  |  |  |      |       |   |
|----------|-----------------|----------------|--------------|---------|----------|----------|----------|--------------|--|---|------------------|-------|------------|--|--|--|--|--|------|-------|---|
| <b>-</b> | <b>~</b> '      | Water<br>Depth | Sar          | mple/Co | re Rec   | overy    |          | SPT<br>Blows | Fracture                                 |   | Depth            |       |            |  |  |  |  |  |      |       |   |
| &        | Casing<br>Depth | (m)<br>(Flush  | Depth        | (m)     | Туре     |          |          | /N<br>Core   | Spacing<br>mm<br>(Min,Avg,Max)           | Description of Strata   | (Thick-<br>ness) | Level | Leg        |  |  |  |  |  |      |       |   |
| ime      | (m)             | Return)        | From         | То      | TCR<br>% | SCR<br>% | RQD<br>% | Size<br>(mm) | or<br>Result                             |   | (m)              | m OD  |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          | , ,          |  | Stiff locally firm silty CLAY as previous                                       | ,                |       | ĸ          |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | sheet.  | ł                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  |   | Į                |       | ×          |  |  |  |  |  |      |       |   |
|          |                 | (50)           |              | -5.50   | 100      | _        |          |              |  |   | (2.50)           |       | ľ.         |  |  |  |  |  |      |       |   |
|          |                 |                | 5.30         | -5.50   | С        | 9        |          |              |  |   | İ.               |       | ř –        |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  |   | ł                |       | ,          |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  |   | L                |       | ×          |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  |   | ŧ                |       | × _        |  |  |  |  |  |      |       |   |
|          |                 |                | Ī            |         |          |          |          |              |  |   | Į                |       | <b>⊢</b> , |  |  |  |  |  |      |       |   |
|          |                 |                | _            |         |          |          |          |              |  |   | t                |       | ×          |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  |   | ł                |       | k _        |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  |   | ‡                |       |            |  |  |  |  |  |      |       |   |
|          |                 | (50)           | 0            | -6.50   | 100      |          |          |              |  |   | ł                |       | × -        |  |  |  |  |  |      |       |   |
|          |                 | (30)           | - 5.50       | -0.50   | 100      |          |          |              |  |   | F                |       | k          |  |  |  |  |  |      |       |   |
|          |                 |                | 1            |         |          |          |          |              |  |   | ŧ                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | [            |         |          |          |          |              |  |   | Į                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  |   | t                |       | ľ          |  |  |  |  |  |      |       |   |
|          |                 |                | 1            |         |          |          |          |              |  |   | ł                |       | ſ -        |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  |   | <b>‡</b>         |       |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         | 1        |          |          |              |  | arise simuma landi di di di di  | 6.50             | 53.48 | ×          |  |  |  |  |  |      |       |   |
|          |                 |                | Ī            |         |          |          |          |              |  | Stiff fissured locally indistinctly laminated/bedded dark brown mottled dark    | Į                |       | <b>K</b> - |  |  |  |  |  |      |       |   |
|          |                 |                | 1            |         |          |          |          |              |  | yellowish brown silty CLAY with   | ŧ                |       | ,          |  |  |  |  |  |      |       |   |
|          |                 |                | Ļ            |         |          |          |          |              | 1  | occasional to frequent locally abundant   | <del> </del>     | I     | × -        |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              | 1  | crystals (<4mm) of gypsum and occasional  | İ                | I     | k _        |  |  |  |  |  |      |       |   |
|          |                 |                | 1            |         |          |          |          |              | 1  | black specks. Partings to thin laminae of yellowish brown silt, 0-10 degs, very | ł                | I     | $\vdash$   |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | closely to medium spaced. Fissures (SET   | (1.05)           |       | × -        |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | 2) are 80-90 degs, spacing not determined                                       |                  |       | ĸ          |  |  |  |  |  |      |       |   |
| (!       |                 |                |              |         |          |          |          |              | possibly locally closely spaced, planar, | ‡   |                  |       |            |  |  |  |  |  |      |       |   |
|          |                 | (50)           | 6 50         | -8.00   | 100      |          |          |              |  | rough, (very tight to tight), with yellowish brown veneer. Fissures (SET 3)     | ł                |       | _          |  |  |  |  |  |      |       |   |
|          |                 | (30)           |              | -7.50   | C        | 10       |          |              |  | are 20-30 degs and 40-45 degs, very   | Ţ.               |       | ľ          |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | closely to closely spaced, planar, rough,                                       | ł                |       | ř -        |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | (very tight to tight), polished, locally  | Į.               |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | _            |         |          |          |          |              | <u>-</u>                                 | -   |                  |       |            |  |  |  |  | with yellowish brown veneer. [LONDON CLAY FORMATION A2 - CLAY] | 7.55 | 52.43 | × |
|          |                 |                |              |         |          |          |          |              |  | [LONDON CLAI FORMATION AZ - CLAI]   | 7.33             | 32.43 |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | Stiff locally very stiff locally  | İ                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | _            |         |          |          |          |              |  | indistinctly fissured indistinctly  | <del> </del>     |       | 1 -        |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | laminated/bedded black brownish grey and dark grey slightly sandy CLAY with     | Į.               |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | occasional to frequent pockets (<50 x   | t                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | 40mm) and lenses (<70 x 25mm) of grey and                                       | F                |       | -          |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | light grey sandy silt and silt. Sand is   | ţ .              |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | _            |         |          |          |          |              |  | mainly fine. Rare pyrite nodules (<10 x 10mm) and occasional fragments (<10 x   | ł                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | 5mm) of lignite. Occasional white shell   | <u>t</u>         |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | fragments (<25mm). Thin laminae of light  | t                |       | 1          |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              | 1  | grey silt and brown sandy silt, 0-10 degs, possibly extremely closely to very   | Į.               | I     | -          |  |  |  |  |  |      |       |   |
|          |                 |                | 8.45         | -8.75   | С        | 11       |          |              | 1  | closely spaced. Fissure sets not  | (1.95)           | I     |            |  |  |  |  |  |      |       |   |
|          |                 |                | -            | -       |          |          |          |              |  | determined, randomly orientated, spacing  | +                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  | not determined, planar, smooth.   | ‡                |       | 1 -        |  |  |  |  |  |      |       |   |
|          |                 | (50)           | Ω ΛΛ         | -9.50   | 100      |          |          |              |  | [LONDON CLAY FORMATION A2 - CLAY]<br>8.00m to 8.20m; soft (possibly DI).        | ł                |       | 1          |  |  |  |  |  |      |       |   |
|          |                 | (30)           | 3.00         | -3.50   | 100      |          |          |              |  | At 8.45m; slightly sandy.   | Ţ                |       | L -        |  |  |  |  |  |      |       |   |
|          |                 |                | +            |         |          |          |          |              | 1  | , 5 2 2 -   | t                | I     |            |  |  |  |  |  |      |       |   |
|          |                 |                | [            |         |          |          |          |              | 1  |   | Į                | I     |            |  |  |  |  |  |      |       |   |
|          |                 |                | _            |         |          |          |          |              |  |   | ┢                |       | 1 -        |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              | 1  |   | ļ.               | I     |            |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  | 9.20m to 9.50m; slightly sandy.   | t                |       | L-         |  |  |  |  |  |      |       |   |
|          |                 |                | <del> </del> |         |          |          |          |              |  |   | +                |       | 1-         |  |  |  |  |  |      |       |   |
|          |                 |                | Ī            |         |          |          |          |              |  |   | <b>İ</b>         |       | -          |  |  |  |  |  |      |       |   |
|          |                 |                | 1            |         |          |          |          |              | 1  |   | ł                | I     | -          |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  |   | 9.50             | 50.48 |            |  |  |  |  |  |      |       |   |
|          |                 |                |              |         |          |          |          |              |  | Stiff to very stiff dark grey silty CLAY  | t                |       | k -        |  |  |  |  |  |      |       |   |
|          |                 |                | Ī            |         |          |          |          |              | 1  | locally gravelly. Rare nodules (<20 x 10mm) of lignite or pyrite. Occasional to | Į                | I     |            |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  | frequent shell fragments (<20 x 5mm) and  | t                |       | × -        |  |  |  |  |  |      |       |   |
|          |                 |                | <u> </u>     |         |          |          |          |              |  | foraminifera. Gravel is black, rounded to                                       | F                |       | k _        |  |  |  |  |  |      |       |   |
|          |                 |                | -            |         |          |          |          |              |  | subangular medium to coarse locally (<3 x                                       | t                |       |            |  |  |  |  |  |      |       |   |
|          |                 |                | ļ            |         |          |          |          |              | 1  | 3mm).<br>[HARWICH FORMATION - CLAY]   | ł                | I     | × -        |  |  |  |  |  |      |       |   |
|          |                 |                |              |         | ī        | Ī        | 1        |              | 1  | [HARMICH FORMATION - CLAY]  | _                | I     |            |  |  |  |  |  |      |       |   |

(See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (2 of 8)

Equipment Hanjin DB 10

Drill Fluid

Crew/Vessel Dates Drilled

Polymer DS60/Pure-Bore

CJ/ZI

Start 04/01/2017 End 06/01/2017

**Borehole Diameter** 146mm to 31.00m **Casing Diameter** 

175mm to 2.60m

507179.59 E

Logged by CJ/GDF 04/01/2017 Compiled by Checked by

NJB 11/12/2017 10/01/2017

Coordinates (National Grid) Ground Level 188653.51 N 59.98 m OD

**BOREHOLE No.ML025-RC051** 

| Date   Capital   Company   |       | End 06/01/2017 |               |                    | 04/    |       | 7 10/0 | 1/2017 11/12/2017 |                     |   |                   |       |                                    |
|--|-------|----------------|---------------|--------------------|--------|-------|--------|-------------------|---------------------|---|-------------------|-------|------------------------------------|
| Company   Comp   | Doto  | Casina         |               | Sample/Co          | re Rec | overy |        | SPT               |                     |   | Depth             |       |                                    |
| 1000   10.25-10.55   C   12  | &     | Depth          | (ṁ)<br>(Flush | Depth (m)          |        |       | DOD    | Core              | mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-           | Level | Legend                             |
| A 9.98m; rounded medium and coarse gravel  | ııme  | (m)            | Return)       | From To            |        |       |        | Size              | or<br>Result        |   | (m)               | m OD  |                                    |
| 10.25-10.55 C   12   |       |                |               | <del>-</del>       |        |       |        | ,                 |                     |   | , ,               | 32    | ××                                 |
| 10.80m to 11.00m; slightly sandy slity   11.00   12.00   13.25   13   14.30-14.60   C   15   15.00   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   14.00-15.50   100   15.00   100   15.00   100   15.00   100   15.00   100   15.00   100   15.00   100   15.00   100   15.00   100   100   15.00   100   |       |                | (100)         |                    |        | 12    |        |                   |                     | At 10.25m; pyrite nodule.   | (1.50)            |       | *<br>                              |
| Clay.   Clay   |       |                |               | -                  |        |       |        |                   |                     |   |                   |       | ^                                  |
| Clay.   Clay   |       |                |               | <del>-</del><br>-  |        |       |        |                   |                     |   |                   |       | ۰ — ×                              |
| 04/01   2.60   GL  |       |                |               | -                  |        |       |        |                   |                     |   | -                 |       | ×                                  |
| Stiff locally frieble dark grey sandy CAX, locally gravely: Sand is fine to CAX Sem) of lignite, Frequent cells In 1.32-11.56 C 13  (100) 11.00-12.50 93   | 04/01 | 2.60           | GL            | -<br>-             |        |       |        |                   |                     | ciay.   | -                 |       | ×                                  |
| (100) 12.50-14.00 100 13.25-13.55 C 14  (100) 12.50-14.00 100 13.25-13.55 C 14  (100) 13.25-13.55 C 14  (100) 14.00-15.50 100  (100) 14.00-15.50 100  (100) 14.00-15.50 100  (100) 14.00-15.50 100  (100) 14.00-15.50 100  (100) 14.00-15.50 100  (100) 14.00-15.50 100  | 05/01 | 2.60           | 1.70          | -                  |        |       |        |                   |                     |   | _11.00            | 48.98 | <u>×</u><br>: —:                   |
| 11.32-11.56 C   13   |       |                |               | <u>.</u>           |        |       |        |                   |                     | coarse. Rare to occasional fragments (<10 x 5mm) of lignite. Frequent shell       | . (0.70)          |       |                                    |
| Stiff to very stiff indistinctly fissured locally fissured light bluish grey mottled dark yellowish brown and white silty CLAY with frequent caltered nodules (c30 x 20mm). Locally with calcareous determined, randomly orientated, spacing not determined, randomly orientated, spacing not determined, planar, smooth and rough. [LOWER MOTTLED CLAY - CLAY]    Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules (c50 x 50mm) and locally with ferricate. So old dags, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red and striated, very tight), polished, clean locally stained dark purplish red are planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the polished clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red of the planar and undulating, smooth planar and undulating the planar and undulating the planar and undulating the planar and undulating the planar and undulating the planar and undulat   |       |                |               | 11.32-11.56        | С      | 13    |        |                   |                     | black rounded fine and medium of possible flint.                                  | (0.70)            |       |                                    |
| Stiff to very stiff indistinctly fissured locally fissured lique blush grey mottled dark yellowish brown and which less than 12.50-14.00 100 and the statement of the statement  |       |                |               | <del>-</del><br>-  |        |       |        |                   |                     | [HARWICH FORMATION - CLAY]  | <del>-</del><br>- |       |                                    |
| mottled dark yellowish brown and white silty CLAY with frequent calcrete nodules (<30 x 20mm). Locally with calcareous enriched beads 300mm). Fissure sets not a continuous properties of the continuous properties of the continuous properties of the continuous properties of the continuous properties of the continuous properties and continuous properties and continuous properties properties and continuous properties properties properties properties and continuous properties properti |       |                | (100)         | _<br>- 11.00-12.50 | 93     |       |        |                   |                     |   | 11.70             | 48.28 | ·. · · · · · · · · · · · · · · · · |
| enriched beds (<300mm). Fissure sets not determined, randomly coincitated, spacing not determined, planar, smooth and rough.  [LOWER MOTILED CLAY - CLAY]  (1.55)  Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules. Sand is mainly fine. Fissures (SET 2) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red.  Pissures (SET dare ovidely spaced, or planar and undulating, smooth, (very tight), polished, clean locally stained dark purplish red.  Pissures (SET 2) paced, or planar and undulating, smooth, (very tight), polished, clean locally stained dark purplish red.  Pissures (SET 2) paced, or planar and undulating, smooth, (very tight), polished, clean locally stained dark purplish red.  [LOWER MOTILED CLAY - CLAY]  |       |                |               |                    |        |       |        |                   |                     | mottled dark yellowish brown and white silty CLAY with frequent calcrete nodules  | -<br>-<br>-       |       | ××                                 |
| Comparison of the control of the c   |       |                |               | <u>-</u>           |        |       |        |                   |                     | enriched beds (<300mm). Fissure sets not determined, randomly orientated, spacing |                   |       | *×                                 |
| Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally with sandy CLAY with rare to occasional calcrete nodules (<50 x 50mm) allocally stining smooth and planar to unchlating, smooth and striated, (very tight), polished, clean locally stained dark purplish red.   Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished, clean locally stained dark purplish red.   Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished, clean locally stained dark purplish red.   Identify the purplish red.    |       |                |               | <u>-</u><br>-      |        |       |        |                   |                     |   | -<br>-<br>-       |       | `×                                 |
| Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules (c50 x 50mm) and locally with ferricrete. Sand is mainly fine. Fissures (ST2 ) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. Fightly, polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]  |       |                |               | -<br>-<br>-        |        |       |        |                   |                     |   | (1.55)            |       | ×                                  |
| Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules (c50 x 50mm) and locally with ferricrete. Sand is mainly fine. Fissures (ST2 ) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. Fightly, polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]  |       |                |               | <del>-</del><br>-  |        |       |        |                   |                     |   | -                 |       | *×                                 |
| Very stiff fissured bluish grey mottled dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules (c50 x 50mm) and locally with ferricrete. Sand is mainly fine. Fissures (ST2 ) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. Fightly, polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]  |       |                |               | -<br>-<br>-        |        |       |        |                   |                     |   | -                 |       | * <sub>×</sub>                     |
| 12.50-14.00   100   13.25-13.55   C   14   |       |                |               | -                  |        |       |        |                   |                     |   | -                 |       |                                    |
| 12.50-14.00   100   13.25-13.55   C   14   |       |                |               | <del>_</del><br>-  |        |       |        |                   |                     |   | -                 |       | *×                                 |
| dark yellowish brown dark purplish red and locally white slightly sandy CLAY with rare to occasional calcrete nodules (<50 x 50mm) and locally with ferricrete. Sand is mainly fine. Fissures (SET 2) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red.  Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red.  [LOWER MOTTLED CLAY - CLAY]  |       |                | (100)         |                    |        |       |        |                   |                     |   | 13.25             | 46.73 | × -                                |
| with rare to occasional calcrete nodules (<50 x 50mm) and locally with ferricrete. Sand is mainly fine. Fissures (SET 2) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]   |       |                |               | 13.25-13.55        | С      | 14    |        |                   |                     | dark yellowish brown dark purplish red  | -                 |       |                                    |
| Sand is mainly fine. Fissures (SET 2) are 60-90 degs, spacing not determined, planar to undulating, smooth and striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]  |       |                |               | <u>-</u><br>-      |        |       |        |                   |                     | with rare to occasional calcrete nodules  | -                 |       |                                    |
| striated, (very tight), polished, clean locally stained dark purplish red. Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red. [LOWER MOTTLED CLAY - CLAY]  NA  (100) 14.00-15.50 100  |       |                |               | <u>.</u><br>-      |        |       |        |                   |                     | Sand is mainly fine. Fissures (SET 2) are 60-90 degs, spacing not determined,     |                   |       |                                    |
| Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced, planar and undulating, smooth, (very tight), polished with occasional slickensides, clean locally stained dark purplish red.  [LOWER MOTTLED CLAY - CLAY]  NA  (100) 14.00-15.50 100  |       |                |               | <del>-</del><br>-  |        |       |        |                   |                     | striated, (very tight), polished, clean   | -<br>-            |       |                                    |
| tight), polished with occasional slickensides, clean locally stained dark purplish red.  [LOWER MOTTLED CLAY - CLAY]  NA  (100) 14.00-15.50 100  |       |                |               | _                  |        |       |        |                   |                     | Fissures (SET 3) are 20-30 degs and 40-50 degs, very closely to widely spaced,    | _                 |       |                                    |
| 14.30-14.60 C   15   |       |                |               | -                  |        |       |        |                   |                     | planar and undulating, smooth, (very tight), polished with occasional             | <u> </u>          |       |                                    |
| (100) 14.00-15.50 100 NA   |       |                |               | -<br>- 14.30-14.60 | С      | 15    |        |                   |                     | purplish red.   | <u> </u>          |       |                                    |
| (100) 14.00-15.50 100  |       |                |               |                    |        |       |        |                   |                     | <u> </u>  |                   |       |                                    |
|  |       |                |               | <u> </u>           |        |       |        |                   | NA                  |   | <u> </u><br>      |       |                                    |
|  |       |                | (100)         | 14.00-15.50        | 100    |       |        |                   |                     |   | <u>.</u>          |       | <u> </u>                           |
| Remarks  |       |                |               |                    |        |       |        |                   |                     |   | -                 |       |                                    |
| Remarks  |       |                |               | <u>-</u>           |        |       |        |                   |                     |   | <u> </u>          |       |                                    |
| (See notes   |       |                |               |                    |        | —     | —      |                   | <u> </u>            |   |                   |       |                                    |

(See notes & keysheets)

Scale 1:25

13/12/2017

**Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (3 of 8)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

Crew/Vessel Dates Drilled

CJ/ZI

Start 04/01/2017 End 06/01/2017

**Borehole Diameter Casing Diameter** 146mm to 31.00m 175mm to 2.60m

**BOREHOLE No.ML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Compiled by Checked by NJB

Logged by CJ/GDF 04/01/2017 10/01/2017 11/12/2017

|         |              | Water                    | 60.               | mple/Co | ro Poo      | OVON |     | SPT                  | Fractions                             |  |                  |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|---------|--------------|--------------------------|-------------------|---------|-------------|------|-----|----------------------|---------------------------------------|--|------------------|--|-------------------|--|---|---|-------------|--|--|--|--|--|--|--|--|-----------------------------|---|--|--|
| ate     | Casing       | Depth                    | Sai               | npie/Co | т —         |      |     | SPT<br>Blows<br>/N   | Fracture<br>Spacing                   |  | Depth            | Lovol  | Logo              |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
| &<br>me | Depth<br>(m) | (m)<br>(Flush<br>Return) | Depth<br>-        |         | Type<br>TCR | SCR  | RQD | Core<br>Size<br>(mm) | (Min,Avg,Max)<br>Or                   | Description of Strata  | (Thick-<br>ness) | Level  | Lege              |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | % ´                      | From              | То      | %           | %    | %   | (mm)                 | Result                                |  | (m)              | m OD   |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-<br>-       |         |             |      |     |                      |                                       | Very stiff CLAY as previous sheet.   | (3.75)           |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | <u> </u>         |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | ‡                |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | F                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | Ŧ                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <del>-</del><br>- |         |             |      |     |                      |                                       |  | F                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | <u> </u>         |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | L                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <del>-</del><br>- |         |             |      |     |                      |                                       |  | ‡                |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          |                   |         |             |      |     |                      |                                       |  | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | (100)                    | 15.50             | -17.00  | 100         |      |     |                      |                                       |  | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <del>-</del><br>- |         |             |      |     |                      |                                       |  | Ŧ                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | _                 |         |             |      |     |                      |                                       |  | F                |  | <u> </u>          |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | <u> </u>         |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <u>-</u>          |         |             |      |     |                      |                                       |  | ‡                |  | -                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | 16.80             | -17.00  | С           | 16   |     |                      |                                       |  | ‡                |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | 1,, 00           | 40.00  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       | Very stiff indistinctly fissured dark  | _17.00           | 42.98  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      | b                                     | brown mottled bluish grey and dark<br>yellowish brown slightly sandy CLAY        | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | 17 30             | -17.60  | С           | 17   |     |                      |                                       | locally with rare fragments (<40 x 10mm) of lignite. Sand is fine and medium.    | F                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | 17.30                    | -17.00            |         |             |      |     |                      | Fissure sets not determined, randomly | <u> </u>   |                  | _  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | _                        |                   | -       | _           | _    |     |                      |                                       |  |                  | orientated, spacing not determined, planar and undulating, rough and smooth. | L                 |  | - |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          |                   | -       | -           | -    |     | =                    |                                       |  | _                | <del>=</del>   | -                 |  |   | • | -<br>-<br>- |  |  |  |  |  |  |  |  | [LOWER MOTTLED CLAY - CLAY] | ‡ |  |  |
|         |              | (100)                    | 17 00             | -18.50  | 100         |      |     |                      |                                       |  | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | (100)                    | - 17.00           | -10.50  | 100         |      |     |                      |                                       |  | F                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | <del>[</del>     |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | _                 |         |             |      |     |                      |                                       |  | <u> </u>         |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <del>-</del><br>- |         |             |      |     |                      |                                       |  | (2.25)           |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | ‡                |  | -                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       |  | ‡                |  | _                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <u>-</u>          |         |             |      |     |                      |                                       |  | Ł                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | ţ                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | ţ                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | ‡                |  | $\vdash$          |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       |  | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>             |         |             |      |     |                      |                                       |  | F                |  | L-                |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <u>-</u>          |         |             |      |     |                      |                                       |  | ŧ                |  | -                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              | (100)                    | 18.50             | -20.00  | 93          |      |     |                      |                                       |  | 19.25            | 40.73  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -<br>-            |         |             |      |     |                      |                                       | Locally laminated/bedded dark brown dark purplish red dark greyish green mottled | ‡                |  | κ<br>             |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       | dark yellowish brown silty SAND. Sand is fine and medium slightly glauconitic to | ‡                |  |                   |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       | glauconitic. Thin to thick laminae of  | F                |  | ×                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       | dark yellowish brown and dark purplish red silty fine and medium sand, 0-5 degs, | E                |  | k. ∴              |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | <u> </u>          |         |             |      |     |                      |                                       | closely to medium spaced.<br>[ANY SAND UNIT (E.G. CHANNEL SANDS) -               | t                |  | [::: <sup>?</sup> |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | -                 |         |             |      |     |                      |                                       | SAND]  | ţ                |  | ×                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |
|         |              |                          | _                 |         | I           | 1    |     |                      |                                       |  | Į.               |  | k                 |  |   |   |             |  |  |  |  |  |  |  |  |                             |   |  |  |

Remarks (See notes & keysheets)

Scale 1:25

UGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (4 of 8)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

CJ/ZI

Crew/Vessel Dates Drilled Start 04/01/2017 End 06/01/2017 **Borehole Diameter** 146mm to 31.00m **Casing Diameter** 175mm to 2.60m

**BOREHOLE No.ML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 **E** 188653.51 N 59.98 m OD

Logged by Compiled by Checked by

| CJ/GDF     | jm         | NJB        |
|------------|------------|------------|
| 04/01/2017 | 10/01/2017 | 11/12/2017 |

| Date | Casing | Water<br>Depth         | San    | nple/Co |           |            |     | SPT<br>Blows                | Fracture<br>Spacing |  | Depth            | l .   | L                                       |
|------|--------|------------------------|--------|---------|-----------|------------|-----|-----------------------------|---------------------|--|------------------|-------|---|
| &    | Danth  | (m)                    | Depth  | (m)     | Туре      | No.<br>SCR | BOL | Blows<br>/N<br>Core<br>Size | (Min,Avg,Max)       | Description of Strata  | (Thick-<br>ness) | Level | Lege                                    |
| ime  | (m)    | (Flush<br>Return)<br>% | From   | То      | %         | %          | %   | Size<br>(mm)                | or<br>Result        |  | (m)              | m OD  |   |
|      |        | (100)                  | 20.00- | -20.75  | <b>EW</b> | 1          |     |                             |                     | Mottled silty SAND as previous sheet.  20.60m to 20.75m; assumed zone of core                    |                  |       | × × ×                                   |
|      |        | (100)                  | 21.00  | -21.50  | EW 87     | 1          |     |                             |                     | loss.  21.40m to 21.50m; assumed zone of core  |                  |       | *                                       |
|      |        | (100)                  | 21.50- | -22.25  | 93<br>EW  | 3          |     |                             |                     | loss.  | (5.10)           |       | × × × × × × ×                           |
|      |        | (100)                  | 22.25- | -23.00  | 67        |            |     |                             |                     | 22.75m to 23.00m; assumed zone of core loss.  23.00m to 23.18m; yellowish brown silty fine sand. |                  |       | × · · · · · · · · · · · · · · · · · · · |
|      |        | (100)                  | 23.00- | -23.75  | 80        |            |     |                             |                     | 23.60m to 23.75m; assumed zone of core loss.   |                  |       | ×                                       |
|      |        | (100)                  | 23.75- | -24.50  | 80        |            |     |                             |                     | Assumed zone of core loss. [ - NO CORE RECOVERY]   | 24.35            | 35.63 | × · · · · · · · · · · · · · · · · · · · |
|      |        | (100)                  |        | -25.25  | 0         |            |     |                             |                     |  | (0.95)           |       |   |

(See notes & keysheets)

Scale 1:25

JGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (5 of 8)

Equipment Hanjin DB 10

Drill Fluid

CJ/ZI

Crew/Vessel Dates Drilled Start 04/01/2017 End 06/01/2017

Polymer DS60/Pure-Bore

Logged by

**Borehole Diameter** 

146mm to 31.00m

175mm to 2.60m

**Casing Diameter** 

**BOREHOLE No.ML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Compiled by Checked by

| 04/01/2017 10/01/2017 11/12/2017 | CO / GDI   | J#1        | NOD        |
|----------------------------------|------------|------------|------------|
|                                  | 04/01/2017 | 10/01/2017 | 11/12/2017 |

|      |        | Ena                      |                    | 2017             |          |          |          | _                  | 4                   | 1/2017 11/12/2017   |                  |       |                                       |
|------|--------|--------------------------|--------------------|------------------|----------|----------|----------|--------------------|---------------------|---|------------------|-------|---------------------------------------|
| Date | Casing | Water<br>Depth           | Sar                | nple/Co          |          |          |          | SPT<br>Blows       | Fracture<br>Spacing |   | Depth            |       |                                       |
| &    | Depth  | (m)<br>(Flush<br>Return) | Depth              | (m)              | Туре     |          |          | /N<br>Core<br>Size | mm<br>(Min,Avg,Max) | Description of Strata   | (Thick-<br>ness) | Level | Lege                                  |
| ime  | (m)    | Return)<br>%             | From               | То               | ICR      | SCR<br>% | RQD<br>% | Size<br>(mm)       | or<br>Result        |   | (m)              | m OD  |                                       |
|      |        |                          | -                  |                  |          |          |          |                    |                     | Assumed zone of core loss as previous sheet.  |                  |       |                                       |
|      |        |                          | -                  |                  |          |          |          |                    |                     | Approximate boundary  | 25.30            | 34.68 |                                       |
|      |        |                          | -<br>-<br>-        |                  |          |          |          |                    |                     | Dark greenish grey mottled dark brownish yellow SAND. Sand is glauconitic, fine and medium.   |                  |       |                                       |
|      |        | (100)                    | 25.25              | -26.00           | 91       |          |          |                    |                     | [UPNOR FORMATION - SAND]  | (0.70)           |       |                                       |
| 5/01 | 2.60   | GL                       | -<br>-<br>-        |                  |          |          |          |                    |                     |   | ļ<br>ļ           |       |                                       |
| 6/01 | 2.60   | 3.90                     | -                  |                  |          |          |          |                    |                     | Dark greenish grey silty SAND. Sand is  | 26.00            | 33.98 | · · · · · · · · · · · · · · · · · · · |
|      |        |                          | -<br>-<br>-        |                  |          |          |          |                    |                     | glauconitic, coarse rarely medium. [UPNOR FORMATION - SAND]   | (0.25)<br>26.25  |       | ×                                     |
|      |        | (100)                    | 26.00              | -26.75           | 33       |          |          |                    |                     | Assumed zone of core loss. [ - NO CORE RECOVERY]  | 7 20.23          | 33.73 |                                       |
|      |        |                          | _                  |                  |          |          |          |                    |                     |   | <u> </u>         |       |                                       |
|      |        |                          | -<br>-<br>-        |                  |          |          |          |                    |                     |   | (1.20)           |       |                                       |
|      |        | (100)                    | _ 26.75            | -27.25           | 0        |          |          |                    |                     |   | <u> </u>         |       |                                       |
|      |        |                          | -<br>-<br>-        |                  |          |          |          |                    |                     |   | ‡<br>‡           |       |                                       |
|      |        | (100)                    |                    |                  |          |          |          |                    |                     |   | 27.45            | 32.53 |                                       |
|      |        | (100)                    | _ 27.25<br>27.50   |                  | 60<br>EW | 2        |          |                    |                     | Dark greenish grey silty SAND. Sand is glauconitic, coarse rarely medium. [UPNOR FORMATION - SAND]  | (0.30)           |       | ×                                     |
|      |        |                          | <u>-</u><br>-<br>- |                  |          |          |          |                    |                     | Dark greyish green rarely mottled dark<br>yellowish brown slightly silty SAND   | 27.75            | 32.23 | ×                                     |
|      |        | (100)                    | 27.75              | -28.25           | 70       |          |          |                    |                     | locally clayey locally gravelly. Gravel is subangular to rounded fine to coarse mainly flint. Sand is fine rarely medium.   | <u> </u>         |       |                                       |
|      |        |                          | -                  |                  |          |          |          |                    |                     | [UPNOR FORMATION - SAND]<br>28.10m to 28.54m; assumed zone of core  | I<br>            |       |                                       |
|      |        |                          | <u>-</u>           |                  |          |          |          |                    |                     | loss.   | (1.30)           |       |                                       |
|      |        | (100)                    | 28.25              | -28.75           | 42       |          |          |                    |                     |   | <b>-</b>         |       |                                       |
|      |        |                          | -<br>-             |                  |          |          |          |                    |                     | 28.75m to 28.88m; frequent subangular to  | [<br>[           |       |                                       |
|      |        | (100)                    | 28.75              | -29.00           | 52       |          |          |                    |                     | rounded fine to coarse flint gravel. 28.88m to 29.00m; assumed zone of core loss.   | ļ<br>Į           |       |                                       |
|      |        |                          |                    |                  |          |          |          |                    |                     | (Very stiff) extremely weak to weak   | 29.05            | 30.93 | × × ×<br>× × ×                        |
|      |        | (100)                    |                    | -29.35<br>-29.50 |          | 18       |          |                    | 450                 | cemented grey mottled dark greyish green<br>and light brown SILTSTONE with frequent<br>chalk and flint clasts. Chalk clasts are<br>subangular and subrounded (<20mm).   | (0.45)           |       | × × × × × × × × × × × × × × × × × × × |
|      |        |                          | -<br>-<br>-        |                  |          |          |          |                    |                     | [SEAFORD CHALK - SILTSTONE]  Weak locally very weak medium to high  | 29.50            | 30.48 | × × ×<br>× × ×                        |
|      |        | (100)                    | 29.50              | -30.00           | 100      | 100      | 64       |                    | 500                 | density white locally stained yellowish<br>brown and dark greyish green fractured<br>locally brecciated CHALK with occasional<br>flint. Single fracture (SET 1) is 0-10 | <u> </u>         |       |                                       |
|      |        |                          | <u> </u>           |                  |          |          |          |                    |                     | degs, spacing not determined, planar and undulating, rough, (very tight), clean, incipient. Fractures (SET 2) are 85-90 degs, possibly extremely closely to             | <u> </u>         |       |                                       |

Remarks (See notes & keysheets)

Scale 1:25

JGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (6 of 8)

Equipment Hanjin DB 10

Drill Fluid

Polymer DS60/Pure-Bore

Crew/Vessel Dates Drilled Start 04/01/2017 End 06/01/2017

CJ/ZI

**Borehole Diameter** 146mm to 31.00m

**Casing Diameter** 

175mm to 2.60m

**BOREHOLE No.ML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Logged by Compiled by Checked by CJ/GDF jm NJB

| 04/01/2017 | 10/01/2017 | 11/12/2017 |
|------------|------------|------------|
|            |            |            |

|        |        | Water        | San           | Sample/Core Recovery |          |          | SPT | Fracture             | •                   |  |                  |       |        |
|--------|--------|--------------|---------------|----------------------|----------|----------|-----|----------------------|---------------------|--|------------------|-------|--------|
| Date   | Casing | Depth<br>(m) | - Cui         | iipio, GG            | Туре     | r -      |     | Blows<br>/N          | Spacing             |  | Depth            | Level | Legend |
| &      | Depth  | (Flush       | Depth         | (m)                  | <u> </u> |          |     |                      | mm<br>(Min,Avg,Max) | Description of Strata  | (Thick-<br>ness) | Level | Legenu |
| Time   | (m)    | Return)      | F             | <b>T</b> -           | TCR      | SCR      | RQD | Core<br>Size<br>(mm) | or<br>Result        |  | · ·              | 00    |        |
|        |        | % ´          | From          | То                   | %        | %        | %   | (mm)                 | Result              |  | (m)              | m OD  |        |
|        |        |              | _             |                      |          |          |     |                      |                     | closely spaced, planar and undulating,   | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      | NR                  | with yellowish brown locally green and dark grey to black staining. Single         | ł                |       |        |
|        |        | (100)        | 30.00-        | -30.50               | 40       | 40       | 40  |                      |                     | fracture (SET 3) is 40-45 degs, spacing  | (1.50)           |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     | not determined, planar and undulating,   | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     | rough (tight), slight to moderate brown and green staining. (Grade A3)             | ł                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     | [SEAFORD CHALK - CHALK]  | Į.               |       |        |
|        |        |              | -             |                      |          |          |     |                      |                     | 29.50m to 29.57m; flint nodular (<100 x  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      | 700                 | 70mm).<br>29.57m to 29.67m; brecciated zone. Intact                                | ł                |       |        |
|        |        | (100)        | 30.50-        | -31.00               | 100      | 70       | 70  |                      |                     | with natural incipient fractures and   | Į.               |       |        |
|        |        |              |               |                      |          |          |     |                      |                     | frequent yellowish brown staining. 29.67m to 29.77m; flint nodular (<100 x         | ţ                |       |        |
| 06/01  | 2.60   | GL           | <u> </u>      |                      |          |          |     |                      |                     | 29.87m to 29.77m; filled hoddlar (<100 x 90 x 70mm).                               | ŧ                |       |        |
|        |        |              |               |                      |          |          |     |                      |                     | 29.95m to 30.00m; brecciated zone. Intact  | _31.00           | 28.98 |        |
|        |        |              | _             |                      |          |          |     |                      |                     | with natural incipient fractures and with  | į.               |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     | occasional to frequent yellowish brown staining.                                   | ŀ                |       |        |
|        |        |              | -             |                      |          |          |     |                      |                     | 30.00m to 30.30m; assumed zone of core   | Į.               |       |        |
|        |        |              | -             |                      |          |          |     |                      |                     | loss.  | t                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     | 30.30m to 30.40m; Non Intact chalk (DI). 30.50m to 30.60m; brecciated zone. Intact | ł                |       |        |
|        |        |              | ļ.            |                      |          |          |     |                      |                     | with abundant yellow staining.   | F                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     | 30.60m to 30.75m; Non Intact chalk (DI).   | t                |       |        |
|        |        |              | ŀ             |                      | 1        |          |     |                      |                     | 30.90m to 30.95m; Non Intact chalk (DI).   | ł                |       |        |
|        |        |              | [             |                      |          |          |     |                      |                     | End of Borehole  | F                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | <u>L</u>      |                      |          |          |     |                      |                     |  | F                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | Ī             |                      |          |          |     |                      |                     |  | Į.               |       |        |
|        |        |              |               |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | <u> </u>         |       |        |
|        |        |              |               |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ‡                |       |        |
|        |        |              |               |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | <u> </u>         |       |        |
|        |        |              |               |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | Ļ             |                      |          |          |     |                      |                     |  | Į.               |       |        |
|        |        |              | ļ             |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | $\vdash$         |       |        |
|        |        |              | <b>-</b><br>- |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | t                |       |        |
|        |        |              | [             |                      |          |          |     |                      |                     |  | F                |       |        |
|        |        |              | <u>-</u>      |                      |          |          |     |                      |                     |  | ţ                |       |        |
|        |        |              | -             |                      |          |          |     |                      |                     |  | ł                |       |        |
|        |        |              | _             |                      |          |          |     |                      |                     |  | F                |       |        |
|        |        |              | ļ             |                      |          |          |     |                      |                     |  | t                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | <del> </del>     |       |        |
|        |        |              | Ļ             |                      |          |          |     |                      |                     |  | Į.               |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | t                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | <del> </del>     |       |        |
|        |        |              | L             |                      |          |          |     |                      |                     |  | L                |       |        |
|        |        |              | <u> </u>      |                      |          |          |     |                      |                     |  | t                |       |        |
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| Remark | ks     |              |               |                      | _        | _        | _   | ·                    | _                   |  |                  | ·     |        |

Remarks (See notes & keysheets)

Scale 1:25

JGRO 13/12/2017 **Project** 

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No.

G160015U

Figure No. ML025-RC051 (7 of 8)

Drilling Method Rotary Cored **Borehole Diameter Casing Diameter BOREHOLE NaML025-RC051** 146mm to 31.00m Coordinates (National Grid) 507179.59 E Equipment Hanjin DB 10 188653.51 N Ground Level 59.98 m OD Polymer DS60/Pure-Bore Crew/Vessel Logged by Compiled by Checked by CJ/ZI **Dates Drilled** Start 04/01/2017 CJ/GDF NJB jm 10/01/2017 End 06/01/2017 04/01/2017 11/12/2017 Installation Level Water Strata Strata Details Installation Details Depth (m) m OD **Strikes** Depth (m) TOPSOIL Concrete 0.40 Instrumentation: 59.48 Bentonite CLAY 50mm slotted section (SL) 1.45 from 19.00 to 2.00 29.00m No Recovery CLAY 4.00 Silty CLAY 7.55 CLAY Silty CLAY 11.00 Sandy CLAY 11.70 Silty CLAY 13.25 CLAY 19.00 40.98 19.25 Gravel backfill |; °; Silty SAND SL=19.00-29.00m 24.35 No Recovery 25.30 SAND Silty SAND No Recovery Silty SAND SAND 29.00 30.98 29.05 Bentonite SILTSTONE 29.50 CHALK 31.00 28.98 31.00 Base of Hole Remarks (See notes & keysheets) ☑ Water Strike ▼ Water Rise Flush lockable stopcock box cover. Pipe diameter  $50 \, \text{mm}$  to  $29.00 \, \text{m}$ , installed on 09/01/2017. Not to Scale Project Contract No. G160015U WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Figure No. ML025-RC051 (8 of 8) 13/12/2017

309/05

Casing Diameter Drilling MethodRotary Cored **Borehole Diameter BOREHOLE NoML025-RC051** 146mm to 31.00m 175mm to 2.60m Equipment

Compiled by Checked by

Coordinates (National Grid) Ground Level 507179.59 E 188653.51 N 59.98 m OD

Crew/Vessel Dates Drilled CJ/ZI

Hanjin DB 10

Logged by

| Dates Drilled | Start<br>End | <br>01/2017<br>01/2017 |  | CJ/GDF<br>04/01/2017 | jm<br>10/01/2017 | NJB<br>11/12/2017 | 7 |
|---------------|--------------|------------------------|--|----------------------|------------------|-------------------|---|
|               |              |                        |  | Poughnoss            |                  |                   |   |

|                | Liiu        |         | 11/201/ | _            |        | -       |       | 10/01/2017 11/12/2017 |          |            |
|----------------|-------------|---------|---------|--------------|--------|---------|-------|-----------------------|----------|------------|
| Discon.        | Depth       | Туре    | Dip °   | Aper         | Infill | Roug    | hness |                       |          |            |
| Discon.<br>Ref | (m)         | . , , , |         | ture<br>(mm) |        | Inter-  | Small | Description           |          | gend       |
|                | (,          |         | (209)   | (,           |        | mediate | Oman  |                       | m OD     |            |
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(See notes & keysheets)

Scale 1:25

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Project

13/12/2017

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC051 (1 of 7)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter BOREHOLE NoML025-RC051** 146mm to 31.00m 175mm to 2.60m 507179.59 E Equipment Coordinates (National Grid) Ground Level Hanjin DB 10 188653.51 N 59.98 m OD Logged by CJ/GDF 04/01/2017 Crew/Vessel CJ/ZI Compiled by Checked by Start 04/01/2017 End 06/01/2017 Dates Drilled NJB

| Dates Dri      | lled Start<br>End | 04/0<br>06/0 | 01/2017<br>01/2017 |              |        | CJ/GDE<br>04/01/  | 2017  | jm NJB<br>10/01/2017 11/12/2017 |                   |          |
|----------------|-------------------|--------------|--------------------|--------------|--------|-------------------|-------|---------------------------------|-------------------|----------|
| Discon.<br>Ref | Depth             | Туре         |                    | Aper         | Infill |                   | hness |                                 |                   | end      |
| Ref            | (m)               |              |                    | ture<br>(mm) |        | Inter-<br>mediate | Small | Description                     | m OD              | ena      |
| -              |                   |              |                    |              |        |                   |       |                                 |                   | k        |
| E              |                   |              |                    |              |        |                   |       |                                 | -                 | ×        |
| E              |                   |              |                    |              |        |                   |       |                                 | [                 | ×        |
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| F              |                   |              |                    |              |        |                   |       |                                 | -                 | ×        |
| F              |                   |              |                    |              |        |                   |       |                                 | -                 | ×        |
| E              |                   |              |                    |              |        |                   |       |                                 | -                 | ×        |
| E              |                   |              |                    |              |        |                   |       |                                 | _                 | x        |
| F              |                   |              |                    |              |        |                   |       |                                 | _                 | ×        |
| F              |                   |              |                    |              |        |                   |       |                                 | -                 |          |
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Remarks (See notes & keysheets)

Scale 1:25

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Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC051 (2 of 7)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter BOREHOLE NoML025-RC051** 146mm to 31.00m 175mm to 2.60m 507179.59 **E** Coordinates (National Grid) Ground Level Equipment Hanjin DB 10 188653.51 N 59.98 m OD

Crew/Vessel CJ/ZI Compiled by Checked by Start End **Dates Drilled** 04/01/2017

06/01/2017

Logged by CJ/GDF 04/01/2017 NJB 10/01/2017 11/12/2017

Roughness Discon. Ref Depth Dip ° Infill Type Aper Description Legend Inter-(m) (Deg) (mm) Small m OD mediate

Remarks (See notes & keysheets)

Scale 1:25

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Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC051 (3 of 7)

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter** 146mm to 31.00m 175mm to 2.60m

> Compiled by Checked by

**BOREHOLE NoML025-RC051** Coordinates (National Grid) Ground Level 507179.59 E 188653.51 N 59.98 m OD

Crew/Vessel CJ/ZI

Equipment

Start 04/01/2017 End 06/01/2017 Dates Drilled

Hanjin DB 10

Logged by CJ/GDF 04/01/2017 NJB 10/01/2017 11/12/2017

|                | Ena   | 1    | 1/2017 |              |        | 0 17 0 17         |       | 10/01/2017 11/12/2017 |          |        |
|----------------|-------|------|--------|--------------|--------|-------------------|-------|-----------------------|----------|--------|
| Discon.<br>Ref | Depth | Туре | Dip °  | Aper<br>ture | Infill | Roug              | hness | Description           | Leg      | end    |
| Ret            | (m)   |      | (Deg)  | ture<br>(mm) |        | Inter-<br>mediate | Small |                       | m OD     |        |
|                |       |      |        |              |        | mediate           |       |                       | - 111 OD | I      |
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Remarks (See notes & keysheets)

Scale 1:25

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Project

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No. G160015U

Figure No.

ML025-RC051 (4 of 7)

13/12/2017

Drilling MethodRotary Cored **Borehole Diameter Casing Diameter** 146mm to 31.00m 175mm to 2.60m

CJ/ZI

**BOREHOLE NoML025-RC051** Coordinates (National Grid) Ground Level 507179.59 E 188653.51 N 59.98 m OD

Logged by CJ/GDF 04/01/2017 Crew/Vessel Compiled by Checked by Start 04/01/2017 End 06/01/2017 **Dates Drilled** NJB 10/01/2017 11/12/2017

|                | Ena   | 06/0  | 01/2017 |                      |        | 04/01/  | 2017  | 10/01/2017 11/12/2017 |          |                  |
|----------------|-------|-------|---------|----------------------|--------|---------|-------|-----------------------|----------|------------------|
| Discon.        | Depth | Туре  | Dip °   | Aper                 | Infill | Roug    | hness |                       |          |                  |
| Discon.<br>Ref | (m)   | ,,,,, | (Deg)   | Aper<br>ture<br>(mm) |        | Inter-  | Small | Description           | Lege     | end              |
|                | (,    |       | (209)   | (                    |        | mediate | Oman  |                       | m OD     | Lee See          |
| ļ.             |       |       |         |                      |        |         |       |                       | F        |                  |
| þ              |       |       |         |                      |        |         |       |                       | F        | · · · × · ·      |
| F              |       |       |         |                      |        |         |       |                       | F        | ×*:              |
| þ              |       |       |         |                      |        |         |       |                       | F        | k: ::: '         |
| ļ.             | _     |       |         |                      |        |         |       |                       | <u> </u> | · ×              |
| ļ.             |       |       |         |                      |        |         |       |                       | F        | ×                |
| F              |       |       |         |                      |        |         |       |                       | F        | < <sup>3</sup>   |
| F              |       |       |         |                      |        |         |       |                       | F        | : . : × :        |
| F              |       |       |         |                      |        |         |       |                       | F        | ×                |
| F              | _     |       |         |                      |        |         |       |                       | F        | < · · · · ·      |
| F              |       |       |         |                      |        |         |       |                       | F        | : ×:             |
| F              |       |       |         |                      |        |         |       |                       | F        | ×···             |
| F              |       |       |         |                      |        |         |       |                       | F        | · · · · ·        |
| F              |       |       |         |                      |        |         |       |                       | F        | ×                |
| F              | _     |       |         |                      |        |         |       |                       | <b>—</b> |                  |
| F              |       |       |         |                      |        |         |       |                       | F        | · · · ·          |
| E              |       |       |         |                      |        |         |       |                       | E        |                  |
| E              |       |       |         |                      |        |         |       |                       | E        |                  |
| E              |       |       |         |                      |        |         |       |                       | E        | ×                |
| E              | _     |       |         |                      |        |         |       |                       | E        |                  |
| Ŀ              |       |       |         |                      |        |         |       |                       | L        | · · · × ·        |
| Ŀ              |       |       |         |                      |        |         |       |                       | L        | ×*               |
| Ŀ              |       |       |         |                      |        |         |       |                       | E        | (                |
| Ŀ              |       |       |         |                      |        |         |       |                       | -        | ×                |
|                | _     |       |         |                      |        |         |       |                       | _        | × : : :          |
| t              |       |       |         |                      |        |         |       |                       | Ļ        | <b>(::::</b> ::: |
| Ŀ              |       |       |         |                      |        |         |       |                       | L        | × :              |
| <u> </u>       |       |       |         |                      |        |         |       |                       | F        | ×                |
| <u> </u>       |       |       |         |                      |        |         |       |                       | F        | <: · · ·         |
| F              | _     |       |         |                      |        |         |       |                       | -        | : . × .          |
| F              |       |       |         |                      |        |         |       |                       | F        | ×                |
| F              |       |       |         |                      |        |         |       |                       | F        | <b>(</b>         |
| F              |       |       |         |                      |        |         |       |                       | F        | . ×:             |
| F              |       |       |         |                      |        |         |       |                       | F        | ×                |
| F              | _     |       |         |                      |        |         |       |                       | F        | <b>.</b>         |
| F              |       |       |         |                      |        |         |       |                       | F        | · · · × :        |
| E              |       |       |         |                      |        |         |       |                       | E        |                  |
| F              |       |       |         |                      |        |         |       |                       | F        | î<br>(:          |
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| E              |       | 1     |         |                      |        |         |       |                       | Ł        | ×                |
| E              |       |       |         |                      |        |         |       |                       | <u> </u> | * · · · ·        |
| E              |       |       |         |                      |        |         |       |                       | <u> </u> | ×                |
| ŀ              |       | 1     |         |                      |        |         |       |                       | ţ        |                  |
| Ŀ              | _     | 1     |         |                      |        |         |       |                       | <u> </u> |                  |
| ţ              |       | 1     |         |                      |        |         |       |                       | ļ.       |                  |
| <u> </u>       |       | 1     |         |                      |        |         |       |                       | <b> </b> |                  |
| <b> </b>       |       | 1     |         |                      |        |         |       |                       | <b> </b> |                  |
| ţ              |       |       |         |                      |        |         |       |                       | ļ.       |                  |
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|                |       | 1     |         |                      |        |         |       |                       |          |                  |

Remarks (See notes & keysheets)

Equipment

Hanjin DB 10

Scale 1:25

|       | E       |           |          |              |
|-------|---------|-----------|----------|--------------|
| - 8   |         | -         | -        | -            |
|       |         | ********* | 900 A007 | ************ |
|       |         |           |          |              |
|       | ******* |           |          |              |
| 2000  |         |           |          |              |
| 6666  | ******  | ******    |          | *******      |
|       |         |           |          |              |
| ***** |         | *****     | m, m     |              |
|       |         |           | #        |              |

Project

WEST RUISLIP HIGH SPEED TWO (HS2) LIMITED Contract No. G160015U

Figure No.

ML025-RC051 (5 of 7)

13/12/2017

Drilling MethodRotary Cored **Borehole Diameter** 146mm to 31.00m

**Casing Diameter** 175mm to 2.60m

**BOREHOLE NoML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Crew/Vessel CJ/ZI

Equipment

**Dates Drilled** Start 04/01/2017 Fnd 06/01/2017

Hanjin DB 10

Logged by CJ/GDF 04/01/2017 Compiled by Checked by jm 10/01/2017 NJB 11/12/2017

|                | End  |      | 01/2017  | '            |        | 04/01/            | 2017     | 10/01/2017 11/12/2017  |      |      |
|----------------|--|------|----------|--------------|--------|-------------------|----------|--|------|------|
| Discon.<br>Ref | Depth  | Туре | Dip °    | Aper<br>ture | Infill | Roug              | hness    | Description  | Leg  | jend |
| Nei            | (m)  |      | (Deg)    | (mm)         |        | Inter-<br>mediate | Small    |  | m OD |      |
|                |  |      |          |              |        |                   |          |  |      |      |
|                | - 29.05  |      |          |              |        |                   |          | 29.05 m - Top of rock.   |      | X    |
|                | <br>- 29.57-29.63<br>-                           | J    | 90       | VT           |        | Pl                | Ro       | Planar to undulating. Incipient. With orangish brown staining.   |      |      |
| 3              | -<br>- 29.83-29.85<br>-<br>-<br>-<br>29.86-30.90 |      | 43<br>90 | T<br>VT      |        | Pl<br>Pl          | Ro<br>Ro | Planar to undulating. Clean, locally with yellowish brown and green staining. 2 No. extremely closely spaced sub-parallel fractures Planar to Undulating. Clean. |      | 3    |

Remarks

(See notes & keysheets)

Scale 1:25

|          | _        |         |            |     |
|----------|----------|---------|------------|-----|
|          |          | 9       | 879        | 679 |
|          |          | <b></b> | <b>***</b> |     |
|          | •        |         |            |     |
| 2000     |          |         |            |     |
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| 20400004 |          | ******* |            |     |

Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC051 (6 of 7)

Drilling MethodRotary Cored **Borehole Diameter** 146mm to 31.00m

**Casing Diameter** 175mm to 2.60m

**BOREHOLE NoML025-RC051** 

Coordinates (National Grid) Ground Level

507179.59 E 188653.51 N 59.98 m OD

Crew/Vessel CJ/ZI

Equipment

Dates Drilled

Start 04/01/2017 End 06/01/2017

Hanjin DB 10

Logged by CJ/GDF 04/01/2017 Compiled by Checked by NJB 10/01/2017

| Dates I        | Drilled Start<br>End         | 04/<br>06/ | 01/2017 | 7            |        | CJ/GDF<br>04/01/  |       | jm NJB<br>10/01/2017 11/12/2017   |             |
|----------------|------------------------------|------------|---------|--------------|--------|-------------------|-------|---|-------------|
| Discon.<br>Ref | Depth                        | Туре       | Dip °   | Aper<br>ture | Infill | Rougi             | nness | Description   | Legend      |
| 1101           | (m)                          |            | (Deg)   | (mm)         |        | Inter-<br>mediate | Small |   | m OD        |
|                | - 29.93<br>- 30.00-30.3<br>- | B          | 5       | VT           |        | Pl                | Ro    | Planar to undulating. Incipient. Clean.<br>Assumed zone of core loss.   | -           |
| 2              | 30.50-30.6<br>               | 50 J       | 90      | VT           |        | Pl                | Ro    | 2 No. extremely closely spaced sub-parallel fractures. Planar to undulating. With yellowish brown staining and dark grey to black specks. |             |
| 2              | - 30.75-30.9<br>-<br>-       | )O J       | 90      | VT           |        | Pl                | Ro    | 2 No. intersecting fractures. Planar to undulating. Fracture 1 is clean. Fracture 2 is with yellowish brown and black staining.           |             |
|                | Ē                            |            |         |              |        |                   |       | End of Borehole   | -           |
|                | -                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | F                            |            |         |              |        |                   |       |   | [           |
|                | F                            |            |         |              |        |                   |       |   | F           |
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|                | F                            |            |         |              |        |                   |       |   | <u> </u>    |
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|                | Ē                            |            |         |              |        |                   |       |   | -<br>-<br>- |
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|                | <u> </u>                     |            |         |              |        |                   |       |   | <u>-</u>    |
|                | Ė                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | F                            |            |         |              |        |                   |       |   | _           |
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|                | Ė                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | -                            |            |         |              |        |                   |       |   | <u>-</u>    |
|                | E                            |            |         |              |        |                   |       |   | -           |
|                | F                            |            |         |              |        |                   |       |   | F           |
|                | E                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | Ė                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | ţ.                           |            |         |              |        |                   |       |   | <u> </u>    |
|                | F                            |            |         |              |        |                   |       |   |             |
|                | E                            |            |         |              |        |                   |       |   | <u> </u>    |
|                | Ė                            |            |         |              |        |                   |       |   | ŧ l         |
|                | <u> </u>                     |            |         |              |        |                   |       |   |             |
| Remarl         |                              |            |         |              |        |                   |       |   |             |

Remarks (See notes & keysheets)

Scale 1:25

|       |                   | <br>-       | -        |
|-------|-------------------|-------------|----------|
|       |                   |             |          |
| J     | l                 | <br>        |          |
|       |                   |             |          |
|       | <b>,</b> ,,,,,,,, |             |          |
| ***** |                   | <br>univer. | ******** |
|       |                   | <br>        |          |
|       |                   | F           |          |

Project

13/12/2017

WEST RUISLIP

HIGH SPEED TWO (HS2) LIMITED

Contract No. G160015U

Figure No.

ML025-RC051 (7 of 7)

Document Title: Stability Risk Assessment - Eastern Mound - Ruislip Northern Sustainable Placement S2

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

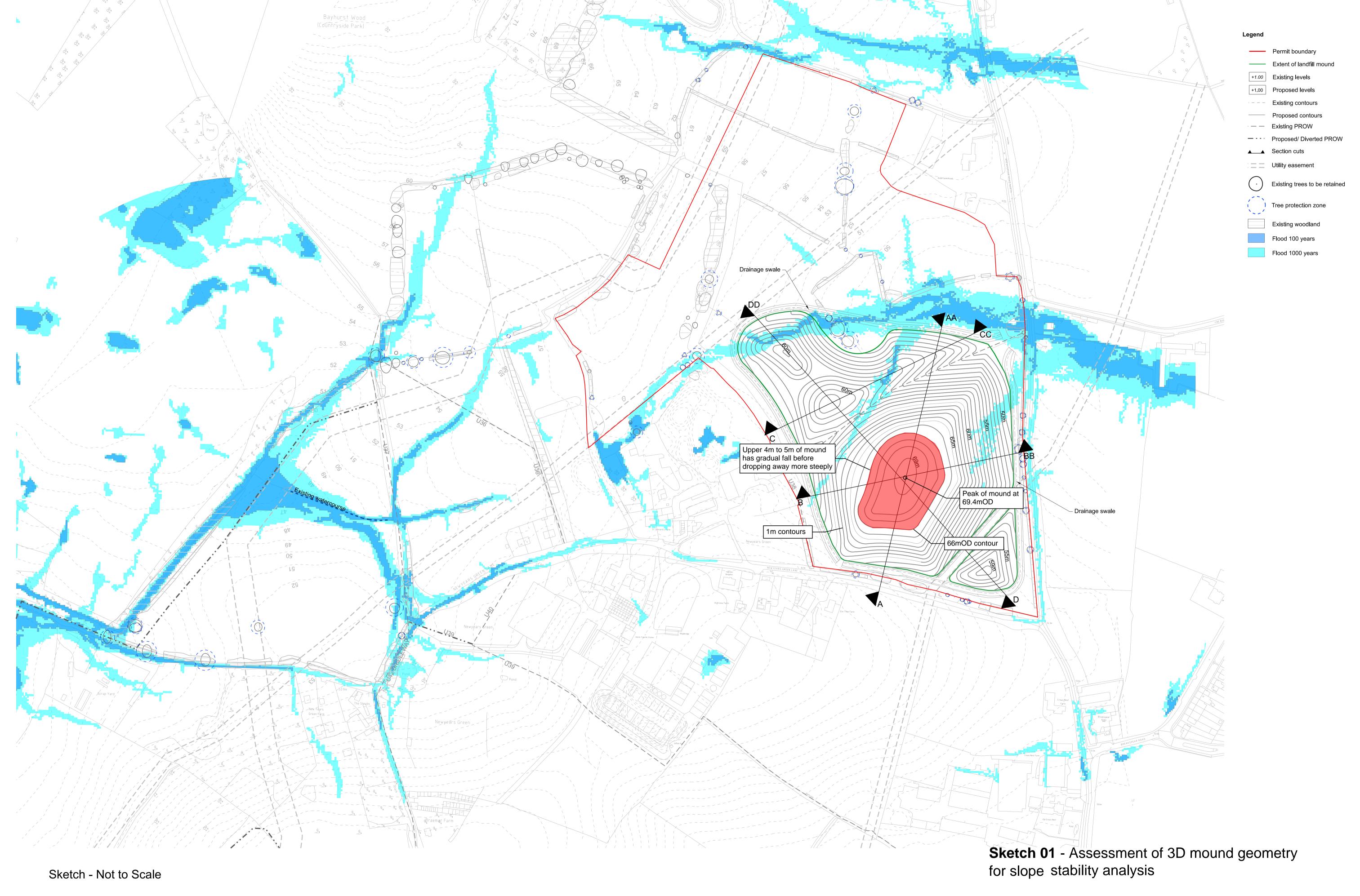
## Appendix B – Slope stability calculations

Document Title: Stability Risk Assessment - Eastern Mound - Ruislip Northern Sustainable Placement S2

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

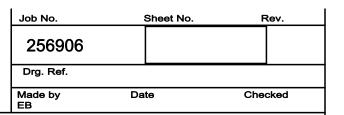
Revision: Co1

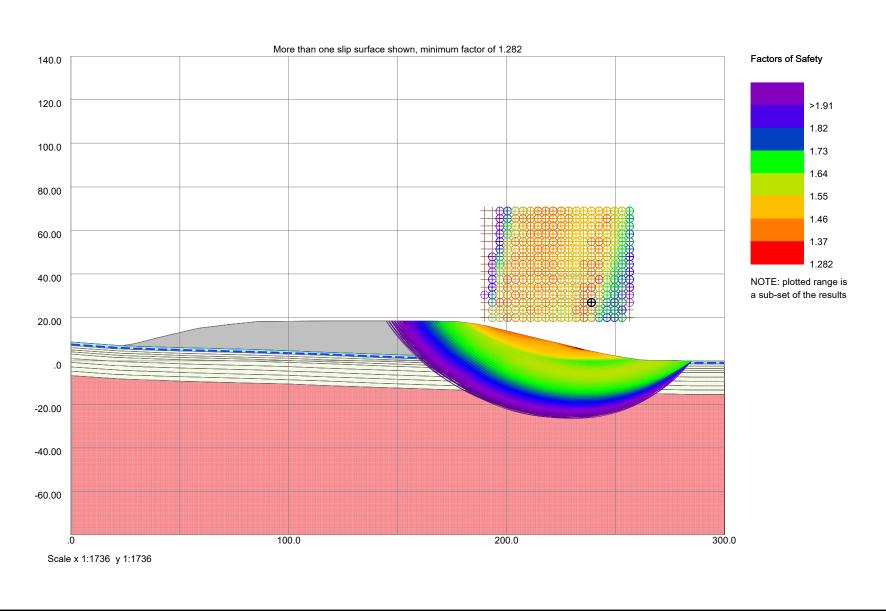
# Appendix B1 – Drained conditions



Arup

**Northern SPA** Eastern Mound - drained Section B-BB (west)





### Northern SPA

Eastern Mound - drained Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

### **General Parameters**

Direction of slip: DOWNHILL

Minimum slip weight [kN/m]: 0.00000 Type of analysis: STATIC

### **Analysis Options**

Partial Factor Analysis

Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

### **Material properties**

| No Description or c0'   | Unit W<br>Above GWL | Weight<br>Below GWL | Shear Strength Parameters Condition | Phi or      | С |
|-------------------------|---------------------|---------------------|-------------------------------------|-------------|---|
|                         | [kN/m3]             | [kN/m3]             |                                     | Phi0<br>[°] |   |
| [kN/m²]     1 Waste 0.0 | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 2 Clay Deposits         | 17.000              | 17.000              | Drained - linear strength           | 25.000      |   |
| 3 London Clay 1         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 4 London Clay 2         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 5 London Clay 3         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 6 London Clay 4         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 7 London Clay 5         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 8 London Clay 6         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 9 London Clay 7         | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 10 London Clay 8        | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 11 London Clay 9        | 19.500              | 19.500              | Drained - linear strength           | 25.000      |   |
| 12 Harwich              | 20.000              | 20.000              | Drained - linear strength           | 25.000      |   |

### Coordinates of top of soil strata

The units of the following coordinates are in m

| Stratum    | x>              | _        |          |          |        |          |          |
|------------|-----------------|----------|----------|----------|--------|----------|----------|
|            | 0.0             | 20.898   | 23.379   | 28.828   | 29.581 | 32.369   | 33.335   |
| 1          | 8.6893          | 7.2080   | 7.0791   |          | 8.1157 |          | •        |
| 2          | 8.6893          | 7.2080   | 7.0791   | 6.8704   | •      | 6.7401   | 6.7034   |
| 3          | 7.1893          | 5.7080   | 5.5791   | 5.3704   | •      | 5.2401   | 5.2034   |
| 4          | 6.1893          | 4.7080   | 4.5791   | 4.3704   | •      | 4.2401   | 4.2034   |
| 5          | 5.1893          | 3.7080   | 3.5791   | 3.3704   | •      | 3.2401   | 3.2034   |
| 6          | 4.1893          | 2.7080   | 2.5791   | 2.3704   | •      | 2.2401   | 2.2034   |
| 7          | 3.1893          | 1.7080   | 1.5791   | 1.3704   | •      | 1.2401   | 1.2034   |
| 8          | 1.1893          | -0.29200 | -0.42090 | -0.62960 | •      | -0.75990 | -0.79660 |
| 9          | -0.81070        | -2.2920  | -2.4209  | -2.6296  | •      | -2.7599  | -2.7966  |
| 10         | -2.8107         | -4.2920  | -4.4209  | -4.6296  | •      | -4.7599  | -4.7966  |
| 11         | -4.8107         | -6.2920  | -6.4209  | -6.6296  | •      | -6.7599  | -6.7966  |
| 12         | -6.8107         | -8.2920  | -8.4209  | -8.6296  | •      | -8.7599  | -8.7966  |
| GW Profile | <b>1</b> 7.6893 | 6.2080   | 6.0791   | 5.8704   |        | . 5.7401 | 5.7034   |

