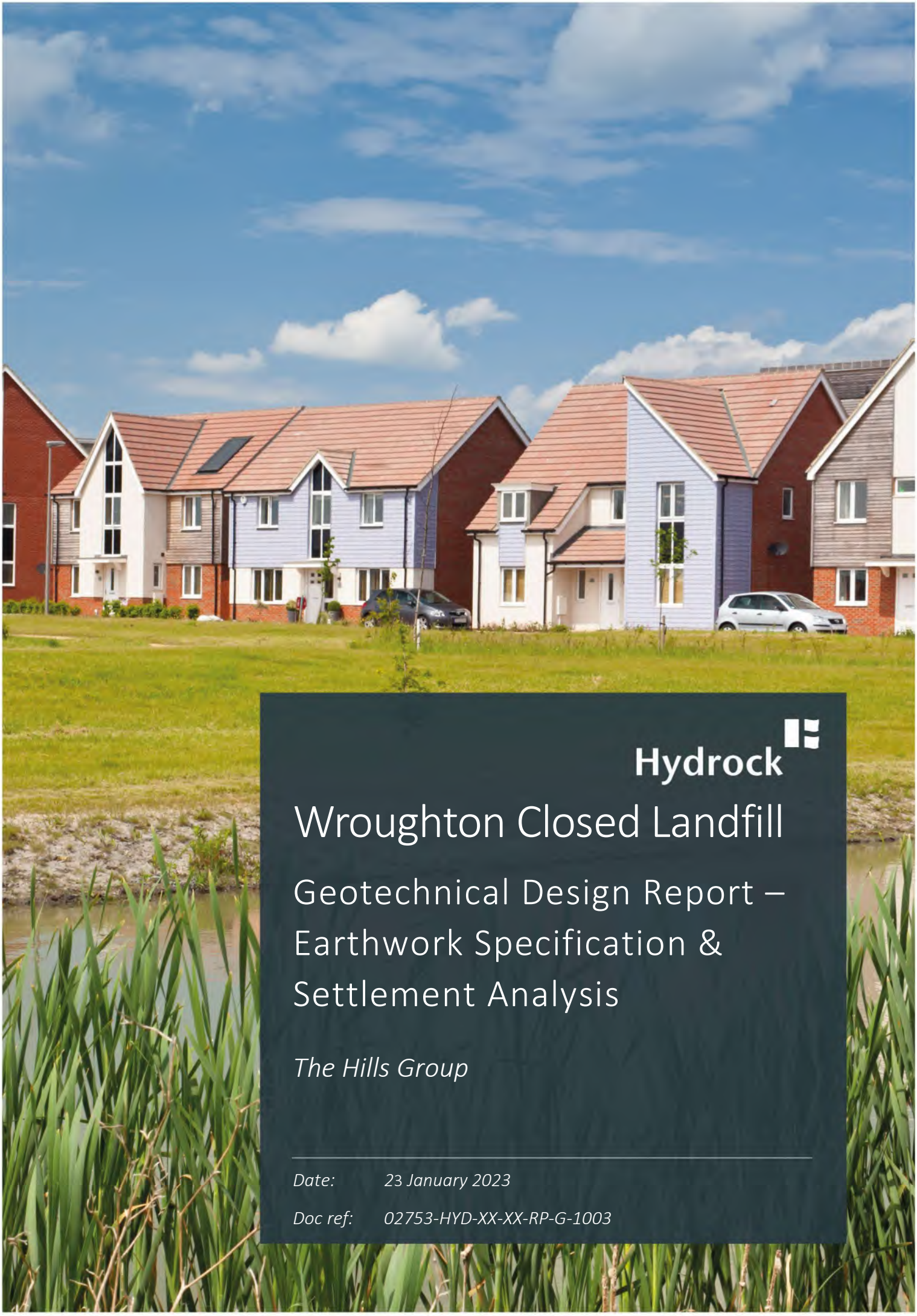

Hydrock

Wroughton Closed Landfill

Geotechnical Design Report – Earthwork Specification & Settlement Analysis

The Hills Group

Date: *23 January 2023*

Doc ref: *02753-HYD-XX-XX-RP-G-1003*

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Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above-named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

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Preamble to the Design and Specification

Terms of Reference

Hydrock Consultants Limited has been commissioned by The Hills Group to produce a Geotechnical Design Report (GDR) in support of the design and construction of infrastructure associated with residential development at Wroughton Closed Landfill site, Wroughton.

The report specifically details the Earthwork Specification and includes a settlement analysis covering the proposed infrastructure routes over the historical landfill. The details are shown on the Drainage Strategy and Preliminary Finished Levels Drawings Sheets 1, 2, 4 and 5 ref. 3429/300/01 dated May 2019. A site layout plan (Drawing WRO-HYD-XX-XX-DR-G-1000) is presented in Appendix A.

The design of infrastructure and drainage has been carried out by the Hills Group. All recommendations made by Hydrock within this GDR have been based on development levels proposed by the Hills Group, as shown on the aforementioned Drainage Strategy and Preliminary Finished Levels Drawings Sheets. If these layout proposals or ground levels are altered in any way, the recommendations provided in this GDR may be invalidated and further advice should be sought from Hydrock at the earliest opportunity.

It is important to note that this GDR does not cover the design of non-infrastructure structures within the development, namely housing and associated structures such as any retaining or screen walls. For design recommendations with respect to these the reader is referred to the historic ground investigation reports listed below. However, the designers of these structures and associated infrastructure should be provided with a copy of this GDR and ensure that their designs allow for the recommendations made within this report.

Geotechnical Category 2 (CAT 2)

In accordance with BS EN 1997 (Eurocode 7, EC 7), BS 6031 (Code of Practice for Earthworks) and BS 8004 (Foundations), a Geotechnical Design Category is attributed to each element that has a geotechnical aspect. The Categories defined in EC 7 range between CAT 1 and CAT 3. The earthworks associated with the development are considered to be CAT 2. For clarity, a description for Geotechnical Category 2 is presented below.

CAT 2 covers a much wider range of elements, including pad foundations, rafts, earthworks and embankments. Where these are present on a development, then there is a requirement for the designer to produce a Geotechnical Design Report (GDR). This covers conventional types of structure and foundation with no exceptional risk or difficult soil or loading conditions. The design should include quantitative geotechnical data and analysis to ensure fundamental requirements are satisfied in accordance with EC 7.

BS EN 1997-1: Clause 2.1 (19) presents a list of conventional structures or parts of structures which are covered by CAT 2.

Earthworks Specification

The content of the GDR should reflect the complexity of the element under consideration. The production of an Earthworks Specification is an intrinsic part of the GDR, as geotechnical design is required to be able to complete the specification.

Whilst EC 7 does not provide a comprehensive list as to what should be included in a GDR, BS 6031 recommends reference is made to the guidance from CD622 (Managing Geotechnical Risk). This document sets out clear guidance as to what should be included in the GDR, and that the Earthworks Specification forms part of the

overall document. In summary you cannot have an Earthworks Specification without a geotechnical design, and the specification is there to demonstrate the design has been built.

As part of the geotechnical design, consideration has to be given to Ultimate and Service Limit States (ULS and SLS). Typical SLS requirements will be in the form of compliance in terms of total and differential settlement of structures.

The content of the reports listed below have been reviewed and relied upon by Hydrock in the formation of this GDR and are considered to provide sufficient information to satisfy the requirements for the purposes of the Preliminary Sources Study Report (PSSR) and Ground Investigation Report (GIR) as described by CD 622, Managing Geotechnical Risk.

The content of this report is based upon the requirements from CD 622 with the inclusion of only those elements which are specific to the works to be undertaken as part of the construction of the proposed infrastructure.

Background

Several phases of investigation have been undertaken at the site:

- In July 2001, boreholes were drilled within the landfill to assess the nature of the waste, the leachate level and quality and to monitor landfill gas within the waste (Report R/11229/001);
- In 2008, Hydrock prepared reports about the site covering the quality of the capping soil, landfill gas and leachate (Reports; R/08180/001, 002 and 003, respectively);
- In May 2011, Hydrock prepared a geo-constraints study for the site (Report R/11229/001);
- January 2015, trial trenches were undertaken within the landfill to assess the nature of the waste and capping soil (Ref C11229/Note 02);
- August 2015, trial pits were undertaken within the proposed housing area in the eastern part of the landfill. The purpose of the investigation to assess the nature of the waste and capping soil and to assess the chemical composition of the ground. (R/11229/002)
- July 2019, supplementary investigation comprising trial pits, CPT's and boreholes. The works pertinent to this report were in the eastern part of the landfill, primarily targeting proposed infrastructure alignments to provide information in support of foundation design, earthworks and remedial works. The boreholes were also undertaken to provide information for pile design. (R/11229/003/03)

In 2019, a Geotechnical Options Appraisal report (ref: 02753-HYD-XX-XX-RP-GE-1001) was commissioned to assess geotechnical options for developing the site. Following this, a Technical Note ref: Wroughton Settlement Assessment 02753-HYD-XX-XX-TN-GE-1000 was issued in October 2021 outlining the probable ranges of settlement associated with the settlement mitigation options for construction over landfill i.e for full or partial replacement of landfill. Subsequent liaisons with the Client and Swindon Borough Council have resulted in the decision to implement Option 1 - partial excavation of landfill and re-engineering of shallow materials within infrastructure corridors. This GDR refines the predictions in the technical note for Option 1 detailing the most credible range of settlements expected beneath the infrastructure corridors following partial replacement.

Ground Model

The topography of the whole site slopes gently to the west, from approximately 110m AOD to approximately 104m AOD. The northern part of the site has been built up by the process of landfilling in the past, to a maximum of 112.6m AOD and this slopes more steeply to the north, west and south, but is at a similar elevation in the east to the surrounding ground level.

The southern portion, south of the landfill, comprises two open fields which slope gently from 109m AOD in the east to 104m AOD in the west. These are considered to be greenfield.

Three zones have been identified within the proposed infrastructure development area based upon the type of sub-surface ground expected to be encountered. With the entirety of the route being underlain by the natural deposits of the Kimmeridge Clay Formation. The zones are presented on drawing WRO-HYD-XX-XX-DR-G-1002 within Appendix A. Cross sections based on the materials encountered predominantly within Zones B and C are also presented in Appendix A, referenced WRO-HYD-XX-XX-DR-G-1003. The zones are underlain by the following deposits:

- Zone A is underlain by natural deposits of the Kimmeridge Clay Formation. This area comprises the access highway on the north-east end and the south third of the site
- Zone B comprises recent construction waste deposits (Made Ground – recent).
- Zone C is underlain by skip waste and landfill deposits (Made Ground – landfill).

The full nature of the materials encountered is detailed in the Hydrock Ground Investigation Report ref R/11229/003/03 and are also summarised in the Options Appraisal Report ref 02753-HYD-XX-XX-RP-GE-1001.

The following table summarises the geotechnical units encountered within Zones B and C:

Table 1: Geotechnical units encountered within Zones B and C.

Stratum		Description	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Topsoil and Capping	Topsoil (Made Ground)	Grass over reworked topsoil (asphalt TP10 only)	0-0	0.05-0.40	0.05-0.40
	Capping** (Made Ground)	Firm silty CLAY with occasional brick fragments	0.05-0.35	0.40-2.40	0.20-2.30
Recent construction waste (1974 - 1998) Formerly called 'builders waste'. (Made Ground)		Sandy gravelly CLAY / clayey gravelly SAND with minor timber brick, plastic bags, metal fragments and occasional concrete rubble. Asbestos present although minor quantities identified.	0.05-1.50	1.30-6.80*	0.60-5.60*
Pits backfill (prior to 1974)	Landfill Waste. Formerly called 'domestic landfill waste' (Made Ground)	Grey-black waste (sandy gravelly CLAY/ clayey gravelly SAND) comprising significant ash and glass bottles, wood and tile. Asbestos present although minor quantities identified.	1.50 – 6.80	1.45-10.00*	0.55-8.00*
	Reworked Site-won Material (Quarry discards) Formerly called 'brick works clay waste (Made Ground)	Reworked dark bluish grey (almost black) very soft to firm silty CLAY with some pockets of peat. No asbestos found.	2.20-6.20	3.50-7.10*	0.20-2.30*
Kimmeridge Clay Formation: slightly weathered / unweathered in-situ clay		Stiff brown, grey and yellow silty CLAY.	0.80-10.00	Not proven	Not proven

** Depth to base (and therefore thickness) not proven at all locations*

*** Capping layer has only been formally logged as part of the most recent supplementary investigation undertaken in June 2019. This stratum was identified during historic ground investigations (albeit not defined on the logs)*

It was found that the recent construction waste typically comprised a very stoney clay. The deeper skip and domestic waste comprised a mixture of granular and cohesive soils, locally soft to firm with inclusions of wood, wire, plastic and glass.

Groundwater monitoring was conducted on nineteen occasions and the perched water within the landfill deposits shown as contours on drawing C11229-GO35_GW with a further drawing, C11229-GO41_GW showing the levels below ground level. The groundwater on site is generally flowing in a north-west direction with the topography of the site. The shallowest monitored levels are located in the southeast corner of the site (in the vicinity of BH111, BH120 and BH18) between 1.27 - 1.64m bgl.

1. EARTHWORKS

1.1 Proposed Works

The whole development comprises a residential development with a cricket ground to the north west. The development layout in the context of this commission is shown on the Drainage Strategy and Preliminary Finished Levels Drawings Sheets 1, 2, 4 and 5 ref. 3429/300/01 dated May 2019. The redline boundary defining the extent of development is shown on drawing reference WRO-HYD-XX-DR-G-1002, Rev P1. The primary site access is off an access track off Swindon Road.

The assessment of cut to fill requirements is presented on the Materials Management Strategy (MMS) and extract of which is presented below:

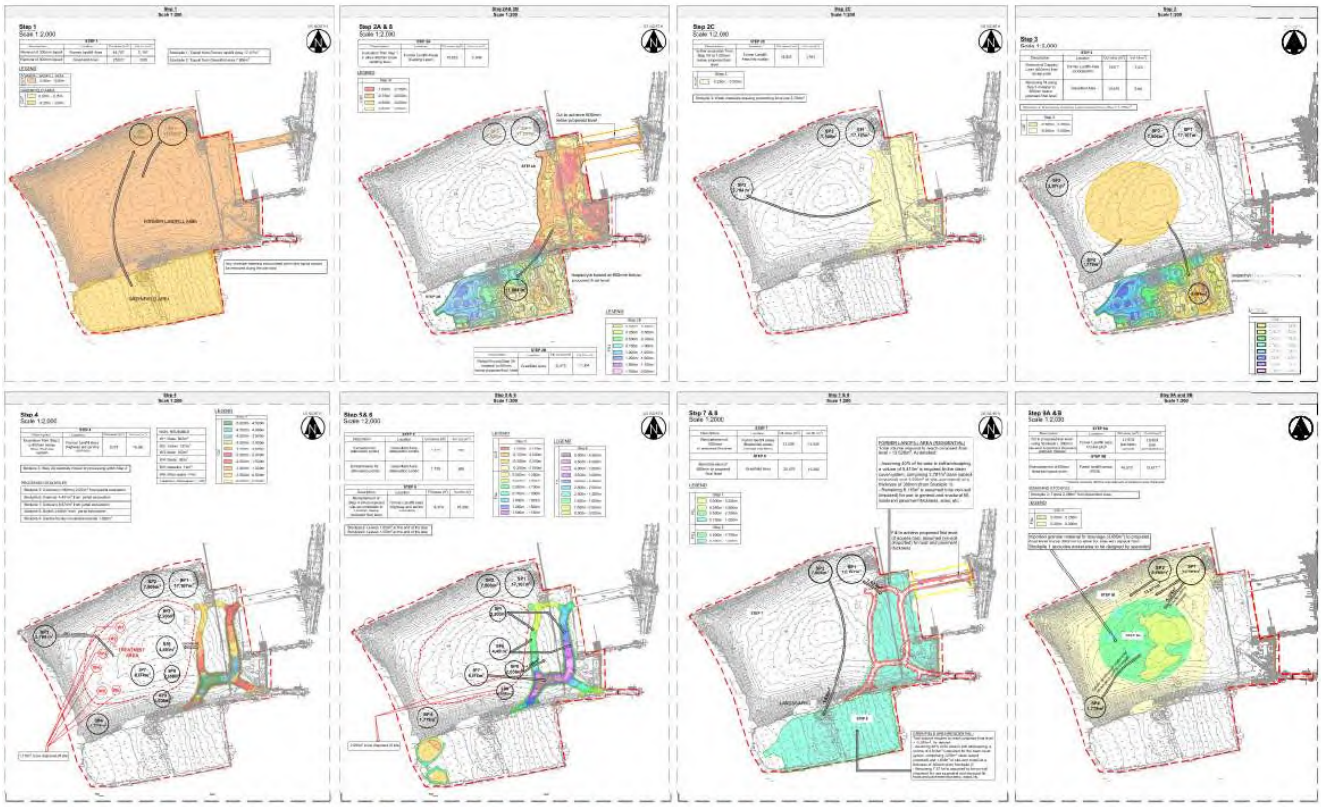


Figure 1: Preliminary Materials Management Strategy – Hydrock ref: 12248-HYD-XX-XX-DR-G-1001

The proposed earthworks cut and fill operation assumes an initial site strip of topsoil 0.20m across the landfilled area and 0.30m off the greenfield area to account for the existing topsoil. Various stages are proposed within the MMS detailing the steps in which materials are removed from the landfill area and those suitable subsequently replaced to raise levels using the Earthwork Specification enclosed within Appendix B referenced 12248-HYD-XX-XX-DR-G-1002.

During the cut phase, the materials will require segregation into capping, recent construction waste and landfill wastes. The materials will require processing into geotechnically suitable classes of materials for use, and will include the removal of oversize materials and waste. Some of the processed materials will be waste such as asbestos, wood, metal etc, amounting to a total of 1,106m^3, and it is anticipated that a further 2,064m^3 of other geotechnically unsuitable materials will also require removal from site. To comply with the Hydrock Remediation Strategy (ref 02753-HYD-XX-XX-RP-G-1002) 'clean' imported materials will be required for the reinstatement of 1000mm to proposed final level within the former

landfill area and 600mm within the greenfield area. Full details of the volumes can be found on the MMS in Appendix A.

It is anticipated the majority of the segregated topsoil will be reused within the former landfill residential areas, greenfield areas and the landscaping including the cricket pitch (excluding the wicket). However, there will be surplus of topsoil anticipated to be 2,286m^3.

The actual sequencing of the works is preliminary and subject to further discussion with the chosen Contractor. The Materials Management Strategy is presented in Appendix A along with the Earthwork Specification in Appendix B. The fill will be selected, placed, and controlled by Method Placement, as defined by BS 6031.

In addition to the earthwork specification an analysis of the magnitude of settlement for the roads and service corridors has been undertaken on the area beneath the former landfill. This assessment is discussed within Section 1.6.

1.2 Methods of Analysis

The analysis has been undertaken using the proprietary software package GEO 5, developed by FINE software using the latest issue. This software uses standard Elastic Theory and a Boussinesq Stress Distribution to determine the total serviceable settlements based on the assigned geotechnical parameters for the anticipated succession of strata and expected range of loadings.

1.3 Soil Parameters

Soil parameters considered appropriate for the area have been assigned to each stratum based on the ground investigation logs, the more recent CPT probes, the results of geotechnical laboratory testing and guidance obtained from relevant Codes of Practice (BS EN ISO 1997-1 (EC7), BS 8004, Peck *et al.*, (1967). Engineering judgement and conservatism has been applied where there are data gaps. These parameters are presented in Table 2.

Table 2: Geotechnical design parameters

Stratum Description	Parameter						
	Bulk Unit Weight	Typical SPT N-value in granular fractions	Undrained cohesion of cohesive fractions	Drained Cohesion	Effective Angle of Internal Friction[1]	Poisson's Ratio	Drained Elastic Modulus
	γ_b	-	S_u	c'	ϕ'_{pk}	ν	E'
	kN/m^3	-	kN/m^2	kN/m^2	º		MPa
Class 2 General Fill	19	N/A	50	0	24		10
Class 1 General Fill	19	N/A	N/A	1	30		10
Class 6I / 6F2 Granular Fill	19	N/A	N/A	1	30		10
Topsoil	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Stratum Description	Parameter						
	Bulk Unit Weight	Typical SPT N-value in granular fractions	Undrained cohesion of cohesive fractions	Drained Cohesion	Effective Angle of Internal Friction[1]	Poisson's Ratio	Drained Elastic Modulus
	γ_b	-	S_u	c'	ϕ'_{pk}	v	E'
	kN/m³	-	kN/m²	kN/m²	º		MPa
Made Ground: Recent construction waste (1974 - 1998) Formerly called 'builders waste'	16.0	11	55 – 90 (predominantly granular)	4	23	0.25	9
Made Ground: Landfill waste Formerly called 'domestic landfill waste'	16.0	6	45 (predominantly granular)	3	22	0.30	4.5 – 9
Made Ground: Reworked site-won Material (Quarry discards) Formerly called 'brick works clay waste	16.0	10	50 – 90	4	21	0.25	4.5 - 9
Kimmeridge Clay Formation: slightly weathered / unweathered in-situ clay	18.0	-	75 - 100	16	20	0.20	15
Kimmeridge Clay Formation: Unweathered	21.0	-	100 - 160	16	20	0.10	20

Notes: [1] *Angle of friction at constant volume (ϕ'_{pk}) derived from BS 8004: 2015, Table 2 with a soil dilatancy (ϕ'_{dil}) of 0º (e.g. $\phi'_{pk} = \phi'_{cv,k}$)*

The values presented in Table 2 should be considered to be the minimum permissible value.

1.4 Drainage (temporary condition)

During any earthworks operation, the control and management of water on site from existing, proposed or redundant watercourses, or from any other sources including groundwater, rainfall and surface water, will be the responsibility of the Contractor. Any uncertainty over the issues associated with water or groundwater control should be submitted to the Engineer for clarification, as soon as any such issue is noted or identified by any party.

The Contractor will be made responsible for all groundwater lowering where this is required for the purposes of the construction works. Based upon the available geotechnical records and the intention not to excavate deep landfill, for the majority of the site it is not perceived that there will be a requirement for major dewatering. However, monitoring has encountered ground water in the southeast corner of the site between 1.27 - 1.64m bgl with cut in this area expected to be 4.50m to 5.00m bgl (maximum 5.70m bgl) the possibility of major dewatering is likely.

The Contractor will be made responsible for obtaining all permits and/or licences required.

1.5 Slope Angles (temporary and permanent conditions)

On account of the short-lived duration of the earthwork batters in the temporary condition, it is anticipated that slope angles of 1h:1v may be permissible where the adjacent ground is flat. Some shallow spalling of these faces may be expected; however, this is not considered to present a problem and can be adequately managed on site through regular inspection, slackening of batter angles by opening up the dig or applying 'pinned' mesh / geogrid face support where necessary. Temporary batter angles and any face support required would ultimately be formulated as part of a formal temporary works design following BS 5975:2008+A1:2011, Code of practice for temporary works procedures.

1.6 Settlement

The development site covers approximately 8.1 ha and includes the closed landfill which covers about two thirds of the current development area with the remainder being the two open fields to the south which are anticipated to be greenfield. The landfill materials have been in place a considerable time (decades) since the landfill closed. As such, it is expected that significant self-settlement of the materials has already occurred under the weight of the materials placed and any movement associated with inundation is likely to have occurred already.

To mitigate excessive future movement of the ground in areas of the site where road and main utility corridors coincide with extreme thicknesses of historical landfill waste the proposal is to excavate the road and service corridor to depths comparable to the invert level of the deepest utility services along the route minus a further 400mm. The excavation would then be backfilled in layers with Engineered Fill to a performance specification in order to unify the quality and stiffness of materials immediately beneath the road and surrounding utilities.

It is recognised that this option leaves a layer un-engineered landfill material to remain below the backfill and that these materials may settle over time. The magnitude of movement based on the proposed solution is discussed in Section 1.6 below and is expected to be manageable. Depths of excavation where the engineered fill is to be placed would vary between 1.80m and 5.70m along the corridor. The thicknesses of landfill remaining below the engineered fill varies between zero and 2.00m. A schematic section through the proposed works along Section A-A' is shown in the figure below:

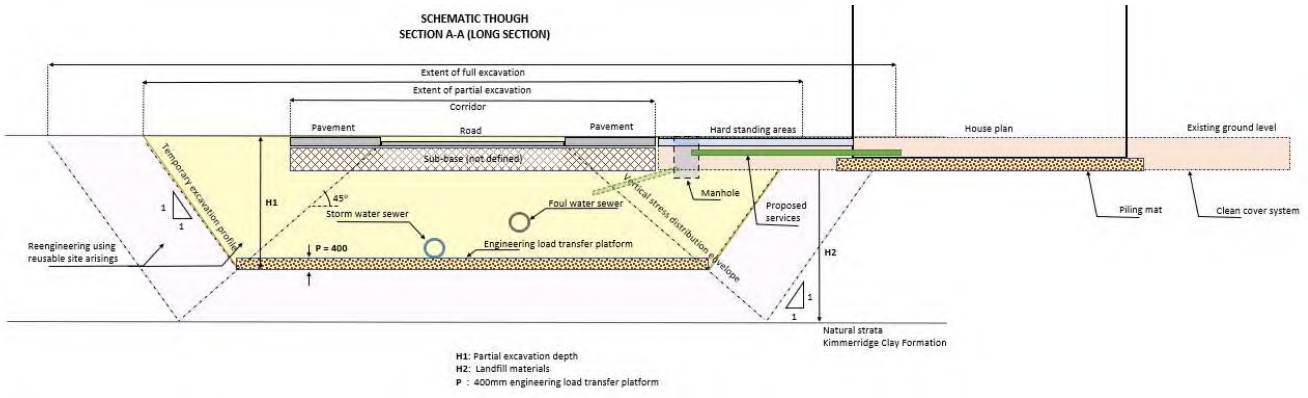


Figure 2: Schematic through Section A-A'

The analysis has been undertaken using the proprietary software package GEO 5, developed by FINE software using the latest issue. This software uses standard Elastic Theory and a Boussinesq Stress Distribution to determine the total serviceable settlements based on the assigned geotechnical

parameters (see Section 1.3) for the anticipated succession of strata, range of stiffnesses, expected cut & fill profile and UDL of 10kPa.