Arup

Northern SPA Eastern Mound - drained Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| ratum  | X>                                    |                   |                                  |                         |  |                         |                      |
|--|---------------------------------------|-------------------|----------------------------------|-------------------------|--|-------------------------|----------------------|
| 1  | 34.766                                | 35.786            | 39.364                           | <b>40.591</b><br>10.836 | <b>47.080</b><br>12.443  | 51.434                  | <b>52.355</b> 13.709 |
| 2  | 6.6573                                | 6.6276            | 6.4857                           |                         | 12.445   | 6.1039                  | 13.709               |
| 3  | 5.1573                                | 5.1276            | 4.9857                           |                         | •  | 4.6039                  | •                    |
| 4  | 4.1573                                | 4.1276            | 3.9857                           |                         | •  | 3.6039                  |                      |
| 5  | 3.1573                                | 3.1276            | 2.9857                           |                         | •  | 2.6039                  | •                    |
| 6  | 2.1573                                | 2.1276            | 1.9857                           |                         | :  | 1.6039                  | •                    |
| 7  | 1.1573                                | 1.1276            | 0.98570                          |                         | :  | 0.60390                 | •                    |
| 8  | -0.84270                              |                   |                                  |                         |  | -1.3961                 |                      |
| 9  | -2.8427                               | -2.8724           | -3.0143                          |                         | :  | -3.3961                 | •                    |
| 10   |                                       | -4.8724           |                                  |                         |  | -5.3961                 | •                    |
| 11   | -6.8427                               | -6.8724           | -7.0143                          |                         |  | -7.3961                 |                      |
| 12   | -8.8427                               | -8.8724           |                                  | •                       |  | -9.3961                 |                      |
|  | <b>1</b> 5.6573                       | 5.6276            | 5.4857                           | •                       |  | . 5.1039                | •                    |
| atum   | x>                                    |                   |                                  |                         | •  |                         |                      |
|  | 56.933                                | 59.521            | 66.317                           | 73.606                  | 78.893   | 85.003                  | 85.461               |
| 1  | 14.621                                |                   |                                  |                         | 17.505   | •                       | 18.116               |
| 2  |                                       |                   |                                  |                         |  | 5.2282                  |                      |
| 3  |                                       | •                 | •                                | •                       | •  | 3.7282                  |                      |
| 4  |                                       |                   |                                  | •                       | •  | 2.7282                  |                      |
| 5  |                                       | •                 | •                                |                         | •  | 1.7282                  | •                    |
| 6  |                                       |                   |                                  |                         |  | 0.72820                 |                      |
| 7  |                                       | •                 | •                                | •                       | •  | -0.27180                | •                    |
| 8  |                                       | •                 |                                  |                         | •  | -2.2718                 |                      |
| 9  |                                       | •                 | •                                |                         | •  | -4.2718                 |                      |
| 10   |                                       | •                 | •                                | •                       | •  | -6.2718                 |                      |
| 11   | •                                     | •                 |                                  | •                       |  | -8.2718                 | •                    |
| 12   | •                                     | •                 | •                                |                         |  | -10.272                 |                      |
| Profile  | 1                                     | -                 |                                  |                         |  | . 4.2282                |                      |
| ratum  | x>                                    |                   |                                  |                         |  |                         |                      |
| 1  | 99.536                                | 115.65            | <b>118.48</b><br>18 <b>.</b> 516 | <b>121.49</b><br>18.516 | <b>127.57</b><br>18.516  | <b>132.45</b><br>18.516 | 141.16               |
| 2  | •<br>4 7505                           | 4 1510            |                                  |                         |  |                         | . 2210               |
| 3  | 4.7505                                | 4.1518            | •                                | •                       | •  | •                       | 3.2210               |
| 3<br>4   | 3.2505                                | 2.6518            | •                                | •                       | •  | •                       | 1.7210               |
|  | 2.2505                                | 1.6518            | •                                | •                       | •  | •                       | 0.72100              |
| 5<br>6   | 1.2505                                | 0.65180           | •                                | •                       |  | •                       | -0.2790              |
| 7  | 0.25050                               | -0.34820          | •                                | •                       | •  | ·<br>·                  | -1.2790              |
| 8  | -0.74950                              | -1.3482           | •                                | •                       | •  | •                       | -2.2790              |
|  | -2.7495                               | -3.3482           | •                                | •                       |  |                         | -4.2790              |
| 9  | -4.7495                               | -5.3482           | •                                | •                       |  |                         | -6.2790<br>-8.2790   |
| 10<br>11   | -6.7495                               | -7.3482           | •                                | •                       |  | •                       |                      |
| 12   | -8.7495                               | -9.3482           | •                                | •                       | •  | •                       | -10.279              |
|  | -10.750<br><b>1</b> 3.7505            | -11.348<br>3.1518 | •                                | •                       | •  | •                       | -12.279<br>. 2.2210  |
| atum   | X>                                    | 3.1518            |                                  | •                       | •  | •                       | . 2.2210             |
| acum   | 144.70                                | 144.70            | 152 01                           | 162 49                  | 172.17   | 177 64                  | 185.66               |
|  | 177.70                                |                   |                                  | 18.516                  |  |                         |                      |
| 1  | 18 516                                | 18 516            |                                  |                         |  | 18 116                  |                      |
| 1<br>2   | 18.516                                |                   | 18.516                           |                         |  | 18.116                  |                      |
| 2  | 18.516                                | 18.516            |                                  |                         | 2.1856   | •                       | •                    |
| 2<br>3   |                                       |                   |                                  |                         | 2.1856<br>0.68560  |                         |                      |
| 2<br>3<br>4  |                                       |                   |                                  | :<br>:                  | 2.1856<br>0.68560<br>-0.31440  | ·<br>·                  |                      |
| 2<br>3<br>4<br>5   |                                       |                   |                                  | ·<br>·<br>·             | 2.1856<br>0.68560<br>-0.31440<br>-1.3144   | ·<br>·<br>·             |                      |
| 2<br>3<br>4<br>5<br>6  |                                       |                   |                                  | · · · · ·               | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144  | · · · ·                 |                      |
| 2<br>3<br>4<br>5<br>6<br>7   |                                       |                   | · · · · · · ·                    | ·<br>·<br>·<br>·        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144   | · · · · · ·             |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8  |                                       |                   |                                  | · · · · · · · ·         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144  | · · · · · · ·           |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   |                                       |                   | · · · · · · ·                    | :<br>:<br>:<br>:<br>:   | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   |                                       |                   | · · · · · · ·                    | · · · · · · · ·         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-5.3144<br>-5.3144<br>-7.3144<br>-9.3144  |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   |                                       |                   | · · · · · · ·                    | :<br>:<br>:<br>:<br>:   | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12   | · · · · · · · · · · · · · · · · · · · |                   | · · · · · · ·                    | :<br>:<br>:<br>:<br>:   | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314  |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile  |                                       |                   | · · · · · · ·                    | :<br>:<br>:<br>:<br>:   | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile  |                                       |                   | · · · · · · ·                    | :<br>:<br>:<br>:<br>:   | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314  |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile  |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile  |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile  |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856   |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum   |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>.0.89880<br>-0.60120  |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4   |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>.0.89880<br>-0.60120<br>-1.6012  |                         |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum   |                                       |                   |                                  | 216.26<br>9.9809        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>0.89880<br>-0.60120<br>-1.6012<br>-2.6012  | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4<br>5  |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-7.3144<br>-7.3144<br>-11.314<br>-11.314<br>-11.314<br>-11.6012<br>-1.6012<br>-2.6012<br>-3.6012   | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4<br>5<br>6   |                                       |                   |                                  |                         | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-7.3144<br>-7.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>0.89880<br>-0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012                                   | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8   |                                       |                   |                                  | 216.26<br>9.9809        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-7.3144<br>-7.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>.0.89880<br>-0.60120<br>-1.6012<br>-2.6012<br>-2.6012<br>-4.6012<br>-6.6012                       | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7  |                                       |                   | 200.18                           | 216.26<br>9.9809        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>.0.89880<br>-0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-4.6012<br>-8.6012 | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>eatum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>9   |                                       |                   |                                  | 216.26<br>9.9809        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-3.3144<br>-7.3144<br>-7.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>.0.89880<br>-0.60120<br>-1.6012<br>-2.6012<br>-2.6012<br>-4.6012<br>-6.6012                       | 222.93<br>8.3921        |                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Profile<br>ratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>12<br>12<br>12<br>12<br>12<br>14<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18 |                                       |                   | 200.18                           | 216.26<br>9.9809        | 2.1856<br>0.68560<br>-0.31440<br>-1.3144<br>-2.3144<br>-5.3144<br>-7.3144<br>-9.3144<br>-11.314<br>-13.314<br>.1.1856<br>218.03<br>0.89880<br>-0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-4.6012<br>-8.6012<br>-10.601  | 222.93<br>8.3921        |                      |

### Arup

### Northern SPA

Eastern Mound - drained Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           | -       |
| Made by<br>EB | Date      | Checked |

| Stratum      | x>     |         |         |        |        |        |          |
|--------------|--------|---------|---------|--------|--------|--------|----------|
|              | 230.21 | 232.54  | 236.31  | 246.23 | 248.97 | 251.04 | 252.69   |
| 1            | 6.6974 | 6.1157  | 5.1157  | 3.1157 | 2.5294 | 2.1157 |          |
| 2            |        |         | •       | •      |        |        | 0.57650  |
| 3            |        |         |         | •      | •      |        | -0.92350 |
| 4            |        |         |         |        |        |        | -1.9235  |
| 5            |        |         |         |        |        |        | -2.9235  |
| 6            |        |         |         |        |        |        | -3.9235  |
| 7            |        |         |         |        |        |        | -4.9235  |
| 8            | •      | •       | •       | •      | •      | •      | -6.9235  |
| 9            | •      | •       | •       | •      | •      | •      | -8.9235  |
| 10           | •      | •       | •       | •      | •      | •      | -10.924  |
| 11           | •      | •       | •       |        |        | •      | -12.924  |
| 12           | •      | •       | •       |        |        | •      | -14.924  |
| GW Profile 1 |        | •       |         | •      | •      | •      | 0.42350  |
| Stratum      | X>     |         |         |        |        |        |          |
|              | 255.13 | 262.54  | 285.08  |        |        |        |          |
| 1            | 1.4450 | 0.45890 | 0.0     |        |        |        |          |
| 2            | •      | 0.45890 | 0.0     |        |        |        |          |
| 3            | •      | -1.0411 | -1.5000 |        |        |        |          |
| 4            |        | -2.0411 | -2.5000 |        |        |        |          |
| 5            | •      | -3.0411 | -3.5000 |        |        |        |          |
| 6            |        | -4.0411 | -4.5000 |        |        |        |          |
| 7            |        | -5.0411 | -5.5000 |        |        |        |          |
| 8            |        | -7.0411 | -7.5000 |        |        |        |          |
| 9            |        | -9.0411 | -9.5000 |        |        |        |          |
| 10           | •      | -11.041 | -11.500 |        |        |        |          |
| 11           | •      | -13.041 | -13.500 |        |        |        |          |
| 12           | •      | -15.041 | -15.500 |        |        |        |          |
| GW Profile 1 |        | 0.54110 | -1.0000 |        |        |        |          |

### **Piezometers**

### Stratum-linked data

| Othata | iii iiiikoa aata |              |                     |
|--------|------------------|--------------|---------------------|
| No.    | Material         | Water table  | Piezo Set/ Ru value |
| 1      | Waste            | -            | 0.10000             |
| 2      | Clay Deposits    | GW Profile 1 | _                   |
| 3      | London Clay 1    | GW Profile 1 | _                   |
| 4      | London Clay 2    | GW Profile 1 | _                   |
| 5      | London Clay 3    | GW Profile 1 | _                   |
| 6      | London Clay 4    | GW Profile 1 | _                   |
| 7      | London Clay 5    | GW Profile 1 | _                   |
| 8      | London Clay 6    | GW Profile 1 | _                   |
| 9      | London Clay 7    | GW Profile 1 | _                   |
| 10     | London Clay 8    | GW Profile 1 | _                   |
| 11     | London Clay 9    | GW Profile 1 | _                   |
| 12     | Harwich          | GW Profile 1 | _                   |
|        |                  |              |                     |

### Slip Surface Specification

Circle centre specification: GRID Bottom left of grid: x = 190.00000 m y = 20.00000 m Inclination of grid: 0.00000 deg (positive anticlockwise direction about bottom left of grid) Centres on grid: 20 in x direction at 3.50000m spacing 15 in y direction at 3.50000m spacing Initial radius of circle 5.00000 m Incremented by 1.00000 m until all possible circles considered

### **WORST CASE**

Centre at (239.00m,27.000m) Radius 22.000m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 302.36E-6 Slip weight [kN/m] 10.395 Net horiz force [kN/m]: 0.0011615 Disturbing moment [kN/m]: 57.623 Restoring moment [kNm/m]: 73.846 Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 1.2815

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

**Arup** 

Northern SPA Eastern Mound - drained Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           | ·       |
| Made by<br>EB | Date      | Checked |

| Slip   | surface                              | coordinates   | Pore Pres  | sure   | Interslice  | e forces [kN   | /m]  |  |
|--|--------------------------------------|---|--|--|---|--|--|--|
|  |                                      |   |  |  |   |  |  |  |
|  |                                      | <b>'-</b> 1 6.4256  |  |  |   |  | 770 472.47E-6  |  |
| 3  | 231.37                               | 6.3640  | 0.083042   | 0.083042   | 0.0023477   | 0.014  | 684 0.0017682  |  |
| 4  | 231.54                               | 6.3036  | 0.12035  | 0.12035  | 0.0062488   | 0.030  | 669 0.0037138  |  |
|  | 231.71                               |   |  |  | 0.011263  |  | 561 0.0061471  |  |
|  | 231.87                               |   |  |  | 0.016939  |  | 080 0.0089192  |  |
|  | 232.04                               |   |  |  | 0.022881  |  | 038 0.011893   |  |
|  | 232.21                               |   |  |  | 0.028747  |  | 133 0.014942   |  |
|  |                                      |   |  |  |   |  |  |  |
|  | 232.37                               |   |  |  | 0.034248  |  | 496 0.017953   |  |
|  | 232.54                               |   |  |  | 0.039150  | 0.16   |  |  |
| 11   | 232.73                               | 5.9134  | 0.29843  | 0.29843  | 0.043837  | 0.18   | 838 0.022836   |  |
| 12   | 232.91                               | 5.8590  | 0.30842  | 0.30842  | 0.047313  | 0.20   | 566 0.024391   |  |
| 13   | 233.10                               | 5.8062  | 0.31497  | 0.31497  | 0.049504  | 0.21   | 831 0.025437   |  |
|  | 233.29                               |   |  |  | 0.050389  |  |  |  |
|  | 233.47                               |   |  |  | 0.049995  |  |  |  |
|  |                                      |   |  |  |   |  |  |  |
|  | 233.66                               | 5.6576  |  |  | 0.048397  |  |  |  |
|  | 233.85                               | 5.6114  |  |  | 0.045709  |  |  |  |
| 18   | 234.04                               | 5.5668  | 0.29600  | 0.29600  | 0.042078  | 0.20   | 411 0.022466   |  |
| 19   | 234.23                               | 5.5240  | 0.28187  | 0.28187  | 0.037683  | 0.18   | 662 0.020373   |  |
| 20   | 234.42                               | 5.4827  | 0.26430  | 0.26430  | 0.032725  | 0.16   | 536 0.017912   |  |
|  | 234.61                               | 5.4432  |  |  | 0.027423  |  | 119 0.015177   |  |
|  | 234.80                               | 5.4053  |  |  | 0.022011  |  | 515 0.012279   |  |
|  | 234.99                               |   |  |  | 0.016725  |  | 442 0.0093487  |  |
|  |                                      |   |  |  | 0.011808  |  |  |  |
|  | 235.18                               |   |  |  |   |  | 500 0.0065330  |  |
|  | 235.37                               |   |  |  | 0.0074924   |  | 913 0.0039973  |  |
|  | 235.56                               |   |  |  | 0.0040024   |  | 477 0.0019259  |  |
| 27   | 235.75                               | 5.2411  | 0.045044   | 0.045044   | 0.0015445   | 0.0061   | 697 520.24E-6  |  |
| 28   | 235.94                               | 5.2133  | 0.0  | _  | 302.36E-6   | 0.0011   | 615 0.0  |  |
|  |                                      |   |  |  |   |  |  |  |
| Slice  | Strengt                              | th Parameter  | s Average  | Slice  | Forces or   | n base [kN/m   | 1  |  |
| No.  |                                      |   | Pore   | Weight   |   | . Just Land  | •  |  |
| мо.  |                                      |   |  | _  |   |  |  |  |
|  |                                      |   | Pressure   |  | -   | <b>a</b> 1   | <b>a</b> 1   |  |
|  | c'                                   | Tan phi   | [kN/m <sup>2</sup> ]   | [kN/m]   | Normal  |  | Shear  |  |
|  | $[kN/m^2]$                           | ]   |  |  |   | (capacity)   | (mobilised)  |  |
| 1  | 0.0                                  | 0.3730  | 5 0.021463   | 0.035268   | 3 0.034287  | 0.011381   | 0.0088812  |  |
| 2  |                                      |   |  |  | 1 0.098854  |  | 0.025549   |  |
| 3  |                                      |   |  |  | 2 0.15974   | 0.052915   | 0.041290   |  |
| 4  |                                      |   |  |  | 0.21685   | 0.071861   | 0.056074   |  |
|  |                                      |   |  |  |   |  |  |  |
| 5  |                                      |   |  |  | 3 0.27007   | 0.089546   | 0.069874   |  |
| 6  |                                      |   |  |  | 9 0.31940   | 0.10596  | 0.082681   |  |
| 7  | 0.0                                  | 0.3730  | 5 0.22838  | 0.38176  | 6 0.36465   | 0.12104  | 0.094447   |  |
| 8  |                                      |   |  |  | 0.40576   | 0.13476  | 0.10515  |  |
| 9  |                                      |   |  |  | 0.44270   | 0.14711  | 0.11479  |  |
|  |                                      |   |  |  |   |  |  |  |
| 10   |                                      |   |  |  | 0.51984   | 0.17283  | 0.13486  |  |
| 11   |                                      |   |  |  | 0.54327   | 0.18072  | 0.14102  |  |
| 12   |                                      |   |  |  | 0.56073   | 0.18664  | 0.14563  |  |
| 13   | 0.0                                  | 0.3730  | <i>5</i> 0.31652   | 0.59183  | 3 0.57199   | 0.19049  | 0.14864  |  |
| 14   |                                      |   |  |  | 0.57702   | 0.19226  | 0.15003  |  |
| 15   |                                      |   | 5 0.31582  |  | 7 0.57572   | 0.19193  | 0.14977  |  |
|  |                                      |   |  |  |   |  |  |  |
| 16   |                                      |   |  |  | 9 0.56801   | 0.18945  | 0.14783  |  |
| 17   |                                      |   | 5 0.30134  |  | 2 0.55383   | 0.18481  | 0.14421  |  |
| 18   |                                      |   |  |  | 1 0.53309   | 0.17797  | 0.13888  |  |
| 19   | 0.0                                  | 0.3730  | 5 0.27309  | 0.51729  | 9 0.50579   | 0.16893  | 0.13182  |  |
| 20   | 0.0                                  | 0.3730  | 5 0.25380  | 0.48168  | 0.47180   | 0.15765  | 0.12302  |  |
| 21   |                                      |   | 5 0.23106  |  | 7 0.43102   | 0.14408  | 0.11243  |  |
| 22   |                                      |   | 5 0.20489  |  | 0.38355   | 0.12826  | 0.10009  |  |
| 23   |                                      |   |  |  |   |  | 0.085945   |  |
|  |                                      |   | 5 0.17528  |  | 5 0.32923   | 0.11014  |  |  |
| 24   |                                      |   | n 1/122/   | 0.27176  | 6 0.26809   | 0.089722   | 0.070012   |  |
|  |                                      |   |  |  |   |  |  |  |
| 25   | 0.0                                  | 0.3730  | 5 0.10576  |  |   | 0.066978   | 0.052264   |  |
| 26   | 0.0                                  | 0.3730  | 5 0.10576  |  | 0.20005<br>0.12512  | 0.066978<br>0.041914   | 0.052264 0.032706  |  |
|  | 0.0                                  | 0.3730<br>0.3730  | 5 0.10576<br>5 0.065855  | 0.12618  |   |  |  |  |
| 26   | 0.0                                  | 0.3730<br>0.3730  | 5 0.10576<br>5 0.065855  | 0.12618  | 0.12512   | 0.041914   | 0.032706   |  |
| 26<br>27   | 0.0<br>0.0                           | 0.3730<br>0.3730  | 5 0.10576<br>5 0.065855<br>5 0.022522  | 0.12618<br>2 0.043208  | 8 0.12512<br>8 0.043274   | 0.041914   | 0.032706<br>0.011326   |  |
| 26<br>27<br><b>Slice</b>   | 0.0<br>0.0                           | 0 0.3730<br>0 0.3730<br>0 0.3730  | 5 0.10576<br>5 0.065855<br>5 0.022522  | 0.12618<br>2 0.043208  | 8 0.12512<br>8 0.043274<br>[kN/m] V   | 0.041914<br>0.014515<br>Water Pressu   | 0.032706<br>0.011326<br>re on  |  |
| 26<br>27   | 0.0<br>0.0<br>0.0                    | 0 0.3730<br>0 0.3730<br>0 0.3730<br>• Load [kN/m  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208  | 9 0.12512<br>9 0.043274<br>[kN/m] V   | 0.041914<br>0.014515<br>Water Pressuground surfa   | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]   |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>0.0<br>Surface         | 0 0.3730<br>0 0.3730<br>0 0.3730<br>• Load [kN/m  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>pint Load   | 9 0.12512<br>9 0.043274<br>[kN/m] V<br>Goriz N  | 0.041914<br>0.014515<br>Water Pressurground surfa-<br>Jert Ho  | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]   |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>2 Load [kN/m<br>Horiz   | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>0.043208<br>0.043208  | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Gariz V  | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho.<br>0.0  | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz  |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>Surface<br>Vert        | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m<br>Horiz<br>0.0  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>0.043208<br>0.043208<br>0.0<br>0.0  | 3 0.12512<br>3 0.043274<br>[kN/m] V<br>GHORIZ V<br>0.0<br>0.0                                     | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0  | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0  |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>2 Load [kN/m<br>Horiz   | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>0.043208<br>0.043208  | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Gariz V  | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho.<br>0.0  | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz  |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m<br>Horiz<br>0.0  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>0.043208<br>0.043208<br>0.0<br>0.0  | 3 0.12512<br>3 0.043274<br>[kN/m] V<br>GHORIZ V<br>0.0<br>0.0                                     | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0  | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0  |  |
| 26<br>27<br><b>Slice</b><br><b>No</b> .  | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m,<br>Horiz<br>0.0<br>0.0  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>pint Load<br>ert F<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0   | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0                             | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0<br>0.0<br>0.0                            | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0  |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4<br>5                                    | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m<br>Horiz<br>0.0<br>0.0<br>0.0  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>2.0.043208<br>pint Load  ert  0.0  0.0  0.0  0.0  0.0  0.0  0.0   | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz V<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                 | 0.041914<br>0.014515<br>Nater Pressu<br>ground surfa<br>Vert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                    | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0  |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4<br>5<br>6                               | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m,<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0  | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>2.0.043208<br>2.0.043208<br>2.0.043208<br>2.0.043208<br>2.0.00<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0  | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz V<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0          | 0.041914<br>0.014515<br>Nater Pressu<br>ground surfa<br>Vert Ho<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0              | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                            |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4<br>5<br>6<br>7                          | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0   | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>Dint Load  Dint Load  O.0  O.0  O.0  O.0  O.0  O.0  O.0  O.   | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>Vert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                     |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b> 1 2 3 4 5 6 7 8   | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>Load [kN/m,<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.                 | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>2.0.043208<br>2.0.043208<br>2.0.043208<br>2.0.043208<br>2.0.00<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0  | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz V<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0          | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                     |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4<br>5<br>6<br>7                          | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0   | 5 0.10576<br>5 0.065855<br>5 0.022522<br>_hor/m] Pc                                    | 0.12618<br>0.043208<br>Dint Load  Dint Load  O.0  O.0  O.0  O.0  O.0  O.0  O.0  O.   | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>Vert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                     |  |
| 26<br>27<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9      | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>E Load [kN/m]<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.               | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  Ve  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | oint Load  oint Load  oint Solution  oint Load  oint Solution  oin | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.               |  |
| 26<br>27<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9                    | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>E Load [kN/m]<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.               | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  | oint Load  oint Load  oint 0.0   | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0              |  |
| 26<br>27<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>8<br>9          | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>E Load [kN/m]<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.               | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  Ve  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | oint Load  oint Load  oint 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0       |  |
| 26<br>27<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>10<br>11        | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m,<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0     | oint Load  oint Load  oint Solution  oint Load  oint Solution  oin | ## 0.12512<br>## 0.043274<br>  kN/m   V   C   C   C   C   C   C   C   C   C                       | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0                               |  |
| 26<br>27<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13 | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730 0.3730 0.3730 0.3730 0.3730 0.03730 0.00 0.0   | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0     | oint Load  oint Load  oint Solution  oint Load  oint Solution  oin | 8 0.12512<br>8 0.043274<br>[kN/m] V<br>Horiz 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>Vert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. |  |
| 26<br>27<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11             | 0.0<br>0.0<br>0.0<br>Surface<br>Vert | 0.3730<br>0.3730<br>0.3730<br>0.3730<br>• Load [kN/m,<br>Horiz<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 5 0.10576 5 0.065855 5 0.022522  _hor/m] Pc  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0     | oint Load  oint Load  oint Solution  oint Load  oint Solution  oin | ## 0.12512<br>## 0.043274<br>  kN/m   V   C   C   C   C   C   C   C   C   C                       | 0.041914<br>0.014515<br>Water Pressu<br>ground surfa<br>/ert Ho.<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0 | 0.032706<br>0.011326<br>re on<br>ce [kN/m_hor/m]<br>riz  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0                               |  |

Arup

Northern SPA Eastern Mound - drained Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | •         |         |
| Made by<br>EB | Date      | Checked |

| Slice | Surface Load | [kN/m_hor/m] | Point Load | [kN/m] | Water Pressure | on  |
|-------|--------------|--------------|------------|--------|----------------|-----|
| 15    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
|       |              |              |            |        |                |     |
| 16    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 17    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 18    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 19    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 20    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 21    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 22    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 23    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 24    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 25    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 26    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 27    | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |

Document Title: Stability Risk Assessment - Eastern Mound - Ruislip Northern Sustainable Placement S2

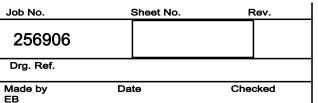
Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

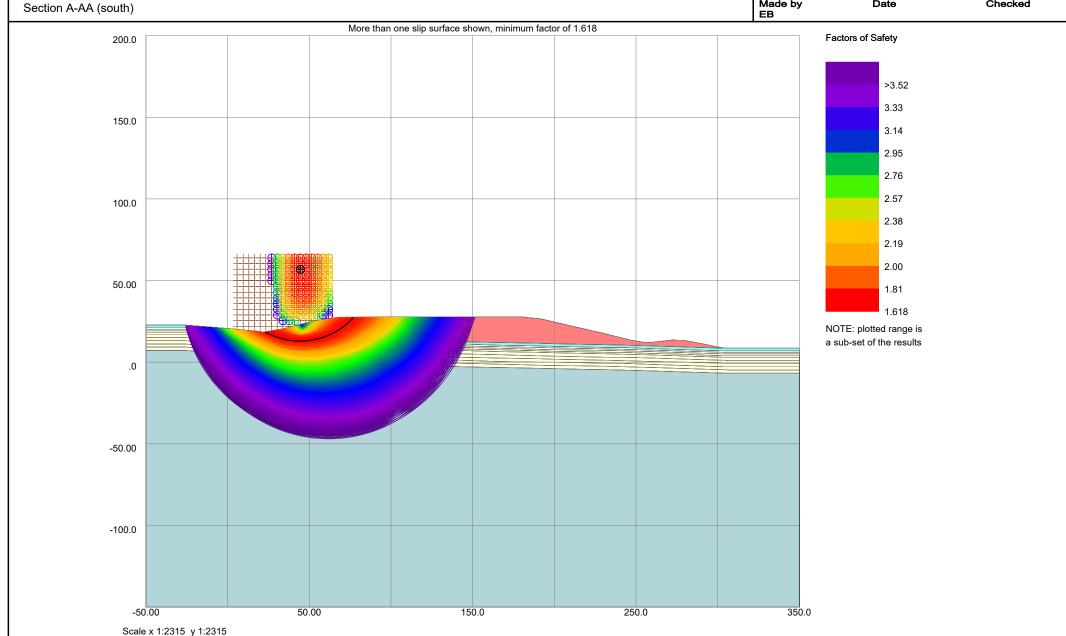
Revision: Co1

# Appendix B2 – Undrained conditions

# ARUP Arup

**Northern SPA**Eastern Mound - Undrained





#### **Northern SPA**

Eastern Mound - Undrained Section A-AA (south)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | <u> </u>  |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m] : 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'     |         | Weight<br>Below GWL | 3           | Phi or      | с |
|---------------------------|---------|---------------------|-------------|-------------|---|
|                           | [kN/m3] | [kN/m3]             |             | Phi0<br>[°] |   |
| [kN/m <sup>2</sup> ]      |         |                     |             |             |   |
| 1 Waste                   | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 50.000                    |         |                     |             |             |   |
| 2 Clay Deposits           | 17.000  | 17.000              | Undrained   | N.A.        |   |
| 30.000                    |         |                     |             |             |   |
| 3 London Clay 1           | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 43.250                    |         |                     |             |             |   |
| 4 London Clay 2           | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 49.750                    |         |                     |             |             |   |
| 5 London Clay 3           | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 56.250                    | 40.500  | 40.500              |             |             |   |
| 6 London Clay 4           | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 62.750                    | 10.500  | 10 500              | TT - d l d  | 37. 3       |   |
| 7 London Clay 5<br>72.500 | 19.500  | 19.500              | Undrained   | N.A.        |   |
|                           | 19.500  | 10 500              | Undrained   | N.A.        |   |
| 8 London Clay 6<br>85.500 | 19.500  | 19.500              | Ulidiailled | N.A.        |   |
| 9 London Clay 7           | 19.500  | 19 500              | Undrained   | N.A.        |   |
| 98.500                    | 19:300  | 17.500              | Ulidiailled | N.A.        |   |
| 10 London Clay 8          | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 111.50                    | 13.000  | 23.000              | onararii oa |             |   |
| 11 London Clay 9          | 19.500  | 19.500              | Undrained   | N.A.        |   |
| 124.50                    |         |                     |             |             |   |
| 12 Harwich                | 20.000  | 20.000              | Undrained   | N.A.        |   |
| 130.00                    |         |                     |             |             |   |
|                           |         |                     |             |             |   |

### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathtt{m}}$ 

| Stratum | 1 X>    | _       |        |        |        |        |        |
|---------|---------|---------|--------|--------|--------|--------|--------|
|         | -25.990 | -13.434 | 2.9935 | 12.353 | 16.539 | 19.617 | 22.041 |
| 1       | 22.764  | 21.893  | 20.594 | 19.594 | 19.220 | 18.936 | 18.712 |
| 2       | 22.764  | 21.893  | 20.594 | 19.594 | 19.220 | 18.936 | 18.712 |
| 3       | 21.264  | 20.393  | 19.094 | 18.094 | 17.720 | 17.436 | 17.212 |
| 4       | 20.264  | 19.393  | 18.094 | 17.094 | 16.720 | 16.436 | 16.212 |
| 5       | 19.264  | 18.393  | 17.094 | 16.094 | 15.720 | 15.436 | 15.212 |
| 6       | 18.264  | 17.393  | 16.094 | 15.094 | 14.720 | 14.436 | 14.212 |
| 7       | 17.264  | 16.393  | 15.094 | 14.094 | 13.720 | 13.436 | 13.212 |
| 8       | 15.264  | 14.393  | 13.094 | 12.094 | 11.720 | 11.436 | 11.212 |
| 9       | 13.264  | 12.393  | 11.094 | 10.094 | 9.7202 | 9.4358 | 9.2119 |
| 10      | 11.264  | 10.393  | 9.0940 | 8.0940 | 7.7202 | 7.4358 | 7.2119 |
| 11      | 9.2635  | 8.3926  | 7.0940 | 6.0940 | 5.7202 | 5.4358 | 5.2119 |
| 12      | 7.2635  | 6.3926  | 5.0940 | 4.0940 | 3.7202 | 3.4358 | 3.2119 |
| Stratum | 1 X>    |         |        |        |        |        |        |

### ARUP

**Arup** 

Northern SPA

Eastern Mound - Undrained Section A-AA (south)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
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|         | 32.403         | 33.593                           | 41.700           | 53.852   | 59.260                           | 60.113                  | 68.027   |
|---------|----------------|----------------------------------|------------------|----------|----------------------------------|-------------------------|----------|
| 1       |                | 20.594                           | 22.594           | 25.594   | •                                | 26.616                  | 27.594   |
| 2       | 17.896         |                                  |                  |          | 16.165                           | •                       |          |
| 3       | 16.396         |                                  |                  |          | 14.665                           |                         |          |
| 4       | 15.396         |                                  |                  |          | 13.665                           |                         |          |
| 5       | 14.396         |                                  |                  |          | 13.665<br>12.665                 |                         |          |
| 6       | 13.396         |                                  |                  |          |                                  |                         |          |
| 7       | 12.396         |                                  |                  |          | 11.665<br>10.665                 | •                       | •        |
| 8       | 10.396         |                                  | •                |          | 8 6648                           |                         | •        |
| 9       | 8.3957         |                                  |                  | •        | 6.6648                           | •                       | •        |
| 10      | 6.3957         | •                                | •                | •        | 4.6648                           | •                       | •        |
| 11      |                | •                                |                  |          | 2.6648                           |                         | •        |
|         | 4.3957         | •                                |                  |          |                                  |                         | •        |
| 12      | 2.3957         | •                                | •                | •        | 0.66480                          | •                       | •        |
| stratum | n X><br>70.780 | 81.062                           | 101.60           | 100 01   | 110 63                           | 120.09                  | 122.32   |
| 1       |                |                                  | 101.60           | 27 004   | <b>119.63</b><br>27 <b>.</b> 994 | 27 004                  |          |
| 2       | 15.549         | 15.129                           | 14.128           | 21.994   | 27.994                           | 27.994                  | 13.324   |
|         |                |                                  |                  | •        | •                                | •                       |          |
| 3       | 14.049         | 13.629                           | 12.628           | •        | •                                |                         | 11.824   |
| 4       | 13.049         | 12.629                           | 11.628           | •        | •                                | •                       | 10.824   |
| 5       | 12.049         | 11.629                           | 10.628           | •        | •                                |                         | 9.8240   |
| 6       | 11.049         | 10.629                           | 9.6284           | •        |                                  |                         | 8.8240   |
| 7       | 10.049         | 10.629<br>9.6291                 | 8.6284           | •        | •                                | ·<br>·                  | 7.8240   |
| 8       | 8.0494         | 7.6291                           | 6.6284           | •        |                                  |                         | 5.8240   |
| 9       | 6.0494         | 7.6291<br>5.6291                 | 4.6284           |          |                                  |                         | 3.8240   |
| 10      | 4 0494         | 3 6291                           | 2 6284           | •        |                                  |                         | 1.8240   |
| 11      | 2.0494         | 1.6291                           | 0.62840          |          | •                                | •                       | -0.17600 |
| 12      | 0.049400       |                                  |                  | •        |                                  | •                       | -2.1760  |
|         | n X>           | 0.07000                          | 1.0/10           |          |                                  |                         |          |
| uu      |                | 135 71                           | 136.60           | 143 05   | 144 38                           | 154 68                  | 163.59   |
| 1       | 131.13         | <b>135.71</b><br>27 <b>.</b> 994 | 136.60           | 143.05   | 27 00/                           | <b>154.68</b><br>27.994 | 27.994   |
| 2       | 13.041         | 27.994                           |                  |          | 41.774                           | 21.994                  | 41.774   |
|         |                |                                  | 12.865<br>11.365 | 12.678   | •                                | •                       | •        |
| 3       | 11.541         | •                                |                  |          | •                                | •                       | •        |
| 4       | 10.541         | •                                | 10.365<br>9.3652 | 10.178   | •                                |                         | •        |
| 5       | 9.5410         | •                                |                  |          | •                                | •                       | •        |
| 6       | 8.5410         | •                                | 8.3652           | 8.1783   |                                  |                         |          |
| 7       | 7.5410         |                                  | 7.3652           |          |                                  | •                       |          |
| 8       | 5.5410         | •                                | 5.3652<br>3.3652 | 5.1783   |                                  |                         |          |
| 9       | 3.5410         |                                  | 3.3652           | 3.1783   |                                  |                         |          |
| 10      | 1.5410         |                                  | 1 3652           | 1 1703   |                                  |                         |          |
| 11      | -0.45900       |                                  | -0.63480         | -0.82170 | •                                |                         |          |
| 12      | -2.4590        |                                  | -2.6348          | -2.8217  |                                  |                         |          |
|         | n X>           | •                                |                  |          | -                                | -                       | -        |
|         | 164.91         | 172,19                           | 179.60           | 185.60   | 188.89                           | 190.60                  | 192.70   |
| 1       | 104.91         | <b>172.19</b><br>27 <b>.</b> 994 | 27.862           | 27 295   | <b>188.89</b><br>26 <b>.</b> 996 |                         | 26.594   |
| 2       | 12.140         |                                  |                  | 41.433   | 20.990                           |                         |          |
| 3       |                | •                                | •                |          |                                  | 11.601                  | •        |
|         | 10.640         | •                                | •                | •        | •                                | 10.101                  | •        |
| 4       | 9.6403         | •                                | •                | •        | •                                | 9.1006                  | •        |
| 5       | 8.6403         | •                                | •                | •        | •                                | 8.1006                  | •        |
| 6       | 7.6403         | •                                |                  | •        | •                                | 7.1006                  | •        |
| 7       | 6.6403         | •                                |                  |          | •                                | 6.1006                  | •        |
| 8       | 4.6403         |                                  |                  | •        |                                  | 4.1006                  |          |
| 9       | 2.6403         | •                                |                  |          |                                  | 2.1006                  |          |
| 10      | 0.64030        | •                                |                  |          | •                                | 0.10060                 |          |
| 11      | -1.3597        | •                                |                  |          |                                  | -1.8994                 |          |
| 12      | -3.3597        |                                  | •                |          |                                  | -3.8994                 |          |
|         | n X>           | •                                | •                | •        | •                                | 0.000                   | -        |
| aculi   | 196.62         | 198.55                           | 220.60           | 222.25   | 230.64                           | 233.03                  | 239.02   |
| 1       |                |                                  |                  |          |                                  |                         |          |
| 1       | 25.691         | 11 262                           | 10 067           |          | 17.594                           | 10 724                  | 15.594   |
| 2       | •              | 11.362                           | 10.967           | •        | •                                | 10.724                  | •        |
| 3       | •              | 9.8624                           | 9.4675           | •        | •                                | 9.2241                  | •        |
| 4       | •              | 8.8624                           | 8.4675           | •        | •                                | 8.2241                  | •        |
| 5       |                | 7.8624                           | 7.4675           | •        |                                  | 7.2241                  |          |
| 6       |                | 6.8624                           | 6.4675           |          | •                                | 6.2241                  |          |
| 7       | •              | 5.8624                           | 5.4675           | •        | •                                | 5.2241                  |          |
| 8       |                | 3.8624                           | 3.4675           | •        |                                  | 3.2241                  |          |
| 9       |                | 1.8624                           | 1.4675           |          |                                  | 1.2241                  |          |
| 10      | •              | -0.13760                         | -0.53250         | •        |                                  | -0.77590                |          |
| 11      |                | -2.1376                          | -2.5325          | •        |                                  | -2.7759                 |          |
| 12      | •              |                                  |                  | •        |                                  |                         |          |
|         |                | -4.1376                          | -4.5325          | •        | •                                | -4.7759                 | •        |
| cratum  | n X>           | 045 45                           | 054 4-           | 050 6-   | 050 05                           | 065 55                  | 000      |
| _       | 242.25         | 247.40                           | 254.47           | 258.65   | 259.38                           | 266.63                  | 273.14   |
| -       | •              | 13.594                           | 12.312           | 12.122   | •                                | 12.992                  | 13.704   |
| 1       |                |                                  |                  |          | 400=0                            |                         |          |
| 2       | 10.576         | •                                | •                | •        | 10.050                           | •                       | •        |
| 2<br>3  | 9.0759         | •                                | •                | •        | 10.050<br>8.5501                 | •                       |          |
| 2       |                |                                  |                  |          |                                  |                         |          |

#### **Northern SPA**

Eastern Mound - Undrained Section A-AA (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
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| Made by   | Date      | Checked |

| _            | 42_25   | 247 40   | 254 47   | 250 65             | 250_20   | 266 62 | 272 14   |
|--------------|---------|----------|----------|--------------------|----------|--------|----------|
|              | .0759   | •        | •        | •                  | 6.5501   | •      | •        |
|              | .0759   | •        | •        | •                  | 5.5501   | •      |          |
|              | .0759   | •        | •        | •                  | 4.5501   | •      |          |
|              | .0759   | •        | •        | •                  | 2.5501   | •      | •        |
|              | .0759   | •        | •        |                    | 0.55010  | •      |          |
|              | 0.92410 |          |          |                    | -1.4499  |        | •        |
| 11 -         | 2.9241  |          |          |                    | -3.4499  |        |          |
| 12 -         | 4.9241  |          |          |                    | -5.4499  | •      |          |
| ratum X      | >       |          |          |                    |          |        |          |
| 2            | 73.80   | 275.41   | 279.18   | 280.74             | 288.42   | 291.81 | 296.17   |
| <b>1</b> 1   | 3.708   | 13.594   | 13.594   |                    |          | 11.137 |          |
| 2 .          |         |          |          | 9.3616             | 9.1283   |        | 8.8925   |
| з.           |         |          |          | 7.8616             | 7.6283   |        | 7.3925   |
| 4 .          |         |          |          | 6.8616             | 6.6283   |        | 6.3925   |
| 5.           |         |          |          | 5.8616             | 5.6283   |        | 5.3925   |
| 6.           |         |          |          | 4.8616             | 4.6283   |        | 4.3925   |
| 7.           |         |          |          | 3.8616             | 3.6283   |        | 3.3925   |
| 8.           |         |          |          | 1.8616             | 1.6283   |        | 1.3925   |
| 9 .          |         |          |          | -0.13840           | -0.37170 |        | -0.60750 |
| 10 .         |         |          |          | -2.1384            | -2.3717  |        | -2.6075  |
| 11 .         |         |          |          | -4.1384            | -4.3717  | _      | -4.6075  |
| 12 .         |         |          |          | -6.1384            | -6.3717  |        | -6.6075  |
| <br>tratum X | >       | •        | •        | 0.1001             | 0.0727   | •      | 0.0070   |
|              | 96.86   | 304.43   | 307.09   | 309.09             |          |        |          |
|              | 0.154   | 8.6578   | 8.5940   | 8.5940             |          |        |          |
| 2 .          |         | 8.6578   | 8.5940   | 8.5940             |          |        |          |
| 3 .          |         | 7.1578   | 7.0940   | 7.0940             |          |        |          |
| 4 .          |         | 6.1578   | 6.0940   | 6.0940             |          |        |          |
| 5 .          |         | 5.1578   | 5.0940   | 5.0940             |          |        |          |
| 6 .          |         | 4.1578   | 4.0940   | 4.0940             |          |        |          |
| 7            |         | 3.1578   | 3.0940   | 3.0940             |          |        |          |
| 8 .          |         | 1.1578   | 1.0940   | 1.0940             |          |        |          |
| ^            |         | -0.84220 | -0.90600 | -0.90600           |          |        |          |
| 9 .<br>10 .  |         | -2.8422  | -2.9060  | -2.9060            |          |        |          |
| 10 .         |         |          |          | -2.9060<br>-4.9060 |          |        |          |
| 11 .         |         | -4.8422  | -4.9060  |                    |          |        |          |
| 12 .         |         | -6.8422  | -6.9060  | -6.9060            |          |        |          |

#### Stratum-linked data

| No. | Material      | Water table | Piezo | Set/ F | Ru value |
|-----|---------------|-------------|-------|--------|----------|
| 1   | Waste         |             |       |        |          |
| 2   | Clay Deposits |             |       |        |          |
| 3   | London Clay 1 |             |       |        |          |
| 4   | London Clay 2 |             |       |        |          |
| 5   | London Clay 3 |             |       |        |          |
| 6   | London Clay 4 |             |       |        |          |
| 7   | London Clay 5 |             |       |        |          |
| 8   | London Clay 6 |             |       |        |          |
| 9   | London Clay 7 |             |       |        |          |
| 10  | London Clay 8 |             |       |        |          |
| 11  | London Clay 9 |             |       |        |          |
| 12  | Harwich       |             |       |        |          |
| I   |               |             |       |        |          |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 6.00000 m y = 22.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 17 in x direction at 3.50000m spacing

13 in y direction at 3.50000m spacing

Grid extended to find minimum FoS

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (44.500m,57.000m)

Iterations: 5

Net vertical force [kN/m]: 16.569

Net horiz force [kN/m]: 76.366

Radius 44.000m

Horiz acceleration [%g]: 0.0

Slip weight [kN/m] 8019.0

Disturbing moment [kN/m]: 56133.

Restoring moment [kNm/m]: 90824.

Reinf.Rest.Moment [kNm/m]: 0.0

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Over-Design Factor: 1.6180

### ARUP <sup>^</sup>

Arup

Northern SPA
Eastern Mound - Undrained
Section A-AA (south)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | <u> </u>  |         |
| Made by<br>EB | Date      | Checked |

| Slip surfa<br>Point x [m | ce coordinates      | Pore Pres              |        | Interslice<br>T    | e forces<br>E | [kN/m]           | E(u)  |
|--------------------------|---------------------|------------------------|--------|--------------------|---------------|------------------|-------|
|                          | ., ,,               | [kN/m <sup>2</sup> ] [ |        |                    | _             |                  | _ (-, |
| 1 22.6                   | 18.811              |                        | 0.0    | 0.0                |               | 0.0              | 0.0   |
| 2 22.9                   |                     |                        | 0.0    | 1.3834             |               | 9.8960           | 0.0   |
| 3 24.6                   |                     |                        | 0.0    | 13.432             |               | 59.965           | 0.0   |
| 4 26.4                   |                     |                        | 0.0    | 19.767             |               | 122.66           | 0.0   |
| 5 27.9                   | 994 16.213          | 0.0                    | 0.0    | 18.283             |               | 192.21           | 0.0   |
| 6 29.5                   | 15.621              | 0.0                    | 0.0    | 15.459             |               | 267.67           | 0.0   |
| 7 30.9                   | 15.134              | 0.0                    | 0.0    | 11.167             |               | 343.68           | 0.0   |
| 8 32.4                   | 103 14.696          | 0.0                    | 0.0    | 7.2935             |               | 421.27           | 0.0   |
| 9 33.5                   | 14.373              | 0.0                    | 0.0    | 4.7154             |               | 484.90           | 0.0   |
| 10 33.8                  | 382 14.300          | 0.0                    | 0.0    | 4.1871             |               | 500.21           | 0.0   |
| 11 35.8                  | 13.866              | 0.0                    | 0.0    | 0.37593            |               | 605.92           | 0.0   |
| 12 37.7                  | 13.519              | 0.0                    | 0.0    | -1.4093            |               | 706.31           | 0.0   |
| 13 39.7                  |                     | 0.0                    | 0.0    | -1.3886            |               | 797.76           | 0.0   |
| 14 41.7                  | 700 13.089          | 0.0                    | 0.0    | -0.24996           |               | 877.08           | 0.0   |
| 15 43.6                  | 13.008              | 0.0                    | 0.0    | 0.91738            |               | 941.17           | 0.0   |
| 16 45.6                  |                     |                        | 0.0    | 1.3638             |               | 988.67           | 0.0   |
| 17 47.5                  | 392 13 <b>.</b> 109 | 0.0                    | 0.0    | 6.9053             |               | 1017.9           | 0.0   |
| 18 49.5                  |                     |                        | 0.0    | 15.749             |               | 1027.4           | 0.0   |
| 19 51.7                  |                     |                        | 0.0    | 26.262             |               | 1008.1           | 0.0   |
| 20 53.8                  |                     |                        | 0.0    | 35.582             |               | 964.34           | 0.0   |
| 21 53.8                  |                     |                        | 0.0    | 35.686             |               | 963.59           |       |
| 22 55.4                  |                     |                        | 0.0    | 39.342             |               | 912.19           |       |
| 23 56.9                  |                     |                        | 0.0    | 40.355             |               | 850.32           | 0.0   |
| 24 58.1                  |                     |                        | 0.0    | 36.947             |               | 791.66           | 0.0   |
| 25 59.2                  |                     |                        | 0.0    | 31.333             |               | 728.33           | 0.0   |
| 26 60.1                  |                     |                        | 0.0    | 25.489             |               | 677.35           | 0.0   |
| 27 60.6                  |                     |                        | 0.0    | 20.703             |               | 641.29           | 0.0   |
| 28 62.5                  |                     |                        | 0.0    | 7.9458             |               | 534.59           |       |
| 29 64.4<br>30 66.2       |                     |                        | 0.0    | -9.4915<br>-30.274 |               | 424.91<br>316.47 | 0.0   |
| 31 68.0                  |                     |                        | 0.0    | -52.474            |               | 213.35           | 0.0   |
| 32 69.7                  |                     |                        | 0.0    | -72.426            |               | 121.86           | 0.0   |
| 33 71.3                  |                     |                        | 0.0    | -86.391            |               | 45.261           | 0.0   |
| 34 72.9                  |                     |                        | 0.0    | -91.057            | _             | -14.048          | 0.0   |
| 35 74.4                  |                     |                        | 0.0    | -83.070            |               | -54.461          | 0.0   |
| 36 75.9                  |                     |                        | 0.0    | -59.210            |               | -75.207          | 0.0   |
| 37 77.3                  |                     |                        |        | -16.569            |               | -76.366          | 0.0   |
| J 77.                    | 27.000              | 0.0                    |        | 10.000             |               | . 0. 500         | 0.0   |
| Slice Stre               | ngth Parameter      | s Average              | Slice  | Forces             | on base       | [kN/m]           |       |
| No.                      | -                   | Pore                   | Weight |                    |               |                  |       |
|                          |                     | Pressure               | -      |                    |               |                  |       |
| c'                       | Tan phi             | [kN/m <sup>2</sup> ]   |        | Normal :           | Shear         | Shear            | r     |
| [kN/                     |                     | • •                    |        |                    | (capacity     |                  |       |
|                          | 714 0.              | 0 0.0                  | 0.6401 | 9 6.9690           | 12.31         |                  | 7.610 |
|                          | 429 0.              |                        |        | 7 59.226           | 42.31         |                  | 26.15 |
|                          | 429 0.              |                        |        | 9 92.597           | 42.31         |                  | 26.15 |
|                          | 893 0.              |                        |        | 7 104.50           | 51.13         |                  | 31.60 |
|                          | 893 0.              |                        |        | 8 129.72           | 51.13         |                  | 31.60 |

| No. |            |         |     | Pore       | Weight  |        |            |             |
|-----|------------|---------|-----|------------|---------|--------|------------|-------------|
|     |            |         |     | Pressure   |         |        |            |             |
|     | c'         | Tan phi |     | $[kN/m^2]$ | [kN/m]  | Normal | Shear      | Shear       |
|     | $[kN/m^2]$ |         |     |            |         |        | (capacity) | (mobilised) |
| 1   |            |         | 0.0 | 0.0        | 0.64019 | 6.9690 | 12.314     | 7.6102      |
| 2   |            |         | 0.0 | 0.0        | 26.317  | 59.226 | 42.314     | 26.152      |
| 3   |            |         | 0.0 | 0.0        | 64.459  | 92.597 | 42.314     | 26.152      |
| 4   |            |         | 0.0 | 0.0        |         | 104.50 | 51.138     | 31.605      |
| 5   |            |         | 0.0 |            |         | 129.72 | 51.138     | 31.605      |
| 6   |            |         | 0.0 | 0.0        | 124.33  | 139.24 | 53.456     | 33.038      |
| 7   |            |         | 0.0 |            |         | 158.80 |            | 33.038      |
| 8   |            |         | 0.0 |            |         | 144.13 |            | 27.082      |
| 9   |            |         | 0.0 |            |         | 36.764 |            | 6.5526      |
| 10  |            |         | 0.0 |            |         | 264.10 |            | 49.177      |
| 11  |            |         | 0.0 |            |         | 297.29 |            | 49.177      |
| 12  |            |         | 0.0 |            |         | 327.01 | 79.570     | 49.177      |
| 13  |            |         | 0.0 |            |         | 352.73 |            | 49.177      |
| 14  |            |         | 0.0 |            |         | 371.11 | 78.962     | 48.802      |
| 15  |            |         | 0.0 |            |         | 388.03 | 78.962     | 48.802      |
| 16  |            |         | 0.0 |            |         | 407.56 | 78.962     | 48.802      |
| 17  |            |         | 0.0 |            |         | 421.91 | 78.962     | 48.802      |
| 18  |            |         | 0.0 |            |         | 478.60 | 77.519     | 47.909      |
| 19  |            |         | 0.0 |            |         | 482.38 | 77.519     | 47.910      |
| 20  |            |         | 0.0 |            |         | 6.4824 | 1.0425     | 0.64428     |
| 21  |            |         | 0.0 |            |         | 351.60 | 49.651     | 30.686      |
| 22  |            |         | 0.0 |            |         | 343.10 | 49.651     | 30.686      |
| 23  |            |         | 0.0 |            |         | 248.20 | 25.551     | 15.791      |
| 24  |            |         | 0.0 |            |         | 242.38 | 25.550     | 15.791      |
| 25  |            |         | 0.0 |            |         | 180.28 | 19.471     | 12.034      |
| 26  |            |         | 0.0 |            |         | 120.92 | 13.336     | 8.2419      |
| 27  | 35.714     |         | 0.0 | 0.0        | 381.57  | 380.84 | 73.564     | 45.465      |
| 28  |            |         | 0.0 |            |         | 348.06 |            | 45.465      |
| 29  |            |         | 0.0 |            |         | 312.67 |            | 45.465      |
| 30  |            |         | 0.0 |            |         | 275.49 |            |             |
| 31  | 35.714     |         | 0.0 | 0.0        | 238.45  | 232.01 | 72.662     | 44.908      |
|     |            |         |     |            |         |        |            |             |

**Northern SPA** 

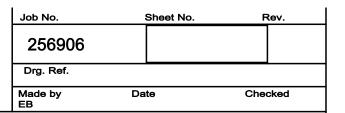
Eastern Mound - Undrained Section A-AA (south)

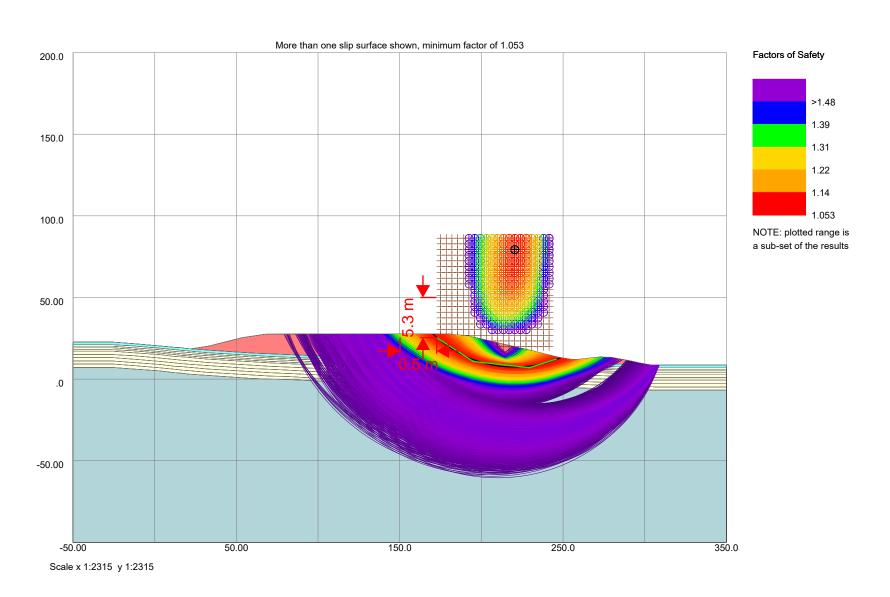
| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

| Slice | Strength | Parameters | Average | Slice           | Forces | on base [kN/m] |        |
|-------|----------|------------|---------|-----------------|--------|----------------|--------|
| 37.   |          |            | D       | 7.7 a 2 a-1a 4. |        |                |        |
| 32    | 35.714   | 0.0        | 0.0     | 194.10          | 189.91 | 72.661         | 44.907 |
| 33    | 35.714   | 0.0        | 0.0     | 149.48          | 149.25 | 72.662         | 44.908 |
| 34    | 35.714   | 0.0        | 0.0     | 105.18          | 110.76 | 72.661         | 44.907 |
| 35    | 35.714   | 0.0        | 0.0     | 61.799          | 75.099 | 72.662         | 44.908 |
| 36    | 35.714   | 0.0        | 0.0     | 19.950          | 42.849 | 72.662         | 44.908 |
|       |          |            |         |                 |        |                |        |

| Slice<br>No. | Surface Load | [kN/m_hor/m] | Point | Load | [kN/m] | Water Pressure ground surface |     |
|--------------|--------------|--------------|-------|------|--------|-------------------------------|-----|
| 1.0.         | Vert Ho:     | riz          | Vert  | 1    | Horiz  | Vert Hori                     |     |
| 1            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 2            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 3            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 4            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 5            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 6            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 7            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 8            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 9            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 10           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 11           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 12           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 13           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 14           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 15           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 16           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 17           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 18           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 19           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 20           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 21           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 22           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 23           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 24           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 25           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 26           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 27           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 28           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 29           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 30           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 31           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 32           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 33           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 34           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 35           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 36           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |

Northern SPA
Eastern Mound - Undrained
Section A-AA (north)





#### Northern SPA

Eastern Mound - Undrained Section A-AA (north)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'     |         | Weight<br>Below GWL | 3           | Phi or<br>Phi0 | С |
|---------------------------|---------|---------------------|-------------|----------------|---|
|                           | [kN/m3] | [kN/m3]             |             | [°]            |   |
| [kN/m <sup>2</sup> ]      |         |                     |             |                |   |
| 1 Waste                   | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 50.000                    |         |                     |             |                |   |
| 2 Clay Deposits           | 17.000  | 17.000              | Undrained   | N.A.           |   |
| 30.000                    |         |                     |             |                |   |
| 3 London Clay 1           | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 43.250                    |         |                     |             |                |   |
| 4 London Clay 2           | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 49.750                    | 40.500  | 40 500              |             |                |   |
| 5 London Clay 3           | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 56.250<br>6 London Clay 4 | 19.500  | 10 500              | Undrained   | N.A.           |   |
| 62.750                    | 19.500  | 19.500              | Ulidiailled | N.A.           |   |
| 7 London Clay 5           | 19.500  | 19 500              | Undrained   | N.A.           |   |
| 72.500                    | 19.500  | 17.500              | Ulidiailled | N.A.           |   |
| 8 London Clay 6           | 19.500  | 19 500              | Undrained   | N.A.           |   |
| 85.500                    | 13.000  | 23.000              | onararnoa   |                |   |
| 9 London Clay 7           | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 98.500                    |         |                     |             |                |   |
| 10 London Clay 8          | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 111.50                    |         |                     |             |                |   |
| 11 London Clay 9          | 19.500  | 19.500              | Undrained   | N.A.           |   |
| 124.50                    |         |                     |             |                |   |
| 12 Harwich                | 20.000  | 20.000              | Undrained   | N.A.           |   |
| 130.00                    |         |                     |             |                |   |
|                           |         |                     |             |                |   |

### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathsf{m}}$ 

| Stratum | x>      | ,       |        |        |        |        |        |
|---------|---------|---------|--------|--------|--------|--------|--------|
|         | -25.990 | -13.434 | 2.9935 | 12.353 | 16.539 | 19.617 | 22.041 |
| 1       | 22.764  | 21.893  | 20.594 | 19.594 | 19.220 | 18.936 | 18.712 |
| 2       | 22.764  | 21.893  | 20.594 | 19.594 | 19.220 | 18.936 | 18.712 |
| 3       | 21.264  | 20.393  | 19.094 | 18.094 | 17.720 | 17.436 | 17.212 |
| 4       | 20.264  | 19.393  | 18.094 | 17.094 | 16.720 | 16.436 | 16.212 |
| 5       | 19.264  | 18.393  | 17.094 | 16.094 | 15.720 | 15.436 | 15.212 |
| 6       | 18.264  | 17.393  | 16.094 | 15.094 | 14.720 | 14.436 | 14.212 |
| 7       | 17.264  | 16.393  | 15.094 | 14.094 | 13.720 | 13.436 | 13.212 |
| 8       | 15.264  | 14.393  | 13.094 | 12.094 | 11.720 | 11.436 | 11.212 |
| 9       | 13.264  | 12.393  | 11.094 | 10.094 | 9.7202 | 9.4358 | 9.2119 |
| 10      | 11.264  | 10.393  | 9.0940 | 8.0940 | 7.7202 | 7.4358 | 7.2119 |
| 11      | 9.2635  | 8.3926  | 7.0940 | 6.0940 | 5.7202 | 5.4358 | 5.2119 |
| 12      | 7.2635  | 6.3926  | 5.0940 | 4.0940 | 3.7202 | 3.4358 | 3.2119 |
| Stratum | x>      |         |        |        |        |        |        |

### ARUP

**Arup** 

Northern SPA

Eastern Mound - Undrained Section A-AA (north)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | •         | _       |
| Made by   | Date      | Checked |

| Section       | n A-AA (north       | 1)                 |                    |                  |                   | EB                 |                     |
|---------------|---------------------|--------------------|--------------------|------------------|-------------------|--------------------|---------------------|
|               |                     |                    |                    |                  |                   | •                  |                     |
|               | 32.403              | 33 503             | 41.700             | 53.852           | 59.260            | 60.113             | 68.027              |
| 1             | 32.403              | 20.594             | 22.594             | 25.594           |                   | 26.616             |                     |
| 2             | 17.896              |                    |                    |                  | 16.165            |                    |                     |
| 3             | 16.396              | •                  | •                  | •                | 14.665            | •                  | •                   |
| 4<br>5        | 15.396<br>14.396    |                    |                    | •                | 13.665<br>12.665  |                    | •                   |
| 6             | 13.396              | •                  | •                  | •                | 11.665            | •                  | •                   |
| 7             | 12.396              |                    |                    |                  | 10.665            | •                  |                     |
| 8             | 10.396              |                    |                    |                  | 8.6648            |                    |                     |
| 9             | 8.3957              | •                  | •                  | •                | 6.6648            |                    | •                   |
|               | 6.3957              | •                  |                    |                  | 4.6648            | •                  | •                   |
| 11<br>12      | 4.3957<br>2.3957    | •                  |                    |                  | 2.6648<br>0.66480 |                    | •                   |
|               | n X>                | •                  | •                  |                  |                   |                    | •                   |
|               | 70.780              | 81.062             | 101.60             | 108.91           | 119.63            | 120.09             | 122.32              |
| 1             |                     |                    |                    | 27.994           | 27.994            | 27.994             |                     |
| 2             | 15.549              | 15.129             | 14.128             | •                | •                 | •                  | 13.324              |
| 3<br>4        | 14.049<br>13.049    | 13.629<br>12.629   | 12.628<br>11.628   | •                | •                 | •                  | 11.824<br>10.824    |
| 5             | 12.049              | 11.629             | 10.628             | •                | •                 | •                  | 9.8240              |
| 6             | 11.049              | 10.629             | 9.6284             |                  | •                 |                    | 8.8240              |
| 7             | 10.049              | 9.6291             | 8.6284             |                  |                   | •                  | 7.8240              |
| 8             | 8.0494              | 7.6291             |                    |                  |                   |                    | 5.8240              |
| 9             | 6.0494              | 5.6291             | 4.6284             | •                |                   |                    | 3.8240              |
| 10            | 4.0494              | 3.6291             |                    | •                | 119.63<br>27.994  | •                  | 1.8240              |
| 11<br>12      | 2.0494              | 1.6291<br>-0.37090 | 0.62840<br>-1.3716 | •                |                   |                    | -0.17600<br>-2.1760 |
| Stratum       |                     | -0.37090           | -1.3710            | •                | •                 | •                  | -2.1700             |
|               | 131.13              | 135.71             | 136.60             | 143.05           |                   | 154.68             | 163.59              |
| 1             |                     | 27.994             |                    |                  | 27.994            | 27.994             | 27.994              |
| 2             | 13.041              |                    | 12.865             | 12.678           | •                 | •                  | •                   |
| 3             | 11.541              | •                  | 11.365             | 11.178           | •                 | •                  | •                   |
| 4<br>5        | 10.541<br>9.5410    | ·<br>·             | 10.365<br>9.3652   | 10.178<br>9.1783 |                   | •                  | •                   |
| 6             |                     | •                  | 8.3652             | 8.1783           | •                 | •                  | •                   |
| 7             | 7.5410              |                    | 7.3652             | 7.1783           | •                 |                    | ·<br>·              |
| 8             |                     | •                  | 5.3652             | 5.1783           | •                 | •                  | •                   |
| 9             | 3.5410              |                    | 3.3652             | 3.1783           |                   | •                  |                     |
| 10            | 1.5410              | •                  |                    | 1.1783           | •                 | •                  | •                   |
| 11<br>12      | -0.45900<br>-2.4590 | •                  | -0.63480           | -0.82170         |                   | •                  | •                   |
|               | -2.4590<br>n X>     | •                  | -2.6348            | -2.8217          | •                 | •                  | •                   |
| 5524544       | 164.91              | 172.19             | 179.60             | 185.60           | 188.89            | 190.60             | 192.70              |
| 1             |                     | 27.994             | 27.862             | 27.295           | 26.996            |                    | 26.594              |
| 2             | 12.140              | •                  | •                  | •                | •                 | 11.601             | •                   |
| 3             | 10.640              | •                  | •                  | •                | •                 | 10.101             | •                   |
| 4<br>5        | 9.6403<br>8.6403    | •                  | •                  | •                | •                 | 9.1006<br>8.1006   | •                   |
| 6             | 7.6403              | •                  | •                  | •                | •                 | 7.1006             | •                   |
| 7             | 6.6403              |                    |                    |                  |                   | 6.1006             | •                   |
| 8             | 4.6403              | •                  |                    |                  | •                 | 4.1006             | •                   |
| 9             | 2.6403              |                    |                    |                  |                   | 2.1006             | •                   |
| 10            | 0.64030             | •                  |                    | •                | •                 | 0.10060            | •                   |
| 11<br>12      | -1.3597<br>-3.3597  |                    |                    | •                | •                 | -1.8994<br>-3.8994 | ·                   |
| Stratum       |                     | •                  | •                  | •                | •                 | -3.0994            | •                   |
|               | 196.62              | 198.55             | 220.60             | 222.25           | 230.64            | 233.03             | 239.02              |
| 1             | 25.691              |                    |                    | 19.594           | 17.594            |                    | 15.594              |
| 2             | •                   | 11.362             | 10.967             | •                | •                 | 10.724             | •                   |
| 3<br>4        | •                   | 9.8624<br>8.8624   | 9.4675             | •                | •                 | 9.2241             | •                   |
| 4<br>5        | •                   | 8.8624<br>7.8624   | 8.4675<br>7.4675   | •                | •                 | 8.2241<br>7.2241   | ·                   |
| 6             | •                   | 6.8624             | 6.4675             | •                |                   | 6.2241             | •                   |
| 7             | •                   | 5.8624             | 5.4675             |                  | •                 | 5.2241             |                     |
| 8             |                     | 3.8624             | 3.4675             |                  |                   | 3.2241             | •                   |
| 9             | •                   | 1.8624             | 1.4675             |                  |                   | 1.2241             | •                   |
| 10            | •                   | -0.13760           | -0.53250           | •                | •                 | -0.77590           | •                   |
| 11            | •                   | -2.1376            | -2.5325            | •                | •                 | -2.7759            | •                   |
| 12<br>Stratum | n X>                | -4.1376            | -4.5325            | •                | •                 | -4.7759            | •                   |
| SCIACUII      | 242.25              | 247.40             | 254.47             | 258.65           | 259.38            | 266.63             | 273.14              |
| 1             |                     | 13.594             | 12.312             | 12.122           |                   | 12.992             | 13.704              |
| 2             | 10.576              |                    |                    |                  | 10.050            |                    | •                   |
| 3             | 9.0759              | •                  | •                  | •                | 8.5501            | •                  | •                   |
| 4             | 8.0759              | •                  | •                  | •                | 7.5501            | •                  | •                   |
|               |                     |                    |                    |                  |                   |                    |                     |

#### **Northern SPA**

Eastern Mound - Undrained Section A-AA (north)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | _         | •       |
| Made by   | Date      | Checked |

| 5       | 7.0755   | 247 40             | 0E4 47             | 2E0 CE             | 6.5501   |        | 070 14   |
|---------|----------|--------------------|--------------------|--------------------|----------|--------|----------|
| 6       | 6.0759   | •                  |                    |                    | 5.5501   |        |          |
| 7       | 5.0759   | •                  | •                  |                    | 4.5501   | •      | •        |
| 8       | 3.0759   | •                  |                    | :                  | 2.5501   | •      |          |
| 9       | 1.0759   | •                  | :                  | :                  | 0.55010  | •      | •        |
| 10      | -0.92410 | •                  |                    | •                  | -1.4499  | •      | •        |
| 11      | -2.9241  | •                  | •                  | •                  | -3.4499  | •      | •        |
| 12      | -4.9241  | •                  | •                  | •                  |          | •      | •        |
|         |          | •                  | •                  | •                  | -5.4499  | •      | •        |
| stratu  | n X>     | 075 41             | 070 10             | 000 74             | 000 40   | 001 01 | 006 17   |
| _       | 273.80   | 275.41             | 279.18             | 280.74             | 288.42   | 291.81 | 296.17   |
| 1       | 13.708   | 13.594             | 13.594             |                    |          | 11.137 |          |
| 2       | •        | •                  | •                  | 9.3616             | 9.1283   | •      | 8.8925   |
| 3       | •        | •                  | •                  | 7.8616             | 7.6283   | •      | 7.3925   |
| 4       | •        | •                  | •                  | 6.8616             | 6.6283   | •      | 6.3925   |
| 5       | •        | •                  | •                  | 5.8616             | 5.6283   | •      | 5.3925   |
| 6       |          | •                  | •                  | 4.8616             | 4.6283   |        | 4.3925   |
| 7       | •        | •                  | •                  | 3.8616             | 3.6283   | •      | 3.3925   |
| 8       | •        | •                  | •                  | 1.8616             | 1.6283   | •      | 1.3925   |
| 9       |          |                    |                    | -0.13840           | -0.37170 |        | -0.60750 |
| 10      | •        |                    |                    | -2.1384            | -2.3717  | •      | -2.6075  |
| 11      |          | •                  | •                  | -4.1384            | -4.3717  | •      | -4.6075  |
| 12      |          | •                  |                    | -6.1384            | -6.3717  | •      | -6.6075  |
| Stratur | n X>     |                    |                    |                    |          |        |          |
|         | 296.86   | 304.43             | 307.09             | 309.09             |          |        |          |
| 1       | 10.154   | 8.6578             | 8.5940             | 8.5940             |          |        |          |
| 2       |          | 8.6578             | 8.5940             | 8.5940             |          |        |          |
| 3       |          | 7.1578             | 7.0940             | 7.0940             |          |        |          |
| 4       |          | 6.1578             | 6.0940             | 6.0940             |          |        |          |
| 5       |          | 5.1578             | 5.0940             | 5.0940             |          |        |          |
| 6       |          | 4.1578             | 4.0940             | 4.0940             |          |        |          |
| 7       | •        | 3.1578             | 3.0940             | 3.0940             |          |        |          |
| 8       | •        | 1.1578             | 1.0940             | 1.0940             |          |        |          |
| 9       | •        | -0.84220           | -0.90600           | -0.90600           |          |        |          |
| 10      | •        | -2.8422            | -2.9060            | -2.9060            |          |        |          |
| 11      | •        |                    |                    | -4.9060            |          |        |          |
| 12      | •        | -4.8422<br>-6.8422 | -4.9060<br>-6.9060 | -4.9060<br>-6.9060 |          |        |          |

#### Stratum-linked data

| No. | Material      | Water table | Piezo | Set/ Ru | value |
|-----|---------------|-------------|-------|---------|-------|
| 1   | Waste         |             |       |         |       |
| 2   | Clay Deposits |             |       |         |       |
| 3   | London Clay 1 |             |       |         |       |
| 4   | London Clay 2 |             |       |         |       |
| 5   | London Clay 3 |             |       |         |       |
| 6   | London Clay 4 |             |       |         |       |
| 7   | London Clay 5 |             |       |         |       |
| 8   | London Clay 6 |             |       |         |       |
| 9   | London Clay 7 |             |       |         |       |
| 10  | London Clay 8 |             |       |         |       |
| 11  | London Clay 9 |             |       |         |       |
| 12  | Harwich       |             |       |         |       |
| 1   |               |             |       |         |       |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 175.00000 m y = 20.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 20 in x direction at 3.50000m spacing

20 in y direction at 3.50000m spacing

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (220.50m, 79.500m) Radius 72.000m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 29.443 Slip weight [kN/m] 14938.

Net horiz force [kN/m]: 145.78 Disturbing moment [kN/m]: 192630.

Restoring moment [kNm/m]: 202890.