For the purposes of this assessment the incompressible soil has been taken as 4.0m below the top of the weathered mudstone of the Kimmeridge Clay Formation. Groundwater has been assumed to be perched within the landfill deposits (~106m AOD) and deeper within the Kimmeridge Clay Formation to the south west (~102m AOD).

1.6.1 Settlement assessment

The long-term settlement of the soils underlying the proposed infrastructure route initially used the long section (A - A') through the site, which encountered variable ground conditions including Made Ground – recent, Made Ground – landfill, weathered and more competent Kimmeridge Clay Formation. The initial (long section) analysis has assumed worst case scenario ground conditions throughout i.e. 'soft' landfill deposits. The subsequent analysis is presented in Appendix B with extracts in this section.

This long section was then split into smaller sections to represent the different anticipated ground conditions encountered and both soft/loose and firm/medium dense models were analysed to interrogate potential differential movements within each zone. The sections are considered to represent the differing vertical and horizontal differences in the materials which have been encountered. Sections a'a, b-b' and d-d' represent the worst-case vertical changes in the material with the greatest thickness of the various deposits selected. Section c-c' was selected as this was an area showing the greatest total settlement within initial analysis of long Section A-A'. The thickest deposits encountered in each section is detailed below:

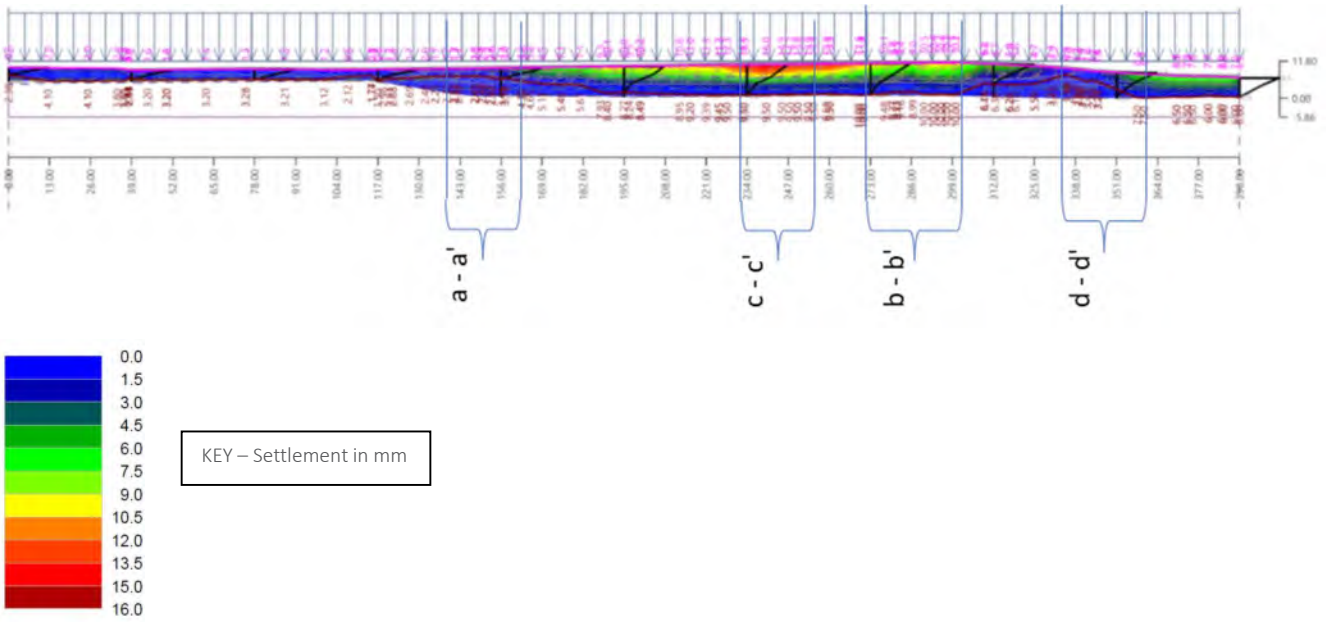
- Section a-a' – comprises up to 1.10m of Made Ground – recent and 4.70m of Made Ground - landfill;
- Section b-b' – comprises up to 6.70m of Made Ground – recent;
- Section c-c' –with up to 4.10m Made Ground – recent overlying 2.00m Made Ground – landfill; and
- Section d-d' – up to 2.70m of Made Ground – recent underlain by a 1.0m thickness of weathered Kimmeridge clay.

Beneath the sections the more competent Kimmeridge Clay has been modelled as being encountered at ~104 to 105m AOD. The sections depicted above are shown on drawing WRO-HYD-XX-XX-DR-G-1003 presented within Appendix A.

Groundwater was assumed to be perched within any made-up ground between levels of 106m AOD and 107m AOD, and at around 102m AOD within the Kimmeridge Clay Formation.

The settlement assessment has considered various construction stages:

» By way of a comparison, the first stage of the assessment has interrogated the range of movements associated with just construction the road including a 10kPa live load for vehicular traffic i.e. settlement with no improvement beyond 600mm below the surface of infrastructure route. Due to the minimal differences in levels along the route, the range of settlements associated with this vary between 1mm and around 16mm assuming the worst case stiffnesses throughout as illustrated below:



To interrogate the potential differential movements associated with variable stiffness characteristics of the landfill, the four key sections have then been analysed applying 'soft' and 'firm' stiffness models.

Table 3: Settlement assessment assuming no improvement i.e., road constructed on existing fill (mm)

Section	Settlement behaviour assuming 'soft' cohesive fill (mm)	Settlement behaviour assuming 'firm' cohesive fill (mm)	Range of potential differential settlement between soft and firm areas (mm)
Section a-a'	2	1	1
Section b-b'	-*	10	6 (bd)
Section c-c'	16	13	3 & 6 (c-b)
Section d-d'	-*	4	6(b-d)

** No Landfill deposits underly this section. Made Ground – firm or medium dense recent*

- The second part of the assessment simulates removal of the Made Ground materials to 400mm below the invert level of the drainage run followed by replacement with re-engineered fill and road construction including a 10kPa live load. This slightly increases the load onto the underlying remaining landfill materials but guarantees a unified condition and stiffness within the zone containing infrastructure. i.e increased settlement can be expected but more confidence in direct underlying support of shallow infrastructure can be expected.

Table 4: Settlement assuming MG replaced with engineered fill 400mm below I.L. (mm)

Section	Settlement behaviour assuming 'soft' cohesive fill (mm)	Settlement behaviour assuming 'firm' cohesive fill (mm)	Settlement differential between soft and firm areas (mm)
Section a-a'	11	8	3
Section b-b'	-*	17	10 (b-d)
Section c-c'	22	17	4 & 5 (c-b)
Section d-d'	-*	7	10 (b-d)

** No landfill deposits underly this section*

A cross section showing the depths and levels of the engineered fill through Section A-A' is presented within Appendix A, referenced WRO-HYD-XX-XX-DR-G-1004.

The tables above show the anticipated magnitude of settlements which are likely to occur whether the road is to be constructed assuming no improvement or with re-engineered fill replacement are tolerable i.e total movement less than 50mm - this being considered as a robust tolerance for which to design drainage and accommodate with a tarmacked road surface.

From the pattern of the predicted settlement profiles, any differential movements would also be expected to be better than 1 in 500. This being considered as a typical tolerance limit for surfacing to accommodate during the design life of the pavements.

Although settlements and differential movement appear slightly greater than the do-nothing approach, more confidence would be given to the values predicted from re-engineered materials. It would not be prudent to construct directly over shallow landfill materials that naturally have had less historical overburden than deeper materials, despite the favourable conditions inferred by this analysis.

The subsequent design of the infrastructure and drainage will still need to accommodate a precautionary limit of 50mm total settlement (including that induced by its construction). The highway and service utilities designs should also be flexible enough in order to accommodate the potential for 1 in 500 differential movement, particularly at any joints and connections which should include flexible couplings. Designers should pay particular attention to any points differential settlement which may be anticipated. For instance, these would include locations where proposed drainage pipes join/abut or cross structures which are piled.

1.7 Reuse of Materials

The re-use of materials shall be in accordance with the Earthworks Specifications, Materials Management Strategy and Remediation Strategy produced by Hydrock for the placement of fill and should be referred to for further details regarding the re-use of materials. The suitability of this shall be assessed in accordance with the Specification for Highway Works Series 600.

2. HIGHWAY STRUCTURES AND FOUNDATIONS

Not used.

3. STRENGTHENED EARTHWORKS

To provide added support and durability, a layer of 30kN/m ultimate strength geogrid shall be placed at the base of the 400mm thick compacted Class 6 material platform on which new services and re-engineered upfill is to be placed. No other strengthened earthworks is anticipated.

4. DRAINAGE (PERMANENT CONDITION)

Details of permanent drainage are provided on the Drainage Strategy and Preliminary Finished Levels Drawings Sheets 1, 2, 4 and 5 ref. 3429/300/01 (presented in Annex A). All drainage shall be designed to accommodate a maximum residual design life settlement of 50mm (no stone columns) or 25mm (with stone columns). Designers should pay particular attention to any points differential settlement which may be anticipated. For instance, these would include locations where proposed drainage pipes join/abut or cross structures which are piled.

5. PAVEMENT DESIGN, SUBGRADE AND CAPPING

Pavement Design is outside of the design requirements of this report. The design of all pavements will be shown on drawings to be issued by Hills Group Ltd. Where a highway is to be placed upon fill, the

Earthworks Specification contained within this report should be consulted for a design equilibrium CBR and the anticipated longterm settlement of the ground considered in the design of pavement finishes and curbing.

6. ASSESSMENT OF POTENTIAL CONTAMINATION

In parallel with this GDR, Hydrock are preparing a specification for remedial works (Remediation Strategy) which will support the design and build tender for the enabling works package and will seek to obtain regulatory / warrantor approval.

The Hydrock report shall be referenced 02753-HYD-XX-XX-RP-G-1003.

7. GROUND TREATMENT

Not used.

8. SPECIFICATION APPENDICES

Contract specific specification appendices have been developed for this site, in accordance with the requirements of BS 6031:2009. These are presented at Annex B of this report, as part of the overall Earthworks Specification.

The earthworks specification is focussed on the use of Class 1 and Class 2 general earthworks fill, suitable for external areas including roads, pavements and open space. Class 6F capping materials are included in the Earthworks Specification, for completeness.

9. INSTRUMENTATION AND MONITORING

A settlement monitoring regime shall be set up as part of the earthworks specification. This shall include level monitoring of fixed stations situated outside the influence of construction activities and together with level monitoring of several stations on finished kerbs, manholes, inverts and road surfaces.

ANNEX A – DRAWINGS

KEY:

	ROAD CENTRE LINE
	ROAD KERBS
	FOOTWAY EDGING KERB
25.0	ROAD CHAINAGE
109.50	PROPOSED ROAD CONTOURS
FFL 109.75	FINISHED FLOOR LEVELS
+109.50	PROPOSED SPOT LEVELS
Type CLAY 225mm @ 1 in 20 IL 105.40	STORM WATER SEWER, MANHOLE & PIPE. DETAILS
Type CLAY 150mm @ 1 in 60 IL 105.60	FOUL WATER SEWER, MANHOLE & PIPE. DETAILS

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Wiltshire

Drawing Title
Drainage Strategy and Preliminary Finished Levels
SHEET 1 OF 7

FOR PLANNING

Drawing Status

FOR COMMENT	FOR PLANNING	FOR TENDER	FOR APPROVAL	FOR CONSTRUCTION	AS BUILT
	X				

"CONSTRUCTION AT CLIENT / CONTRACTOR RISK"

Designed by	Drawn by	Checked by
JRC	JRC	PW

Date: May 2019
Scale: 1:250 @ A1

Dig No. 3429/300/01
Rev. -

KEY:

	ROAD CENTRE LINE
	ROAD KERBS
	FOOTWAY EDGING KERB
25.0	ROAD CHAINAGE
109.50	PROPOSED ROAD CONTOURS
FFL 109.75	FINISHED FLOOR LEVELS
+109.50	PROPOSED SPOT LEVELS
Type CLAY 225mm @ 1 in 20 IL 105.40	STORM WATER SEWER, MANHOLE & PIPE DETAILS
Type CLAY 150mm @ 1 in 60 IL 105.60	FOUL WATER SEWER, MANHOLE & PIPE DETAILS

Welcome to 'Pavillion View'

Clyde Cl

Client

Hills

COLE EASDON CONSULTANTS
YORK HOUSE
EDISON PARK
DORCAN WAY
SWINDON
WILTSHIRE
SN3 3RB
Tel : 01793 619965
Web Site www.ColeEasdon.com
E-mail cec@ColeEasdon.com

Client
Hills Homes Developments Ltd.

Job Title
Land at North Wroughton
Wiltshire

Drawing Title
Drainage Strategy and Preliminary Finished Levels
SHEET 2 OF 7

FOR PLANNING

Drawing Status:

FOR COMMENT	FOR PLANNING	FOR TENDER	FOR APPROVAL	FOR CONSTRUCTION	AS BUILT
X					

CONSTRUCTION AT CLIENT / CONTRACTOR RISK

Designed by:	Drawn by:	Checked by:
JRC	JRC	PW

Date: May 2019
Scale: 1:250 @ A1

Drg. No.: 3429/300/02
Rev.: -

KEY:

	ROAD CENTRE LINE
	ROAD KERBS
	FOOTWAY EDGING KERB
25.0	ROAD CHAINAGE
109.50	PROPOSED ROAD CONTOURS
FFL 109.75	FINISHED FLOOR LEVELS
+109.50	PROPOSED SPOT LEVELS
Type CLAY 225mm @ 1 in 20 IL=105.45	STORM WATER SEWER, MANHOLE & PIPE DETAILS
Type CLAY 150mm @ 1 in 60 IL=105.60	FOUL WATER SEWER, MANHOLE & PIPE DETAILS

Client

Hills

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E-mail cec@ColeEasdon.com

Client
Hills Homes Developments Ltd.

Job Title
Land at North Wroughton
Wiltshire

Drawing Title
Drainage Strategy and Preliminary Finished Levels
SHEET 4 OF 7

FOR PLANNING

Drawing Status:

FOR COMMENT	FOR PLANNING	FOR TENDER	FOR APPROVAL	FOR CONSTRUCTION	AS BUILT

CONSTRUCTION AT CLIENT / CONTRACTOR RISK

Designed by:	Drawn by:	Checked by:
JRC	JRC	PW

Date: May 2019
Scale: 1:250 @ A1

Drg. No. 3429/300/04
Rev. -

KEY:

	ROAD CENTRE LINE
	ROAD KERBS
	FOOTWAY EDGING KERB
25.0	ROAD CHAINAGE
109.50	PROPOSED ROAD CONTOURS
FFL 109.75	FINISHED FLOOR LEVELS
+109.50	PROPOSED SPOT LEVELS
Type CLAY 225mm @ 1 in 20 IL=105.40	STORM WATER SEWER, MANHOLE & PIPE DETAILS
Type CLAY 150mm @ 1 in 60 IL=105.60	FOUL WATER SEWER, MANHOLE & PIPE DETAILS

Client

Hills

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Client
Hills Homes Developments Ltd.

Job Title
Land at North Wroughton
Wiltshire

Drawing Title
Drainage Strategy and Preliminary Finished Levels
SHEET 5 OF 7

FOR PLANNING

Drawing Status:

FOR COMMENT	FOR PLANNING	FOR TENDER	FOR APPROVAL	FOR CONSTRUCTION	AS BUILT

CONSTRUCTION AT CLIENT / CONTRACTOR RISK

Designed by:	Drawn by:	Checked by:
JRC	JRC	PW

Date: May 2019
Scale: 1:250 @ A1

Drg. No. 3429/300/05
Rev. -

KEY

- Proposed Strategic Landscape
- Retained habitat to support reptile mitigation
- Existing trees to be removed
- Proposed footpath diversion
- Existing footpath (FP 78)
- Other footpath
- Primary (Spine) Road 6m + 2m footpath on both sides
- Secondary (Residential) Road 5m + 2m footpath on one side only
- Shared Surface Min 4.5m + no footpath
- Adoptable Shared Surface Min 4.5m + no footpath
- V Visitor Parking
- W Woodland View Residents Parking
- Affordable Unit

111.35 Finished Floor Level
122.51 Ridge Level

Site Area	= 11.6 Ha approx.
Development Area	= 5.2 Ha approx.
Houses	= 98
Apartments	= 6
TOTAL	= 104

Approx. 21 DPH

REV:	DATE:	AMENDMENTS:	DRAWN:	CHECKED:
A	10.06.19	General amendments	SW	CF

CLIENT: Hills UK Ltd

DRAWING: Proposed Site Layout

SCALE: 1:1000

SIZE: A1

P:\two\26420127\27 ...

OS NORTH

BH101
BH102
BH103
BH104
BH105
BH106
BH107
BH108
BH109
BH110
BH111

Note: Extent to be confirmed

POND 1
Total Vol:1120m3
(top of bank 105m)
746m3 to top
WL:104.7m)

POND 2
Total Vol:495m3
(top of bank 105m)
320m3 to top
WL:104.7m)

Pond

Drain

Clyde Cottages

SWINDON ROAD

109.7m

8694

KEY

- Proposed highway/services corridors
- Zone A - Over Greenfield deposits - Kimmeridge Formation
- Zone B - Over recent construction waste deposits
- Zone C - Over shallow construction waste deposits but deep landfill deposits underneath
- Proposed surface water drainage
- Proposed foul water drainage
- Dig for clean cover, pavement construction and pile mat
- Dig for soft gravel finished
- Borehole
- Extent of partial excavation
- Extent of full excavation

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information: Cole Easdon Consultants - Drawing No: 3429/300/01 May 2019

REV.						
P1	FIRST ISSUE					
	AT	04/06/19	PLA	04/06/19	RH	04/06/19
	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT
THE HILLS GROUP

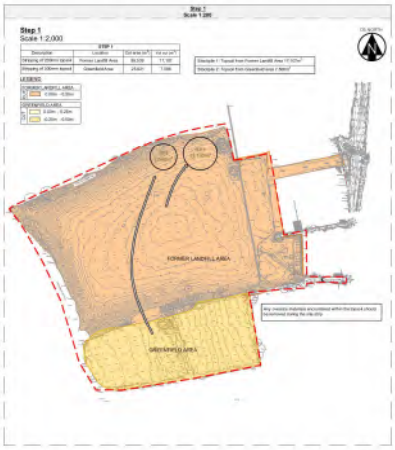
PROJECT
GEOTECHNICAL APPRAISAL REPORT

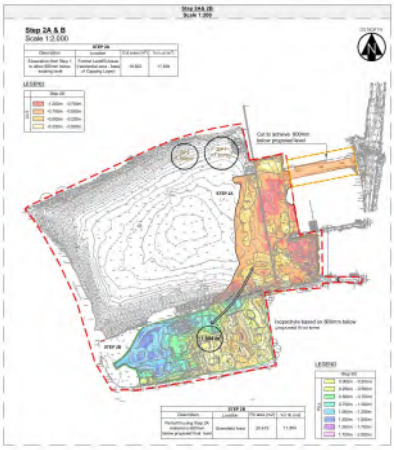
TITLE
POTENTIAL TREATMENT PLAN

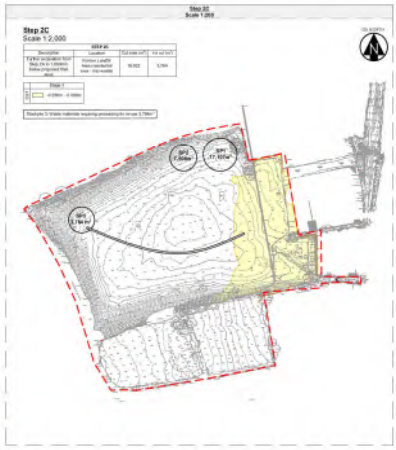
HYDROCK PROJECT NO.	SCALE @ A2
C-02753-C	1:1000

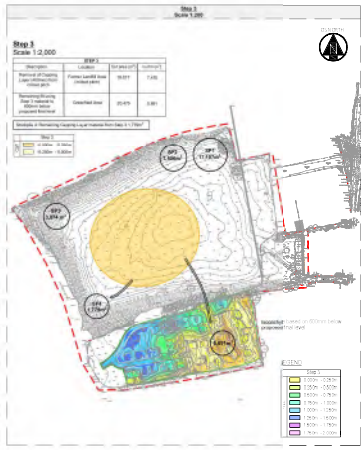
PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

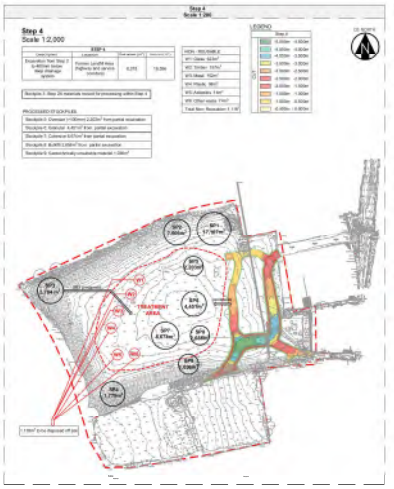
DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
WRO-HYD-XX-XX-DR-G-1000	P1

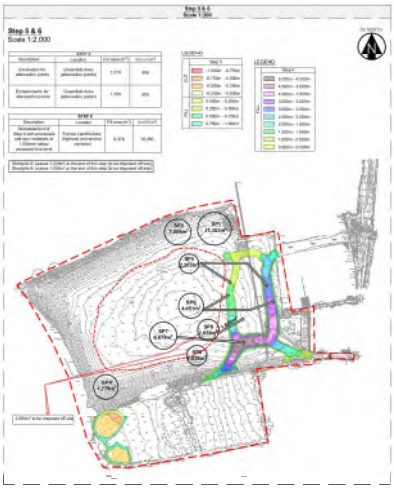


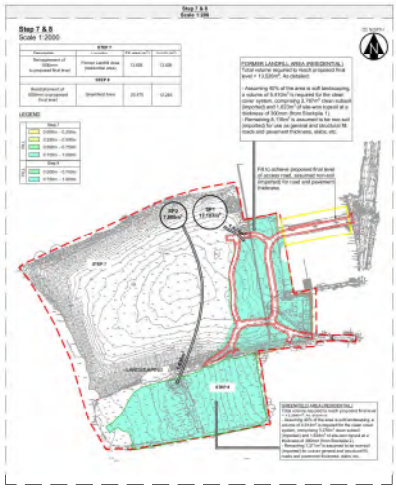


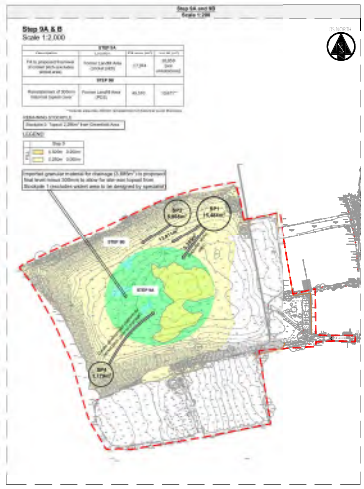












GENERAL NOTES:

1. The stockpile sizes are not to scale and also have not considered the impact of placement on perimeter slopes. The appointed Contractor should satisfy themselves that the sequencing (see below), placement and available space for stockpiling is appropriate.
2. The sequencing of works is preliminary and has been undertaken to determine an estimate of volumes and potential uses of the different materials available on site. The sequencing is subject to further discussion with the appointed contractor.
3. The area of the residential footprints assumed to be soft landscaping has currently been estimated at 40% to provide preliminary volumes of required soil. The actual soft landscaping areas (and calculated volumes) may differ.
4. The widest areas of the cricket pitch (approximately 21m by 33m based on Oak Tandem Consultants 'Finished levels drawing (Ref: 4175-10-7)') is excluded from the fill during Step 7. This area should be designed by a specialist.
5. This Materials Management Strategy is to be read in conjunction with the mitigation measures detailed in the Hydrock Remediation Strategy (Ref: 02753-HYD-XX-XX-RP-G-1002) and the Hydrock Earthworks Strategy (Ref: 12248-HYD-XX-XX-DR-G-1002).

NOTES:

1. All dimensions are from checked scaled artwork. Any discrepancies are to be reported to the Architect & Engineer for verification.
2. Figured dimensions only are to be taken from this Drawing.
3. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

Hydrock

CLIENT: HILLS HOMES DEVELOPMENT LTD.

PROJECT: LAND OF WOODLAND WAY, WROUGHTON

TITLE: CUT & FILL AND MATERIALS MANAGMENT STRATEGY

HYDROCK PROJECT NO: C12248-C

SCALE @ A1: 1:2,000

DRAWING NO: 12248-HYD-XX-XX-DR-G-1003

STATUS: S2

PURPOSE OF ISSUE: SUITABLE FOR INFORMATION

REVISION: P1

OS NORTH

KEY

- Proposed highway/services corridors
- Zone A - Over Greenfield deposits - Kimmeridge Formation
- Zone B - Over recent construction waste deposits
- Zone C - Over shallow construction waste deposits but deep landfill deposits underneath
- Proposed surface water drainage
- Proposed foul water drainage
- Dig for clean cover, pavement construction and pile mat
- Dig for soft gravel finished
- Borehole
- Site Boundary
- Extent of partial excavation
- Photo location and reference
- Extent of full excavation

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information: Cole Easdon Consultants - Drawing No: 3429/300/01 May 2019

REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P1	FIRST ISSUE	AT	04/06/19	PLA	04/06/19	RH	04/06/19

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CLIENT

THE HILLS GROUP

PROJECT

GEOTECHNICAL APPRAISAL REPORT

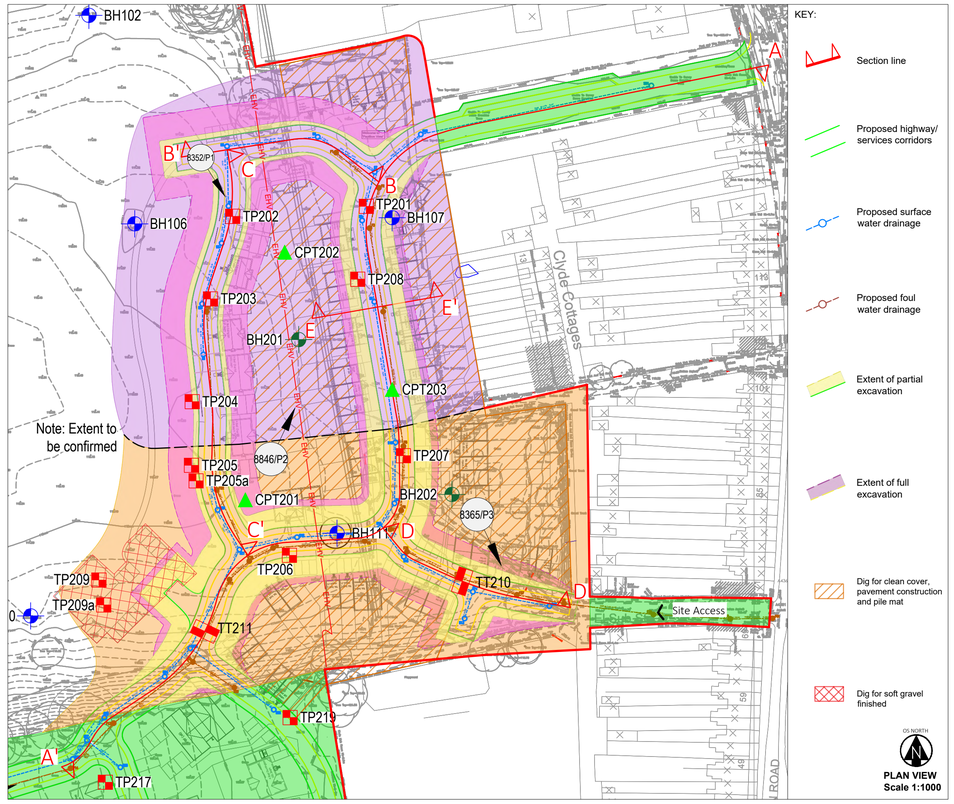
TITLE

EXPLORATORY HOLE LOCTION AND ZONATION PLAN

HYDROCK PROJECT NO.	SCALE @ A2
C-02753-C	1:1000

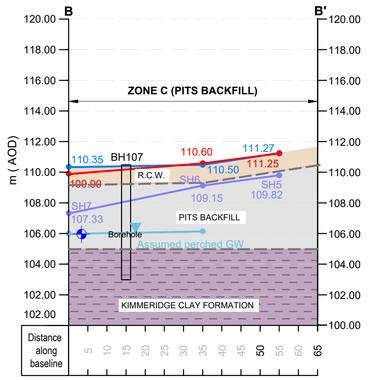
PURPOSE OF ISSUE	STATUS
WORK IN PROGRESS	S0

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
WRO-HYD-XX-XX-DR-G-1002	P1

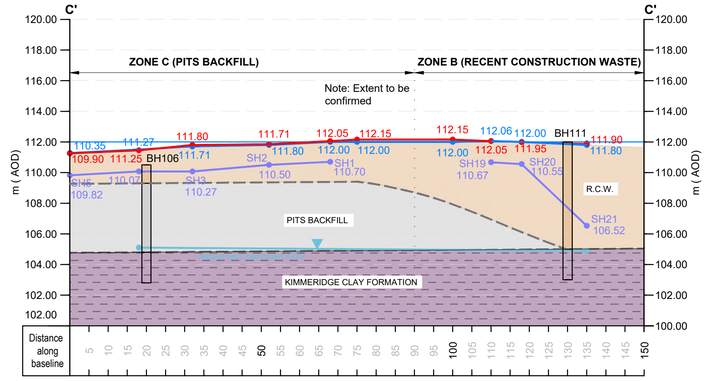


109.54 Existing ground level (mOD)
109.60 Proposed development (mOD)
SH1 108 Proposed drainage invert level (mOD)
Groundwater level (mOD)
Conjectural geological boundary
Recent construction waste (R.C.W)
Pits backfill - waste amd landfill
Weathered Kimmeridge Clay Formation
Kimmeridge Clay Formation

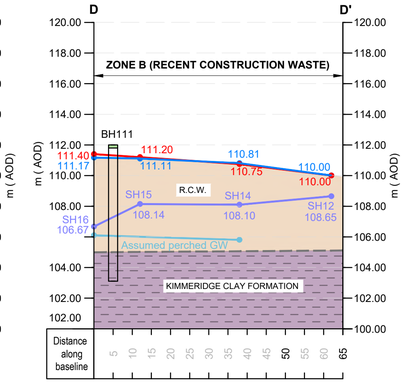
SECTION B - B'
Horizonal Scale:1:125
Vertical Scale 1:200



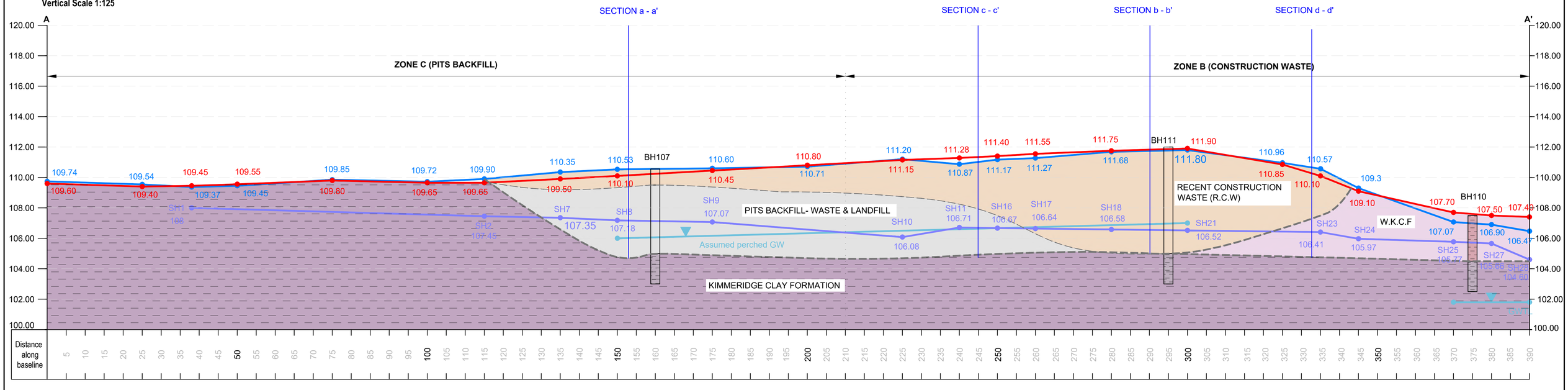
SECTION C - C'
Horizonal Scale:1:125
Vertical Scale 1:200



SECTION D - D'
Horizonal Scale:1:125
Vertical Scale 1:200



SECTION A - A' - EXISITNG GROUND CONDITIONS
Horizonal Scale:1:125
Vertical Scale 1:125



KEY

NOTES

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2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information:
Cole Easdon Consultants - Drawing No: 3429/300/01 May 2019.

REV.						
P1	FIRST ISSUE	EP	16/03/2022	LL	04/04/2022	SC	08/04/2022
	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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or visit www.hydrock.com

CLIENT: THE HILLS GROUP

PROJECT: WROUGHTON CLOSED LANDFILL

TITLE: CROSS SECTIONS THROUGH INFRASRUTURE ROUTES

HYDROCK PROJECT NO.: C-02753-C

SCALE @ A1: 1:1000

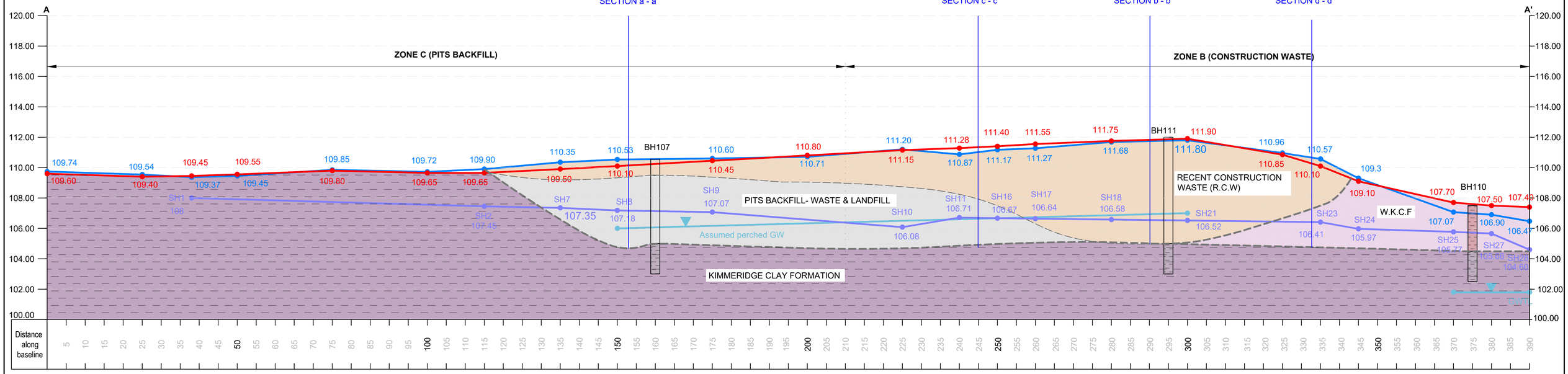
PURPOSE OF ISSUE: SUITABLE FOR INFORMATION

STATUS: S2

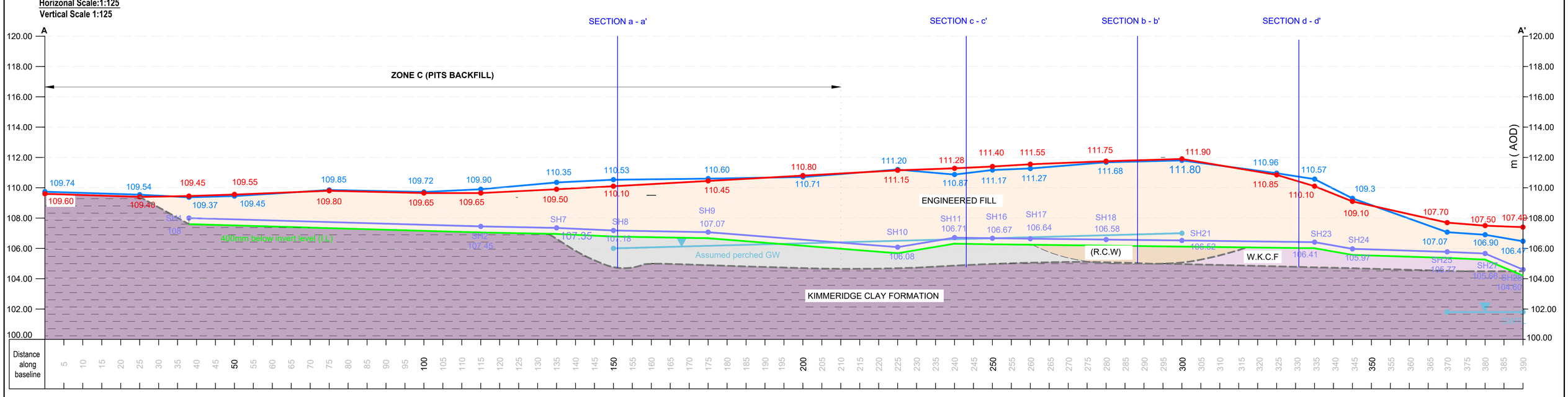
DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): WRO-HYD-XX-XX-DR-G-1003

REVISION: P1

SECTION A - A' - EXISITNG GROUND CONDITIONS
Horizonal Scale:1:125
Vertical Scale 1:125



SECTION A - A' - PROPOSED ENGINEERING FILL LEVEL
Horizonal Scale:1:125
Vertical Scale 1:125



KEY

- Existing ground level (mOD)
- Proposed development (mOD)
- Proposed drainage invert level (mOD)
- Groundwater level (mOD)
- Conjectural geological boundary
- Recent construction waste (R.C.W)
- Pits backfill - waste amd landfill
- Weathered Kimmeridge Clay Formation
- Kimmeridge Clay Formation
- Engineered Fill

NOTES

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3. This drawing has been based on the following drawings and information:
Cole Easdon Consultants - Drawing No: 3429/300/01 May 2019.

REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P1	FIRST ISSUE	EP	16/03/2022	LL	04/04/2022	SC	08/04/2022

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FAX: 01454 614 125
E-Mail: bristol@hydrock.com
or visit www.hydrock.com

CLIENT: THE HILLS GROUP

PROJECT: WROUGHTON CLOSED LANDFILL

TITLE: CROSS SECTION TROUGH SECTION A-A' SHOWING PROPOSED ENGINEERED FILL EXTENTS

HYDROCK PROJECT NO.	SCALE @ A1
C-02753-C	1:1000

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): WRO-HYD-XX-XX-DR-G-1004

REVISION: P1

ANNEX B – EARTHWORK SPECIFICATION

(see separate electronic copy)

ANNEX B – GROUND SETTLEMENT ASSESSMENT ANALYSIS

Settlement analysis

Input data

Project

Task : Settlement Assessment Wroughton Landfill
Part : Long Section A-A'
Customer : Hills Group
Author : Hydrock
Date : 10/03/2022
Project ID : Wroughton Closed Landfill
Project number : 02753

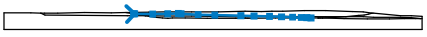
Settings

Standard - no reduction of parameters

Settlement

Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	9.74	25.00	9.54	34.38	9.42
		38.00	9.37	50.00	9.45	75.00	9.85
		100.00	9.72	113.89	9.89	115.00	9.90
		135.00	10.35	150.00	10.53	175.00	10.60
		200.00	10.71	225.00	11.20	240.00	10.87
		250.00	11.17	260.00	11.27	280.00	11.68
		300.00	11.80	325.00	10.96	335.00	10.57
		343.52	9.49	345.00	9.30	370.00	7.07
		380.00	6.90	390.00	6.47		
2		113.89	9.89	120.73	8.78	131.96	6.97
		141.60	5.42	147.80	4.77	152.90	4.62
		157.09	4.86	169.00	4.85	189.71	4.69
		215.87	4.58	227.52	4.64	253.14	4.93
		270.71	5.03	281.22	4.99	286.50	5.00
		292.90	5.01	293.07	4.99	297.07	4.75
		317.05	4.40	339.06	4.14	359.69	4.14
		373.31	4.43	384.19	4.40	388.55	4.36
		390.00	4.35				
3		293.07	4.99	295.49	4.97	297.26	5.01
		309.37	5.50	319.07	6.20	331.02	7.15
		336.03	7.58	340.27	8.33	343.52	9.49
4		34.38	9.42	38.03	7.60	115.03	7.05
		131.96	6.97				
5		120.73	8.78	121.77	8.83	138.66	8.51
		152.70	8.70	162.56	9.05	165.22	8.88
		181.08	8.00	196.65	7.65	221.00	7.09
		233.18	6.76	247.72	6.33	259.01	5.97
		269.20	5.61	277.39	5.34	282.60	5.24
		286.50	5.00				

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
6		131.96	6.97	135.03	6.95	150.03	6.78
		175.03	6.67	225.04	5.68	240.04	6.31
		247.72	6.33				
7		247.72	6.33	260.03	6.24	280.03	6.18
		300.03	6.12	319.07	6.20		
8		319.07	6.20	335.02	6.01	345.02	5.57
		370.03	5.37	380.01	5.26	388.55	4.36

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		0.00	5.60	25.02	5.40	38.06	5.45
		50.07	5.55	75.04	5.80	100.02	5.65
		115.04	5.65	141.09	1.45	147.54	0.77
		152.95	0.62	155.99	0.76	157.27	0.86
		169.00	0.85	189.70	0.69	215.89	0.58
		227.57	0.64	253.18	0.93	270.72	1.03
		281.21	0.99	292.91	0.93	295.40	0.97
		316.99	0.40	339.05	0.14	359.74	0.14
		373.37	0.43	384.20	0.40	390.00	0.40

Soil parameters

Made Ground - landfill

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	4.50 MPa
Poisson's ratio :	ν	=	0.30
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Made Ground - recent

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Weathered KCF (Clay)

Unit weight :	γ	=	18.00 kN/m^3
Deformation modulus :	E_{def}	=	15.00 MPa
Poisson's ratio :	ν	=	0.20
Saturated unit weight :	γ_{sat}	=	19.50 kN/m^3

Weak MUDSTONE

Unit weight :	γ	=	21.00 kN/m^3
Deformation modulus :	E_{def}	=	20.00 MPa
Poisson's ratio :	ν	=	0.10
Saturated unit weight :	γ_{sat}	=	21.50 kN/m^3

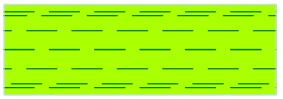
Engineered Fill

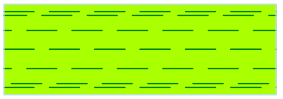
Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	16.00 MPa

Poisson's ratio : $\nu = 0.25$
Saturated unit weight : $\gamma_{sat} = 21.00\ kN/m^3$

Road Constuction
Unit weight : $\gamma = 20.00\ kN/m^3$
Deformation modulus : $E_{def} = 10.00\ MPa$
Poisson's ratio : $\nu = 0.25$
Saturated unit weight : $\gamma_{sat} = 21.00\ kN/m^3$

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		38.03	7.60	115.03	7.05	Weak MUDSTONE
		131.96	6.97	120.73	8.78	
		113.89	9.89	100.00	9.72	
		75.00	9.85	50.00	9.45	
		38.00	9.37	34.38	9.42	
2		260.03	6.24	280.03	6.18	Made Ground - recent
		300.03	6.12	319.07	6.20	
		331.02	7.15	336.03	7.58	
		340.27	8.33	343.52	9.49	
		335.00	10.57	325.00	10.96	
		300.00	11.80	280.00	11.68	
		260.00	11.27	250.00	11.17	
		240.00	10.87	225.00	11.20	
		200.00	10.71	175.00	10.60	
		150.00	10.53	135.00	10.35	
		115.00	9.90	113.89	9.89	
		120.73	8.78	121.77	8.83	
		138.66	8.51	152.70	8.70	
		162.56	9.05	165.22	8.88	
		181.08	8.00	196.65	7.65	
		221.00	7.09	233.18	6.76	
		247.72	6.33			
3		135.03	6.95	150.03	6.78	Made Ground - landfill
		175.03	6.67	225.04	5.68	
		240.04	6.31	247.72	6.33	
		233.18	6.76	221.00	7.09	
		196.65	7.65	181.08	8.00	
		165.22	8.88	162.56	9.05	
		152.70	8.70	138.66	8.51	
		121.77	8.83	120.73	8.78	
		131.96	6.97			
4		300.03	6.12	280.03	6.18	Made Ground - recent
		260.03	6.24	247.72	6.33	
		259.01	5.97	269.20	5.61	
		277.39	5.34	282.60	5.24	
		286.50	5.00	292.90	5.01	
		293.07	4.99	295.49	4.97	
		297.26	5.01	309.37	5.50	
		319.07	6.20			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		240.04	6.31	225.04	5.68	Made Ground - landfill
		175.03	6.67	150.03	6.78	
		135.03	6.95	131.96	6.97	
		141.60	5.42	147.80	4.77	
		152.90	4.62	157.09	4.86	
		169.00	4.85	189.71	4.69	
		215.87	4.58	227.52	4.64	
		253.14	4.93	270.71	5.03	
		281.22	4.99	286.50	5.00	
		282.60	5.24	277.39	5.34	
		269.20	5.61	259.01	5.97	
		247.72	6.33			
6		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		370.03	5.37	380.01	5.26	
		388.55	4.36	390.00	4.35	
		390.00	6.47	380.00	6.90	
		370.00	7.07	345.00	9.30	
		343.52	9.49	340.27	8.33	
		336.03	7.58	331.02	7.15	
		319.07	6.20			
7		380.01	5.26	370.03	5.37	Weathered KCF (Clay)
		345.02	5.57	335.02	6.01	
		319.07	6.20	309.37	5.50	
		297.26	5.01	295.49	4.97	
		293.07	4.99	297.07	4.75	
		317.05	4.40	339.06	4.14	
		359.69	4.14	373.31	4.43	
		384.19	4.40	388.55	4.36	
8		115.03	7.05	38.03	7.60	Weak MUDSTONE
		34.38	9.42	25.00	9.54	
		0.00	9.74	0.00	-5.86	
		390.00	-5.86	390.00	4.35	
		388.55	4.36	384.19	4.40	
		373.31	4.43	359.69	4.14	
		339.06	4.14	317.05	4.40	
		297.07	4.75	293.07	4.99	
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		253.14	4.93	227.52	4.64	
		215.87	4.58	189.71	4.69	
		169.00	4.85	157.09	4.86	
		152.90	4.62	147.80	4.77	
		141.60	5.42	131.96	6.97	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	4.63	150.00	6.00	233.18	6.76
		300.00	7.00	308.90	1.95	390.00	1.61

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Results (Stage of construction 1)

Results

Analysis of geostatic stress was successfully completed

Input data (Stage of construction 2)

Earth cut

No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.02	8.85	50.02	8.95
		75.02	9.20	100.02	9.05	115.02	9.05
		135.03	9.30	150.03	9.50	175.03	9.85
		200.03	10.20	225.03	10.55	240.02	10.68
		250.03	10.80	260.03	10.95	280.02	11.15
		300.01	11.30	324.98	10.25	334.97	9.50
		344.97	8.50	370.00	7.07	380.00	6.90
		390.00	6.80				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		120.73	8.78	118.78	9.10	Weak MUDSTONE
		115.02	9.05	100.02	9.05	
		75.02	9.20	50.02	8.95	
		38.02	8.85	36.41	9.39	
		34.38	9.42	38.03	7.60	
		115.03	7.05	131.96	6.97	
2		260.03	6.24	280.03	6.18	Made Ground - recent
		300.03	6.12	319.07	6.20	
		331.02	7.15	336.03	7.58	
		340.27	8.33	341.67	8.83	
		334.97	9.50	324.98	10.25	
		300.01	11.30	280.02	11.15	
		260.03	10.95	250.03	10.80	
		240.02	10.68	225.03	10.55	
		200.03	10.20	175.03	9.85	
		150.03	9.50	135.03	9.30	
		118.78	9.10	120.73	8.78	
		121.77	8.83	138.66	8.51	
		152.70	8.70	162.56	9.05	
		165.22	8.88	181.08	8.00	
		196.65	7.65	221.00	7.09	
		233.18	6.76	247.72	6.33	
3		135.03	6.95	150.03	6.78	Made Ground - landfill
		175.03	6.67	225.04	5.68	
		240.04	6.31	247.72	6.33	
		233.18	6.76	221.00	7.09	
		196.65	7.65	181.08	8.00	
		165.22	8.88	162.56	9.05	
		152.70	8.70	138.66	8.51	
		121.77	8.83	120.73	8.78	
		131.96	6.97			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		300.03	6.12	280.03	6.18	Made Ground - recent
		260.03	6.24	247.72	6.33	
		259.01	5.97	269.20	5.61	
		277.39	5.34	282.60	5.24	
		286.50	5.00	292.90	5.01	
		293.07	4.99	295.49	4.97	
		297.26	5.01	309.37	5.50	
		319.07	6.20			
5		240.04	6.31	225.04	5.68	Made Ground - landfill
		175.03	6.67	150.03	6.78	
		135.03	6.95	131.96	6.97	
		141.60	5.42	147.80	4.77	
		152.90	4.62	157.09	4.86	
		169.00	4.85	189.71	4.69	
		215.87	4.58	227.52	4.64	
		253.14	4.93	270.71	5.03	
		281.22	4.99	286.50	5.00	
		282.60	5.24	277.39	5.34	
		269.20	5.61	259.01	5.97	
		247.72	6.33			
6		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		370.03	5.37	380.01	5.26	
		388.55	4.36	390.00	4.35	
		390.00	6.47	380.00	6.90	
		370.00	7.07	344.97	8.50	
		341.67	8.83	340.27	8.33	
		336.03	7.58	331.02	7.15	
		319.07	6.20			
7		380.01	5.26	370.03	5.37	Weathered KCF (Clay)
		345.02	5.57	335.02	6.01	
		319.07	6.20	309.37	5.50	
		297.26	5.01	295.49	4.97	
		293.07	4.99	297.07	4.75	
		317.05	4.40	339.06	4.14	
		359.69	4.14	373.31	4.43	
		384.19	4.40	388.55	4.36	
8		388.55	4.36	384.19	4.40	Weak MUDSTONE
		373.31	4.43	359.69	4.14	
		339.06	4.14	317.05	4.40	
		297.07	4.75	293.07	4.99	
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		253.14	4.93	227.52	4.64	
		215.87	4.58	189.71	4.69	
		169.00	4.85	157.09	4.86	
		152.90	4.62	147.80	4.77	
		141.60	5.42	131.96	6.97	
		115.03	7.05	38.03	7.60	
		34.38	9.42	25.00	9.54	
		0.00	9.74	0.00	-5.86	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
		390.00	-5.86	390.00	4.35	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	4.63	150.00	6.00	233.18	6.76
		300.00	7.00	308.90	1.95	390.00	1.61

Results (Stage of construction 2)

Results

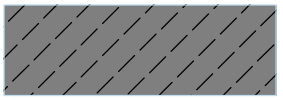
Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 0.0 mm
Maximum depth of influence zone = 0.00 m

Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.00	9.37	50.00	9.45
		75.02	9.80	100.02	9.65	115.02	9.65
		135.02	9.90	150.02	10.10	175.02	10.45
		200.00	10.71	225.00	11.20	240.02	11.28
		250.02	11.40	260.07	11.55	280.02	11.75
		300.00	11.80	325.02	10.85	335.02	10.10
		345.02	9.10	370.02	7.70	380.02	7.50
		390.00	7.40				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		120.73	8.78	118.78	9.10	Weak MUDSTONE
		115.02	9.05	100.02	9.05	
		75.02	9.20	50.02	8.95	
		38.02	8.85	36.41	9.39	
		34.38	9.42	38.03	7.60	
		115.03	7.05	131.96	6.97	
2		380.00	6.90	390.00	6.47	Road Constuction
		390.00	7.40	380.02	7.50	
		370.02	7.70	345.02	9.10	
		335.02	10.10	325.02	10.85	
		300.00	11.80	280.02	11.75	
		260.07	11.55	250.02	11.40	
		240.02	11.28	225.00	11.20	
		200.00	10.71	175.02	10.45	
		150.02	10.10	135.02	9.90	
		115.02	9.65	100.02	9.65	
		75.02	9.80	50.00	9.45	
		38.00	9.37	36.41	9.39	
		38.02	8.85	50.02	8.95	
		75.02	9.20	100.02	9.05	
		115.02	9.05	118.78	9.10	
		135.03	9.30	150.03	9.50	
		175.03	9.85	200.03	10.20	
		225.03	10.55	240.02	10.68	
		250.03	10.80	260.03	10.95	
		280.02	11.15	300.01	11.30	
		324.98	10.25	334.97	9.50	
		341.67	8.83	344.97	8.50	
		370.00	7.07			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
3		260.03	6.24	280.03	6.18	Made Ground - recent
		300.03	6.12	319.07	6.20	
		331.02	7.15	336.03	7.58	
		340.27	8.33	341.67	8.83	
		334.97	9.50	324.98	10.25	
		300.01	11.30	280.02	11.15	
		260.03	10.95	250.03	10.80	
		240.02	10.68	225.03	10.55	
		200.03	10.20	175.03	9.85	
		150.03	9.50	135.03	9.30	
		118.78	9.10	120.73	8.78	
		121.77	8.83	138.66	8.51	
		152.70	8.70	162.56	9.05	
		165.22	8.88	181.08	8.00	
		196.65	7.65	221.00	7.09	
		233.18	6.76	247.72	6.33	
4		135.03	6.95	150.03	6.78	Made Ground - landfill
		175.03	6.67	225.04	5.68	
		240.04	6.31	247.72	6.33	
		233.18	6.76	221.00	7.09	
		196.65	7.65	181.08	8.00	
		165.22	8.88	162.56	9.05	
		152.70	8.70	138.66	8.51	
		121.77	8.83	120.73	8.78	
		131.96	6.97			
5		300.03	6.12	280.03	6.18	Made Ground - recent
		260.03	6.24	247.72	6.33	
		259.01	5.97	269.20	5.61	
		277.39	5.34	282.60	5.24	
		286.50	5.00	292.90	5.01	
		293.07	4.99	295.49	4.97	
		297.26	5.01	309.37	5.50	
		319.07	6.20			
6		240.04	6.31	225.04	5.68	Made Ground - landfill
		175.03	6.67	150.03	6.78	
		135.03	6.95	131.96	6.97	
		141.60	5.42	147.80	4.77	
		152.90	4.62	157.09	4.86	
		169.00	4.85	189.71	4.69	
		215.87	4.58	227.52	4.64	
		253.14	4.93	270.71	5.03	
		281.22	4.99	286.50	5.00	
		282.60	5.24	277.39	5.34	
		269.20	5.61	259.01	5.97	
		247.72	6.33			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
7		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		370.03	5.37	380.01	5.26	
		388.55	4.36	390.00	4.35	
		390.00	6.47	380.00	6.90	
		370.00	7.07	344.97	8.50	
		341.67	8.83	340.27	8.33	
		336.03	7.58	331.02	7.15	
		319.07	6.20			
8		380.01	5.26	370.03	5.37	Weathered KCF (Clay)
		345.02	5.57	335.02	6.01	
		319.07	6.20	309.37	5.50	
		297.26	5.01	295.49	4.97	
		293.07	4.99	297.07	4.75	
		317.05	4.40	339.06	4.14	
		359.69	4.14	373.31	4.43	
		384.19	4.40	388.55	4.36	
9		388.55	4.36	384.19	4.40	Weak MUDSTONE
		373.31	4.43	359.69	4.14	
		339.06	4.14	317.05	4.40	
		297.07	4.75	293.07	4.99	
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		253.14	4.93	227.52	4.64	
		215.87	4.58	189.71	4.69	
		169.00	4.85	157.09	4.86	
		152.90	4.62	147.80	4.77	
		141.60	5.42	131.96	6.97	
		115.03	7.05	38.03	7.60	
		34.38	9.42	25.00	9.54	
		0.00	9.74	0.00	-5.86	
		390.00	-5.86	390.00	4.35	

Surcharge

No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	Yes		strip	on terrain	x = 0.00	l = 390.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Load Road

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	4.63	150.00	6.00	233.18	6.76
		300.00	7.00	308.90	1.95	390.00	1.61

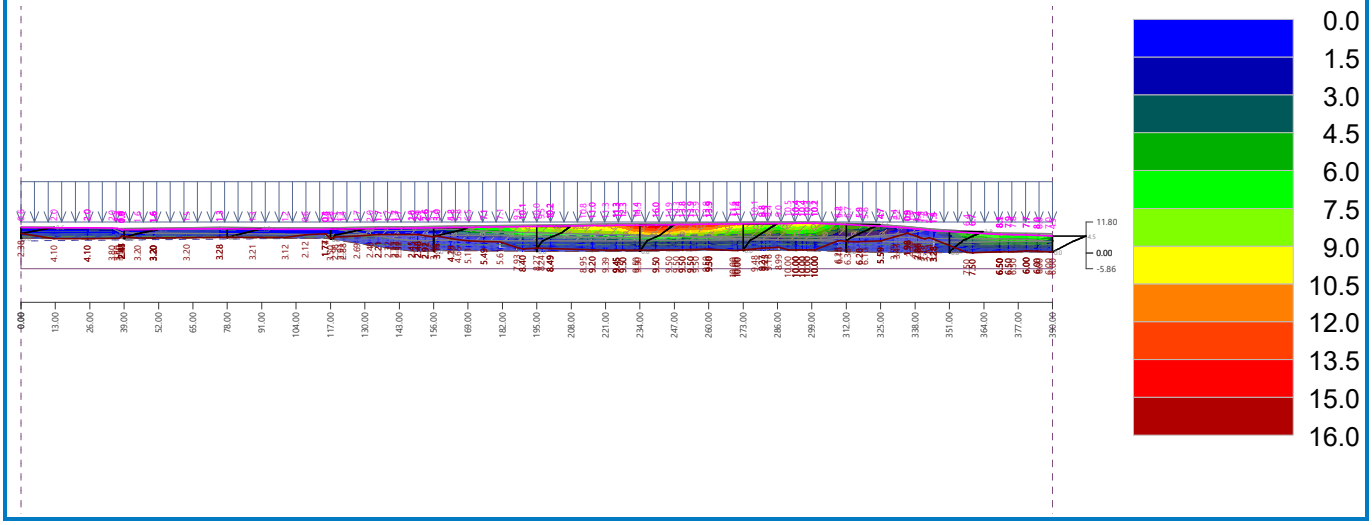
Results (Stage of construction 3)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 16.0 mm
Maximum depth of influence zone = 10.00 m

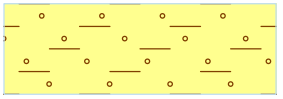
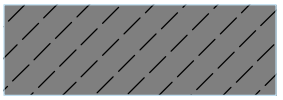
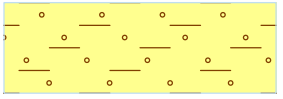
Name : Analysis	Stage : 3

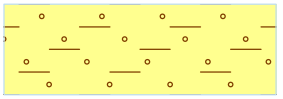
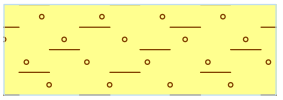
Results : overall; variable : Settlement; range : <0.0; 16.0> mm

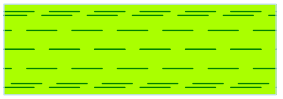


Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		120.73	8.78	118.78	9.10	Engineered Fill
		115.02	9.05	100.02	9.05	
		75.02	9.20	50.02	8.95	
		38.02	8.85	36.41	9.39	
		34.38	9.42	38.03	7.60	
		115.03	7.05	131.96	6.97	
2		380.00	6.90	390.00	6.47	Road Constuction
		390.00	7.40	380.02	7.50	
		370.02	7.70	345.02	9.10	
		335.02	10.10	325.02	10.85	
		300.00	11.80	280.02	11.75	
		260.07	11.55	250.02	11.40	
		240.02	11.28	225.00	11.20	
		200.00	10.71	175.02	10.45	
		150.02	10.10	135.02	9.90	
		115.02	9.65	100.02	9.65	
		75.02	9.80	50.00	9.45	
		38.00	9.37	36.41	9.39	
		38.02	8.85	50.02	8.95	
		75.02	9.20	100.02	9.05	
		115.02	9.05	118.78	9.10	
		135.03	9.30	150.03	9.50	
		175.03	9.85	200.03	10.20	
		225.03	10.55	240.02	10.68	
		250.03	10.80	260.03	10.95	
		280.02	11.15	300.01	11.30	
		324.98	10.25	334.97	9.50	
		341.67	8.83	344.97	8.50	
		370.00	7.07			
3		260.03	6.24	280.03	6.18	Engineered Fill
		300.03	6.12	319.07	6.20	
		331.02	7.15	336.03	7.58	
		340.27	8.33	341.67	8.83	
		334.97	9.50	324.98	10.25	
		300.01	11.30	280.02	11.15	
		260.03	10.95	250.03	10.80	
		240.02	10.68	225.03	10.55	
		200.03	10.20	175.03	9.85	
		150.03	9.50	135.03	9.30	
		118.78	9.10	120.73	8.78	
		121.77	8.83	138.66	8.51	
		152.70	8.70	162.56	9.05	
		165.22	8.88	181.08	8.00	
		196.65	7.65	221.00	7.09	
		233.18	6.76	247.72	6.33	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		135.03	6.95	150.03	6.78	Engineered Fill
		175.03	6.67	225.04	5.68	
		240.04	6.31	247.72	6.33	
		233.18	6.76	221.00	7.09	
		196.65	7.65	181.08	8.00	
		165.22	8.88	162.56	9.05	
		152.70	8.70	138.66	8.51	
		121.77	8.83	120.73	8.78	
		131.96	6.97			
5		300.03	6.12	280.03	6.18	Made Ground - recent
		260.03	6.24	247.72	6.33	
		259.01	5.97	269.20	5.61	
		277.39	5.34	282.60	5.24	
		286.50	5.00	292.90	5.01	
		293.07	4.99	295.49	4.97	
		297.26	5.01	309.37	5.50	
		319.07	6.20			
6		240.04	6.31	225.04	5.68	Made Ground - landfill
		175.03	6.67	150.03	6.78	
		135.03	6.95	131.96	6.97	
		141.60	5.42	147.80	4.77	
		152.90	4.62	157.09	4.86	
		169.00	4.85	189.71	4.69	
		215.87	4.58	227.52	4.64	
		253.14	4.93	270.71	5.03	
		281.22	4.99	286.50	5.00	
		282.60	5.24	277.39	5.34	
		269.20	5.61	259.01	5.97	
		247.72	6.33			
7		335.02	6.01	345.02	5.57	Engineered Fill
		370.03	5.37	380.01	5.26	
		388.55	4.36	390.00	4.35	
		390.00	6.47	380.00	6.90	
		370.00	7.07	344.97	8.50	
		341.67	8.83	340.27	8.33	
		336.03	7.58	331.02	7.15	
		319.07	6.20			
8		380.01	5.26	370.03	5.37	Weathered KCF (Clay)
		345.02	5.57	335.02	6.01	
		319.07	6.20	309.37	5.50	
		297.26	5.01	295.49	4.97	
		293.07	4.99	297.07	4.75	
		317.05	4.40	339.06	4.14	
		359.69	4.14	373.31	4.43	
		384.19	4.40	388.55	4.36	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
9		388.55	4.36	384.19	4.40	Weak MUDSTONE
		373.31	4.43	359.69	4.14	
		339.06	4.14	317.05	4.40	
		297.07	4.75	293.07	4.99	
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		253.14	4.93	227.52	4.64	
		215.87	4.58	189.71	4.69	
		169.00	4.85	157.09	4.86	
		152.90	4.62	147.80	4.77	
		141.60	5.42	131.96	6.97	
		115.03	7.05	38.03	7.60	
		34.38	9.42	25.00	9.54	
		0.00	9.74	0.00	-5.86	
		390.00	-5.86	390.00	4.35	

Surcharge

No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	No	No	strip	on terrain	x = 0.00	l = 390.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Load Road

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	4.63	150.00	6.00	233.18	6.76
		300.00	7.00	308.90	1.95	390.00	1.61

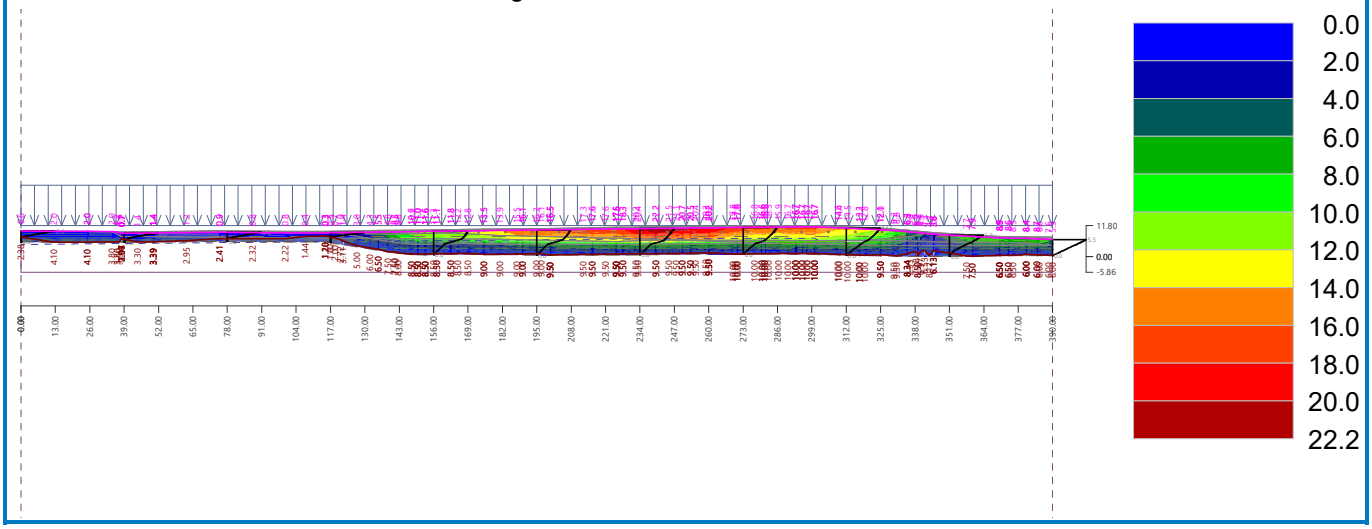
Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 22.2 mm
Maximum depth of influence zone = 10.00 m

Name : Analysis	Stage : 4

Results : overall; variable : Settlement; range : <0.0; 22.2> mm



Settlement analysis

Input data

Project

Task : Settlement Assessment Wroughton Landfill
Part : Section a-a'
Description : 'Firm' landfill desposits
Customer : Hills Group
Author : Hydrock
Date : 10/03/2022
Project ID : Wroughton Closed Landfill
Project number : 02753

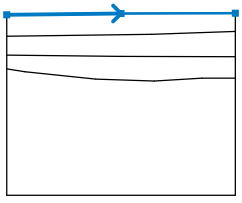
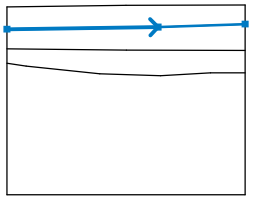
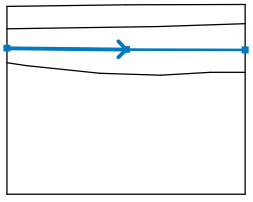
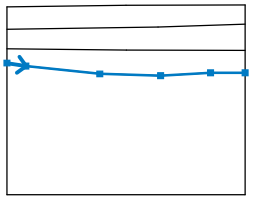
Settings

Standard - EN 1997 - DA1

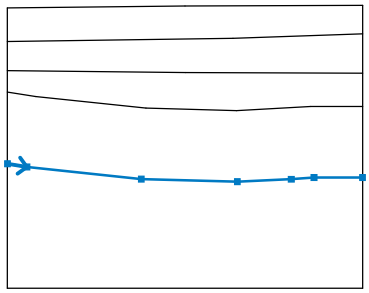
Settlement

Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		140.00	10.41	150.00	10.53	160.00	10.56
2		140.00	8.53	152.70	8.70	160.00	8.96
3		140.00	6.89	150.03	6.78	160.00	6.74
4		140.00	5.68	141.60	5.42	147.80	4.77
		152.90	4.62	157.09	4.86	160.00	4.86

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		140.00	1.63	141.09	1.45	147.54	0.77
		152.95	0.62	155.99	0.76	157.27	0.86
		160.00	0.86				

Soil parameters

Made Ground - landfill

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.30
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Made Ground - recent

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Weathered KCF (Clay)

Unit weight :	γ	=	18.00 kN/m^3
Deformation modulus :	E_{def}	=	15.00 MPa
Poisson's ratio :	ν	=	0.20
Saturated unit weight :	γ_{sat}	=	19.50 kN/m^3

Weak MUDSTONE

Unit weight :	γ	=	21.00 kN/m^3
Deformation modulus :	E_{def}	=	20.00 MPa
Poisson's ratio :	ν	=	0.10
Saturated unit weight :	γ_{sat}	=	21.50 kN/m^3

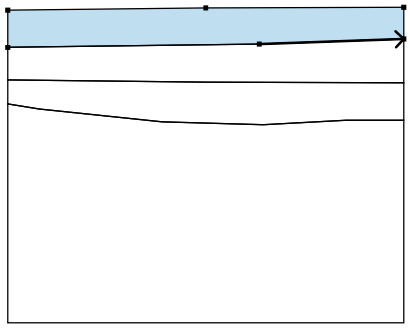
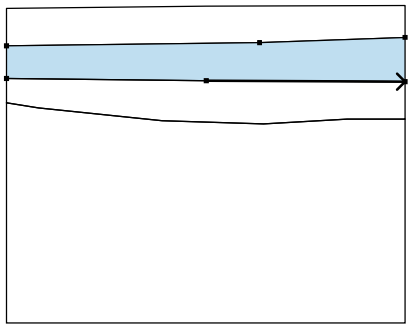
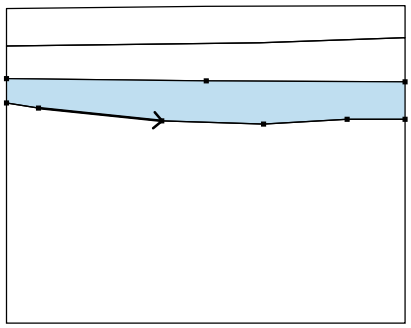
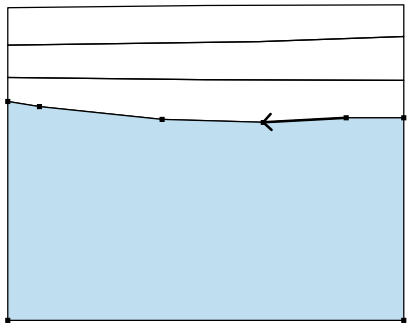
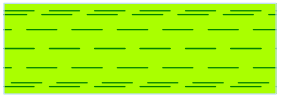
Engineered Fill

Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	16.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	21.00 kN/m^3

Road Constuction

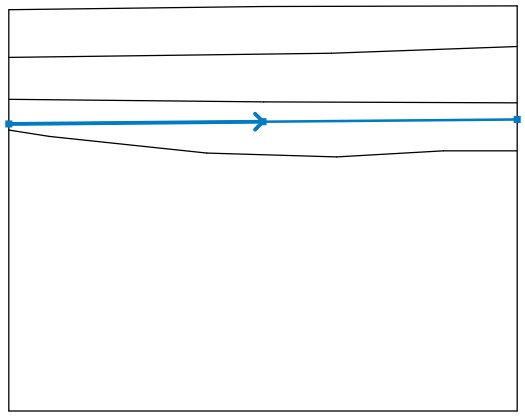
Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	10.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	21.00 kN/m^3

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		152.70	8.70	160.00	8.96	Made Ground - recent
		160.00	10.56	150.00	10.53	
		140.00	10.41	140.00	8.53	
2		150.03	6.78	160.00	6.74	Made Ground - landfill
		160.00	8.96	152.70	8.70	
		140.00	8.53	140.00	6.89	
3		141.60	5.42	147.80	4.77	Made Ground - landfill
		152.90	4.62	157.09	4.86	
		160.00	4.86	160.00	6.74	
		150.03	6.78	140.00	6.89	
		140.00	5.68			
4		157.09	4.86	152.90	4.62	Weak MUDSTONE
		147.80	4.77	141.60	5.42	
		140.00	5.68	140.00	-5.38	
		160.00	-5.38	160.00	4.86	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		140.00	5.91	150.00	6.00	160.00	6.09

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Results (Stage of construction 1)

Results

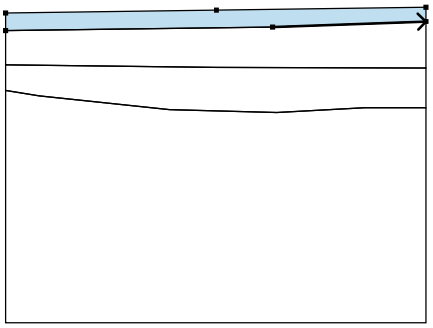
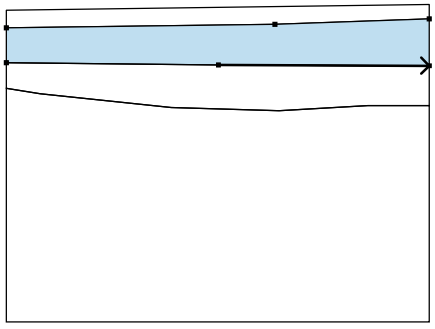
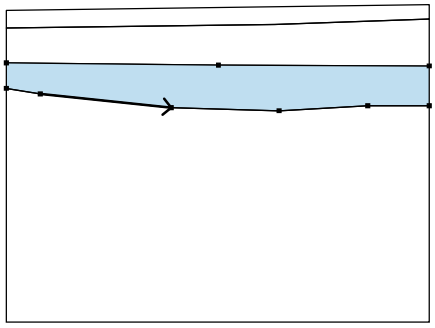
Analysis of geostatic stress was successfully completed

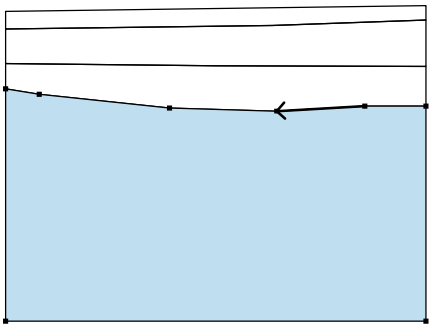
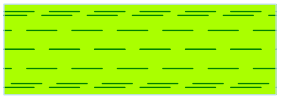
Input data (Stage of construction 2)

Earth cut

No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.02	8.85	50.02	8.95
		75.02	9.20	100.02	9.05	115.02	9.05
		135.03	9.30	150.03	9.50	175.03	9.85
		200.03	10.20	225.03	10.55	240.02	10.68
		250.03	10.80	260.03	10.95	280.02	11.15
		300.01	11.30	324.98	10.25	334.97	9.50
		344.97	8.50	370.00	7.07	380.00	6.90
		390.00	6.80				

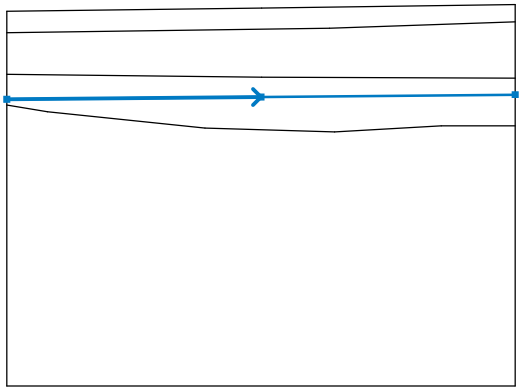
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		152.70	8.70	160.00	8.96	Made Ground - recent
		160.00	9.64	150.03	9.50	
		140.00	9.37	140.00	8.53	
2		150.03	6.78	160.00	6.74	Made Ground - landfill
		160.00	8.96	152.70	8.70	
		140.00	8.53	140.00	6.89	
3		141.60	5.42	147.80	4.77	Made Ground - landfill
		152.90	4.62	157.09	4.86	
		160.00	4.86	160.00	6.74	
		150.03	6.78	140.00	6.89	
		140.00	5.68			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		157.09	4.86	152.90	4.62	Weak MUDSTONE
		147.80	4.77	141.60	5.42	
		140.00	5.68	140.00	-5.38	
		160.00	-5.38	160.00	4.86	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		140.00	5.91	150.00	6.00	160.00	6.09

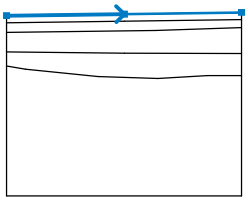
Results (Stage of construction 2)

Results

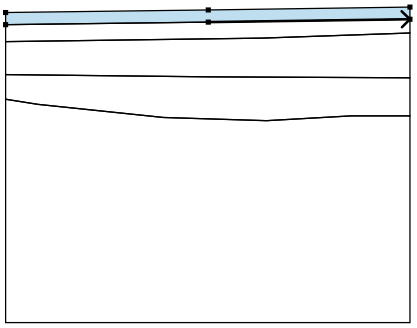
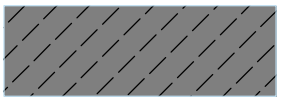
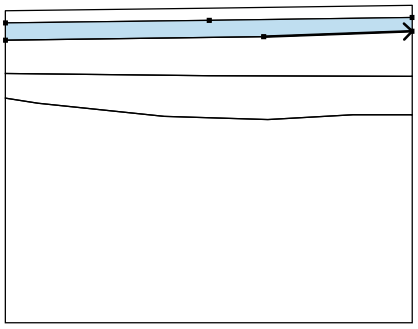
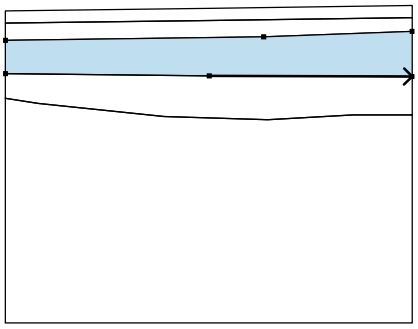
Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 0.0 mm
Maximum depth of influence zone = 0.00 m