Reinf.Rest.Moment [kNm/m]: 0.0Over-Design Factor: 1.0533

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

### ARUP

Arup

Slip surface coordinates Pore Pressure Interslice forces [kN/m]

Northern SPA
Eastern Mound - Undrained
Section A-AA (north)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

| Slig | <b>9</b> 5                           | surface  | COO                                  | rdinates                                      | Pore Pro             | essure   | Intersl  | ice for                                      | ces  | [kN/m]                |  |
|------|--------------------------------------|--|--------------------------------------|---|----------------------|--|--|--|--|-----------------------|--|
| Poir | nt                                   | x [m]  | у [                                  | m]  | L                    | R  | T  | E  |  |                       | E(u)   |
|      |                                      |  |                                      | -   | [ kN /m 2 1          | [kN/m <sup>2</sup> ]   |  |  |  |                       | • •  |
|      | 1                                    | 170.19   |                                      | 27.994  |                      | 0.0  | 0 0  |  |  | 0.0                   | 0 0  |
|      |                                      |  |                                      |   |                      |  | 0.0  |  |  |                       |  |
|      |                                      | 172.19   |                                      | 26.115  | 0.0                  |  | -79.185  |  |  | -18.785               |  |
|      | 3                                    | 173.97   |                                      | 24.556  | 0.0                  | 0.0  | -122.14  |  | -  | -7.5022               | 0.0  |
|      | 4                                    | 175.80   |                                      | 23.057  | 0.0                  | 0.0  | -144.99  |  |  | 28.529                | 0.0  |
|      | 5                                    | 177.68   |                                      | 21.618  | 0.0                  | 0.0  | -150.84  |  |  | 88.350                | 0.0  |
|      |                                      | 179.60   |                                      | 20.242  | 0.0                  |  | -142.86  |  |  | 170.46                |  |
|      |                                      | 181.56   |                                      | 18.939  | 0.0                  |  | -125.19  |  |  | 270.81                |  |
|      |                                      |  |                                      |   |                      |  |  |  |  |                       |  |
|      |                                      | 183.56   |                                      | 17.700  | 0.0                  |  | -101.50  |  |  | 386.12                |  |
|      |                                      | 185.60   |                                      | 16.527  | 0.0                  |  | -74.312  |  |  | 513.60                |  |
| ] ]  | 10                                   | 187.23   |                                      | 15.647  | 0.0                  | 0.0  | -51.855  |  |  | 620.96                | 0.0  |
| 1    | 11                                   | 188.89   |                                      | 14.810  | 0.0                  | 0.0  | -29.609  |  |  | 732.46                | 0.0  |
| 1    | 12                                   | 190.78   |                                      | 13.920  | 0.0                  | 0.0  | -6.0150  |  |  | 860.55                | 0.0  |
| 1    | 1.3                                  | 192.70   |                                      | 13.085  | 0.0                  | 0.0  |  |  |  | 988.89                |  |
|      |                                      | 194.65   |                                      | 12.302  | 0.0                  | 0.0  | 32.105   |  |  | 1114.1                |  |
|      |                                      | 196.62   |                                      | 11.576  | 0.0                  | 0.0  |  |  |  | 1231.6                |  |
|      |                                      |  |                                      |   |                      |  | 44.233   |  |  |                       |  |
|      |                                      | 197.11   |                                      | 11.406  | 0.0                  | 0.0  | 46.467   |  |  | 1259.2                |  |
| ]    | 17                                   | 198.55   |                                      | 10.926  | 0.0                  | 0.0  | 57.671   |  |  | 1355.6                | 0.0  |
| 1    | 18                                   | 200.51   |                                      | 10.331  | 0.0                  | 0.0  | 67.910   |  |  | 1474.7                | 0.0  |
| 1    | 19                                   | 202.48   |                                      | 9.7921  | 0.0                  | 0.0  | 73.127   |  |  | 1580.7                | 0.0  |
|      | 2.0                                  | 204.92   |                                      | 9.2053  | 0.0                  | 0.0  | 68.399   |  |  | 1669.8                | 0.0  |
| l .  |                                      | 207.39   |                                      | 8.7042  | 0.0                  | 0.0  | 59.354   |  |  | 1735.8                |  |
|      |                                      | 210.01   |                                      | 8.2685  | 0.0                  | 0.0  | 44.929   |  |  | 1767.5                |  |
|      |                                      |  |                                      |   |                      |  |  |  |  |                       |  |
|      |                                      | 212.64   |                                      | 7.9299  | 0.0                  | 0.0  | 29.970   |  |  | 1770.8                |  |
| l .  |                                      | 215.29   |                                      | 7.6887  | 0.0                  | 0.0  | 16.685   |  |  | 1745.8                |  |
| 2    | 25                                   | 217.94   |                                      | 7.5454  | 0.0                  | 0.0  | 7.2861   |  |  | 1693.2                | 0.0  |
| 2    | 26                                   | 220.60   |                                      | 7.5001  | 0.0                  | 0.0  | 3.8708   |  |  | 1614.7                | 0.0  |
| 2    | 27                                   | 222.25   |                                      | 7.5214  | 0.0                  | 0.0  | 3.5775   |  |  | 1553.9                | 0.0  |
|      | 2.8                                  | 225.06   |                                      | 7.6443  | 0.0                  | 0.0  | 2.7330   |  |  | 1431.6                |  |
|      |                                      | 227.85   |                                      | 7.8763  | 0.0                  | 0.0  | 2.9169   |  |  | 1288.5                |  |
|      |                                      |  |                                      | 8.2171  | 0.0                  | 0.0  | 5.3208   |  |  |                       |  |
| l .  |                                      | 230.64   |                                      |   |                      |  |  |  |  | 1129.1                |  |
| l .  |                                      | 230.96   |                                      | 8.2646  | 0.0                  | 0.0  | 5.7906   |  |  | 1109.4                |  |
|      |                                      | 233.03   |                                      | 8.5991  | 0.0                  | 0.0  | 8.2147   |  |  | 991.14                | 0.0  |
| 3    | 33                                   | 235.95   |                                      | 9.1772  | 0.0                  | 0.0  | 13.880   |  |  | 817.74                | 0.0  |
| 3    | 34                                   | 237.49   |                                      | 9.5329  | 0.0                  | 0.0  | 14.542   |  |  | 739.01                | 0.0  |
| 3    | 3.5                                  | 239.02   |                                      | 9.9222  | 0.0                  | 0.0  | 15.283   |  |  | 661.02                | 0.0  |
|      |                                      | 241.37   |                                      | 10.590  | 0.0                  | 0.0  | 15.943   |  |  | 544.28                |  |
|      |                                      | 243.40   |                                      | 11.238  | 0.0                  | 0.0  | 23.713   |  |  | 421.84                |  |
|      |                                      |  |                                      |   |                      |  |  |  |  |                       |  |
|      |                                      | 245.41   |                                      | 11.947  | 0.0                  | 0.0  | 29.341   |  |  | 309.64                |  |
|      |                                      | 247.40   |                                      | 12.714  | 0.0                  | 0.0  | 31.287   |  |  | 210.42                |  |
| 4    | 40                                   | 248.87   |                                      | 13.327  | 0.0                  | -  | 29.443   |  |  | 145.78                | 0.0  |
|      |                                      |  |                                      |   |                      |  |  |  |  |                       |  |
| Slic | ce                                   | Strengt  | h P                                  | arameters                                     | Average              | e Slice  | Forces   | on bas                                       | e [k   | :N/m]                 |  |
| No.  |                                      |  |                                      |   | Pore                 | Weight   | t  |  |  |                       |  |
|      |                                      |  |                                      |   | Pressu               | re   |  |  |  |                       |  |
|      |                                      | c'   | Ta                                   | n phi   | [kN/m <sup>2</sup> ] | ] [kN/m]   | ] Normal   | Shear  |  | Shear                 |  |
|      |                                      | [kN/m <sup>2</sup> ]   |                                      | -   |                      |  | =  | (capac                                       | itv)   | (mobi                 |  |
|      | -1                                   | 35.71  | -                                    | 0.0   | 0                    | .0 36.60   | 2 70 210   |  | .954   |                       |  |
|      |                                      |  |                                      |   | , ,                  | . 0 30.00.   | 2 /0.219   |  | - 9:)4   |                       | 93.000   |
|      | 1                                    |  |                                      |   |                      | 0 01 74  | 1 100 00   |  |  |                       |  |
|      | 2                                    | 35.71  | 4                                    | 0.0   |                      | .0 91.74   |  | 84   | .517   | 7                     | 80.243   |
|      |                                      | 35.71<br>35.71   | 4<br>4                               | 0.0   | 0                    | .0 147.7   | <i>8</i> 153.82  | 84<br>84                                     | .517   | 7<br>5                | 80.242   |
|      | 2                                    | 35.71  | 4<br>4                               | 0.0   | 0                    |  | <i>8</i> 153.82  | 84<br>84                                     | .517   | 7<br>5                |  |
|      | 2<br>3<br>4                          | 35.71<br>35.71<br>35.71  | 4<br>4<br>4                          | 0.0<br>0.0<br>0.0                             | 0 0                  | .0 147.7   | 8 153.82<br>0 202.26   | 8 4<br>8 4<br>8 4                            | .517<br>.516   | 1<br>5<br>1           | 80.242<br>80.243   |
|      | 2<br>3<br>4<br>5                     | 35.71<br>35.71<br>35.71<br>35.71                                     | 4<br>4<br>4<br>4                     | 0.0<br>0.0<br>0.0                             | 0 0 0                | .0 147.70<br>.0 204.30<br>.0 260.8   | 8 153.82<br>0 202.26<br>9 252.58   | 8 4<br>8 4<br>8 4<br>8 4                     | .517<br>.516<br>.517                                 | 7<br>5<br>7           | 80.242<br>80.243<br>80.242   |
|      | 2<br>3<br>4<br>5<br>6                | 35.71<br>35.71<br>35.71<br>35.71<br>35.71                            | 4<br>4<br>4<br>4                     | 0.0<br>0.0<br>0.0<br>0.0                      | 0 0 0 0 0 0          | .0 147.76<br>.0 204.36<br>.0 260.85<br>.0 312.05   | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75   | 84<br>84<br>84<br>83                         | .517<br>.516<br>.517<br>.516                         | 1<br>5<br>1<br>5      | 80.242<br>80.243<br>80.242<br>79.715                               |
|      | 2<br>3<br>4<br>5<br>6<br>7           | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71                   | 4<br>4<br>4<br>4<br>4                | 0.0<br>0.0<br>0.0<br>0.0                      |                      | .0 147.76<br>.0 204.36<br>.0 260.86<br>.0 312.06<br>.0 360.88                                | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52   | 84<br>84<br>84<br>84<br>83                   | .517<br>.516<br>.517<br>.516<br>.962                 | 7<br>5<br>7<br>5      | 80.242<br>80.243<br>80.242<br>79.715<br>79.715                     |
|      | 2<br>3<br>4<br>5<br>6<br>7<br>8      | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71          | 4<br>4<br>4<br>4<br>4                | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |                      | .0 147.76<br>.0 204.36<br>.0 260.86<br>.0 312.06<br>.0 360.86<br>.0 408.33                   | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52<br>2 393.14                                     | 84<br>84<br>84<br>83<br>83                   | .517<br>.516<br>.517<br>.516<br>.962<br>.961         | 7<br>5<br>7<br>5<br>2 | 80.242<br>80.243<br>80.242<br>79.715<br>79.715                     |
|      | 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71          | 4<br>4<br>4<br>4<br>4<br>4           | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |                      | .0 147.7<br>.0 204.3<br>.0 260.8<br>.0 312.0<br>.0 360.8<br>.0 408.3<br>.0 355.2             | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52<br>2 393.14<br>0 343.34                         | 84<br>84<br>84<br>83<br>83<br>83             | .517<br>.516<br>.517<br>.516<br>.962<br>.961<br>.961 | 7<br>5<br>7<br>5<br>2 | 80.242<br>80.243<br>80.242<br>79.715<br>79.715<br>62.982           |
|      | 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71 | 4<br>4<br>4<br>4<br>4<br>4<br>4      | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |                      | .0 147.7<br>.0 204.3<br>.0 260.8<br>.0 312.0<br>.0 360.8<br>.0 408.3<br>.0 355.2<br>.0 382.9 | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52<br>2 393.14<br>0 343.34<br>2 371.69             | 84<br>84<br>84<br>83<br>83<br>83<br>66       | .517<br>.516<br>.517<br>.516<br>.962<br>.961<br>.961 | 5                     | 80.242<br>80.243<br>80.242<br>79.715<br>79.715<br>62.982<br>62.982 |
|      | 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71          | 4<br>4<br>4<br>4<br>4<br>4<br>4      | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |                      | .0 147.7<br>.0 204.3<br>.0 260.8<br>.0 312.0<br>.0 360.8<br>.0 408.3<br>.0 355.2             | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52<br>2 393.14<br>0 343.34<br>2 371.69             | 84<br>84<br>84<br>83<br>83<br>83<br>66       | .517<br>.516<br>.517<br>.516<br>.962<br>.961<br>.961 | 5                     | 80.242<br>80.243<br>80.242<br>79.715<br>79.715<br>62.982           |
| 1    | 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | 35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71<br>35.71 | 4<br>4<br>4<br>4<br>4<br>4<br>4<br>4 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |                      | .0 147.7<br>.0 204.3<br>.0 260.8<br>.0 312.0<br>.0 360.8<br>.0 408.3<br>.0 355.2<br>.0 382.9 | 8 153.82<br>0 202.26<br>9 252.58<br>3 299.75<br>9 346.52<br>2 393.14<br>0 343.34<br>2 371.69<br>5 450.68 | 84<br>84<br>84<br>83<br>83<br>83<br>66<br>66 | .517<br>.516<br>.517<br>.516<br>.962<br>.961<br>.961 |                       | 80.242<br>80.243<br>80.242<br>79.715<br>79.715<br>62.982<br>62.982 |

### **Arup**

**Northern SPA** Eastern Mound - Undrained

Section A-AA (north)

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| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Occu  | 0117171711 | Orun,        |           |          |           |             | EB          |       |
|-------|------------|--------------|-----------|----------|-----------|-------------|-------------|-------|
| Slice | Strength   | Parameters   | Average   |          | Forces on | base [kN/m] |             |       |
| 30    | 35.536     | 0.0          | 0.0       | 58.478   | 60.378    | 11.804      | 11.207      |       |
| 31    | 30.893     | 0.0          |           | 348.54   |           | 64.706      | 61.433      |       |
| 32    | 30.893     | 0.0          | 0.0       | 432.00   | 453.66    | 91.878      | 87.232      |       |
| 33    | 21.429     | 0.0          | 0.0       | 198.56   | 211.62    | 33.832      | 32.121      |       |
| 34    | 21.429     | 0.0          | 0.0       | 176.99   | 191.20    | 33.832      | 32.121      |       |
| 35    | 21.429     | 0.0          | 0.0       | 229.55   | 254.07    | 52.322      | 49.676      |       |
| 36    | 35.714     | 0.0          | 0.0       | 153.61   | 178.05    | 76.170      | 72.318      |       |
| 37    | 35.714     | 0.0          | 0.0       | 106.56   | 134.50    | 76.169      | 72.317      |       |
| 38    | 35.714     | 0.0          | 0.0       | 58.249   | 90.411    | 76.169      | 72.317      |       |
| 39    | 35.714     | 0.0          | 0.0       | 12.647   | 39.906    | 57.007      | 54.124      |       |
| lice  | Surface 1  | Load [kN/m_] | hor/m] Po | int Load | d [kN/m]  | Water Press | ure on      |       |
| lo.   |            |              |           |          |           | ground surf | ace [kN/m_h | or/m] |
|       | Vert       | Horiz        | Ve        |          | Horiz     |             | loriz       |       |
| 1     | 0.         |              | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 2     | 0.         |              | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 3     | 0.         |              | 0.0       | 0.0      |           | 0.0         |             | 0.0   |
| 4     | 0.         |              | 0.0       | 0.0      |           |             |             | 0.0   |
| 5     | 0.         |              | 0.0       | 0.0      |           |             |             | 0.0   |
| 6     | 0.         |              | 0.0       | 0.0      |           |             |             | 0.0   |
| 7     | 0.         |              | 0.0       | 0.0      |           |             |             | 0.0   |
| 8     | 0.         |              | 0.0       | 0.0      |           | 0.0         |             | 0.0   |
| 9     | 0.         |              | 0.0       | 0.0      |           | 0.0         |             | 0.0   |
| 10    | 0.         |              | 0.0       | 0.0      |           | 0.0         |             | 0.0   |
| 11    | 0.         | 0            | 0.0       | 0.0      |           | 0.0         |             | 0.0   |
| 12    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 13    | 0.         |              | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 14    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 15    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 16    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 17    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 18    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 19    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 20    | 0.         | 0            | 0.0       | 0.0      | 0.0       | 0.0         |             | 0.0   |
| 21    | 0          | 0            | 0 0       | 0 0      | 0 0       | 0 0         |             | 0 0   |

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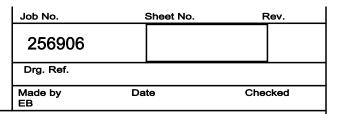
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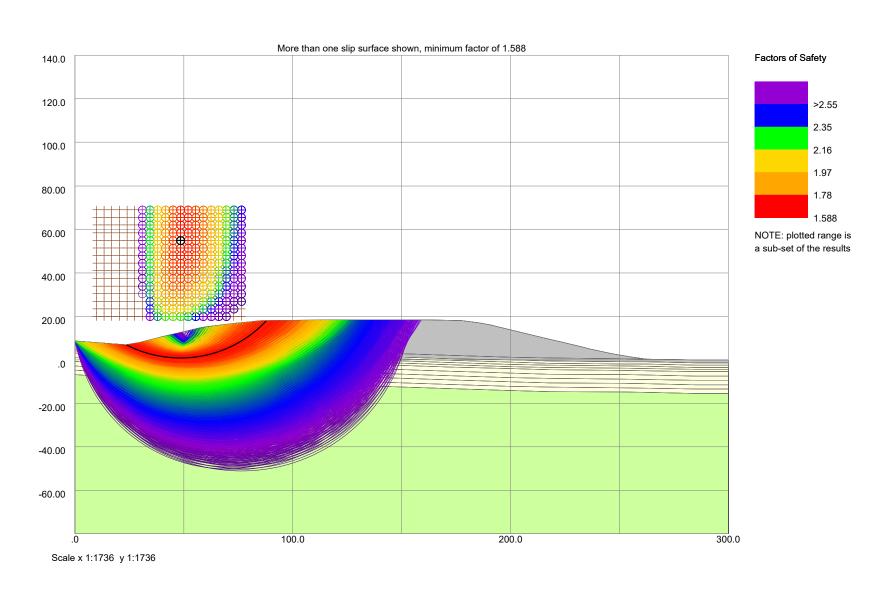
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Northern SPA
Eastern Mound - Undrained
Section B-BB





#### **Northern SPA**

Eastern Mound - Undrained Section B-BB

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description             | Unit W<br>Above GWL | -       | Shear Strength Parameters<br>Condition | Phi or    | с |
|----------------------------|---------------------|---------|--|-----------|---|
|                            |                     |         |  | Phi0      |   |
|                            | [kN/m3]             | [kN/m3] |  | [°]       |   |
| [kN/m <sup>2</sup> ]       |                     |         |  |           |   |
| 1 Waste                    | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 50.000                     |                     |         |  |           |   |
| 2 Clay Deposits            | 17.000              | 17.000  | Undrained                              | N.A.      |   |
| 30.000                     | 40.500              | 40 500  | , ,                                    |           |   |
| 3 London Clay 1            | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 43.250<br>4 London Clay 2  | 19.500              | 10 F00  | Undrained                              | N.A.      |   |
| 4 London Clay 2<br>49.750  | 19.500              | 19.500  | Ulidiailled                            | N.A.      |   |
| 5 London Clay 3            | 19.500              | 19 500  | Undrained                              | N.A.      |   |
| 56.250                     | 19.300              | 13.300  | onaramea                               | 14 • 11 • |   |
| 6 London Clay 4            | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 62.750                     |                     |         |  |           |   |
| 7 London Clay 5            | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 72.500                     |                     |         |  |           |   |
| 8 London Clay 6            | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 85.500                     |                     |         |  |           |   |
| 9 London Clay 7            | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 98.500                     |                     |         |  |           |   |
| 10 London Clay 8           | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 111.50                     | 10 500              | 10 500  | 1 1 1                                  |           |   |
| 11 London Clay 9<br>124.50 | 19.500              | 19.500  | Undrained                              | N.A.      |   |
| 12 Harwich                 | 20.000              | 20 000  | Undrained                              | N.A.      |   |
| 130.00                     | 20.000              | 20.000  | Ulidiailled                            | N.A.      |   |
| 130.00                     |                     |         |  |           |   |

#### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathtt{m}}$ 

| Stratum | X>       | _        |          |          |        |          |          |
|---------|----------|----------|----------|----------|--------|----------|----------|
|         | 0.0      | 20.898   | 23.379   | 28.828   | 29.581 | 32.369   | 33.335   |
| 1       | 8.6893   | 7.2080   | 7.0791   |          | 8.1157 |          |          |
| 2       | 8.6893   | 7.2080   | 7.0791   | 6.8704   | •      | 6.7401   | 6.7034   |
| 3       | 7.1893   | 5.7080   | 5.5791   | 5.3704   | •      | 5.2401   | 5.2034   |
| 4       | 6.1893   | 4.7080   | 4.5791   | 4.3704   | •      | 4.2401   | 4.2034   |
| 5       | 5.1893   | 3.7080   | 3.5791   | 3.3704   | •      | 3.2401   | 3.2034   |
| 6       | 4.1893   | 2.7080   | 2.5791   | 2.3704   | •      | 2.2401   | 2.2034   |
| 7       | 3.1893   | 1.7080   | 1.5791   | 1.3704   | •      | 1.2401   | 1.2034   |
| 8       | 1.1893   | -0.29200 | -0.42090 | -0.62960 | •      | -0.75990 | -0.79660 |
| 9       | -0.81070 | -2.2920  | -2.4209  | -2.6296  | •      | -2.7599  | -2.7966  |
| 10      | -2.8107  | -4.2920  | -4.4209  | -4.6296  | •      | -4.7599  | -4.7966  |
| 11      | -4.8107  | -6.2920  | -6.4209  | -6.6296  | •      | -6.7599  | -6.7966  |
| 12      | -6.8107  | -8.2920  | -8.4209  | -8.6296  | •      | -8.7599  | -8.7966  |
| Stratum | X>       |          |          |          |        |          |          |

### ARUP Art

Northern SPA

Eastern Mound - Undrained Section B-BB

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Section | า B-BB<br>              |               |                      |        |               | EB                               | Date                | Спескеа |
|---------|-------------------------|---------------|----------------------|--------|---------------|----------------------------------|---------------------|---------|
|         | 34.766                  | 35.786        | 39.364               | 40.591 | 47.080        | 51.434                           | 52.355              |         |
| 1       |                         |               |                      | 10.836 |               |                                  | 13.709              |         |
| 2       | 6.6573                  | 6.6276        | 6.4857               |        |               | 6.1039                           | •                   |         |
| 3       | 5.1573                  | 5.1276        | 4.9857               | •      |               | 4.6039                           | •                   |         |
| 4       | 4.1573                  | 4.1276        | 3.9857               | •      |               | 3.6039                           |                     |         |
| 5       | 3.1573                  | 3.1276        | 2.9857               | •      |               | 2.6039                           | •                   |         |
| 6       | 2.1573                  | 2.1276        | 1.9857               | •      |               | 1.6039                           |                     |         |
| 7       | 1.1573                  | 1.1276        | 0.98570              | •      |               | 0.60390                          | •                   |         |
| 8       | -0.84270                | -0.87240      | -1.0143              |        |               | -1.3961                          | •                   |         |
| 9       | -2.8427                 | -2.8724       | -3.0143              | •      | •             | -3.3961                          | •                   |         |
| 10      | -4.8427                 | -4.8724       | -5.0143              |        | •             | -5.3961                          | •                   |         |
| 11      | -6.8427                 | -6.8724       | -7.0143              | •      | •             | -7.3961                          | •                   |         |
| 12      | -8.8427                 | -8.8724       | -9.0143              | •      | •             | -9.3961                          | •                   |         |
| ratum   | 1 X>                    |               |                      |        |               |                                  |                     |         |
|         | 56.933                  | 59.521        | 66.317               | 73.606 |               | 85.003                           | 85.461              |         |
| 1       | 14.621                  | 15.116        | 16.116               | 16.989 |               | ·                                | 18.116              |         |
| 2       | •                       | •             | •                    | •      | •             | 5.2282                           | •                   |         |
| 3       | •                       | •             | •                    | •      | •             | 3.7282                           | •                   |         |
| 4       | •                       | •             | •                    | •      | •             | 2.7282                           | •                   |         |
| 5       | •                       | •             | •                    | •      | •             | 1.7282                           | •                   |         |
| 6       | •                       | •             | •                    | •      | •             | 0.72820                          | •                   |         |
| 7       | •                       | •             | •                    | •      | •             | -0.27180                         | •                   |         |
| 8       | •                       | •             | •                    | •      | •             | -2.2718                          | •                   |         |
| 9       | •                       | •             | •                    | •      | •             | -4.2718                          | •                   |         |
| 10      | •                       | •             | •                    | •      | •             | -6.2718                          | •                   |         |
| 11      | •                       | •             |                      | •      | •             | -8.2718                          | •                   |         |
| 12      | 1 X>                    | •             | •                    | •      | •             | -10.272                          | •                   |         |
| ratum   | 1 X><br>99.536          | 115.65        | 118.48               | 121.49 | 127.57        | 122 45                           | 141.16              |         |
| 1       |                         |               | 18.516               |        | 18.516        | <b>132.45</b><br>18 <b>.</b> 516 |                     |         |
| 2       | 4.7505                  | 4.1518        |                      |        |               |                                  | 3.2210              |         |
| 3       | 3.2505                  | 2.6518        | •                    |        | •             |                                  | 1.7210              |         |
| 4       | 2.2505                  | 1.6518        | •                    | •      |               | •                                | 0.72100             |         |
| 5       | 1.2505                  | 0.65180       | •                    | •      | •             | •                                | -0.27900            |         |
| 6       | 0.25050                 | -0.34820      | •                    | •      | •             | •                                | -1.2790             |         |
| 7       | -0.74950                | -1.3482       | •                    | •      | •             | •                                | -2.2790             |         |
| 8       | -2.7495                 | -3.3482       | •                    | •      | •             |                                  | -4.2790             |         |
| 9       | -4.7495                 | -5.3482       |                      | •      | •             | •                                | -6.2790             |         |
| 10      | -6.7495                 | -7.3482       | •                    | •      | •             | •                                | -8.2790             |         |
| 11      | -8.7495                 | -9.3482       | •                    | •      | •             | •                                | -10.279             |         |
| 12      | -10.750                 | -11.348       | •                    | •      | •             | •                                | -10.279             |         |
|         | 10.750                  | 11.540        | •                    | •      | •             | •                                | 12.273              |         |
|         | 144.70                  | 144.70        | 153.81               | 162.49 | 172.17        | 177.64                           | 185.66              |         |
| 1       | 18.516                  | 18.516        | 18.516               | 18.516 | •             | 18.116                           | 17.116              |         |
| 2       |                         |               |                      |        | 2.1856        |                                  | •                   |         |
| 3       |                         |               | •                    |        | 0.68560       |                                  |                     |         |
| 4       |                         |               | •                    |        | -0.31440      |                                  |                     |         |
| 5       |                         |               |                      |        | -1.3144       |                                  |                     |         |
| 6       |                         |               |                      |        | -2.3144       | •                                |                     |         |
| 7       |                         |               |                      |        | -3.3144       |                                  |                     |         |
| 8       |                         |               |                      |        | -5.3144       |                                  |                     |         |
| 9       | •                       |               |                      |        | -7.3144       |                                  | •                   |         |
| 10      | •                       |               |                      |        | -9.3144       |                                  | •                   |         |
| 11      | •                       |               |                      | •      | -11.314       |                                  |                     |         |
| 12      | •                       |               |                      |        | -13.314       |                                  | •                   |         |
| ratum   | 1 X>                    |               |                      |        |               |                                  |                     |         |
| _       | 191.41                  | 194.77        | 200.18               | 216.26 | 218.03        | 222.93                           | 225.17              |         |
| 1       | 16.116                  | 15.267        | 1 2265               | 9.9809 |               | 8.3921                           | 7.9546              |         |
| 2       | •                       | •             | 1.3365               | •      | 0.89880       | •                                | •                   |         |
| 3       | •                       | •             | -0.16350             | •      | -0.60120      | •                                | •                   |         |
| 4       | •                       | •             | -1.1635              | •      | -1.6012       | •                                | •                   |         |
| 5       | •                       | •             | -2.1635              | •      | -2.6012       | •                                | •                   |         |
| 6       | •                       | •             | -3.1635              | •      | -3.6012       | •                                | •                   |         |
| 7       | •                       | •             | -4.1635              | •      | -4.6012       | •                                | •                   |         |
| 8       | •                       | •             | -6.1635              | •      | -6.6012       | •                                | •                   |         |
| 9       | •                       | •             | -8.1635              | •      | -8.6012       | •                                | •                   |         |
| 10      | •                       | •             | -10.163              | •      | -10.601       | •                                | •                   |         |
| 11      | •                       | •             | -12.163              | •      | -12.601       | •                                | •                   |         |
| 12      | . v                     | •             | -14.163              | •      | -14.601       | •                                | •                   |         |
| ratum   | 1 X>                    | 232 64        | 226 21               | 246.23 | 240 07        | 251 04                           | 252.69              |         |
|         | <b>230.21</b><br>6.6974 | <b>232.54</b> | <b>236.31</b> 5 1157 |        | <b>248.97</b> | <b>251.04</b><br>2 <b>.</b> 1157 |                     |         |
| 1       | 0.09/4                  | 6.1157        | 5.1157               | 3.1157 | 2.5294        | 2.115/                           | 0.57650             |         |
| 1       |                         |               |                      |        |               |                                  |                     |         |
| 2       | •                       | •             | •                    |        |               |                                  |                     |         |
|         |                         | •             | •                    | :      | ·<br>·        |                                  | -0.92350<br>-1.9235 |         |

### ARUP

**Arup** 

#### **Northern SPA**

Eastern Mound - Undrained Section B-BB

| Job No.   | Sheet No. | Rev. |
|-----------|-----------|------|
| 256906    |           |      |
| Drg. Ref. | _         |      |

Checked

Date

Made by

EΒ

| Stratum |        |         |         |   |   |   |         |
|---------|--------|---------|---------|---|---|---|---------|
| 5       |        | 020 E4  |         |   |   |   | -2.9235 |
| 6       | •      | •       |         | • | • | • | -3.9235 |
| 7       | •      |         |         |   |   | • | -4.9235 |
| 8       | •      | •       |         | • | • | • | -6.9235 |
| 9       | •      |         |         |   |   |   | -8.9235 |
| 10      | •      | •       |         | • | • | • | -10.924 |
| 11      | •      |         |         |   |   |   | -12.924 |
| 12      | •      |         |         |   |   |   | -14.924 |
| Stratum |        | •       | •       | • | • | • | 11,021  |
|         | 255.13 | 262.54  | 285.08  |   |   |   |         |
| 1       | 1.4450 | 0.45890 | 0.0     |   |   |   |         |
| 2       |        | 0.45890 | 0.0     |   |   |   |         |
| 3       |        | -1.0411 | -1.5000 |   |   |   |         |
| 4       | •      | -2.0411 | -2.5000 |   |   |   |         |
| 5       | •      | -3.0411 | -3.5000 |   |   |   |         |
| 6       | •      | -4.0411 | -4.5000 |   |   |   |         |
| 7       | •      |         |         |   |   |   |         |
|         | •      | -5.0411 | -5.5000 |   |   |   |         |
| 8       | •      | -7.0411 | -7.5000 |   |   |   |         |
| 9       | •      | -9.0411 | -9.5000 |   |   |   |         |
| 10      | •      | -11.041 | -11.500 |   |   |   |         |
| 11      | •      | -13.041 | -13.500 |   |   |   |         |
| 12      |        | -15.041 | -15.500 |   |   |   |         |

#### Stratum-linked data

| <b>-</b> |               |             |   |                     |
|----------|---------------|-------------|---|---------------------|
| No.      | Material      | Water table |   | Piezo Set/ Ru value |
| 1        | Waste         |             | - | _                   |
| 2        | Waste         |             | - | _                   |
| 3        | London Clay 1 |             | - | _                   |
| 4        | London Clay 2 |             | - | _                   |
| 5        | London Clay 3 |             | - | _                   |
| 6        | London Clay 4 |             | - | _                   |
| 7        | London Clay 5 |             | - | _                   |
| 8        | London Clay 6 |             | - | _                   |
| 9        | London Clay 7 |             | - | _                   |
| 10       | London Clay 8 |             | - | _                   |
| 11       | London Clay 9 |             | - | _                   |
| 12       | Harwich       |             | - | _                   |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 10.00000 m y = 20.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 20 in x direction at 3.50000m spacing

15 in y direction at 3.50000m spacing

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (48.500m, 55.000m) Radius 54.000m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 22.027 Slip weight [kN/m] 10824. Disturbing moment [kN/m]: 91265. Restoring moment [kNm/m]: 144910. Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 1.5878

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

| Slip  | surface | coordinates | Pore Pre   | essure     | Interslice | forces | [kN/m] |      |
|-------|---------|-------------|------------|------------|------------|--------|--------|------|
| Point | x [m]   | y [m]       | L          | R          | T E        |        |        | E(u) |
|       |         |             | $[kN/m^2]$ | $[kN/m^2]$ |            |        |        |      |
| 1     | 23.553  | 7.1082      | _          | 0.0        | 0.0        |        | 0.0    | 0.0  |
| 2     | 23.627  | 7.0696      | 0.0        | 0.0        | 0.52045    | :      | 2.4100 | 0.0  |
| 3     | 25.330  | 6.2236      | 0.0        | 0.0        | 8.9130     |        | 64.503 | 0.0  |
| 4     | 27.061  | 5.4381      | 0.0        | 0.0        | 12.045     |        | 139.22 | 0.0  |
| 5     | 28.828  | 4.7106      | 0.0        | 0.0        | 13.821     | :      | 219.42 | 0.0  |
| 6     | 29.581  | 4.4225      | 0.0        | 0.0        | 13.816     | :      | 255.79 | 0.0  |
| 7     | 29.820  | 4.3339      | 0.0        | 0.0        | 13.742     | :      | 267.56 | 0.0  |
| 8     | 31.089  | 3.8838      | 0.0        | 0.0        | 11.474     | ;      | 335.79 | 0.0  |
| 9     | 32.369  | 3.4655      | 0.0        | 0.0        | 8.7035     |        | 407.15 | 0.0  |
| 10    | 33.217  | 3.2079      | 0.0        | 0.0        | 6.8028     |        | 455.29 | 0.0  |
| 11    | 33.335  | 3.1732      | 0.0        | 0.0        | 6.4394     |        | 462.38 | 0.0  |
| 12    | 34.766  | 2.7758      | 0.0        | 0.0        | 2.2635     | !      | 548.62 | 0.0  |

## ARUP Aruj

Northern SPA Eastern Mound - Undrained Section B-BB

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

| Slin .   | zurface  | coordinates   | Pore Pres  | zure  | Interelica   | forces [kN   | /m1        |  |
|--|--|---|--|---|--|--|------------|--|
|  |  |   |  |   |  |  |            | m / \  |
|  | 35.786   | 2.5180  |  |   | -0.33479   |  | .99        |  |
|  | 37.943   | 2.0421  | 0.0  |   | -4.4137  |  |            | 0.0  |
|  | 39.364   | 1.7784  | 0.0  |   | -6.7090  |  | .69        |  |
|  | 40.591   | 1.5823  | 0.0  |   | -7.8676  |  |            | 0.0  |
|  | 42.746   | 1.3074  | 0.0  | 0.0   | -8.2820  |  |            | 0.0  |
|  | 44.910<br>47.080   | 1.1195<br>1.0187  | 0.0  |   | -7.2941<br>-5.9688   |  |            | 0.0  |
|  | 49.258   | 1.0053  | 0.0  |   | -5.6757  |  |            | 0.0  |
|  | 51.434   | 1.0798  | 0.0  |   | -0.61613   |  |            | 0.0  |
|  | 52.355   | 1.1378  | 0.0  | 0.0   | 2.9014   |  |            | 0.0  |
|  |  |   | 0.0  | 0.0   |  |  |            |  |
|  | 54.063   | 1.2873<br>1.4909  |  |   | 10.997   |  |            | 0.0  |
|  | 55.765<br>56.933   |   | 0.0  | 0.0   | 20.288   |  | 5.6<br>1.7 | 0.0  |
|  | 58.230   | 1.6625  | 0.0  | 0.0   | 26.370<br>32.846   |  |            | 0.0  |
|  | 59.521   | 1.8838<br>2.1366  | 0.0  | 0.0   | 38.621   |  |            | 0.0  |
|  | 60.567   | 2.3656  | 0.0  | 0.0   | 42.571   |  |            | 0.0  |
|  |  | 2.7923  | 0.0  |   | 46.017   |  |            |  |
|  | 62.297   |   |  | 0.0   |  |  |            | 0.0  |
|  | 64.012   | 3.2758  | 0.0  | 0.0   | 46.399   |  | 2.2        |  |
|  | 66.317   | 4.0242  | 0.0  | 0.0   | 39.086   |  |            | 0.0  |
|  | 66.820   | 4.2025  | 0.0  | 0.0   | 36.499   |  |            | 0.0  |
|  | 68.589   | 4.8759  | 0.0  | 0.0   | 26.668   |  |            | 0.0  |
|  | 70.334   | 5.6109  | 0.0  | 0.0   | 13.005   |  | .64        |  |
|  | 71.983   | 6.3734  | 0.0  |   | -3.2370  |  | .03        |  |
|  | 73.606   | 7.1909  | 0.0  | 0.0   | -21.823  |  | .99        |  |
|  | 75.408   | 8.1816  | 0.0  | 0.0   | -44.326  |  |            | 0.0  |
|  | 77.171   | 9.2402  | 0.0  | 0.0   | -66.531  |  |            | 0.0  |
|  | 78.893   | 10.365  | 0.0  | 0.0   | -86.348  |  | .83        |  |
|  | 80.611   | 11.585  | 0.0  |   | -101.69  |  | 654        |  |
|  | 82.280   | 12.870  | 0.0  |   | -109.27  |  | 586        |  |
|  | 83.897   | 14.220  | 0.0  |   | -106.28  | -52.   |            | 0.0  |
|  | 85.461   | 15.631  | 0.0  |   | -89.902  | -88.   | 978        | 0.0  |
|  | 86.736   | 16.868  | 0.0  | 0.0   | -63.079  |  | .53        | 0.0  |
| 45   | 87.969   | 18.146  | 0.0 -  |   | -22.027  | -105   | .28        | 0.0  |
|  |  |   |  |   |  |  |            |  |
| Slice  | Strengt  | h Parameters  | <b>Average</b>   | Slice   | Forces   | on base [kN  | /m]        |  |
| No.  |  |   | Pore   | Weight  |  |  |            |  |
|  |  |   | Pressure   |   |  |  |            |  |
|  | c'   | Tan phi   | [kN/m <sup>2</sup> ]   | /   | 1  | Oh   |            |  |
|  |  |   | [KM/III-]  | [kN/m   | ] Normal   | Snear  | Shear      | Ľ  |
|  | $[kN/m^2]$   | -   | [KM/M-]  | [kN/m   | _  |  |            |  |
| 1  | [kN/m <sup>2</sup> ] 35.714  | _   |  |   | _  | (capacity)<br>2.9869   |            |  |
|  | 35.714   | 0.0   | 0.0  | 0.0368  | 85 1.6953  | (capacity)<br>2.9869   |            | <b>ilised)</b><br>1.8811   |
| 2  | 35.714<br>35.714   | 0.0   | 0.0  | 0.0368  | 85 1.6953<br>65 55.449   | (capacity)<br>2.9869<br>67.911   |            | <b>ilised)</b><br>1.8811<br>42.769   |
| 2  | 35.714<br>35.714<br>35.714   | 0.0<br>0.0<br>0.0   | 0.0  | 0.0368<br>20.4<br>58.0  | 85 1.6953<br>65 55.449<br>48 88.461  | (capacity)<br>2.9869<br>67.911<br>67.910   |            | ilised)<br>1.8811<br>42.769<br>42.769  |
| 2<br>3<br>4  | 35.714<br>35.714<br>35.714<br>30.893   | 0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0                                    | 0.0368<br>20.4<br>58.0<br>95.3  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15   | (capacity) 2.9869 67.911 67.910 59.034   |            | 1.8811<br>42.769<br>42.769<br>37.179   |
| 2<br>3<br>4<br>5   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893   | 0.0<br>0.0<br>0.0<br>0.0                                    | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                             | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503  | (capacity)   |            | ilised)<br>1.8811<br>42.769<br>42.769<br>37.179<br>15.682  |
| 2<br>3<br>4<br>5<br>6  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>30.893   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0                             | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647   |            | 1.8811<br>42.769<br>42.769<br>37.179<br>15.682<br>4.9531   |
| 2<br>3<br>4<br>5<br>6<br>7   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>30.893<br>35.536   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                      | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858  |            | 1.8811<br>42.769<br>42.769<br>37.179<br>15.682<br>4.9531<br>30.140   |
| 2<br>3<br>4<br>5<br>6<br>7<br>8  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>30.893<br>35.536   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56   | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858   |            | ilised)<br>1.8811<br>42.769<br>42.769<br>37.179<br>15.682<br>4.9531<br>30.140  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>30.893<br>35.536<br>35.536   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>76 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477  |            | ilised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 19.824   |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179   |   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423   |            | ilised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 19.824 3.1126  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179   |   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668  |            | ilised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 19.824 3.1126 37.578   |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179   |   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85   | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290   |            | ilised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 19.824 3.1126 37.578 26.634  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179   |   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727  |            | 11ised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 31.126 37.578 26.634 55.879  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08   | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799   |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 32.6.634 55.879 40.810  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>80 145.85<br>07 338.20<br>15 244.08<br>44 223.13  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694  |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 37.578 40.810 35.075  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08   | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799   |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 32.6.634 55.879 40.810  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>80 145.85<br>07 338.20<br>15 244.08<br>44 223.13  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694  |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 37.578 40.810 35.075  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>405.<br>439.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>761.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368   |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 37.578 26.634 55.879 40.810 35.075 61.321   |
| 2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>761.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368  |            | ilised) 1.8811 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 37.578 26.634 55.879 40.810 61.321 61.321  |
| 2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>18<br>19  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>234.<br>215.<br>405.<br>439.<br>469.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694 97.368 97.368 97.368   |            | ilised) 1.8811 42.769 42.769 35.169 15.682 4.9531 30.140 30.140 19.824 3.1126 37.578 26.634 55.879 40.810 35.075 61.321 61.321 61.468  |
| 2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>12<br>13<br>14<br>15<br>16<br>17<br>17<br>18<br>19<br>20  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>469.<br>517.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694 97.368 97.368 97.368 97.3601   |            | ilised) 1.8811 42.769 42.769 37.179 15.179 30.140 30.140 19.824 3.1126 35.075 61.321 61.321 61.468 61.468  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>469.<br>496.<br>517.<br>224.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694 97.368 97.368 97.368 97.368 97.601 97.601 41.385   |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 37.578 40.810 35.075 61.321 61.321 61.326 661.468 26.064  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>469.<br>469.<br>421.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694 97.368 97.368 97.368 97.368 97.368 97.368  |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 37.578 40.810 35.075 61.321 61.321 61.468 26.064 48.384   |
| 2 3 3 4 4 5 6 6 7 7 7 8 9 10 11 12 13 3 14 4 15 16 17 18 19 20 20 22 23  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>469.<br>496.<br>517.<br>224.<br>421.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>761.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.368     97.368     97.368     97.368     97.368     77.601     41.385     76.825   |            | ilised) 1.8811 42.769 42.769 42.769 15.682 4.9531 30.140 30.140 31.126 37.578 26.634 55.879 40.810 35.075 661.321 61.468 61.468 61.468 48.384 48.384   |
| 2 3 4 4 5 6 6 7 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>469.<br>496.<br>517.<br>224.<br>421.<br>425.<br>294.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 423.13<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.368     97.601     97.601     41.385     76.825     76.825     76.825  |            | ilised) 1.8811 42.769 42.769 42.769 15.682 4.9531 30.140 30.140 19.824 3.1126 63.37.578 26.634 55.879 40.810 35.075 61.321 61.468 62.064 48.384 48.384   |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>7<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25  | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>234.<br>215.<br>405.<br>439.<br>469.<br>496.<br>517.<br>224.<br>421.<br>425.<br>294.<br>328.  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21<br>12 333.63  | (capacity) 2.9869 67.911 67.910 59.034 24.900 7.8647 47.858 47.858 31.477 4.9423 59.668 42.290 88.727 64.799 55.694 97.368 97.368 97.368 97.368 97.361 41.385 76.825 76.825 76.825   |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 37.578 26.634 55.879 40.810 35.075 61.321 61.468 626.064 48.384 429.865 33.297  |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>26<br>27<br>26<br>27<br>26<br>27<br>27<br>28<br>28<br>29<br>20<br>20<br>21<br>21<br>22<br>22<br>23<br>24<br>24<br>25<br>26<br>26<br>26<br>26<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27<br>27   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>40.179<br>40.179<br>40.179   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>215.<br>405.<br>439.<br>46.<br>517.<br>224.<br>421.<br>425.<br>294.<br>328.<br>326.   | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>87 187.99<br>87 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.369     97.361     41.385     76.825     76.825     47.420     52.870  |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 35.075 61.321 61.321 61.468 26.064 48.384 48.384 297 33.297   |
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| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31   | 35.714<br>35.714<br>35.714<br>30.893<br>30.893<br>35.536<br>35.536<br>40.179<br>40.179<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>44.821<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>30.893<br>30.893<br>30.893<br>30.893<br>30.893   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>427.<br>427.<br>427.<br>427.<br>427.<br>427.<br>427 | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>29 438.73<br>79 427.13<br>99 257.88<br>87 118.55<br>13 406.37  | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.601     41.385     76.825     76.825     47.420     52.870     43.038     63.302     63.302     74.896     16.469     67.611  |            | ilised) 1.8811 42.769 42.769 37.179 37.179 30.140 30.140 19.824 3.1126 32.6.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 48.384 49.865 33.297 33.297 27.105 39.867 39.867 40.372 42.580   |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>31<br>32<br>33<br>33<br>33<br>33<br>33<br>33<br>33<br>33<br>33<br>34<br>34<br>34<br>34   | 35.714 35.714 35.714 30.893 30.893 30.893 35.536 40.179 40.179 40.179 44.821 44.821 44.821 44.821 44.821 44.821 44.821 44.821 44.821 44.821 44.821 45.821 47.821 47.821 47.821 47.821 47.821 47.821  |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>215.<br>405.<br>439.<br>496.<br>517.<br>224.<br>421.<br>425.<br>294.<br>328.<br>326.<br>264.<br>432.<br>432.<br>432.<br>405.<br>334.<br>405.<br>344.<br>328.<br>326.<br>326.<br>326.<br>326.<br>326.<br>326.<br>326.<br>326   | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 444.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>88 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>29 438.73<br>79 427.13<br>92 557.88<br>87 118.55<br>13 406.37<br>69 382.07   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.3601     41.385     76.825     76.825     76.825     47.420     52.870     43.038     63.302     74.896     16.469     67.611     67.611  |            | ilised) 1.8811 42.769 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 31.126 33.37.578 26.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 48.384 48.384 49.865 33.297 27.105 33.297 27.105 39.867 47.169 10.372 42.580 40.867 40.867            |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31   | 35.714 35.714 35.714 30.893 30.893 30.893 35.536 35.536 40.179 40.179 40.179 44.821  |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>136.<br>321.<br>234.<br>215.<br>405.<br>439.<br>496.<br>517.<br>224.<br>421.<br>425.<br>294.<br>328.<br>326.<br>264.<br>432.<br>432.<br>432.<br>432.<br>432.<br>432.<br>432.<br>43  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>29 438.73<br>79 427.13<br>92 557.88<br>87 118.55<br>13 406.37<br>69 382.07<br>21 341.99   | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.858     31.477     4.9423     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.368     97.601     41.385     76.825     76.825     76.825     76.825     47.420     52.870     43.038     63.302     74.896     16.469     67.611     67.611     64.891  |            | ilised) 1.8811 42.769 42.769 42.769 37.179 15.682 4.9531 30.140 30.140 31.126 33.37.578 26.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 48.384 48.384 49.865 33.297 27.105 33.297 27.105 39.867 47.169 10.372 42.580 40.867 40.867            |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>34<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>31<br>33<br>34<br>34<br>35<br>36<br>36<br>37<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>38<br>37<br>37<br>37<br>38<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37<br>37 | 35.714 35.714 35.714 30.893 30.893 35.536 35.536 40.179 40.179 40.179 44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>234.<br>215.<br>409.<br>496.<br>517.<br>224.<br>425.<br>429.<br>421.<br>552.<br>117.<br>405.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382   | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 4223.13<br>92 444.87<br>47 497.19<br>08 520.30<br>44 226.73<br>79 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>91 332.34<br>07 268.30<br>92 9 438.73<br>79 427.13<br>92 557.88<br>87 118.55<br>13 406.37<br>69 382.07<br>21 341.99<br>87 316.29<br>03 324.90 | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.4943     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.368     97.601     97.601     41.385     76.825     47.420     52.870     43.038     63.302     74.896     16.469     67.611     67.611     64.890     73.451  |            | ilised) 1.8811 42.769 42.769 42.769 15.682 4.9531 30.140 30.140 19.824 3.1126 33.7.578 26.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 49.865 33.297 27.105 33.297 27.105 39.867 47.169 10.372 42.580 42.581 40.867 40.867 40.867             |
| 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 3 14 15 16 17 18 19 2 2 2 3 2 2 4 2 5 5 2 6 6 7 2 7 2 8 2 9 3 0 3 1 3 2 2 3 3 3 4 3 5 5  | 35.714 35.714 35.714 30.893 30.893 35.536 35.536 40.179 40.179 44.821   |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>234.<br>215.<br>409.<br>429.<br>421.<br>425.<br>224.<br>421.<br>425.<br>328.<br>326.<br>264.<br>432.<br>405.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382.<br>382   | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 417.27<br>92 448.41<br>92 474.87<br>47 497.19<br>08 520.30<br>44 226.73<br>76 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>29 438.73<br>79 427.13<br>92 557.88<br>87 118.55<br>13 406.37<br>69 382.07<br>21 341.99<br>03 324.90<br>63 288.18                 | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.858     47.99     55.694     97.368     97.368     97.368     97.601     41.385     76.825     77.368     97.361 |            | ilised) 1.8811 42.769 42.769 37.179 37.179 15.682 4.9531 30.140 30.140 19.824 3.1126 37.578 26.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 42.865 33.297 33.297 27.105 39.867 47.169 10.372 42.580 40.867 40.867 40.867 40.867 40.867 40.867 |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>17<br>18<br>20<br>21<br>22<br>23<br>32<br>4<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31<br>31  | 35.714 35.714 35.714 30.893 30.893 30.893 35.536 40.179 40.179 44.821 45.71 40.179 |   |  | 0.0368<br>20.4<br>58.0<br>95.3<br>51.1<br>17.5<br>104.<br>124.<br>92.0<br>13.4<br>174.<br>215.<br>405.<br>4321.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>224.<br>421.<br>425.<br>328.<br>326.<br>264.<br>432.<br>405.<br>328.<br>328.<br>328.<br>328.<br>328.<br>328.<br>328.<br>328  | 85 1.6953<br>65 55.449<br>48 88.461<br>74 122.15<br>77 61.503<br>31 20.681<br>52 120.30<br>11 138.56<br>92 100.96<br>36 14.629<br>27 187.99<br>83 145.85<br>07 338.20<br>15 244.08<br>44 223.13<br>84 4223.13<br>92 444.87<br>47 497.19<br>08 520.30<br>44 226.73<br>79 427.18<br>79 432.28<br>38 299.21<br>12 333.63<br>91 332.34<br>07 268.30<br>91 332.34<br>07 268.30<br>92 9 438.73<br>79 427.13<br>92 557.88<br>87 118.55<br>13 406.37<br>69 382.07<br>21 341.99<br>87 316.29<br>03 324.90 | (capacity)     2.9869     67.911     67.910     59.034     24.900     7.8647     47.858     47.858     47.4943     59.668     42.290     88.727     64.799     55.694     97.368     97.368     97.368     97.368     97.601     97.601     41.385     76.825     47.420     52.870     43.038     63.302     74.896     16.469     67.611     67.611     64.890     73.451  |            | ilised) 1.8811 42.769 42.769 42.769 15.682 4.9531 30.140 30.140 19.824 3.1126 33.7.578 26.634 55.879 40.810 35.075 61.321 61.468 61.468 26.064 48.384 49.865 33.297 27.105 33.297 27.105 39.867 47.169 10.372 42.580 42.581 40.867 40.867 40.867             |

Northern SPA

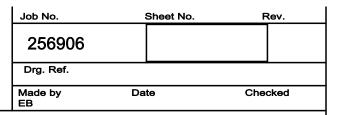
Eastern Mound - Undrained Section B-BB

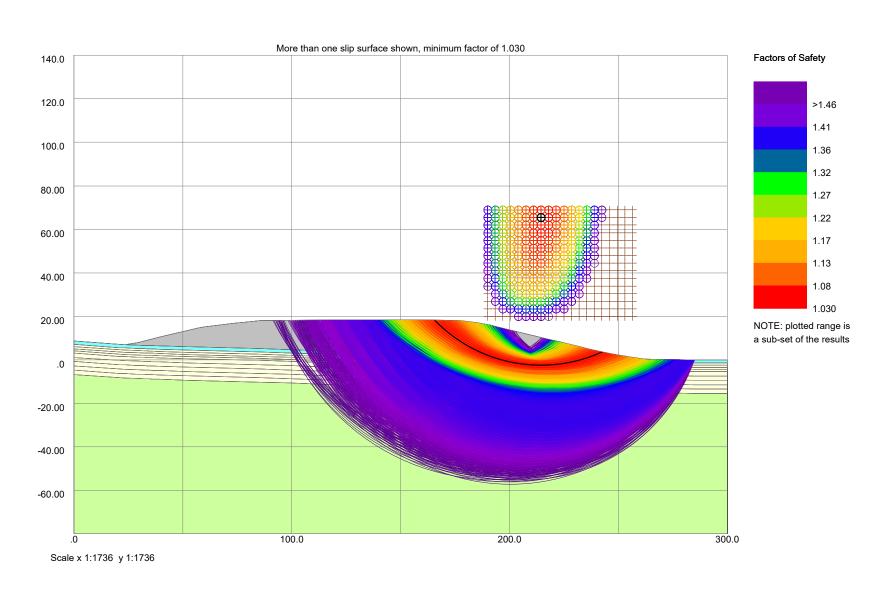
| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           | -       |
| Made by<br>EB | Date      | Checked |

| Slice | Strength | Parameters | Average  | Slice          | Forces | on base [kN/m] |        |
|-------|----------|------------|----------|----------------|--------|----------------|--------|
| 17-   |          |            | <b>n</b> | 7.7 ± 2 ± 1. ± |        |                |        |
| 40    | 35.714   | 0.0        | 0.0      | 179.48         | 179.70 | 75.237         | 47.383 |
| 41    | 35.714   | 0.0        | 0.0      | 137.22         | 142.24 | 75.237         | 47.383 |
| 42    | 35.714   | 0.0        | 0.0      | 95.058         | 106.49 | 75.237         | 47.383 |
| 43    | 35.714   | 0.0        | 0.0      | 46.572         | 62.751 | 63.430         | 39.947 |
| 44    | 35.714   | 0.0        | 0.0      | 15.188         | 38.816 | 63.430         | 39.947 |

| Slice | Surface Load | [kN/m_hor/m] | Point | Load | [kN/m] | Water Pressure | on           |
|-------|--------------|--------------|-------|------|--------|----------------|--------------|
| No.   |              |              |       |      |        | ground surface | [kN/m_hor/m] |
|       | Vert Ho      | riz          | Vert  |      | Horiz  | Vert Horiz     |              |
| 1     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 2     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 3     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 4     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 5     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 6     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 7     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 8     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 9     | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 10    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 11    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 12    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 13    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 14    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 15    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 16    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 17    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 18    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 19    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 20    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 21    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 22    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 23    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 24    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 25    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 26    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 27    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 28    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 29    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 30    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 31    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 32    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 33    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 34    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 35    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 36    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 37    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 38    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 39    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 40    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 41    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 42    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 43    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |
| 44    | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0            | 0.0          |

Northern SPA
Eastern Mound - Undrained
Section B-BB (west)





### ARUP Arus

#### **Northern SPA**

Eastern Mound - Undrained Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'      | Unit N<br>Above GWL | -       | Shear Strength Parameters Condition | Phi or    | С |
|----------------------------|---------------------|---------|-------------------------------------|-----------|---|
| 01 60                      |                     |         |                                     | Phi0      |   |
|                            | [kN/m3]             | [kN/m3] |                                     | [°]       |   |
| [kN/m <sup>2</sup> ]       |                     |         |                                     |           |   |
| 1 Waste                    | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 50.000                     |                     |         |                                     |           |   |
| 2 Clay Deposits            | 17.000              | 17.000  | Undrained                           | N.A.      |   |
| 30.000                     |                     |         |                                     |           |   |
| 3 London Clay 1            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 43.250                     | 10.500              | 10 500  | TT - A 1 A                          | 37. 3     |   |
| 4 London Clay 2<br>49.750  | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 5 London Clay 3            | 19.500              | 10 500  | Undrained                           | N.A.      |   |
| 56.250                     | 19.300              | 17.500  | Olidiailled                         | N.A.      |   |
| 6 London Clay 4            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 62.750                     |                     |         |                                     |           |   |
| 7 London Clay 5            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 72.500                     |                     |         |                                     |           |   |
| 8 London Clay 6            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 85.500                     |                     |         |                                     |           |   |
| 9 London Clay 7            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 98.500                     |                     |         |                                     |           |   |
| 10 London Clay 8           | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 111.50                     | 10.500              | 10 500  | TT - A 1 A                          | 37. 3     |   |
| 11 London Clay 9<br>124.50 | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 12 Harwich                 | 20.000              | 20 000  | Undrained                           | N.A.      |   |
| 130.00                     | 20.000              | 20.000  | OHALATHEA                           | 14 • 14 • |   |
| 100.00                     |                     |         |                                     |           |   |

#### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathtt{m}}$ 

| Stratum | X>       |          |          |          |        |          |          |
|---------|----------|----------|----------|----------|--------|----------|----------|
|         | 0.0      | 20.898   | 23.379   | 28.828   | 29.581 | 32.369   | 33.335   |
| 1       | 8.6893   | 7.2080   | 7.0791   |          | 8.1157 |          |          |
| 2       | 8.6893   | 7.2080   | 7.0791   | 6.8704   | •      | 6.7401   | 6.7034   |
| 3       | 7.1893   | 5.7080   | 5.5791   | 5.3704   | •      | 5.2401   | 5.2034   |
| 4       | 6.1893   | 4.7080   | 4.5791   | 4.3704   | •      | 4.2401   | 4.2034   |
| 5       | 5.1893   | 3.7080   | 3.5791   | 3.3704   | •      | 3.2401   | 3.2034   |
| 6       | 4.1893   | 2.7080   | 2.5791   | 2.3704   | •      | 2.2401   | 2.2034   |
| 7       | 3.1893   | 1.7080   | 1.5791   | 1.3704   | •      | 1.2401   | 1.2034   |
| 8       | 1.1893   | -0.29200 | -0.42090 | -0.62960 | •      | -0.75990 | -0.79660 |
| 9       | -0.81070 | -2.2920  | -2.4209  | -2.6296  | •      | -2.7599  | -2.7966  |
| 10      | -2.8107  | -4.2920  | -4.4209  | -4.6296  | •      | -4.7599  | -4.7966  |
| 11      | -4.8107  | -6.2920  | -6.4209  | -6.6296  | •      | -6.7599  | -6.7966  |
| 12      | -6.8107  | -8.2920  | -8.4209  | -8.6296  |        | -8.7599  | -8.7966  |
| Stratum | X>       |          |          |          |        |          |          |

### ARUP

**Arup** 

Northern SPA Eastern Mound - Undrained Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

|         |              |            |   |                                       |  | EB                  |                                       |
|---------|--------------|------------|---|---------------------------------------|--|---------------------|---------------------------------------|
|         |              |            |   |                                       |  |                     |                                       |
|         | 34.766       | 35.786     | 39.364  | <b>40.591</b> 10.836                  | <b>47.080</b>  | 51.434              | <b>52.355</b> 13.709                  |
|         | 6.6573       | 6.6276     | 6.4857  |                                       |  | 6.1039              | •                                     |
|         | 5.1573       | 5.1276     | 4.9857  | •                                     |  | 4.6039              |                                       |
|         | 4.1573       | 4.1276     | 3.9857  |                                       |  | 3.6039              |                                       |
|         | 3.1573       | 3.1276     | 2.9857  |                                       |  | 2.6039              | ·<br>·                                |
|         |              |            |   |                                       | •  |                     | •                                     |
|         | 2.1573       | 2.1276     | 1.9857  | •                                     | •  | 1.6039              | •                                     |
|         | 1.1573       | 1.1276     | 0.98570   | •                                     | •  | 0.60390             | •                                     |
|         | -0.84270     | -0.87240   | -1.0143   |                                       | •  | -1.3961             | •                                     |
|         | -2.8427      | -2.8724    | -3.0143   |                                       |  | -3.3961             | •                                     |
|         | -4.8427      | -4.8724    | -5.0143   |                                       | •  | -5.3961             |                                       |
|         | -6.8427      | -6.8724    | -7.0143   |                                       |  | -7.3961             |                                       |
|         | -8.8427      | -8.8724    | -9.0143   |                                       |  | -9.3961             |                                       |
|         | x>           |            |   |                                       |  |                     |                                       |
|         | 56.933       | 59.521     | 66.317  | 73.606                                | 78.893   | 85.003              | 85.461                                |
|         | 14.621       |            | 16.116  | 16.989                                |  |                     | 18.116                                |
|         |              |            |   |                                       |  |                     |                                       |
|         | •            | •          | •   | •                                     | •  | 5.2282              | •                                     |
|         | •            | •          | •   | •                                     | •  | 3.7282              | •                                     |
|         | •            | •          | •   | •                                     | •  | 2.7282              | •                                     |
|         | •            | •          | •   | •                                     | •  | 1.7282              | •                                     |
|         |              |            |   | •                                     | •  | 0.72820             |                                       |
|         | •            |            | •   |                                       | •  | -0.27180            |                                       |
|         | •            |            |   | •                                     | •  | -2.2718             |                                       |
|         |              |            |   | •                                     |  | -4.2718             |                                       |
|         |              | •          |   |                                       |  | -6.2718             | ·                                     |
|         | •            | •          |   |                                       |  | -8.2718             | •                                     |
|         | •            | •          | •   | •                                     | •  |                     | •                                     |
|         | •            | •          |   | •                                     | •  | -10.272             | •                                     |
|         | X>           | 115 65     | 110 40  | 101 40                                | 107 57   | 100 45              | 141 16                                |
|         | 99.536       |            | 118.48  |                                       | 127.57   |                     | 141.16                                |
|         |              |            | 18.516  |                                       |  | 18.516              | :                                     |
|         | 4.7505       | 4.1518     | •   | •                                     | •  | •                   | 3.2210                                |
|         | 3.2505       | 2.6518     |   | •                                     | •  | •                   | 1.7210                                |
|         | 2.2505       | 1.6518     |   |                                       |  |                     | 0.72100                               |
|         | 1.2505       | 0.65180    |   | •                                     | •  | •                   | -0.27900                              |
|         | 0.25050      | -0.34820   |   |                                       |  |                     | -1.2790                               |
|         | -0.74950     | -1.3482    |   | •                                     |  |                     | -2.2790                               |
|         | -2.7495      | -3.3482    | •   |                                       | •  |                     | -4.2790                               |
|         | -4.7495      | -5.3482    |   |                                       |  | •                   | -6.2790                               |
|         | -6.7495      | -7.3482    |   | •                                     |  | •                   | -8.2790                               |
|         |              |            |   | •                                     |  |                     | -10.279                               |
|         | -8.7495      | -9.3482    | •   | •                                     | •  | •                   |                                       |
|         | -10.750      | -11.348    | •   | •                                     | •  | •                   | -12.279                               |
|         | X>           | 444 50     |   | 1.60 40                               | 100 10   |                     | 105.66                                |
|         | 144.70       | 144.70     |   | 162.49                                |  | 177.64              |                                       |
|         | 18.516       |            | 18.516  |                                       | :  | 18.116              |                                       |
|         | •            | •          |   |                                       | 2.1856   | •                   | •                                     |
|         | •            | •          |   | •                                     | 0.68560  | •                   | •                                     |
|         | •            | •          |   |                                       | -0.31440   |                     | •                                     |
|         | •            | •          |   |                                       | -1.3144  | •                   |                                       |
|         | •            |            | •   | •                                     | -2.3144  | •                   |                                       |
|         |              | •          |   | •                                     | -3.3144  | •                   |                                       |
|         |              |            |   |                                       | -5.3144  |                     |                                       |
|         | -            | •          |   |                                       | -7.3144  |                     |                                       |
|         | -            | •          | •   | •                                     | -9.3144  | •                   | •                                     |
|         | •            | •          | •   | •                                     |  | •                   | •                                     |
|         | •            | •          | •   | •                                     | -11.314  | •                   | ·                                     |
| <b></b> | ·            | •          | •   | •                                     | -13.314  | •                   | •                                     |
| cum :   | X><br>191.41 | 104 77     | 200 12  | 016.66                                | 010 00   | 000 00              | 225 17                                |
|         |              |            | 200.18  | 216.26                                | 218.03   | 222.93              | 225.17                                |
|         |              | 194.77     |   | 9.9809                                |  | 8.3921              | 7.9546                                |
|         | 16.116       | 15.267     |   |                                       |  |                     | •                                     |
|         | 16.116       | 15.267     | 1.3365  |                                       | 0.89880  | •                   |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350  |                                       | -0.60120   | •                   | •                                     |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635   |                                       | -0.60120<br>-1.6012  |                     |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350  | •                                     | -0.60120   | •                   |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635   |                                       | -0.60120<br>-1.6012  |                     |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635  |                                       | -0.60120<br>-1.6012<br>-2.6012   |                     |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635  | ·<br>·<br>·                           | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012   | ·<br>·<br>·         |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635   | ·<br>·<br>·<br>·                      | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012  | ·<br>·<br>·<br>·    |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635  | ·<br>·<br>·                           | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012   | ·<br>·<br>·         |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163   | :<br>:<br>:<br>:<br>:                 | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601                                | · · · · · · · · · · |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163                                | ·<br>·<br>·<br>·                      | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601<br>-12.601                     | ·<br>·<br>·<br>·    |                                       |
|         | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163   | :<br>:<br>:<br>:<br>:                 | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601                                | · · · · · · · · · · |                                       |
| tum :   | 16.116       | 15.267<br> | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163<br>-14.163                     | · · · · · · · · · · · · · · · · · · · | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601<br>-12.601<br>-14.601          |                     | · · · · · · · · · · · · · · · · · · · |
| tum :   | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163<br>-14.163                     |                                       | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601<br>-12.601<br>-14.601          |                     |                                       |
| tum :   | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163<br>-14.163<br>236.31<br>5.1157 |                                       | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-10.601<br>-12.601<br>-14.601<br>248.97<br>2.5294 |                     |                                       |
| tum :   | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163<br>-14.163                     |                                       | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-8.6012<br>-10.601<br>-12.601<br>-14.601          |                     | 252.69                                |
| tum :   | 16.116       | 15.267     | 1.3365<br>-0.16350<br>-1.1635<br>-2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163<br>-14.163<br>236.31<br>5.1157 |                                       | -0.60120<br>-1.6012<br>-2.6012<br>-3.6012<br>-4.6012<br>-6.6012<br>-10.601<br>-12.601<br>-14.601<br>248.97<br>2.5294 |                     |                                       |

### ARUP

### **Arup**

#### **Northern SPA**

Eastern Mound - Undrained Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Stratum | n X>   |         |         |        |        |        |         |
|---------|--------|---------|---------|--------|--------|--------|---------|
|         | 000 01 | 020 E4  | 006 01  | 046 00 | 040 07 | 051 04 | 252.60  |
| 5       | •      | •       | •       | •      | •      | •      | -2.9235 |
| 6       | •      |         | •       | •      | •      | •      | -3.9235 |
| 7       |        |         | •       | •      |        |        | -4.9235 |
| 8       |        |         |         | •      |        |        | -6.9235 |
| 9       |        |         |         |        |        |        | -8.9235 |
| 10      |        |         |         |        |        |        | -10.924 |
| 11      |        |         |         |        |        |        | -12.924 |
| 12      |        |         |         |        |        |        | -14.924 |
| Stratum |        | •       | •       | •      | ·      | ·      |         |
| 552454  | 255.13 | 262.54  | 285.08  |        |        |        |         |
| 1       | 1.4450 | 0.45890 | 0.0     |        |        |        |         |
| 2       |        | 0.45890 | 0.0     |        |        |        |         |
| 3       |        | -1.0411 | -1.5000 |        |        |        |         |
|         | •      |         |         |        |        |        |         |
| 4       | •      | -2.0411 | -2.5000 |        |        |        |         |
| 5       | •      | -3.0411 | -3.5000 |        |        |        |         |
| 6       |        | -4.0411 | -4.5000 |        |        |        |         |
| 7       |        | -5.0411 | -5.5000 |        |        |        |         |
| 8       |        | -7.0411 | -7.5000 |        |        |        |         |
| 9       |        | -9.0411 | -9.5000 |        |        |        |         |
| 10      |        | -11.041 | -11.500 |        |        |        |         |
| 11      |        | -13.041 | -13.500 |        |        |        |         |
| 12      |        | -15.041 | -15.500 |        |        |        |         |
| 12      | •      | 10.041  | 13.300  |        |        |        |         |

EB

#### Stratum-linked data

| No. | Material      | Water table | Piezo Set/ Ru value |
|-----|---------------|-------------|---------------------|
| 1   | Waste         | -           |                     |
| 2   | Clay Deposits |             |                     |
| 3   | London Clay 1 | -           |                     |
| 4   | London Clay 2 |             |                     |
| 5   | London Clay 3 |             |                     |
| 6   | London Clay 4 |             |                     |
| 7   | London Clay 5 |             |                     |
| 8   | London Clay 6 |             |                     |
|     | London Clay 7 |             |                     |
|     | London Clay 8 |             |                     |
|     | London Clay 9 |             |                     |
|     | Harwich       |             |                     |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 190.00000 m y = 20.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 20 in x direction at 3.50000m spacing