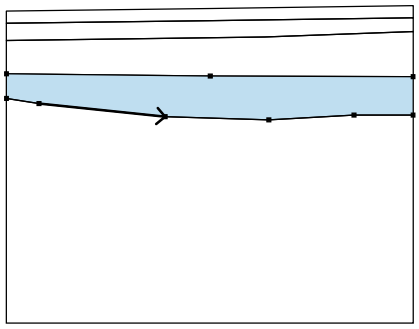
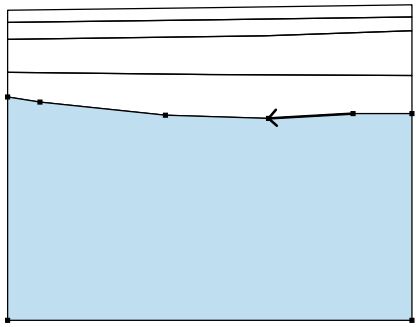
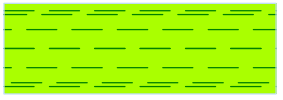
Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		140.00	9.97	150.02	10.10	160.00	10.24

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		150.03	9.50	160.00	9.64	Road Constuction
		160.00	10.24	150.02	10.10	
		140.00	9.97	140.00	9.37	
2		152.70	8.70	160.00	8.96	Made Ground - recent
		160.00	9.64	150.03	9.50	
		140.00	9.37	140.00	8.53	
3		150.03	6.78	160.00	6.74	Made Ground - landfill
		160.00	8.96	152.70	8.70	
		140.00	8.53	140.00	6.89	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		141.60	5.42	147.80	4.77	Made Ground - landfill
		152.90	4.62	157.09	4.86	
		160.00	4.86	160.00	6.74	
		150.03	6.78	140.00	6.89	
		140.00	5.68			
5		157.09	4.86	152.90	4.62	Weak MUDSTONE
		147.80	4.77	141.60	5.42	
		140.00	5.68	140.00	-5.38	
		160.00	-5.38	160.00	4.86	

Surcharge

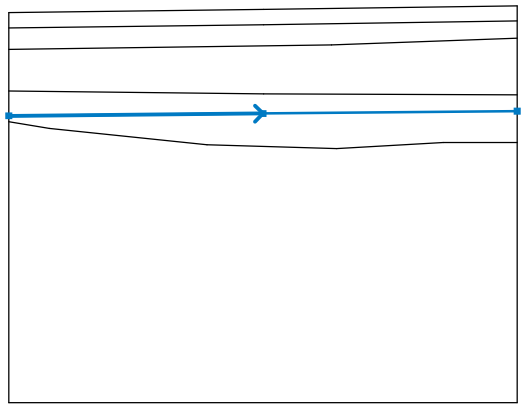
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	Yes		strip	on terrain	x = 140.00	l = 20.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		140.00	5.91	150.00	6.00	160.00	6.09

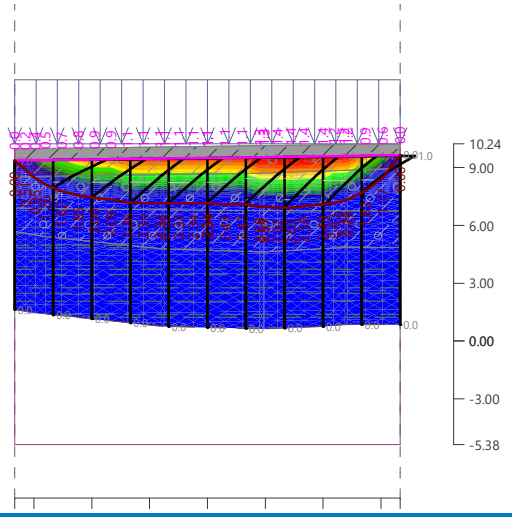
Results (Stage of construction 3)

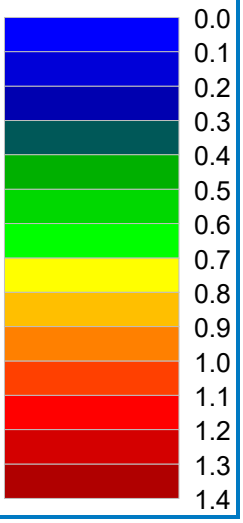
Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 1.4 mm
Maximum depth of influence zone = 2.65 m

Name : Analysis	Stage : 3

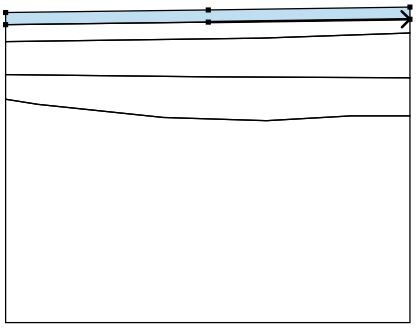
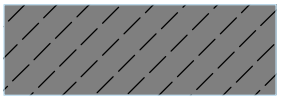
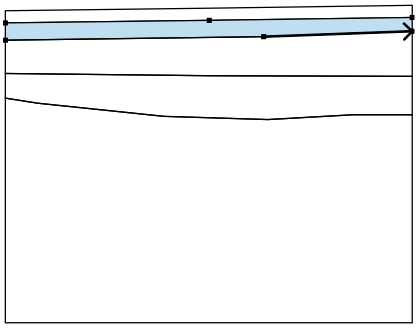
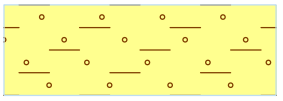
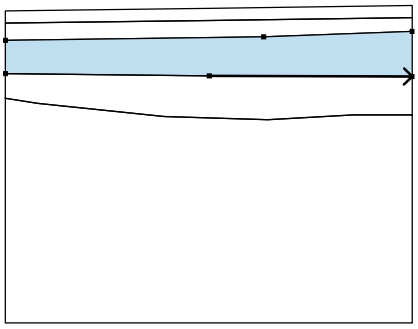
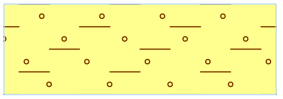
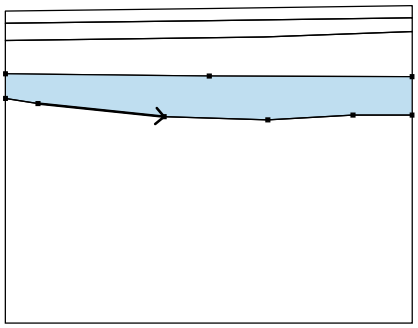
Results : overall; variable : Settlement; range : <0.0; 1.4> mm

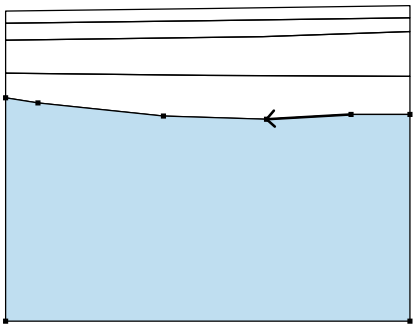
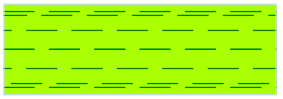




Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		150.03	9.50	160.00	9.64	Road Constuction
		160.00	10.24	150.02	10.10	
		140.00	9.97	140.00	9.37	
2		152.70	8.70	160.00	8.96	Engineered Fill
		160.00	9.64	150.03	9.50	
		140.00	9.37	140.00	8.53	
3		150.03	6.78	160.00	6.74	Engineered Fill
		160.00	8.96	152.70	8.70	
		140.00	8.53	140.00	6.89	
4		141.60	5.42	147.80	4.77	Made Ground - landfill
		152.90	4.62	157.09	4.86	
		160.00	4.86	160.00	6.74	
		150.03	6.78	140.00	6.89	
		140.00	5.68			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		157.09	4.86	152.90	4.62	Weak MUDSTONE
		147.80	4.77	141.60	5.42	
		140.00	5.68	140.00	-5.38	
		160.00	-5.38	160.00	4.86	

Surcharge

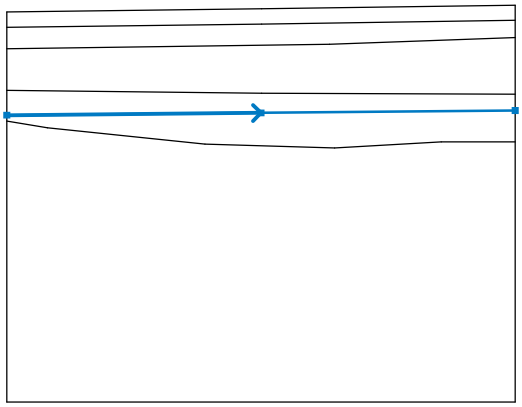
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	No	No	strip	on terrain	x = 140.00	l = 20.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		140.00	5.91	150.00	6.00	160.00	6.09

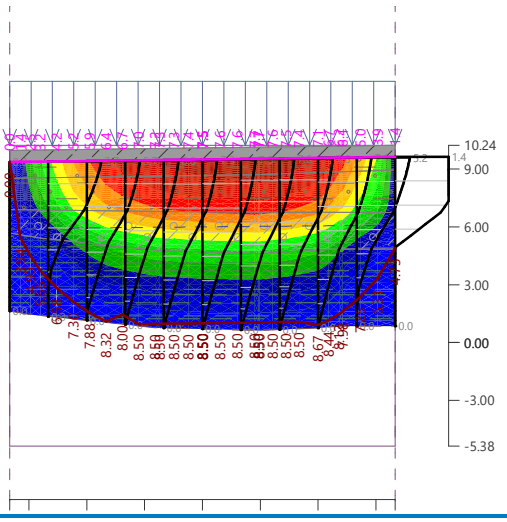
Results (Stage of construction 4)

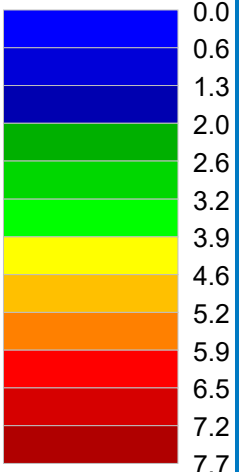
Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 7.7 mm
Maximum depth of influence zone = 8.67 m

Name : Analysis | **Stage : 4**

Results : overall; variable : Settlement; range : <0.0; 7.7> mm





Settlement analysis

Input data

Project

Task : Settlement Assessment Wroughton Landfill
Part : Section b-b'
Description : 'Firm' landfill deposits
Customer : Hills Group
Author : Hydrock
Date : 10/03/2022
Project ID : Wroughton Closed Landfill
Project number : 02753

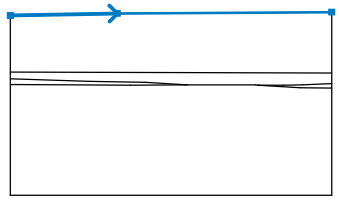
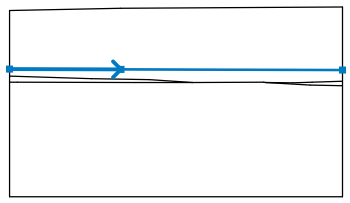
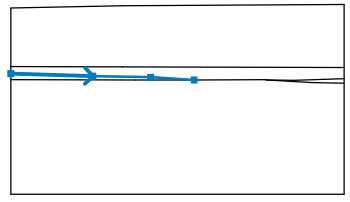
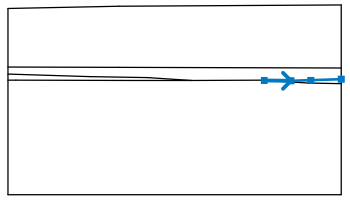
Settings

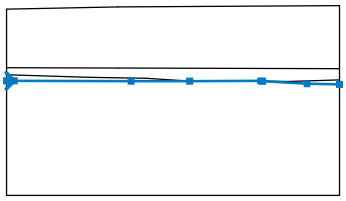
Standard - EN 1997 - DA1

Settlement

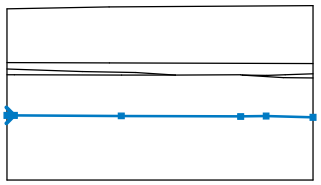
Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		270.00	11.48	280.00	11.68	300.00	11.80
2		270.00	6.21	280.03	6.18	300.00	6.12
3		270.00 286.50	5.58 5.00	277.39	5.34	282.60	5.24
4		293.07 300.00	4.99 5.12	295.49	4.97	297.26	5.01

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
5		270.00	5.03	270.71	5.03	281.22	4.99
		286.50	5.00	292.90	5.01	293.07	4.99
		297.07	4.75	300.00	4.70		

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		270.00	1.03	270.72	1.03	281.21	0.99
		292.91	0.93	295.40	0.97	300.00	0.85

Soil parameters

Made Ground - landfill

Unit weight : $\gamma = 16.00$ kN/m^3
Deformation modulus : $E_{def} = 9.00$ MPa
Poisson's ratio : $\nu = 0.30$
Saturated unit weight : $\gamma_{sat} = 17.00$ kN/m^3

Made Ground - recent

Unit weight : $\gamma = 16.00$ kN/m^3
Deformation modulus : $E_{def} = 9.00$ MPa
Poisson's ratio : $\nu = 0.25$
Saturated unit weight : $\gamma_{sat} = 17.00$ kN/m^3

Weathered KCF (Clay)

Unit weight : $\gamma = 18.00$ kN/m^3
Deformation modulus : $E_{def} = 15.00$ MPa
Poisson's ratio : $\nu = 0.20$
Saturated unit weight : $\gamma_{sat} = 19.50$ kN/m^3

Weak MUDSTONE

Unit weight : $\gamma = 21.00$ kN/m^3
Deformation modulus : $E_{def} = 20.00$ MPa
Poisson's ratio : $\nu = 0.10$
Saturated unit weight : $\gamma_{sat} = 21.50$ kN/m^3

Engineered Fill

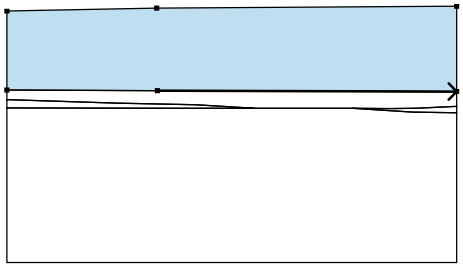
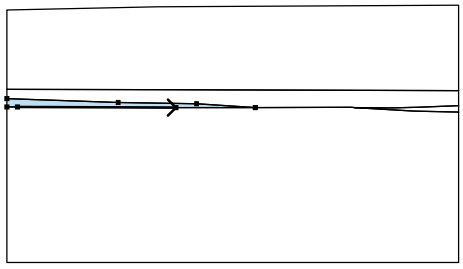
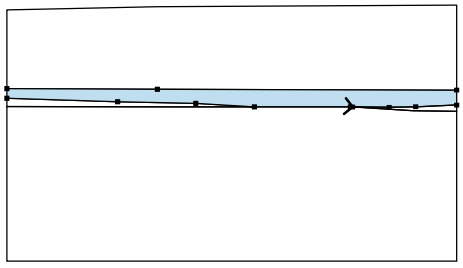
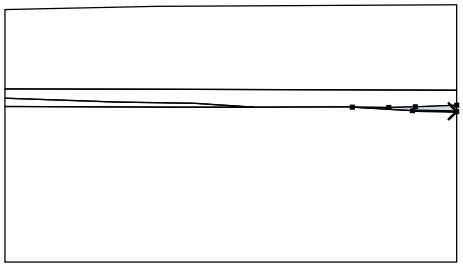
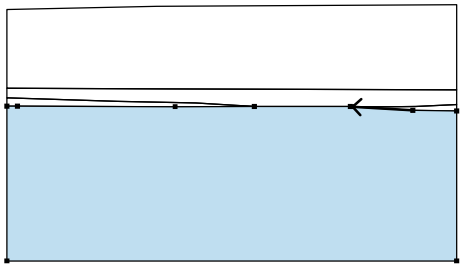
Unit weight : $\gamma = 20.00$ kN/m^3
Deformation modulus : $E_{def} = 16.00$ MPa
Poisson's ratio : $\nu = 0.25$
Saturated unit weight : $\gamma_{sat} = 21.00$ kN/m^3

Road Constuction

Unit weight : $\gamma = 20.00$ kN/m^3

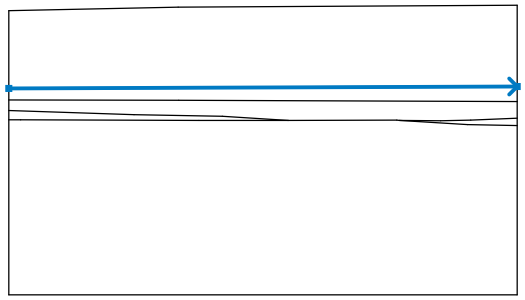
Deformation modulus : E_{def} = 10.00 MPa
Poisson's ratio : ν = 0.25
Saturated unit weight : γ_{sat} = 21.00 kN/m^3

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		280.03	6.18	300.00	6.12	Made Ground - recent
		300.00	11.80	280.00	11.68	
		270.00	11.48	270.00	6.21	
2		270.71	5.03	281.22	4.99	Made Ground - landfill
		286.50	5.00	282.60	5.24	
		277.39	5.34	270.00	5.58	
		270.00	5.03			
3		292.90	5.01	293.07	4.99	Made Ground - recent
		295.49	4.97	297.26	5.01	
		300.00	5.12	300.00	6.12	
		280.03	6.18	270.00	6.21	
		270.00	5.58	277.39	5.34	
		282.60	5.24	286.50	5.00	
4		297.07	4.75	300.00	4.70	Weathered KCF (Clay)
		300.00	5.12	297.26	5.01	
		295.49	4.97	293.07	4.99	
5		297.07	4.75	293.07	4.99	Weak MUDSTONE
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		270.00	5.03	270.00	-5.30	
		300.00	-5.30	300.00	4.70	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		270.00	6.89	300.00	7.00		

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Results (Stage of construction 1)

Results

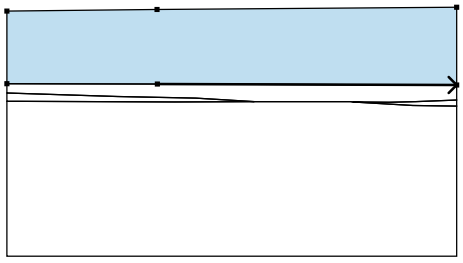
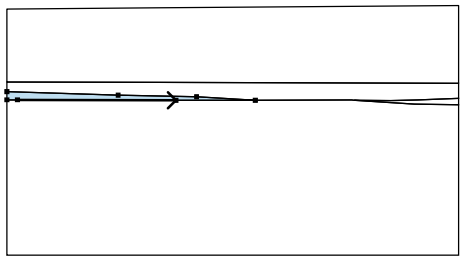
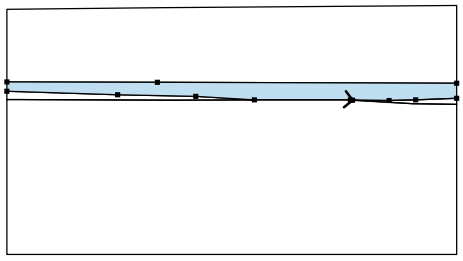
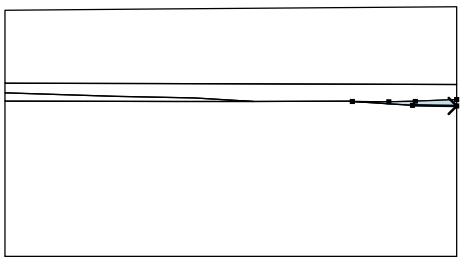
Analysis of geostatic stress was successfully completed

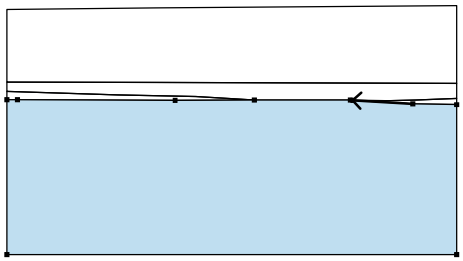
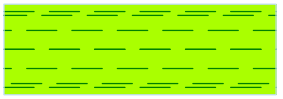
Input data (Stage of construction 2)

Earth cut

No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.02	8.85	50.02	8.95
		75.02	9.20	100.02	9.05	115.02	9.05
		135.03	9.30	150.03	9.50	175.03	9.85
		200.03	10.20	225.03	10.55	240.02	10.68
		250.03	10.80	260.03	10.95	280.02	11.15
		300.01	11.30	324.98	10.25	334.97	9.50
		344.97	8.50	370.00	7.07	380.00	6.90
		390.00	6.80				

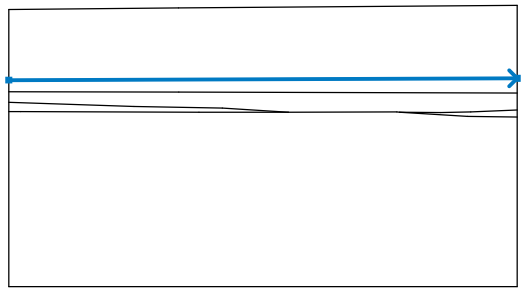
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		280.03	6.18	300.00	6.12	Made Ground - recent
		300.00	11.30	280.02	11.15	
		270.00	11.05	270.00	6.21	
2		270.71	5.03	281.22	4.99	Made Ground - landfill
		286.50	5.00	282.60	5.24	
		277.39	5.34	270.00	5.58	
		270.00	5.03			
3		292.90	5.01	293.07	4.99	Made Ground - recent
		295.49	4.97	297.26	5.01	
		300.00	5.12	300.00	6.12	
		280.03	6.18	270.00	6.21	
		270.00	5.58	277.39	5.34	
		282.60	5.24	286.50	5.00	
4		297.07	4.75	300.00	4.70	Weathered KCF (Clay)
		300.00	5.12	297.26	5.01	
		295.49	4.97	293.07	4.99	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		297.07	4.75	293.07	4.99	Weak MUDSTONE
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		270.00	5.03	270.00	-5.30	
		300.00	-5.30	300.00	4.70	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		270.00	6.89	300.00	7.00		

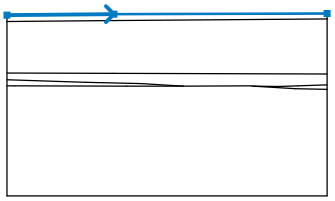
Results (Stage of construction 2)

Results

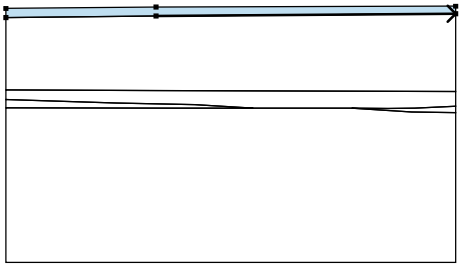
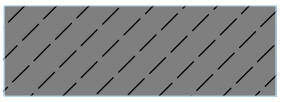
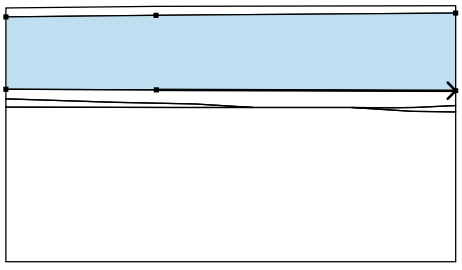
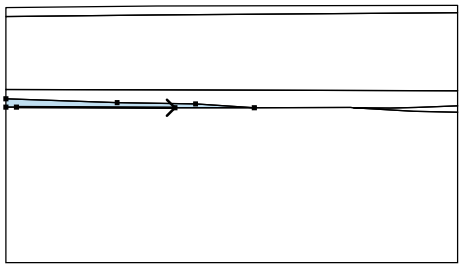
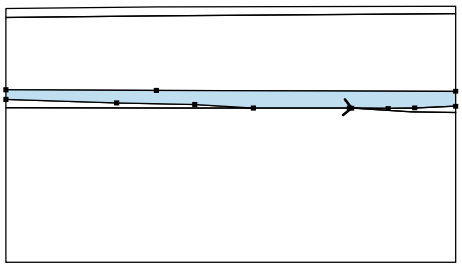
Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 0.0 mm
Maximum depth of influence zone = 0.00 m

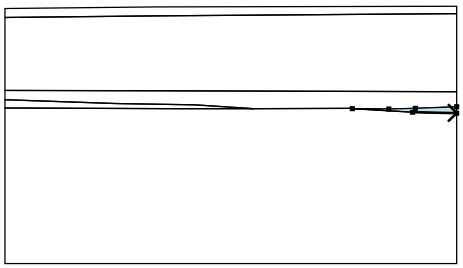
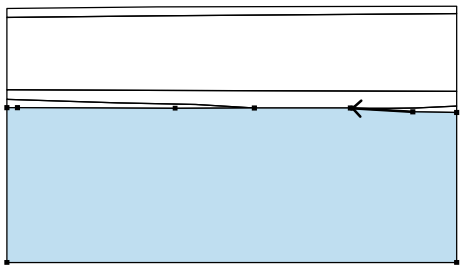
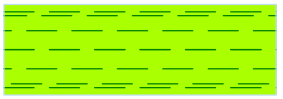
Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		270.00	11.65	280.02	11.75	300.00	11.80

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		280.02	11.15	300.00	11.30	Road Constuction
		300.00	11.80	280.02	11.75	
		270.00	11.65	270.00	11.05	
2		280.03	6.18	300.00	6.12	Made Ground - recent
		300.00	11.30	280.02	11.15	
		270.00	11.05	270.00	6.21	
3		270.71	5.03	281.22	4.99	Made Ground - landfill
		286.50	5.00	282.60	5.24	
		277.39	5.34	270.00	5.58	
		270.00	5.03			
4		292.90	5.01	293.07	4.99	Made Ground - recent
		295.49	4.97	297.26	5.01	
		300.00	5.12	300.00	6.12	
		280.03	6.18	270.00	6.21	
		270.00	5.58	277.39	5.34	
		282.60	5.24	286.50	5.00	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		297.07	4.75	300.00	4.70	Weathered KCF (Clay)
		300.00	5.12	297.26	5.01	
		295.49	4.97	293.07	4.99	
6		297.07	4.75	293.07	4.99	Weak MUDSTONE
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		270.00	5.03	270.00	-5.30	
		300.00	-5.30	300.00	4.70	