15 in y direction at 3.50000m spacing

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (214.50m,65.500m) Radius 68.000m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 33.357 Slip weight [kN/m] 15127. Net horiz force [kN/m]: 158.16 Disturbing moment [kN/m]: 185400. Restoring moment [kNm/m]: 191050. Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 1.0305

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

| Slip  | surface | coordinates | Pore Pre   | essure     | Intersli | ce forces [kN/m] |      |
|-------|---------|-------------|------------|------------|----------|------------------|------|
| Point | x [m]   | y [m]       | L          | R          | T        | E                | E(u) |
|       |         |             | $[kN/m^2]$ | $[kN/m^2]$ |          |                  |      |
| 1     | 165.42  | 18.438      | _          | 0.0        | 0.0      | 0.0              | 0.0  |
| 2     | 167.29  | 16.564      | 0.0        | 0.0        | -80.814  | -15.520          | 0.0  |
| 3     | 169.23  | 14.763      | 0.0        | 0.0        | -131.00  | 0.69905          | 0.0  |
| 4     | 171.23  | 13.039      | 0.0        | 0.0        | -154.82  | 48.487           | 0.0  |
| 5     | 173.31  | 11.395      | 0.0        | 0.0        | -156.84  | 126.68           | 0.0  |
| 6     | 175.45  | 9.8328      | 0.0        | 0.0        | -141.75  | 233.16           | 0.0  |
| 7     | 177.64  | 8.3550      | 0.0        | 0.0        | -114.22  | 364.88           | 0.0  |
| 8     | 180.25  | 6.7567      | 0.0        | 0.0        | -74.564  | 540.33           | 0.0  |
| 9     | 182.92  | 5.2771      | 0.0        | 0.0        | -33.523  | 731.47           | 0.0  |
| 10    | 185.66  | 3.9190      | 0.0        | 0.0        | 4.2896   | 930.48           | 0.0  |
| 11    | 188.42  | 2.7019      | 0.0        | 0.0        | 34.383   | 1125.0           | 0.0  |
| 12    | 191.22  | 1.6080      | 0.0        | 0.0        | 54.800   | 1308.7           | 0.0  |

## ARUP '

**Arup** 

Northern SPA Eastern Mound - Undrained Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Clin a   |                      |                    | Dama Dmaga           |            | Tobonoli         | <b>-</b>       | []=N[/==1        |                  |          |
|----------|----------------------|--------------------|----------------------|------------|------------------|----------------|------------------|------------------|----------|
| -        |                      | coordinates 1      |                      |            |                  | ce forces      |                  | ₩ /\             |          |
|          | 191.41               | 1.5405             |                      |            | <b>56.</b> 723   |                | 1322.8           | 0.0              |          |
|          | 193.08<br>194.77     | 0.96122<br>0.42567 | 0.0                  | 0.0        | 71.182<br>80.966 |                | 1443.8<br>1555.4 | 0.0              |          |
|          | 196.41               | -0.049100          | 0.0                  | 0.0        | 86.336           |                | 1653.1           |                  |          |
|          | 198.29               | -0.53940           | 0.0                  | 0.0        | 83.688           |                | 1734.5           | 0.0              |          |
|          | 200.18               | -0.97574           | 0.0                  | 0.0        | 77.724           |                | 1801.4           | 0.0              |          |
|          | 201.21               | -1.1887            | 0.0                  | 0.0        | 73.414           |                | 1831.2           | 0.0              |          |
|          | 203.87               | -1.6645            | 0.0                  | 0.0        | 57.602           |                | 1874.7           | 0.0              |          |
|          | 206.55               | -2.0340            | 0.0                  | 0.0        | 40.773           |                | 1886.2           | 0.0              |          |
|          | 209.25 211.95        | -2.2967<br>-2.4520 | 0.0                  | 0.0        | 25.612<br>14.824 |                | 1865.7<br>1814.0 | 0.0              |          |
|          | 213.72               | -2.4955            | 0.0                  | 0.0        | 11.212           |                | 1756.0           | 0.0              |          |
|          | 216.26               | -2.4773            | 0.0                  | 0.0        | 10.863           |                | 1664.1           | 0.0              |          |
|          | 218.03               | -2.4084            | 0.0                  | 0.0        | 10.050           |                | 1586.7           |                  |          |
|          | 220.49               | -2.2361            | 0.0                  | 0.0        | 9.1721           |                | 1463.2           | 0.0              |          |
|          | 222.93               | -1.9749            | 0.0                  | 0.0        | 9.6161           |                | 1323.8           | 0.0              |          |
|          | 225.11               | -1.6671            | 0.0                  | 0.0        | 11.807           |                | 1188.7           |                  |          |
|          | 225.17<br>227.59     | -1.6572<br>-1.2283 | 0.0                  | 0.0        | 11.855<br>14.790 |                | 1185.0<br>1036.3 | 0.0              |          |
|          | 229.99               | -0.71243           | 0.0                  | 0.0        | 19.660           |                | 883.32           |                  |          |
|          | 230.21               | -0.66100           | 0.0                  | 0.0        | 19.711           |                | 871.30           | 0.0              |          |
| 34       | 232.54               | -0.063148          | 0.0                  | 0.0        | 20.503           |                | 742.58           | 0.0              |          |
|          | 235.24               | 0.73878            | 0.0                  |            | 20.860           |                | 597.75           | 0.0              |          |
|          | 236.31               | 1.0931             | 0.0                  | 0.0        | 25.168           |                | 527.83           |                  |          |
|          | 238.58               | 1.9046             | 0.0                  | 0.0        | 32.655           |                | 388.36           |                  |          |
|          | 240.81 243.01        | 2.7956<br>3.7650   | 0.0                  | 0.0        | 36.237<br>33.357 |                | 263.85<br>158.16 |                  |          |
| 3,7      | 243.01               | 3.7030             | 0.0                  |            | 33.337           |                | 130.10           | 0.0              |          |
| Slice    | Strength             | n Parameters       | Average              | Slice      | Forces           | on base [      | kN/m]            |                  |          |
| No.      |                      |                    | Pore                 | Weight     |                  |                |                  |                  |          |
|          |                      |                    | Pressure             |            |                  |                |                  |                  |          |
|          | c'                   | Tan phi            | [kN/m <sup>2</sup> ] | [kN/m]     | Normal           |                | Shear            |                  |          |
|          | [kN/m <sup>2</sup> ] |                    |                      |            |                  | (capacity      |                  |                  |          |
|          | 35.714               | 0.0                |                      |            | 68.166           | 94.54          |                  | 91.748           |          |
| 2        | 35.714<br>35.714     | 0.0                |                      |            | 121.39<br>179.06 | 94.54<br>94.54 |                  | 91.747<br>91.749 |          |
| 4        | 35.714               | 0.0                |                      |            | 240.46           | 94.54          |                  | 91.747           |          |
| 5        | 35.714               | 0.0                |                      |            | 304.80           | 94.54          |                  | 91.749           |          |
| 6        | 35.714               | 0.0                |                      |            | 371.22           | 94.54          | 3                | 91.748           |          |
| 7        | 35.714               | 0.0                |                      |            | 506.95           | 109.1          |                  | 105.92           |          |
| 8        | 35.714               | 0.0                |                      |            | 585.13           | 109.1          |                  | 105.92           |          |
| 9        | 35.714               | 0.0                |                      |            | 660.44           | 109.1          |                  | 105.92           |          |
| 10<br>11 | 35.714<br>35.714     | 0.0                |                      |            | 717.19<br>773.16 | 107.6<br>107.6 |                  | 104.43           |          |
| 12       | 21.429               | 0.0                |                      |            | 52.641           | 4.245          |                  | 4.1199           |          |
| 13       | 21.429               | 0.0                |                      |            | 475.84           | 37.92          |                  | 36.804           |          |
| 14       | 21.429               | 0.0                |                      | 482.88     | 484.32           | 37.92          |                  | 36.803           |          |
| 15       | 21.429               | 0.0                |                      |            | 473.53           | 36.57          |                  | 35.497           |          |
| 16       | 30.893               | 0.0                |                      |            | 545.68           | 60.04          |                  | 58.270           |          |
| 17       | 30.893<br>30.893     | 0.0                |                      |            | 550.83<br>298.43 | 60.04          |                  | 58.270           |          |
| 18<br>19 | 35.536               | 0.0                |                      |            | 768.67           | 32.40<br>96.13 |                  | 31.451<br>93.287 |          |
| 20       | 35.536               | 0.0                |                      |            | 761.10           | 96.12          |                  | 93.287           |          |
| 21       | 35.536               | 0.0                |                      |            | 744.99           | 96.12          |                  | 93.287           |          |
| 22       | 35.536               | 0.0                | 0.0                  | 713.87     | 720.39           | 96.12          | 9                | 93.287           |          |
| 23       | 40.179               | 0.0                |                      |            | 455.20           | 71.27          |                  | 69.167           |          |
| 24       | 35.536               | 0.0                |                      |            | 623.51           | 90.12          |                  | 87.457           |          |
| 25<br>26 | 35.536<br>35.536     | 0.0                |                      |            | 419.27<br>554.81 | 63.04<br>87.52 |                  | 61.178<br>84.937 |          |
| 26       | 35.536               | 0.0                |                      |            | 518.45           | 87.52          |                  | 84.937           |          |
| 28       | 35.536               | 0.0                |                      |            | 429.94           | 78.10          |                  | 75.798           |          |
| 29       | 30.893               | 0.0                |                      |            | 11.896           | 1.950          | 16               | 1.8929           |          |
| 30       | 30.893               | 0.0                | 0.0                  |            | 437.64           | 75.82          | :3               | 73.581           |          |
| 31       | 30.893               | 0.0                |                      |            | 387.28           | 75.82          |                  | 73.581           |          |
| 32       | 21.429               | 0.0                |                      |            | 32.794           | 4.804          |                  | 4.6624           |          |
| 33<br>34 | 21.429<br>21.429     | 0.0                |                      |            | 325.08<br>313.95 | 51.61<br>60.25 |                  | 50.092<br>58.474 |          |
| 35       | 35.714               | 0.0                |                      |            | 105.44           | 40.45          |                  | 39.254           |          |
| 36       | 35.714               | 0.0                |                      |            | 183.39           | 85.88          |                  | 83.342           |          |
| 37       | 35.714               | 0.0                |                      |            | 129.88           | 85.88          |                  | 83.342           |          |
| 38       | 35.714               | 0.0                |                      |            | 75.946           | 85.88          |                  | 83.342           |          |
| <b></b>  |                      |                    | . , -                |            |                  |                | _                |                  |          |
|          | Surface              | Load [kN/m_]       | hor/m] Poi           | int Loa    | d [kN/m]         |                | Pressur          |                  | . h/1    |
| No.      | Vort                 | Uori-              | 17                   | ~ <b>+</b> | Howi -           | ground<br>Vert |                  |                  | m_hor/m] |
| 1        | Vert                 | Horiz<br>.0        | 0.0                  | 0.0        | Horiz            | .0             | 0.0              | 12               | 0.0      |
| 2        |                      | . 0                | 0.0                  | 0.0        |                  | .0             | 0.0              |                  | 0.0      |
| 3        |                      | . 0                | 0.0                  | 0.0        |                  | .0             | 0.0              |                  | 0.0      |
|          |                      |                    |                      |            |                  |                |                  |                  |          |

### ARUP

**Arup** 

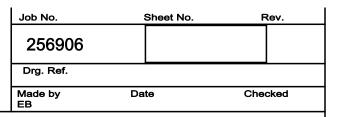
Northern SPA Eastern Mound - Undrained Section B-BB (west)

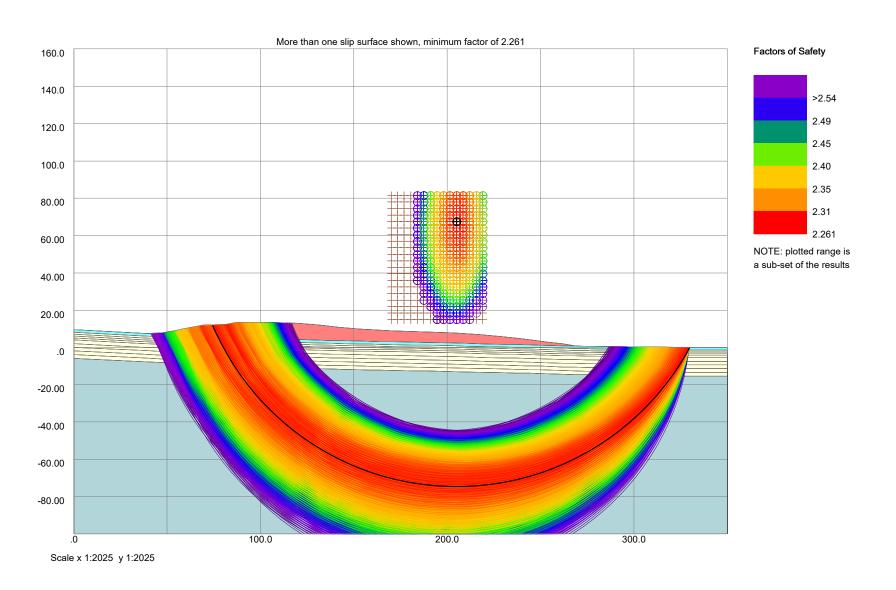
| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | -         |         |
| Made by<br>EB | Date      | Checked |

|    | Surface Load | [kN/m_hor/m] | Point Load | [kN/m] | Water Pressure |     |
|----|--------------|--------------|------------|--------|----------------|-----|
| 4  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 5  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 6  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 7  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 8  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 9  | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 10 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 11 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 12 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 13 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 14 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 15 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 16 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 17 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 18 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 19 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 20 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 21 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 22 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 23 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 24 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 25 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 26 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 27 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 28 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 29 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 30 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 31 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 32 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 33 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 34 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 35 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 36 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 37 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |
| 38 | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0 |

Northern SPA

Eastern Mound - Undrained (East)
Section C-CC





#### Northern SPA

Eastern Mound - Undrained (East) Section C-CC

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis: STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25 Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000Factor on DRAINED SOIL COHESION: 1.25000Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'      | Unit W<br>Above GWL | Weight<br>Below GWL | 3           | Phi or | С |
|----------------------------|---------------------|---------------------|-------------|--------|---|
| or co                      |                     |                     |             | Phi0   |   |
|                            | [kN/m3]             | [kN/m3]             |             | [°]    |   |
| [kN/m <sup>2</sup> ]       |                     |                     |             |        |   |
| 1 Waste                    | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 50.000                     |                     |                     |             |        |   |
| 2 Clay Deposits            | 17.000              | 17.000              | Undrained   | N.A.   |   |
| 30.000                     |                     |                     |             |        |   |
| 3 London Clay 1            | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 43.250                     | 10 500              | 10 500              | 1 1 1       |        |   |
| 4 London Clay 2<br>49.750  | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 5 London Clay 3            | 19.500              | 10 500              | Undrained   | N.A.   |   |
| 56.250                     | 19.500              | 19.300              | Ulidiailled | N.A.   |   |
| 6 London Clay 4            | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 62.750                     | 13.000              | 13.000              | onararii oa |        |   |
| 7 London Clay 5            | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 72.500                     |                     |                     |             |        |   |
| 8 London Clay 6            | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 85.500                     |                     |                     |             |        |   |
| 9 London Clay 7            | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 98.500                     |                     |                     |             |        |   |
| 10 London Clay 8           | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 111.50                     | 10 500              | 10 500              | 1 1 1       |        |   |
| 11 London Clay 9<br>124.50 | 19.500              | 19.500              | Undrained   | N.A.   |   |
| 12 Harwich                 | 20.000              | 20 000              | Undrained   | N.A.   |   |
| 130.00                     | 20.000              | 20.000              | Ulidiailled | N.A.   |   |
| 130.00                     |                     |                     |             |        |   |

#### Coordinates of top of soil strata

The units of the following coordinates are in m

| Stratum | n X>    | _       |        |        |          |        |          |
|---------|---------|---------|--------|--------|----------|--------|----------|
|         | 0.0     | 37.887  | 39.880 | 47.753 | 48.087   | 50.946 | 52.674   |
| 1       | 9.6040  | 7.6791  | 7.6000 | 8.0369 |          | 8.5415 |          |
| 2       | 9.6040  | 7.6791  |        |        | 7.2131   |        | 7.0000   |
| 3       | 8.1040  | 6.1791  |        |        | 5.7131   |        | 5.5000   |
| 4       | 7.1040  | 5.1791  |        |        | 4.7131   |        | 4.5000   |
| 5       | 6.1040  | 4.1791  |        |        | 3.7131   |        | 3.5000   |
| 6       | 5.1040  | 3.1791  |        |        | 2.7131   |        | 2.5000   |
| 7       | 4.1040  | 2.1791  |        |        | 1.7131   |        | 1.5000   |
| 8       | 2.1040  | 0.17910 |        |        | -0.28690 |        | -0.50000 |
| 9       | 0.10400 | -1.8209 |        |        | -2.2869  |        | -2.5000  |
| 10      | -1.8960 | -3.8209 |        |        | -4.2869  |        | -4.5000  |
| 11      | -3.8960 | -5.8209 |        |        | -6.2869  |        | -6.5000  |
| 12      | -5.8960 | -7.8209 |        | •      | -8.2869  | •      | -8.5000  |
| Stratum | n X>    |         |        |        |          |        |          |

### ARUP Arus

### **Northern SPA**

Eastern Mound - Undrained (East) Section C-CC

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| 1 9.0382 9.7094 10.038  |          |                  |
|---|----------|------------------|
| 1 9.0382 9.7094 10.038  |          |                  |
| 2   | 69.256   | 73.969           |
| 3   | 12.037   |                  |
| \$ 1.   | •        | 6.0203<br>4.5203 |
| 5         .         .         2,988         2,7419         .           6         .         .         1,9898         1,7419         .           8         .         .         .         -1,0102         -1,2581         .           9         .         .         .         -3,0102         -3,2581         .           10         .         .         .         -5,0102         -5,2581         .           11         .         .         .         -9,0102         -7,2581         .           12         .         .         .         -9,0102         -9,2581         .           12         .         .         .         -9,0102         -9,2581         .           12         .   |          | 3.5203           |
| 6   |          | 2.5203           |
| 8   |          | 1.5203           |
| 8   |          | 0.52030          |
| 9   |          | -1.4797          |
| 10  |          | -3.4797          |
| 11  |          | -5.4797          |
| 12  |          | -7.4797          |
| ### ### ### ### ### ### ### ### ### ##  |          | -9.4797          |
| 78.810       81.563       82.267       86.824       89.785       99         1       .       12.436       .       13.436       .       12         2       5.8370       .       4.2080       .       3.9187       .         3       4.33370       .       4.2080       .       2.9187       .         5       2.3370       .       2.2080       .       1.91870       .         6       1.3370       .       1.2080       .       0.91870       .         7       0.33700       .       0.20800       .       -0.081300       .         8       -1.6630       .       -1.7920       .       -2.0813       .         9       -3.6630       .       -5.7920       .       -6.0813       .         11       -7.6630       .       -7.7920       .       -8.0813       .         12       -9.6630       .       -7.7920       .       -8.0813       .         12       -9.6630       .       -7.7920       .       -8.0813       .         12       -9.6630       .       -7.7920       .       -8.0813       .         12 <td>•</td> <td>3.1737</td>   | •        | 3.1737           |
| 1 . 12.436 . 13.436 . 13.436 . 12. 2 5.8370 . 5.7080 . 3.9187 . 3. 3 4.3370 . 4.2080 . 3.9187 . 3. 4 3.3370 . 2.2080 . 1.9187 . 6. 5 2.3370 . 2.2080 . 1.9187 . 6. 6 1.3370 . 0.20800 . 0.91870 . 6. 7 0.33700 . 0.208000.0813000.081300 . 8. 8 -1.66301.79202.0813 . 9. 9 -3.66305.79206.0813 . 10. 10 -5.66307.79208.0813 . 11. 2 -9.66307.79208.0813 . 12. 12 -9.66307.792010.081  | 95.064   | 95.328           |
| 2 5.8370 . 5.7080 . 5.4187 . 3 4.2080 . 3.9187 . 4 3.3370 . 4.2080 . 2.9187 . 4 3.3370 . 3.2080 . 2.9187 . 5 2.3370 . 2.2080 . 1.9187 . 6 1.3370 . 1.2080 . 0.91870 . 7 0.33700 . 0.208000.0813000.081300 . 9 -3.66301.79202.0813 . 9 -3.66307.79204.0813 . 10 -5.66307.79206.0813 . 11 -7.66307.79208.0813 . 12 -9.66309.79208.0813 . 12 -9.66309.79208.0813 . 12 -9.66309.792010.081 . ratum X>  102.13 102.26 107.56 114.16 120.11 12 1 13.436 . 13.038 . 2 4 4.9444 . 4.5316 . 13.038 . 2 4 4.9444 . 4.5316 . 13.038 . 2 4 4.9444 . 4.5316 . 13.038 . 2 4.4444 . 1.0316 . 0.0 4.4440 . 0.0316000.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0  | 13.436   |                  |
| 3       4.3370       .       4.2080       .       3.9187       .         5       2.3370       .       3.2080       .       2.9187       .         6       1.3370       .       1.2080       .       0.91870       .         7       0.33700       .       0.20800       .       -0.081300       .         9       -3.6630       .       -1.7920       .       -2.0813       .         10       -5.6630       .       -5.7920       .       -6.0813       .         11       -7.6630       .       -7.7920       .       -8.0813       .         12       -9.6630       .       -9.7920       .       -10.081       .         ratum X>       102.13       102.26       107.56       114.16       120.11       12         1       1.3.436       .       13.436       .       13.038       .         2       4.9444       .       3.0316       .       2.24444       .       1.0316       .       1.         4       .       2.0316       .       1.       .       .       .       .       .       .       .       .       . </td <td></td> <td>5.2048</td>  |          | 5.2048           |
| 4 3.3370 . 3.2080 . 2.9187 . 5 2.3370 . 2.2080 . 1.9187 . 6 1.3370 . 1.2080 . 0.91870 . 0.91870 . 0.33700 . 0.208000.081300 . 8 -1.66301.79202.0813 . 9 -3.66305.79206.0813 . 11 -7.66307.79206.0813 . 11 -7.66307.79208.0813 . 12 -9.66309.792010.081  |          | 3.7048           |
| 5       2.3370       .       2.2080       .       1.9187       .         6       1.3370       .       1.2080       .       0.91870       .         7       0.33700       .       0.20800       .       -0.081300       .         8       -1.6630       .       -1.7920       .       -4.0813       .         10       -5.6630       .       -5.7920       .       -6.0813       .         11       -7.6630       .       -7.7920       .       -8.0813       .         12       -9.6630       .       -9.7920       .       -10.081       .         ratum       X       ->       102.13       102.26       107.56       114.16       120.11       12         1       13.436       .       13.436       .       13.038       .       .       13.038       .         2       .       4.9444       .       3.0316       .       2.       .       4.       .       2.0316       .       1.       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       . <td< td=""><td></td><td>2.7048</td></td<>  |          | 2.7048           |
| 6 1.3370 . 1.2080 . 0.91870 . 7 0.33700 . 0.20800 . −0.081300 . −0.081300 . 9 −3.6630 . −1.7920 . −2.0813 . 9 −3.6630 . −5.7920 . −4.0813 . 10 −5.6630 . −5.7920 . −6.0813 . 11 −7.6630 . −7.7920 . −8.0813 . 11 −7.6630 . −7.7920 . −8.0813 . 12 −9.6630 . −9.7920 . −10.081 . 7810 . 12 −9.6630 . −9.7920 . −10.081 . 12 −10.081 . 12 −10.081 . 12 −10.081 . 13.436 . 13.436 . 13.436 . 13.038 . 2 . 4.9444 . 4.5316 . 4.3 . 13.038 . 2 . 4.9444 . 3.0316 . 2.4444 . 3.0316 . 2.4444 . 1.0316 . 0.4444 . 1.0316 . 0.4444 . 1.0316 . 0.4444 . 1.0316 . 0.44440 . 0.031600 . −0.98840 . −0. |          | 1.7048           |
| 7   |          | 0.70480          |
| 8   |          |                  |
| 9 -3.66303.79204.0813 . 10 -5.66305.79206.0813 . 11 -7.66309.79208.0813 . 12 -9.66309.792010.081 .  12 -9.66309.792010.081 .  12 -9.66309.792010.081 .  13 -7.66309.792010.081 .  14 13.436 . 13.436 . 13.038 .  2 . 4.9444 . 4.5316 . 4.  3 . 3.4444 . 3.0316 . 2.  4 . 2.4444 . 1.0316 . 1.  5 . 1.4444 . 1.0316 1.  6 . 0.44440 . 0.0316000.  70.555600.968401.  82.55562.96845.  94.55566.96845.  118.55566.96845.  1210.55610.9681.  1210.55610.9681.  138.49 140.91 143.43 152.59 152.99 15  1 . 11.039 10.037  2 3.7749 . 3.6682 . 3.4738 3.  3 2.2749 . 2.1682 . 1.9738 1.  4 1.2749 . 1.1682 . 0.97380 0.  5 0.27490 . 0.168200.026200 -0.66 -0.725100.831801.0262 -1.  7 -1.72510.831801.0262 -1.  7 -1.72510.831801.0262 -1.  9 -5.72515.83186.0262 -6.  9 -5.72515.83186.0262 -6.  10 -7.72517.83188.0262 -6.  11 -9.72517.83186.0262 -6.  12 -11.72511.83212.026 -1.  17 -0.72519.831810.026 -1.  17 -7.72517.83186.0262 -6.  10 -7.72519.831810.026 -1.  11 -9.72519.831810.026 -1.  12 -11.72511.83212.026 -1.  17 -0.74541.  170.37 171.66 181.35 189.75 201.03 20  1 9.0342  |          | -0.29520         |
| 10  |          | -2.2952          |
| 11  |          | -4.2952          |
| 12       −9.6630       .       −9.7920       .       −10.081       .         102.13       102.26       107.56       114.16       120.11       12         1       13.436       .       13.436       .       13.038       .         2       .       4.9444       .       4.5316       .       4.         3       .       3.4444       .       3.0316       .       2.         4       .       2.0316       .       1.       1.         5       .       1.4444       .       1.0316       .       0.         6       .       0.44440       .       0.031600       .       -6         7       .       -0.55560       .       -0.96840       .       -1         8       .       -2.5556       .       -2.9684       .       -5         10       .       -6.5556       .       -8.9684       .       -5         12       .       -10.556       .       -10.968       .       -1         12       .       -10.556       .       -10.968       .       -1         12       .       -10.556       .  |          | -6.2952          |
| ratum X>           102.13         102.26         107.56         114.16         120.11         12           1         13.436         .         13.436         .         13.038         .           2         4.9444         .         4.5316         .         4.4           3         .         3.4444         .         3.0316         .         2.           4         .         2.0316         .         1.         1.           5         .         1.4444         .         1.0316         .         0.           6         .         0.44440         .         0.031600         .         -1.           7         .         -0.55560         .         -0.96840         .         -1.           8         .         -2.5556         .         -2.9684         .         -5.           9         .         -4.5556         .         -4.9684         .         -5.           10         .         -6.5556         .         -8.9684         .         -5.           12         .         -10.556         .         -10.968         .         -1           12         .   | •        | -8.2952          |
| 102.13  | •        | -10.295          |
| 1 13.436 . 13.436 . 13.038  | 107 60   | 122 14           |
| 2 . 4.9444 . 4.5316 . 4. 3 . 3.4444 . 3.0316 . 2. 4 . 2.4444 . 2.0316 . 1. 5 . 1.4444 . 1.0316 . 0. 6 . 0.44440 . 0.0316000. 70.555600.968401. 82.55562.96843. 94.55564.96845. 106.55566.96845. 118.55568.96845. 1210.55610.9681. 138.49 140.91 143.43 152.59 152.99 152.99 1 . 138.49 140.91 143.43 152.59 152.99 152.99 1 . 1.039 . 10.037 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0.66 -0.725100.831801.0262 -1  | 127.69   | 132.14           |
| 3 . 3.4444 . 3.0316 . 2. 4 . 2.4444 . 2.0316 . 1. 5 . 1.4444 . 1.0316 . 0. 6 . 0.44440 . 0.0316000. 70.555600.968401. 82.55562.96843. 94.55564.96845. 106.55566.96845. 118.55566.96845. 1210.55610.9681. 138.49 140.91 143.43 152.59 152.99 15 1 . 11.039 . 10.037 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0. 6 -0.725100.831801.0262 -1. 7 -1.72511.83182.0262 -2. 9 -5.72513.83184.0262 -6. 9 -5.72513.83184.0262 -6. 9 -5.72517.83188.0262 -6. 10 -7.72517.83188.0262 -6. 11 -9.72519.831810.026 -1. 12 -11.72511.83212.026 -1. 13 -9.0342   |          | 12.032           |
| 4 . 2.4444 . 2.0316 . 1. 5 . 1.4444 . 1.0316 . 0. 6 . 0.44440 . 0.031600( 70.555600.968401 82.55562.96845 94.55564.96845 106.55566.96845 118.55568.96845 1210.55610.9681 1210.55610.9681 138.49 140.91 143.43 152.59 152.99 15 1 . 11.039 . 10.037 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0 6 -0.725100.831801.0262 -2 7 -1.72511.83182.0262 -6 9 -5.72513.83184.0262 -6 10 -7.72517.83188.0262 -6 11 -9.72519.831810.026 -1 12 -11.72511.83210.026 -1 13 -9.72519.831810.026 -1 11 -9.72519.83188.0262 -6 10 -7.72517.83188.0262 -6 11 -9.72519.831810.026 -1 12 -11.72511.83210.026 -1 13 -9.737 171.66 181.35 189.75 201.03 20 1 9.0342   | 4.0601   | •                |
| 5 . 1.4444 . 1.0316 . 0.44440 . 0.0316000 70.555600.968401 82.55562.96842 94.55564.96845 106.55566.96845 118.55568.96845 118.555610.9681 1210.55610.9681 138.49 140.91 143.43 152.59 152.99 15 1 . 11.039 . 10.037 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0 6 -0.725100.831801.0262 -1 7 -1.72510.831801.0262 -1 7 -1.72513.83182.0262 -2 8 -3.72513.83184.0262 -6 10 -7.72517.83186.0262 -6 11 -9.72519.831810.026 -1 12 -11.72511.83210.026 -1 12 -11.72511.83210.026 -1 12 -11.72511.83210.026 -1 13 -9.73519.831810.026 -1 14 -9.72517.83188.0262 -6 15 -1.4157 -0.59890 -0.745400.6 60.41570 -0.59890 -0.745400.6 60.41570 -0.59890 -0.745400.6 60.41570 -0.59890 -0.745400.6 60.41570 -0.59890 -0.745400.6 60.41570 -0.59890 -0.745400.6   | 2.5601   | •                |
| 6 . 0.44440 . 0.0316000 70.555600.968401 82.55562.96843 94.55564.96845 106.55566.96845 118.55568.96845 1210.55610.9681 1210.55610.9681 138.49 140.91 143.43 152.59 152.99 15 1 . 11.039 . 10.037 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0.06 -0.725100.831801.0262 -1.72511.83182.0262 -2.0  | 1.5601   | •                |
| 7 .   | 0.56010  | •                |
| 8 .   | -0.43990 | •                |
| 9 .   | -1.4399  | •                |
| 10 .  | -3.4399  |                  |
| 11 .  | -5.4399  |                  |
| 1210.55610.9681  Fratum X>  138.49  | -7.4399  | •                |
| 138.49  | -9.4399  | •                |
| 138.49       140.91       143.43       152.59       152.99       15         1       .       11.039       .       10.037       .       .         2       3.7749       .       3.6682       .       3.4738   | -11.440  | •                |
| 1 . 11.039 . 10.037   |          |                  |
| 2 3.7749 . 3.6682 . 3.4738 3. 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0. 6 -0.725100.831801.0262 -1. 7 -1.72511.83182.0262 -2. 8 -3.72513.83184.0262 -6. 9 -5.72515.83186.0262 -6. 10 -7.72517.83186.0262 -6. 11 -9.72519.831810.026 -1. 12 -11.72511.83212.026 -1. 12 -11.72511.83212.026 -1. 13 -9.0342   | 158.50   | 163.69           |
| 3 2.2749 . 2.1682 . 1.9738 1. 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0. 6 -0.725100.831801.0262 -1. 7 -1.72511.83182.0262 -2. 8 -3.72513.83184.0262 -4. 9 -5.72515.83186.0262 -6. 10 -7.72517.83188.0262 -6. 11 -9.72519.831810.026 -1. 12 -11.72511.83212.026 -1. 12 -11.72511.83212.026 -1. 13 9.0342 8.0000 . 2 . 3.0843 2.9011 2.7546 3 . 1.5843 1.4011 1.2546 4 . 0.58430 0.40110 0.25460 . 0. 50.41570 -0.59890 -0.745400.59890 -0.74554   |          | •                |
| 4 1.2749 . 1.1682 . 0.97380 0. 5 0.27490 . 0.168200.026200 -0. 6 -0.725100.831801.0262 -1. 7 -1.72511.83182.0262 -2. 8 -3.72513.83184.0262 -4. 9 -5.72515.83186.0262 -6. 10 -7.72517.83188.0262 -6. 11 -9.72519.831810.026 -1. 12 -11.72511.83212.026 -1. 13 -1.72511.83212.026 -1. 14 9.0342 8.0000 . 2 . 3.0843 2.9011 2.7546 . 2. 3 . 1.5843 1.4011 1.2546 . 1. 4 . 0.58430 0.40110 0.25460 . 0. 50.41570 -0.59890 -0.745400. 61.4157 -1.5989 -1.74541.  | 3.3339   | 3.2289           |
| 5  0.27490 .  | 1.8339   | 1.7289           |
| 6  -0.72510 .   | 0.83390  | 0.72890          |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$   | -0.16610 | -0.27110         |
| 8 $-3.7251$ . $-3.8318$ . $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-6.0262$ <td>-1.1661</td> <td>-1.2711</td>   | -1.1661  | -1.2711          |
| 8 $-3.7251$ . $-3.8318$ . $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-4.0262$ $-6.0262$ <td>-2.1661</td> <td>-2.2711</td>   | -2.1661  | -2.2711          |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | -4.1661  | -4.2711          |
| 10  | -6.1661  | -6.2711          |
| 11  | -8.1661  | -8.2711          |
| 12 -11.72511.83212.026 -1 ratum X>  | -10.166  | -10.271          |
| ratum X>       170.37     171.66     181.35     189.75     201.03     20       1     9.0342     .     .     8.0000     .       2     .     3.0843     2.9011     2.7546     .     2.       3     .     1.5843     1.4011     1.2546     .     1.       4     .     0.58430     0.40110     0.25460     .     0.       5     .     -0.41570     -0.59890     -0.74540     .     -0.6       6     .     -1.4157     -1.5989     -1.7454     .     -1.7454   | -12.166  | -12.271          |
| 1       9.0342       .       .       8.0000       .         2       .       3.0843       2.9011       2.7546       .       2.         3       .       1.5843       1.4011       1.2546       .       1.         4       .       0.58430       0.40110       0.25460       .       0.         5       .       -0.41570       -0.59890       -0.74540       .       -0.6         6       .       -1.4157       -1.5989       -1.7454       .       -1.7454  |          |                  |
| 2       .       3.0843       2.9011       2.7546       .       2.         3       .       1.5843       1.4011       1.2546       .       1.         4       .       0.58430       0.40110       0.25460       .       0.         5       .       -0.41570       -0.59890       -0.74540       .       -0.         6       .       -1.4157       -1.5989       -1.7454       .       -1.   | 201.38   | 205.61           |
| 3       .       1.5843       1.4011       1.2546       .       1.4011         4       .       0.58430       0.40110       0.25460       .       0.58430         5       .       -0.41570       -0.59890       -0.74540       .       -0.66         6       .       -1.4157       -1.5989       -1.7454       .       -1.7454  |          | 7.8090           |
| 4       .       0.58430       0.40110       0.25460       .       0.5         5       .       -0.41570       -0.59890       -0.74540       .       -0.6         6       .       -1.4157       -1.5989       -1.7454       .       -1.7454   | 2.5170   |                  |
| <b>5</b> 0.41570 -0.59890 -0.745400.661.4157 -1.5989 -1.74541.  | 1.0170   |                  |
| <b>5</b> 0.41570 -0.59890 -0.745400<br><b>6</b> 1.4157 -1.5989 -1.74541   | 0.017000 |                  |
| <b>6</b> 1.4157 -1.5989 -1.74541  | -0.98300 |                  |
|   | -1.9830  |                  |
|   | -2.9830  |                  |
|   | -4.9830  |                  |
|   | -6.9830  |                  |
|   | -8.9830  |                  |
|   | -10.983  |                  |
|   | -12.983  | ·<br>·           |
| ratum X>  | ,        |                  |
|   | 236.79   | 238.53           |
| <b>1</b> . 7.0357 . 6.0363  | •        | 5.0366           |
|   | 1.6882   | •                |
|   | 0.18820  | ·<br>·           |
|   | -0.81180 | ·<br>·           |

#### Northern SPA

Eastern Mound - Undrained (East)

Section C-CC

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| 5      | -1.2075  | 017 AE   | -1.5000  | 000 E1  | -1.6857  | -1.8118  | 330 E3  |
|--------|----------|----------|----------|---------|----------|----------|---------|
| 6      | -2.2075  | •        | -2.5000  | •       | -2.6857  | -2.8118  |         |
| 7      | -3.2075  | •        | -3.5000  |         | -3.6857  | -3.8118  |         |
| 8      | -5.2075  |          | -5.5000  |         | -5.6857  | -5.8118  |         |
| 9      | -7.2075  |          | -7.5000  |         | -7.6857  | -7.8118  |         |
| 10     | -9.2075  |          | -9.5000  |         | -9.6857  | -9.8118  |         |
| 11     | -11.208  |          | -11.500  |         | -11.686  | -11.812  |         |
| 12     | -13.208  |          | -13.500  |         | -13.686  | -13.812  |         |
|        | m X>     | •        |          | •       |          |          | · ·     |
|        | 241.91   | 243.25   | 243.98   | 246.44  | 249.30   | 253.99   | 261.82  |
| 1      | •        | •        |          | 4.0371  | •        | 3.0370   | 2.0376  |
| 2      | 1.5678   | 1.5422   | 1.5283   |         | 1.3846   | •        | •       |
| 3      | 0.067800 | 0.042200 | 0.028300 |         | -0.11540 |          |         |
| 4      | -0.93220 | -0.95780 | -0.97170 |         | -1.1154  |          |         |
| 5      | -1.9322  | -1.9578  | -1.9717  |         | -2.1154  |          | •       |
| 6      | -2.9322  | -2.9578  | -2.9717  |         | -3.1154  |          | •       |
| 7      | -3.9322  | -3.9578  | -3.9717  |         | -4.1154  | •        | •       |
| 8      | -5.9322  | -5.9578  | -5.9717  |         | -6.1154  | •        |         |
| 9      | -7.9322  | -7.9578  | -7.9717  |         | -8.1154  | •        | •       |
| 10     | -9.9322  | -9.9578  | -9.9717  |         | -10.115  | •        | •       |
| 11     | -11.932  | -11.958  | -11.972  |         | -12.115  | •        | •       |
| 12     | -13.932  | -13.958  | -13.972  |         | -14.115  | •        | •       |
| Stratu | m X>     |          |          |         |          |          |         |
|        | 262.26   | 268.02   | 268.80   | 272.18  | 274.68   | 277.27   | 329.94  |
| 1      | •        | •        | 1.0000   | 0.80000 | 0.71990  | 0.66680  | 0.0     |
| 2      | 0.96400  | 0.85690  | •        |         | 0.71990  | 0.66680  | 0.0     |
| 3      | -0.53600 | -0.64310 | •        |         | -0.78010 | -0.83320 | -1.5000 |
| 4      | -1.5360  | -1.6431  | •        |         | -1.7801  | -1.8332  | -2.5000 |
| 5      | -2.5360  | -2.6431  |          |         | -2.7801  | -2.8332  | -3.5000 |
| 6      | -3.5360  | -3.6431  |          |         | -3.7801  | -3.8332  | -4.5000 |
| 7      | -4.5360  | -4.6431  |          |         | -4.7801  | -4.8332  | -5.5000 |
| 8      | -6.5360  | -6.6431  | •        |         | -6.7801  | -6.8332  | -7.5000 |
| 9      | -8.5360  | -8.6431  | •        |         | -8.7801  | -8.8332  | -9.5000 |
| 10     | -10.536  | -10.643  | •        | •       | -10.780  | -10.833  | -11.500 |
| 11     | -12.536  | -12.643  | •        | •       | -12.780  | -12.833  | -13.500 |
| 12     | -14.536  | -14.643  |          |         | -14.780  | -14.833  | -15.500 |

#### Stratum-linked data

| No. | Material      | Water table | Pi | ezo S | et/ Ru | ı value |
|-----|---------------|-------------|----|-------|--------|---------|
| 1   | Waste         |             |    |       |        |         |
| 2   | Clay Deposits |             |    |       |        |         |
| 3   | London Clay 1 |             |    |       |        |         |
| 4   | London Clay 2 |             |    |       |        |         |
| 5   | London Clay 3 |             |    |       |        |         |
| 6   | London Clay 4 |             |    |       |        |         |
| 7   | London Clay 5 |             |    |       |        |         |
| 8   | London Clay 6 |             |    |       |        |         |
| 9   | London Clay 7 |             |    |       |        |         |
| 10  | London Clay 8 |             |    |       |        |         |
| 11  | London Clay 9 |             |    |       |        |         |
| 12  | Harwich       |             |    |       |        |         |
|     |               |             |    |       |        |         |

#### **Slip Surface Specification**

Circle centre specification: GRID

Bottom left of grid: x = 170.00000 m y = 15.00000 m

Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)

Centres on grid: 15 in x direction at 3.50000m spacing
20 in y direction at 3.50000m spacing

Grid extended to find minimum FoS

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (205.00m,67.500m) Radius 142.00m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 3521.2 Slip weight [kN/m] 296330. Net horiz force [kN/m]: 436.53 Disturbing moment [kN/m]: 1.7546E+6 Restoring moment [kN/m]: 3.9678E+6 Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 2.2615

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

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| Eastern | Mound - Undrained | (East |
|---------|-------------------|-------|
| Section | C-CC              |       |

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | •         | •       |
| Made by<br>EB | Date      | Checked |

| Slip surface<br>Point x [m] |                    | Pore Pre | essure<br>R          | Interslice<br>T E  | forces | [kN/m]           | E (u) |
|-----------------------------|--------------------|----------|----------------------|--------------------|--------|------------------|-------|
| FOIRC X [m]                 | y [m]              |          | [kN/m <sup>2</sup> ] | 1 1                |        |                  | E(u)  |
| 1 74.211                    | 12.198             |          | 0.0                  | 0.0                |        | 0.0              | 0.0   |
| 2 77.055                    | 5.9034             | 0.0      |                      | -270.33            |        | 725.34           | 0.0   |
| 3 77.802<br>4 78.313        | 4.3751<br>3.3558   | 0.0      |                      | -295.35<br>-309.80 |        | 950.41<br>1108.8 | 0.0   |
| 5 78.810                    | 2.3850             | 0.0      |                      | -320.06            |        | 1266.8           | 0.0   |
| 6 78.835                    | 2.3361             | 0.0      |                      | -320.43            |        | 1275.0           | 0.0   |
| 7 79.367                    | 1.3162             | 0.0      | 0.0                  | -327.17            |        | 1449.3           | 0.0   |
| 8 79.910                    | 0.29595            | 0.0      |                      | -329.96            |        | 1632.1           | 0.0   |
| 9 81.028<br>10 81.563       | -1.7458<br>-2.6955 | 0.0      |                      | -323.37<br>-315.73 |        | 2024.0 2218.2    | 0.0   |
| 11 82.192                   | -3.7892            | 0.0      |                      | -299.73            |        | 2453.6           | 0.0   |
| 12 82.267                   | -3.9180            | 0.0      |                      | -297.84            |        | 2481.8           | 0.0   |
| 13 83.403                   | -5.8357            | 0.0      |                      | -256.18            |        | 2924.7           | 0.0   |
| 14 84.662<br>15 85.971      | -7.8842<br>-9.9345 | 0.0      |                      | -191.92            |        | 3440.3<br>4003.2 | 0.0   |
| 16 86.824                   | -11.231            | 0.0      |                      | -106.63<br>-39.546 |        | 4386.1           | 0.0   |
| 17 89.785                   | -15.504            | 0.0      | 0.0                  | 256.73             |        | 5808.2           | 0.0   |
| 18 95.064                   | -22.379            | 0.0      | 0.0                  | 953.34             |        | 8661.5           | 0.0   |
| 19 95.328                   | -22.700            | 0.0      | 0.0                  | 991.98             |        | 8813.5           | 0.0   |
| 20 98.658<br>21 102.13      | -26.603<br>-30.382 | 0.0      | 0.0                  | 1500.3<br>2052.8   |        | 10805.<br>13002. | 0.0   |
| 22 102.26                   | -30.527            | 0.0      | 0.0                  | 2075.0             |        | 13091.           | 0.0   |
| 23 107.56                   | -35.797            | 0.0      | 0.0                  | 2918.9             |        | 16648.           | 0.0   |
| 24 114.16                   | -41.642            | 0.0      | 0.0                  | 3889.1             |        | 21296.           | 0.0   |
| 25 120.11                   | -46.334            | 0.0      | 0.0                  | 4629.7             |        | 25602.           | 0.0   |
| 26 127.69<br>27 132.14      | -51.612<br>-54.382 | 0.0      | 0.0                  | 5328.5<br>5598.6   |        | 31083.<br>34231. | 0.0   |
| 28 138.49                   | -57.959            | 0.0      | 0.0                  | 5802.3             |        | 38571.           | 0.0   |
| 29 140.91                   | -59.217            | 0.0      | 0.0                  | 5825.9             |        | 40168.           | 0.0   |
| 30 143.43                   | -60.459            | 0.0      | 0.0                  | 5820.7             |        | 41781.           | 0.0   |
| 31 152.59<br>32 152.99      | -64.475<br>-64.631 | 0.0      | 0.0                  | 5568.3<br>5550.4   |        | 47239.<br>47458. | 0.0   |
| 33 158.50                   | -66.670            | 0.0      | 0.0                  | 5249.3             |        | 50360.           | 0.0   |
| 34 163.69                   | -68.357            | 0.0      | 0.0                  | 4894.2             |        | 52816.           | 0.0   |
| 35 170.37                   | -70.212            | 0.0      | 0.0                  | 4368.6             |        | 55553.           | 0.0   |
| 36 171.66                   | -70.532            | 0.0      | 0.0                  | 4261.9             |        | 56025.           | 0.0   |
| 37 181.35<br>38 189.75      | -72.516<br>-73.679 | 0.0      | 0.0                  | 3460.7<br>2855.6   |        | 58936.<br>60550. | 0.0   |
| 39 195.39                   | -74.174            | 0.0      | 0.0                  | 2553.9             |        | 61150.           | 0.0   |
| 40 201.03                   | -74.445            | 0.0      | 0.0                  | 2370.1             |        | 61368.           | 0.0   |
| 41 201.38                   | -74.454            | 0.0      | 0.0                  | 2363.5             |        | 61369.           | 0.0   |
| 42 205.61                   | -74.499            | 0.0      | 0.0                  | 2330.2             |        | 61269.           | 0.0   |
| 43 210.16<br>44 217.45      | -74.406<br>-73.953 | 0.0      | 0.0                  | 2271.2<br>2014.5   |        | 60930.<br>59883. | 0.0   |
| 45 221.16                   | -73.577            | 0.0      | 0.0                  | 1826.3             |        | 59108.           | 0.0   |
| 46 228.51                   | -72.541            | 0.0      | 0.0                  | 1378.3             |        | 57106.           | 0.0   |
| 47 230.35                   | -72.220            | 0.0      | 0.0                  | 1257.3             |        | 56508.           | 0.0   |
| 48 236.79<br>49 238.53      | -70.896<br>-70.484 | 0.0      | 0.0                  | 824.63<br>709.64   |        | 54120.<br>53398. | 0.0   |
| 50 241.91                   | -69.620            | 0.0      | 0.0                  |                    |        | 51913.           | 0.0   |
| 51 243.25                   | -69.250            | 0.0      | 0.0                  |                    |        | 51288.           | 0.0   |
| 52 243.98                   | -69.046            | 0.0      | 0.0                  |                    |        | 50947.           | 0.0   |
| 53 246.44<br>54 249.30      | -68.319<br>-67.413 | 0.0      | 0.0                  | 226.55<br>75.653   |        | 49743.<br>48279. | 0.0   |
| 55 253.99                   | -65.783            | 0.0      |                      | -134.06            |        | 45730.           | 0.0   |
| 56 261.82                   | -62.637            | 0.0      |                      | -355.15            |        | 41107.           | 0.0   |
| 57 262.26                   | -62.444            | 0.0      |                      | -361.94            |        | 40835.           | 0.0   |
| 58 268.02                   | -59.747            | 0.0      |                      | -393.68            |        | 37186.           | 0.0   |
| 59 268.80<br>60 272.18      | -59.360<br>-57.604 | 0.0      |                      | -389.44<br>-345.17 |        | 36683.<br>34465. | 0.0   |
| 61 274.68                   | -56.229            | 0.0      |                      | -283.90            |        | 32794.           | 0.0   |
| 62 277.27                   | -54.733            | 0.0      |                      | -193.96            |        | 31041.           | 0.0   |
| 63 285.52                   | -49.464            | 0.0      | 0.0                  | 271.01             |        | 25367.           | 0.0   |
| 64 293.38<br>65 300.83      | -43.640<br>-37.288 | 0.0      | 0.0                  | 949.59<br>1749.9   |        | 19954.<br>14988. | 0.0   |
| 66 307.82                   | -30.438            | 0.0      | 0.0                  |                    |        | 10614.           | 0.0   |
| 67 314.32                   | -23.123            | 0.0      | 0.0                  | 3256.6             |        | 6925.0           | 0.0   |
| 68 320.30                   | -15.378            | 0.0      | 0.0                  | 3730.1             |        | 3962.8           | 0.0   |
| 69 321.70                   | -13.396            | 0.0      | 0.0                  | 3798.8             |        | 3341.6           | 0.0   |
| 70 323.05<br>71 324.36      | -11.413<br>-9.4293 | 0.0      | 0.0                  | 3839.3<br>3851.4   |        | 2775.1<br>2260.3 | 0.0   |
| 72 325.61                   | -7.4452            | 0.0      | 0.0                  | 3835.0             |        | 1794.4           | 0.0   |
| 73 326.82                   | -5.4605            | 0.0      | 0.0                  | 3790.2             |        | 1374.6           | 0.0   |
| 74 327.41                   | -4.4680            | 0.0      | 0.0                  | 3757.2             |        | 1181.1           | 0.0   |
|                             |                    |          |                      |                    |        |                  |       |

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Eastern Mound - Undrained (East) Section C-CC

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | -         | •       |
| Made by<br>EB | Date      | Checked |

| Slip  | surface | coordinates | Pore Pressu | re  | Interslice | forces | [kN/m] |       |
|-------|---------|-------------|-------------|-----|------------|--------|--------|-------|
| D-:== | [1      | F-1         | T , D       |     | m m        |        |        | TT /\ |
| 75    | 327.99  | -3.4753     | 0.0         | 0.0 | 3717.2     |        | 998.15 | 0.0   |
| 76    | 328.56  | -2.4825     | 0.0         | 0.0 | 3670.2     |        | 825.36 | 0.0   |
| 77    | 329.11  | -1.4896     | 0.0         | 0.0 | 3616.2     |        | 662.43 | 0.0   |
| 78    | 329.93  | 110.51E-6   | 0.0 -       |     | 3521.2     |        | 436.53 | 0.0   |

Slice Strength Parameters Average Slice Forces on base [kN/m]

| No. | _ |                      |          | Pore<br>Pressure     | Weight           |        |                  | ,]               |
|-----|---|----------------------|----------|----------------------|------------------|--------|------------------|------------------|
|     |   | c'                   | Tan phi  | [kN/m <sup>2</sup> ] |                  | Normal | Shear            | Shear            |
|     |   | [kN/m <sup>2</sup> ] |          |                      | L, <u>-</u>      |        |                  | (mobilised)      |
|     | 1 | 35.714               | 0.       | 0.0                  | 177.08           | 873.41 | 246.68           | 109.08           |
|     | 2 | 21.429               | 0.       |                      | 102.95           |        | 36.453           | 16.119           |
|     | 3 | 30.893               | 0.       |                      | 82.353           |        | 35.226           | 15.577           |
|     | 4 | 35.536               | 0.       |                      | 89.752           |        | 38.741           | 17.131           |
|     | 5 | 35.536               | 0.       |                      | 4.8304           |        | 1.9590           | 0.86626          |
|     | 6 | 40.179               | 0.       |                      | 107.24           |        | 46.215           | 20.436           |
|     | 7 | 44.821               | 0.       |                      | 120.41           |        |                  |                  |
|     | 8 | 51.786               | 0.       |                      | 282.10           |        | 120.56           | 53.311           |
|     | 9 | 61.071               | 0.       |                      | 150.89           |        | 66.578           |                  |
|     | 0 | 61.071               | 0.       |                      | 190.50           |        | 77.036           | 34.065           |
|     | 1 | 70.357               | 0.       |                      | 23.688           |        | 10.484           |                  |
| 1   | 2 | 70.357               | 0.       | 0.0                  | 384.65           | 569.43 | 156.82           | 69.346           |
| 1   | 3 | 79.643               | 0.       | 0.0                  | 480.60           | 672.62 | 191.50           | 84.681           |
| 1   | 4 | 88.929               | 0.       | 0.0                  | 558.17           | 745.19 | 216.33           | 95.659           |
| 1   | 5 | 92.857               | 0.       | 0.0                  | 395.40           | 511.04 | 144.10           | 63.722           |
| 1   | 6 | 92.857               | 0.       | 0.0                  | 1541.5           | 1916.4 | 482.74           | 213.46           |
| 1   | 7 | 92.857               | 0.       | 0.0                  | 3336.2           | 3941.4 | 804.87           | 355.91           |
| 1   | 8 | 92.857               | 0.       | 0.0                  | 185.40           | 214.26 | 38.573           | 17.057           |
| 1   | 9 | 92.857               | 0.       | 0.0                  | 2484.3           | 2843.4 | 476.37           | 210.65           |
| 2   | 0 | 92.857               | 0.       | 0.0                  | 2854.1           | 3223.2 | 476.37           | 210.65           |
| 2   | 1 | 92.857               | 0.       | 0.0                  | 119.05           | 133.75 | 18.590           | 8.2204           |
| 2   | 2 | 92.857               | 0.       | 0.0                  | 4856.0           | 5427.1 | 694.04           | 306.90           |
| 2   | 3 | 92.857               | 0.       | 0.0                  | 6761.0           | 7509.6 | 818.27           | 361.84           |
| 2   | 4 | 92.857               | 0.       | 0.0                  | 6706.5           | 7432.8 | 703.83           | 311.23           |
|     | 5 | 92.857               | 0.       |                      | 9234.5           | 10238. | 857.78           | 379.30           |
|     | 6 | 92.857               | 0.       |                      | 5729.3           |        | 486.41           | 215.09           |
|     | 7 | 92.857               | 0.       |                      | 8515.8           |        | 676.61           | 299.19           |
|     | 8 | 92.857               | 0.       |                      | 3350.0           |        | 253.83           | 112.24           |
|     | 9 | 92.857               | 0.       |                      | 3525.2           |        | 260.67           | 115.27           |
|     | 0 | 92.857               | 0.       |                      | 13218.           |        | 928.78           | 410.70           |
|     | 1 | 92.857               | 0.       |                      | 583.19           |        | 39.431           | 17.436           |
|     | 2 | 92.857               | 0.       |                      | 8239.4           |        | 545.49           | 241.21           |
|     | 3 | 92.857               | 0.       |                      | 7920.9           |        | 506.58           | 224.01           |
|     | 4 | 92.857               | 0.       |                      | 10395.           |        | 643.96           | 284.75           |
|     | 5 | 92.857               | 0.       |                      | 2040.2           |        | 124.02           | 54.841           |
|     | 6 | 92.857               | 0.       |                      | 15419.           |        | 917.70           | 405.80           |
|     | 7 | 92.857               | 0.<br>0. |                      | 13605.<br>9178.3 |        | 788.22           | 348.54<br>232.11 |
|     | 8 | 92.857<br>92.857     | 0.       |                      | 9225.0           |        | 524.90<br>524.90 | 232.11           |
|     | 0 | 92.857               | 0.       |                      | 570.32           |        | 32.410           | 14.332           |
|     | 1 | 92.857               | 0.       |                      | 6905.9           |        | 392.65           | 173.63           |
|     | 2 | 92.857               | 0.       |                      | 7410.3           |        | 422.73           | 186.93           |
|     | 3 | 92.857               | 0.       |                      | 11768.           |        | 677.92           | 299.77           |
|     | 4 | 92.857               | 0.       |                      | 5941.9           |        | 346.88           | 153.39           |
|     | 5 | 92.857               | 0.       |                      | 11562.           |        | 688.49           | 304.45           |
|     | 6 | 92.857               | 0.       |                      | 2857.4           |        | 173.44           | 76.695           |
|     | 7 | 92.857               | 0.       |                      | 9847.1           |        | 610.74           | 270.07           |
|     | 8 | 92.857               | 0.       |                      | 2622.8           |        | 166.50           | 73.625           |
|     | 9 | 92.857               | 0.       |                      | 5007.5           |        | 323.35           | 142.98           |
|     | 0 | 92.857               | 0.       |                      | 1977.1           |        | 129.84           | 57.414           |
|     | 1 | 92.857               | 0.       |                      | 1050.6           |        | 69.533           | 30.747           |
|     | 2 | 92.857               | 0.       |                      | 3561.2           |        | 238.67           | 105.54           |
|     | 3 | 92.857               | 0.       |                      | 4064.1           |        | 278.46           | 123.14           |
|     | 4 | 92.857               | 0.       |                      | 6499.0           | 7220.9 | 460.87           | 203.79           |
| 5   | 5 | 92.857               | 0.       |                      | 10360.           |        | 783.77           | 346.58           |
| 5   | 6 | 92.857               | 0.       | 0.0                  | 562.71           | 635.78 | 44.615           | 19.729           |
|     | 7 | 92.857               | 0.       |                      | 7154.9           |        | 591.03           | 261.35           |
|     | 0 | 02 057               | 0        | 0 0 0                | 020 72           | 1062 2 | 00 451           | 25 575           |

0.0 930.73 1063.3

0.0 3972.7 4553.7

0.0 *2856.4* 3288.8 0.0 *2882.4* 3331.5

0.0 8600.6 10032. 0.0 7313.2 8676.0

0.0 6001.8 7300.7

0.0 4699.3 5955.4

0.0 3438.8 4685.2

0.0 2253.7 3529.1

0.0 390.39 715.07

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Northern SPA

Eastern Mound - Undrained (East) Section C-CC

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Silce   Strength   Parameters   Average   Silce   Forces on   base   kN/m  |  |
|--|--|
| 69 79.643 0.0 0.0 323.96 648.92 191.04 84.478 70 70.357 0.0 0.0 261.71 587.44 166.94 73.818 71 61.071 0.0 0.0 203.43 530.39 143.40 63.411 72 57.786 0.0 0.0 148.93 477.48 120.39 53.238 73 44.821 0.0 0.0 55.218 220.19 51.730 22.875 74 40.179 0.0 0.0 42.933 208.40 46.157 20.410 75 35.536 0.0 0.0 10.9640 186.19 35.174 15.554 77 21.429 0.0 0.0 10.409 260.52 36.401 16.096  Slice Surface Load [kN/m_hor/m] Point Load [kN/m] No.  Vert Horiz Vert Horiz  1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.   |  |
| 71 61.071 0.0 0.0 203.43 530.39 143.40 63.411 72 51.786 0.0 0.0 148.93 477.48 120.39 53.238 73 44.821 0.0 0.0 55.218 220.19 51.730 22.875 74 40.179 0.0 0.0 42.933 208.40 46.157 20.410 75 35.536 0.0 0.0 31.078 197.08 40.640 17.971 76 30.893 0.0 0.0 19.640 186.19 35.174 15.554 77 21.429 0.0 0.0 10.409 260.52 36.401 16.096  Slice Surface Load [kN/m_hor/m] Point Load [kN/m]  Vert Horiz Vert Horiz  1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.  |  |
| 72 51.786  |  |
| 73 44.821 0.0 0.0 55.218 220.19 51.730 22.875 74 40.179 0.0 0.0 42.933 208.40 46.157 20.410 75 35.536 0.0 0.0 31.078 197.08 40.640 17.971 76 30.893 0.0 0.0 19.640 186.19 35.174 15.554 77 21.429 0.0 0.0 10.409 260.52 36.401 16.096  Slice Surface Load [kN/m_hor/m] Point Load [kN/m]   |  |
| 74         40.179         0.0         0.0         42.933         208.40         46.157         20.410           75         35.536         0.0         0.0         31.078         197.08         40.640         17.971           76         30.893         0.0         0.0         19.640         186.19         35.174         15.554           77         21.429         0.0         0.0         10.409         260.52         36.401         16.096           Slice Surface Load [kN/m_hor/m] Point Load [kN/m]         Water Pressure on ground surface [kN/m_hor/m]           1         0.0         0.0         0.0         0.0         0.0         0.0           2         0.0         0.0         0.0         0.0         0.0         0.0           3         0.0         0.0         0.0         0.0         0.0         0.0           4         0.0         0.0         0.0         0.0         0.0         0.0           5         0.0         0.0         0.0         0.0         0.0         0.0           6         0.0         0.0         0.0         0.0         0.0         0.0           7         0.0         0.0         0  |  |
| 75 35.536  |  |
| Slice   Surface   Load   [kN/m_hor/m]   Point   Load   [kN/m]   Water   Pressure on ground   surface   [kN/m_hor/m]   S |  |
| Slice   Surface   Load   [kN/m_hor/m]   Point   Load   [kN/m]   Water   Pressure on ground   surface   [kN/m_hor/m]   Vert   Horiz   Vert   Vert   Horiz   Vert   Vert   Horiz   Vert   Horiz   Vert   Horiz   Vert   Vert   Horiz   Vert   Vert   Vert   Horiz   Vert   V |  |
| No.         Vert         Horiz         Vert         Horiz         Vert         Horiz           1         0.0         0.0         0.0         0.0         0.0         0.0           2         0.0         0.0         0.0         0.0         0.0         0.0           3         0.0         0.0         0.0         0.0         0.0         0.0           4         0.0         0.0         0.0         0.0         0.0         0.0           5         0.0         0.0         0.0         0.0         0.0         0.0           6         0.0         0.0         0.0         0.0         0.0         0.0           7         0.0         0.0         0.0         0.0         0.0         0.0           8         0.0         0.0         0.0         0.0         0.0         0.0           9         0.0         0.0         0.0         0.0         0.0         0.0           11         0.0         0.0         0.0         0.0         0.0         0.0           12         0.0         0.0         0.0         0.0         0.0         0.0           13         0.0         0  |  |
| No.         Vert         Horiz         Vert         Horiz         Vert         Horiz           1         0.0         0.0         0.0         0.0         0.0         0.0           2         0.0         0.0         0.0         0.0         0.0         0.0           3         0.0         0.0         0.0         0.0         0.0         0.0           4         0.0         0.0         0.0         0.0         0.0         0.0           5         0.0         0.0         0.0         0.0         0.0         0.0           6         0.0         0.0         0.0         0.0         0.0         0.0           7         0.0         0.0         0.0         0.0         0.0         0.0           8         0.0         0.0         0.0         0.0         0.0         0.0           9         0.0         0.0         0.0         0.0         0.0         0.0           11         0.0         0.0         0.0         0.0         0.0         0.0           12         0.0         0.0         0.0         0.0         0.0         0.0           13         0.0         0  |  |
| Vert         Horiz         Vert         Horiz           1         0.0         0.0         0.0         0.0         0.0           2         0.0         0.0         0.0         0.0         0.0           3         0.0         0.0         0.0         0.0         0.0           4         0.0         0.0         0.0         0.0         0.0           5         0.0         0.0         0.0         0.0         0.0         0.0           6         0.0         0.0         0.0         0.0         0.0         0.0           7         0.0         0.0         0.0         0.0         0.0         0.0           8         0.0         0.0         0.0         0.0         0.0         0.0           9         0.0         0.0         0.0         0.0         0.0         0.0           10         0.0         0.0         0.0         0.0         0.0         0.0           11         0.0         0.0         0.0         0.0         0.0         0.0           12         0.0         0.0         0.0         0.0         0.0         0.0           14         0.0 <th></th>  |  |
| 2       0.0       0.0       0.0       0.0       0.0       0.0         3       0.0       0.0       0.0       0.0       0.0       0.0         4       0.0       0.0       0.0       0.0       0.0       0.0         5       0.0       0.0       0.0       0.0       0.0       0.0         6       0.0       0.0       0.0       0.0       0.0       0.0         7       0.0       0.0       0.0       0.0       0.0       0.0         8       0.0       0.0       0.0       0.0       0.0       0.0         9       0.0       0.0       0.0       0.0       0.0       0.0         10       0.0       0.0       0.0       0.0       0.0       0.0         11       0.0       0.0       0.0       0.0       0.0       0.0         12       0.0       0.0       0.0       0.0       0.0       0.0         13       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0         16       0.0       0.0       0.0<   |  |
| 3       0.0       0.0       0.0       0.0       0.0       0.0         4       0.0       0.0       0.0       0.0       0.0       0.0         5       0.0       0.0       0.0       0.0       0.0       0.0         6       0.0       0.0       0.0       0.0       0.0       0.0         7       0.0       0.0       0.0       0.0       0.0       0.0         8       0.0       0.0       0.0       0.0       0.0       0.0         9       0.0       0.0       0.0       0.0       0.0       0.0         10       0.0       0.0       0.0       0.0       0.0       0.0         11       0.0       0.0       0.0       0.0       0.0       0.0         12       0.0       0.0       0.0       0.0       0.0       0.0         13       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0         15       0.0       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0   |  |
| 4       0.0       0.0       0.0       0.0       0.0       0.0       0.0         5       0.0       0.0       0.0       0.0       0.0       0.0       0.0         6       0.0       0.0       0.0       0.0       0.0       0.0       0.0         7       0.0       0.0       0.0       0.0       0.0       0.0       0.0         8       0.0       0.0       0.0       0.0       0.0       0.0       0.0         9       0.0       0.0       0.0       0.0       0.0       0.0       0.0         10       0.0       0.0       0.0       0.0       0.0       0.0       0.0         11       0.0       0.0       0.0       0.0       0.0       0.0       0.0         12       0.0       0.0       0.0       0.0       0.0       0.0       0.0         13       0.0       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0       0.0         15       0.0       0.0       0.0       0.0       0.0       0.0       0.0  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |  |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  |  |
| 7       0.0  |  |
| 8       0.0  |  |
| 9       0.0       0.0       0.0       0.0       0.0       0.0         10       0.0       0.0       0.0       0.0       0.0       0.0         11       0.0       0.0       0.0       0.0       0.0       0.0         12       0.0       0.0       0.0       0.0       0.0       0.0         13       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0         15       0.0       0.0       0.0       0.0       0.0       0.0         16       0.0       0.0       0.0       0.0       0.0       0.0         17       0.0       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0       0.0  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |  |
| 12       0.0       0.0       0.0       0.0       0.0       0.0         13       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0         15       0.0       0.0       0.0       0.0       0.0       0.0         16       0.0       0.0       0.0       0.0       0.0       0.0         17       0.0       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0       0.0  |  |
| 13       0.0       0.0       0.0       0.0       0.0       0.0         14       0.0       0.0       0.0       0.0       0.0       0.0         15       0.0       0.0       0.0       0.0       0.0       0.0         16       0.0       0.0       0.0       0.0       0.0       0.0         17       0.0       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0       0.0   |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |  |
| 15       0.0       0.0       0.0       0.0       0.0       0.0         16       0.0       0.0       0.0       0.0       0.0       0.0         17       0.0       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0       0.0   |  |
| 16       0.0       0.0       0.0       0.0       0.0         17       0.0       0.0       0.0       0.0       0.0         18       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0  |  |
| 18       0.0       0.0       0.0       0.0       0.0       0.0         19       0.0       0.0       0.0       0.0       0.0       0.0  |  |
| 19 0.0 0.0 0.0 0.0 0.0   |  |
|  |  |
|  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |  |
| 22 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 23 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 24 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 25 0.0 0.0 0.0 0.0 0.0   |  |
| 26 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 27   |  |
| 29 0.0 0.0 0.0 0.0 0.0   |  |
| 30 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 31 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 32 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 33 0.0 0.0 0.0 0.0 0.0   |  |
| 34 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 35   |  |
| 37 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 38 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 39 0.0 0.0 0.0 0.0 0.0   |  |
| 40 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |  |
| 43 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 44 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 45 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 46 0.0 0.0 0.0 0.0 0.0   |  |
| 47 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 48   |  |
| 50 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 51 0.0 0.0 0.0 0.0 0.0   |  |
| 52 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 53 0.0 0.0 0.0 0.0 0.0   |  |
| 54 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 55   |  |
| 56   |  |
| 58 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 59 0.0 0.0 0.0 0.0 0.0   |  |
| 60 0.0 0.0 0.0 0.0 0.0 0.0   |  |
| 61 0.0 0.0 0.0 0.0 0.0   |  |
| 62 0.0 0.0 0.0 0.0 0.0   |  |
| 63   |  |
| 65 0.0 0.0 0.0 0.0 0.0 0.0   |  |
|  |  |