Surcharge

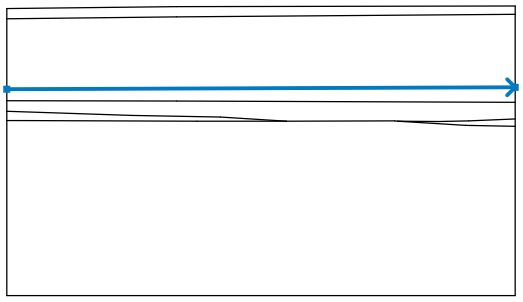
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	Yes		strip	on terrain	x = 270.00	l = 30.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		270.00	6.89	300.00	7.00		

Results (Stage of construction 3)

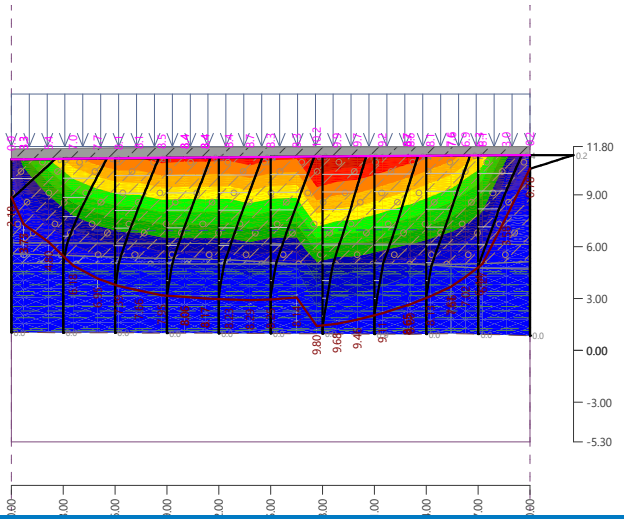
Results

Analysis performed, method Analysis using oedometric modulus

Maximum settlement = 10.2 mm
Maximum depth of influence zone = 9.80 m

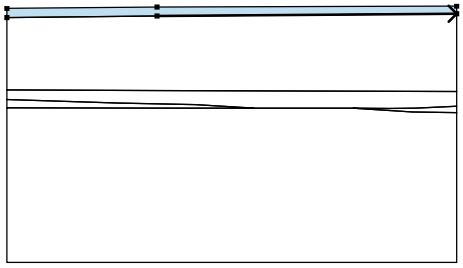
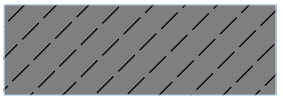
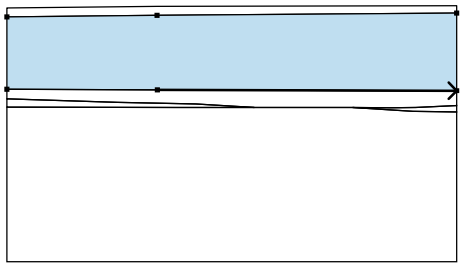
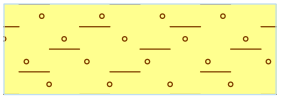
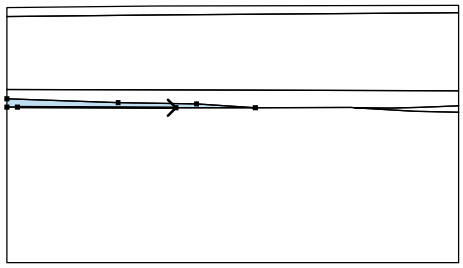
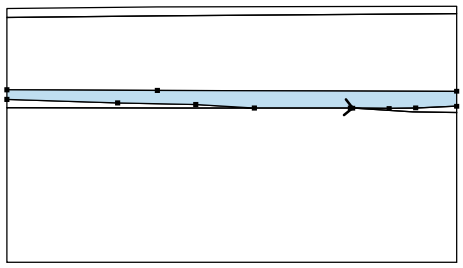
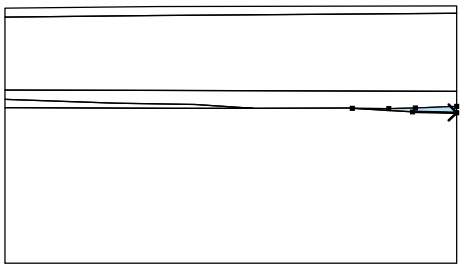
Name : Analysis	Stage : 3

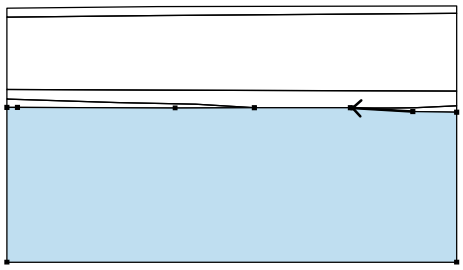
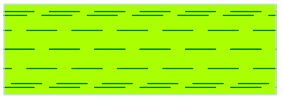
Results : overall; variable : Settlement; range : <0.0; 10.2> mm



Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		280.02	11.15	300.00	11.30	Road Constuction
		300.00	11.80	280.02	11.75	
		270.00	11.65	270.00	11.05	
2		280.03	6.18	300.00	6.12	Engineered Fill
		300.00	11.30	280.02	11.15	
		270.00	11.05	270.00	6.21	
3		270.71	5.03	281.22	4.99	Made Ground - landfill
		286.50	5.00	282.60	5.24	
		277.39	5.34	270.00	5.58	
		270.00	5.03			
4		292.90	5.01	293.07	4.99	Made Ground - recent
		295.49	4.97	297.26	5.01	
		300.00	5.12	300.00	6.12	
		280.03	6.18	270.00	6.21	
		270.00	5.58	277.39	5.34	
		282.60	5.24	286.50	5.00	
5		297.07	4.75	300.00	4.70	Weathered KCF (Clay)
		300.00	5.12	297.26	5.01	
		295.49	4.97	293.07	4.99	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
6		297.07	4.75	293.07	4.99	Weak MUDSTONE
		292.90	5.01	286.50	5.00	
		281.22	4.99	270.71	5.03	
		270.00	5.03	270.00	-5.30	
		300.00	-5.30	300.00	4.70	

Surcharge

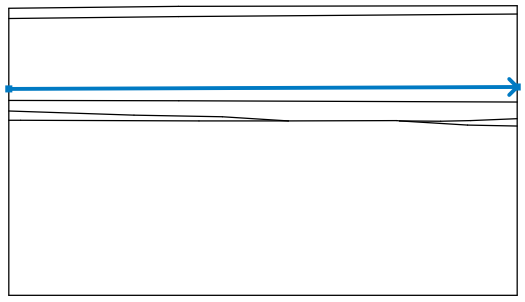
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	No	No	strip	on terrain	x = 270.00	l = 30.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		270.00	6.89	300.00	7.00		

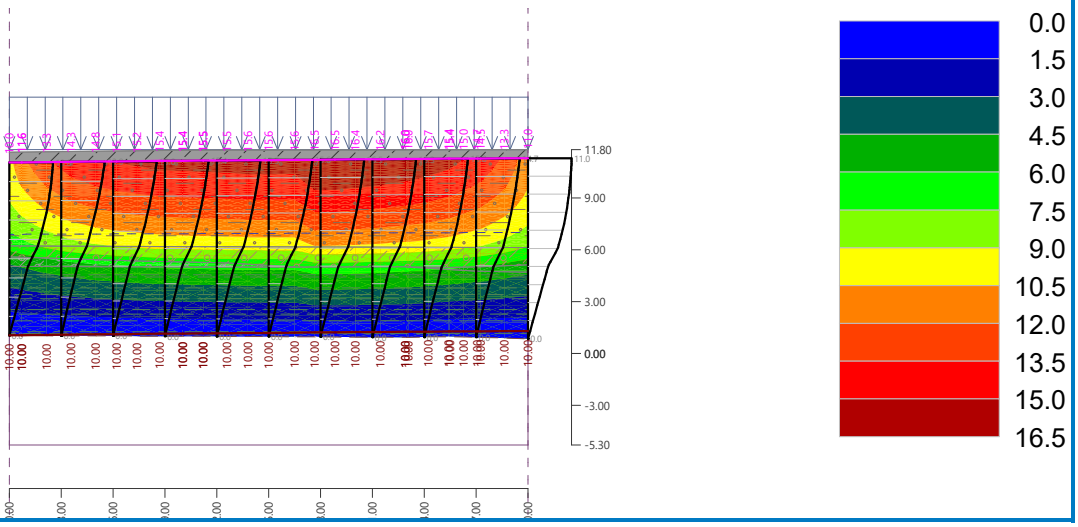
Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 16.5 mm
Maximum depth of influence zone = 10.00 m

Name : Analysis	Stage : 4

Results : overall; variable : Settlement; range : <0.0; 16.5> mm



Settlement analysis

Input data

Project

Task : Settlement Assessment Wroughton Landfill
Part : Section c-c'
Description : 'firm' landfill deposits
Customer : Hills Group
Author : Hydrock
Date : 10/03/2022
Project ID : Wroughton Closed Landfill
Project number : 02753

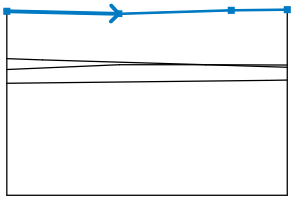
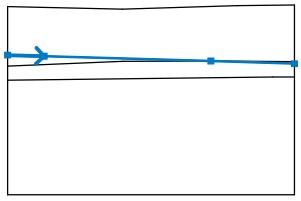
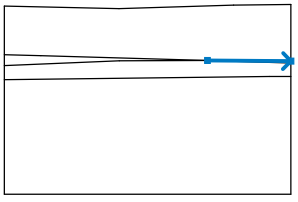
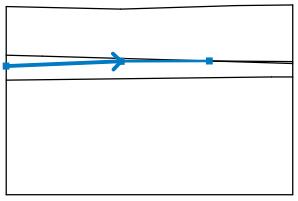
Settings

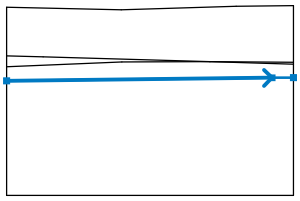
Standard - no reduction of parameters

Settlement

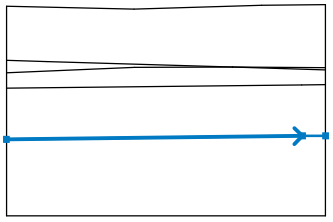
Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		230.00	11.09	240.00	10.87	250.00	11.17
		255.00	11.22				
2		230.00	6.85	233.18	6.76	247.72	6.33
		255.00	6.10				
3		247.72	6.33	255.00	6.28		
4		230.00	5.89	240.04	6.31	247.72	6.33

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
5		230.00	4.67	253.14	4.93	255.00	4.94

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		230.00	0.67	253.18	0.93	255.00	0.94

Soil parameters

Made Ground - landfill

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.30
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Made Ground - recent

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Weathered KCF (Clay)

Unit weight :	γ	=	18.00 kN/m^3
Deformation modulus :	E_{def}	=	15.00 MPa
Poisson's ratio :	ν	=	0.20
Saturated unit weight :	γ_{sat}	=	19.50 kN/m^3

Weak MUDSTONE

Unit weight :	γ	=	21.00 kN/m^3
Deformation modulus :	E_{def}	=	20.00 MPa
Poisson's ratio :	ν	=	0.10
Saturated unit weight :	γ_{sat}	=	21.50 kN/m^3

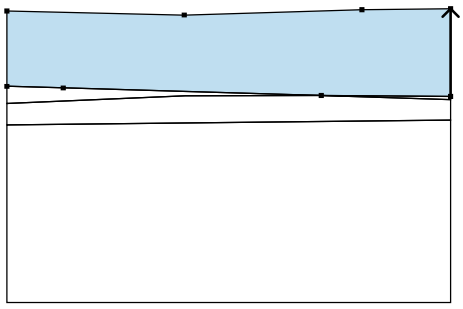
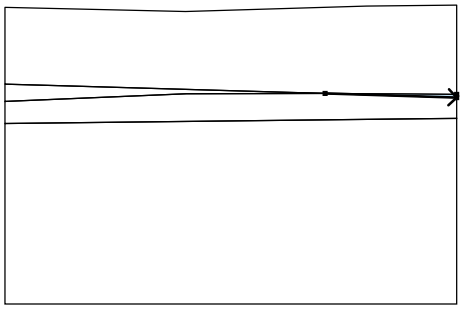
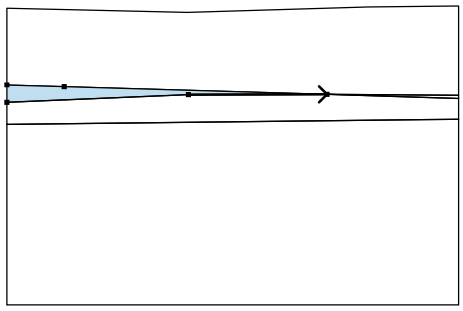
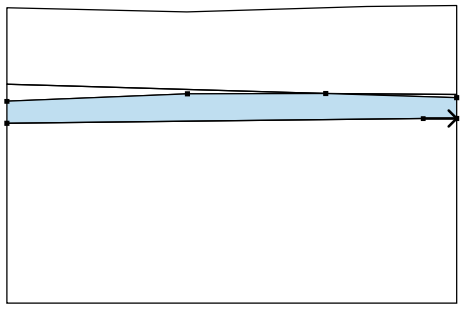
Engineered Fill

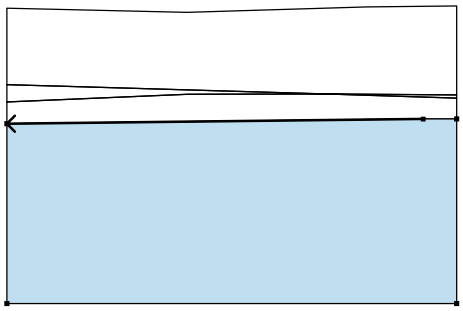
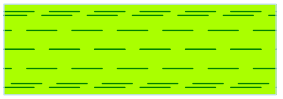
Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	16.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	21.00 kN/m^3

Road Constuction

Unit weight : γ = 20.00 kN/m^3
Deformation modulus : E_{def} = 10.00 MPa
Poisson's ratio : ν = 0.25
Saturated unit weight : γ_{sat} = 21.00 kN/m^3

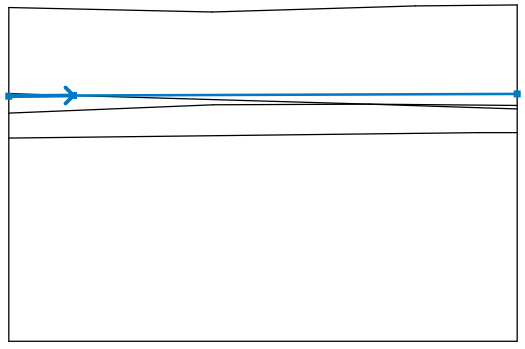
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		255.00	6.28	255.00	11.22	Made Ground - recent
		250.00	11.17	240.00	10.87	
		230.00	11.09	230.00	6.85	
		233.18	6.76	247.72	6.33	
2		247.72	6.33	255.00	6.10	Made Ground - recent
		255.00	6.28			
3		240.04	6.31	247.72	6.33	Made Ground - landfill
		233.18	6.76	230.00	6.85	
		230.00	5.89			
4		253.14	4.93	255.00	4.94	Made Ground - landfill
		255.00	6.10	247.72	6.33	
		240.04	6.31	230.00	5.89	
		230.00	4.67			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		253.14	4.93	230.00	4.67	Weak MUDSTONE
		230.00	-5.33	255.00	-5.33	
		255.00	4.94			

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		230.00	6.73	233.18	6.76	255.00	6.84

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Results (Stage of construction 1)

Results

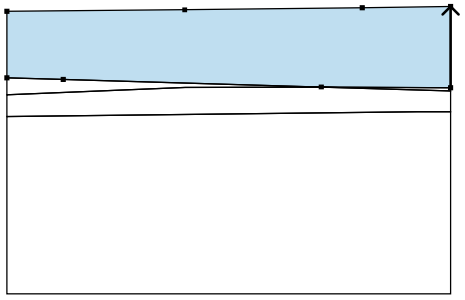
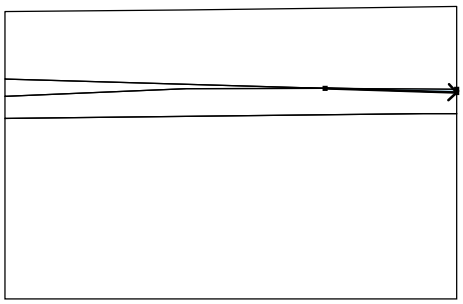
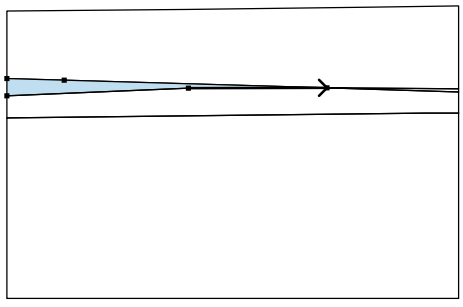
Analysis of geostatic stress was successfully completed

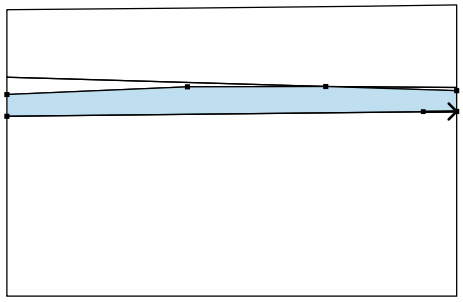
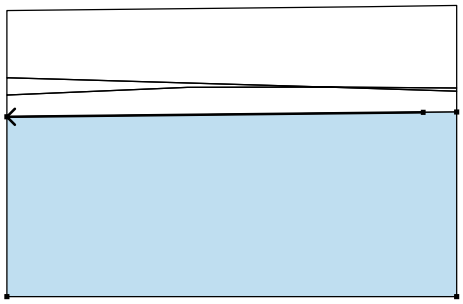
Input data (Stage of construction 2)

Earth cut

No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.02	8.85	50.02	8.95
		75.02	9.20	100.02	9.05	115.02	9.05
		135.03	9.30	150.03	9.50	175.03	9.85
		200.03	10.20	225.03	10.55	240.02	10.68
		250.03	10.80	260.03	10.95	280.02	11.15
		300.01	11.30	324.98	10.25	334.97	9.50
		344.97	8.50	370.00	7.07	380.00	6.90
		390.00	6.80				

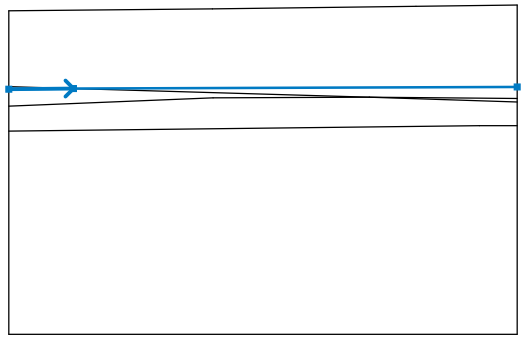
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		255.00	6.28	255.00	10.87	Made Ground - recent
		250.03	10.80	240.02	10.68	
		230.00	10.59	230.00	6.85	
		233.18	6.76	247.72	6.33	
2		247.72	6.33	255.00	6.10	Made Ground - recent
		255.00	6.28			
3		240.04	6.31	247.72	6.33	Made Ground - landfill
		233.18	6.76	230.00	6.85	
		230.00	5.89			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		253.14	4.93	255.00	4.94	Made Ground - landfill
		255.00	6.10	247.72	6.33	
		240.04	6.31	230.00	5.89	
		230.00	4.67			
5		253.14	4.93	230.00	4.67	Weak MUDSTONE
		230.00	-5.33	255.00	-5.33	
		255.00	4.94			

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		230.00	6.73	233.18	6.76	255.00	6.84

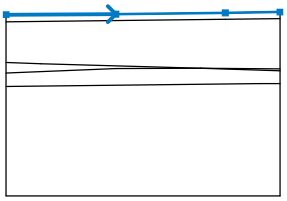
Results (Stage of construction 2)

Results

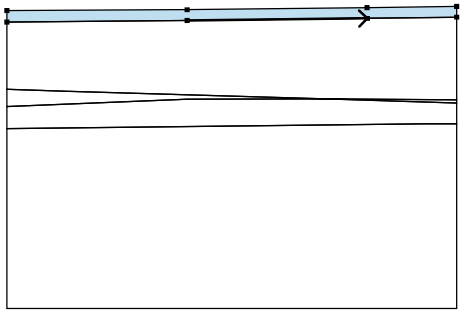
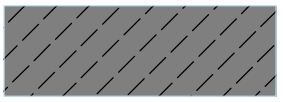
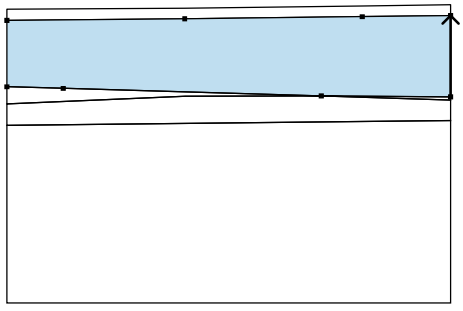
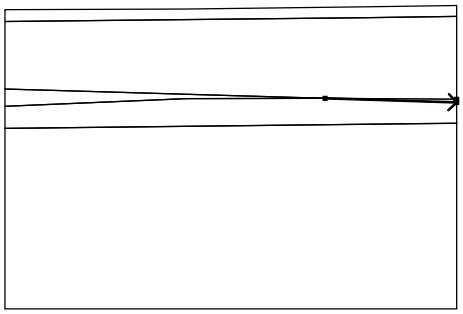
Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 0.0 mm
Maximum depth of influence zone = 0.00 m

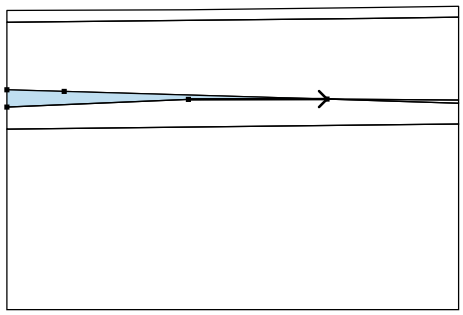
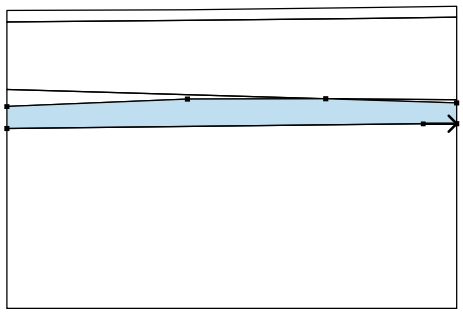
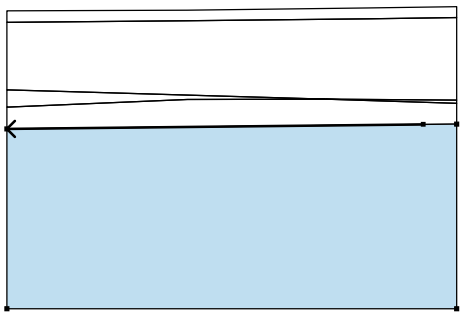
Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		230.00	11.23	240.02	11.28	250.02	11.40
		255.00	11.47				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		240.02	10.68	250.03	10.80	Road Constuction
		255.00	10.87	255.00	11.47	
		250.02	11.40	240.02	11.28	
		230.00	11.23	230.00	10.59	
2		255.00	6.28	255.00	10.87	Made Ground - recent
		250.03	10.80	240.02	10.68	
		230.00	10.59	230.00	6.85	
		233.18	6.76	247.72	6.33	
3		247.72	6.33	255.00	6.10	Made Ground - recent
		255.00	6.28			

No.	Surface position	Coordinates of surface points [m] x	z	x	z	Assigned soil
4		240.04	6.31	247.72	6.33	Made Ground - landfill
		233.18	6.76	230.00	6.85	
		230.00	5.89			
5		253.14	4.93	255.00	4.94	Made Ground - landfill
		255.00	6.10	247.72	6.33	
		240.04	6.31	230.00	5.89	
		230.00	4.67			
6		253.14	4.93	230.00	4.67	Weak MUDSTONE
		230.00	-5.33	255.00	-5.33	
		255.00	4.94			

Surcharge

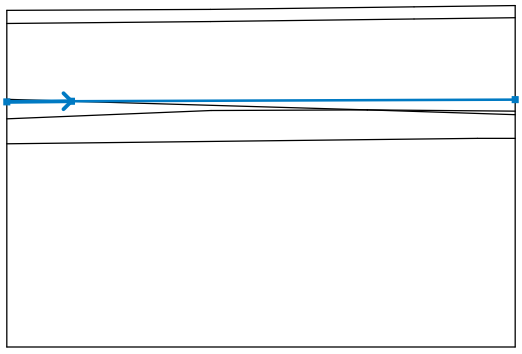
No.	Surcharge new	Surcharge change	Type	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Distance from axes y [m]	Magnitude q, q_1, f, F	Magnitude q_2	Magnitude unit
1	Yes		strip	on terrain	x = 230.00	l = 25.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		230.00	6.73	233.18	6.76	255.00	6.84