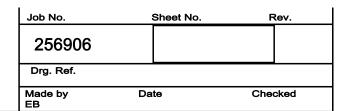
Northern SPA

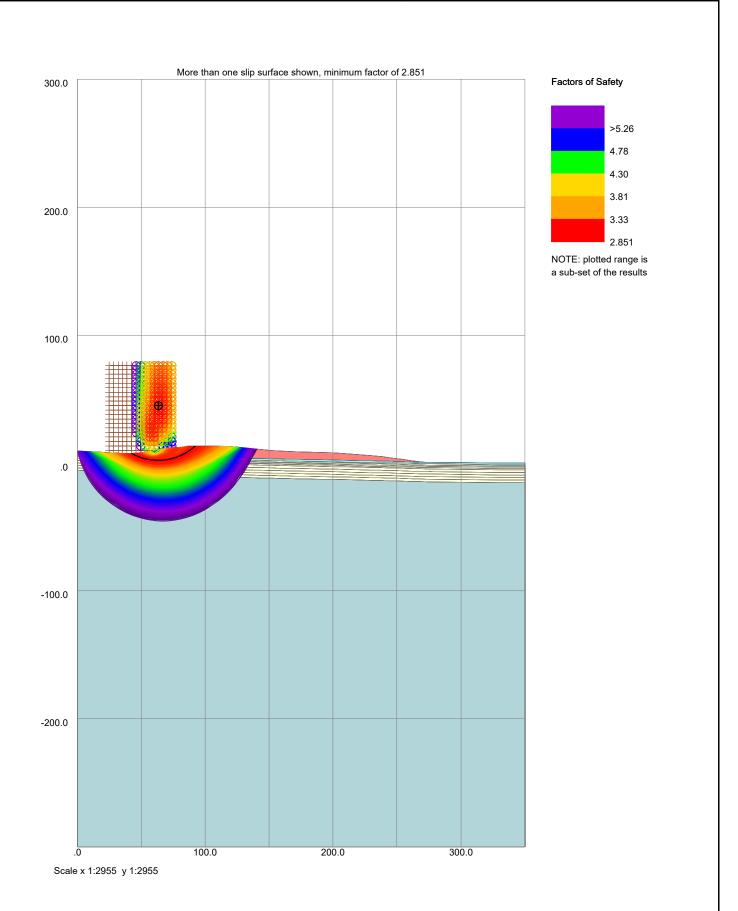
Eastern Mound - Undrained (East) Section C-CC

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Slice  | Surface Load | [kN/m_hor/m] | Point Load | [kN/m] | Water Pressure | on            |
|--------|--------------|--------------|------------|--------|----------------|---------------|
| NT- CC | 0 0          | 0 0          | 0 0        | 0 0    |                | [1-x] / L / 1 |
| 66     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 67     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 68     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 69     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 70     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 71     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 72     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 73     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 74     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 75     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 76     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |
| 77     | 0.0          | 0.0          | 0.0        | 0.0    | 0.0            | 0.0           |

Northern SPA
Eastern Mound - Undrained
Section C-CC (west)





#### **Northern SPA**

Eastern Mound - Undrained Section C-CC (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m] : 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description             |         | Unit Weight Shear Strength Parame<br>Above GWL Below GWL Condition |             |           | с |
|----------------------------|---------|--|-------------|-----------|---|
|                            |         |  |             | Phi0      |   |
|                            | [kN/m3] | [kN/m3]  |             | [°]       |   |
| [kN/m <sup>2</sup> ]       |         |  |             |           |   |
| 1 Waste                    | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 50.000                     |         |  |             |           |   |
| 2 Clay Deposits            | 17.000  | 17.000   | Undrained   | N.A.      |   |
| 30.000                     | 40.500  | 40 500   | , ,         |           |   |
| 3 London Clay 1            | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 43.250<br>4 London Clay 2  | 19.500  | 10 F00   | Undrained   | N.A.      |   |
| 4 London Clay 2<br>49.750  | 19.500  | 19.500   | Ulidiailled | N.A.      |   |
| 5 London Clay 3            | 19.500  | 19 500   | Undrained   | N.A.      |   |
| 56.250                     | 19.300  | 13.300   | onaramea    | 14 • 11 • |   |
| 6 London Clay 4            | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 62.750                     |         |  |             |           |   |
| 7 London Clay 5            | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 72.500                     |         |  |             |           |   |
| 8 London Clay 6            | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 85.500                     |         |  |             |           |   |
| 9 London Clay 7            | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 98.500                     |         |  |             |           |   |
| 10 London Clay 8           | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 111.50                     | 10 500  | 10 500   | 1 1 1       |           |   |
| 11 London Clay 9<br>124.50 | 19.500  | 19.500   | Undrained   | N.A.      |   |
| 12 Harwich                 | 20.000  | 20 000   | Undrained   | N.A.      |   |
| 130.00                     | 20.000  | 20.000   | Ulidiailled | N.A.      |   |
| 130.00                     |         |  |             |           |   |

#### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathsf{m}}$ 

| Stratum | 1 X>    |         |        |        |          |        |          |
|---------|---------|---------|--------|--------|----------|--------|----------|
|         | 0.0     | 37.887  | 39.880 | 47.753 | 48.087   | 50.946 | 52.674   |
| 1       | 9.6040  | 7.6791  | 7.6000 | 8.0369 |          | 8.5415 | •        |
| 2       | 9.6040  | 7.6791  | •      |        | 7.2131   |        | 7.0000   |
| 3       | 8.1040  | 6.1791  |        |        | 5.7131   |        | 5.5000   |
| 4       | 7.1040  | 5.1791  |        |        | 4.7131   |        | 4.5000   |
| 5       | 6.1040  | 4.1791  |        |        | 3.7131   |        | 3.5000   |
| 6       | 5.1040  | 3.1791  |        |        | 2.7131   |        | 2.5000   |
| 7       | 4.1040  | 2.1791  |        |        | 1.7131   |        | 1.5000   |
| 8       | 2.1040  | 0.17910 |        |        | -0.28690 |        | -0.50000 |
| 9       | 0.10400 | -1.8209 |        |        | -2.2869  |        | -2.5000  |
| 10      | -1.8960 | -3.8209 |        |        | -4.2869  |        | -4.5000  |
| 11      | -3.8960 | -5.8209 |        |        | -6.2869  |        | -6.5000  |
| 12      | -5.8960 | -7.8209 |        |        | -8.2869  |        | -8.5000  |
| Stratum | 1 X>    |         |        |        |          |        |          |

### ARUP A

**Northern SPA** 

Eastern Mound - Undrained Section C-CC (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Section  | 1 C-CC (wesi       | ι)       |                    |          |                               | EB                            |                     |
|----------|--------------------|----------|--------------------|----------|-------------------------------|-------------------------------|---------------------|
|          |                    |          |                    |          |                               |                               |                     |
|          | 53.908             | 56.525   | 58.187             | 63.253   | 68.895                        | 69.256                        | 73.969              |
| 1        | 9.0382             |          | 10.038             |          |                               | 12.037                        |                     |
| 2        |                    |          | •                  | 6.4898   |                               |                               | 6.0203              |
| 3        | •                  | •        | •                  | 4.9898   | 4.7419                        | •                             | 4.5203              |
| 4        | •                  | •        | •                  |          | 3.7419                        |                               | 3.5203              |
| 5        | •                  | •        | •                  | 2.9898   | 2.7419                        | •                             | 2.5203              |
| 6        | •                  | •        | •                  |          | 1.7419                        |                               | 1.5203              |
| 7        | •                  | •        | •                  |          | 0.74190                       |                               | 0.52030             |
| 8        | •                  | •        | •                  |          | -1.2581                       |                               | -1.4797             |
| 9        | •                  | •        | •                  |          | -3.2581                       |                               | -3.4797             |
| 10       | •                  | •        | •                  |          | -5.2581                       |                               | -5.4797             |
| 11       | •                  | •        | •                  |          | -7.2581                       |                               | -7.4797             |
| 12       | •                  | •        | •                  | -9.0102  | -9.2581                       | •                             | -9.4797             |
| tratum   | 1 X>               | 01 560   | 00 007             | 06 004   | 00 705                        | 05 064                        | 05 200              |
|          | 78.810             |          | 82.267             |          |                               |                               | 95.328              |
| 1        |                    | 12.436   |                    | 13.436   |                               | 13.436                        |                     |
| 2        | 5.8370             | •        | 5.7080             |          | 5.4187                        | •                             | 5.2048              |
| 3        | 4.3370             |          | 4.2080             | •        |                               | •                             | 3.7048              |
| 4        | 3.3370             | •        |                    | •        | 2.9187                        |                               | 2.7048              |
| 5        | 2.3370             | •        | 2.2080             | •        | 1.9187                        | •                             | 1.7048              |
| 6<br>7   | 1.3370             | •        |                    |          |                               | •                             | 0.70480             |
| 8        | 0.33700            | •        | 0.20800            |          | -0.081300                     |                               | -0.29520<br>-3.3953 |
|          | -1.6630            |          |                    |          |                               | •                             | -2.2952<br>-4.2952  |
| 9<br>10  | -3.6630<br>-5.6630 |          |                    |          | -4.0813<br>-6.0813            |                               | -4.2952<br>-6.2952  |
| 10<br>11 | -5.6630<br>-7.6630 |          |                    |          | -6.0813<br>-8.0813            |                               | -6.2952<br>-8.2952  |
| 12       | -7.6630<br>-9.6630 | •        | -7.7920<br>-9.7920 | •        | -10.081                       |                               | -8.2952<br>-10.295  |
|          | -9.6630<br>n X>    | •        | J. 134U            | •        | 10.001                        | •                             | 10.233              |
| CLACUII  | 102.13             | 102 26   | 107.56             | 114.16   | 120.11                        | 127.69                        | 132.14              |
| 1        | 13.436             |          | 13.436             |          |                               |                               | 12.032              |
|          |                    |          |                    |          |                               | 4.0601                        |                     |
| 3        | •                  | 3.4444   | •                  | 3.0316   |                               | 2.5601                        | •                   |
|          | •                  | 2.4444   |                    | 2.0316   |                               | 1.5601                        | •                   |
| 5        | •                  | 1.4444   |                    | 1.0316   |                               | 0.56010                       | •                   |
|          | •                  | 0.44440  | •                  | 0.031600 |                               | -0.43990                      | •                   |
|          | •                  | -0.55560 |                    | -0.96840 |                               | -1.4399                       | •                   |
|          | •                  |          | •                  | -2.9684  |                               | -3.4399                       | •                   |
| 9        | •                  | -4.5556  |                    | -4.9684  |                               | -5.4399                       | •                   |
| 10       | •                  |          | •                  | -6.9684  |                               | -7.4399                       | •                   |
| 11       | •                  | -8.5556  | •                  | -8.9684  | •                             | -9.4399                       | •                   |
| 12       |                    |          |                    | -10.968  |                               | -11.440                       |                     |
|          | n X>               |          |                    |          | •                             |                               | •                   |
|          | 138.49             | 140.91   | 143.43             | 152.59   | 152.99                        | 158.50                        | 163.69              |
| 1        |                    | 11.039   |                    | 10.037   |                               |                               |                     |
| 2        | 3.7749             | •        | 3.6682             |          | 3.4738                        | 3.3339                        | 3.2289              |
| 3        | 2.2749             | •        | 2.1682             | •        | 1.9738                        | 1.8339                        | 1.7289              |
| 4        | 1.2749             | •        | 1.1682             | •        | 0.97380                       | 0.83390                       | 0.72890             |
| 5        | 0.27490            |          | 0.16820            | •        | -0.026200                     | -0.16610                      | -0.27110            |
| 6        | -0.72510           | •        | -0.83180           | •        | -1.0262                       | -1.1661                       | -1.2711             |
| 7        | -1.7251            | •        | -1.8318            | •        | -2.0262                       | -2.1661                       | -2.2711             |
| 8        | -3.7251            | •        | -3.8318            | •        | -4.0262                       | -4.1661                       | -4.2711             |
| 9        | -5.7251            | •        | -5.8318            | •        | -6.0262                       | -6.1661                       | -6.2711             |
| 10       | -7.7251            |          | -7.8318            | •        | -8.0262                       | -8.1661                       | -8.2711             |
| 11       | -9.7251            | •        | -9.8318            |          | -10.026                       | -10.166                       | -10.271             |
| 12       | -11.725            | •        | -11.832            |          | -12.026                       | -12.166                       | -12.271             |
| tratum   | n X>               |          |                    |          |                               |                               |                     |
|          | 170.37             | 171.66   | 181.35             | 189.75   | 201.03                        | 201.38                        | 205.61              |
| 1        | 9.0342             | •        |                    |          | 8.0000                        | •                             | 7.8090              |
| 2        | •                  | 3.0843   | 2.9011             | 2.7546   |                               | 2.5170                        |                     |
| 3        | •                  | 1.5843   | 1.4011             | 1.2546   | •                             | 1.0170                        | •                   |
| 4        |                    | 0.58430  | 0.40110            | 0.25460  | •                             | 0.017000                      | •                   |
| 5        |                    | -0.41570 | -0.59890           | -0.74540 | •                             | -0.98300                      | •                   |
| 6        |                    | -1.4157  | -1.5989            | -1.7454  | •                             | -1.9830                       | •                   |
| 7        | •                  | -2.4157  | -2.5989            | -2.7454  | •                             | -2.9830                       | •                   |
| 8        | •                  | -4.4157  | -4.5989            | -4.7454  | •                             | -4.9830                       | •                   |
| 9        |                    | -6.4157  | -6.5989            | -6.7454  | •                             | -6.9830                       | •                   |
| 10       | •                  | -8.4157  | -8.5989            | -8.7454  |                               | -8.9830                       | •                   |
| 11       |                    | -10.416  | -10.599            | -10.745  | •                             | -10.983                       | •                   |
| 12       | •                  | -12.416  | -12.599            | -12.745  | •                             | -12.983                       | •                   |
| tratum   | n X>               |          |                    |          |                               |                               |                     |
| oraca.   | 210.16             | 217.45   | 221.16             | 228.51   | 230.35                        | 236.79                        | 238.53              |
|          |                    |          |                    | 6.0363   |                               |                               | 5.0366              |
| 1        | •                  | 7.0357   |                    |          |                               |                               |                     |
| 1<br>2   | 2.2925             |          | 2.0000             | •        | 1.8143                        | 1.6882                        | •                   |
| 1        | •                  |          |                    |          | 1.8143<br>0.31430<br>-0.68570 | 1.6882<br>0.18820<br>-0.81180 |                     |

### ARUP Arus

#### **Northern SPA**

Eastern Mound - Undrained Section C-CC (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Stratum  | Y>       |          |          |         |          |          |         |
|----------|----------|----------|----------|---------|----------|----------|---------|
|          | 210 16   | 217 45   | 221 16   | 220 E1  | 220 25   | 226 70   | 220 E2  |
| 5        | -1.2075  | •        | -1.5000  | •       | -1.6857  | -1.8118  | •       |
| 6        | -2.2075  | •        | -2.5000  | •       | -2.6857  | -2.8118  | •       |
| 7        | -3.2075  | •        | -3.5000  | •       | -3.6857  | -3.8118  | •       |
| 8        | -5.2075  | •        | -5.5000  |         | -5.6857  | -5.8118  |         |
| 9        | -7.2075  | •        | -7.5000  |         | -7.6857  | -7.8118  |         |
| 10       | -9.2075  | •        | -9.5000  |         | -9.6857  | -9.8118  |         |
| 11       | -11.208  | •        | -11.500  |         | -11.686  | -11.812  |         |
| 12       | -13.208  |          | -13.500  |         | -13.686  | -13.812  |         |
| Stratum  | X>       |          |          |         |          |          |         |
|          | 241.91   | 243.25   | 243.98   | 246.44  | 249.30   | 253.99   | 261.82  |
| 1        | •        |          |          | 4.0371  |          | 3.0370   | 2.0376  |
| 2        | 1.5678   | 1.5422   | 1.5283   |         | 1.3846   | •        |         |
| 3        | 0.067800 | 0.042200 | 0.028300 |         | -0.11540 | •        |         |
| 4        | -0.93220 | -0.95780 | -0.97170 |         | -1.1154  |          |         |
| 5        | -1.9322  | -1.9578  | -1.9717  |         | -2.1154  |          |         |
| 6        | -2.9322  | -2.9578  | -2.9717  |         | -3.1154  |          |         |
| 7        | -3.9322  | -3.9578  | -3.9717  |         | -4.1154  |          |         |
| 8        | -5.9322  | -5.9578  | -5.9717  |         | -6.1154  |          |         |
| 9        | -7.9322  | -7.9578  | -7.9717  |         | -8.1154  |          |         |
| 10       | -9.9322  | -9.9578  | -9.9717  |         | -10.115  |          |         |
| 11       | -11.932  | -11.958  | -11.972  |         | -12.115  |          |         |
| 12       | -13.932  | -13.958  | -13.972  |         | -14.115  |          |         |
| Stratum  | x>       |          |          |         |          |          |         |
|          | 262.26   | 268.02   | 268.80   | 272.18  | 274.68   | 277.27   | 329.94  |
| 1        | •        |          | 1.0000   | 0.80000 | 0.71990  | 0.66680  | 0.0     |
| 2        | 0.96400  | 0.85690  |          |         | 0.71990  | 0.66680  | 0.0     |
| 3        | -0.53600 | -0.64310 |          |         | -0.78010 | -0.83320 | -1.5000 |
| 4        | -1.5360  | -1.6431  |          |         | -1.7801  | -1.8332  | -2.5000 |
| 5        | -2.5360  | -2.6431  |          |         | -2.7801  | -2.8332  | -3.5000 |
| 6        | -3.5360  | -3.6431  |          |         | -3.7801  | -3.8332  | -4.5000 |
| 7        | -4.5360  | -4.6431  |          |         | -4.7801  | -4.8332  | -5.5000 |
| 8        | -6.5360  | -6.6431  |          |         | -6.7801  | -6.8332  | -7.5000 |
| 9        | -8.5360  | -8.6431  |          |         | -8.7801  | -8.8332  | -9.5000 |
|          | -10.536  | -10.643  | •        | •       | -10.780  | -10.833  | -11.500 |
| 10       |          |          | -        | -       |          |          |         |
| 10<br>11 | -12.536  | -12.643  |          |         | -12.780  | -12.833  | -13.500 |

#### Stratum-linked data

| No. | Material      | Water table | Piezo Set/ Ru value |
|-----|---------------|-------------|---------------------|
| 1   | Waste         | -           |                     |
| 2   | Clay Deposits |             |                     |
| 3   | London Clay 1 | -           |                     |
| 4   | London Clay 2 | -           |                     |
| 5   | London Clay 3 | -           |                     |
| 6   | London Clay 4 | -           |                     |
| 7   | London Clay 5 | -           |                     |
| 8   | London Clay 6 | -           |                     |
| 9   | London Clay 7 | -           |                     |
| 10  | London Clay 8 |             |                     |
| 11  | London Clay 9 |             |                     |
| 12  | Harwich       | -           |                     |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 25.00000 m y = 10.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 15 in x direction at 3.50000m spacing

20 in y direction at 3.50000m spacing

Grid extended to find minimum FoS

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (63.500m, 45.000m)Iterations: 5 Net vertical force [kN/m]: 6.0727Net horiz force [kN/m]: 35.814 Radius 43.000m Horiz acceleration [%g]: 0.0 Slip weight [kN/m] 5954.4 Disturbing moment [kN/m]: 28828. Restoring moment [kNm/m]: 82177. Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 2.8506

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Pore Pressure  $\,$  Interslice forces [kN/m]

Northern SPA Eastern Mound - Undrained Section C-CC (west)

18

19

20

21

22

23

2.4

2.5

26

44.821

40.179

40.179

40.179

40.179

40.179

40.179

35.536

35.536

35.536

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

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| ı |       |                      | coordinates |                        |        |          | ce forces  | [kN/m]  |        |
|---|-------|----------------------|-------------|------------------------|--------|----------|------------|---------|--------|
| I | Point | x [m]                | y [m]       | L R                    |        | T        | E          |         | E (u)  |
| ı |       |                      |             | [kN/m <sup>2</sup> ] [ | kN/m²] |          |            |         |        |
| ı | 1     | 42.069               | 7.7214      | _                      | 0.0    | 0.0      |            | 0.0     | 0.0    |
| ı | 2     | 42.516               | 7.4676      | 0.0                    | 0.0    | 2.1985   |            | 9.3482  | 0.0    |
| ı | 3     | 44.133               | 6.6081      | 0.0                    | 0.0    | 10.946   |            | 41.370  | 0.0    |
| ı |       | 45.786               | 5.8182      |                        | 0.0    | 15.569   |            | 82.286  |        |
| ı |       | 46.764               | 5.3905      |                        | 0.0    | 15.485   |            | 112.88  |        |
| ı |       | 47.753               | 4.9871      |                        | 0.0    | 14.741   |            | 145.75  |        |
| ı |       | 48.087               | 4.8573      |                        | 0.0    | 14.376   |            | 157.24  |        |
| ı |       | 48.522               | 4.6929      |                        | 0.0    | 13.812   |            | 172.54  |        |
| ı |       | 49.728               | 4.2651      |                        | 0.0    | 11.201   |            | 218.41  |        |
| ı |       | 50.946               | 3.8734      |                        | 0.0    | 8.4563   |            | 266.24  |        |
| ı |       | 52.153               | 3.5242      |                        | 0.0    | 5.9509   |            | 314.18  |        |
| ı |       | 52.674               | 3.3852      |                        | 0.0    | 4.7677   |            | 335.66  |        |
| ı |       | 53.908               | 3.0834      |                        | 0.0    | 2.4076   |            | 385.94  |        |
| ı |       | 55.213               | 2.8062      |                        | 0.0    |          |            | 437.59  |        |
| ı |       | 56.525               | 2.5694      |                        |        |          |            | 487.24  |        |
| ı |       |                      |             |                        |        | -0.45284 |            |         |        |
| ı |       | 58.187               | 2.3295      |                        |        | -0.74457 |            | 544.95  |        |
| ı |       | 59.885               | 2.1522      |                        |        | -0.10814 |            | 596.03  |        |
| ı |       | 61.429               | 2.0499      |                        | 0.0    | 0.64538  |            | 636.79  |        |
| ı |       | 62.975               | 2.0032      |                        | 0.0    | 1.2550   |            | 668.93  |        |
| ı |       | 63.253               | 2.0007      |                        | 0.0    | 1.3005   |            | 673.27  |        |
| ı |       | 65.138               | 2.0312      |                        | 0.0    | 2.6308   |            | 694.53  |        |
| ı |       | 67.020               | 2.1443      |                        | 0.0    | 6.6518   |            | 700.65  |        |
| ı |       | 68.895               | 2.3397      |                        | 0.0    | 11.947   |            | 691.11  |        |
| ı | 24    | 69.256               | 2.3870      |                        | 0.0    | 12.984   |            | 687.45  |        |
| ı |       | 70.958               | 2.6518      |                        | 0.0    | 17.648   |            | 663.01  |        |
| ı | 26    | 72.470               | 2.9459      | 0.0                    | 0.0    | 20.497   |            | 629.67  | 0.0    |
| ı | 27    | 73.969               | 3.2940      | 0.0                    | 0.0    | 22.008   |            | 588.93  | 0.0    |
| ı | 28    | 74.727               | 3.4916      | 0.0                    | 0.0    | 22.155   |            | 565.78  | 0.0    |
| ı | 29    | 76.178               | 3.9116      | 0.0                    | 0.0    | 20.492   |            | 514.97  | 0.0    |
| ı | 30    | 77.614               | 4.3823      | 0.0                    | 0.0    | 17.053   |            | 460.39  | 0.0    |
| ı | 31    | 78.810               | 4.8177      | 0.0                    | 0.0    | 11.345   |            | 408.41  | 0.0    |
| ı | 32    | 79.946               | 5.2691      | 0.0                    | 0.0    | 4.6223   |            | 357.39  | 0.0    |
| ı | 33    | 81.068               | 5.7527      | 0.0                    | 0.0    | -3.1347  |            | 306.07  | 0.0    |
| ı | 34    | 81.563               | 5.9780      | 0.0                    | 0.0    | -5.7009  |            | 285.89  | 0.0    |
| ı | 35    | 83.361               | 6.8618      | 0.0                    | 0.0    | -16.220  |            | 212.41  | 0.0    |
| ı |       | 85.116               | 7.8284      |                        | 0.0    | -27.757  |            | 141.88  |        |
| ı |       | 86.824               | 8.8756      | 0.0                    | 0.0    | -38.512  |            | 77.403  |        |
| ı |       | 88.366               | 9.9192      |                        | 0.0    | -44.497  |            | 27.431  |        |
| ı |       | 89.862               | 11.029      |                        | 0.0    | -42.770  |            | -8.8861 |        |
| ı |       | 91.308               | 12.202      |                        | 0.0    | -30.794  |            | -30.220 |        |
| ı |       | 92.701               | 13.436      |                        |        | -6.0727  |            | -35.814 |        |
| I |       |                      |             |                        |        |          |            |         |        |
| I | Slice | Strengt              | h Parameter | s Average              | Slice  | Forces   | on base [] | kN/m]   |        |
| ı | No.   | •                    |             | Pore                   | Weight |          | -          | • •     |        |
| ı |       |                      |             | Pressure               | _      |          |            |         |        |
| ı |       | c'                   | Tan phi     | [kN/m <sup>2</sup> ]   |        | Normal   | Shear      | Shear   |        |
| ı |       | [kN/m <sup>2</sup> ] | _           | [, ]                   | [,]    |          | (capacity  |         |        |
| ı | 1     | 35.714               |             | 0 0 0                  | 1 2164 | 7.8139   | 18.38      |         | 6.4477 |
| ١ | 2     | 21.429               |             |                        |        | 43.132   | 39.24      |         | 13.768 |
| ı |       |                      |             |                        |        |          |            |         |        |
| ı | 3     | 21.429               |             |                        |        | 66.829   | 39.24      |         | 13.768 |
| ı | 4     | 30.893               |             |                        |        | 50.328   | 32.98      |         | 11.572 |
| ı | 5     | 30.893               |             |                        |        | 59.048   | 32.98      |         | 11.572 |
| ı | 6     | 30.893               |             |                        |        | 21.855   | 11.07      |         | 3.8836 |
| ١ | 7     | 30.893               |             |                        |        | 30.099   | 14.37      |         | 5.0410 |
| ١ | 8     | 35.536               |             |                        |        | 92.700   | 45.46      |         | 15.949 |
| ١ | 9     | 35.536               |             |                        |        | 107.03   | 45.46      |         | 15.949 |
| ١ | 10    | 35.536               |             |                        |        | 118.71   | 44.64      |         | 15.663 |
| ١ | 11    | 40.179               |             |                        |        | 54.986   | 21.65      | 9       | 7.5982 |
| ١ | 12    | 40.179               |             |                        |        | 138.77   | 51.06      |         | 17.913 |
| ١ | 13    | 40.179               |             |                        |        | 160.28   | 53.58      |         | 18.798 |
| ١ | 14    | 40.179               |             |                        |        | 175.79   | 53.58      | 5       | 18.798 |
| ١ | 15    | 40.179               | 9 0.        | 0.0                    | 234.35 | 240.17   | 67.46      | 1       | 23.666 |
| ١ | 16    | 40.179               | 9 0.        |                        |        | 261.67   | 68.60      |         | 24.067 |
| ۱ | 17    | 44.82                | 0.          |                        |        | 249.52   | 69.32      |         | 24.320 |
| ı | 1.0   | 11 82                | 1 0         |                        |        | 259 10   | 69 32      |         |        |

0.0 257.58 259.10

0.0 47.356 47.441

0.0 327.68 328.62

0.0 336.98 339.99

0.0 342.54 346.89

0.0 66.569 67.495

0.0 310.51 315.11 0.0 268.92 273.04 0.0 258.91 262.78

0.0 127.35 129.16

69.326

11.173

75.746

75.746

75.746

14.640

69.228

54.710

54.710

27.833

24.320

3.9195

26.572

26.572

26.572

5.1358

24.286

19.193

19.193

9.7642

**Arup** 

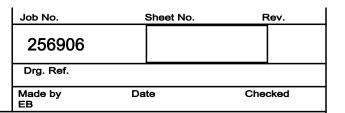
Northern SPA
Eastern Mound - Undrained
Section C-CC (west)

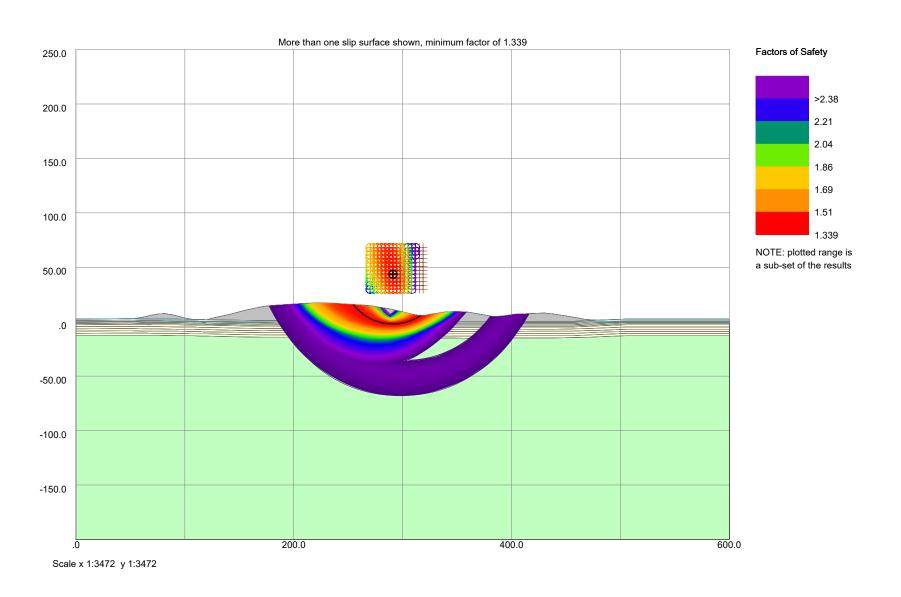
| Job No.       | Sheet No. | Rev.    |
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| Made by<br>EB | Date      | Checked |

|          |           |              | _          |                  | _      |                |           |                |
|----------|-----------|--------------|------------|------------------|--------|----------------|-----------|----------------|
| NT.      | _         | Parameters   |            |                  |        |                |           |                |
| 28       |           | 0.0          |            | 236.11           |        | 46.66          |           | 5.372          |
| 29       |           | 0.0          |            | 222.41           |        | 46.66          |           | 5.372          |
| 30       |           | 0.0          |            | 176.40           |        | 27.26          |           | .5655          |
| 31       |           | 0.0          |            | 160.02           |        | 26.19          |           | .1901          |
| 32       |           | 0.0          |            | 150.14           |        | 26.19          |           | .1902          |
| 33       |           | 0.0          |            | 63.341           |        | 19.42          |           | .8135          |
| 34       | 35.714    | 0.0          |            | 216.94           |        | 71.55          |           | 5.102          |
| 35       |           | 0.0          |            | 191.63           |        | 71.55          |           | 5.102          |
| 36       |           | 0.0          |            | 163.93           |        | 71.55          |           | 5.102          |
| 37<br>38 |           | 0.0          |            | 121.44           |        | 66.49          |           | 3.328<br>3.328 |
| 39       |           | 0.0          |            | 86.380<br>51.347 |        | 66.49<br>66.49 |           | 3.328          |
| 40       |           | 0.0          |            | 16.777           |        | 66.49          |           | 3.328          |
| 40       | 33.714    | 0.0          | 0.0        | 10.///           | 34.373 | 00.4.          | 70 23     | 0.520          |
| Slice    | Surface 1 | Load [kN/m_] | hor/m] Po  | int Load         | [kN/m] | Water          | Pressure  | on             |
| No.      |           |              |            |                  |        | ground         | d surface | [kN/m_hor/m    |
|          | Vert      | Horiz        | Ve:        |                  | Horiz  | Vert           | Horiz     | Z              |
| 1        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 2        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 3        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 4        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 5        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 6        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 7        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 8        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 9        | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 10       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 11       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 12       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 13       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 14       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 15       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 16       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 17       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 18<br>19 | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 20       | 0.        |              | 0.0<br>0.0 | 0.0              | 0.     |                | 0.0       | 0.             |
| 21       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 22       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 23       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 24       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 25       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 26       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 27       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 28       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 29       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 30       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 31       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 32       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 33       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 34       | 0.        |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 35       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 36       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 37       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 38       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 39       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
| 40       |           |              | 0.0        | 0.0              | 0.     |                | 0.0       | 0.             |
|          |           |              |            |                  |        |                |           |                |
|          |           |              |            |                  |        |                |           |                |

# ARUP Arup

Northern SPA
Eastern Mound - Undrained
Section D-DD (north)





### ARUP Arup

#### **Northern SPA**

Eastern Mound - Undrained Section D-DD (north)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis
Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

#### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'      | Unit N<br>Above GWL | -       | Shear Strength Parameters Condition | Phi or    | С |
|----------------------------|---------------------|---------|-------------------------------------|-----------|---|
| 01 60                      |                     |         |                                     | Phi0      |   |
|                            | [kN/m3]             | [kN/m3] |                                     | [°]       |   |
| [kN/m <sup>2</sup> ]       |                     |         |                                     |           |   |
| 1 Waste                    | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 50.000                     |                     |         |                                     |           |   |
| 2 Clay Deposits            | 17.000              | 17.000  | Undrained                           | N.A.      |   |
| 30.000                     |                     |         |                                     |           |   |
| 3 London Clay 1            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 43.250                     | 10.500              | 10 500  | TT - A 1 A                          | 37. 3     |   |
| 4 London Clay 2<br>49.750  | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 5 London Clay 3            | 19.500              | 10 500  | Undrained                           | N.A.      |   |
| 56.250                     | 19.300              | 17.500  | Olidiailled                         | N.A.      |   |
| 6 London Clay 4            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 62.750                     |                     |         |                                     |           |   |
| 7 London Clay 5            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 72.500                     |                     |         |                                     |           |   |
| 8 London Clay 6            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 85.500                     |                     |         |                                     |           |   |
| 9 London Clay 7            | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 98.500                     |                     |         |                                     |           |   |
| 10 London Clay 8           | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 111.50                     | 10.500              | 10 500  | TT - A 1 A                          | 37. 3     |   |
| 11 London Clay 9<br>124.50 | 19.500              | 19.500  | Undrained                           | N.A.      |   |
| 12 Harwich                 | 20.000              | 20 000  | Undrained                           | N.A.      |   |
| 130.00                     | 20.000              | 20.000  | OHALATHEA                           | 14 • 14 • |   |
| 100.00                     |                     |         |                                     |           |   |

### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathsf{m}}$ 

| Stratum | n X>     | _        |          |        |        |        |          |
|---------|----------|----------|----------|--------|--------|--------|----------|
|         | 0.0      | 45.962   | 49.759   | 51.953 | 54.883 | 59.695 | 64.560   |
| 1       | 2.6980   | 2.9579   | 2.9332   | 2.9400 | 3.1990 | 4.0976 | •        |
| 2       | 2.6880   | 2.9479   | 2.9232   |        |        |        | 2.7612   |
| 3       | 1.1880   | 1.4479   | 1.4232   |        |        |        | 1.2612   |
| 4       | 0.18800  | 0.44790  | 0.42320  |        |        |        | 0.26120  |
| 5       | -0.81200 | -0.55210 | -0.57680 |        |        |        | -0.73880 |
| 6       | -1.8120  | -1.5521  | -1.5768  |        |        |        | -1.7388  |
| 7       | -2.8120  | -2.5521  | -2.5768  |        |        |        | -2.7388  |
| 8       | -4.8120  | -4.5521  | -4.5768  |        |        |        | -4.7388  |
| 9       | -6.8120  | -6.5521  | -6.5768  |        |        |        | -6.7388  |
| 10      | -8.8120  | -8.5521  | -8.5768  |        |        |        | -8.7388  |
| 11      | -10.812  | -10.552  | -10.577  |        |        |        | -10.739  |
| 12      | -12.812  | -12.552  | -12.577  |        |        |        | -12.739  |
| Stratum | n X>     |          |          |        |        |        |          |

Northern SPA

Eastern Mound - Undrained Section D-DD (north)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | •         |         |
| Made by   | Date      | Checked |

|          |        |                    |                    |                      |                    | EB                               |                   |
|----------|--------|--------------------|--------------------|----------------------|--------------------|----------------------------------|-------------------|
|          |        |                    |                    |                      |                    |                                  |                   |
|          | 64 754 | 68.531             | 70.667             | 73.559               | 75.785             | 76.349                           | 78.727            |
|          | 5.1990 | 6.0478             |                    | 6.9178               |                    | 7.3059                           |                   |
|          | •      | •                  | 2.7127             | •                    | 2.7056             | •                                |                   |
| 3        |        | •                  | 1.2127             | •                    | 1.2056             | •                                | •                 |
| Į.       |        | •                  | 0.21270            |                      | 0.20560            |                                  |                   |
| 5        |        |                    | -0.78730           |                      | -0.79440           |                                  |                   |
| 6        |        | •                  | -1.7873            |                      | -1.7944            | •                                |                   |
| 7        | •      | •                  | -2.7873            | •                    | -2.7944            | •                                | •                 |
| 8        | •      | •                  | -4.7873            | •                    | -4.7944            | •                                | •                 |
| 9        |        | •                  | -6.7873            | •                    | -6.7944            | •                                | •                 |
| .0       | •      | •                  | -8.7873            | •                    | -8.7944            | •                                | •                 |
| 11<br>12 | •      |                    | -10.787<br>-12.787 |                      | -10.794<br>-12.794 | •                                | •                 |
|          | 1 X>   | •                  | -12.707            | •                    | -12.794            | •                                | •                 |
| acun     | 81.104 | 83.565             | 85.009             | 87.400               | 92.023             | 92.106                           | 96.293            |
| 1        | 7.6990 | 7.4535             | 7.1990             |                      | 5.6844             |                                  | 4.6335            |
| 2        | •      | •                  |                    | •                    | •                  | 2.5277                           |                   |
| 3        |        |                    |                    |                      |                    | 1.0277                           |                   |
| 4        | •      | •                  | •                  |                      | •                  | 0.027700                         |                   |
| 5        |        | •                  | •                  |                      |                    | -0.97230                         |                   |
| 6        |        |                    |                    |                      | •                  | -1.9723                          |                   |
| 7        | •      | •                  | •                  |                      |                    | -2.9723                          |                   |
| 8        |        |                    |                    | •                    |                    | -4.9723                          |                   |
| 9        | •      | •                  | •                  | •                    | •                  | -6.9723                          | •                 |
| 10       | •      |                    |                    |                      | •                  | -8.9723                          | •                 |
| L1       | •      |                    | •                  | •                    | •                  | -10.972                          | •                 |
| 2        |        | •                  | •                  | •                    | •                  | -12.972                          | •                 |
| atum     | X>     | 107.70             | 114.57             | 117.64               | 119.79             | 106 21                           | 130.80            |
| 1        | 3.8142 | 2 3500             | 114.57             | 117.64               | 2.0700             | <b>126.31</b><br>3 <b>.</b> 5739 |                   |
| 2        |        | 2.3500<br>2.3239   | 2.1890             | 2.1188               | 2.0562             | •                                | 4.0001            |
| 3        | •      | 0.82390            | 0.68900            |                      |                    | •                                | •                 |
| 4        | •      | -0.17610           | -0.31100           |                      |                    |                                  | •                 |
| 5        |        | -1.1761            | -1.3110            | -1.3812              | -1.4438            | •                                |                   |
| 6        |        | -2.1761            | -2.3110            | -2.3812              | -2.4438            |                                  |                   |
| 7        |        | -3.1761            | -3.3110            | -3.3812              | -3.4438            | •                                |                   |
| 8        |        | -5.1761            | -5.3110            | -5.3812              | -5.4438            | •                                |                   |
| 9        |        | -7.1761            | -7.3110            | -7.3812              | -7.4438            |                                  |                   |
| 10       | •      | -9.1761            | -9.3110            | -9.3812              | -9.4438            | •                                |                   |
| 11       |        | -11.176            | -11.311            | -11.381              | -11.444            |                                  |                   |
| 12       |        | -13.176            | -13.311            | -13.381              | -13.444            | •                                |                   |
| ratum    | x>     |                    |                    |                      |                    |                                  |                   |
| _        | 135.67 | 142.07             | 148.43             | 148.77               | 156.55             | 171.43                           |                   |
| 1        | 5.7893 | 7.2601             | 8.7875             |                      | 10.788             | 14.199                           | . 1246            |
| 2<br>3   | •      | •                  | •                  | 1.5117               | •                  | •                                | 1.1346            |
| 3<br>4   | •      | •                  |                    | 0.011700<br>-0.98830 | •                  | •                                | -0.36540          |
| 5        | •      | •                  | •                  | -1.9883              | •                  | •                                | -1.3654 $-2.3654$ |
| 6        | •      | •                  | •                  | -2.9883              |                    | •                                | -3.3654           |
| 7        | •      | •                  | •                  | -3.9883              | •                  | •                                | -4.3654           |
| 8        |        | •                  | •                  | -5.9883              | •                  | •                                | -6.3654           |
| 9        | •      |                    |                    | -7.9883              |                    | •                                | -8.3654           |
| LO       |        |                    | •                  | -9.9883              |                    |                                  | -10.365           |
| 11       |        | •                  | •                  | -11.988              | •                  | •                                | -12.365           |
| L2       | •      |                    |                    | -13.988              | •                  | •                                | -14.365           |
| atum     | x>     |                    |                    |                      |                    |                                  |                   |
|          | 179.78 | 186.36             | 201.87             | 211.22               | 215.38             | 217.28                           | 217.71            |
| 1        | 15.199 | •                  | •                  | 17.199               | 17.355             |                                  | 17.482            |
| 2        | •      | 1.2139             | 1.0963             | •                    | •                  | 0.87990                          | •                 |
| 3        | •      | -0.28610           | -0.40370           | •                    |                    | -0.62010                         | •                 |
| 4        | •      | -1.2861            | -1.4037            | •                    | •                  | -1.6201                          | •                 |
| 5        | •      | -2.2861            | -2.4037            | •                    | •                  | -2.6201                          | •                 |
| 6        | •      | -3.2861            | -3.4037            | •                    | •                  | -3.6201                          | •                 |
| 7<br>8   | •      | -4.2861<br>-6.2861 | -4.4037<br>-6.4037 | •                    | •                  | -4.6201<br>-6.6201               | •                 |
| 9        | •      | -6.2861<br>-8.2861 | -6.4037<br>-8.4037 | •                    | •                  | -6.6201<br>-8.6201               | •                 |
| 10       | •      | -8.2861<br>-10.286 | -8.4037<br>-10.404 | •                    | •                  | -8.6201<br>-10.620               | •                 |
| 11       | •      | -10.286            | -10.404            | •                    | •                  | -10.620                          | •                 |
| 12       | •      | -12.286<br>-14.286 | -12.404            | •                    | •                  | -12.620<br>-14.620               |                   |
|          | 1 X>   | 14.200             | T-101              | •                    | •                  | 14.020                           | •                 |
|          | 221.59 | 224.46             | 234.21             | 236.68               | 243.63             | 255.53                           | 269.24            |
| 1        | 17.599 |                    |                    | 17.199               |                    |                                  | 15.199            |
| 2        |        | 0.88650            | 0.90540            | •                    | 0.95470            | 1.0016                           |                   |
| 3        |        | -0.61350           | -0.59460           | •                    | -0.54530           | -0.49840                         | •                 |
| 4        |        | -1.6135            | -1.5946            |                      | -1.5453            | -1.4984                          |                   |
|          |        |                    |                    |                      |                    |                                  |                   |

### ARUP Art

**Northern SPA** 

Eastern Mound - Undrained Section D-DD (north)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           | •       |
| Made by   | Date      | Checked |

|  | n D-DD (north  | 1)      |         |   |  | Made by<br>EB | Date   | Checked |
|--|--|---------|---------|---|--|---------------|--|---------|
| Stratum  | n X>   |         |         |   |  |               |  |         |
|  | 001 FO   | 2 6125  | 2 5046  | 226 60  | 2 5 4 5 2  | 2 4004        | 262.24   |         |
| 5  | •  | -2.6135 | -2.5946 | •   | -2.5453  | -2.4984       | •  |         |
| 6  | •  | -3.6135 | -3.5946 | •   | -3.5453  | -3.4984       | •  |         |
| 7  | •  | -4.6135 | -4.5946 |   | -4.5453  | -4.4984       | •  |         |
| 8  | •  | -6.6135 | -6.5946 |   | -6.5453  | -6.4984       | •  |         |
| 9  |  | -8.6135 | -8.5946 |   | -8.5453  | -8.4984       |  |         |
| 10   |  | -10.613 | -10.595 |   | -10.545  | -10.498       |  |         |
| 11   | •  | -12.613 | -12.595 |   | -12.545  | -12.498       | •  |         |
| 12   | •  | -14.613 | -14.595 | •   | -14.545  | -14.498       | •  |         |
|  |  | -14.613 | -14.393 | •   | -14.545  | -14.490       | •  |         |
| Stratum  | n X>   |         |         |   |  |               |  |         |
| _  | 272.62   | 279.71  | 287.12  | 289.49  | 289.81   | 297.32        | 304.59   |         |
| 1  | •  | 13.513  | 12.199  | •   | 11.660   | 10.048        | •  |         |
| 2  | 0.78170  | •       | •       | 0.42960   |  |               | 0.17560  |         |
| 3  | -0.71830   |         | •       | -1.0704   |  |               | -1.3244  |         |
| 4  | -1.7183  |         |         | -2.0704   |  |               | -2.3244  |         |
| 5  | -2.7183  | •       |         | -3.0704   |  |               | -3.3244  |         |
| 6  | -3.7183  | •       | •       | -4.0704   | •  | ·             | -4.3244  |         |
| 7  |  | •       | •       |   | •  | •             |  |         |
|  | -4.7183  | •       | •       | -5.0704   | •  | •             | -5.3244  |         |
| 8  | -6.7183  | •       | •       | -7.0704   | •  | •             | -7.3244  |         |
| 9  | -8.7183  | •       | •       | -9.0704   | •  | •             | -9.3244  |         |
| 10   | -10.718  | •       |         | -11.070   | •  |               | -11.324  |         |
| 11   | -12.718  | •       |         | -13.070   | •  | •             | -13.324  |         |
| 12   | -14.718  |         |         | -15.070   |  |               | -15.324  |         |
|  | n X>   | -       | -       |   | -  | -             |  |         |
| JEACUII  | 308.73   | 314 00  | 320.53  | 320.82  | 325 72   | 327.94        | 340 24   |         |
| _  |  | 314.89  |         |   | 325.73   |               | 340.24   |         |
| 1  | 7.1990   | 6.1990  | : .     | 6.1990  | 6.9555   | :             | 9.1990   |         |
| 2  |  |         | 0.0     | •   |  | 0.12360       | •  |         |
| 3  | •  | •       | -1.5000 |   |  | -1.3764       | •  |         |
| 4  |  |         | -2.5000 |   |  | -2.3764       |  |         |
| 5  |  |         | -3.5000 |   |  | -3.3764       |  |         |
| 6  | •  | •       |         | •   | •  | -4.3764       | •  |         |
|  | •  | •       | -4.5000 | •   | •  |               | •  |         |
| 7  | •  | •       | -5.5000 | •   | •  | -5.3764       | •  |         |
| 8  | •  | •       | -7.5000 | •   | •  | -7.3764       | •  |         |
| 9  |  |         | -9.5000 |   |  | -9.3764       | •  |         |
| 10   |  |         | -11.500 |   |  | -11.376       |  |         |
| 11   |  |         | -13.500 |   |  | -13.376       |  |         |
| 12   |  |         | -15.500 |   |  | -15.376       |  |         |
|  | n X>   | •       | 13.300  | •   | •  | 13.370        | •  |         |
| cracum   |  | 240 56  | 250 11  | 359.43  | 370.45   | 202 00        | 387.29   |         |
|  | 343.34   | 349.56  | 359.11  |   |  |               | 387 79   |         |
|  |  |         |         | 339.43  | 370.43   | 383.28        | 307.23   |         |
| 1  | •  | 9.6990  | 9.1990  |   | •  | 5.1990        |  |         |
| 1<br>2   | 0.23810  |         |         |   | 0.23660  |               |  |         |
|  |  | 9.6990  | 9.1990  |   | •  | 5.1990        |  |         |
| 2  | 0.23810  | 9.6990  | 9.1990  | 0.22100<br>-1.2790  | 0.23660  | 5.1990        | 0.34010  |         |
| 2<br>3<br>4  | 0.23810<br>-1.2619<br>-2.2619  | 9.6990  | 9.1990  | 0.22100<br>-1.2790<br>-2.2790   | 0.23660<br>-1.2634<br>-2.2634  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599  |         |
| 2<br>3<br>4<br>5   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619   | 9.6990  | 9.1990  | 0.22100<br>-1.2790<br>-2.2790<br>-3.2790  | 0.23660<br>-1.2634<br>-2.2634<br>-3.2634   | 5.1990<br>·   | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599   |         |
| 2<br>3<br>4<br>5<br>6  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599  |         |
| 2<br>3<br>4<br>5<br>6<br>7   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790  | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634   | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790   | 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790  | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634   | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279  | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263                                       | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263  | 5.1990        | 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279   | 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-11.263<br>-13.263<br>-15.263   | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br><b>X</b> -><br><b>391.88</b>  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279   | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263  | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>tratum   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br><b>X</b> -><br><b>391.88</b><br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279   | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263                                      | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>a X><br>391.88<br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263<br>-15.263                            | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 .  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>stratum<br>1<br>2<br>3   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>1X -><br>391.88<br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080  | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263                                      | 5.1990        | . 0.34010 -1.1599 -2.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>a X><br>391.88<br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263<br>-15.263                            | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 .  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>tratum<br>1<br>2<br>3<br>4<br>5  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>1X -><br>391.88<br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080  | . 0.23660<br>-1.2634<br>-2.2634<br>-4.2634<br>-4.2634<br>-7.2634<br>-7.2634<br>-11.263<br>-13.263<br>-15.263<br><b>421.17</b><br>7.8857            | 5.1990        | . 0.34010 -1.1599 -2.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br><b>X</b> -><br><b>391.88</b><br>5.2314   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263<br>-15.263<br><b>421.17</b><br>7.8857 | 5.1990        | . 0.34010 -1.1599 -2.1599 -2.1599 -4.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-7.2619<br>-7.2619<br>-11.262<br>-13.262<br>-15.262<br>at X>  391.88<br>5.2314<br>  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808   | . 0.23660   -1.2634   -2.2634   -3.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263  | 5.1990<br>    | . 0.34010 -1.1599 -2.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7   | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-7.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>1X> 391.88<br>5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808  | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-15.263<br><b>421.17</b><br>7.8857<br>                   | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>8<br>8<br>7<br>10<br>11<br>12<br>8<br>14<br>14<br>15<br>16<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  1 X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808   | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263<br>-15.263<br><b>421.17</b><br>7.8857<br>        | 5.1990<br>    | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179 -7.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9  | 0.23810<br>-1.2619<br>-2.2619<br>-3.2619<br>-4.2619<br>-5.2619<br>-7.2619<br>-9.2619<br>-11.262<br>-13.262<br>-15.262<br>1X> 391.88<br>5.2314<br>  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-4.9808<br>-4.9808<br>-8.9808   | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263   421.17   7.8857                              | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179 -7.0179 -9.0179  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>10<br>11<br>12<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  1 X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-8.9808<br>-10.981                                    | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-5.2634<br>-7.2634<br>-9.2634<br>-11.263<br>-13.263<br>-15.263<br><b>421.17</b><br>7.8857<br>        | 5.1990        | . 0.34010 -1.1599 -2.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -9.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179 -7.0179 -9.0179 -11.018  |         |
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| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>10<br>11<br>11<br>12<br>12<br>13<br>14<br>14<br>15<br>16<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -7.2619 -7.2619 -11.262 -13.262 -15.262 -15.262 -15.262 -15.2314   | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981                         | . 0.23660   -1.2634   -2.2634   -3.2634   -5.2634   -7.2634   -9.2634   -11.263   -15.263    421.17   7.8857                                       | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -7.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179 -7.0179 -9.0179 -11.018 -13.018 -15.018  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>12<br>12<br>13<br>14<br>14<br>15<br>16<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18            | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -7.2619 -7.2619 -11.262 -13.262 -15.262 -15.262 -15.262 -15.261 -10.262 -10.261 -10.262 -10.26 | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883     | . 0.23660   -1.2634   -2.2634   -3.2634   -5.2634   -7.2634   -9.2634   -11.263   -15.263    421.17   7.8857                                       | 5.1990        | . 0.34010 -1.1599 -2.1599 -3.1599 -4.1599 -5.1599 -7.1599 -7.1599 -11.160 -13.160 -15.160  439.15 . 0.48210 -1.0179 -2.0179 -3.0179 -4.0179 -5.0179 -7.0179 -9.0179 -11.018 -13.018 -15.018  479.86 1.5100   |         |
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| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18                        | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -7.2619 -7.2619 -11.262 -13.262 -15.262 -15.262 -15.262 -15.261 -10.262 -10.261 -10.262 -10.26 | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-4.9808<br>-4.9808<br>-4.9808<br>-4.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883     | . 0.23660   -1.2634   -2.2634   -3.2634   -5.2634   -7.2634   -9.2634   -11.263   -15.263    421.17   7.8857                                       | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-5.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>10<br>11<br>11<br>12<br>12<br>12<br>13<br>14<br>14<br>15<br>16<br>16<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18                                | 0.23810 -1.2619 -2.2619 -3.2619 -4.2619 -7.2619 -7.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-4.9808<br>-4.9808<br>-4.9808<br>-4.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883     | . 0.23660   -1.2634   -2.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -15.263   421.17   7.8857  | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-5.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858   |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18                        | 0.23810 -1.2619 -2.2619 -3.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883<br>  | . 0.23660<br>-1.2634<br>-2.2634<br>-3.2634<br>-4.2634<br>-5.2634<br>-7.2634<br>-11.263<br>-13.263<br>-15.263<br>421.17<br>7.8857<br>               | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-5.0179<br>-7.0179<br>-9.0179<br>-1.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858<br>-0.014200<br>-1.0142  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>2<br>3<br>4<br>4<br>5<br>5<br>5<br>5<br>5<br>7<br>8<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8                   | 0.23810 -1.2619 -2.2619 -3.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883<br> | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263   421.17   7.8857                    | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-7.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142                                  |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>2<br>3<br>4<br>4<br>5<br>5<br>6<br>7<br>10<br>11<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12                               | 0.23810 -1.2619 -2.2619 -3.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883<br> | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263    421.17   7.8857                   | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-7.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142<br>-3.0142                       |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>7<br>8<br>8<br>9<br>10<br>11<br>11<br>12<br>5<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7<br>8<br>7 | 0.23810 -1.2619 -2.2619 -3.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883<br> | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -15.263    421.17   7.8857                             | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-5.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142<br>-3.0142<br>-3.0142<br>-4.0142 |         |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>12<br>13<br>14<br>14<br>15<br>15<br>16<br>16<br>17<br>18<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18                          | 0.23810 -1.2619 -2.2619 -3.2619 -5.2619 -7.2619 -9.2619 -11.262 -13.262 -15.262  X> 391.88 5.2314  | 9.6990  | 9.1990  | . 0.22100<br>-1.2790<br>-2.2790<br>-3.2790<br>-4.2790<br>-5.2790<br>-7.2790<br>-9.2790<br>-11.279<br>-13.279<br>-15.279<br>418.64<br>. 0.51920<br>-0.98080<br>-1.9808<br>-2.9808<br>-3.9808<br>-4.9808<br>-6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br>461.31<br>3.5883<br> | . 0.23660   -1.2634   -2.2634   -3.2634   -4.2634   -5.2634   -7.2634   -9.2634   -11.263   -13.263   -15.263    421.17   7.8857                   | 5.1990        | . 0.34010<br>-1.1599<br>-2.1599<br>-3.1599<br>-4.1599<br>-5.1599<br>-7.1599<br>-9.1599<br>-11.160<br>-13.160<br>-15.160<br>439.15<br>. 0.48210<br>-1.0179<br>-2.0179<br>-3.0179<br>-4.0179<br>-7.0179<br>-7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br>479.86<br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142<br>-3.0142                       |         |

#### **Northern SPA**

Eastern Mound - Undrained Section D-DD (north)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | _         |         |
| Made by   | Date      | Checked |

|         | 120 67   | 450 60    | AEC CA  | 161 21 | ACO AC | 472 06  | 470 06  |
|---------|----------|-----------|---------|--------|--------|---------|---------|
| 10      |          | •         | -10.886 |        |        | -10.311 | -10.014 |
| 11      |          |           | -12.886 |        |        | -12.311 | -12.014 |
| 12      |          | •         | -14.886 |        |        | -14.311 | -14.014 |
| Stratum | X>       |           |         |        |        |         |         |
|         | 487.82   | 505.89    |         |        |        |         |         |
| 1       | 1.8044   | 2.4739    |         |        |        |         |         |
| 2       | 1.7944   | 2.4639    |         |        |        |         |         |
| 3       | 0.29440  | 0.96390   |         |        |        |         |         |
| 4       | -0.70560 | -0.036100 |         |        |        |         |         |
| 5       | -1.7056  | -1.0361   |         |        |        |         |         |
| 6       | -2.7056  | -2.0361   |         |        |        |         |         |
| 7       | -3.7056  | -3.0361   |         |        |        |         |         |
| 8       | -5.7056  | -5.0361   |         |        |        |         |         |
| 9       | -7.7056  | -7.0361   |         |        |        |         |         |
| 10      | -9.7056  | -9.0361   |         |        |        |         |         |
| 11      | -11.706  | -11.036   |         |        |        |         |         |
| 12      | -13.706  | -13.036   |         |        |        |         |         |

| Stratu | m-linked data |             |                     |
|--------|---------------|-------------|---------------------|
| No.    | Material      | Water table | Piezo Set/ Ru value |
| 1      | Waste         | -           |                     |
| 2      | Clay Deposits | -           |                     |
| 3      | London Clay 1 | -           |                     |
| 4      | London Clay 2 | -           |                     |
| 5      | London Clay 3 | -           |                     |
| 6      | London Clay 4 | -           |                     |
| 7      | London Clay 5 | -           |                     |
| 8      | London Clay 6 | -           |                     |
| 9      | London Clay 7 | -           |                     |
| 10     | London Clay 8 | -           |                     |
| 11     | London Clay 9 | -           |                     |
| 12     | Harwich       | -           |                     |
|        |               |             |                     |

#### Slip Surface Specification

Circle centre specification: GRID Bottom left of grid: x = 270.00000 m y = 30.00000 m Inclination of grid: 0.00000 deg (positive anticlockwise direction about bottom left of grid) Centres on grid: 15 in x direction at 3.50000m spacing 12 in y direction at 3.50000m spacing Grid extended to find minimum FoS Initial radius of circle 5.00000 m Incremented by 1.00000 m until all possible circles considered

### **WORST CASE**

Centre at (291.00m, 44.000m) Radius 46.000m Iterations: 5 Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 32.420 Slip weight [kN/m] 11637. Net horiz force [kN/m]: 123.09 Disturbing moment [kN/m]: 77326. Restoring moment [kNm/m]: 103570. Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 1.3393

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

| Slip  | surface | coordinates | Pore Pre   | essure     | Interslice | forces | [kN/m] |      |
|-------|---------|-------------|------------|------------|------------|--------|--------|------|
| Point | x [m]   | y [m]       | L          | R          | T E        |        |        | E(u) |
|       |         |             | $[kN/m^2]$ | $[kN/m^2]$ |            |        |        |      |
| 1     | 254.42  | 16.110      | -          | 0.0        | 0.0        |        | 0.0    | 0.0  |
| 2     | 255.96  | 14.199      | 0.0        | 0.0        | -63.333    |        | 8.1713 | 0.0  |
| 3     | 257.60  | 12.373      | 0.0        | 0.0        | -98.104    |        | 44.336 | 0.0  |
| 4     | 259.33  | 10.637      | 0.0        | 0.0        | -108.51    |        | 109.61 | 0.0  |
| 5     | 261.15  | 8.9966      | 0.0        | 0.0        | -99.598    |        | 203.49 | 0.0  |
| 6     | 263.06  | 7.4553      | 0.0        | 0.0        | -76.887    |        | 323.82 | 0.0  |
| 7     | 265.05  | 6.0179      | 0.0        | 0.0        | -45.956    |        | 466.85 | 0.0  |
| 8     | 267.11  | 4.6885      | 0.0        | 0.0        | -12.073    |        | 627.43 | 0.0  |
| 9     | 269.24  | 3.4710      | 0.0        | 0.0        | 20.136     |        | 799.22 | 0.0  |
| 10    | 271.25  | 2.4549      | 0.0        | 0.0        | 44.241     |        | 958.98 | 0.0  |
| 11    | 273.31  | 1.5384      | 0.0        | 0.0        | 60.574     |        | 1113.2 | 0.0  |
| 12    | 275.41  | 0.72359     | 0.0        | 0.0        | 68.492     |        | 1256.2 | 0.0  |
| 13    | 277.54  | 0.011986    | 0.0        | 0.0        | 75.655     |        | 1404.8 | 0.0  |
| 14    | 279.71  | -0.59409    | 0.0        | 0.0        | 74.421     |        | 1531.5 | 0.0  |
| 15    | 280.97  | -0.89250    | 0.0        | 0.0        | 70.733     |        | 1592.5 | 0.0  |
| 16    | 283.00  | -1.2997     | 0.0        | 0.0        | 58.624     |        | 1657.4 | 0.0  |

Northern SPA Eastern Mound - Undrained Section D-DD (north)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | <u> </u>  |         |
| Made by<br>EB | Date      | Checked |

|          | (-                   | ,                  |                      |        |                  |                  | EB                       |          |  |
|----------|----------------------|--------------------|----------------------|--------|------------------|------------------|--------------------------|----------|--|
| g1 4     | f                    | oordinatis         | Dome Deser           |        | Tn+1'            | as forces        | [leN] /m ]               |          |  |
| STIP     | suriace c            | oordinates         |                      |        |                  | ce forces        | TI ()                    |          |  |
| 17       | 285.06               | -1.6146            | 0.0                  |        | 45.153           |                  | 1697.0 0.0               |          |  |
| 18       | 287.12               | -1.8364            | 0.0                  |        | 32.731           |                  | 1710.3 0.0               |          |  |
|          | 289.49               | -1.9751            | 0.0                  |        | 23.022           |                  | 1693.1 0.0               |          |  |
|          | 289.81               | -1.9846            | 0.0                  |        | 22.278           |                  | L688.2 0.0<br>L629.3 0.0 |          |  |
|          | 292.32<br>294.83     | -1.9810<br>-1.8404 | 0.0                  |        | 22.115<br>17.775 |                  | L536.6 0.0               |          |  |
|          | 297.32               | -1.5633            | 0.0                  |        | 12.686           |                  | L413.9 0.0               |          |  |
|          | 299.35               | -1.2363            | 0.0                  |        | 9.8887           |                  | 1295.4 0.0               |          |  |
|          | 301.11               | -0.87529           | 0.0                  |        | 6.7121           |                  | 1193.5 0.0               |          |  |
|          | 302.86               | -0.44566           | 0.0                  |        | 5.1474           |                  | L084.4 0.0               |          |  |
| 27       | 304.59               | 0.051945           | 0.0                  | 0.0    | 5.2283           | 9                | 971.09 0.0               |          |  |
|          | 304.97               | 0.17141            | 0.0                  |        | 5.4464           |                  | 945.68 0.0               |          |  |
|          | 306.86               | 0.82132            | 0.0                  |        | 14.104           |                  | 798.30 0.0               |          |  |
|          | 308.73               | 1.5532             | 0.0                  |        | 23.684           |                  | 555.53 0.0               |          |  |
|          | 310.83<br>312.89     | 2.4948<br>3.5407   | 0.0                  |        | 34.204<br>41.838 |                  | 501.00 0.0<br>360.99 0.0 |          |  |
|          | 314.89               | 4.6882             | 0.0                  |        | 42.967           |                  | 240.48 0.0               |          |  |
|          | 316.06               | 5.4261             | 0.0                  |        | 39.404           |                  | 178.14 0.0               |          |  |
|          | 317.21               | 6.1990             | 0.0 -                |        | 32.420           |                  | 123.09 0.0               |          |  |
|          |                      |                    |                      |        |                  |                  |                          |          |  |
| Slice    | Strength             | Parameters         | Average              | Slice  | Forces           | on base [kl      | N/m]                     |          |  |
| No.      |                      |                    |                      | Weight |                  |                  |                          |          |  |
|          |                      |                    | Pressure             |        |                  |                  |                          |          |  |
|          |                      | Tan phi            | [kN/m <sup>2</sup> ] | [kN/m] | Normal           |                  | Shear                    |          |  |
|          | [kN/m <sup>2</sup> ] | <u> </u>           | 2 2                  | 07 01- | C1 0::           |                  | (mobilised)              |          |  |
|          | 35.714               | 0.0                |                      |        | 61.944           | 87.615           | 65.416                   |          |  |
| 2        |                      | 0.0                |                      |        | 106.11<br>156.46 | 87.613<br>87.615 | 65.415<br>65.416         |          |  |
| 4        |                      | 0.0                |                      |        | 212.00           | 87.613           | 65.415                   |          |  |
| 5        |                      | 0.0                |                      |        | 271.53           | 87.614           | 65.415                   |          |  |
| 6        | 35.714               | 0.0                |                      |        | 333.70           | 87.614           | 65.416                   |          |  |
| 7        |                      | 0.0                |                      |        | 396.98           | 87.614           | 65.415                   |          |  |
| 8        | 35.714               | 0.0                | 0.0                  | 464.50 | 459.83           | 87.615           | 65.416                   |          |  |
| 9        |                      | 0.0                |                      |        | 472.14           | 80.408           | 60.035                   |          |  |
| 10       |                      | 0.0                |                      |        | 513.00           | 80.408           | 60.035                   |          |  |
| 11       | 35.714               | 0.0                |                      |        | 549.23           | 80.408           | 60.035                   |          |  |
| 12       |                      | 0.0                |                      |        | 578.62           | 48.278           | 36.046                   |          |  |
| 13       | 21.429<br>21.429     | 0.0                |                      |        | 599.70<br>349.51 | 48.279           | 36.046                   |          |  |
| 15       | 30.893               | 0.0                |                      |        | 570.31           | 27.592<br>64.182 | 20.601<br>47.920         |          |  |
| 16       | 30.893               | 0.0                |                      |        | 573.79           | 64.182           | 47.920                   |          |  |
| 17       | 30.893               | 0.0                |                      |        | 570.99           | 64.182           | 47.921                   |          |  |
| 18       |                      | 0.0                |                      |        | 637.95           | 73.156           | 54.621                   |          |  |
| 19       |                      | 0.0                |                      |        | 85.832           | 10.026           | 7.4858                   |          |  |
| 20       | 30.893               | 0.0                | 0.0                  | 645.29 | 645.55           | 77.555           | 57.905                   |          |  |
| 21       |                      | 0.0                |                      |        | 623.47           | 77.554           | 57.904                   |          |  |
| 22       |                      | 0.0                |                      |        | 591.39           | 77.554           | 57.905                   |          |  |
| 23       |                      | 0.0                |                      |        | 451.38           | 63.325           | 47.281                   |          |  |
| 24       | 21.429<br>21.429     | 0.0                |                      |        | 368.55<br>340.98 | 38.550<br>38.551 | 28.783<br>28.783         |          |  |
|          | 21.429               | 0.0                |                      |        | 311.41           | 38.550           | 28.783                   |          |  |
| 27       |                      | 0.0                |                      |        | 64.900           | 8.5471           | 6.3816                   |          |  |
| 28       |                      | 0.0                |                      |        | 300.64           | 71.576           | 53.441                   |          |  |
| 29       | 35.714               | 0.0                | 0.0                  | 227.20 | 257.00           | 71.577           | 53.442                   |          |  |
|          | 35.714               | 0.0                |                      |        | 243.81           | 82.345           | 61.481                   |          |  |
| 31       |                      | 0.0                |                      |        | 190.91           | 82.344           | 61.481                   |          |  |
|          | 35.714<br>35.714     | 0.0                |                      |        | 138.22           | 82.345           | 61.482                   |          |  |
| 33<br>34 | 35.714<br>35.714     | 0.0                |                      |        | 60.327<br>45.730 | 49.524<br>49.525 | 36.976<br>36.977         |          |  |
| 54       | 55.713               | 0.0                | 0.0                  | 5.0702 | 10.750           | 47.020           | 50.511                   |          |  |
| Slice    | Surface              | Load [kN/m_        | hor/m] Poi           | nt Loa | d [kN/m]         | Water Pr         | ressure on               |          |  |
| No.      |                      | _                  |                      |        | _                |                  | surface [kN/m            | m_hor/m] |  |
|          | Vert                 | Horiz              | Ver                  |        | Horiz            | Vert             | Horiz                    |          |  |
| 1        | 0.                   |                    | 0.0                  | 0.0    |                  |                  | .0                       | 0.0      |  |
| 2        | 0.                   |                    | 0.0                  | 0.0    |                  |                  | . 0                      | 0.0      |  |
| 3        | 0.                   |                    | 0.0                  | 0.0    |                  | 0.0              |                          | 0.0      |  |
| 4<br>5   | 0.<br>0.             |                    | 0.0<br>0.0           | 0.0    |                  | 0.0 0.0          |                          | 0.0      |  |
| 6        | 0.                   |                    | 0.0                  | 0.0    |                  |                  | .0                       | 0.0      |  |
| 7        | 0.                   |                    | 0.0                  | 0.0    |                  |                  | .0                       | 0.0      |  |
| 8        | 0.                   |                    | 0.0                  | 0.0    |                  |                  | .0                       | 0.0      |  |
| 9        | 0.                   |                    | 0.0                  | 0.0    |                  | 0.0              |                          | 0.0      |  |
| 10       | 0.                   |                    | 0.0                  | 0.0    |                  |                  | . 0                      | 0.0      |  |
| 11       | 0.                   |                    | 0.0                  | 0.0    |                  | 0.0              |                          | 0.0      |  |
| 12       | 0.                   |                    | 0.0                  | 0.0    |                  | 0.0              |                          | 0.0      |  |
| 13       | 0.                   |                    | 0.0                  | 0.0    |                  | 0.0              |                          | 0.0      |  |
| 14       | 0.                   |                    | 0.0                  | 0.0    |                  |                  | . 0                      | 0.0      |  |
| 15       | 0.                   | U                  | 0.0                  | 0.0    | Ü                | 0.0              | . 0                      | 0.0      |  |