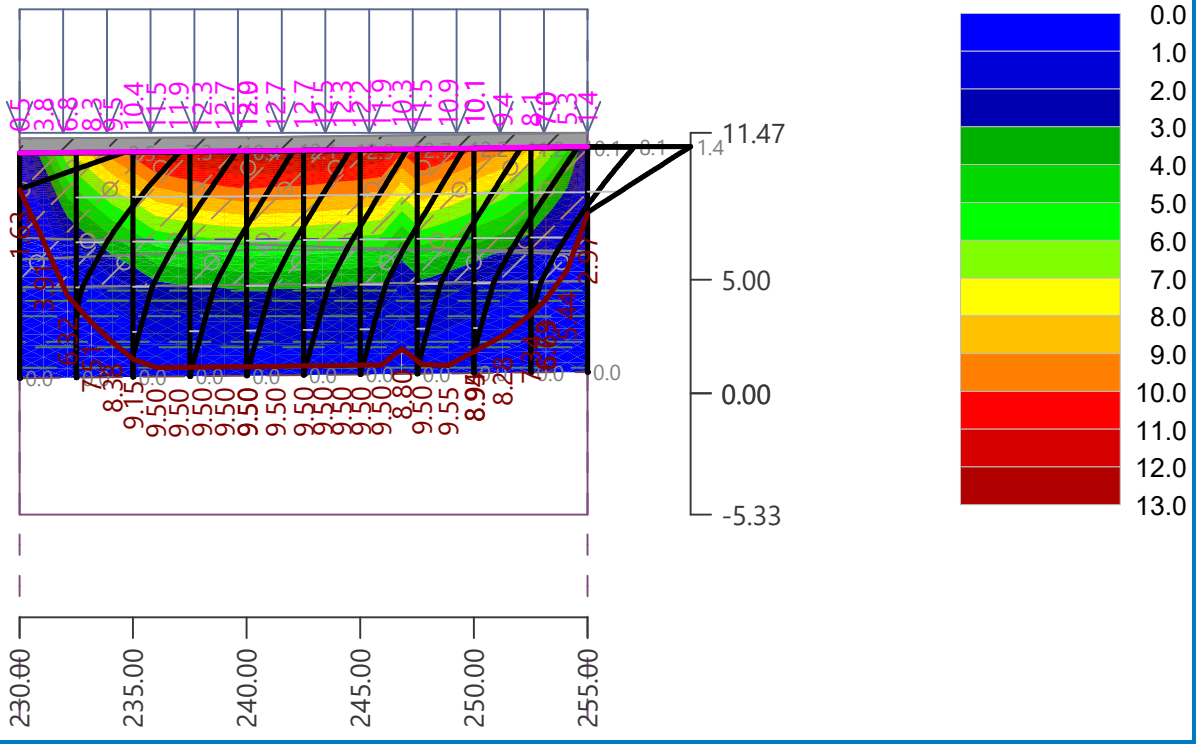
Results (Stage of construction 3)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 13.0 mm
Maximum depth of influence zone = 9.55 m

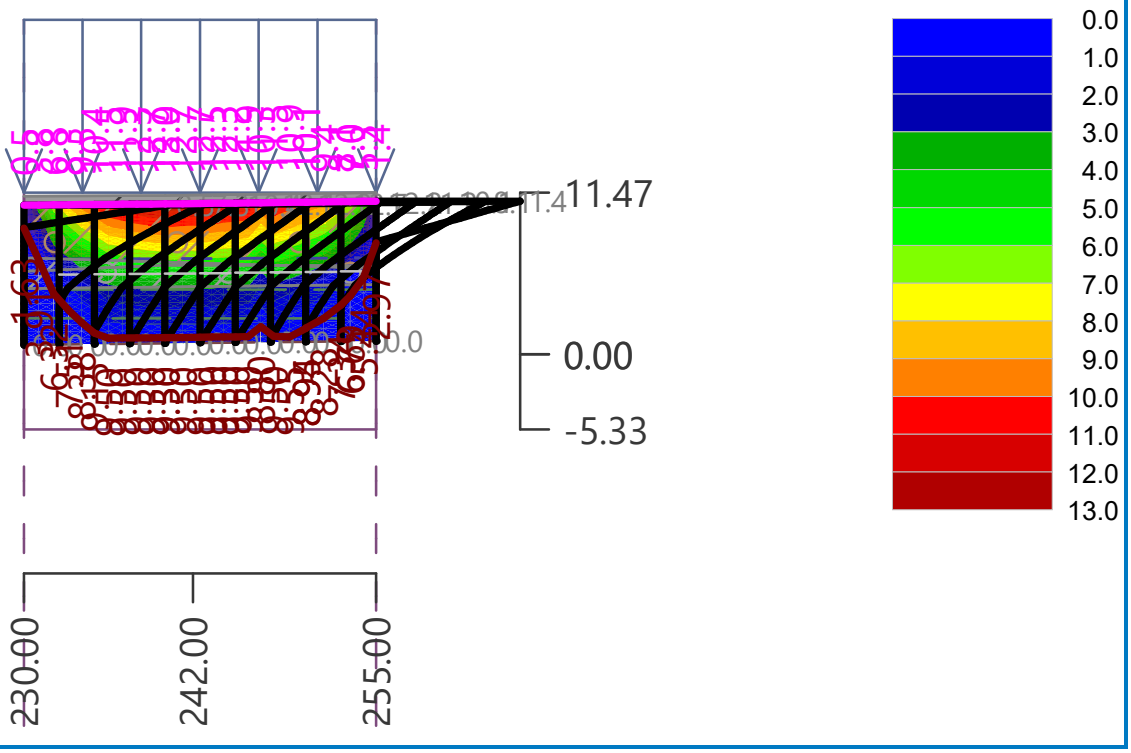
Name : Analysis	Stage : 3

Results : overall; variable : Settlement; range : <0.0; 13.0> mm



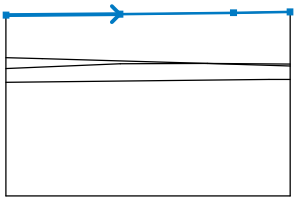
Name : Analysis	Stage : 3

Results : overall; variable : Settlement; range : <0.0; 13.0> mm

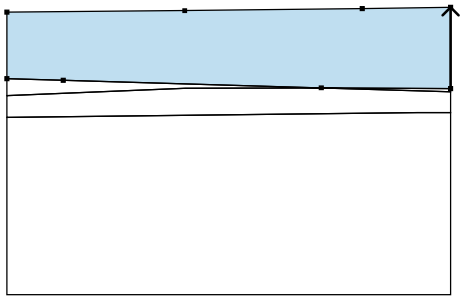
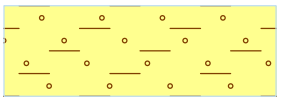
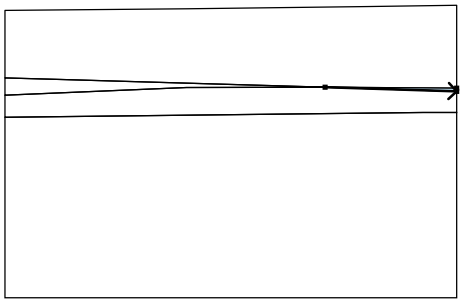
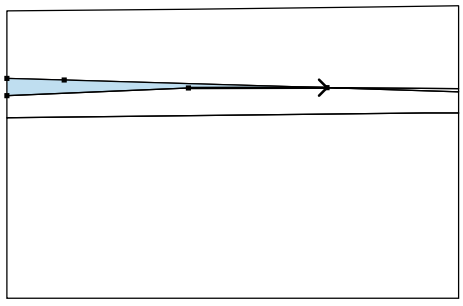
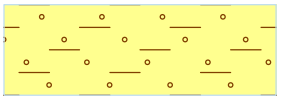


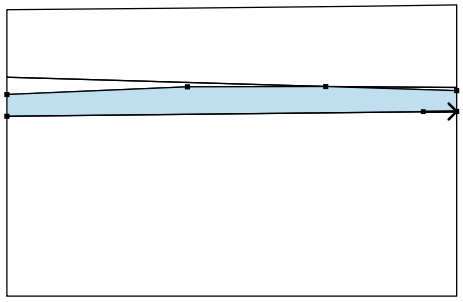
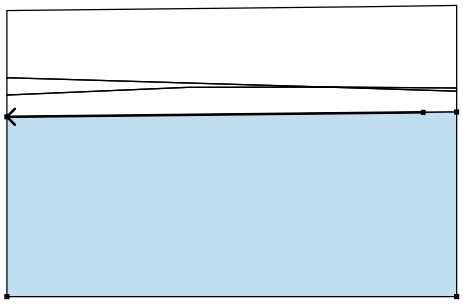
Input data (Stage of construction 4)

Earth cut

No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		230.00	10.59	240.02	10.68	250.03	10.80
		255.00	10.87				

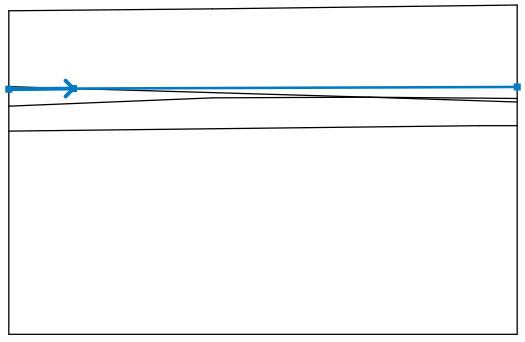
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		255.00	6.28	255.00	10.87	Engineered Fill
		250.03	10.80	240.02	10.68	
		230.00	10.59	230.00	6.85	
		233.18	6.76	247.72	6.33	
2		247.72	6.33	255.00	6.10	Made Ground - recent
		255.00	6.28			
3		240.04	6.31	247.72	6.33	Engineered Fill
		233.18	6.76	230.00	6.85	
		230.00	5.89			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		253.14	4.93	255.00	4.94	Made Ground - landfill
		255.00	6.10	247.72	6.33	
		240.04	6.31	230.00	5.89	
		230.00	4.67			
5		253.14	4.93	230.00	4.67	Weak MUDSTONE
		230.00	-5.33	255.00	-5.33	
		255.00	4.94			

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		230.00	6.73	233.18	6.76	255.00	6.84

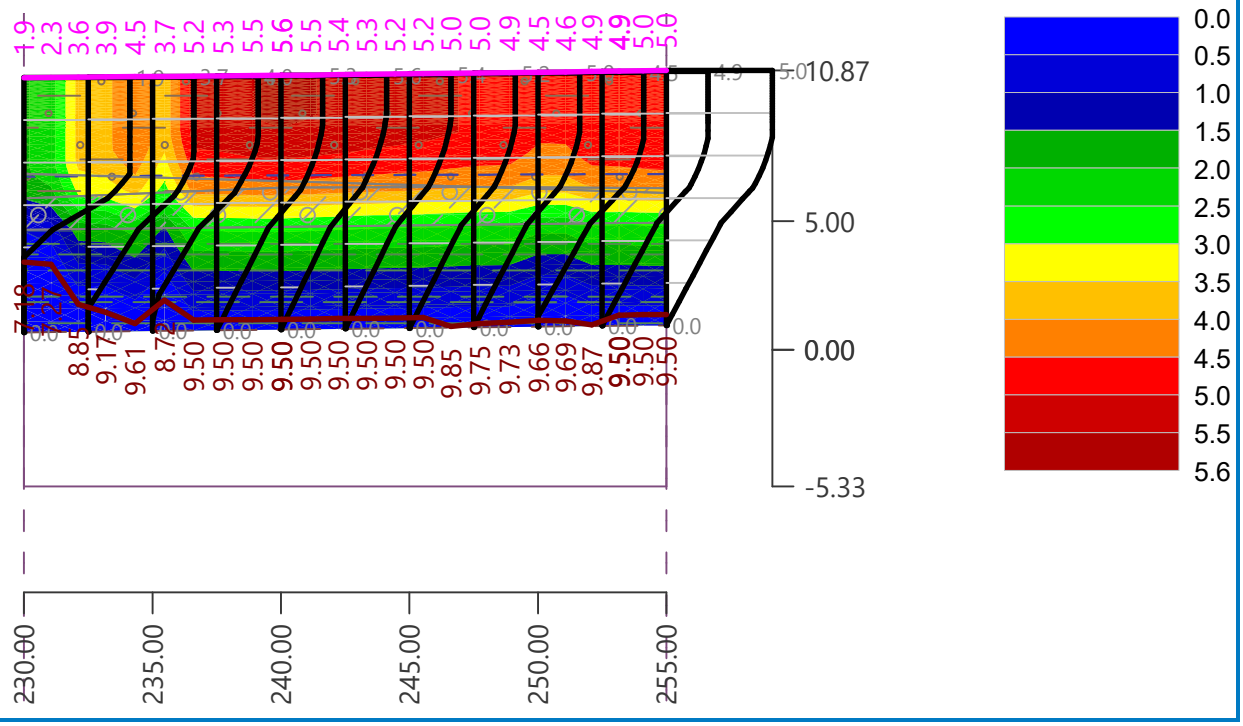
Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 5.6 mm
Maximum depth of influence zone = 9.87 m

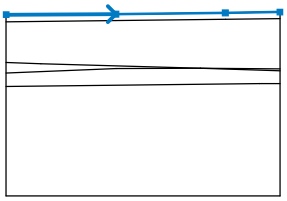
Name : Analysis | **Stage : 4**

Results : overall; variable : Settlement; range : <0.0; 5.6> mm

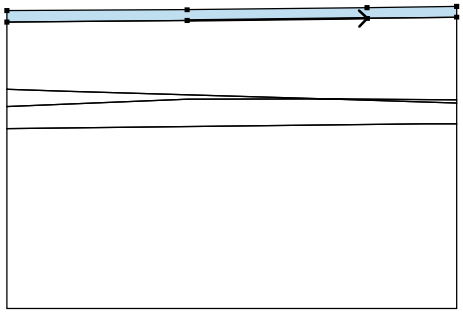
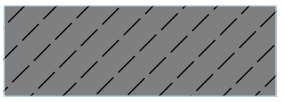
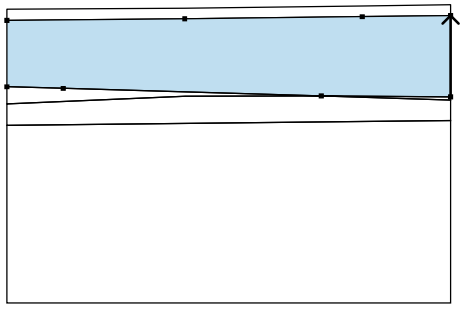
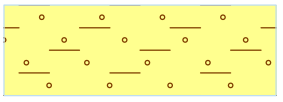
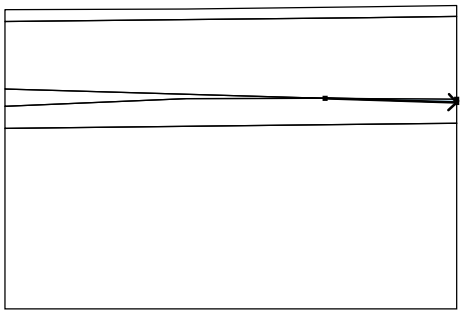


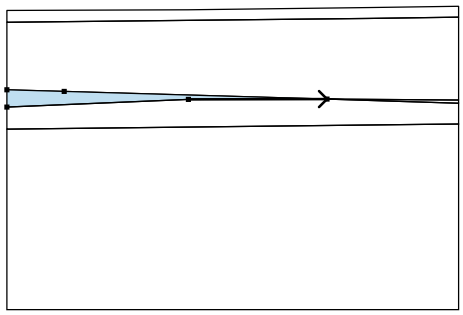
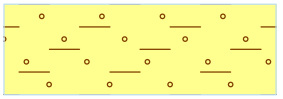
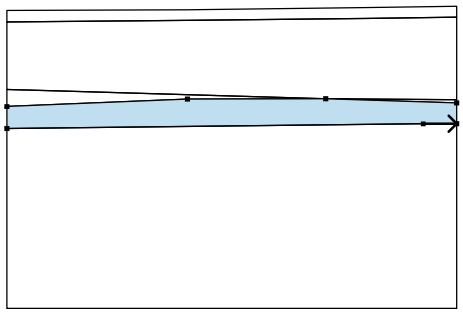
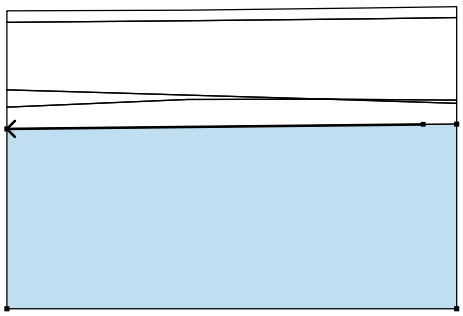
Input data (Stage of construction 5)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		230.00	11.23	240.02	11.28	250.02	11.40
		255.00	11.47				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		240.02	10.68	250.03	10.80	Road Constuction
		255.00	10.87	255.00	11.47	
		250.02	11.40	240.02	11.28	
		230.00	11.23	230.00	10.59	
2		255.00	6.28	255.00	10.87	Engineered Fill
		250.03	10.80	240.02	10.68	
		230.00	10.59	230.00	6.85	
		233.18	6.76	247.72	6.33	
3		247.72	6.33	255.00	6.10	Made Ground - recent
		255.00	6.28			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		240.04	6.31	247.72	6.33	Engineered Fill
		233.18	6.76	230.00	6.85	
		230.00	5.89			
5		253.14	4.93	255.00	4.94	Made Ground - landfill
		255.00	6.10	247.72	6.33	
		240.04	6.31	230.00	5.89	
		230.00	4.67			
6		253.14	4.93	230.00	4.67	Weak MUDSTONE
		230.00	-5.33	255.00	-5.33	
		255.00	4.94			

Surcharge

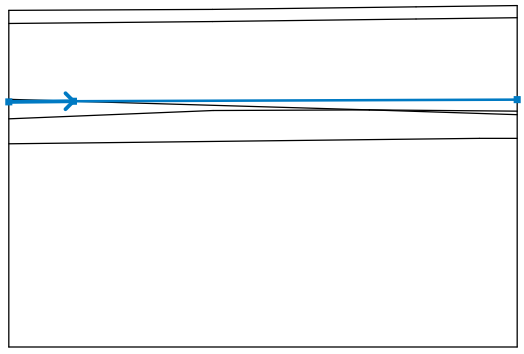
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	Yes		strip	on terrain	x = 230.00	l = 25.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		230.00	6.73	233.18	6.76	255.00	6.84

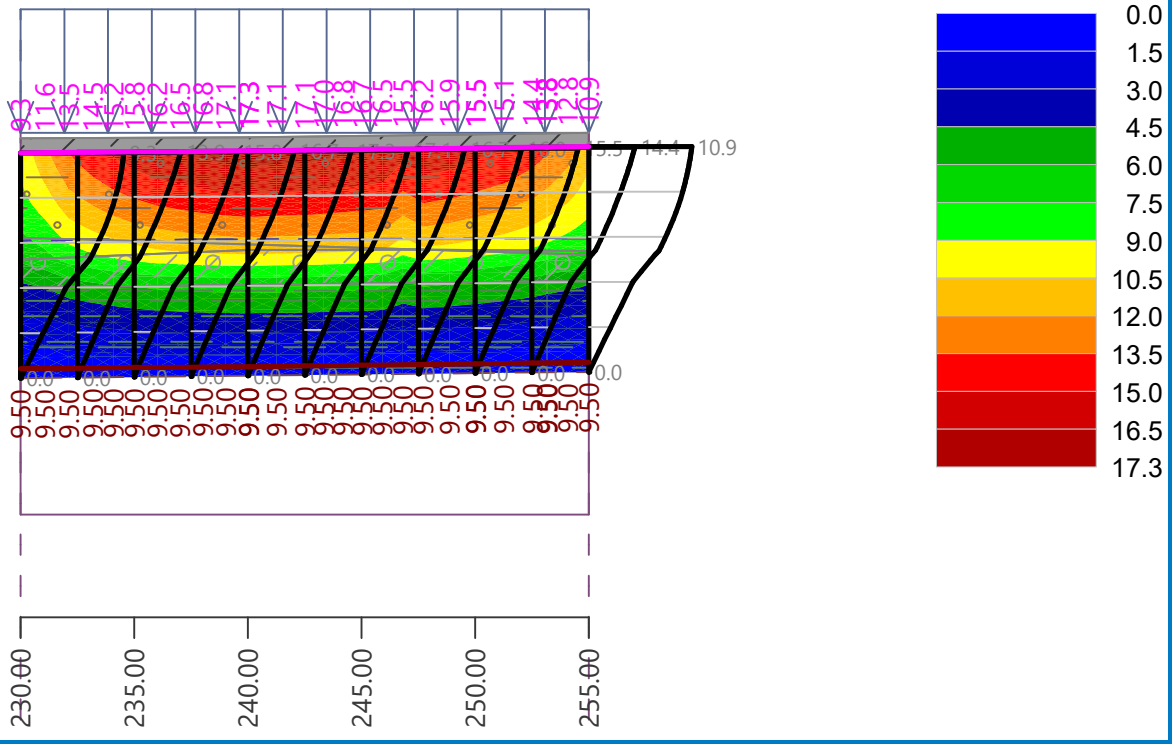
Results (Stage of construction 5)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 17.3 mm
Maximum depth of influence zone = 9.50 m

Name : Analysis	Stage : 5

Results : overall; variable : Settlement; range : <0.0; 17.3> mm



Settlement analysis

Input data

Project

Task : Settlement Assessment Wroughton Landfill
Part : Section d-d'
Customer : Hills Group
Author : Hydrock
Date : 10/03/2022
Project ID : Wroughton Closed Landfill
Project number : 02753

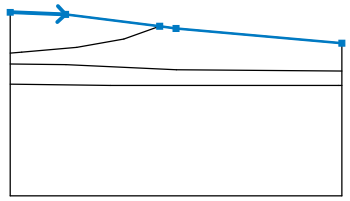
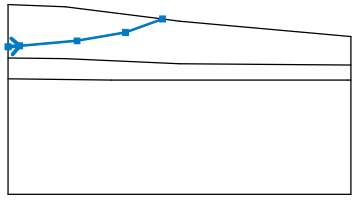
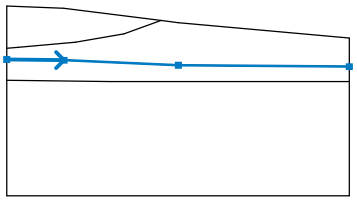
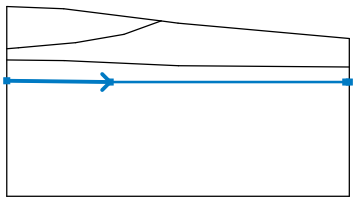
Settings

Standard - EN 1997 - DA1

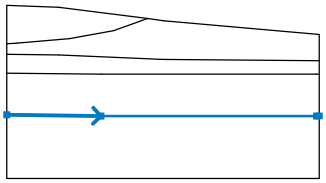
Settlement

Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		330.00	10.76	335.00	10.57	343.52	9.49
		345.00	9.30	360.00	7.96		
2		330.00	7.07	331.02	7.15	336.03	7.58
		340.27	8.33	343.52	9.49		
3		330.00	6.07	335.02	6.01	345.02	5.57
		360.00	5.45				
4		330.00	4.25	339.06	4.14	359.69	4.14
		360.00	4.15				

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		330.00	0.25	339.05	0.14	359.74	0.14
		360.00	0.15				

Soil parameters

Made Ground - landfill

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	4.50 MPa
Poisson's ratio :	ν	=	0.30
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Made Ground - recent

Unit weight :	γ	=	16.00 kN/m^3
Deformation modulus :	E_{def}	=	9.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	17.00 kN/m^3

Weathered KCF (Clay)

Unit weight :	γ	=	18.00 kN/m^3
Deformation modulus :	E_{def}	=	15.00 MPa
Poisson's ratio :	ν	=	0.20
Saturated unit weight :	γ_{sat}	=	19.50 kN/m^3

Weak MUDSTONE

Unit weight :	γ	=	21.00 kN/m^3
Deformation modulus :	E_{def}	=	20.00 MPa
Poisson's ratio :	ν	=	0.10
Saturated unit weight :	γ_{sat}	=	21.50 kN/m^3

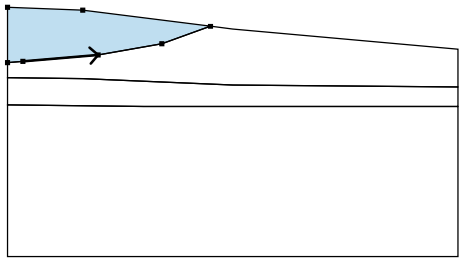
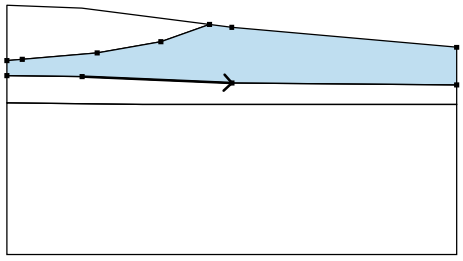
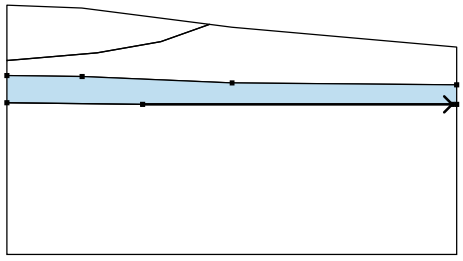
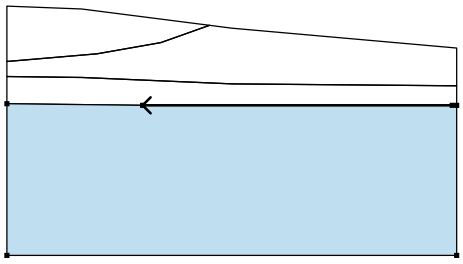
Engineered Fill

Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	16.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	21.00 kN/m^3

Road Constuction

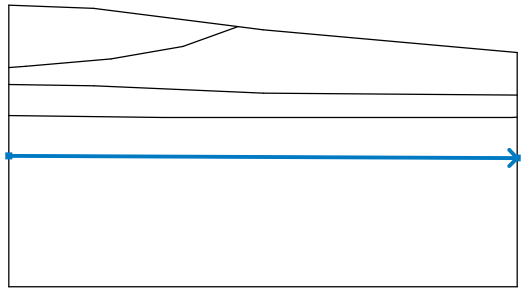
Unit weight :	γ	=	20.00 kN/m^3
Deformation modulus :	E_{def}	=	10.00 MPa
Poisson's ratio :	ν	=	0.25
Saturated unit weight :	γ_{sat}	=	21.00 kN/m^3

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		331.02	7.15	336.03	7.58	Made Ground - recent
		340.27	8.33	343.52	9.49	
		335.00	10.57	330.00	10.76	
		330.00	7.07			
2		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		360.00	5.45	360.00	7.96	
		345.00	9.30	343.52	9.49	
		340.27	8.33	336.03	7.58	
		331.02	7.15	330.00	7.07	
		330.00	6.07			
3		339.06	4.14	359.69	4.14	Weathered KCF (Clay)
		360.00	4.15	360.00	5.45	
		345.02	5.57	335.02	6.01	
		330.00	6.07	330.00	4.25	
4		359.69	4.14	339.06	4.14	Weak MUDSTONE
		330.00	4.25	330.00	-5.86	
		360.00	-5.86	360.00	4.15	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		330.00	1.86	360.00	1.74		

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Results (Stage of construction 1)