### Arup

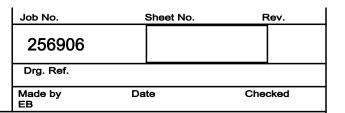
Northern SPA
Eastern Mound - Undrained
Section D-DD (north)

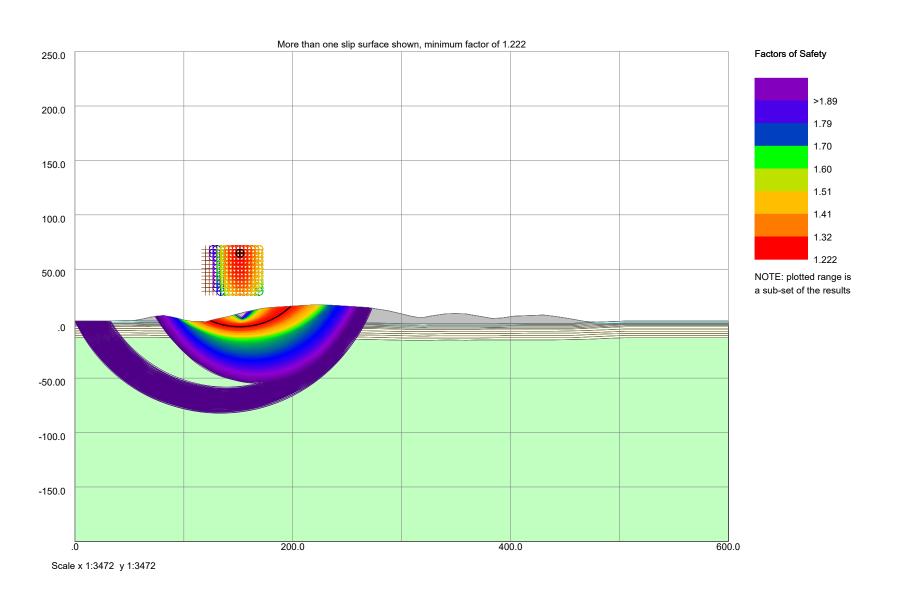
| Job No.   | Sheet No. | Rev.    |
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|    | Surface Load | [kN/m_hor/m] Point | Load | [kN/m] | Water Pressure |     |
|----|--------------|--------------------|------|--------|----------------|-----|
| 16 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 17 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 18 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 19 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 20 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 21 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 22 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 23 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 24 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 25 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 26 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 27 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 28 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 29 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 30 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 31 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 32 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 33 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |
| 34 | 0.0          | 0.0                | 0.0  | 0.0    | 0.0            | 0.0 |

# ARUP Arup

Northern SPA
Eastern Mound - Undrained
Section D-DD (south)





### ARUP Arus

#### **Northern SPA**

Eastern Mound - Undrained Section D-DD (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | <u> </u>  | •       |
| Made by   | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Bishop (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

### Material properties

| No Description or c0' | Unit W<br>Above GWL | -       | Shear Strength Parameters<br>Condition | Phi or      | с |
|-----------------------|---------------------|---------|--|-------------|---|
|                       | [kN/m3]             | [kN/m3] |  | PhiO<br>[°] |   |
| [kN/m <sup>2</sup> ]  | [KIN/III3]          | [KM/M3] |  | 1 1         |   |
| 1 Waste               | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 50.000                |                     |         |  |             |   |
| 2 Clay Deposits       | 17.000              | 17.000  | Undrained                              | N.A.        |   |
| 30.000                |                     |         |  |             |   |
| 3 London Clay 1       | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 43.250                |                     |         |  |             |   |
| 4 London Clay 2       | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 49.750                | 4.0 5.00            | 40 500  |  |             |   |
| 5 London Clay 3       | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 6 London Clay 4       | 19.500              | 10 500  | Undrained                              | N.A.        |   |
| 62.750                | 19.500              | 19.500  | Ulidiailled                            | N.A.        |   |
| 7 London Clay 5       | 19.500              | 19 500  | Undrained                              | N.A.        |   |
| 72.500                | 13.000              | 13.000  | onararii oa                            |             |   |
| 8 London Clay 6       | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 85.500                |                     |         |  |             |   |
| 9 London Clay 7       | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 98.500                |                     |         |  |             |   |
| 10 London Clay 8      | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 111.50                |                     |         |  |             |   |
| 11 London Clay 9      | 19.500              | 19.500  | Undrained                              | N.A.        |   |
| 124.50                | 00.000              | 00.000  | 1 1 1                                  |             |   |
| 12 Harwich            | 20.000              | 20.000  | Undrained                              | N.A.        |   |
| 130.00                |                     |         |  |             |   |

### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathsf{m}}$ 

| Stratum | X>       | _        |          |        |        |        |          |
|---------|----------|----------|----------|--------|--------|--------|----------|
|         | 0.0      | 45.962   | 49.759   | 51.953 | 54.883 | 59.695 | 64.560   |
| 1       | 2.6980   | 2.9579   | 2.9332   | 2.9400 | 3.1990 | 4.0976 |          |
| 2       | 2.6880   | 2.9479   | 2.9232   | •      |        |        | 2.7612   |
| 3       | 1.1880   | 1.4479   | 1.4232   | •      |        |        | 1.2612   |
| 4       | 0.18800  | 0.44790  | 0.42320  | •      |        |        | 0.26120  |
| 5       | -0.81200 | -0.55210 | -0.57680 | •      |        |        | -0.73880 |
| 6       | -1.8120  | -1.5521  | -1.5768  | •      |        |        | -1.7388  |
| 7       | -2.8120  | -2.5521  | -2.5768  | •      |        |        | -2.7388  |
| 8       | -4.8120  | -4.5521  | -4.5768  | •      |        |        | -4.7388  |
| 9       | -6.8120  | -6.5521  | -6.5768  | •      |        |        | -6.7388  |
| 10      | -8.8120  | -8.5521  | -8.5768  | •      |        |        | -8.7388  |
| 11      | -10.812  | -10.552  | -10.577  |        |        |        | -10.739  |
| 12      | -12.812  | -12.552  | -12.577  | •      |        |        | -12.739  |
| Stratum | X>       |          |          |        |        |        |          |

### ARUP Ar

**Northern SPA** 

Eastern Mound - Undrained Section D-DD (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Section       | טט-טו (soc | atri)    |                     |          |                     | EB       |          |
|---------------|------------|----------|---------------------|----------|---------------------|----------|----------|
|               |            |          |                     |          |                     |          |          |
|               | 64.754     | 68.531   | 70.667              | 73.559   | 75.785              | 76.349   | 78.727   |
| 1             | 5.1990     | 6.0478   | •                   | 6.9178   | •                   | 7.3059   | 7.5024   |
| 2             | •          | •        | 2.7127              | •        | 2.7056              | •        | •        |
| 3             | •          | •        | 1.2127              | •        | 1.2056              | •        | •        |
| <b>4</b><br>5 | •          | •        | 0.21270             | •        | 0.20560             | •        | •        |
| 6             | •          | •        | -0.78730<br>-1.7873 | •        | -0.79440<br>-1.7944 |          | •        |
| 7             | •          |          | -2.7873             |          | -2.7944             | •        | •        |
| 8             | •          | •        |                     | •        | -4.7944             | •        | •        |
| 9             |            | •        |                     | •        |                     | •        | •        |
| 10            | •          | •        |                     | •        |                     | •        | •        |
| 11            | •          | •        | -10.787             | •        | -10.794             | •        | •        |
| 12            | •          | •        | -12.787             | •        | -12.794             | •        | •        |
|               | n X>       | •        | 12.707              | •        | 12.734              | •        | •        |
| Lacun         |            | 83.565   | 85.009              | 87.400   | 92.023              | 92.106   | 96.293   |
| 1             | 7.6990     |          | 7.1990              | 6.7117   |                     | 32.100   | 4.6335   |
| 2             |            |          |                     |          |                     | 2.5277   | •        |
| 3             |            |          | •                   |          |                     | 1.0277   | •        |
| 4             |            | •        | •                   |          | •                   | 0.027700 |          |
| 5             | •          | •        | •                   | ·<br>·   | •                   | -0.97230 | ·        |
| 6             | •          | •        | •                   | •        | •                   |          | •        |
| 6<br>7        | •          | •        |                     | •        |                     | -1.9723  | •        |
|               | •          | •        | •                   | •        | •                   | -2.9723  | •        |
| 8             | •          | •        | •                   | •        | •                   | -4.9723  | •        |
| 9             | •          |          | •                   | •        | •                   | -6.9723  | •        |
| 10            | •          | •        | •                   | •        | •                   | -8.9723  | •        |
| 11            | •          | •        | •                   | •        | •                   | -10.972  | •        |
| 12            | •          | •        | •                   | •        | •                   | -12.972  | •        |
| ratum         | 1 X>       |          |                     |          |                     |          |          |
|               |            | 107.70   | 114.57              | 117.64   |                     | 126.31   | 130.80   |
| 1             | 3.8142     | 2.3500   | •                   | •        | 2.0700              | 3.5739   | 4.6001   |
|               | •          | 2.3239   | 2.1890              |          |                     | •        | •        |
| 3             | •          | 0.82390  | 0.68900             | 0.61880  | 0.55620             | •        | •        |
| 4             | •          |          | -0.31100            |          |                     | •        | •        |
| 5             | •          | -1.1761  | -1.3110             | -1.3812  | -1.4438             | •        | •        |
| 6             |            | -2.1761  | -2.3110             | -2.3812  | -2.4438             | •        | •        |
| 7             | •          | -3.1761  | -3.3110             | -3.3812  | -3.4438             | •        | •        |
| 8             | •          | -5.1761  | -5.3110             | -5.3812  | -5.4438             | •        | •        |
| 9             |            | -7.1761  | -7.3110             | -7.3812  | -7.4438             | •        |          |
| 10            |            | -9.1761  | -9.3110             | -9.3812  | -9.4438             |          | •        |
| 11            |            | -11.176  | -11.311             | -11.381  | -11.444             |          | •        |
| 12            |            | -13.176  | -13.311             | -13.381  | -13.444             |          | •        |
| ratum         | 1 X>       |          |                     |          |                     |          |          |
|               | 135.67     | 142.07   | 148.43              | 148.77   | 156.55              | 171.43   | 172.29   |
| 1             | 5.7893     | 7.2601   | 8.7875              |          | 10.788              | 14.199   | •        |
| 2             | •          | •        |                     | 1.5117   | •                   | •        | 1.1346   |
| 3             |            |          |                     | 0.011700 |                     |          | -0.36540 |
| 4             |            |          |                     | -0.98830 |                     | •        | -1.3654  |
| 5             |            |          |                     | -1.9883  |                     |          | -2.3654  |
| 6             |            | •        |                     | -2.9883  |                     |          | -3.3654  |
| 7             |            |          |                     | -3.9883  |                     |          | -4.3654  |
| 8             | •          |          |                     | -5.9883  | •                   |          | -6.3654  |
| 9             |            | •        | :                   | -7.9883  |                     |          | -8.3654  |
| 10            |            |          | •                   | -9.9883  |                     | ·        | -10.365  |
| 11            |            |          |                     | -11.988  |                     |          | -12.365  |
| 12            |            |          |                     | -13.988  |                     |          | -14.365  |
|               | 1 X>       | •        | -                   |          |                     | •        |          |
|               | 179.78     | 186.36   | 201.87              | 211.22   | 215.38              | 217.28   | 217.71   |
| 1             | 15.199     |          | •                   | 17.199   | 17.355              |          | 17.482   |
| 2             |            | 1.2139   | 1.0963              | •        | •                   | 0.87990  | •        |
| 3             | •          | -0.28610 | -0.40370            |          |                     | -0.62010 | •        |
| 4             |            | -1.2861  | -1.4037             |          |                     | -1.6201  |          |
| 5             |            | -2.2861  | -2.4037             | •        |                     | -2.6201  | -        |
| 6             | •          | -3.2861  | -3.4037             | •        |                     | -3.6201  | •        |
| 7             | •          | -4.2861  | -4.4037             | •        | •                   | -4.6201  | •        |
| 8             | •          | -6.2861  | -6.4037             |          |                     | -6.6201  | •        |
|               | •          |          |                     | •        |                     |          | •        |
| 9             | •          | -8.2861  | -8.4037             | •        | •                   | -8.6201  | •        |
| 10            | •          | -10.286  | -10.404             | •        | •                   | -10.620  | •        |
| 11            | •          | -12.286  | -12.404             | •        | •                   | -12.620  | •        |
| 12            | <u>:</u>   | -14.286  | -14.404             | •        | •                   | -14.620  | •        |
| ratun         | 1 X>       | 004.45   | 004.05              | 005 55   | 040.00              | 055 55   | 262.24   |
| _             | 221.59     | 224.46   | 234.21              | 236.68   | 243.63              | 255.53   | 269.24   |
| 1             | 17.599     | •        | •                   | 17.199   | •                   |          | 15.199   |
| 2             | •          | 0.88650  | 0.90540             | •        | 0.95470             | 1.0016   | •        |
| 3             | •          | -0.61350 | -0.59460            | •        | -0.54530            | -0.49840 | •        |
| 4             |            | -1.6135  | -1.5946             | •        | -1.5453             | -1.4984  | •        |
|               |            |          |                     |          |                     |          |          |

### ARUP Art

**Northern SPA** 

Eastern Mound - Undrained Section D-DD (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           | •       |
| Made by   | Date      | Checked |

| Section D-DD (south)  |          |   |             |  | Made by<br>EB    | Checked          |  |  |
|---|----------|---|-------------|--|------------------|------------------|--|--|
| Stratun   | m X>     |   |             |  |                  |                  |  |  |
| 5   | 001 FO   | -2.6135   | 2 5046      | 226 60   | -2.5453          | 2 4004           | 262.24   |  |
|   | •        |   | -2.5946     | •  |                  | -2.4984          | •  |  |
| 6   | •        | -3.6135   | -3.5946     | •  | -3.5453          | -3.4984          | •  |  |
| 7   | •        | -4.6135   | -4.5946     | •  | -4.5453          | -4.4984          | •  |  |
| 8   |          | -6.6135   | -6.5946     |  | -6.5453          | -6.4984          | •  |  |
| 9   |          | -8.6135   | -8.5946     |  | -8.5453          | -8.4984          |  |  |
| 10  |          | -10.613   | -10.595     |  | -10.545          | -10.498          |  |  |
| 11  |          | -12.613   | -12.595     |  | -12.545          | -12.498          |  |  |
| 12  | •        | -14.613   | -14.595     | •  | -14.545          | -14.498          | •  |  |
|   |          | -14.013   | -14.595     | •  | -14.545          | -14.490          | •  |  |
| tratun  | m X>     |   |             |  |                  |                  |  |  |
|   | 272.62   | 279.71  | 287.12      | 289.49   | 289.81           | 297.32           | 304.59   |  |
| 1   | •        | 13.513  | 12.199      | •  | 11.660           | 10.048           | •  |  |
| 2   | 0.78170  | •   |             | 0.42960  |                  | •                | 0.17560  |  |
| 3   | -0.71830 |   | _           | -1.0704  |                  |                  | -1.3244  |  |
| 4   | -1.7183  |   |             | -2.0704  |                  |                  | -2.3244  |  |
| 5   | -2.7183  | •   | •           |  | •                | •                |  |  |
|   |          | •   | •           | -3.0704  | •                | •                | -3.3244  |  |
| 6   | -3.7183  | •   | •           | -4.0704  | •                | •                | -4.3244  |  |
| 7   | -4.7183  | •   |             | -5.0704  |                  |                  | -5.3244  |  |
| 8   | -6.7183  |   |             | -7.0704  |                  |                  | -7.3244  |  |
| 9   | -8.7183  |   |             | -9.0704  |                  |                  | -9.3244  |  |
| 10  |          | •   | •           |  | •                | •                |  |  |
|   | -10.718  | •   | •           | -11.070  | •                | •                | -11.324  |  |
| 11  | -12.718  | •   | •           | -13.070  | •                | •                | -13.324  |  |
| 12  | -14.718  |   | •           | -15.070  |                  | •                | -15.324  |  |
| tratum  | m X>     |   |             |  |                  |                  |  |  |
|   | 308.73   | 314.89  | 320.53      | 320.82   | 325.73           | 327.94           | 340.24   |  |
| 1   | 7.1990   | 6.1990  |             | 6.1990   | 6.9555           |                  | 9.1990   |  |
|   |          | 0.1990  | •           |  | 0.3333           | . 10260          |  |  |
| 2   | •        | •   | 0.0         | •  | •                | 0.12360          | •  |  |
| 3   |          |   | -1.5000     |  |                  | -1.3764          | •  |  |
| 4   |          |   | -2.5000     |  |                  | -2.3764          |  |  |
| 5   |          |   | -3.5000     |  |                  | -3.3764          |  |  |
| 6   | •        | •   |             | •  | •                |                  | •  |  |
|   | •        | •   | -4.5000     | •  | •                | -4.3764          | •  |  |
| 7   | •        | •   | -5.5000     | •  | •                | -5.3764          | •  |  |
| 8   | •        | •   | -7.5000     |  |                  | -7.3764          | •  |  |
| 9   |          |   | -9.5000     | •  |                  | -9.3764          | •  |  |
| 10  | _        |   | -11.500     |  |                  | -11.376          | _  |  |
| 11  | •        | •   | -13.500     | •  | •                | -13.376          | -  |  |
|   | •        | •   |             | •  | •                |                  | •  |  |
| 12  | •        | •   | -15.500     | •  | •                | -15.376          | •  |  |
| Stratum   | m X>     |   |             |  |                  |                  |  |  |
|   | 343.34   | 349.56  | 359.11      | 359.43   | 370.45           | 383.28           | 387.29   |  |
| 1   |          | 9.6990  | 9.1990      |  |                  | 5.1990           | •  |  |
| 2   | 0.23810  |   |             | 0.22100  | 0.23660          | •                | 0.34010  |  |
|   |          |   | •           |  |                  |                  |  |  |
| 3   | -1.2619  | •   | •           | -1.2790  | -1.2634          | •                | -1.1599  |  |
| 4   | -2.2619  | •   | •           | -2.2790  | -2.2634          | •                | -2.1599  |  |
| 5   | -3.2619  | •   | •           | -3.2790  | -3.2634          |                  | -3.1599  |  |
| 6   | -4.2619  | _   | _           | -4.2790  | -4.2634          |                  | -4.1599  |  |
| 7   | -5.2619  | •   | •           | -5.2790  | -5.2634          |                  | -5.1599  |  |
|   |          | •   | •           |  |                  |                  |  |  |
| 8   | -7.2619  | •   | •           | -7.2790  |                  |                  | -7.1599  |  |
| 9   |          |   |             | -9.2790  | -9.2634          |                  | -9.1599  |  |
| 10  |          |   | •           | -11.279  | -11.263          | •                | -11.160  |  |
| 11  | -13.262  | •   |             |  |                  | •                | -13.160  |  |
| 12  | -15.262  | •   |             | -15.279  | -15.263          | •                | -15.160  |  |
|   |          | •   | •           | 10.413   | 13.203           | •                | 10.100   |  |
| cratun  | m X>     |   |             |  |                  |                  |  |  |
|   | 391.88   | 399.19  |             | 418.64   | 421.17           |                  | 439.15   |  |
| 1   | 5.2314   | •   | 7.1990      | •  | 7.8857           | 8.1869           | •  |  |
| 2   | •        | 0.45500   | •           | 0.51920  |                  | •                | 0.48210  |  |
| 3   |          | -1.0450   |             | -0.98080   | •                | •                | -1.0179  |  |
| 4   |          | -2.0450   |             | -1.9808  |                  |                  | -2.0179  |  |
|   | •        |   |             |  | •                | •                |  |  |
|   |          | -3.0450   | •           | -2.9808  | •                | •                | -3.0179  |  |
| 5   | •        |   |             | -3.9808  |                  | •                | -4.0179  |  |
| 5<br>6  | •        | -4.0450   | •           |  |                  |                  | -5.0179  |  |
| 5<br>6  |          | -4.0450<br>-5.0450  | •           | -4.9808  |                  |                  |  |  |
| 5<br>6  | :        | -5.0450   |             |  |                  |                  |  |  |
| 5<br>6<br>7<br>8  | ·<br>·   | -5.0450<br>-7.0450  |             | -6.9808  |                  |                  | -7.0179  |  |
| 5<br>6<br>7<br>8<br>9   | · · ·    | -5.0450<br>-7.0450<br>-9.0450   | ·<br>·      | -6.9808<br>-8.9808   |                  |                  | -7.0179<br>-9.0179   |  |
| 5<br>6<br>7<br>8<br>9   | •        | -5.0450<br>-7.0450<br>-9.0450<br>-11.045  | ·           | -6.9808<br>-8.9808<br>-10.981  | ·<br>·           |                  | -7.0179<br>-9.0179<br>-11.018  |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11   | · · ·    | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045                                       | ·<br>·      | -6.9808<br>-8.9808<br>-10.981<br>-12.981                                       |                  |                  | -7.0179<br>-9.0179   |  |
| 5<br>6<br>7<br>8<br>9   | •        | -5.0450<br>-7.0450<br>-9.0450<br>-11.045  | ·           | -6.9808<br>-8.9808<br>-10.981  | ·<br>·           |                  | -7.0179<br>-9.0179<br>-11.018  |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11   | •        | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045                                       | · · · · · · | -6.9808<br>-8.9808<br>-10.981<br>-12.981                                       | ·<br>·<br>·      | ·<br>·<br>·      | -7.0179<br>-9.0179<br>-11.018<br>-13.018   |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11   |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045                            |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981                            | ·<br>·<br>·      | · · · · ·        | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018  |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum                                    | 439.67   | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045                            |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981                            |                  | 472.06           | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018  |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum                                    |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 | 456.64      | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  | 472.06           | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100   |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum                                    | 439.67   | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  | 472.06<br>1.1890 | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858   |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3                     |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 | 456.64      | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  | 472.06           | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858   |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum                                    |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  | 472.06<br>1.1890 | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858   |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4                |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  |                  | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858<br>-0.014200<br>-1.0142                       |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5           |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  |                  | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142            |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6      |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 | 468.46<br>2.1990 |                  | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142<br>-3.0142 |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5           |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 |                  |                  | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142            |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6      |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 | 468.46<br>2.1990 |                  | -7.0179<br>-9.0179<br>-11.018<br>-13.018<br>-15.018<br><b>479.86</b><br>1.5100<br>1.4858<br>-0.014200<br>-1.0142<br>-2.0142<br>-3.0142 |  |
| 5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>Stratum<br>1<br>2<br>3<br>4<br>5<br>6<br>7 |          | -5.0450<br>-7.0450<br>-9.0450<br>-11.045<br>-13.045<br>-15.045<br><b>450.69</b><br>5.5400 |             | -6.9808<br>-8.9808<br>-10.981<br>-12.981<br>-14.981<br><b>461.31</b><br>3.5883 | 468.46<br>2.1990 |                  | -7.0179 -9.0179 -11.018 -13.018 -15.018  479.86 1.5100 1.4858 -0.014200 -1.0142 -2.0142 -3.0142 -4.0142                                |  |

### Arup

#### **Northern SPA**

Eastern Mound - Undrained Section D-DD (south)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           | •       |
| Made by<br>EB | Date      | Checked |

|         | 120 67   | 450 60    | AEC CA  | 161 21 | 160 16 | 472 06  | 470 06  |
|---------|----------|-----------|---------|--------|--------|---------|---------|
| 10      |          |           | -10.886 |        |        | -10.311 | -10.014 |
| 11      |          | •         | -12.886 |        |        | -12.311 | -12.014 |
| 12      |          | •         | -14.886 |        |        | -14.311 | -14.014 |
| Stratum | X>       |           |         |        |        |         |         |
|         | 487.82   | 505.89    |         |        |        |         |         |
| 1       | 1.8044   | 2.4739    |         |        |        |         |         |
| 2       | 1.7944   | 2.4639    |         |        |        |         |         |
| 3       | 0.29440  | 0.96390   |         |        |        |         |         |
| 4       | -0.70560 | -0.036100 |         |        |        |         |         |
| 5       | -1.7056  | -1.0361   |         |        |        |         |         |
| 6       | -2.7056  | -2.0361   |         |        |        |         |         |
| 7       | -3.7056  | -3.0361   |         |        |        |         |         |
| 8       | -5.7056  | -5.0361   |         |        |        |         |         |
| 9       | -7.7056  | -7.0361   |         |        |        |         |         |
| 10      | -9.7056  | -9.0361   |         |        |        |         |         |
| 11      | -11.706  | -11.036   |         |        |        |         |         |
| 12      | -13.706  | -13.036   |         |        |        |         |         |

#### Stratum-linked data

| Stratt | ini-inked data |             |                     |
|--------|----------------|-------------|---------------------|
| No.    | Material       | Water table | Piezo Set/ Ru value |
| 1      | Waste          |             |                     |
| 2      | Clay Deposits  |             |                     |
| 3      | London Clay 1  |             |                     |
| 4      | London Clay 2  |             |                     |
| 5      | London Clay 3  |             |                     |
| 6      | London Clay 4  |             |                     |
| 7      | London Clay 5  |             |                     |
| 8      | London Clay 6  |             |                     |
| 9      | London Clay 7  |             |                     |
| 10     | London Clay 8  |             |                     |
| 11     | London Clay 9  |             |                     |
| 12     | Harwich        |             |                     |
|        |                |             |                     |

#### Slip Surface Specification

Circle centre specification: GRID

Bottom left of grid: x = 120.00000 m y = 30.00000 m

Inclination of grid: 0.00000 deg

(positive anticlockwise direction about bottom left of grid)

Centres on grid: 15 in x direction at 3.50000m spacing

12 in y direction at 3.50000m spacing

Grid extended to find minimum FoS

Initial radius of circle 5.00000 m

Incremented by 1.00000 m until all possible circles considered

#### **WORST CASE**

Centre at (151.50m,65.000m) Radius 68.000m Horiz acceleration [%g]: 0.0 Net vertical force [kN/m]: 25.645 Slip weight [kN/m] 13909. Net horiz force [kN/m]: 129.69 Disturbing moment [kN/m]: 157970. Restoring moment [kNm/m]: 193020. Reinf.Rest.Moment [kNm/m]: 0.0 Over-Design Factor: 1.2218

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

| Slip  | surface | coordinates | Pore Pre   | essure     | Interslice | forces | [kN/m] |       |
|-------|---------|-------------|------------|------------|------------|--------|--------|-------|
| Point | x [m]   | y [m]       | L          | R          | T E        |        |        | E (u) |
|       |         |             | $[kN/m^2]$ | $[kN/m^2]$ |            |        |        |       |
| 1     | 123.66  | 2.9618      | _          | 0.0        | 0.0        |        | 0.0    | 0.0   |
| 2     | 126.06  | 1.9384      | 0.0        | 0.0        | 4.1055     |        | 100.46 | 0.0   |
| 3     | 126.31  | 1.8373      | 0.0        | 0.0        | 5.2318     |        | 109.30 | 0.0   |
| 4     | 128.34  | 1.0644      | 0.0        | 0.0        | 11.588     |        | 187.11 | 0.0   |
| 5     | 130.40  | 0.35687     | 0.0        | 0.0        | 14.439     |        | 275.52 | 0.0   |
| 6     | 130.80  | 0.22804     | 0.0        | 0.0        | 13.711     |        | 296.64 | 0.0   |
| 7     | 132.40  | -0.26112    | 0.0        | 0.0        | 10.273     |        | 383.84 | 0.0   |
| 8     | 134.00  | -0.71088    | 0.0        | 0.0        | 6.4132     |        | 474.70 | 0.0   |
| 9     | 135.67  | -1.1314     | 0.0        | 0.0        | 0.92015    |        | 576.58 | 0.0   |
| 10    | 137.22  | -1.4843     | 0.0        | 0.0        | -3.6103    |        | 671.83 | 0.0   |
| 11    | 138.79  | -1.8007     | 0.0        | 0.0        | -7.3507    |        | 766.34 | 0.0   |
| 12    | 140.42  | -2.0918     | 0.0        | 0.0        | -11.387    |        | 869.16 | 0.0   |
| 13    | 142.07  | -2.3428     | 0.0        | 0.0        | -14.239    |        | 968.59 | 0.0   |
| 14    | 144.18  | -2.6051     | 0.0        | 0.0        | -16.264    |        | 1089.0 | 0.0   |
| 15    | 146.30  | -2.8011     | 0.0        | 0.0        | -16.794    |        | 1199.6 | 0.0   |
| 16    | 148.43  | -2.9306     | 0.0        | 0.0        | -16.379    |        | 1298.1 | 0.0   |

# ARUP Arus

Northern SPA

Eastern Mound - Undrained Section D-DD (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | •         |         |
| Made by   | Date      | Checked |

| Slip s   | surface   | coordinates 1  | Pore Pres  | ure Intersi  | lice forces [k   | N/m]   |  |
|--|---|--|--|--|--|--|--|
| B-1-4  | 148.77  | -2.9452  | 0.0  | 0.0 -16.27   |  | 12.7 0.0   |  |
|  |   | -2.9452  | 0.0  | 0.0 -16.27   |  |  |  |
|  | 151.37<br>153.96  | -2.9999<br>-2.9555   | 0.0  | 0.0 -15.63   |  | 10.8 0.0<br>85.1 0.0   |  |
|  | 156.55  | -2.8122  | 0.0  | 0.0 -3.188   |  | 33.3 0.0   |  |
|  | 159.23  | -2.5586  | 0.0  | 0.0 10.210   |  | 53.9 0.0   |  |
|  | 161.91  | -2.1989  | 0.0  | 0.0 25.03  |  | 43.9 0.0   |  |
|  | 164.32  | -1.7807  | 0.0  | 0.0 36.000   |  | 99.4 0.0   |  |
|  | 166.71  | -1.2760  | 0.0  | 0.0 43.96  |  | 30.9 0.0   |  |
|  | 168.54  | -0.83028   | 0.0  | 0.0 45.33  |  | 56.1 0.0   |  |
| 26   | 170.35  | -0.33431   | 0.0  | 0.0 43.23  |  | 69.3 0.0   |  |
|  | 171.43  | -0.014328  | 0.0  | 0.0 37.59  |  | 03.6 0.0   |  |
|  | 172.29  | 0.25662  | 0.0  | 0.0 31.87  |  | 48.1 0.0   |  |
|  | 174.89  | 1.1492   | 0.0  | 0.0 8.429  |  | 8.66 0.0   |  |
|  | 177.35  | 2.1059   | 0.0  | 0.0 -11.270  |  | 4.15 0.0   |  |
|  | 179.78  | 3.1574   | 0.0  | 0.0 -36.860  |  | 4.71 0.0   |  |
|  | 182.43  | 4.4391   | 0.0  | 0.0 -69.69   |  | 9.13 0.0   |  |
|  | 185.02  | 5.8342   | 0.0  | 0.0 -103.0   |  | 4.22 0.0   |  |
|  | 187.55  | 7.3402   | 0.0  | 0.0 -132.54  |  | 6.86 0.0   |  |
|  | 190.01  | 8.9543   | 0.0  | 0.0 -152.9   |  | .160 0.0   |  |
|  | 192.40<br>194.71  | 10.673<br>12.494   | 0.0  | 0.0 -158.55<br>0.0 -143.28   |  | .700 0.0<br>3.71 0.0   |  |
|  | 194.71  | 14.414   | 0.0  | 0.0 -143.28  |  | 0.15 0.0   |  |
|  | 199.09  | 16.428   | 0.0 -  | -25.64   |  | 9.69 0.0   |  |
|  | ,   | 10.120   | J. 0   | 20.04  | . 12   |  |  |
| Slice  | Strengt   | h Parameters   | Average  | Slice Forces   | s on base [kN/   | m]   |  |
| No.  |   |  | Pore   | Weight   |  |  |  |
|  | _   | _  | Pressure   |  |  |  |  |
|  | c'  | Tan phi  | $[kN/m^2]$   | [kN/m] Normal  |  | hear   |  |
| ] _  | [kN/m <sup>2</sup> ]  | 2 -  | <u> </u>   | 26 054 52 55   | (capacity) (   |  |  |
| 1  |   |  |  | 36.954 79.75   |  | 76.338   |  |
| 2  | 21.429  |  |  | 8.1118 12.12   |  | 4.7617   |  |
| 3  | 21.429  |  |  | 90.971 120.65  |  | 38.127   |  |
| 4 5  | 21.429  |  |  | 136.83 162.73  |  | 38.127   |  |
| 5  | 30.893  |  |  | 31.650 36.26   |  | 10.597   |  |
| 6<br>7   | 30.893  |  |  | 143.94 161.19  |  | 42.252   |  |
| 8  | 30.893<br>35.536  |  |  | 172.00 187.63<br>204.88 219.43   |  | 42.253   |  |
| 9  | 35.536<br>35.536  |  |  | 214.69 227.03  |  | 49.910<br>46.356   |  |
| 10   | 35.536  |  |  | 236.88 248.1   |  | 46.356   |  |
| 11   | 40.179  |  |  | 269.89 280.5   |  | 54.721   |  |
| 12   | 40.179  |  |  | 291.78 301.33  |  | 54.721   |  |
| 13   | 40.179  |  |  | 403.75 414.2   |  | 70.041   |  |
| 14   | 40.179  |  |  | 435.62 443.98  |  |  |  |
| 15   | 40.179  | 0.0  |  |  | 5 82-21  | /() (14()  |  |
| 16   |   | 0.0  |  |  |  | 70.040<br>70.041   |  |
|  |   |  | 0.0  | 464.56 470.4   | 7 85.578   | 70.041   |  |
|  | 40.179  | 0.0  | 0.0  | 464.56 470.47<br>77.332 78.028   | 7 85.578<br>3 13.778   | 70.041<br>11.276   |  |
| 17<br>18   | 40.179<br>40.179  | 0.0<br>0.0   | 0.0<br>0.0<br>0.0  | 464.56 470.4°<br>77.332 78.028<br>605.57 608.30  | 7 85.578<br>3 13.778<br>0 104.25   | 70.041<br>11.276<br>85.322   |  |
| 17   | 40.179  | 0.0<br>0.0<br>0.0  | 0.0<br>0.0<br>0.0  | 464.56 470.47<br>77.332 78.028   | 7 85.578<br>8 13.778<br>0 104.25<br>9 104.25   | 70.041<br>11.276   |  |
| 17<br>18   | 40.179<br>40.179<br>40.179  | 0.0<br>0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>0.0<br>0.0   | 464.56 470.4<br>77.332 78.028<br>605.57 608.30<br>638.19 640.08  | 7 85.578<br>3 13.778<br>0 104.25<br>9 104.25<br>1 104.25   | 70.041<br>11.276<br>85.322<br>85.322   |  |
| 17<br>18<br>19   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179  | 0.0<br>0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0                                    | 464.56 470.4<br>77.332 78.028<br>605.57 608.30<br>638.19 640.09<br>664.83 670.23   | 7 85.578<br>8 13.778<br>0 104.25<br>9 104.25<br>1 104.25<br>7 108.33   | 70.041<br>11.276<br>85.322<br>85.322<br>85.322   |  |
| 17<br>18<br>19<br>20   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                             | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                      | 464.56 470.4<br>77.332 78.020<br>605.57 608.30<br>638.19 640.00<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>104.25<br>104.25<br>108.33<br>108.33<br>9 86.998   | 70.041<br>11.276<br>85.322<br>85.322<br>85.322<br>88.662   |  |
| 17<br>18<br>19<br>20<br>21   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                             | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                      | 464.56 470.4<br>77.332 78.028<br>605.57 608.30<br>638.19 640.00<br>664.83 670.2<br>711.26 719.3<br>724.06 733.41<br>662.76 671.11<br>662.39 669.78   | 7 85.578<br>8 13.778<br>104.25<br>9 104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>9 86.998<br>8 6.999  | 70.041<br>11.276<br>85.322<br>85.322<br>85.322<br>88.662<br>88.662   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.028<br>605.57 608.3<br>638.19 640.09<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.78<br>505.05 509.4  | 7 85.578<br>8 13.778<br>104.25<br>9 104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>9 86.998<br>86.999<br>4 58.050   | 70.041<br>11.276<br>85.322<br>85.322<br>85.322<br>88.662<br>88.662<br>71.203<br>71.204<br>47.511   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4° 77.332 78.028 605.57 608.30 638.19 640.00 664.83 670.22 711.26 719.3° 724.06 733.4° 662.76 671.18 662.39 669.78 505.05 509.48  | 7 85.578<br>8 13.778<br>104.25<br>9 104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>9 86.998<br>8 6.999<br>4 58.050<br>5 8.050   | 70.041<br>11.276<br>85.322<br>85.322<br>85.322<br>88.662<br>88.662<br>71.203<br>71.204<br>47.511   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        | 464.56 470.4° 77.332 78.026 605.57 608.30 638.19 640.00 664.83 670.22 711.26 719.3° 724.06 733.4° 662.76 671.10 662.39 669.76 505.05 509.46 499.56 502.48 295.27 296.1°  | 7 85.578<br>8 13.778<br>104.25<br>9 104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>1 86.998<br>8 86.999<br>4 58.050<br>58.050<br>3 24.045   | 70.041<br>11.276<br>85.322<br>85.322<br>85.322<br>88.662<br>71.203<br>71.204<br>47.511<br>47.511<br>19.679   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4° 77.332 78.026 605.57 608.36 638.19 640.09 664.83 670.2° 711.26 719.3° 724.06 733.4° 662.76 671.1° 662.39 669.78 505.05 509.4° 499.56 502.4° 295.27 296.1° 235.69 235.88  | 7 85.578<br>3 13.778<br>104.25<br>104.25<br>1 104.25<br>7 108.33<br>1 108.33<br>9 86.998<br>86.999<br>4 58.050<br>55.50<br>3 24.045<br>19.391  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.23<br>711.26 719.3<br>724.06 733.4<br>662.76 671.13<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.13<br>235.69 235.8<br>694.01 691.9  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>9 86.998<br>8 86.998<br>8 86.999<br>5 58.050<br>5 58.050<br>3 24.045<br>19.391<br>5 8.867  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>31.429<br>21.429<br>21.429<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.23<br>724.06 733.4<br>662.76 671.13<br>662.39 669.76<br>505.05 509.44<br>499.56 502.43<br>295.27 296.13<br>235.69 235.88<br>694.01 691.93<br>630.62 624.83  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>9 86.998<br>8 86.999<br>4 58.050<br>5 58.050<br>24.045<br>19.391<br>58.867<br>94.344   | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4<br>77.332 78.024<br>605.57 608.3<br>638.19 640.0<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.74<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.88<br>694.01 691.98<br>630.62 624.86<br>587.01 577.8  | 7 85.578<br>8 13.778<br>104.25<br>9 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>9 86.998<br>8 6.999<br>4 58.050<br>58.050<br>24.045<br>19.391<br>58.867<br>94.344<br>94.344  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.0<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.8<br>694.01 691.9<br>630.62 624.8<br>587.01 577.8<br>593.48 580.3  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>1 108.33<br>2 86.998<br>8 86.999<br>4 58.050<br>5 8.050<br>3 24.045<br>19.391<br>5 8.867<br>9 4.344<br>9 4.344<br>7 105.13   | 70.041 11.276 85.322 85.322 85.322 88.662 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.8<br>694.01 691.9<br>508.05 509.4<br>694.01 691.9<br>508.05 509.4<br>694.01 691.9<br>508.05 509.4<br>694.01 691.9<br>508.05 509.4<br>509.40 691.9<br>509.40 <br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>8 6.998<br>8 6.999<br>4 58.050<br>5 8.050<br>5 8.050<br>3 24.045<br>19.391<br>5 8.867<br>94.344<br>94.344<br>7 105.13<br>105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.216 86.042 86.042  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33                               | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 464.56 470.4° 77.332 78.026 605.57 608.36 638.19 640.09 664.83 670.2° 711.26 719.3° 724.06 733.4° 662.76 671.1° 662.39 669.76 505.05 509.4° 499.56 502.4° 295.27 296.1° 235.69 235.8° 694.01 691.9° 630.62 624.8° 587.01 577.8° 593.48 580.3° 521.28 506.9° 445.14 431.5°  | 7 85.578<br>3 13.778<br>104.25<br>104.25<br>1 104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 86.998<br>8 86.999<br>4 58.050<br>5 58.050<br>3 24.045<br>8 19.391<br>5 8.867<br>9 4.344<br>9 4.344<br>105.13<br>105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33                               | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.23<br>724.06 733.4<br>662.76 671.13<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.8<br>694.01 691.9<br>630.62 624.8<br>587.01 577.8<br>593.48 580.3<br>521.28 506.3<br>445.14 431.5<br>365.98 355.7   | 85.578<br>13.778<br>104.25<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>9 86.998<br>8 86.998<br>8 86.998<br>8 86.999<br>15 58.050<br>15 58.050<br>16 58.050<br>17 58.867<br>18 94.344<br>19 94.344<br>105.13<br>105.13<br>105.13   | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042   |  |
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| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35                   | 40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.23<br>711.26 719.3<br>724.06 733.4<br>662.76 671.13<br>662.39 669.73<br>505.05 509.44<br>499.56 502.43<br>295.27 296.13<br>235.69 235.83<br>694.01 691.93<br>630.62 624.83<br>587.01 577.83<br>593.48 580.3<br>521.28 506.93<br>445.14 431.55<br>365.98 355.73<br>284.79 280.93<br>202.58 208.33  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 86.998<br>8 86.999<br>4 58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050<br>58.050     | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>30<br>31<br>32<br>33<br>34<br>35<br>36                   | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.024<br>605.57 608.3<br>638.19 640.0<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.8<br>694.01 691.9<br>630.62 624.8<br>587.01 577.8<br>593.48 580.3<br>521.28 506.9<br>445.14 431.5<br>365.98 355.7<br>284.79 280.9<br>202.58 208.3<br>120.39 139.3  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>1 108.33<br>1 108.33<br>2 86.998<br>8 86.999<br>4 58.050<br>5 8.050<br>5 8.050<br>5 8.050<br>6 58.050<br>7 94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.345<br>105.13<br>105.13<br>105.13<br>105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35                   | 40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>21.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.023<br>605.57 608.3<br>638.19 640.03<br>664.83 670.23<br>711.26 719.3<br>724.06 733.4<br>662.76 671.13<br>662.39 669.73<br>505.05 509.44<br>499.56 502.43<br>295.27 296.13<br>235.69 235.83<br>694.01 691.93<br>630.62 624.83<br>587.01 577.83<br>593.48 580.3<br>521.28 506.93<br>445.14 431.55<br>365.98 355.73<br>284.79 280.93<br>202.58 208.33  | 7 85.578<br>8 13.778<br>104.25<br>104.25<br>1 104.25<br>1 108.33<br>1 108.33<br>1 108.33<br>1 108.33<br>1 108.33<br>2 86.998<br>8 86.999<br>4 58.050<br>5 8.050<br>5 8.050<br>5 8.050<br>6 58.050<br>7 94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.344<br>94.345<br>105.13<br>105.13<br>105.13<br>105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042  |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35<br>36<br>37<br>38 | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>31.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714                  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4<br>77.332 78.024<br>605.57 608.3<br>638.19 640.0<br>664.83 670.2<br>711.26 719.3<br>724.06 733.4<br>662.76 671.1<br>662.39 669.7<br>505.05 509.4<br>499.56 502.4<br>295.27 296.1<br>235.69 235.8<br>694.01 691.9<br>630.62 624.8<br>587.01 577.8<br>593.48 580.3<br>521.28 506.9<br>445.14 431.5<br>365.98 355.7<br>284.79 280.9<br>202.58 208.3<br>120.39 139.3  | 85.578<br>13.778<br>104.25<br>104.25<br>104.25<br>104.25<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33<br>108.33 | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042   |  |
| 17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35<br>36<br>37<br>38 | 40.179<br>40.179<br>40.179<br>40.179<br>40.179<br>35.536<br>35.536<br>30.893<br>30.893<br>31.429<br>21.429<br>21.429<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714<br>35.714                  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4° 77.332 78.026 605.57 608.36 638.19 640.09 664.83 670.22 711.26 719.3° 724.06 733.4° 662.76 671.1° 662.39 669.76 505.05 509.4° 499.56 502.4° 295.27 296.1° 235.69 235.8° 694.01 691.9° 630.62 624.8° 587.01 577.8° 593.48 580.3° 521.28 506.9° 445.14 431.5° 365.98 355.7° 284.79 280.9° 202.58 208.3° 120.39 139.3° 39.297 75.12°  | 7 85.578 3 13.778 104.25 104.25 1 104.25 1 104.25 7 108.33 1 108.33 9 86.998 8 86.999 4 58.050 5 58.050 3 24.045 3 19.391 5 8.867 2 94.344 4 94.344 4 94.344 7 105.13 105.13 105.13 105.13 105.13 105.13 105.13 105.13 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042   | <b>/</b> m]                            |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38  Slice No.   | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.33 638.19 640.03 664.83 670.23 724.06 733.43 662.76 671.13 662.39 669.74 505.05 509.44 499.56 502.43 295.27 296.13 235.69 235.68 694.01 691.93 630.62 624.83 587.01 577.88 593.48 580.3 521.28 506.93 445.14 431.53 365.98 355.73 284.79 280.93 202.58 208.33 120.39 139.3 39.297 75.123   | 85.578  13.778  104.25  104.25  104.25  104.25  108.33  108.33  86.998  86.999  458.050  58.05   | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042                                    |  |
| 17 18 19 20 21 22 23 24 25 26 27 28 30 31 32 33 34 35 36 37 38  Slice No.  | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 21.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.33 638.19 640.03 664.83 670.23 711.26 719.3 724.06 733.4 662.76 671.11 662.39 669.73 505.05 509.44 499.56 502.43 295.27 296.13 235.69 235.83 694.01 691.93 630.62 624.83 587.01 577.8 593.48 580.3 521.28 506.93 445.14 431.53 365.98 355.73 284.79 280.93 202.58 208.33 120.39 139.33 39.297 75.125  .nt Load [kN/richard contraction of the co   | 7 85.578 3 13.778 104.25 9 104.25 1 104.25 1 108.33 1 108.33 1 86.998 8 86.999 4 58.050 5 58.050 3 24.045 19.391 5 58.867 94.344 4 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 | 0.0                                    |
| 17 18 19 20 21 22 23 24 25 26 27 28 30 31 32 33 34 35 36 37 38  Slice No.  | 40.179 40.179 40.179 40.179 40.179 40.179 35.536 30.893 30.893 21.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.024 605.57 608.30 638.19 640.09 664.83 670.22 711.26 719.3 724.06 733.41 662.76 671.14 662.39 669.78 505.05 509.44 499.56 502.48 295.27 296.11 235.69 235.88 694.01 691.99 630.62 624.82 587.01 577.88 593.48 580.33 521.28 506.92 445.14 431.51 365.98 355.79 284.79 280.93 202.58 208.33 39.297 75.12   | 7 85.578 3 13.778 104.25 104.25 1 104.25 7 108.33 1 108.33 9 86.998 86.999 4 58.050 5 58.050 5 24.045 8 19.391 5 58.867 9 4.344 9 4.344 7 105.13   | 70.041 11.276 85.322 85.322 85.322 88.662 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042                                    | 0.0                                    |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 355 36 37 38  Slice No.  | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.024 605.57 608.34 668.83.19 640.09 664.83 670.22 711.26 719.3 724.06 733.41 662.76 671.14 662.39 669.78 505.05 509.44 499.56 502.41 235.69 235.88 694.01 691.99 630.62 624.83 5593.48 580.33 521.28 506.99 445.14 431.53 365.98 355.79 284.79 280.93 202.58 208.38 120.39 139.33 39.297 75.129  Int Load [kN/rict Horiz 0.0 0.0   | 7 85.578 3 13.778 104.25 104.25 1 104.25 1 104.25 7 108.33 1 108.33 9 86.998 8 86.999 4 58.050 5 58.050 3 24.045 8 19.391 5 58.867 2 94.344 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042  | 0.0<br>0.0<br>0.0                      |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38  Slice No.   | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.33 638.19 640.03 664.83 670.22 711.26 719.3 724.06 733.4 662.76 671.13 662.39 669.73 505.05 509.44 499.56 502.43 295.27 296.13 235.69 235.83 694.01 691.93 630.62 624.83 587.01 577.84 587.01 577.84 587.01 577.84 587.01 577.84 587.01 577.84 587.01 577.84 587.01 577.84 588.03 445.14 431.53 365.98 355.73 2844.79 280.93 202.58 208.33 120.39 139.33 39.297 75.123  Int Load [kN/int]  **t Horiz 0.0 0.0 0.0   | 7 85.578 3 13.778 104.25 104.25 1 104.25 1 104.25 7 108.33 1 108.33 9 86.998 8 86.999 4 58.050 5 58.050 3 24.045 8 19.391 5 58.867 2 94.344 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042                                    | 0.0<br>0.0<br>0.0<br>0.0               |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 Slice No.  | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 36.714   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.33 638.19 640.03 664.83 670.23 724.06 733.43 662.76 671.13 662.39 669.73 505.05 509.44 499.56 502.43 295.27 296.13 235.69 235.83 694.01 691.93 630.62 624.83 587.01 577.84 587   | 7 85.578 3 13.778 104.25 104.25 1 104.25 1 104.25 7 108.33 1 108.33 9 86.998 8 86.999 4 58.050 5 58.050 3 24.045 3 19.391 5 58.867 2 94.344 4 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042 86.042                                    | 0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 Slice No.  1 2 3 4 5 6   | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 36.714 36.714 37.714 37.714 37.714 37.714 37.714 37.714 37.714 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.30 638.19 640.03 664.83 670.23 724.06 733.43 662.76 671.13 662.39 669.76 505.05 509.46 499.56 502.43 295.27 296.13 235.69 235.88 694.01 691.93 630.62 624.83 587.01 577.86 593.48 580.3 521.28 506.93 445.14 431.53 365.98 355.73 284.79 280.93 202.58 208.33 120.39 139.3 39.297 75.123  Int Load [kN/ri  Horiz 0.0 0.0 0.0 0.0 0.0   | 7 85.578 3 13.778 104.25 104.25 1 104.25 7 108.33 1 108.33 1 108.33 1 86.998 8 86.999 4 58.050 5 88.050 5 88.050 5 24.045 19.391 5 58.867 2 94.344 4 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042        | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |
| 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 Slice No.  | 40.179 40.179 40.179 40.179 40.179 35.536 35.536 30.893 30.893 31.429 21.429 21.429 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 36.714 36.714 37.714 37.714 37.714 37.714 37.714 37.714 37.714 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               | 464.56 470.4 77.332 78.023 605.57 608.33 638.19 640.03 664.83 670.23 724.06 733.43 662.76 671.13 662.39 669.73 505.05 509.44 499.56 502.43 295.27 296.13 235.69 235.83 694.01 691.93 630.62 624.83 587.01 577.84 587   | 7 85.578 3 13.778 104.25 104.25 1 104.25 1 104.25 7 108.33 1 108.33 9 86.998 8 86.999 4 58.050 5 58.050 3 24.045 3 19.391 5 58.867 2 94.344 4 94.344 7 105.13  | 70.041 11.276 85.322 85.322 85.322 88.662 88.662 71.203 71.204 47.511 47.511 19.679 15.871 48.179 77.215 77.216 86.042        | 0.0<br>0.0<br>0.0<br>0.0<br>0.0        |

### Arup

Northern SPA
Eastern Mound - Undrained
Section D-DD (south)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. | •         | -       |
| Made by   | Date      | Checked |

| Slice  | Surface Load | [kN/m_hor/m] P | oint Load | [kN/m] | Water Pressure | on         |
|--------|--------------|----------------|-----------|--------|----------------|------------|
| NT.    |              |                |           |        |                | [1-37/ h/1 |
| 8<br>9 | 0.0          | 0.0<br>0.0     | 0.0       | 0.0    | 0.0            | 0.0        |
|        | 0.0          |                | 0.0       | 0.0    | 0.0            |            |
| 10     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 11     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 12     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 13     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 14     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 15     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 16     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 17     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 18     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 19     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 20     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 21     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 22     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 23     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 24     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 25     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 26     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 27     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 28     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 29     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 30     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 31     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 32     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 33     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 34     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 35     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 36     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 37     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 38     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |
| 50     | 0.0          | 0.0            | 0.0       | 0.0    | 0.0            | 0.0        |

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

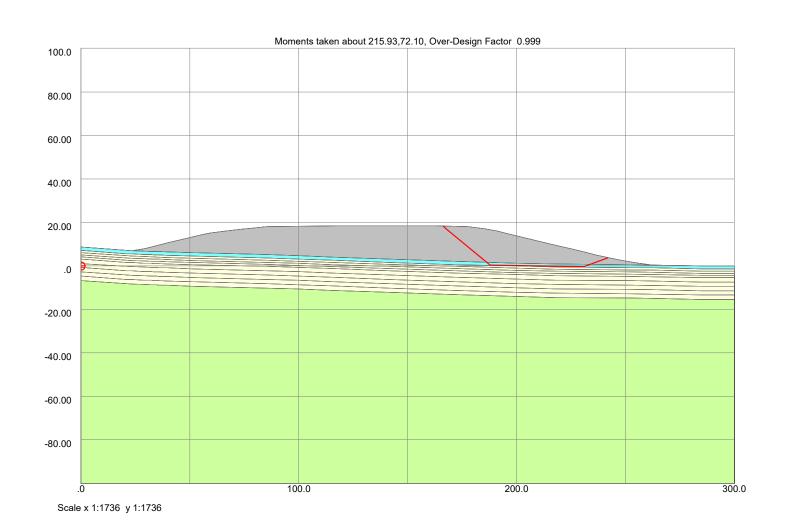
# Appendix B<sub>3</sub> – Wedge analysis



Arup

Northern SPA
Eastern Mound - Wedge
Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |



### Arup

### Northern SPA

Eastern Mound - Wedge Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>EB | Date      | Checked |

#### **General Parameters**

Direction of slip: DOWNHILL Minimum slip weight [kN/m]: 0.00000 Type of analysis : STATIC

#### **Analysis Options**

Partial Factor Analysis Minimum number of slices: 25

Method: Janbu (Variably inclined interslice forces)

Maximum number of iterations: 300

Reinforcement: NOT ACTIVE

### **Method Partial Factors**

Current selection: BS EN 1997-1:2011 DA1-2 Factor on FAVOURABLE PERMANENT LOAD: 1.00000 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000 Factor on FAVOURABLE VARIABLE LOAD: 0.00000 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000 Factor on SOIL UNIT WEIGHT: 1.00000 Factor on DRAINED SOIL COHESION: 1.25000 Factor on UNDRAINED SOIL COHESION: 1.40000 Factor on SOIL FRICTION ANGLE: 1.25000 Factor on reinforcement pullout: 1.50000 Economic ramification of failure: 1.00000 Sliding along reinforcement: 1.50000

#### **Material properties**

| No Description or c0'     |         | Weight<br>Below GWL | Shear Strength Parameters<br>Condition | Phi or<br>Phi0 | С |
|---------------------------|---------|---------------------|--|----------------|---|
|                           | [kN/m3] | [kN/m3]             |  | [°]            |   |
| [kN/m <sup>2</sup> ]      |         |                     |  |                |   |
| 1 Waste                   | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 50.000                    |         |                     |  |                |   |
| 2 Clay Deposits           | 17.000  | 17.000              | Undrained                              | N.A.           |   |
| 30.000                    |         |                     |  |                |   |
| 3 London Clay 1           | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 43.250                    |         |                     |  |                |   |
| 4 London Clay 2           | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 49.750                    | 40.500  | 40 500              |  |                |   |
| 5 London Clay 3           | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 56.250<br>6 London Clay 4 | 19.500  | 10 500              | Undrained                              | N.A.           |   |
| 62.750                    | 19.500  | 19.500              | Ulidiailled                            | N.A.           |   |
| 7 London Clay 5           | 19.500  | 19 500              | Undrained                              | N.A.           |   |
| 72.500                    | 19.300  | 17.500              | ondrained                              | N.A.           |   |
| 8 London Clay 6           | 19.500  | 19 500              | Undrained                              | N.A.           |   |
| 85.500                    | 19.000  | 13.300              | onararnea                              | 14.21.         |   |
| 9 London Clay 7           | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 98.500                    |         |                     |  |                |   |
| 10 London Clay 8          | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 111.50                    |         |                     |  |                |   |
| 11 London Clay 9          | 19.500  | 19.500              | Undrained                              | N.A.           |   |
| 124.50                    |         |                     |  |                |   |
| 12 Harwich                | 20.000  | 20.000              | Undrained                              | N.A.           |   |
| 130.00                    |         |                     |  |                |   |
|                           |         |                     |  |                |   |

### Coordinates of top of soil strata

The units of the following coordinates are in  $\ensuremath{\mathtt{m}}$ 

| Stratum | X>       |          |          |          |        |          |          |
|---------|----------|----------|----------|----------|--------|----------|----------|
|         | 0.0      | 20.898   | 23.379   | 28.828   | 29.581 | 32.369   | 33.335   |
| 1       | 8.6893   | 7.2080   | 7.0791   |          | 8.1157 |          | •        |
| 2       | 8.6893   | 7.2080   | 7.0791   | 6.8704   |        | 6.7401   | 6.7034   |
| 3       | 7.1893   | 5.7080   | 5.5791   | 5.3704   |        | 5.2401   | 5.2034   |
| 4       | 6.1893   | 4.7080   | 4.5791   | 4.3704   |        | 4.2401   | 4.2034   |
| 5       | 5.1893   | 3.7080   | 3.5791   | 3.3704   |        | 3.2401   | 3.2034   |
| 6       | 4.1893   | 2.7080   | 2.5791   | 2.3704   |        | 2.2401   | 2.2034   |
| 7       | 3.1893   | 1.7080   | 1.5791   | 1.3704   |        | 1.2401   | 1.2034   |
| 8       | 1.1893   | -0.29200 | -0.42090 | -0.62960 |        | -0.75990 | -0.79660 |
| 9       | -0.81070 | -2.2920  | -2.4209  | -2.6296  |        | -2.7599  | -2.7966  |
| 10      | -2.8107  | -4.2920  | -4.4209  | -4.6296  |        | -4.7599  | -4.7966  |
| 11      | -4.8107  | -6.2920  | -6.4209  | -6.6296  |        | -6.7599  | -6.7966  |
| 12      | -6.8107  | -8.2920  | -8.4209  | -8.6296  |        | -8.7599  | -8.7966  |
| Slip 1  |          |          |          |          |        | •        |          |

**Arup** 

Northern SPA Eastern Mound - Wedge Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | _         | •       |
| Made by<br>EB | Date      | Checked |

|  |                         |                    |                                  |                                       |                      | EB  |                                       |
|--|-------------------------|--------------------|----------------------------------|---------------------------------------|----------------------|---|---------------------------------------|
|  |                         |                    |                                  |                                       |                      |   |                                       |
| tratum                                     | x>                      |                    |                                  |                                       |                      |   |                                       |
|  | 34.766                  | 35.786             | 39.364                           | 40.591                                |                      | 51.434  | 52.355                                |
| 1  |                         |                    |                                  | 10.836                                |                      |   | 13.709                                |
| 2<br>3                                     | 6.6573<br>5.1573        | 6.6276<br>5.1276   | 6.4857<br>4.9857                 |                                       | •                    | 6.1039<br>4.6039  | •                                     |
| 3<br>4                                     | 4.1573                  | 4.1276             | 3.9857                           | •                                     | •                    | 3.6039  | •                                     |
| 5  | 3.1573                  | 3.1276             | 2.9857                           |                                       |                      | 2.6039  |                                       |
| 6  | 2.1573                  | 2.1276             | 1.9857                           |                                       | •                    | 1.6039  | •                                     |
| 7  | 1.1573                  | 1.1276             | 0.98570                          |                                       |                      | 0.60390   | •                                     |
| 8  | -0.84270                |                    | -1.0143                          | •                                     | •                    | -1.3961   | •                                     |
| 9<br>10                                    | -2.8427<br>-4.8427      |                    | -3.0143<br>-5.0143               |                                       |                      | -3.3961<br>-5.3961  | •                                     |
| 11   | -6.8427                 |                    | -7.0143                          |                                       | •                    | -7.3961   | •                                     |
| 12   | -8.8427                 |                    |                                  | •                                     | •                    | -9.3961   | •                                     |
| ip 1                                       |                         | •                  |                                  | •                                     |                      |   |                                       |
| ratum                                      | X>                      |                    |                                  |                                       |                      |   |                                       |
| 1  | <b>56.933</b><br>14.621 |                    | <b>66.317</b><br>16 <b>.</b> 116 |                                       |                      | 85.003  | <b>85.461</b><br>18 <b>.</b> 116      |
| 2  | 14.621                  |                    |                                  |                                       | 17.505               | 5.2282  | 18.116                                |
| 3  |                         |                    |                                  |                                       |                      | 3.7282  |                                       |
| 4  |                         | •                  |                                  | •                                     |                      | 2.7282  |                                       |
| 5  |                         | •                  |                                  | •                                     |                      | 1.7282  |                                       |
| 6  | •                       | •                  | •                                | •                                     | ·<br>·               | 0.72820   |                                       |
| 7<br>8                                     | •                       | •                  |                                  | •                                     | •                    | -0.27180  | •                                     |
| 8<br>9                                     |                         |                    | •                                | •                                     |                      | -2.2718<br>-4.2718  | •                                     |
| 10   |                         | •                  | •                                |                                       | •                    | -6.2718   | •                                     |
| 11   |                         |                    |                                  |                                       |                      | -8.2718   |                                       |
| 12   | ٠                       |                    |                                  |                                       | •                    | -10.272   | •                                     |
| ip 1                                       |                         | •                  | •                                | •                                     | •                    | •   | •                                     |
| ratum                                      | x>                      |                    |                                  |                                       |                      |   |                                       |
| 1  | 99.536                  | 115.65             | 118.48                           | 121.49                                | <b>127.57</b> 18.516 | <b>132.45</b><br>18 <b>.</b> 516  | 141.16                                |
|  | 4.7505                  | 4.1518             |                                  |                                       |                      |   | 3.2210                                |
| 3  | 3.2505                  | 2.6518             |                                  |                                       |                      |   | 1.7210                                |
| 4  |                         | 1.6518             |                                  |                                       | •                    |   | 0.72100                               |
| 5  | 1.2505                  | 0.65180            |                                  | •                                     | •                    | •   | -0.27900                              |
| 6  |                         | -0.34820           |                                  | •                                     | •                    | •   | -1.2790                               |
| 7<br>8                                     |                         | -1.3482            | •                                | •                                     |                      |   | -2.2790                               |
| 9  | -2.7495<br>-4.7495      | -3.3482<br>-5.3482 |                                  |                                       | •                    | •   | -4.2790<br>-6.2790                    |
| 10   |                         | -7.3482            |                                  |                                       | •                    | ·   | -8.2790                               |
| .1   |                         | -9.3482            |                                  |                                       | •                    | •   | -10.279                               |
| L <b>2</b>                                 | -10.750                 | -11.348            |                                  | •                                     |                      |   | -12.279                               |
| p 1  |                         | •                  | •                                | •                                     | •                    | •   | •                                     |
|  | X><br>144.70            | 144.70             | 152 01                           | 162 40                                | 166.28               | 168.00  | 170 17                                |
| 1  | 18.516                  |                    | 18.516                           |                                       |                      | 166.00  | 1/2.1/                                |
| 2  |                         |                    |                                  |                                       | •                    | ·   | 2.1856                                |
| 3  |                         | •                  | •                                |                                       | •                    | •   | 0.68560                               |
| 4  |                         | •                  |                                  |                                       |                      | •   | -0.31440                              |
| 5  | •                       | •                  | •                                | •                                     | •                    | •   | -1.3144                               |
| 6<br>7                                     | •                       | •                  | •                                | •                                     | •                    |   | -2.3144<br>-3.3144                    |
| 8  | •                       | •                  | •                                | •                                     | •                    | •   | -3.3144<br>-5.3144                    |
| 9  | •                       | •                  | •                                | •                                     | •                    | •   | -7.3144                               |
| 10   |                         | •                  | •                                |                                       |                      |   | -9.3144                               |
| 11   |                         | •                  |                                  |                                       | •                    | •   | -11.314                               |
| 12   | •                       | •                  | •                                | •                                     | •                    | •   | -13.314                               |
| ip 1                                       | V                       | •                  | •                                | •                                     | •                    | . 17.00   | U                                     |
| ratum                                      | X>                      | 185.66             | 188 00                           | 191 /1                                | 194 77               | 200.18  | 216.26                                |
|  | 18.116                  | 17.116             |                                  | 16.116                                | 15.267               |   | 9.9809                                |
| 1  |                         |                    |                                  |                                       |                      | 1.3365  |                                       |
| 1<br>2                                     |                         |                    | •                                |                                       | •                    | -0.16350  |                                       |
| 2<br>3                                     | •                       | •                  |                                  |                                       |                      | -1.1635   |                                       |
| 2<br>3<br>4                                |                         | •                  | •                                | •                                     |                      |   |                                       |
| 2<br>3<br>4<br>5                           | •                       | ·<br>·             |                                  |                                       | •                    | -2.1635   | •                                     |
| 2<br>3<br>4<br>5<br>6                      | •                       | ·<br>·<br>·        | ·<br>·                           | ·<br>·                                |                      | -2.1635<br>-3.1635  |                                       |
| 2<br>3<br>4<br>5<br>6<br>7                 | •                       | ·<br>·<br>·        | ·<br>·<br>·                      |                                       | ·<br>·               | -2.1635<br>-3.1635<br>-4.1635   | •                                     |
| 2<br>3<br>4<br>5<br>6<br>7<br>8            | •                       |                    |                                  | · · · · · · · · · · · · · · · · · · · | ·<br>·<br>·          | -2.1635<br>-3.1635<br>-4.1635<br>-6.1635                                  | · · · · · · · · · · · · · · · · · · · |
| 2<br>3<br>4<br>5<br>6<br>7                 | •                       |                    |                                  | · · · · · · · · ·                     | ·<br>·               | -2.1635<br>-3.1635<br>-4.1635   | ·<br>·<br>·                           |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10 | •                       |                    | :<br>:<br>:<br>:<br>:            | ·                                     | ·<br>·<br>·          | -2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163<br>-12.163 | ·<br>·<br>·<br>·                      |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9       | •                       |                    |                                  |                                       | ·<br>·<br>·          | -2.1635<br>-3.1635<br>-4.1635<br>-6.1635<br>-8.1635<br>-10.163            | · · · · · · · · · · · · · · · ·       |

**Arup** 

Northern SPA Eastern Mound - Wedge

Section B-BB (west)

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Stratum | x>       |        |        |        |        |          |        |
|---------|----------|--------|--------|--------|--------|----------|--------|
|         | 218.03   | 222.93 | 225.17 | 230.21 | 231.00 | 232.54   | 236.31 |
| 1       |          | 8.3921 | 7.9546 | 6.6974 |        | 6.1157   | 5.1157 |
| 2       | 0.89880  |        |        |        |        |          |        |
| 3       | -0.60120 |        |        |        |        |          |        |
| 4       | -1.6012  | •      |        |        |        | •        |        |
| 5       | -2.6012  | •      |        |        |        | •        |        |
| 6       | -3.6012  | •      |        |        |        | •        |        |
| 7       | -4.6012  | •      |        |        |        | •        |        |
| 8       | -6.6012  | •      |        |        |        |          |        |
| 9       | -8.6012  | •      |        | •      |        |          |        |
| 10      | -10.601  |        |        |        |        |          |        |
| 11      | -12.601  | •      |        |        |        |          | •      |
| 12      | -14.601  | •      |        |        |        |          | •      |
| Slip 1  |          |        |        |        | 0.5000 | 00       |        |
| Stratum | x>       |        |        |        |        |          |        |
|         | 240.00   | 242.32 | 246.23 | 248.97 | 251.04 | 252.69   | 255.13 |
| 1       |          |        | 3.1157 | 2.5294 | 2.1157 |          | 1.4450 |
| 2       | •        | •      | •      |        |        | 0.57650  | •      |
| 3       | •        | •      | •      |        |        | -0.92350 | •      |
| 4       | •        | •      | •      |        |        | -1.9235  | •      |
| 5       | •        | •      | •      |        |        | -2.9235  | •      |
| 6       |          | •      |        |        |        | -3.9235  | •      |
| 7       | •        | •      |        |        |        | -4.9235  | •      |
| 8       | •        | •      |        |        |        | -6.9235  | •      |
| 9       | •        | •      |        |        |        | -8.9235  | •      |
| 10      | •        | •      |        |        |        | -10.924  | •      |
| 11      | •        | •      | •      |        |        | -12.924  | •      |
| 12      |          | •      |        |        |        | -14.924  |        |
| Slip 1  | 3.000    | 0      | •      | •      | •      | •        | •      |
| Stratum |          |        |        |        |        |          |        |
|         | 262.54   | 285.08 |        |        |        |          |        |
| 1       | 0.45890  | 0.0    |        |        |        |          |        |
| 2       | 0 45890  | 0 0    |        |        |        |          |        |

| 1      | 0.45890 | 0.0     |
|--------|---------|---------|
| 2      | 0.45890 | 0.0     |
| 3      | -1.0411 | -1.5000 |
| 4      | -2.0411 | -2.5000 |
| 5      | -3.0411 | -3.5000 |
| 6      | -4.0411 | -4.5000 |
| 7      | -5.0411 | -5.5000 |
| 8      | -7.0411 | -7.5000 |
| 9      | -9.0411 | -9.5000 |
| 10     | -11.041 | -11.500 |
| 11     | -13.041 | -13.500 |
| 12     | -15.041 | -15.500 |
| Slip 1 |         | •       |
|        |         |         |

### Stratum-linked data

| No. | Material      | Water table | Piezo Set/ Ru value |
|-----|---------------|-------------|---------------------|
| 1   | Waste         |             |                     |
| 2   | Clay Deposits |             |                     |
| 3   | London Clay 1 |             |                     |
| 4   | London Clay 2 |             |                     |
| 5   | London Clay 3 |             |                     |
| 6   | London Clay 4 |             |                     |
| 7   | London Clay 5 |             |                     |
| 8   | London Clay 6 |             |                     |
| 9   | London Clay 7 |             |                     |
| 10  | London Clay 8 |             |                     |
| 11  | London Clay 9 |             |                     |
| 12  | Harwich       |             |                     |
|     |               |             |                     |

### **WORST CASE**

Slip 1
Iterations: 69
Net vertical force [kN/m]: 0.20109
Net horiz force [kN/m]: 1.1395
Disturb

Horiz acceleration [%g]: 0.0 Slip weight [kN/m] 13974.
Disturbing moment [kN/m]: 166270.
Restoring moment [kNm/m]: 166060.
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 0.99873

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Pore Pressure Interslice forces [kN/m]

Arup

R

 $[kN/m^2]$   $[kN/m^2]$ 

E

E(u)

**Northern SPA** Eastern Mound - Wedge Section B-BB (west)

Point x [m] y [m]

27

28

29

30

31

21.429

21.429

21.429

21.429 21.429

21.429

| Job No.       | Sheet No. | Rev.   |
|---------------|-----------|--|
| 256906        |           |  |
| Drg. Ref.     |           | <u>.                                      </u> |
| Made by<br>EB | Date      | Checked  |

|   |   |  | [kN/m <sup>2</sup> ] [1   | kN/m²]   |   |   |   |  |
|---|---|--|---|--|---|---|---|--|
| 1   | 166.28  | 18.416 -   | _   | 0.0  | 0.0   |   | 0.0   | 0.0  |
|   | 168.00  | 17.000   | 0.0   |  | -86.350   |   | -12.967   | 0.0  |
|   | 170.08  |  |   |  | -166.22   |   |   |  |
| _   |   | 15.282   | 0.0   |  |   |   | 1.5298  | 0.0  |
|   | 172.17  | 13.564   | 0.0   |  | -218.73   |   | 49.183  | 0.0  |
| 5   | 173.99  | 12.057   | 0.0   | 0.0  | -242.26   |   | 118.24  | 0.0  |
| 6   | 175.82  | 10.551   | 0.0   | 0.0  | -244.77   |   | 212.78  | 0.0  |
| 7   | 177.64  | 9.0446   | 0.0   | 0.0  | -226.26   |   | 332.81  | 0.0  |
|   | 179.65  | 7.3912   | 0.0   |  | -183.29   |   | 492.00  | 0.0  |
|   | 181.65  |  |   |  |   |   |   |  |
|   |   | 5.7378   | 0.0   |  | -118.11   |   | 678.12  | 0.0  |
|   | 183.66  | 4.0845   | 0.0   |  | -30.721   |   | 891.15  | 0.0  |
| 11  | 185.66  | 2.4311   | 0.0   | 0.0  | 78.879  |   | 1131.1  | 0.0  |
| 12  | 186.48  | 1.7517   | 0.0   | 0.0  | 130.22  |   | 1237.4  | 0.0  |
| 13  | 188.00  | 0.50000  | 0.0   | 0.0  | 250.92  |   | 1464.7  | 0.0  |
| 14  | 189.70  | 0.46036  | 0.0   | 0.0  | 247.40  |   | 1440.5  | 0.0  |
|   | 191.41  | 0.42071  | 0.0   | 0.0  | 243.88  |   | 1416.1  | 0.0  |
|   | 193.09  | 0.38165  | 0.0   | 0.0  | 240.40  |   | 1391.9  | 0.0  |
|   |   |  |   |  |   |   |   |  |
|   | 194.77  | 0.34259  | 0.0   | 0.0  | 236.92  |   | 1367.3  | 0.0  |
|   | 197.48  | 0.27963  | 0.0   | 0.0  | 231.29  |   | 1327.1  | 0.0  |
| 19  | 200.18  | 0.21667  | 0.0   | 0.0  | 225.64  |   | 1286.1  | 0.0  |
| 20  | 202.86  | 0.15438  | 0.0   | 0.0  | 220.04  |   | 1244.9  | 0.0  |
| 21  | 205.54  | 0.092081   | 0.0   | 0.0  | 214.42  |   | 1202.9  | 0.0  |
|   | 208.22  | 0.029785   | 0.0   | 0.0  | 208.78  |   | 1160.2  | 0.0  |
|   | 210.90  | -0.032512  | 0.0   | 0.0  | 203.12  |   | 1116.8  | 0.0  |
|   |   |  | 0.0   | 0.0  |   |   | 1072.6  | 0.0  |
|   | 213.58  | -0.094808  |   |  | 197.45  |   |   |  |
|   | 216.26  | -0.15710   | 0.0   | 0.0  | 191.76  |   | 1027.8  | 0.0  |
|   | 218.03  | -0.19833   | 0.0   | 0.0  | 187.99  |   | 997.69  | 0.0  |
| 27  | 220.48  | -0.25538   | 0.0   | 0.0  | 182.76  |   | 955.56  | 0.0  |
| 28  | 222.93  | -0.31243   | 0.0   | 0.0  | 177.51  |   | 912.83  | 0.0  |
| 29  | 225.17  | -0.36449   | 0.0   | 0.0  | 172.71  |   | 873.37  | 0.0  |
|   | 227.69  | -0.42303   | 0.0   | 0.0  | 167.30  |   | 828.45  | 0.0  |
|   |   |  | 0.0   | 0.0  |   |   |   | 0.0  |
|   | 230.21  | -0.48157   |   |  | 161.88  |   | 782.88  |  |
|   | 231.00  | -0.50000   | 0.0   | 0.0  | 160.16  |   | 768.39  | 0.0  |
| 33  | 232.54  | 0.099236   | 0.0   | 0.0  | 144.04  |   | 649.46  | 0.0  |
| 34  | 234.21  | 0.74832  | 0.0   | 0.0  | 122.49  |   | 531.15  | 0.0  |
| 35  | 236.31  | 1.5657   | 0.0   | 0.0  | 100.63  |   | 368.59  | 0.0  |
|   |   |  |   |  |   |   | 300.33  |  |
| 36  | 238.16  |  |   |  |   |   |   |  |
|   | 238.16  | 2.2828   | 0.0   | 0.0  | 75.636  |   | 240.92  | 0.0  |
| 37  | 240.00  | 2.2828<br>3.0000   | 0.0   | 0.0  | 75.636<br>45.495  |   | 240.92<br>126.48  | 0.0  |
| 37  |   | 2.2828   | 0.0   | 0.0  | 75.636  |   | 240.92  | 0.0  |
| 37<br>38  | 240.00<br>242.32  | 2.2828<br>3.0000<br>3.9034   | 0.0<br>0.0<br>0.0 -   | 0.0  | 75.636<br>45.495<br>0.20109   |   | 240.92<br>126.48<br>1.1395  | 0.0  |
| 37<br>38<br><b>Slice</b>  | 240.00<br>242.32  | 2.2828<br>3.0000   | 0.0<br>0.0<br>0.0 -   | 0.0<br>0.0<br>Slice  | 75.636<br>45.495<br>0.20109   | on base [   | 240.92<br>126.48<br>1.1395  | 0.0  |
| 37<br>38  | 240.00<br>242.32  | 2.2828<br>3.0000<br>3.9034   | 0.0<br>0.0<br>0.0 -<br><b>Average</b><br><b>Pore</b>  | 0.0<br>0.0<br>Slice<br>Weight  | 75.636<br>45.495<br>0.20109   | on base [   | 240.92<br>126.48<br>1.1395  | 0.0  |
| 37<br>38<br><b>Slice</b>  | 240.00<br>242.32<br><b>Strength</b>   | 2.2828<br>3.0000<br>3.9034   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure  | 0.0<br>0.0<br>Slice<br>Weight  | 75.636<br>45.495<br>0.20109<br>Forces   | _   | 240.92<br>126.48<br>1.1395  | 0.0  |
| 37<br>38<br><b>Slice</b>  | 240.00<br>242.32<br><b>Strength</b>   | 2.2828<br>3.0000<br>3.9034   | 0.0<br>0.0<br>0.0 -<br><b>Average</b><br><b>Pore</b>  | 0.0<br>0.0<br>Slice<br>Weight  | 75.636<br>45.495<br>0.20109   | _   | 240.92<br>126.48<br>1.1395  | 0.0  |
| 37<br>38<br><b>Slice</b>  | 240.00<br>242.32<br>Strength  | 2.2828<br>3.0000<br>3.9034<br>Parameters   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure  | 0.0<br>0.0<br>Slice<br>Weight  | 75.636<br>45.495<br>0.20109<br>Forces   | Shear   | 240.92<br>126.48<br>1.1395<br>kN/m]   | 0.0<br>0.0<br>0.0  |
| 37<br>38<br><b>Slice</b><br><b>No</b> .   | 240.00<br>242.32<br>Strength<br>C'<br>[kN/m <sup>2</sup> ]  | 2.2828<br>3.0000<br>3.9034<br>Parameters   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m <sup>2</sup> ]  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal   | Shear<br>(capacity  | 240.92<br>126.48<br>1.1395<br>kN/m]<br>Shear<br>(mobil  | 0.0<br>0.0<br>0.0  |
| 37<br>38<br><b>Slice</b><br><b>No</b> .   | 240.00<br>242.32<br>Strength<br>c'<br>[kN/m <sup>2</sup> ]<br>35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters<br>Tan phi                                      | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]   | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031   | Shear<br>(capacity  | 240.92<br>126.48<br>1.1395<br>kN/m]<br>Shear<br>) (mobil<br>0 7   | 0.0<br>0.0<br>0.0  |
| 37<br>38<br><b>Slice</b><br><b>No</b> .   | 240.00<br>242.32<br>Strength<br>c' '<br>[kN/m²]<br>35.714<br>35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters<br>Tan phi<br>0.0<br>0.0                        | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0   | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80   | Shear<br>(capacity<br>79.44<br>96.42  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9   | 0.0<br>0.0<br>0.0<br>.ised)<br>9.541<br>16.546   |
| 37<br>38<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3   | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters<br>Tan phi<br>0.0<br>0.0<br>0.0                 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m <sup>2</sup> ]<br>0.0<br>0.0  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 4 9   | 0.0<br>0.0<br>0.0<br>0.0   |
| 37<br>38<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4  | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters<br>Tan phi<br>0.0<br>0.0<br>0.0<br>0.0          | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646  |
| 37<br>38<br><b>Slice</b><br><b>No</b> .   | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0                   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m <sup>2</sup> ]<br>0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8   | 0.0<br>0.0<br>0.0<br>0.0<br><b>ised)</b><br>9.541<br>6.546<br>6.546<br>4.646<br>4.646  |
| 37<br>38<br><b>Slice</b><br><b>No.</b><br>1<br>2<br>3<br>4  | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters<br>Tan phi<br>0.0<br>0.0<br>0.0<br>0.0          | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m <sup>2</sup> ]<br>0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646  |
| 37<br>38<br><b>Slice</b><br><b>No</b> .   | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0                   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 8   | 0.0<br>0.0<br>0.0<br>0.0<br><b>ised)</b><br>9.541<br>6.546<br>6.546<br>4.646<br>4.646  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>5<br>6<br>7  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0       | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0   | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>84.53  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 8 9 9   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>4.646<br>4.646<br>4.646<br>4.646<br>2.907   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0   | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>84.53<br>92.78   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 4 9 8 8 8 8 9 9 9   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>4.646<br>2.907<br>2.906  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0  | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>84.53<br>92.78<br>92.78  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 4 9 8 8 8 8 9 9 9 9 9   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                                     | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>84.53<br>92.78<br>92.78<br>92.78   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 8 9 9 9 9 9 9 9   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.907  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>10   | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                              | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>407.37<br>489.67<br>213.22   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>82.78<br>92.78<br>92.78<br>92.78<br>92.78  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 8 9 9 9 9 9 9 9 9 8 3   | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>2.907<br>8.176   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                       | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>84.53<br>92.78<br>92.78<br>92.78   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 8 9 9 9 9 9 9 9 9 8 3   | 0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.907  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>10   | 240.00<br>242.32<br><b>Strength</b> c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714   | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                       | 0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>82.78<br>92.78<br>92.78<br>92.78<br>92.78  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 9 9 9 9 9 9 9 9 9 9 8 3 7   | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>2.907<br>8.176   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>9<br>10<br>11<br>12   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 25.714 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                       | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>489.67<br>213.22   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>82.78<br>92.78<br>92.78<br>92.78<br>92.78  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 9 9 9 9 9 9 9 9 7 4 8 3 7   | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>12<br>13  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73   | Shear<br>(capacity<br>79.44<br>96.42<br>96.42<br>84.53<br>84.53<br>92.78<br>92.78<br>92.78<br>92.78<br>92.78<br>38.12<br>42.14<br>36.53<br>36.53                            | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 9 9 9 9 9 9 9 7 4 8 8 8 8 8 8 8 9 9 9 9 9 9 8 8 8 8 8 8   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>4.646<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.906<br>2.201<br>6.584<br>6.584  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>2<br>3<br>14<br>15<br>14<br>15<br>15<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429   | 2.2828<br>3.0000<br>3.9034<br>Parameters  O.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.         | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.          | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57   | Shear (capacity 79.44 96.42 84.53 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 9 9 9 9 9 9 9 9 8 3 7 4 8 3 8 3 1   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>ised)<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>8.176<br>2.201<br>6.584<br>6.584<br>6.584  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.          | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01   | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 36.00   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil<br>0 4 99<br>4 99<br>8 8 8<br>8 8 8<br>9 99<br>9 99<br>9 99<br>9 9  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br><b>ised)</b><br>9.541<br>66.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.584<br>6.546   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>8<br>9<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>8lice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>407.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68   | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 58.02   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 99 8 8 8 8 99 9 99 9 99 8 33 7 4 8 3 8 3 1 3 1 3 8 5  | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.584<br>6.047<br>8.102   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>9<br>1<br>10<br>11<br>12<br>13<br>14<br>15<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49   | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99   | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 58.02 58.02   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 9 9 9 9 9 9 9 9 8 3 7 4 8 3 8 3 1 3 1 3 8 5 5   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.047<br>8.102<br>8.102  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>8<br>9<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>5240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52  | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97   | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 58.02   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 9 9 9 9 9 9 9 9 8 3 7 4 8 3 8 3 1 3 1 3 8 5 5   | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.584<br>6.047<br>8.102   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>9<br>1<br>10<br>11<br>12<br>13<br>14<br>15<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49   | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97   | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 58.02 58.02   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 7 4 9 8 8 8 8 9 9 9 9 9 9 9 9 8 3 7 4 8 3 8 3 1 3 1 3 8 5 7   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.047<br>8.102<br>8.102  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>5<br>5<br>6<br>7<br>7<br>8<br>9<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>17<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18<br>18   | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429  | 2.2828<br>3.0000<br>3.9034<br>Parameters  Tan phi  0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>5240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52  | 75.636 45.495 0.20109 Forces Normal 76.031 139.80 191.90 211.11 251.16 291.20 362.76 405.06 447.37 489.67 213.22 408.46 532.22 523.73 505.57 493.01 768.68 736.99 697.97 666.84   | Shear (capacity 79.44 96.42 96.42 96.42 96.278 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.00 36.00 36.00 58.02 58.02 57.41  | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 9 9 9 9 9 9 9 9 9 1 3 7 4 8 3 8 3 1 3 1 3 8 5 7 7 5 7   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.907<br>2.907<br>6.584<br>6.584<br>6.584<br>6.047<br>6.047<br>8.102<br>8.102<br>7.490   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>18<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429   | 2.2828 3.0000 3.9034  Parameters  Tan phi   0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0          | 0.0<br>0.0<br>0.0 -<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0. | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>662.37<br>631.22   | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97<br>666.84<br>635.69   | Shear (capacity 79.44 96.42 84.53 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.00 36.00 58.02 57.41 57.41 57.41   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 8 8 8 8 9 9 9 9 9 9 9 9 9 9 1 7 4 8 3 8 1 3 3 1 3 3 8 5 7 7 5 7   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.906<br>2.201<br>6.584<br>6.584<br>6.047<br>6.047<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.102<br>8.10 |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>4<br>5<br>6<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19<br>19  | 240.00<br>242.32<br>Strength  c' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429               | 2.2828 3.0000 3.9034  Parameters  Tan phi  | 0.0<br>0.0<br>0.0 - 0<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.                      | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>603.07   | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>503.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97<br>666.84<br>635.69<br>604.56 | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.53 36.00 36.00 58.02 57.41 57.41 57.41   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 99 8 8 8 8 99 99 99 99 8 7 4 4 8 3 1 1 3 8 5 7 7 5 7 5 7  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>6<br>7<br>7<br>8<br>8<br>9<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>20<br>21<br>21<br>22<br>22<br>23<br>23<br>24<br>24<br>25<br>26<br>26<br>27<br>27<br>28<br>28<br>29<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20              | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429                                    | 2.2828 3.0000 3.9034  Parameters  Fan phi   0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0          | 0.0<br>0.0<br>0.0 - 0<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.                      | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>662.37<br>631.22<br>600.07<br>568.92                     | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>211.11<br>251.16<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97<br>666.84<br>635.69<br>604.56<br>573.41 | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 92.78 92.78 92.78 57.41 57.41 57.41 57.41   | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 99 8 8 8 8 99 9 99 9 99 8 33 7 44 8 33 1 33 8 55 7 55 7 55 7 55 7 55  | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.584<br>6.047<br>8.102<br>8.102<br>7.490<br>7.490<br>7.490<br>7.490<br>7.490   |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>9<br>10<br>0<br>11<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>18<br>19<br>20<br>21<br>21<br>22<br>23<br>23<br>24<br>24<br>25<br>26<br>27<br>27<br>28<br>27<br>28<br>27<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28          | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429               | 2.2828 3.0000 3.9034  Parameters  Tan phi  | 0.0<br>0.0<br>0.0<br>0.0 -  | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>662.37<br>631.22<br>600.07<br>568.92<br>537.78           | 75.636<br>45.495<br>0.20109<br>Forces<br>Normal<br>76.031<br>139.80<br>191.90<br>291.20<br>362.76<br>405.06<br>447.37<br>489.67<br>213.22<br>408.46<br>532.22<br>523.73<br>505.57<br>493.01<br>768.68<br>736.99<br>697.97<br>666.84<br>635.69<br>604.56<br>573.41<br>542.28           | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.00 36.00 58.02 57.41 57.41 57.41 57.41 57.41 57.41                               | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 8 8 8 8 9 9 9 9 9 9 9 8 3 7 4 8 3 8 3 1 3 1 3 8 5 7 7 5 7 7 5 7   | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.047<br>8.102<br>7.490<br>7.490<br>7.490<br>7.490<br>7.490  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>5<br>5<br>6<br>7<br>7<br>8<br>8<br>9<br>10<br>11<br>11<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>22<br>23<br>24<br>24<br>25<br>26<br>26<br>27<br>27<br>28<br>28<br>28<br>29<br>29<br>20<br>20<br>21<br>21<br>22<br>22<br>22<br>22<br>22<br>22<br>22<br>22<br>22<br>22<br>22 | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 | 2.2828 3.0000 3.9034  Parameters  Tan phi   0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0          | 0.0<br>0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.                 | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>240.11<br>462.64<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>662.37<br>631.22<br>600.07<br>568.92<br>537.78<br>339.00 | 75.636 45.495 0.20109 Forces  Normal 76.031 139.80 191.90 251.16 291.20 362.76 405.06 447.37 489.67 213.22 408.46 532.22 523.73 505.57 493.01 768.68 736.99 697.97 666.84 635.69 604.56 573.41 542.28 341.99  | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.00 36.00 36.00 58.02 57.41 57.41 57.41 57.41 57.41 57.41 57.41 57.41 57.41 57.41 | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 8 8 8 8 9 9 9 9 9 9 9 9 8 3 7 4 8 8 3 1 3 1 3 5 7 7 5 7 7 5 7 7 5 7 7 3   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.906<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.047<br>6.047<br>6.047<br>7.490<br>7.490<br>7.490<br>7.490<br>7.490<br>7.490<br>8.045  |
| 37<br>38<br>Slice<br>No.<br>1<br>2<br>3<br>3<br>4<br>4<br>5<br>5<br>6<br>6<br>7<br>7<br>8<br>9<br>9<br>10<br>0<br>11<br>12<br>13<br>14<br>15<br>16<br>16<br>17<br>18<br>19<br>20<br>21<br>21<br>22<br>23<br>23<br>24<br>24<br>25<br>26<br>27<br>27<br>28<br>27<br>28<br>27<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28<br>28          | 240.00<br>242.32<br>Strength  C' [kN/m²] 35.714 35.714 35.714 35.714 35.714 35.714 35.714 35.714 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429 21.429               | 2.2828 3.0000 3.9034  Parameters  Tan phi  | 0.0<br>0.0<br>0.0<br>0.0 -<br>Average<br>Pore<br>Pressure<br>[kN/m²]<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.                 | 0.0<br>0.0<br>0.0<br>Slice<br>Weight<br>[kN/m]<br>22.923<br>89.418<br>156.96<br>193.18<br>245.10<br>297.02<br>381.92<br>436.76<br>491.61<br>546.45<br>529.40<br>520.92<br>502.80<br>490.23<br>764.20<br>732.49<br>693.52<br>662.37<br>631.22<br>600.07<br>568.92<br>537.78<br>339.00<br>447.32           | 75.636 45.495 0.20109 Forces  Normal 76.031 139.80 191.90 251.16 291.20 362.76 405.06 447.37 489.67 213.22 408.46 532.22 523.73 505.57 493.01 768.68 736.99 697.97 666.84 635.69 604.56 573.41 542.28 341.99  | Shear (capacity 79.44 96.42 96.42 84.53 84.53 92.78 92.78 92.78 92.78 38.12 42.14 36.53 36.00 36.00 58.02 57.41 57.41 57.41 57.41 57.41 57.41                               | 240.92<br>126.48<br>1.1395<br>kN/m]  Shear ) (mobil 0 4 9 4 9 9 9 9 9 9 9 9 9 9 7 5 7 7 7 5 7 7 7 7 8 8 8 8 | 0.0<br>0.0<br>0.0<br>0.0<br>9.541<br>6.546<br>6.546<br>4.646<br>4.646<br>2.907<br>2.907<br>8.176<br>2.201<br>6.584<br>6.047<br>8.102<br>7.490<br>7.490<br>7.490<br>7.490<br>7.490  |

0.0 421.93 426.06

0.0 364.97 368.75 0.0 386.71 390.97 0.0 358.51 362.78 0.0 107.05 108.40 0.0 191.81 236.91

0.0

0.0

0.0

0.0

0.0

0.0

52.580 47.985

53.955

53.955

16.989

35.428

52.646 48.046

54.023

54.023 17.010

35.473

Arup

Northern SPA Eastern Mound - Wedge Section B-BB (west)

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     | _         |         |
| Made by<br>EB | Date      | Checked |

| Slice S | Strength | Parameters | Average | Slice          | Forces o | on base [kN/m] |        |
|---------|----------|------------|---------|----------------|----------|----------------|--------|
| 37      |          |            | D       | 7.7 a 2 au1a A |          |                |        |
| 33      | 21.429   | 0.0        | 0.0     | 176.67         | 227.64   | 38.376         | 38.424 |
| 34      | 35.714   | 0.0        | 0.0     | 173.67         | 241.17   | 80.541         | 80.643 |
| 35      | 35.714   | 0.0        | 0.0     | 108.08         | 170.31   | 70.666         | 70.755 |
| 36      | 35.714   | 0.0        | 0.0     | 68.915         | 133.82   | 70.666         | 70.755 |
| 37      | 35.714   | 0.0        | 0.0     | 31.075         | 116.63   | 89.022         | 89.135 |

| Slice<br>No. | Surface Load | [kN/m_hor/m] | Point | Load | [kN/m] | Water Pressure ground surface |     |
|--------------|--------------|--------------|-------|------|--------|-------------------------------|-----|
|              | Vert Ho      | riz          | Vert  | I    | Horiz  | Vert Horiz                    | 2   |
| 1            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 2            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 3            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 4            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 5            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 6            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 7            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 8            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 9            | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 10           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 11           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 12           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 13           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 14           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 15           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 16           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 17           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 18           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 19           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 20           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 21           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 22           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 23           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 24           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 25           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 26           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 27           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 28           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 29           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 30           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 31           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 32           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 33           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 34           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 35           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 36           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |
| 37           | 0.0          | 0.0          |       | 0.0  | 0.0    | 0.0                           | 0.0 |

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

### Appendix C – Settlement calculations

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

### Appendix C1 – Formation settlement

Document no.: 1MCo4-SCJ\_SDH-EV-RIA-SSo5\_SLo7-000001

Revision: Co1

# Appendix C2 – Internal settlement

| <b>Project Title</b> | High Speed 2                         |
|----------------------|--------------------------------------|
| Job No.              | 256906                               |
| Heading              | SPA internal settlement calculations |
| Date                 | 21/04/2020                           |
| Revision             | Rev 1                                |
| Ву                   | EB                                   |
| Checked              | JKL                                  |

| Density of soil     | 19.5 | kN/m <sup>3</sup> |
|---------------------|------|-------------------|
| Height of fill      | 17   | m                 |
| Constrained modulus | 8    |                   |

Internal settlement 352.2188 mm

#### **Notes**

Methodology for calculation is as per Section 4.4.2 of Trenter (2001) Earthworks: A Guide. The equation and other relevant information is reproduced below

$$\rho=0.50\frac{\gamma H^2}{D*}~(m)$$

Where H is the embankment height,  $\gamma$  the material unit weight and D\* is the constant equivalent constrained modulus.

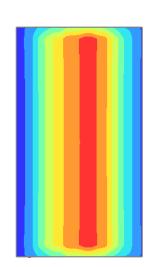
Table 4.1 Typical values of constant equivalent constrained modulus D\* for various fill types and embankment heights (Charles, 1993)

| Fill type                           | $D^*$               |                     |            |  |  |  |  |  |
|-------------------------------------|---------------------|---------------------|------------|--|--|--|--|--|
|                                     | $H = 10 \mathrm{m}$ | $H = 30 \mathrm{m}$ | H = 100  m |  |  |  |  |  |
| Sandy gravel ( $D_r = 80\%$ )       | 50                  | 90                  | 170        |  |  |  |  |  |
| Sandy gravel $(D_r = 50\%)$         | 30                  | 50                  | 90         |  |  |  |  |  |
| Sandstone rockfill ( $D_r = 80\%$ ) | 15                  | 25                  | 45         |  |  |  |  |  |
| Sandstone rockfill ( $D_r = 50\%$ ) | 6                   | 10                  | 20         |  |  |  |  |  |
| Clay (plasticity index, 15%;        |                     |                     |            |  |  |  |  |  |
| liquidity index, 0.1)               | 6                   | 10                  | 18         |  |  |  |  |  |

# ARUF Northern SPA Eastern Mound Section F-FF

**Arup** 

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>DH | Date      | Checked |



Displacement - Z - Elastic -50.00 : 0 mm 0 : 50.00 mm 50.00 : 100.0 mm 100.0 : 150.0 mm 150.0 : 200.0 mm 200.0 : 250.0 mm 250.0 : 300.0 mm 300.0 : 350.0 mm

### **Arup**

Northern SPA
Eastern Mound
Section F-FF

| Job No.       | Sheet No. | Rev.    |
|---------------|-----------|---------|
| 256906        |           |         |
| Drg. Ref.     |           |         |
| Made by<br>DH | Date      | Checked |

Results: Immediate: Load Centres: Rectangular

| Re: | f. | Name  | • | ×         | У         | z       | δz        | Stress:<br>Calc.<br>Level | Stress:<br>Vertical  | Stress:<br>Sum Princ. | Vert.<br>Strain |
|-----|----|-------|---|-----------|-----------|---------|-----------|---------------------------|----------------------|-----------------------|-----------------|
|     |    |       |   | [m]       | [m]       | [mOD]   | [mm]      | [mOD]                     | [kN/m <sup>2</sup> ] | [kN/m <sup>2</sup> ]  | [µ]             |
|     | 1  | Layer | 1 | 104.00000 | 255.00000 | 0.00000 | 290.47673 | -0.12500                  | 341.25               | 818.47                | 0.040968        |
|     | 2  | Layer | 2 | 102.80000 | 255.00000 | 0.00000 | 289.88229 | -0.12500                  | 341.25               | 818.39                | 0.040970        |
|     | 3  | Layer | 3 | 102.80000 | 255.00000 | 0.00000 | 289.88229 | -0.12500                  | 341.25               | 818.39                | 0.040970        |
|     | 4  | Layer | 4 | 102.80000 | 255.00000 | 0.00000 | 289.88229 | -0.12500                  | 341.25               | 818.39                | 0.040970        |
|     | 5  | Layer | 5 | 104.70000 | 255.00000 | 0.00000 | 290.88329 | -0.12500                  | 341.25               | 818.53                | 0.040966        |
|     | 6  | Layer | 6 | 107.00000 | 255.00000 | 0.00000 | 292.67118 | -0.12500                  | 341.25               | 818.84                | 0.040955        |
|     | 7  | Layer | 7 | 154.00000 | 255.00000 | 0.00000 | 288.33849 | -0.12500                  | 341.25               | 817.97                | 0.040984        |
|     | 9  | Laver | 8 | 172 00000 | 255 00000 | 0 00000 | 244 54696 | -0 12500                  | 292 50               | 700 92                | 0.035136        |

Results : Consolidation : Load Centres : Rectangular

None

Results : Total : Load Centres : Rectangular

None

Results: Immediate: Displacement Data: Grids

| Carl      | Ref. | Name             | ×         | У         | z       | δz        | Stress:<br>Calc.<br>Level | Stress:<br>Vertical | Stress:<br>Sum Princ. | Vert.<br>Strain |
|--|------|------------------|-----------|-----------|---------|-----------|---------------------------|---------------------|-----------------------|-----------------|
| Grid   -50.0000   25.5000   0.0000   -2.3342   -0.1250   1.1948-   0.3943   10.1446-   1.0000   1.0000   1.0000   -2.3342   -0.1250   1.4458-   0.3943   1.1446-   1.0000   1.1448-   1.0000   1.1448-   1.0000   1.1448-   1.14   |      | 0.11.1           |           |           |         |           | [mOD]                     |                     |                       | [µ]             |
| 1 Grid   1 -30,0000   76,3000   0,0000   -4,2743   0,1250   1,4208-4   0,3848   12,7828-6   1,6418   1 -30,0000   13,0000   0,0000   -4,2420   -4,1400   -0,1250   1,4618-5   0,4240   -4,1408-6   1,6418   1 -30,0000   13,0000   0,0000   -4,2410   -0,1250   1,4618-6   0,4240   -4,1410-1   -4,1410   -0,1250   1,4618-6   0,4240   -4,1410-1      |      |                  | -30.00000 | 25.50000  |         |           |                           | 1.1946E-6           |                       | -10.144E-6      |
| 1   Grid   1   -30,0000   10,0000   0,0000   -4,4400   -1,4448-6   0,4426   -1,408-6   |      |                  |           |           |         |           |                           |                     |                       | -11.775E-6      |
| Grid   -30,0000   127,5000   0,0000   -4,21428   -0,1250   1,4857e   0,41850   -13,883e   -14,885   |      |                  |           |           | 0.00000 |           | -0.12500                  |                     | 0.40281               | -13.427E-6      |
| 1   Grid   -30,0000   178,5000   0,0000   -4,42730   -0,12500   1,464656   0,42996   14,3312-6   1   Grid   -30,0000   25,0000   0,0000   -4,42730   -0,12500   1,4672-6   0,43631   14,5432-6   1   Grid   -30,00000   30,0000   0,0000   -4,5433   -0,12500   1,4672-6   0,43631   14,5435-6   1   Grid   -30,00000   37,70000   0,0000   -4,5433   -0,12500   1,4672-6   0,43631   14,5435-6   1   Grid   -30,00000   37,00000   0,0000   -4,42730   -0,12500   1,46465-6   0,42996   14,3312-6   1   Grid   -30,00000   37,00000   0,0000   -4,42730   -0,12500   1,46465-6   0,42996   14,3312-6   1   Grid   -30,00000   37,00000   0,0000   -4,42730   -0,12500   1,46465-6   0,42996   14,3312-6   1   Grid   -30,00000   37,00000   0,0000   -4,42730   -0,12500   1,46465-6   0,42996   14,3312-6   1   Grid   -30,00000   34,50000   0,0000   -3,77066   -0,12500   1,4455-6   0,42996   14,3312-6   1   Grid   -30,00000   34,50000   0,0000   -3,77066   -0,12500   1,4455-6   0,42996   14,3312-6   1   Grid   -30,00000   34,50000   0,0000   -3,77066   -0,12500   1,4455-6   0,42996   14,3312-6   1   Grid   -30,00000   34,50000   0,0000   -3,7706   -0,12500   1,4455-6   0,42996   14,3312-6   1   Grid   -30,00000   34,50000   0,0000   -3,7506   -0,12500   1,4455-6   0,42996   -1,2500   1,4455-6   0,42996   -1,2500   1,4455-6   0,42996   -1,2500   -1,2506   -1,2   |      |                  | -30.00000 |           | 0.00000 |           | -0.12500                  |                     | 0.41560               | -13.853E-6      |
| 1   Grid   1   -30,0000   20,0000   0,0000   -4,8110   -0,1250   1,4687=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   20,5000   0,0000   -4,5143   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   20,5000   0,0000   -4,8110   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   30,5000   0,0000   -4,8110   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   30,5000   0,0000   -4,8110   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   32,5000   0,0000   -4,8140   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   32,5000   0,0000   -4,8140   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   32,5000   0,0000   -4,8140   -0,1250   1,4672=6   0,4356   -14,5218=6   1   Grid   1   -30,0000   32,5000   0,0000   -3,4636   -0,1250   1,4672=6   0,3834   -12,782=6   1   Grid   1   -30,0000   48,5500   0,0000   -3,4635   -0,1250   1,4672=6   0,3834   -12,782=6   1   Grid   1   -30,0000   48,5500   0,0000   -3,4635   -0,1250   1,4672=6   0,3834   -12,782=6   1   Grid   1   -30,0000   48,5500   0,0000   -3,4635   -0,1250   1,4672=6   0,3834   -12,782=6   1   Grid   1   -16,0000   25,5000   0,0000   -2,3534   -0,1250   1,4687=6   0,3833   -10,482=6   1   Grid   1   -16,0000   25,5000   0,0000   -2,3534   -2,1250   -1,1250      |      |                  |           |           |         |           | -0.12500                  |                     |                       |                 |
| 1 Grid   -30,0000   25,0000   0,0000   -4,5243   -0,1250   1,4672E   0,4363   -14,531E   1 Grid   -30,0000   31,5000   0,0000   -4,2730   -0,1250   1,466E   0,4299   -14,331E   1 Grid   -30,0000   37,0000   0,0000   -4,4273   -0,1250   1,466E   0,4299   -14,331E   1 Grid   -30,0000   37,0000   0,0000   -4,4273   -0,1250   1,466E   0,4299   -14,331E   1 Grid   -30,0000   37,0000   0,0000   -4,4273   -0,1250   1,466E   0,4299   -14,331E   -1 Grid   -30,0000   37,0000   0,0000   -4,4310   -0,1250   1,445E   0,429E   -1,420E   -1,42   |      |                  | -30.00000 | 204.00000 | 0.00000 |           | -0.12500                  | 1.4663E-6           |                       | -14.453E-6      |
| Grid   -30,0000   280,5000   0.0000   -4.3142   -0.1250   1.46725   0.4355   -14.5215   1.6141   -30,0000   30,0000   0.0000   -4.3140   -0.1250   1.46725   0.4253   -14.5315   1.46725   0.4252   -14.1405      |      |                  |           |           |         |           |                           |                     |                       | -14.521E-6      |
| 1   Grid   1   -30,0000   31,5000   0,0000   -4,42730   -0,1250   1,464656   0,4294   -4,3318-6   1   Grid   1   -30,0000   48,5000   0,0000   -4,2432   -0,1250   1,4457-6   0,4028   -1,477-6   1   Grid   1   -30,0000   48,5000   0,0000   -3,7768   -0,1250   1,4457-6   0,4028   -1,477-6   1   Grid   1   -30,0000   48,5000   0,0000   -3,7768   -0,1250   1,4455-6   0,4028   -1,477-6   1   Grid   1   -30,0000   48,5000   0,0000   -3,7768   -0,1250   1,4455-6   0,4028   -1,477-6   1   Grid   1   -30,0000   30,0000   0,0000   -2,59342   -0,1250   1,3465-6   0,3043   -10,1445-6   1   Grid   1   -30,0000   0,0000   0,0000   -2,59342   -0,1250   1,355-9   0,3031   -7,6728-6   1   Grid   1   -16,0000   2,5000   0,0000   -2,59342   -0,1250   7,6566-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   7,5000   0,0000   -2,44102   -0,1250   7,6666-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   7,5000   0,0000   -2,44102   -0,1250   7,1605-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   7,5000   0,0000   -3,4952   -0,1250   7,1605-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   7,5000   0,0000   -3,4952   -0,1250   7,1605-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   7,5000   0,0000   -3,4952   -0,1250   7,1605-6   0,6423   -2,4865-6   1   Grid   1   -16,0000   2,5000   0,0000   -3,4952   -0,1250   7,2255-6   0,7139   -2,4865-6   1   Grid   1   -16,0000   2,5000   0,0000   -3,4952   -0,1250   7,2255-6   0,7139   -2,4315-6   1   Grid   1   -16,0000   2,5000   0,0000   -4,2974   -0,1250   7,2255-6   0,7139   -2,4315-6   1   Grid   1   -16,0000   3,0000   0,0000   -4,2974   -0,1250   7,2255-6   0,7139   -2,4315-6   1   Grid   1   -16,0000   3,0000   0,0000   -4,2974   -0,1250   7,2255-6   0,7149   -2,4315-6   1   Grid   1   -16,0000   3,0000   0,0000   -4,2974   -0,1250   7,2255-6   0,7149   -2,4315-6   1   Grid   1   -16,0000   3,0000   0,0000   -4,2432   -0,1250   7,2255-6   0,7149   -2,4315-6   1   Grid   1   -16,0000   3,0000   0,0000   -4,2432   -0,1250   0,0000   -4,2432   -0,1250   0,0000   -4,2432   -0,1   | 1 (  | Grid 1           | -30.00000 | 280.50000 | 0.00000 | -4.51443  | -0.12500                  | 1.4672E-6           | 0.43565               | -14.521E-6      |
| Grid   -30.00000   357.00000   0.00000   -4.34100   -0.12500   1.4518-6   0.4220   1.4698-6   1.4   |      |                  |           |           |         |           |                           |                     |                       | -14.453E-6      |
| Grid   -30.0000   408.0000   0.0000   -4.03171   -0.12500   1.4485=6   0.40281   -1.4787=6   1.47   | 1 (  | Grid 1           | -30.00000 | 357.00000 | 0.00000 | -4.34100  | -0.12500                  | 1.4614E-6           | 0.42420               | -14.140E-6      |
| Grid   -30.0000   489.0000   0.0000   -3.40449   -0.12500   1.3631E-6   0.35325   -11.775E-6   1   Grid   -30.00000   484.50000   0.00000   -2.35518   -0.12500   3.6532E-6   0.3760E   -12.535E-6   0.3760E   |      |                  |           | 408.00000 |         |           | -0.12500                  |                     | 0.41560               | -13.853E-6      |
| 1   Grid   -30,0000   648,5000   0.0000   -2.9342   -0.12500   1.1346-6   0.3043   -1.248-6   1.0000   0.3043   -0.12500   -0.0000   -2.41102   -0.12500   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0.12500   -0.2043   -0   | 1 (  | Grid 1           | -30.00000 |           | 0.00000 | -3.77068  | -0.12500                  | 1.4209E-6           |                       |                 |
| Grid   -04.00000   510.00000   0.00000   -2.45499   -0.12500   735.558-9   0.2019 -7.6728E-6   1 Grid   -16.00000   0.000000   0.00000   -2.45819   -0.12500   735.558-9   0.2019 -7.6728E-6   1 Grid   -16.00000   510.00000   0.00000   -2.49852   -0.12500   7.06686-6   0.62343 -72.760E-6   1 Grid   -16.00000   0.000000   0.00000   -2.49852   -0.12500   7.1640E-6   0.62343 -72.760E-6   1 Grid   -16.00000   102.000000   0.00000   -3.74453   -0.12500   7.1540E-6   0.66422   -2.12500   -2.4666   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -2.1466   -0.62343   -0.623   |      |                  | -30.00000 |           | 0.00000 |           | -0.12500<br>-0.12500      | 1.3631E-6           |                       | -11.775E-6      |
| Grid 1   | 1 (  | Grid 1           | -30.00000 | 510.00000 | 0.00000 | -2.45499  | -0.12500                  | 735.53E-9           | 0.23019               | -7.6728E-6      |
| 1 crid   -1.6.0000   51.0000   0.0000   -2.96986   -0.1250   7.6668-6   0.66433   -20.7808-6   1 crid   -1.6.0000   175.5000   0.0000   -3.9587   -0.1250   7.1608-6   0.66432   -2.1408-6   1 crid   -1.6.0000   127.5000   0.0000   -3.9587   -0.1250   7.1235-6   0.7035   -23.4518-6   1 crid   -1.6.0000   135.0000   0.0000   -4.28107   -0.12500   7.2235-6   0.7035   -23.4518-6   0.7035   -23.45   |      |                  |           | 25.50000  |         |           |                           |                     |                       | -12.535E-6      |
| 1 cried   1 -16,00000   102,00000   0.00000   -3,74453   -0,12500   7,127856   0.70336 -23,4812-6   1 cried   1 -16,00000   127,50000   0.00000   -4,25027   -0,12500   7,212856   0.70336 -23,4812-6   1 cried   1 -16,00000   27,50000   0.00000   -4,25027   -0,12500   7,222856   0.72635 -24,1385-6   1 cried   1 -16,00000   28,00000   0.00000   -4,25027   -0,12500   7,222856   0.72635 -24,1385-6   1 cried   1 -16,00000   28,500000   0.00000   -4,25027   -0,12500   7,222856   0.72635 -24,1385-6   1 cried   1 -16,00000   35,000000   0.00000   -4,25027   -0,12500   7,222856   0.72635 -24,1385-6   1 cried   1 -16,00000   31,50000   0.00000   -4,26327   -0,12500   7,222856   0.72635 -24,1385-6   1 cried   1 -16,00000   31,50000   0.00000   -4,26327   -0,12500   7,22285-6   0.72699 -24,1385-6   1 cried   1 -16,00000   357,00000   0.00000   -4,26327   -0,12500   7,22285-6   0.72999 -24,1385-6   1 cried   1 -16,00000   357,00000   0.00000   -4,26327   -0,12500   7,22385-6   0.72999 -24,1385-6   1 cried   1 -16,00000   357,00000   0.00000   -4,26327   -0,12500   7,22385-6   0.7399 -23,7882-6   1 cried   1 -16,00000   357,00000   0.00000   -4,26327   -0,12500   7,23985-6   0.7399 -23,7882-6   1 cried   1 -16,00000   459,00000   0.00000   -3,42852   0.12500   7,12985-6   0.68835   22,4483-6   1 cried   1 -16,00000   459,00000   0.00000   -3,42852   0.12500   7,12985-6   0.68835   22,4483-6   1 cried   1 -16,00000   45,00000   0.00000   -2,41838   0.12500   7,6005-6   0.66425   -22,1408-6   1 cried   1 -2,00000   45,00000   0.00000   -2,41838   0.12500   7,6005-6   0.66425   -22,1408-6   1 cried   1 -2,00000   45,00000   0.00000   -2,41838   0.12500   7,6005-6   0.66425   -22,1408-6   1 cried   1 -2,00000   45,00000   0.00000   -2,41838   0.12500   7,6005-6   0.66425   -22,1408-6   1 cried   1 -2,00000   45,00000   0.00000   -2,41838   0.12500   7,6005-6   0.66425   -22,1408-6   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   0.66835   | 1 (  | Grid 1           | -16.00000 | 51.00000  | 0.00000 | -2.96986  | -0.12500                  | 7.0666E-6           | 0.62343               | -20.780E-6      |
| 1 crid 1   |      |                  |           |           |         |           |                           |                     | 0.66425               | -22.140E-6      |
| 1 Grid   -1-6,0000   178,50000   0.00000   -4,20107   -0,12500   7,2232E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   225,50000   0.00000   -4,27878   -0,12500   7,2252E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   280,50000   0.00000   -4,278784   -0,12500   7,2252E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   305,00000   0.00000   -4,278784   -0,12500   7,2252E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   315,00000   0.00000   -4,26321   -0,12500   7,2252E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   315,00000   0.00000   -4,26321   -0,12500   7,2252E-6   0.72499   -24,139E-6   1 Grid   1 -16,00000   357,00000   0.00000   -4,10389   -0,12500   7,2252E-6   0.73499   -24,139E-6   1 Grid   1 -16,00000   357,00000   0.00000   -4,10389   -0,12500   7,2252E-6   0.73499   -23,178E-6   1 Grid   1 -16,00000   435,00000   0.00000   -3,42852   -0,12500   7,1978E-6   0.6835   -23,178E-6   1 Grid   1 -16,00000   435,00000   0.00000   -3,42852   -0,12500   7,1978E-6   0.6835   -22,1408-6   1 Grid   1 -16,00000   434,50000   0.00000   -2,41102   -0,12500   7,1978E-6   0.6835   -2,483E-6   1 Grid   1 -2,00000   0.00000   0.00000   -2,41102   -0,12500   7,1978E-6   0.6835   -2,483E-6   1 Grid   1 -2,00000   0.00000   0.00000   -2,41102   -0,12500   7,4698E-6   0.6233   -3,498E-6   1 Grid   1 -2,00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0   | 1 (  | Grid 1           | -16.00000 | 127.50000 | 0.00000 | -3.95867  | -0.12500                  | 7.2123E-6           | 0.70356               | -23.451E-6      |
| Grid   1 -16.0000  |      |                  |           |           |         |           |                           |                     |                       |                 |
| Grid   1 -16.0000   295.0000   0.0000   -4.30897   -0.12500   7.22658-6   0.72768   24.2108-6   1 Grid   1 -16.0000   305.0000   0.0000   0.0000   -4.2821   -0.12500   7.22528-6   0.72635   24.2108-6   1 Grid   1 -16.0000   357.0000   0.0000   0.0000   -4.2821   -0.12500   7.22528-6   0.72639   24.1308-6   1 Grid   1 -16.0000   357.0000   0.0000   0.0000   -4.2821   -0.12500   7.22528-6   0.72639   24.1318-6   1 Grid   1 -16.0000   357.0000   0.0000   0.0000   -3.95867   -0.12500   7.21238-6   0.70356   22.3418-6   1 Grid   1 -16.0000   38.20000   0.0000   -3.74853   -0.12500   7.21238-6   0.70356   22.3418-6   1 Grid   1 -16.00000   343.50000   0.00000   -3.42852   -0.12500   7.12408-6   0.68425   22.3448-6   1 Grid   1 -16.00000   343.50000   0.00000   -3.42852   -0.12500   7.16408-6   0.66425   22.1408-6   1 Grid   1 -16.00000   343.50000   0.00000   -2.41012   -0.12500   6.05868-6   0.54537   -18.1788-6   1 Grid   1 -2.00000   540.00000   0.00000   0.00000   2.35518   -0.12500   3.61528-6   0.53757   -18.1788-6   1 Grid   1 -2.00000   25.50000   0.00000   8.47847   -0.12500   0.0023346   2.34314   97.3938-6   1 Grid   1 -2.00000   0.00000   0.00000   8.47847   -0.12500   0.0023346   2.34314   97.3938-6   1 Grid   1 -2.00000   0.00000   0.00000   0.00000   6.97143   -0.12500   0.0023348   2.34314   97.3938-6   1 Grid   1 -2.00000   0.00000   0.00000   0.00000   6.97143   -0.12500   0.0023348   3.1347   -104.5886   1 Grid   1 -2.00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.0   | 1 (  | Grid 1           | -16.00000 | 204.00000 | 0.00000 | -4.26321  | -0.12500                  | 7.2252E-6           | 0.72409               | -24.135E-6      |
| 1 Grid   -1-6.00000   20.50000   0.00000   -4.29784   -0.12500   7.2252E-6   0.72465   -24.135E-6   1 Grid   1 -16.00000   306.00000   0.00000   -4.26317   -0.12500   7.2252E-6   0.72469   -24.135E-6   1 Grid   1 -16.00000   306.00000   0.00000   -4.26317   -0.12500   7.2232E-6   0.72469   -24.135E-6   1 Grid   1 -16.00000   382.50000   0.00000   -3.73453   -0.12500   7.2232E-6   0.72469   -23.35E-6   1 Grid   1 -16.00000   382.50000   0.00000   -3.73453   -0.12500   7.1252E-6   0.72636   -23.451E-6   1 Grid   1 -16.00000   433.50000   0.00000   -3.73453   -0.12500   7.12507   -7.1260E-6   0.66855   -22.346E-6   1 Grid   1 -16.00000   343.50000   0.00000   -2.95698   -0.12500   7.1666E-6   0.66855   -22.346E-6   1 Grid   1 -16.00000   340.00000   0.00000   -2.95698   -0.12500   7.1666E-6   0.62343   -20.7866E-6   1 Grid   1 -16.00000   340.00000   0.00000   -2.95698   -0.12500   7.1656E-6   0.37463   -20.358E-6   1 Grid   1 -2.00000   340.00000   0.00000   0.00000   2.95682   -0.12500   0.0012660   1.6126   -33.3982-6   1 Grid   1 -2.00000   35.50000   0.00000   0.00000   2.95682   -0.12500   0.0012660   1.6126   -33.3982-6   1 Grid   1 -2.00000   35.50000   0.00000   0.00000   7.95511   -0.12500   0.0025357   3.0704   101.8482-6   1 Grid   1 -2.00000   35.00000   0.00000   6.72264   -0.12500   0.0025358   3.1376   -103.5882-6   1 Grid   1 -2.00000   13.00000   0.00000   6.72264   -0.12500   0.0025359   3.1376   -103.5882-6   1 Grid   1 -2.00000   13.00000   0.00000   6.72264   -0.12500   0.0025359   3.1376   -103.5882-6   1 Grid   1 -2.00000   13.00000   0.00000   6.72264   -0.12500   0.0025359   3.1376   -103.5882-6   1 Grid   1 -2.00000   13.00000   0.00000   6.72264   -0.12500   0.0025359   3.1393   -105.872-6   1 Grid   1 -2.00000   37.50000   0.00000   6.73264   -0.12500   0.0025359   3.1393   -105.872-6   1 Grid   1 -2.00000   37.50000   0.00000   6.73264   -0.12500   0.0025359   3.1393   -105.872-6   1 Grid   1 -2.00000   33.50000   0.00000   6.73264   -0.12500   0.0025359   3.1393   -105.872-6   1 Gr   |      |                  |           |           | 0.00000 |           | -0.12500                  |                     |                       |                 |
| Grid   1 -16.0000   337.0000   0.0000   -4.20107   -0.12500   7.2232E-6   0.71399   -23.982E-6   1 Grid   1 -16.0000   337.0000   0.0000   -4.20168   -0.12500   7.2232E-6   0.7238   -23.782E-6   1 Grid   1 -16.0000   337.0000   0.0000   -3.42852   -0.12500   7.2232E-6   0.7336   -23.582E-6   1 Grid   1 -16.0000   433.5000   0.0000   -3.42852   -0.12500   7.1252E-6   0.7238   -23.782E-6   1 Grid   1 -16.0000   433.5000   0.0000   -3.42852   -0.12500   7.0668E-6   0.62343   -20.7826   -20.12500   -1.0668E-6   0.62343   -20.7826   -20.12500   -2.06000      | 1 (  | Grid 1           | -16.00000 | 280.50000 | 0.00000 | -4.29784  | -0.12500                  | 7.2262E-6           | 0.72635               | -24.210E-6      |
| 1 Grid   -16.00000   387.500000   0.00000   -4.10385   -0.12500   7.2195E-6   0.71349   2.738EE-6   1 Grid   1 -16.000000   40.00000   0.00000   -3.79887   -0.12500   7.1278EE-6   0.68833   -22.451E-6   1 Grid   1 -16.00000   489.00000   0.00000   -3.748433   -0.12500   7.1978EE-6   0.68833   -22.451E-6   1 Grid   1 -16.00000   489.00000   0.00000   -2.45986   -0.12500   7.1978EE-6   0.68833   -22.451E-6   1 Grid   1 -16.00000   489.00000   0.00000   -2.45986   -0.12500   0.6666E-6   0.62433   -20.780E-6   1 Grid   1 -6.00000   510.00000   0.00000   -2.45102   -0.12500   0.6666E-6   0.54537   -1878E-6   1 Grid   1 -2.00000   0.00000   0.00000   2.35518   0.12500   0.6152E-6   0.74537   -1878E-6   1 Grid   1 -2.00000   2.50000   0.00000   0.00000   0.743986   -0.12500   0.0025346   1.6126-3.7988-6   1 Grid   1 -2.00000   7.50000   0.00000   0.00000   0.743986   -0.12500   0.0025346   1.6126-3.7988-6   1 Grid   1 -2.00000   17.50000   0.00000   0.00000   0.743986   -0.12500   0.0025345   3.1250-1036   6.6666-6   1 Grid   1 -2.00000   15.00000   0.00000   6.79143   -0.12500   0.0025358   3.1250-1036   6.6666-6   1 Grid   1 -2.00000   15.00000   0.00000   6.75778   -0.12500   0.0025359   3.1347-104.68E-6   1 Grid   1 -2.00000   15.00000   0.00000   6.75778   -0.12500   0.0025359   3.1347-104.68E-6   1 Grid   1 -2.00000   15.00000   0.00000   6.55778   -0.12500   0.0025359   3.1347-104.68E-6   1 Grid   1 -2.00000   2.50000   0.00000   6.55778   -0.12500   0.0025359   3.1340-105.62E-6   1 Grid   1 -2.00000   2.500000   0.00000   6.34352   -0.12500   0.0025359   3.1389-106.10E-6   1 Grid   1 -2.00000   2.500000   0.00000   6.34352   -0.12500   0.0025359   3.1389-106.10E-6   1 Grid   1 -2.00000   2.500000   0.00000   6.34352   -0.12500   0.0025359   3.1389-106.10E-6   1 Grid   1 -2.00000   2.500000   0.00000   6.34352   -0.12500   0.0025359   3.1389-106.10E-6   1 Grid   1 -2.00000   2.500000   0.00000   6.34352   -0.12500   0.0025359   3.1389-106.10E-6   1 Grid   1 -2.00000   3.500000   0.00000   6.34352   -0.12500     |      |                  |           |           | 0.00000 |           | -0.12500                  |                     | 0.72409               |                 |
| 1 Grid   -16.00000   382.50000   0.00000   -3.74853   -0.12500   7.2123E-6   0.70356   22.548E-6   1 Grid   1 -6.00000   484.50000   0.00000   -3.74853   -0.12500   7.1378E-6   0.68632   -22.140E-6   1 Grid   1 -16.00000   484.50000   0.00000   -3.42852   -0.12500   7.1640E-6   0.68632   -22.140E-6   1 Grid   1 -16.00000   484.50000   0.00000   -2.45102   -0.12500   0.6458E-6   0.35507   -18.178E-6   1 Grid   1 -2.00000   5.00000   0.00000   -2.35518   -0.12500   0.0012680   1.6126   -53.498E-6   1 Grid   1 -2.00000   5.00000   0.00000   0.75518   -0.12500   0.0025355   0.37068   -1.2558E-6   1 Grid   1 -2.00000   5.00000   0.00000   0.75518   -0.12500   0.0025355   0.3704   -10.184E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   0.75518   -0.12500   0.0025355   0.3704   -10.184E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   0.75518   -0.12500   0.0025355   0.3704   -10.184E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   6.72264   -0.12500   0.0025355   0.3704   -10.184E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   6.72264   -0.12500   0.0025355   0.3704   -10.184E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   6.72264   -0.12500   0.0025355   0.31567   -105.52E-6   1 Grid   1 -2.00000   1 -0.0000   0.00000   6.72264   -0.12500   0.0025355   0.31567   -105.52E-6   1 Grid   1 -2.00000   1 -0.00000   0.00000   6.72264   -0.12500   0.0025355   0.31547   -105.52E-6   1 Grid   1 -2.00000   1 -0.00000   0.00000   6.44916   -0.12500   0.0025355   0.3193   -105.62E-6   1 Grid   1 -2.00000   1 -0.00000   0.00000   6.44916   -0.12500   0.0025355   0.3193   -105.62E-6   1 Grid   1 -2.00000   2 -0.00000   0.00000   6.30522   -0.12500   0.0025355   0.3193   -106.62E-6   1 Grid   1 -2.00000   2 -0.00000   0.00000   6.30522   -0.12500   0.0025355   3.1933   -106.62E-6   1 Grid   1 -2.00000   3 -0.00000   0.00000   6.30522   -0.12500   0.0025355   3.1933   -106.62E-6   1 Grid   1 -2.00000   3 -0.00000   0.00000   6.30522   -0.12500   0.0025355   3.1933   -106.62E-6   1 Grid   1 -2.00000   3 -0.00000   0.00000   6.305   |      |                  |           |           | 0.00000 |           | -0.12500                  |                     | 0.71349               | -23.782E-6      |
| 1 Grid   -1-6.00000   433,00000   0.00000   -3.42852   -0.12500   7.1640E-6   0.66425   -2.140E-6   1 Grid   1   -16.00000   435,00000   0.00000   -2.49596   -0.12500   7.0666E-6   0.54337   -2.140E-6   1 Grid   1   -16.00000   310,00000   0.00000   -2.49516   -0.12500   6.6458E-6   0.54337   -2.158E-6   1 Grid   1   -2.00000   25.500000   0.00000   8.47847   -0.12500   0.0025357   3.77600   -2.15358E   1 Grid   1   -2.00000   25.500000   0.00000   7.34966   -0.12500   0.0025357   3.7074   -7.10166E-6   1 Grid   1   -2.00000   7.550000   0.00000   7.34966   -0.12500   0.0025357   3.7074   -7.10166E-6   1 Grid   1   -2.00000   7.550000   0.00000   7.34966   -0.12500   0.0025357   3.7074   -7.10166E-6   1 Grid   1   -2.00000   7.50000   0.00000   6.79143   -0.12500   0.0025357   3.1547   -104.68E-6   1 Grid   1   -2.00000   7.50000   0.00000   6.79143   -0.12500   0.0025359   3.1250   -103.66E-6   1 Grid   1   -2.00000   7.50000   0.00000   6.75036   -0.12500   0.0025359   3.1547   -104.68E-6   1 Grid   1   -2.00000   7.50000   0.00000   6.75036   -0.12500   0.0025359   3.1547   -104.68E-6   1 Grid   1   -2.00000   7.50000   0.00000   6.35032   -0.12500   0.0025359   3.1589   -105.62E-6   1 Grid   1   -2.00000   27.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   27.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   28.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   28.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   28.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   28.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   33.500000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   33.50000   0.00000   6.34525   -0.12500   0.0025359   3.1589   -106.62E-6   1 Grid   1   -2.00000   33.5000   |      |                  |           |           |         |           | -0.12500                  |                     |                       |                 |
| Grid   1-16.00000   484.50000   0.00000   -2.45118   -0.12500   6.6458E-6   0.54537 -18.178E-6   1   Grid   1   -2.00000   510.00000   0.000000   -2.351518   -0.12500   0.0125600   1.6126   1.6126   -3.4598E-6   1   Grid   1   -2.00000   25.50000   0.000000   4.78847   -0.12500   0.0025346   1.6126   -3.4598E-6   1   Grid   1   -2.00000   102.0000   0.000000   4.78847   -0.12500   0.0025346   3.4516   -7.5588E-6   1   Grid   1   -2.00000   102.00000   0.000000   6.72648   -0.12500   0.0025338   3.1250   -1013.68E-6   1   Grid   1   -2.00000   102.00000   0.000000   6.72548   -0.12500   0.0025339   3.1250   -1013.68E-6   1   Grid   1   -2.00000   127.50000   0.000000   6.72548   -0.12500   0.0025359   3.1726   -105.25E-6   1   Grid   1   -2.00000   127.50000   0.000000   6.55778   -0.12500   0.0025359   3.1913   -105.87E-6   1   Grid   1   -2.00000   240.00000   0.000000   6.38052   -0.12500   0.0025359   3.1913   -105.87E-6   1   Grid   1   -2.00000   240.00000   0.000000   6.38052   -0.12500   0.0025359   3.1913   -105.87E-6   1   Grid   1   -2.00000   240.00000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.10E-6   1   Grid   1   -2.00000   280.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.10E-6   1   Grid   1   -2.00000   280.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.10E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.0025359   3.1983   -106.02E-6   1   Grid   1   -2.00000   380.50000   0.00000   6.38052   -0.12500   0.00   | 1 (  |                  | -16.00000 | 433.50000 | 0.00000 | -3.42852  | -0.12500                  |                     | 0.66425               | -22.140E-6      |
| 1   Grid   -2.00000   29.50000   0.00000   0.00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.000000   0.000000   0.000000   0.0000000   0.0000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.00000000   | 1 (  |                  | -16.00000 | 459.00000 | 0.00000 |           | -0.12500                  |                     | 0.62343               | -20.780E-6      |
| Grid   -2.00000   25.50000   0.00000   7.91511   -0.12500   0.0025378   3.1250   -103.68E-6   1 Grid   -2.00000   102.00000   0.00000   7.91511   -0.12500   0.0025378   3.1250   -103.68E-6   1 Grid   -2.00000   102.00000   0.00000   6.97143   -0.12500   0.0025378   3.1250   -103.68E-6   1 Grid   -2.00000   178.50000   0.00000   6.97143   -0.12500   0.0025378   3.1250   -103.68E-6   1 Grid   -2.00000   178.50000   0.00000   6.97143   -0.12500   0.0025378   3.1250   -103.68E-6   1 Grid   -2.00000   178.50000   0.00000   6.49146   -0.12500   0.0025379   3.1840   -105.62E-6   1 Grid   -2.00000   229.50000   0.00000   6.49146   -0.12500   0.0025379   3.1840   -105.62E-6   1 Grid   -2.00000   229.50000   0.00000   6.34052   -0.12500   0.0025379   3.1958   -106.02E-6   1 Grid   -2.00000   259.50000   0.00000   6.34052   -0.12500   0.0025379   3.1958   -106.02E-6   1 Grid   -2.00000   239.50000   0.00000   6.33036   -0.12500   0.0025379   3.1958   -106.02E-6   1 Grid   -2.00000   239.50000   0.00000   6.33036   -0.12500   0.0025379   3.1958   -106.02E-6   1 Grid   -2.00000   239.50000   0.00000   6.33036   -0.12500   0.0025379   3.1958   -106.102E-6   1 Grid   -2.00000   239.50000   0.00000   6.33036   -0.12500   0.0025379   3.1958   -106.102E-6   1 Grid   -2.00000   337.50000   0.00000   6.5778   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   382.50000   0.00000   6.5778   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   6.5778   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   6.57264   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   6.72644   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   6.72449   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   6.73478   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.00000   439.50000   0.00000   7.5378   -0.12500   0.0025379   3.1951   -105.62E-6   1 Grid   -2.   |      |                  | -16.00000 |           | 0.00000 | -2.41102  | -0.12500                  |                     | 0.37608               | -12.535E-6      |
| 1 Grid   -2.00000   51.00000   0.00000   7.34986   -0.12500   0.0025358   3.1255   -103.668-6     1 Grid   -2.00000   127.500000   0.000000   6.72348   -0.12500   0.0025358   3.1255   -103.668-6     1 Grid   -2.00000   127.500000   0.000000   6.72248   -0.125000   0.0025359   3.1255   -103.668-6     1 Grid   -2.00000   127.500000   0.000000   6.72248   -0.125000   0.0025359   3.1257   -104.658-6     1 Grid   -2.00000   127.500000   0.000000   6.72248   -0.125000   0.0025359   3.1913   -105.878-6     1 Grid   -2.00000   128.500000   0.000000   6.30052   -0.125000   0.0025359   3.1913   -105.878-6     1 Grid   -2.00000   295.500000   0.000000   6.30525   -0.125000   0.0025359   3.1913   -106.108-6     1 Grid   -2.00000   295.500000   0.000000   6.30525   -0.125000   0.0025359   3.1983   -106.108-6     1 Grid   -2.00000   205.500000   0.000000   6.34535   -0.125000   0.0025359   3.1983   -106.108-6     1 Grid   -2.00000   335.500000   0.000000   6.34535   -0.125000   0.0025359   3.1983   -106.108-6     1 Grid   -2.00000   337.500000   0.000000   6.34535   -0.125000   0.0025359   3.1983   -106.108-6     1 Grid   -2.00000   337.500000   0.000000   6.55778   -0.125000   0.0025359   3.1983   -106.108-6     1 Grid   -2.00000   337.500000   0.000000   6.55778   -0.125000   0.0025359   3.1913   -105.878-6     1 Grid   -2.00000   337.500000   0.000000   6.55778   -0.125000   0.0025359   3.1913   -106.108-6     1 Grid   -2.00000   435.500000   0.000000   7.34986   -0.125000   0.0025359   3.1547   -104.658-6     1 Grid   -2.00000   435.500000   0.000000   7.34986   -0.125000   0.0025359   3.1547   -104.658-6     1 Grid   -2.00000   435.500000   0.000000   7.34986   -0.125000   0.0025357   3.1547   -104.658-6     1 Grid   -2.00000   435.500000   0.000000   7.34986   -0.125000   0.0025357   3.1547   -104.658-6     1 Grid   -2.00000   435.500000   0.000000   7.34986   -0.125000   0.0025357   3.1547   -104.658-6     1 Grid   -2.00000   435.500000   0.0000000   7.34986   -0.125000   0.0025357   3.1547   -0.12500   -0.025357      |      |                  |           |           |         |           |                           |                     | 1.6126                | -53.499E-6      |
| 1   Grid   -2.00000   76.50000   0.00000   0.39143   -0.12500   0.0025358   3.1250   -103.66E-6   1   Grid   1   -2.00000   127.50000   0.000000   6.72264   -0.12500   0.0025359   3.1547   -104.65E-6   1   Grid   1   -2.00000   178.50000   0.000000   6.72264   -0.12500   0.0025359   3.1726   -105.25E-6   1   Grid   1   -2.00000   178.50000   0.000000   6.72264   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   178.50000   0.000000   6.43916   -0.12500   0.0025359   3.1843   -105.62E-6   1   Grid   1   -2.00000   225.50000   0.000000   6.43916   -0.12500   0.0025359   3.1813   -105.62E-6   1   Grid   1   -2.00000   225.50000   0.000000   6.43916   -0.12500   0.0025359   3.1931   -106.61E-6   1   Grid   1   -2.00000   285.50000   0.000000   6.43916   -0.12500   0.0025359   3.1931   -106.18E-6   1   Grid   1   -2.00000   280.50000   0.00000   6.349152   -0.12500   0.0025359   3.1939   -106.18E-6   1   Grid   1   -2.00000   331.50000   0.00000   6.38052   -0.12500   0.0025359   3.1938   -106.18E-6   1   Grid   1   -2.00000   337.00000   0.00000   6.55778   -0.12500   0.0025359   3.1938   -106.02E-6   1   Grid   1   -2.00000   387.00000   0.00000   6.55778   -0.12500   0.0025359   3.1938   -106.02E-6   1   Grid   1   -2.00000   382.50000   0.00000   6.55778   -0.12500   0.0025359   3.1934   -105.62E-6   1   Grid   1   -2.00000   483.50000   0.00000   6.73743   -0.12500   0.0025359   3.1947   -105.62E-6   1   Grid   1   -2.00000   483.50000   0.00000   6.73743   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   483.50000   0.00000   6.73743   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   484.50000   0.00000   6.73743   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   484.50000   0.00000   7.37443   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   484.50000   0.00000   7.37443   -0.12500   0.0025359   3.1840   -105.62E-6   1   Grid   1   -2.00000   484.50000   0.00000   7.37443   -0.12500   0.0025359   3.1   |      | Grid 1<br>Grid 1 |           | 51.00000  | 0.00000 | 7.91511   | -0.12500                  | 0.0025346           | 3.0704                | -101.84E-6      |
| 1 Grid   -2.00000   127.50000   0.00000   6.72264   -0.12500   0.0025359   3.1376   -105.628-6   1 Grid   1   -2.00000   178.50000   0.000000   6.44916   -0.12500   0.0025359   3.1840   -105.628-6   1 Grid   1   -2.00000   24.00000   0.00000   6.44916   -0.12500   0.0025359   3.1931   -105.628-6   1 Grid   1   -2.00000   24.00000   0.00000   6.34952   -0.12500   0.0025359   3.1931   -105.628-6   1 Grid   1   -2.00000   25.50000   0.000000   6.34952   -0.12500   0.0025359   3.1931   -106.108-6   1 Grid   -2.00000   285.50000   0.000000   6.34952   -0.12500   0.0025359   3.1931   -106.108-6   1 Grid   -2.00000   285.50000   0.000000   6.34952   -0.12500   0.0025359   3.1931   -106.108-6   1 Grid   -2.00000   381.5000   0.00000   6.34952   -0.12500   0.0025359   3.1931   -105.108-6   1 Grid   -2.00000   387.00000   0.00000   6.34952   -0.12500   0.0025359   3.1933   -105.108-6   1 Grid   -2.00000   387.00000   0.00000   6.55778   -0.12500   0.0025359   3.1940   -105.628-6   1 Grid   -2.00000   387.00000   0.00000   6.55778   -0.12500   0.0025359   3.1940   -105.628-6   1 Grid   -2.00000   488.00000   0.00000   6.97143   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105.628-6   1 Grid   -2.00000   489.00000   0.00000   7.39486   -0.12500   0.0025359   3.1726   -105   |      |                  |           | 76.50000  | 0.00000 | 7.34986   | -0.12500                  |                     | 3.1250                | -103.66E-6      |
| Grid   -2.0000   153.0000   0.00000   6.55778   -0.12500   0.0025359   3.1840   -105.628-6   1   Grid   -2.00000   244.00000   0.00000   6.48916   -0.12500   0.0025359   3.1933   -105.878-6   1   Grid   -2.00000   224.00000   0.00000   6.38052   -0.12500   0.0025359   3.1933   -105.188-6   1   Grid   -2.00000   255.00000   0.000000   6.38052   -0.12500   0.0025359   3.1938   -106.188-6   1   Grid   -2.00000   255.00000   0.000000   6.38052   -0.12500   0.0025359   3.1938   -106.188-6   1   Grid   -2.00000   255.00000   0.000000   6.38052   -0.12500   0.0025359   3.1938   -106.188-6   1   Grid   -2.00000   316.00000   0.00000   6.38052   -0.12500   0.0025359   3.1938   -106.028-6   1   Grid   -2.00000   331.50000   0.00000   6.48916   -0.12500   0.0025359   3.1938   -106.028-6   1   Grid   -2.00000   382.50000   0.00000   6.48916   -0.12500   0.0025359   3.1938   -105.628-6   1   Grid   -2.00000   382.50000   0.00000   6.72264   -0.12500   0.0025359   3.1840   -105.628-6   1   Grid   -2.00000   483.50000   0.00000   6.72264   -0.12500   0.0025359   3.1547   -104.658-6   1   Grid   -2.00000   484.50000   0.000000   7.34986   -0.12500   0.0025359   3.1547   -104.658-6   1   Grid   -2.00000   484.50000   0.000000   7.34986   -0.12500   0.0025358   3.1547   -104.658-6   1   Grid   -2.00000   484.50000   0.000000   7.34986   -0.12500   0.0025358   3.1547   -104.658-6   1   Grid   -2.00000   484.50000   0.000000   7.34986   -0.12500   0.0025358   3.1547   -104.658-6   1   Grid   -2.00000   484.50000   0.000000   7.34986   -0.12500   0.0025358   3.1547   -104.658-6   1   Grid   -2.00000   5.000000   0.000   |      |                  |           |           |         |           | -0.12500                  |                     |                       | -105.25E-6      |
| 1 Grid   -2.00000   204,00000   0.00000   6.38052   -0.12500   0.0025399   3.1958   -106,028-6   1 Grid   1   -2.00000   255,00000   0.00000   6.33036   -0.12500   0.0025399   3.1991   -106,138-6   1 Grid   1   -2.00000   280,00000   0.00000   6.34052   -0.12500   0.0025399   3.1993   -106,108-6   1 Grid   1   -2.00000   306,00000   0.00000   6.38052   -0.12500   0.0025399   3.1993   -106,108-6   1 Grid   1   -2.00000   336,00000   0.00000   6.38052   -0.12500   0.0025399   3.1993   -106,108-6   1 Grid   1   -2.00000   337,00000   0.00000   6.4916   -0.12500   0.0025399   3.1993   -106,108-6   1 Grid   1   -2.00000   337,00000   0.00000   6.55778   -0.12500   0.0025399   3.1913   -105,878-6   1 Grid   1   -2.00000   382,50000   0.00000   6.55778   -0.12500   0.0025399   3.1947   -104,658-6   1 Grid   1   -2.00000   483,00000   0.00000   6.97143   -0.12500   0.0025399   3.1947   -104,658-6   1 Grid   1   -2.00000   439,00000   0.00000   7.91511   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   -2.00000   459,00000   0.00000   7.91511   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   -2.00000   459,00000   0.00000   7.91511   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   2.00000   459,0000   0.00000   37,37443   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   2.00000   55,0000   0.00000   37,37443   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   1   2.00000   55,0000   0.00000   37,37443   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   1   2.00000   0.00000   37,37443   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   1   2.00000   0.00000   0.00000   37,37443   -0.12500   0.0025398   3.1247   -104,658-6   1 Grid   1   1   2.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.000000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.0000000   0.00000000      | 1 (  | Grid 1           |           |           | 0.00000 | 6.55778   | -0.12500                  | 0.0025359           | 3.1840                | -105.62E-6      |
| 1 Grid   -2,0000   229,50000   0.00000   6,34252   -0,12500   0.0025359   3,1983   -106,108-6   1 Grid   1   -2,00000   280,50000   0.00000   6,34252   -0,12500   0.0025359   3,1983   -106,108-6   1 Grid   1   -2,00000   331,50000   0.00000   6,34252   -0,12500   0.0025359   3,1983   -106,108-6   1 Grid   1   -2,00000   331,50000   0.00000   6,44916   -0,12500   0.0025359   3,1983   -106,108-6   1 Grid   1   -2,00000   331,50000   0.00000   6,44916   -0,12500   0.0025359   3,1983   -106,108-6   1 Grid   1   -2,00000   382,50000   0.00000   6,72264   -0,12500   0.0025359   3,1943   -105,828-6   1 Grid   1   -2,00000   382,50000   0.00000   6,72264   -0,12500   0.0025359   3,1943   -105,828-6   1 Grid   1   -2,00000   438,50000   0.00000   7,91511   -0,12500   0.0025358   3,1226   -105,828-6   1 Grid   1   -2,00000   438,50000   0.00000   7,91511   -0,12500   0.0025378   3,1726   -105,828-6   1 Grid   1   -2,00000   459,00000   0.00000   7,91511   -0,12500   0.0025378   3,0704   -101,848-6   1 Grid   1   -2,00000   510,00000   0.00000   7,91511   -0,12500   0.0025378   3,0704   -101,848-6   1 Grid   1   -2,00000   510,00000   0.00000   8,4847   -0,12500   0.0025378   3,0704   -101,848-6   1 Grid   1   -2,00000   510,00000   0.00000   7,93743   -0,12500   0.0025378   3,0704   -101,848-6   1 Grid   1   12,00000   25,50000   0.00000   77,49216   -0,12500   0,0025378   3,0704   -101,848-6   1 Grid   1   12,00000   25,50000   0.00000   77,49216   -0,12500   0,7500   233,18   0.011727   1 Grid   1   12,00000   76,50000   0.00000   77,49216   -0,12500   0,7500   233,18   0.011717   1 Grid   1   12,00000   76,50000   0.00000   77,49216   -0,12500   0,7500   233,14   0.011718   1 Grid   1   12,00000   17,50000   0.00000   75,6009   0.00000   75,0000   0,75000   0,750000   0,75000   0,   | 1 (  |                  | -2.00000  |           |         |           | -0.12500                  |                     |                       | -105.87E-6      |
| Grid   -2.0000   280.50000   0.00000   6.34252   -0.12500   0.0025359   3.1983   -106.108-6  | 1 (  | Grid 1           | -2.00000  | 229.50000 | 0.00000 | 6.34252   | -0.12500                  | 0.0025359           | 3.1983                | -106.10E-6      |
| 1 Grid   1 -2.00000   306.00000   0.000000   6.38052   -0.12500   0.0025359   3.1958   -106.028-6   1 Grid   1 -2.00000   357.00000   0.00000   6.55778   -0.12500   0.0025359   3.1958   -106.028-6   1 Grid   1 -2.00000   357.00000   0.00000   6.55778   -0.12500   0.0025359   3.1940   -105.628-6   1 Grid   1 -2.00000   408.00000   0.00000   6.55778   -0.12500   0.0025359   3.1947   -105.528-6   1 Grid   1 -2.00000   435.00000   0.00000   7.91511   -0.12500   0.0025359   3.1547   -104.658-6   1 Grid   1 -2.00000   435.00000   0.00000   7.91511   -0.12500   0.0025358   3.1250   -103.668-6   1 Grid   1 -2.00000   435.00000   0.00000   7.91511   -0.12500   0.0025358   3.1250   -103.668-6   1 Grid   1 -2.00000   435.00000   0.00000   7.91511   -0.12500   0.0025354   2.9431   97.5582-6   1 Grid   1 -2.00000   435.00000   0.00000   3.95642   -0.12500   0.0025354   2.9431   97.5582-6   1 Grid   1 -2.00000   510.00000   0.00000   3.95642   -0.12500   0.0012686   1 6.626   53.458573   1 Grid   1 12.00000   510.00000   0.00000   77.49216   -0.12500   0.0012686   1 6.626   53.458573   1 Grid   1 12.00000   510.00000   0.00000   77.03020   -0.12500   97.500   233.18   0.011727   1 Grid   1 12.00000   510.00000   0.00000   77.03020   -0.12500   97.500   233.48   0.011777   1 Grid   1 12.00000   102.00000   0.00000   75.49294   -0.12500   97.500   233.48   0.011777   1 Grid   1 12.00000   153.00000   0.00000   75.42994   -0.12500   97.500   233.48   0.011717   1 Grid   1 12.00000   153.00000   0.00000   75.42994   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.3456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.3456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.3456   -0.12500   97.500   233.53   0.011716   1 Grid     |      |                  |           |           |         |           | -0.12500                  |                     |                       |                 |
| 1 Grid   1 -2.00000   357.00000   0.00000   6.55778   -0.12500   0.00253599   3.1746   -105.528-6   1 Grid   1 -2.00000   408.00000   0.00000   6.97143   -0.12500   0.00253599   3.1746   -105.528-6   1 Grid   1 -2.00000   408.00000   0.00000   7.91496   -0.12500   0.0025359   3.1547   -104.658-6   1 Grid   1 -2.00000   435.00000   0.00000   7.91511   -0.12500   0.0025358   3.1250   -103.658-6   1 Grid   1 -2.00000   445.00000   0.00000   7.91511   -0.12500   0.0025358   3.1250   -103.668-6   1 Grid   1 -2.00000   445.0000   0.00000   3.95682   -0.12500   0.0025364   2.9431   97.5585-6   1 Grid   1 -2.00000   510.00000   0.00000   2.95682   -0.12500   0.0025364   2.9431   97.5585-6   1 Grid   1 -2.00000   510.00000   0.00000   2.95682   -0.12500   0.0012680   1.6126   -53.4985-6   1 Grid   1 -2.00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.00000   0.000000   0.   | 1 (  | Grid 1           | -2.00000  | 306.00000 | 0.00000 | 6.38052   | -0.12500                  | 0.0025359           | 3.1958                | -106.02E-6      |
| 1 Grid   -2.0000   382.50000   0.00000   6.72264   -0.12500   0.0025359   3.1547   -105.258-6   1 Grid   1 -2.00000   433.50000   0.00000   6.734986   -0.12500   0.0025359   3.1547   -104.658-6   1 Grid   1 -2.00000   433.50000   0.00000   7.34986   -0.12500   0.0025358   3.1547   -104.658-6   1 Grid   1 -2.00000   433.50000   0.00000   7.34986   -0.12500   0.0025357   3.0704   -101.848-6   1 Grid   1 -2.00000   500.00000   0.00000   8.47847   -0.12500   0.0025368   3.1540   -101.848-6   1 Grid   1 -2.00000   500.00000   0.00000   8.47847   -0.12500   0.0025368   1.6126   -53.498-6   1 Grid   1 -2.00000   510.00000   0.00000   3.47847   -0.12500   0.0025368   1.6126   -53.498-6   1 Grid   1 12.00000   2.500000   0.00000   77.49216   -0.12500   0.7002688   1.6126   -53.498-6   1 Grid   1 12.00000   51.00000   0.00000   77.49216   -0.12500   0.7500   233.18   0.017171   1 Grid   1 12.00000   76.50000   0.00000   77.49216   -0.12500   97.500   233.18   0.017171   1 Grid   1 12.00000   127.50000   0.00000   75.61521   -0.12500   97.500   233.44   0.011717   1 Grid   1 12.00000   127.500000   0.00000   75.61521   -0.12500   97.500   233.50   0.011717   1 Grid   1 12.00000   127.500000   0.00000   75.61521   -0.12500   97.500   233.50   0.011716   1 Grid   1 12.00000   127.500000   0.00000   75.61521   -0.12500   97.500   233.51   0.011716   1 Grid   1 12.00000   128.50000   0.00000   75.30973   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   229.50000   0.00000   75.19322   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   229.50000   0.00000   75.19322   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   230.50000   0.00000   75.19322   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   235.50000   0.00000   75.19322   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   235.50000   0.00000   75.19322   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   245.50000   0.00000   75.19320   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000     |      |                  |           |           | 0.00000 |           | -0.12500                  |                     | 3.1913                | -105.87E-6      |
| 1 Grid   -2,0000   433,50000   0.00000   7,34986   -0.12500   0.0025387   3.0704   -103,66E-6     1 Grid   1 -2,00000   484,50000   0.00000   7,34986   -0.12500   0.0025387   3.0704   -103,66E-6     1 Grid   1 -2,00000   548,50000   0.00000   8,47847   -0.12500   0.0025346   2,9431   -97,595E-6     1 Grid   1 -2,00000   51,00000   0.00000   3,47843   -0.12500   0.0025346   1.6126   -53,499E-6     1 Grid   1 12,00000   0.00000   0.00000   37,37443   -0.12500   0.0025346   1.6126   -53,499E-6     1 Grid   1 12,00000   51,00000   0.00000   77,03020   -0.12500   97,500   233,18   0.011727     1 Grid   1 12,00000   51,00000   0.00000   77,03020   -0.12500   97,500   233,37   0.011721     1 Grid   1 12,00000   102,00000   0.00000   75,40738   -0.12500   97,500   233,48   0.011717     1 Grid   1 12,00000   153,00000   0.00000   75,40294   -0.12500   97,500   233,48   0.011717     1 Grid   1 12,00000   153,00000   0.00000   75,42294   -0.12500   97,500   233,51   0.011717     1 Grid   1 12,00000   178,0000   0.00000   75,42294   -0.12500   97,500   233,51   0.011716     1 Grid   1 12,00000   244,00000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   244,00000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   280,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   280,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   280,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   381,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   381,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   381,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   381,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716     1 Grid   1 12,00000   381,50000   0.00000   75,42294   -0.12500   97,500   233,53   0.011716   |      |                  |           |           | 0.00000 | 6.72264   | -0.12500                  | 0.0025359           | 3.1726                | -105.25E-6      |
| 1 Grid   -2.0000   459.0000   0.00000   7.91511   -0.12500   0.0025387   3.0704   -101.848-6   1 Grid   1 -2.00000   481.80000   0.00000   8.78487   -0.12500   0.0025386   2.9431   97.5958-6   1 Grid   1 -2.00000   510.00000   0.00000   2.95682   -0.12500   0.0012685   0.94319   97.5958-6   1 Grid   1 12.00000   0.00000   0.00000   77.43216   -0.12500   97.500   233.18   0.011727   1 Grid   1 12.00000   15.00000   0.00000   77.43216   -0.12500   97.500   233.18   0.011727   1 Grid   1 12.00000   76.50000   0.00000   77.43216   -0.12500   97.500   233.18   0.011727   1 Grid   1 12.00000   16.50000   0.00000   77.43216   -0.12500   97.500   233.44   0.011718   1 Grid   1 12.00000   15.00000   0.00000   76.34738   -0.12500   97.500   233.44   0.011718   1 Grid   1 12.00000   153.00000   0.00000   75.42994   -0.12500   97.500   233.44   0.011718   1 Grid   1 12.00000   153.00000   0.00000   75.42994   -0.12500   97.500   233.48   0.011716   1 Grid   1 12.00000   153.00000   0.00000   75.42994   -0.12500   97.500   233.51   0.011716   1 Grid   1 12.00000   204.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.18922   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.18922   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   255.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.23456   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.42994   -0.12500   97.500   233.53   0.011716   1 Grid   1 12.00000   357.00000   0.00000   75.2   |      |                  |           |           | 0.00000 | 7.34986   | -0.12500                  |                     | 3.1547                | -104.65E-6      |
| 1 Grid   1   | 1 (  |                  | -2.00000  | 459.00000 | 0.00000 | 7.91511   | -0.12500                  | 0.0025357           | 3.0704                | -101.84E-6      |
| 1 Grid   12,0000   |      |                  |           |           |         |           |                           |                     |                       |                 |
| 1 Grid   1 12,00000   51,00000   0.00000   77,03020   -0.12500   97,500   233,37   0.011721  |      |                  |           | 0.00000   | 0.00000 | 37.37443  | -0.12500                  | 48.750              | 116.78                | 0.0058573       |
| Grid   12,0000   76,5000   0.0000   76,34738   -0.12500   97,500   233,44   0.011718   1   1   1   1   1   1   1   1   1   |      |                  |           |           |         |           |                           |                     |                       |                 |
| Grid   12.00000   127.50000   0.00000   75.61521   -0.12500   97.500   233.50   0.011716   1   1   1   1   1   1   1   1   1   | 1 (  | Grid 1           | 12.00000  | 76.50000  | 0.00000 | 76.34738  | -0.12500                  | 97.500              | 233.44                | 0.011718        |
| Grid   12,0000   153,0000   0.0000   75,42994   -0.12500   97,500   233.51   0.011716   1   1   1   1   1   1   1   1   1  |      |                  | 12.00000  | 102.00000 | 0.00000 | 75.90079  | -0.12500                  | 97.500              | 233.48                |                 |
| 1 Grid   1   12,0000   204,0000   0.0000   75,23456   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,0000   235.0000   0.0000   75,18002   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,0000   285.00000   0.00000   75,18002   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   280.00000   0.00000   75,18002   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   306.00000   0.00000   75,23456   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   337.00000   0.00000   75,23456   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   337.00000   0.00000   75,42994   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   337.00000   0.00000   75,42994   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   488.00000   0.00000   75,42994   -0.12500   97,500   233.53   0.011716   1 Grid   1   12,00000   488.00000   0.00000   75,90079   -0.12500   97,500   233.548   0.011717   1 Grid   1   12,00000   484.50000   0.00000   77,40328   -0.12500   97,500   233.48   0.011717   1 Grid   1   12,00000   484.50000   0.00000   77,49216   -0.12500   97,500   233.18   0.011727   1 Grid   1   12,00000   484.50000   0.00000   77,49216   -0.12500   97,500   233.18   0.011727   1 Grid   1   12,00000   0.00000   0.00000   77,49216   -0.12500   97,500   233.18   0.011727   1 Grid   1   12,00000   0.00000   0.00000   77,49216   -0.12500   48,750   116,78   0.005873   1 Grid   1   26,00000   0.00000   0.00000   0.00000   77,49216   -0.12500   48,550   116,78   0.005873   1 Grid   1   26,00000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0.000000   0   | 1 (  |                  |           | 153.00000 | 0.00000 | 75.42994  | -0.12500                  | 97.500              | 233.51                |                 |
| Grid   12,0000   229,50000   0.00000   75,19322   -0.12500   97,500   233.53   0.011716  |      |                  | 12.00000  |           | 0.00000 |           | -0.12500                  |                     |                       |                 |
| Grid   12,0000 280,5000  |      |                  | 12.00000  |           | 0.00000 | 75.19322  | -0.12500                  | 97.500              | 233.53                |                 |
| 1 Grid   1 12.00000 306.00000  | 1 (  | Grid 1           | 12.00000  | 280.50000 | 0.00000 | 75.19322  | -0.12500                  | 97.500              | 233.53                | 0.011716        |
| 1 Grid   12,0000 357,00000 0.0000 75,42994 -0.12500 97,500 233.51 0.011716   | 1 (  | Grid 1           | 12.00000  | 306.00000 | 0.00000 | 75.23456  | -0.12500                  | 97.500              | 233.53                | 0.011716        |
| Grid   12.0000 382.50000 0.0000 75.61521 -0.12500 97.500 233.50 0.011717   |      |                  |           |           |         |           |                           |                     |                       |                 |
| Grid   12,0000 433,5000 0.0000 76,34738 -0.12500 97,500 233,34 0.011718  |      |                  | 12.00000  | 382.50000 | 0.00000 | 75.61521  | -0.12500                  | 97.500              | 233.50                | 0.011717        |
| Grid   1   12,0000   459,0000   0.0000   77.03020   -0.12500   97.500   233.37   0.011721  | 1 (  |                  |           |           |         |           | -0.12500                  |                     |                       |                 |
| Grid   1   12,0000   510,00000   0.00000   37,37443   -0.12500   48,750   116.78   0.0058573     Grid   1   26,00000   0.00000   0.00000   62,02602   -0.12500   73,1525   175.85   0.0087634     Grid   1   26,00000   25,50000   0.00000   126,96064   -0.12500   146,25   351,12   0.017543     Grid   1   26,00000   51,00000   0.00000   126,96064   -0.12500   146,25   351,12   0.017543     Grid   1   26,00000   76,50000   0.00000   125,81531   -0.12500   146,25   351,57   0.017531     Grid   1   26,00000   127,50000   0.00000   125,81531   -0.12500   146,25   351,64   0.017531     Grid   1   26,00000   127,50000   0.00000   124,97425   -0.12500   146,25   351,66   0.017529     Grid   1   26,00000   178,50000   0.00000   124,97425   -0.12500   146,25   351,65   0.017528     Grid   1   26,00000   178,50000   0.00000   124,676851   -0.12500   146,25   351,66   0.017528     Grid   1   26,00000   178,50000   0.00000   124,6585   -0.12500   146,25   351,66   0.017528     Grid   1   26,00000   229,50000   0.00000   124,51074   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   229,50000   0.00000   124,51074   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   280,50000   0.00000   124,51074   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   280,50000   0.00000   124,51074   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   331,50000   0.00000   124,51074   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   331,50000   0.00000   124,6585   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   382,50000   0.00000   124,67685   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   382,50000   0.00000   124,97425   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   382,50000   0.00000   124,97425   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   382,50000   0.00000   124,97425   -0.12500   146,25   351,67   0.017528     Grid   1   26,00000   382,50000   0.00000   124,97425   -0.12500   146,25   351,67   0.017   | 1 (  | Grid 1           | 12.00000  | 459.00000 | 0.00000 |           |                           | 97.500              | 233.37                |                 |
| Grid   26.00000   0.00000   0.00000   62.02602   -0.12500   73.125   175.85   0.0087634  |      |                  |           |           |         |           |                           |                     |                       |                 |
| 1 Grid 1   | 1 (  | Grid 1           | 26.00000  | 0.00000   | 0.00000 | 62.02602  | -0.12500                  | 73.125              | 175.85                | 0.0087634       |
| $ \begin{array}{c} 1 \   \mathrm{Grid} \   1 \   26,00000 \    76,50000 \                  $   |      |                  |           |           | 0.00000 |           |                           |                     |                       |                 |
| Grid   1   26.00000   127.50000   0.00000   124.97425   -0.12500   146.25   351.64   0.017529  |      |                  |           |           | 0.00000 |           |                           |                     |                       |                 |
| 1 Grid 1 26.00000 153.00000 0.00000 124.76851 -0.12500 146.25 351.65 0.017528 1 Grid 1 26.00000 178.50000 0.00000 124.63685 -0.12500 146.25 351.65 0.017528 1 Grid 1 26.00000 178.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 229.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 285.00000 0.00000 124.455530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 280.00000 0.00000 124.49655 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 386.00000 0.00000 124.455530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 386.00000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 386.00000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 381.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 382.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 382.50000 0.00000 124.97825 -0.12500 146.25 351.64 0.017529 1 Grid 1 26.00000 433.50000 0.00000 124.97825 -0.12500 146.25 351.64 0.017529 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017529 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017529 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017529 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017529 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 430.00000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531 1 Grid 1 26.00000 433.50000 0.000000 125.81531 -0.12500 146.25 351.45 0.017531 1 Grid 1 26.000 | 1 (  | Grid 1           | 26.00000  |           |         | 125.29/47 |                           |                     |                       |                 |
| 1 Grid 1 26.00000 204.00000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 229.50000 0.00000 124.51074 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 285.00000 0.00000 124.43655 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 280.50000 0.00000 124.43655 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 280.50000 0.00000 124.51074 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 310.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 313.50000 0.00000 124.55530 -0.12500 146.25 351.67 0.017528 1 Grid 1 26.00000 317.50000 0.00000 124.5685 -0.12500 146.25 351.66 0.017528 1 Grid 1 26.00000 377.50000 0.00000 124.97825 -0.12500 146.25 351.66 0.017528 1 Grid 1 26.00000 377.500000 0.00000 124.97825 -0.12500 146.25 351.66 0.017528 1 Grid 1 26.00000 400.00000 0.00000 124.97825 -0.12500 146.25 351.65 0.017528 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531  | 1 (  | Grid 1           | 26.00000  | 153.00000 | 0.00000 | 124.76851 | -0.12500                  | 146.25              | 351.65                | 0.017528        |
| 1 Grid   1 26.00000 229.50000 0.00000 124.51074 -0.12500 146.25 351.67 0.017528     1 Grid   1 26.00000 255.00000 0.00000 124.49655 -0.12500 146.25 351.67 0.017528     1 Grid   1 26.00000 280.50000 0.00000 124.51074 -0.12500 146.25 351.67 0.017528     1 Grid   1 26.00000 306.00000 0.00000 124.51074 -0.12500 146.25 351.67 0.017528     1 Grid   1 26.00000 331.50000 0.00000 124.65530 -0.12500 146.25 351.66 0.017528     1 Grid   1 26.00000 331.50000 0.00000 124.63685 -0.12500 146.25 351.66 0.017528     1 Grid   1 26.00000 382.50000 0.00000 124.97425 -0.12500 146.25 351.65 0.017528     1 Grid   1 26.00000 382.50000 0.00000 124.97425 -0.12500 146.25 351.65 0.017529     1 Grid   1 26.00000 408.00000 0.00000 124.97425 -0.12500 146.25 351.65 0.017529     1 Grid   1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531     1 Grid   1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531     1 Grid   1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531     1 Grid   1 26.00000 430.500000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531     1 Grid   1 26.00000 470.00000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531     1 Grid   1 26.00000 470.00000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531     1 Grid   1 26.00000 470.00000 0.00000 125.81531 -0.12500 146.25 351.65 0.017531     1 Grid   1 26.00000 470.00000 0.00000 125.81531 -0.12500 146.25 351.48 0.017534     1 Grid   1 26.00000 470.00000 0.00000 125.81531 -0.12500 146.25 351.48 0.017534     1 Grid   1 26.00000 470.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000  |      |                  |           |           |         |           |                           |                     |                       |                 |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  | 1 (  | Grid 1           | 26.00000  |           | 0.00000 | 124.51074 | -0.12500                  | 146.25              | 351.67                | 0.017528        |
| 1 Grid 1   |      |                  |           |           |         | 124.51074 |                           |                     |                       |                 |
| 1 Grid 1 26.00000 357.00000 0.00000 124.76851 -0.12500 146.25 351.65 0.017528<br>1 Grid 1 26.00000 382.50000 0.00000 124.97425 -0.12500 146.25 351.66 0.017528<br>1 Grid 1 26.00000 408.00000 0.00000 125.29747 -0.12500 146.25 351.62 0.017530<br>1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531<br>1 Grid 1 26.00000 459.00000 0.00000 126.8223 -0.12500 146.25 351.58 0.017531   | 1 (  | Grid 1           | 26.00000  | 306.00000 | 0.00000 | 124.55530 | -0.12500                  | 146.25              | 351.67                | 0.017528        |
| 1 Grid 1 26.00000 382.50000 0.00000 124.97425 -0.12500 146.25 351.64 0.017529<br>1 Grid 1 26.00000 408.00000 0.00000 125.29747 -0.12500 146.25 351.62 0.017530<br>1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531<br>1 Grid 1 26.00000 459.00000 0.00000 126.62283 -0.12500 146.25 351.48 0.017534   |      |                  | 26.00000  |           | 0.00000 | 124.63685 |                           | 146.25              | 351.66<br>351.65      | 0.017528        |
| 1 Grid 1 26.00000 433.50000 0.00000 125.81531 -0.12500 146.25 351.57 0.017531<br>1 Grid 1 26.00000 459.00000 0.00000 126.62283 -0.12500 146.25 351.48 0.017534   | 1 (  | Grid 1           | 26.00000  | 382.50000 | 0.00000 | 124.97425 | -0.12500                  | 146.25              | 351.64                | 0.017529        |
| 1 Grid 1 26.00000 459.00000 0.00000 126.62283 -0.12500 146.25 351.48 0.017534  |      |                  | 26.00000  |           | 0.00000 |           | -0.12500<br>-0.12500      |                     |                       |                 |
| 1 Grid 1 26.00000 484.50000 0.00000 126.96064 -0.12500 146.25 351.21 0.017543  | 1 (  | Grid 1           | 26.00000  | 459.00000 | 0.00000 | 126.62283 | -0.12500                  | 146.25              | 351.48                | 0.017534        |
|  | 1 (  | GIIG I           | 26.00000  | 404.50000 | 0.00000 | 120.96064 | -0.12500                  | 146.25              | 351.21                | 0.01/543        |

Arup

Northern SPA
Eastern Mound
Section F-FF

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Ref. Name                        | ×                                   | У                                   | z                             | δz                                  | Stress:                          | Stress:                        | Stress:                        | Vert.                            |
|----------------------------------|-------------------------------------|-------------------------------------|-------------------------------|-------------------------------------|----------------------------------|--------------------------------|--------------------------------|----------------------------------|
|                                  |                                     |                                     |                               |                                     | Calc.<br>Level                   |                                | Sum Princ.                     | Strain                           |
| 1 Grid 1                         | [m]<br>26.00000                     | [m]<br>510.00000                    | [mOD]<br>0.00000              | [mm]<br>62.02602                    | [mOD]<br>-0.12500                | [kN/m <sup>2</sup> ]<br>73.125 | [kN/m <sup>2</sup> ]<br>175.85 | [µ]<br>0.0087634                 |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 0.00000<br>25.50000                 | 0.00000                       | 84.30175<br>171.72218               | -0.12500<br>-0.12500             | 97.501<br>195.00               | 234.65<br>468.69               | 0.011679<br>0.023377             |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 51.00000<br>76.50000                | 0.00000                       | 171.46150<br>170.52735              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.04<br>469.15               | 0.023366                         |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 102.00000<br>127.50000<br>153.00000 | 0.00000                       | 169.93851<br>169.57836              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.20<br>469.23<br>469.24     | 0.023360                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 40.00000<br>40.00000<br>40.00000    | 178.50000<br>204.00000              | 0.00000<br>0.00000<br>0.00000 | 169.35283<br>169.21026<br>169.12271 | -0.12500<br>-0.12500<br>-0.12500 | 195.00<br>195.00<br>195.00     | 469.25<br>469.26               | 0.023359<br>0.023359<br>0.023358 |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 229.50000<br>255.00000              | 0.00000                       | 169.07512<br>169.06001              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.26<br>469.26               | 0.023358                         |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 280.50000<br>306.00000              | 0.00000                       | 169.07512<br>169.12271              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.26<br>469.26               | 0.023358                         |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 331.50000<br>357.00000              | 0.00000                       | 169.21026<br>169.35283              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.25<br>469.24               | 0.023359                         |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 382.50000<br>408.00000              | 0.00000                       | 169.57836<br>169.93851              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.23<br>469.20               | 0.023360                         |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 433.50000<br>459.00000              | 0.00000                       | 170.52735<br>171.46150              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 469.15<br>469.04               | 0.023362<br>0.023366             |
| 1 Grid 1<br>1 Grid 1             | 40.00000                            | 484.50000<br>510.00000              | 0.00000                       | 171.72218<br>84.30175               | -0.12500<br>-0.12500             | 195.00<br>97.501               | 468.69<br>234.65               | 0.023377<br>0.011679             |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 0.00000<br>25.50000                 | 0.00000                       | 101.30283<br>205.97551              | -0.12500<br>-0.12500             | 121.87<br>243.75               | 292.19<br>583.69               | 0.014635<br>0.029294             |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 54.00000<br>54.00000                | 51.00000<br>76.50000<br>102.00000   | 0.00000<br>0.00000<br>0.00000 | 205.73452<br>204.67878<br>204.02282 | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75<br>243.75     | 584.11<br>584.23<br>584.29     | 0.029280<br>0.029276<br>0.029274 |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 127.50000                           | 0.00000                       | 203.62815                           | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.32<br>584.33               | 0.029273                         |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 178.50000<br>204.00000              | 0.00000                       | 203.23182                           | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.34<br>584.35               | 0.029272                         |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 229.50000<br>255.00000              | 0.00000                       | 203.08852<br>203.07258              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.35<br>584.36               | 0.029272                         |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 280.50000<br>306.00000              | 0.00000                       | 203.08852<br>203.13883              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.35<br>584.35               | 0.029272<br>0.029272             |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000                | 331.50000<br>357.00000              | 0.00000                       | 203.23182<br>203.38435              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.34<br>584.33               | 0.029272<br>0.029272             |
| 1 Grid 1<br>1 Grid 1             | 54.00000<br>54.00000<br>54.00000    | 382.50000<br>408.00000              | 0.00000                       | 203.62815                           | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.32<br>584.29               | 0.029273                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 54.00000<br>54.00000                | 433.50000<br>459.00000<br>484.50000 | 0.00000<br>0.00000<br>0.00000 | 204.67878<br>205.73452<br>205.97551 | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75<br>243.75     | 584.23<br>584.11<br>583.69     | 0.029276<br>0.029280<br>0.029294 |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 54.00000<br>54.00000<br>68.00000    | 510.00000                           | 0.00000                       | 101.30283                           | -0.12500<br>-0.12500<br>-0.12500 | 121.87<br>121.88               | 292.19                         | 0.014635                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 68.00000<br>68.00000                | 25.50000<br>51.00000                | 0.00000                       | 217.77950<br>217.56576              | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75               | 585.67<br>586.15               | 0.029228                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>68.00000                | 76.50000<br>102.00000               | 0.00000                       | 216.40125<br>215.68562              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.29<br>586.35               | 0.029207                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>68.00000                | 127.50000<br>153.00000              | 0.00000                       | 215.26056<br>215.00083              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.38<br>586.40               | 0.029204                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>68.00000                | 178.50000<br>204.00000              | 0.00000                       | 214.83969 214.74205                 | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.41<br>586.42               | 0.029203                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>68.00000                | 229.50000<br>255.00000              | 0.00000                       | 214.68942<br>214.67278              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.42<br>586.42               | 0.029203                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000                            | 280.50000                           | 0.00000                       | 214.68942                           | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.42<br>586.42               | 0.029203                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 68.00000<br>68.00000<br>68.00000    | 331.50000<br>357.00000<br>382.50000 | 0.00000<br>0.00000<br>0.00000 | 214.83969<br>215.00083<br>215.26056 | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75<br>243.75     | 586.41<br>586.40<br>586.38     | 0.029203<br>0.029203<br>0.029204 |
| 1 Grid 1<br>1 Grid 1             | 68.00000                            | 408.00000<br>433.50000              | 0.00000                       | 215.68562<br>216.40125              | -0.12500<br>-0.12500             | 243.75<br>243.75<br>243.75     | 586.35<br>586.29               | 0.029205                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>68.00000                | 459.00000<br>484.50000              | 0.00000                       | 217.56576<br>217.77950              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 586.15<br>585.67               | 0.029212                         |
| 1 Grid 1<br>1 Grid 1             | 68.00000<br>82.00000                | 510.00000                           | 0.00000                       | 107.09861<br>140.85284              | -0.12500<br>-0.12500             | 121.88<br>170.62               | 293.23<br>408.65               | 0.014601 0.020503                |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 25.50000<br>51.00000                | 0.00000                       | 285.41855<br>285.26956              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 816.44<br>816.97               | 0.041035                         |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 76.50000<br>102.00000               | 0.00000                       | 284.01574<br>283.25121              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.12<br>817.19               | 0.041013<br>0.041010             |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 127.50000<br>153.00000              | 0.00000                       | 282.80145<br>282.52890              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.22<br>817.24               | 0.041009                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 82.00000<br>82.00000<br>82.00000    | 178.50000<br>204.00000<br>229.50000 | 0.00000<br>0.00000<br>0.00000 | 282.36090<br>282.25956<br>282.20509 | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 817.25<br>817.26<br>817.26     | 0.041008<br>0.041008<br>0.041008 |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 255.00000<br>280.50000              | 0.00000                       | 282.18790<br>282.20509              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.27<br>817.26               | 0.041008                         |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 306.00000<br>331.50000              | 0.00000                       | 282.25956<br>282.36090              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.26<br>817.25               | 0.041008                         |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 357.00000<br>382.50000              | 0.00000                       | 282.52890<br>282.80145              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.24<br>817.22               | 0.041009<br>0.041009             |
| 1 Grid 1<br>1 Grid 1             | 82.00000<br>82.00000                | 408.00000<br>433.50000              | 0.00000                       | 283.25121<br>284.01574              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.19<br>817.12               | 0.041010<br>0.041013             |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 82.00000<br>82.00000<br>82.00000    | 459.00000<br>484.50000<br>510.00000 | 0.00000<br>0.00000<br>0.00000 | 285.26956<br>285.41855<br>140.85284 | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>170.62     | 816.97<br>816.44               | 0.041018<br>0.041035<br>0.020503 |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 0.00000<br>25.50000                 | 0.00000                       | 143.66659<br>291.14802              | -0.12500<br>-0.12500<br>-0.12500 | 170.62<br>170.63<br>341.25     | 408.65<br>409.06<br>817.21     | 0.020490                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000                            | 51.00000<br>76.50000                | 0.00000                       | 291.03743<br>289.71884              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.78<br>817.95               | 0.040991                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 102.00000<br>127.50000              | 0.00000                       | 288.91902<br>288.45163              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.02<br>818.05               | 0.040983                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 153.00000<br>178.50000              | 0.00000                       | 288.17002<br>287.99719              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.07<br>818.08               | 0.040981<br>0.040981             |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 204.00000                           | 0.00000                       | 287.89327<br>287.83753              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.09<br>818.09               | 0.040980                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 96.00000<br>96.00000<br>96.00000    | 255.00000<br>280.50000<br>306.00000 | 0.00000<br>0.00000<br>0.00000 | 287.81995<br>287.83753<br>287.89327 | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 818.10<br>818.09<br>818.09     | 0.040980<br>0.040980<br>0.040980 |
| 1 Grid 1<br>1 Grid 1             | 96.00000                            | 331.50000<br>357.00000              | 0.00000                       | 287.99719<br>288.17002              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.08<br>818.07               | 0.040981                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000                            | 382.50000<br>408.00000              | 0.00000                       | 288.45163<br>288.91902              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.05<br>818.02               | 0.040982                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 433.50000<br>459.00000              | 0.00000                       | 289.71884<br>291.03743              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.95<br>817.78               | 0.040985                         |
| 1 Grid 1<br>1 Grid 1             | 96.00000<br>96.00000                | 484.50000<br>510.00000              | 0.00000                       | 291.14802<br>143.66659              | -0.12500<br>-0.12500             | 341.25<br>170.63               | 817.21<br>409.06               | 0.041010                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 110.00000<br>110.00000              | 0.00000<br>25.50000<br>51.00000     | 0.00000<br>0.00000<br>0.00000 | 148.33002<br>300.50193<br>300.44079 | -0.12500<br>-0.12500<br>-0.12500 | 170.63<br>341.25<br>341.25     | 410.13<br>819.32<br>819.91     | 0.020454<br>0.040940<br>0.040920 |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 110.00000                           | 76.50000<br>102.00000               | 0.00000                       | 299.08652<br>298.26731              | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 820.08<br>820.16               | 0.040914                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000                           | 127.50000<br>153.00000              | 0.00000                       | 297.79041<br>297.50397              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 820.19<br>820.21               | 0.040911                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000<br>110.00000              | 178.50000<br>204.00000              | 0.00000                       | 297.32860<br>297.22333              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 820.22<br>820.23               | 0.040910                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000<br>110.00000              | 229.50000<br>255.00000              | 0.00000                       | 297.16692<br>297.14914              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 820.24<br>820.24               | 0.040909                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000                           | 280.50000<br>306.00000              | 0.00000                       | 297.16692<br>297.22333              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 820.24<br>820.23               | 0.040909                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 110.00000<br>110.00000<br>110.00000 | 331.50000<br>357.00000<br>382.50000 | 0.00000<br>0.00000<br>0.00000 | 297.32860<br>297.50397<br>297.79041 | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 820.22<br>820.21<br>820.19     | 0.040910<br>0.040910<br>0.040911 |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 110.00000                           | 408.00000<br>433.50000              | 0.00000                       | 298.26731<br>299.08652              | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 820.16<br>820.08               | 0.040912                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000<br>110.00000              | 459.00000<br>484.50000              | 0.00000                       | 300.44079<br>300.50193              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 819.91<br>819.32               | 0.040920                         |
| 1 Grid 1<br>1 Grid 1             | 110.00000<br>124.00000              | 510.00000<br>0.00000                | 0.00000                       | 148.33002<br>163.67905              | -0.12500<br>-0.12500             | 170.63<br>195.00               | 410.13<br>467.24               | 0.020454<br>0.023425             |
| 1 Grid 1<br>1 Grid 1             | 124.00000                           | 25.50000<br>51.00000                | 0.00000                       | 331.14310<br>331.14582              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.51<br>934.12               | 0.046883                         |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 124.00000<br>124.00000<br>124.00000 | 76.50000<br>102.00000<br>127.50000  | 0.00000<br>0.00000<br>0.00000 | 329.78795<br>328.96671<br>328.48905 | -0.12500<br>-0.12500<br>-0.12500 | 390.00<br>390.00<br>390.00     | 934.29<br>934.36<br>934.40     | 0.046857<br>0.046855<br>0.046853 |
| 1 Grid 1<br>1 Grid 1<br>1 Grid 1 | 124.00000<br>124.00000<br>124.00000 | 153.00000<br>178.50000              | 0.00000                       | 328.48905<br>328.20231<br>328.02680 | -0.12500<br>-0.12500<br>-0.12500 | 390.00<br>390.00               | 934.42<br>934.43               | 0.046853<br>0.046852             |
| 1 Grid 1<br>1 Grid 1             | 124.00000<br>124.00000              | 204.00000                           | 0.00000                       | 327.92147<br>327.86505              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 934.44<br>934.44               | 0.046852<br>0.046852             |
| 1 Grid 1<br>1 Grid 1             | 124.00000<br>124.00000              | 255.00000<br>280.50000              | 0.00000                       | 327.84726<br>327.86505              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 934.44<br>934.44               | 0.046852<br>0.046852             |
| 1 Grid 1<br>1 Grid 1             | 124.00000<br>124.00000              | 306.00000<br>331.50000              | 0.00000                       | 327.92147<br>328.02680              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 934.44<br>934.43               | 0.046852<br>0.046852             |
|                                  |                                     |                                     |                               |                                     |                                  |                                |                                |                                  |

Arup

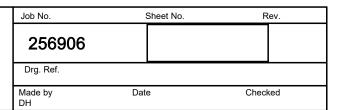
Northern SPA
Eastern Mound
Section F-FF

| Job No.   | Sheet No. | Rev.    |
|-----------|-----------|---------|
| 256906    |           |         |
| Drg. Ref. |           |         |
| Made by   | Date      | Checked |

| Ref. | Name                             | ×                                   | У                                   | z                             | δz                                  | Stress:                          | Stress:                        | Stress:                        | Vert.                              |
|------|----------------------------------|-------------------------------------|-------------------------------------|-------------------------------|-------------------------------------|----------------------------------|--------------------------------|--------------------------------|------------------------------------|
| Nel. | Name                             | •                                   | y                                   | -                             | 02                                  | Calc.<br>Level                   | Vertical                       | Sum Princ.                     | Strain                             |
|      | l Grid 1                         | [m]<br>124.00000                    | [m]<br>357.00000                    | [mOD]<br>0.00000              | [mm]<br>328.20231                   | [mOD]<br>-0.12500                | [kN/m <sup>2</sup> ]<br>390.00 | [kN/m <sup>2</sup> ]<br>934.42 | [µ]<br>0.046853                    |
| 1    | Grid 1<br>Grid 1                 | 124.00000<br>124.00000              | 382.50000<br>408.00000              | 0.00000                       | 328.48905<br>328.96671              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 934.40<br>934.36               | 0.046853                           |
| 1    | Grid 1<br>Grid 1                 | 124.00000<br>124.00000<br>124.00000 | 433.50000<br>459.00000              | 0.00000                       | 329.78795<br>331.14582              | -0.12500<br>-0.12500<br>-0.12500 | 390.00<br>390.00               | 934.29<br>934.12               | 0.046857                           |
| 1    | Grid 1<br>Grid 1                 | 124.00000<br>124.00000              | 484.50000<br>510.00000              | 0.00000                       | 331.14310<br>163.67905              | -0.12500<br>-0.12500             | 390.00<br>195.00               | 933.51<br>467.24               | 0.046883                           |
| 1    | Grid 1<br>Grid 1                 | 138.00000                           | 0.00000                             | 0.00000                       | 162.09421                           | -0.12500<br>-0.12500             | 195.00                         | 466.96<br>932.97               | 0.023435                           |
| 1    | Grid 1<br>Grid 1                 | 138.00000<br>138.00000              | 51.00000<br>76.50000                | 0.00000                       | 327.91236<br>326.58348              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.57<br>933.74               | 0.046881                           |
| 1    | Grid 1<br>Grid 1                 | 138.00000                           | 102.00000<br>127.50000              | 0.00000                       | 325.77808<br>325.30855              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.81<br>933.84               | 0.046873                           |
| 1    | Grid 1<br>Grid 1                 | 138.00000<br>138.00000              | 153.00000<br>178.50000              | 0.00000                       | 325.02608<br>324.85287              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.86<br>933.88               | 0.046871                           |
| 1    | Grid 1                           | 138.00000                           | 204.00000                           | 0.00000                       | 324.74878<br>324.69297              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.88<br>933.89               | 0.046871                           |
| 1    | Grid 1                           | 138.00000                           | 255.00000                           | 0.00000                       | 324.67537<br>324.69297              | -0.12500<br>-0.12500             | 390.00                         | 933.89                         | 0.046870                           |
|      | Grid 1<br>Grid 1                 | 138.00000<br>138.00000              | 306.00000                           | 0.00000                       | 324.74878<br>324.85287              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.88<br>933.88               | 0.046871                           |
|      | l Grid 1<br>l Grid 1             | 138.00000<br>138.00000              | 357.00000<br>382.50000              | 0.00000                       | 325.02608<br>325.30855              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.86<br>933.84               | 0.046871<br>0.046872               |
| 1    | l Grid 1<br>l Grid 1             | 138.00000<br>138.00000              | 408.00000<br>433.50000              | 0.00000                       | 325.77808<br>326.58348              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.81<br>933.74               | 0.046873<br>0.046875               |
|      | l Grid 1<br>l Grid 1             | 138.00000<br>138.00000              | 459.00000<br>484.50000              | 0.00000                       | 327.91236<br>327.89858              | -0.12500<br>-0.12500             | 390.00<br>390.00               | 933.57<br>932.97               | 0.046881                           |
|      | Grid 1<br>Grid 1                 | 138.00000<br>152.00000              | 510.00000<br>0.00000                | 0.00000                       | 162.09421<br>144.51283              | -0.12500<br>-0.12500             | 195.00<br>170.63               | 466.96<br>409.08               | 0.023435                           |
| 1    | l Grid 1<br>l Grid 1             | 152.00000<br>152.00000              | 25.50000<br>51.00000                | 0.00000                       | 292.64234<br>292.61791              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.27<br>817.83               | 0.041008                           |
| 1    | l Grid 1<br>l Grid 1             | 152.00000<br>152.00000              | 76.50000<br>102.00000               | 0.00000                       | 291.34928<br>290.57687              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 817.99<br>818.06               | 0.040984                           |
| 1    | l Grid 1<br>l Grid 1             | 152.00000<br>152.00000              | 127.50000<br>153.00000              | 0.00000                       | 290.12400<br>289.85017              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.09<br>818.11               | 0.040980<br>0.040980               |
| 1    | l Grid 1<br>l Grid 1             | 152.00000<br>152.00000              | 178.50000<br>204.00000              | 0.00000                       | 289.68159<br>289.57999              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.12<br>818.13               | 0.040979<br>0.040979               |
|      | 1 Grid 1                         | 152.00000<br>152.00000              | 229.50000<br>255.00000              | 0.00000                       | 289.52540<br>289.50817              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.13<br>818.13               | 0.040979<br>0.040979<br>0.040979   |
| 1    | Grid 1                           | 152.00000<br>152.00000              | 280.50000<br>306.00000              | 0.00000                       | 289.52540<br>289.57999              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.13<br>818.13               | 0.040979                           |
| 1    | Grid 1                           | 152.00000<br>152.00000              | 331.50000<br>357.00000              | 0.00000                       | 289.68159<br>289.85017              | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.12<br>818.11               | 0.040979                           |
|      | l Grid 1<br>l Grid 1<br>l Grid 1 | 152.00000<br>152.00000<br>152.00000 | 382.50000<br>408.00000<br>433.50000 | 0.00000                       | 290.12400<br>290.57687<br>291.34928 | -0.12500<br>-0.12500             | 341.25<br>341.25               | 818.09<br>818.06<br>817.99     | 0.040980<br>0.040981<br>0.040984   |
|      | Grid 1                           | 152.00000<br>152.00000<br>152.00000 | 433.50000<br>459.00000<br>484.50000 | 0.00000<br>0.00000<br>0.00000 | 291.34928<br>292.61791<br>292.64234 | -0.12500<br>-0.12500<br>-0.12500 | 341.25<br>341.25<br>341.25     | 817.99<br>817.83<br>817.27     | 0.040984<br>0.040989<br>0.041008   |
|      | 1 Grid 1                         | 152.00000<br>152.00000<br>166.00000 | 510.00000<br>0.00000                | 0.00000                       | 144.51283<br>136.78347              | -0.12500<br>-0.12500<br>-0.12500 | 170.63<br>170.62               | 409.08<br>406.96               | 0.041008<br>0.020489<br>0.020559   |
| 1    | Grid 1<br>Grid 1                 | 166.00000<br>166.00000              | 25.50000<br>51.00000                | 0.00000                       | 277.06038<br>276.96692              | -0.12500<br>-0.12500<br>-0.12500 | 341.24<br>341.24               | 813.10<br>813.60               | 0.020333<br>0.041144<br>0.041128   |
| 1    | Grid 1                           | 166.00000                           | 76.50000<br>102.00000               | 0.00000                       | 275.78623                           | -0.12500<br>-0.12500             | 341.24                         | 813.75<br>813.81               | 0.041123                           |
| 1    | Grid 1                           | 166.00000<br>166.00000              | 127.50000<br>153.00000              | 0.00000                       | 274.63345<br>274.37220              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.84<br>813.86               | 0.041120<br>0.041119               |
| 1    | l Grid 1                         | 166.00000<br>166.00000              | 178.50000<br>204.00000              | 0.00000                       | 274.21036<br>274.11238              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.87<br>813.88               | 0.041119<br>0.041118               |
| 1    | 1 Grid 1                         | 166.00000<br>166.00000              | 229.50000<br>255.00000              | 0.00000                       | 274.05959<br>274.04290              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.88<br>813.88               | 0.041118                           |
| 1    | l Grid 1<br>l Grid 1             | 166.00000                           | 280.50000<br>306.00000              | 0.00000                       | 274.05959<br>274.11238              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.88<br>813.88               | 0.041118<br>0.041118               |
|      | Grid 1<br>Grid 1                 | 166.00000<br>166.00000              | 331.50000<br>357.00000              | 0.00000                       | 274.21036<br>274.37220              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.87<br>813.86               | 0.041119<br>0.041119               |
| 1    | l Grid 1<br>l Grid 1             | 166.00000<br>166.00000              | 382.50000<br>408.00000              | 0.00000                       | 274.63345<br>275.06207              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.84<br>813.81               | 0.041120<br>0.041121               |
| 1    |                                  | 166.00000<br>166.00000              | 433.50000<br>459.00000              | 0.00000                       | 275.78623<br>276.96692              | -0.12500<br>-0.12500             | 341.24<br>341.24               | 813.75<br>813.60               | 0.041123<br>0.041128               |
| 1    |                                  | 166.00000<br>166.00000              | 484.50000<br>510.00000              | 0.00000                       | 277.06038<br>136.78347              | -0.12500<br>-0.12500             | 341.24<br>170.62               | 813.10<br>406.96               | 0.041144                           |
| 1    | Grid 1                           | 180.00000                           | 0.00000<br>25.50000                 | 0.00000                       | 103.77652<br>210.92304              | -0.12500<br>-0.12500             | 121.88<br>243.75               | 292.61<br>584.51               | 0.014621                           |
| 1    | Grid 1                           | 180.00000                           | 51.00000<br>76.50000                | 0.00000<br>0.00000<br>0.00000 | 210.71191 209.64087                 | -0.12500<br>-0.12500             | 243.75<br>243.75               | 584.94<br>585.07               | 0.029252                           |
| 1    | l Grid 1<br>l Grid 1<br>l Grid 1 | 180.00000<br>180.00000<br>180.00000 | 102.00000<br>127.50000<br>153.00000 | 0.00000                       | 208.97714<br>208.57901<br>208.33361 | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75<br>243.75     | 585.13<br>585.16<br>585.18     | 0.029246<br>0.029245<br>0.029244   |
| 1    |                                  | 180.00000                           | 178.50000                           | 0.00000                       | 208.18031                           | -0.12500<br>-0.12500<br>-0.12500 | 243.75<br>243.75               | 585.19<br>585.19               | 0.029244                           |
| 1    |                                  | 180.00000                           | 229.50000<br>255.00000              | 0.00000                       | 208.03645                           | -0.12500<br>-0.12500             | 243.75<br>243.75               | 585.20<br>585.20               | 0.029244                           |
| 1    | Grid 1<br>Grid 1                 | 180.00000                           | 280.50000                           | 0.00000                       | 208.03645<br>208.08694              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 585.20<br>585.19               | 0.029244                           |
| 1    | Grid 1<br>Grid 1                 | 180.00000                           | 331.50000<br>357.00000              | 0.00000                       | 208.18031<br>208.33361              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 585.19<br>585.18               | 0.029244                           |
| 1    | l Grid 1<br>l Grid 1             | 180.00000<br>180.00000              | 382.50000<br>408.00000              | 0.00000                       | 208.57901<br>208.97714              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 585.16<br>585.13               | 0.029245                           |
| 1    | l Grid 1<br>l Grid 1             | 180.00000<br>180.00000              | 433.50000<br>459.00000              | 0.00000                       | 209.64087<br>210.71191              | -0.12500<br>-0.12500             | 243.75<br>243.75               | 585.07<br>584.94               | 0.029248<br>0.029252               |
| 1    | l Grid 1<br>l Grid 1             | 180.00000<br>180.00000              | 484.50000<br>510.00000              | 0.00000                       | 210.92304<br>103.77652              | -0.12500<br>-0.12500             | 243.75<br>121.88               | 584.51<br>292.61               | 0.029266<br>0.014621               |
| 1    | l Grid 1<br>l Grid 1             | 194.00000<br>194.00000              | 0.00000<br>25.50000                 | 0.00000                       | 78.94391<br>161.11416               | -0.12500<br>-0.12500             | 97.500<br>195.00               | 233.51<br>466.42               | 0.011716<br>0.023453               |
| 1    | l Grid 1<br>l Grid 1             | 194.00000<br>194.00000              | 51.00000<br>76.50000                | 0.00000                       | 160.77127<br>159.82434              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 466.77<br>466.87               | 0.023441                           |
| 1    | Grid 1<br>Grid 1                 | 194.00000<br>194.00000              | 102.00000<br>127.50000              | 0.00000                       | 159.22937<br>158.86618              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 466.92<br>466.95               | 0.023436<br>0.023435               |
| 1    | Grid 1                           | 194.00000<br>194.00000              | 153.00000<br>178.50000              | 0.00000                       | 158.63913<br>158.49579              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 466.97<br>466.98               | 0.023434                           |
| 3    | l Grid 1<br>l Grid 1             | 194.00000<br>194.00000<br>194.00000 | 204.00000<br>229.50000<br>255.00000 | 0.00000                       | 158.40784<br>158.36006              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 466.98<br>466.99               | 0.023434                           |
| 1    | l Grid 1<br>l Grid 1<br>l Grid 1 | 194.00000                           | 255.00000<br>280.50000<br>306.00000 | 0.00000<br>0.00000<br>0.00000 | 158.34489<br>158.36006<br>158.40784 | -0.12500<br>-0.12500<br>-0.12500 | 195.00<br>195.00<br>195.00     | 466.99<br>466.99<br>466.98     | 0.023434<br>0.023434<br>0.023434   |
| 1    | l Grid 1<br>l Grid 1<br>l Grid 1 | 194.00000<br>194.00000<br>194.00000 | 331.50000<br>357.00000              | 0.00000                       | 158.40784<br>158.49579<br>158.63913 | -0.12500<br>-0.12500<br>-0.12500 | 195.00<br>195.00<br>195.00     | 466.98<br>466.97               | 0.023434<br>0.023434<br>0.023434   |
| 1    | Grid 1<br>Grid 1<br>Grid 1       | 194.00000<br>194.00000              | 382.50000<br>408.00000              | 0.00000                       | 158.83913<br>158.86618<br>159.22937 | -0.12500<br>-0.12500<br>-0.12500 | 195.00<br>195.00               | 466.95<br>466.92               | 0.023435                           |
| 1    | Grid 1<br>Grid 1                 | 194.00000<br>194.00000              | 433.50000<br>459.00000              | 0.00000                       | 159.82434<br>160.77127              | -0.12500<br>-0.12500             | 195.00<br>195.00               | 466.87<br>466.77               | 0.023437                           |
| 3    | Grid 1<br>Grid 1                 | 194.00000<br>194.00000              | 484.50000<br>510.00000              | 0.00000                       | 161.11416<br>78.94391               | -0.12500<br>-0.12500<br>-0.12500 | 195.00<br>97.500               | 466.42<br>233.51               | 0.023441<br>0.023453<br>0.011716   |
| 1    | Grid 1                           | 208.00000                           | 0.00000                             | 0.00000                       | 50.16602<br>103.36453               | -0.12500<br>-0.12500             | 60.938<br>121.88               | 146.43                         | 0.0073064                          |
| 1    | Grid 1<br>Grid 1                 | 208.00000                           | 51.00000<br>76.50000                | 0.00000                       | 102.92163<br>102.10538              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.65<br>292.74               | 0.014620<br>0.014617               |
| 1    | l Grid 1<br>l Grid 1             | 208.00000                           | 102.00000<br>127.50000              | 0.00000                       | 101.58325<br>101.25760              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.78<br>292.81               | 0.014616<br>0.014615               |
| 1    | l Grid 1<br>l Grid 1             | 208.00000                           | 153.00000<br>178.50000              | 0.00000                       | 101.05051<br>100.91812              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.82<br>292.83               | 0.014614<br>0.014614               |
| 1    | l Grid 1<br>l Grid 1             | 208.00000                           | 204.00000 229.50000                 | 0.00000                       | 100.83618<br>100.79143              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.83<br>292.84               | 0.014614<br>0.014614               |
| 1    | Grid 1<br>Grid 1                 | 208.00000                           | 255.00000<br>280.50000              | 0.00000                       | 100.77718<br>100.79143              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.84<br>292.84               | 0.014614<br>0.014614               |
| 1    | Grid 1                           | 208.00000                           | 306.00000<br>331.50000              | 0.00000                       | 100.83618<br>100.91812              | -0.12500<br>-0.12500             | 121.88<br>121.88               | 292.83<br>292.83               | 0.014614<br>0.014614               |
| 1    | Grid 1                           | 208.00000                           | 357.00000<br>382.50000              | 0.00000                       | 101.05051                           | -0.12500<br>-0.12500             | 121.88                         | 292.82<br>292.81               | 0.014614                           |
| 1    | Grid 1                           | 208.00000                           | 408.00000                           | 0.00000                       | 101.58325                           | -0.12500<br>-0.12500             | 121.88                         | 292.78<br>292.74               | 0.014616                           |
| 1    | l Grid 1<br>l Grid 1<br>l Grid 1 | 208.00000<br>208.00000<br>208.00000 | 459.00000<br>484.50000<br>510.00000 | 0.00000<br>0.00000<br>0.00000 | 102.92163<br>103.36453<br>50.16602  | -0.12500<br>-0.12500<br>-0.12500 | 121.88<br>121.88<br>60.938     | 292.65<br>292.38<br>146.43     | 0.014620<br>0.014629<br>0.0073064  |
| 1    | Grid 1<br>1 Grid 1<br>1 Grid 1   | 208.00000<br>222.00000<br>222.00000 | 0.00000<br>25.50000                 | 0.00000                       | 37.42971<br>77.65340                | -0.12500<br>-0.12500<br>-0.12500 | 48.750<br>97.500               | 146.43<br>116.89<br>233.41     | 0.0073064<br>0.0058536<br>0.011720 |
| 1    | Grid 1<br>Grid 1<br>Grid 1       | 222.00000<br>222.00000<br>222.00000 | 51.00000<br>76.50000                | 0.00000                       | 77.15267<br>76.46558                | -0.12500<br>-0.12500<br>-0.12500 | 97.500<br>97.500<br>97.500     | 233.41<br>233.60<br>233.67     | 0.011720<br>0.011713<br>0.011711   |
| 1    | Grid 1<br>Grid 1                 | 222.00000                           | 102.00000<br>127.50000              | 0.00000                       | 76.01626<br>75.72884                | -0.12500<br>-0.12500             | 97.500<br>97.500               | 233.71<br>233.73               | 0.011710<br>0.011709               |
| 1    | Grid 1<br>Grid 1                 | 222.00000                           | 153.00000                           | 0.00000                       | 75.54244<br>75.42157                | -0.12500<br>-0.12500             | 97.500<br>97.500               | 233.74<br>233.75               | 0.011709<br>0.011708               |
|      |                                  |                                     |                                     |                               |                                     |                                  |                                |                                |                                    |

### **Arup**

Northern SPA Eastern Mound Section F-FF



| Ref. | Nan          | ie | ×         | У                      | z       | δz                   | Stress:<br>Calc.     | Stress:<br>Vertical    | Stress:<br>Sum Princ. | Vert.<br>Strain          |
|------|--------------|----|-----------|------------------------|---------|----------------------|----------------------|------------------------|-----------------------|--------------------------|
|      |              |    |           |                        |         |                      | Level                |                        |                       |                          |
|      |              |    | [m]       | [m]                    | [mOD]   | [mm]                 | [mOD]                | [kN/m <sup>2</sup> ]   | [kN/m <sup>2</sup> ]  | [µ]                      |
|      | Grid         |    | 222.00000 | 204.00000              | 0.00000 | 75.34603             | -0.12500             | 97.500                 | 233.75                | 0.011708                 |
|      | Grid         |    | 222.00000 | 229.50000              | 0.00000 | 75.30450             | -0.12500             | 97.500                 | 233.76                | 0.011708                 |
|      | Grid         |    | 222.00000 | 255.00000              | 0.00000 | 75.29125             | -0.12500             | 97.500                 | 233.76                | 0.011708                 |
|      | Grid<br>Grid |    | 222.00000 | 280.50000<br>306.00000 | 0.00000 | 75.30450<br>75.34603 | -0.12500<br>-0.12500 | 97.500<br>97.500       | 233.76<br>233.75      | 0.011708                 |
|      | Grid         |    | 222.00000 | 331.50000              | 0.00000 | 75.42157             | -0.12500             | 97.500                 | 233.75                | 0.011708                 |
|      | Grid         |    | 222.00000 | 357.00000              | 0.00000 | 75.54244             | -0.12500             | 97.500                 | 233.74                | 0.011708                 |
|      | Grid         |    | 222.00000 | 382.50000              | 0.00000 | 75.72884             | -0.12500             | 97.500                 | 233.73                | 0.011709                 |
|      | Grid         |    | 222.00000 | 408.00000              | 0.00000 | 76.01626             | -0.12500             | 97.500                 | 233.71                | 0.011710                 |
|      | Grid         |    | 222.00000 | 433.50000              | 0.00000 | 76.46558             | -0.12500             | 97.500                 | 233.67                | 0.011711                 |
| 1    | Grid         | 1  | 222.00000 | 459.00000              | 0.00000 | 77.15267             | -0.12500             | 97.500                 | 233.60                | 0.011713                 |
| 1    | Grid         | 1  | 222.00000 | 484.50000              | 0.00000 | 77.65340             | -0.12500             | 97.500                 | 233.41                | 0.011720                 |
|      | Grid         |    | 222.00000 | 510.00000              | 0.00000 | 37.42971             | -0.12500             | 48.750                 | 116.89                | 0.0058536                |
|      | Grid         |    | 236.00000 | 0.00000                | 0.00000 | 3.87468              | -0.12500             | 531.86E-6              |                       | -51.231E-6               |
|      | Grid         |    | 236.00000 | 25.50000               | 0.00000 | 10.31167             | -0.12500             | 0.0010624              |                       | -93.086E-6               |
|      | Grid         |    | 236.00000 | 51.00000               | 0.00000 | 9.75787              | -0.12500             | 0.0010635              |                       | -97.301E-6               |
|      | Grid         |    | 236.00000 | 76.50000               | 0.00000 | 9.19134              | -0.12500             | 0.0010636              |                       | -99.112E-6               |
|      | Grid<br>Grid |    | 236.00000 | 102.00000              | 0.00000 | 8.81126<br>8.56112   | -0.12500<br>-0.12500 | 0.0010637              |                       | -100.10E-6<br>-100.70E-6 |
|      | Grid         |    | 236.00000 | 153.00000              | 0.00000 | 8.39534              | -0.12500             | 0.0010637              |                       | -100.70E-6               |
|      | Grid         |    | 236.00000 | 178.50000              | 0.00000 | 8.28615              | -0.12500             | 0.0010637              |                       | -101.03E-6               |
|      | Grid         |    | 236.00000 | 204.00000              | 0.00000 | 8.21717              | -0.12500             | 0.0010637              |                       | -101.48E-6               |
|      | Grid         |    | 236.00000 | 229.50000              | 0.00000 | 8.17900              | -0.12500             | 0.0010637              |                       | -101.57E-6               |
|      | Grid         |    | 236.00000 | 255.00000              | 0.00000 | 8.16678              | -0.12500             | 0.0010637              |                       | -101.59E-6               |
|      | Grid         |    | 236.00000 | 280.50000              | 0.00000 | 8.17900              | -0.12500             | 0.0010637              |                       | -101.57E-6               |
|      | Grid         |    | 236.00000 | 306.00000              | 0.00000 | 8.21717              | -0.12500             | 0.0010637              |                       | -101.48E-6               |
|      | Grid         |    | 236.00000 | 331.50000              | 0.00000 | 8.28615              | -0.12500             | 0.0010637              |                       | -101.33E-6               |
|      | Grid         |    | 236.00000 | 357.00000              | 0.00000 | 8.39534              | -0.12500             | 0.0010637              |                       | -101.09E-6               |
| 1    | Grid         | 1  | 236.00000 | 382.50000              | 0.00000 | 8.56112              | -0.12500             | 0.0010637              | 3.0275                | -100.70E-6               |
| 1    | Grid         | 1  | 236.00000 | 408.00000              | 0.00000 | 8.81126              | -0.12500             | 0.0010637              | 3.0095                | -100.10E-6               |
| 1    | Grid         | 1  | 236.00000 | 433.50000              | 0.00000 | 9.19134              | -0.12500             | 0.0010636              |                       | -99.112E-6               |
|      | Grid         |    | 236.00000 | 459.00000              | 0.00000 | 9.75787              | -0.12500             | 0.0010635              |                       | -97.301E-6               |
|      | Grid         |    | 236.00000 | 484.50000              | 0.00000 | 10.31167             | -0.12500             | 0.0010624              |                       | -93.086E-6               |
|      | Grid         |    | 236.00000 | 510.00000              | 0.00000 | 3.87468              | -0.12500             | 531.86E-6              |                       | -51.231E-6               |
|      | Grid         |    | 250.00000 | 0.00000                | 0.00000 | -2.22525             | -0.12500             | 4.0751E-6              |                       | -12.858E-6               |
|      | Grid         |    | 250.00000 | 25.50000               | 0.00000 | -2.15600             | -0.12500             | 7.5494E-6              |                       | -18.811E-6               |
|      | Grid         |    | 250.00000 | 51.00000               | 0.00000 | -2.70534             | -0.12500             | 7.9873E-6              |                       | -21.421E-6               |
|      | Grid<br>Grid |    | 250.00000 | 76.50000               | 0.00000 | -3.16420             | -0.12500<br>-0.12500 | 8.0838E-6<br>8.1174E-6 |                       | -22.777E-6<br>-23.582E-6 |
|      | Grid         |    | 250.00000 | 127.50000              | 0.00000 | -3.48123<br>-3.69637 | -0.12500             | 8.1174E-6<br>8.1320E-6 |                       | -24.091E-6               |
|      | Grid         |    | 250.00000 | 153.00000              | 0.00000 | -3.84228             | -0.12500             | 8.1391E-6              |                       | -24.423E-6               |
|      | Grid         |    | 250.00000 | 178.50000              | 0.00000 | -3.93999             | -0.12500             | 8.1429E-6              |                       | -24.641E-6               |
|      | Grid         |    | 250.00000 | 204.00000              | 0.00000 | -4.00242             | -0.12500             | 8.1449E-6              |                       | -24.778E-6               |
|      | Grid         |    | 250.00000 | 229.50000              | 0.00000 | -4.03722             | -0.12500             | 8.1459E-6              |                       | -24.854E-6               |
|      | Grid         |    | 250.00000 | 255.00000              | 0.00000 | -4.04840             | -0.12500             | 8.1462E-6              |                       | -24.879E-6               |
| 1    | Grid         | 1  | 250.00000 | 280.50000              | 0.00000 | -4.03722             | -0.12500             | 8.1459E-6              | 0.74568               | -24.854E-6               |
| 1    | Grid         | 1  | 250.00000 | 306.00000              | 0.00000 | -4.00242             | -0.12500             | 8.1449E-6              | 0.74340               | -24.778E-6               |
| 1    | Grid         | 1  | 250.00000 | 331.50000              | 0.00000 | -3.93999             | -0.12500             | 8.1429E-6              | 0.73928               | -24.641E-6               |
|      | Grid         |    | 250.00000 | 357.00000              | 0.00000 | -3.84228             | -0.12500             | 8.1391E-6              |                       | -24.423E-6               |
|      | Grid         |    | 250.00000 | 382.50000              | 0.00000 | -3.69637             | -0.12500             | 8.1320E-6              |                       | -24.091E-6               |
|      | Grid         |    | 250.00000 | 408.00000              | 0.00000 | -3.48123             | -0.12500             | 8.1174E-6              |                       | -23.582E-6               |
|      | Grid         |    | 250.00000 | 433.50000              | 0.00000 | -3.16420             | -0.12500             | 8.0838E-6              |                       | -22.777E-6               |
|      | Grid         |    | 250.00000 | 459.00000              | 0.00000 | -2.70534             | -0.12500             | 7.9873E-6              |                       | -21.421E-6               |
|      | Grid         |    | 250.00000 | 484.50000              | 0.00000 | -2.15600             | -0.12500             | 7.5494E-6              |                       | -18.811E-6               |
| 1    | Grid         | 1  | 250.00000 | 510.00000              | 0.00000 | -2.22525             | -0.12500             | 4.0751E-6              | 0.38577               | -12.858E-6               |

Results : Consolidation : Displacement Data : Grids

None

Results : Total : Displacement Data : Grids

None