Results

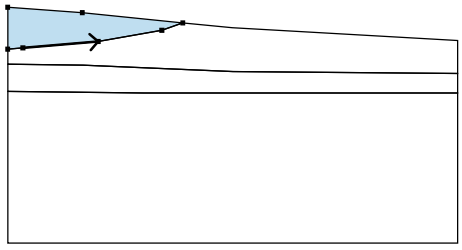
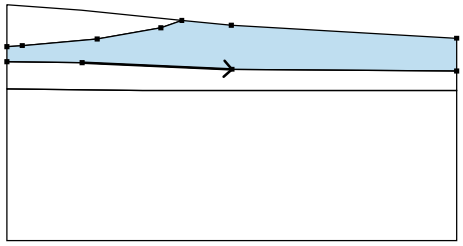
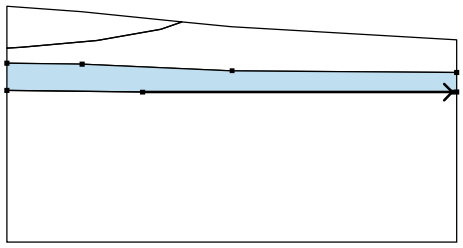
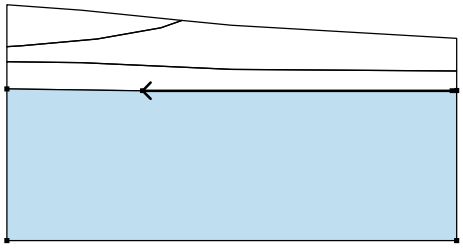
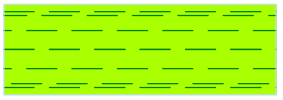
Analysis of geostatic stress was successfully completed

Input data (Stage of construction 2)

Earth cut

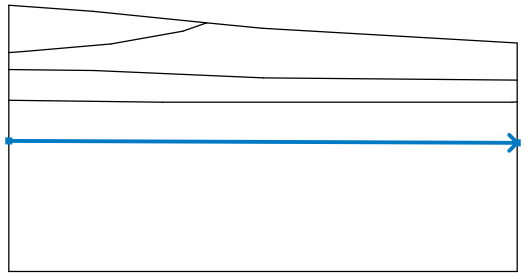
No.	Cut location	Coordinates of cut points [m]					
		x	z	x	z	x	z
1		36.41	9.39	38.02	8.85	50.02	8.95
		75.02	9.20	100.02	9.05	115.02	9.05
		135.03	9.30	150.03	9.50	175.03	9.85
		200.03	10.20	225.03	10.55	240.02	10.68
		250.03	10.80	260.03	10.95	280.02	11.15
		300.01	11.30	324.98	10.25	334.97	9.50
		344.97	8.50	370.00	7.07	380.00	6.90
		390.00	6.80				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		331.02	7.15	336.03	7.58	Made Ground - recent
		340.27	8.33	341.67	8.83	
		334.97	9.50	330.00	9.87	
		330.00	7.07			
2		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		360.00	5.45	360.00	7.64	
		344.97	8.50	341.67	8.83	
		340.27	8.33	336.03	7.58	
		331.02	7.15	330.00	7.07	
		330.00	6.07			
3		339.06	4.14	359.69	4.14	Weathered KCF (Clay)
		360.00	4.15	360.00	5.45	
		345.02	5.57	335.02	6.01	
		330.00	6.07	330.00	4.25	
4		359.69	4.14	339.06	4.14	Weak MUDSTONE
		330.00	4.25	330.00	-5.86	
		360.00	-5.86	360.00	4.15	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		330.00	1.86	360.00	1.74		

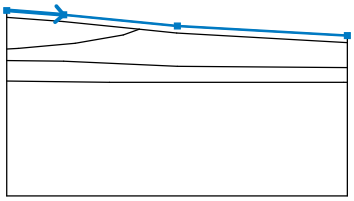
Results (Stage of construction 2)

Results

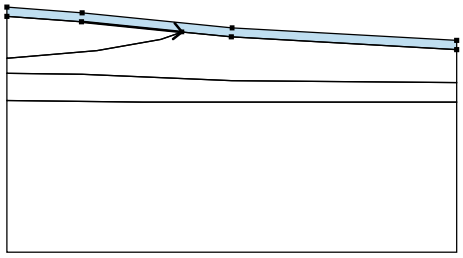
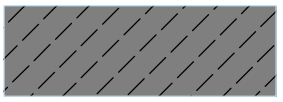
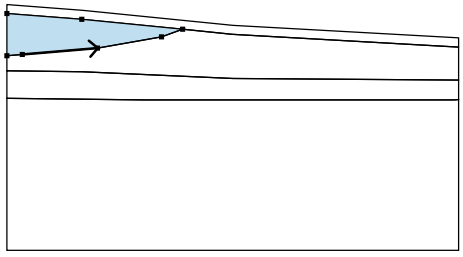
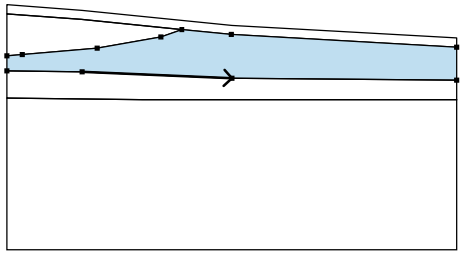
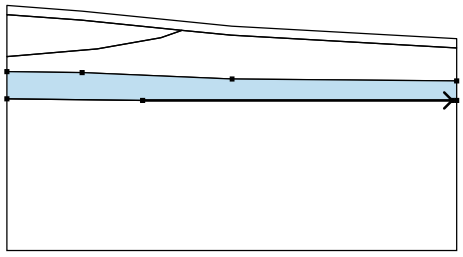
Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 0.0 mm
Maximum depth of influence zone = 0.00 m

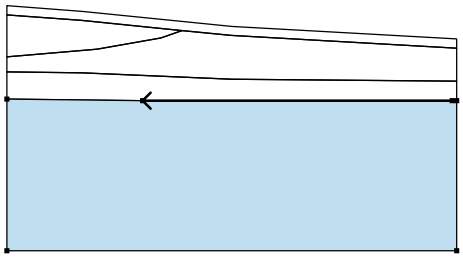
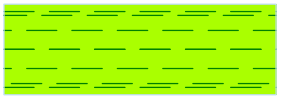
Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		330.00	10.48	335.02	10.10	345.02	9.10
		360.00	8.26				

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		334.97	9.50	341.67	8.83	Road Constuction
		344.97	8.50	360.00	7.64	
		360.00	8.26	345.02	9.10	
		335.02	10.10	330.00	10.48	
		330.00	9.87			
2		331.02	7.15	336.03	7.58	Made Ground - recent
		340.27	8.33	341.67	8.83	
		334.97	9.50	330.00	9.87	
		330.00	7.07			
3		335.02	6.01	345.02	5.57	Weathered KCF (Clay)
		360.00	5.45	360.00	7.64	
		344.97	8.50	341.67	8.83	
		340.27	8.33	336.03	7.58	
		331.02	7.15	330.00	7.07	
		330.00	6.07			
4		339.06	4.14	359.69	4.14	Weathered KCF (Clay)
		360.00	4.15	360.00	5.45	
		345.02	5.57	335.02	6.01	
		330.00	6.07	330.00	4.25	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		359.69	4.14	339.06	4.14	Weak MUDSTONE
		330.00	4.25	330.00	-5.86	
		360.00	-5.86	360.00	4.15	

Surcharge

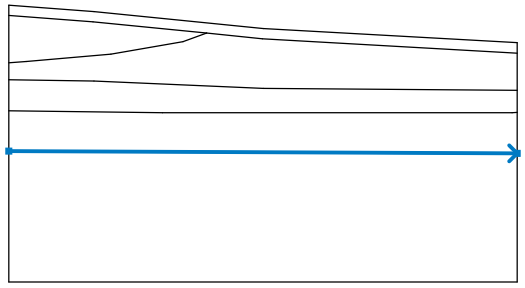
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	Yes		strip	on terrain	x = 330.00	l = 30.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		330.00	1.86	360.00	1.74		

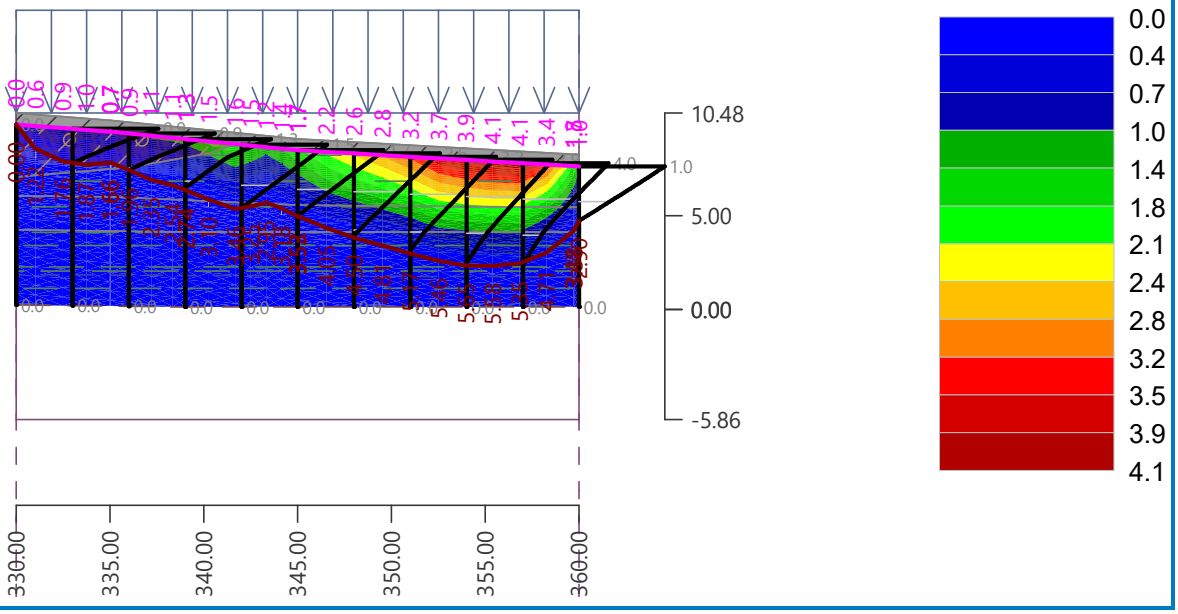
Results (Stage of construction 3)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 4.1 mm
Maximum depth of influence zone = 5.65 m

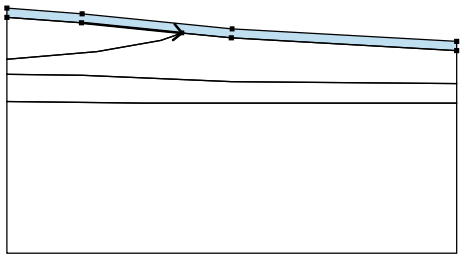
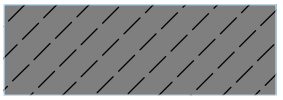
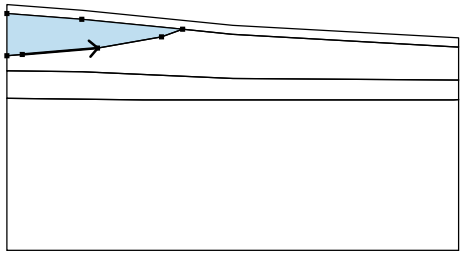
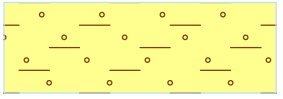
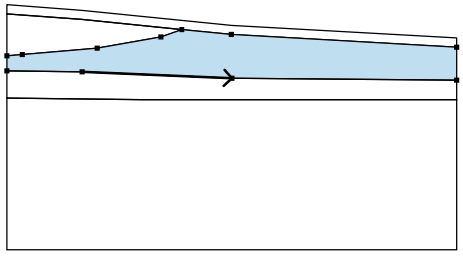
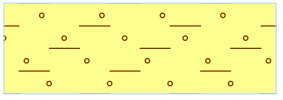
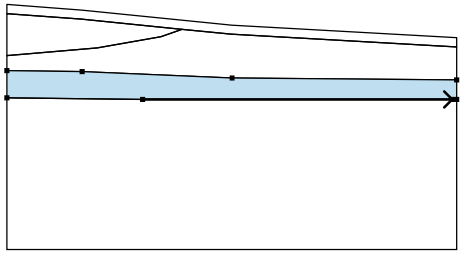
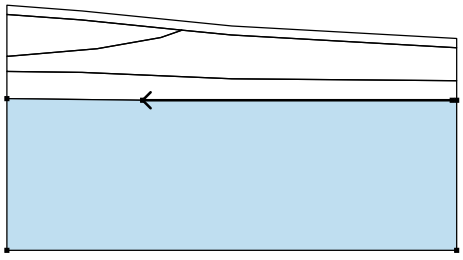
Name : Analysis | **Stage : 3**

Results : overall; variable : Settlement; range : <0.0; 4.1> mm



Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		334.97	9.50	341.67	8.83	Road Constuction
		344.97	8.50	360.00	7.64	
		360.00	8.26	345.02	9.10	
		335.02	10.10	330.00	10.48	
		330.00	9.87			
2		331.02	7.15	336.03	7.58	Engineered Fill
		340.27	8.33	341.67	8.83	
		334.97	9.50	330.00	9.87	
		330.00	7.07			
3		335.02	6.01	345.02	5.57	Engineered Fill
		360.00	5.45	360.00	7.64	
		344.97	8.50	341.67	8.83	
		340.27	8.33	336.03	7.58	
		331.02	7.15	330.00	7.07	
		330.00	6.07			
4		339.06	4.14	359.69	4.14	Weathered KCF (Clay)
		360.00	4.15	360.00	5.45	
		345.02	5.57	335.02	6.01	
		330.00	6.07	330.00	4.25	
5		359.69	4.14	339.06	4.14	Weak MUDSTONE
		330.00	4.25	330.00	-5.86	
		360.00	-5.86	360.00	4.15	

Surcharge

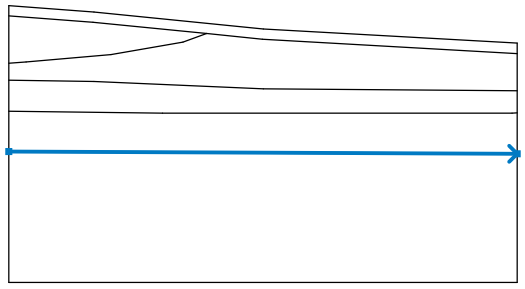
No.	Surcharge		Type	Location	Origin	Length	Width	Distance from axes	Magnitude		
	new	change		z [m]	x [m]	l [m]	b [m]	y [m]	q, q_1, f, F	q_2	unit
1	No	No	strip	on terrain	x = 330.00	l = 30.00			10.00		kN/m^2

Surcharges

No.	Name
1	Live Road Load

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		330.00	1.86	360.00	1.74		

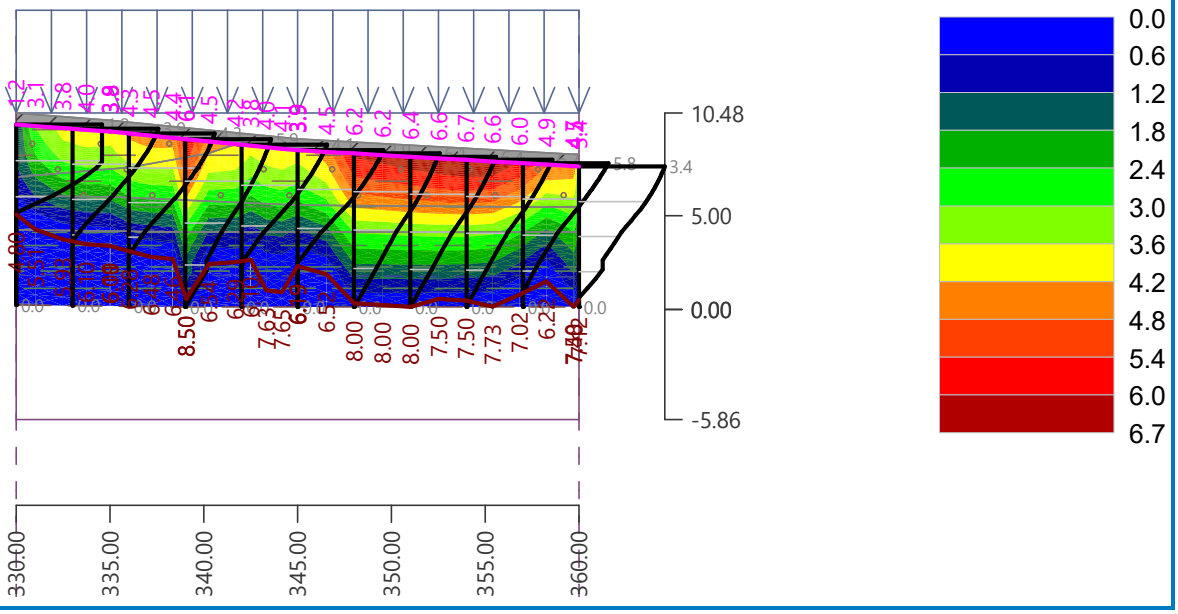
Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 6.7 mm
Maximum depth of influence zone = 8.50 m

Name : Analysis | **Stage : 4**

Results : overall; variable : Settlement; range : <0.0; 6.7> mm



DESIGN OF VIBRO STONE COLUMNS
WROUGHTON CLOSED LANDFILL

Base dimensions (m):

Breadth	25	L/B=	2
Length	50		

Square (0) or triangular (1) grid?	1
Foundation Pressure (kPa)	22
Depth to water table	4.1
Average length of columns (m)	0
Column spacing between column centres (m	2
E' of column (E'c) (MPa)	50
Unit Weight of Column above WT (kN/m3)	21
Buoyant Unit Weight of Column (kN/m3)	11
Angle of Shearing Resistance of stone, ϕ	45
A (m2) (calculated)	3.4641
Ko (calculated)	0.29289
Ka (calculated)	0.17157

Settlement without improvemen	17.30	
Settlement with improvement	17.30	
Total number of columns	361	

GROUND CONDITIONS

Layer	Stratum	z base (m)	Col.dia (m)	E' (MPa)	γ' soil (kN/m3)	poissons ratio Nu soil	spt N	Cu soil (kPa)	t (m)	Ac/A	E'c/E's	Ws	Wc
1	recent landfill	1.00	0.65	9	16	0.25			1.00	0.096	5.56	8	10.5
2	recent landfill	2.00	0.65	9	16	0.25			1.00	0.096	5.56	24	31.5
3	recent landfill	4.10	0.65	9	16	0.25			2.10	0.096	5.56	48.8	64.05
4	landfill	6.10	0.65	4.5	6	0.30			2.00	0.096	11.11	71.6	107.1
5	K Clay	7.00	0.65	20	11.5	0.20			0.90	0.096	2.50	82.775	133.05
6	K Clay	8.00	0.65	20	11.5	0.20			1.00	0.096	2.50	93.7	143.5
7	K Clay	9.00	0.65	20	11.5	0.20			1.00	0.096	2.50	105.2	154.5
8	K Clay	10.00	0.65	20	11.5	0.20			1.00	0.096	2.50	116.7	165.5

SOIL IMPROVEMENT

Layer	Stratum	n0	(Ac/A)1	d(A/Ac)	(Ac/A)bar	n1	pc/ps	pc	fd	n2
1	recent landfill	1.708	0.428	1.337	0.085	1.621	8.312	112.82	1.000	1.436
2	recent landfill	1.708	0.428	1.337	0.085	1.621	8.312	112.82	1.000	1.436
3	recent landfill	1.708	0.428	1.337	0.085	1.621	8.312	112.82	1.000	1.436
4	landfill	1.681	0.628	0.593	0.091	1.641	8.075	108.24	1.000	1.641
5	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	122.95	1.000	1.144
6	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	122.95	1.000	1.144
7	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	122.95	1.000	1.144
8	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	122.95	1.000	1.144

SETTLEMENT

Layer	Stratum	n	A	B	without imp (mm)	with imp (mm)
			0.766	0		
1	recent landfill	0.080	0.765	0.018863	1.57	1.57
2	recent landfill	0.160	0.761	0.035481	1.66	1.66
3	recent landfill	0.328	0.748	0.063471	3.71	3.71
4	landfill	0.488	0.728	0.082444	6.86	6.86
5	K Clay	0.560	0.717	0.088916	0.82	0.82
6	K Clay	0.640	0.704	0.094828	0.91	0.91
7	K Clay	0.720	0.691	0.099559	0.90	0.90
8	K Clay	0.800	0.677	0.103268	0.88	0.88
					17.30	17.30

3.23

n2 is only factored in where column passess through the soil layer.

DESIGN OF VIBRO STONE COLUMNS
WROUGHTON CLOSED LANDFILL

Base dimensions (m):

Breadth	25	L/B=	2
Length	50		

Square (0) or triangular (1) grid?	1
Foundation Pressure (kPa)	38.4
Depth to water table	0
Average length of columns (m)	2
Column spacing between column centres (m	1.5
E' of column (E'c) (MPa)	50
Unit Weight of Column above WT (kN/m3)	21
Buoyant Unit Weight of Column (kN/m3)	11
Angle of Shearing Resistance of stone, ϕ	45
A (m2) (calculated)	1.94856
Ko (calculated)	0.29289
Ka (calculated)	0.17157

Settlement without improvemen	22.09	
Settlement with improvement	16.92	
Total number of columns	642	

GROUND CONDITIONS

Layer	Stratum	z base (m)	Col.dia (m)	E' (MPa)	γ' soil (kN/m3)	poissons ratio Nu soil	spt N	Cu soil (kPa)	t (m)	Ac/A	E'c/E's	Ws	Wc
1	landfill	1.00	0.65	4.5	6	0.30		45	1.00	0.170	11.11	3	10.5
2	landfill	2.00	0.65	4.5	6	0.30		45	1.00	0.170	11.11	9	31.5
3	K Clay	3.00	0.65	20	10	0.20		55	1.00	0.170	2.50	17	52.5
4	K Clay	4.00	0.65	20	10	0.20		75	1.00	0.170	2.50	27	73.5
5	K Clay	5.00	0.65	20	10	0.20		95	1.00	0.170	2.50	37	89.5
6	K Clay	6.00	0.65	20	10	0.20		115	1.00	0.170	2.50	47	100.5
7	K Clay	8.00	0.65	20	10	0.20		155	2.00	0.170	2.50	62	117
8	K Clay	10.00	0.65	20	10	0.20		195	2.00	0.170	2.50	82	139

SOIL IMPROVEMENT

Layer	Stratum	n0	(Ac/A)1	d(A/Ac)	(Ac/A)bar	n1	pc/ps	pc	fd	n2
1	landfill	2.310	0.628	0.593	0.155	2.169	8.560	151.53	0.998	2.166
2	landfill	2.310	0.628	0.593	0.155	2.169	8.560	151.53	0.995	2.158
3	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
4	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
5	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
6	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
7	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
8	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255

SETTLEMENT

Layer	Stratum	n	A	B	without imp (mm)	with imp (mm)	
			0.766	0			
1	landfill	0.080	0.765	0.018863	4.63	2.14	
2	landfill	0.160	0.761	0.035481	4.99	2.31	
3	K Clay	0.240	0.756	0.049932	1.50	1.50	
4	K Clay	0.320	0.748	0.062337	1.54	1.54	12.66
5	K Clay	0.400	0.739	0.072852	1.57	1.57	
6	K Clay	0.480	0.729	0.081651	1.58	1.58	
7	K Clay	0.640	0.704	0.094828	3.17	3.17	
8	K Clay	0.800	0.677	0.103268	3.11	3.11	
					22.09	16.92	

n2 is only factored in where column passess through the soil layer.

DESIGN OF VIBRO STONE COLUMNS
WROUGHTON CLOSED LANDFILL

Base dimensions (m):

Breadth	25	L/B=	2
Length	50		

Square (0) or triangular (1) grid?	1
Foundation Pressure (kPa)	38.4
Depth to water table	4.1
Average length of columns (m)	0
Column spacing between column centres (m	2
E' of column (E'c) (MPa)	50
Unit Weight of Column above WT (kN/m3)	21
Buoyant Unit Weight of Column (kN/m3)	11
Angle of Shearing Resistance of stone, ϕ	45
A (m2) (calculated)	3.4641
Ko (calculated)	0.29289
Ka (calculated)	0.17157

Settlement without improvemen	22.09	
Settlement with improvement	22.09	
Total number of columns	361	

GROUND CONDITIONS

Layer	Stratum	z base (m)	Col.dia (m)	E' (MPa)	γ' soil (kN/m3)	poissons ratio Nu soil	spt N	Cu soil (kPa)	t (m)	Ac/A	E'c/E's	Ws	Wc
1	landfill	1.00	0.65	4.5	6	0.30		45	1.00	0.096	11.11	3	10.5
2	landfill	2.00	0.65	4.5	6	0.30		45	1.00	0.096	11.11	9	31.5
3	K Clay	3.00	0.65	20	10	0.20		55	1.00	0.096	2.50	17	52.5
4	K Clay	4.00	0.65	20	10	0.20		75	1.00	0.096	2.50	27	73.5
5	K Clay	5.00	0.65	20	10	0.20		95	1.00	0.096	2.50	37	89.5
6	K Clay	6.00	0.65	20	10	0.20		115	1.00	0.096	2.50	47	100.5
7	K Clay	8.00	0.65	20	10	0.20		155	2.00	0.096	2.50	62	117
8	K Clay	10.00	0.65	20	10	0.20		195	2.00	0.096	2.50	82	139

SOIL IMPROVEMENT

Layer	Stratum	n0	(Ac/A)1	d(A/Ac)	(Ac/A)bar	n1	pc/ps	pc	fd	n2
1	landfill	1.681	0.628	0.593	0.091	1.641	8.075	188.92	0.999	1.639
2	landfill	1.681	0.628	0.593	0.091	1.641	8.075	188.92	0.996	1.635
3	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144
4	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144
5	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144
6	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144
7	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144
8	K Clay	1.731	0.195	4.131	0.069	1.511	8.444	214.60	1.000	1.144

SETTLEMENT

Layer	Stratum	n	A	B	without imp (mm)	with imp (mm)	
			0.766	0			
1	landfill	0.080	0.765	0.018863	4.63	4.63	
2	landfill	0.160	0.761	0.035481	4.99	4.99	
3	K Clay	0.240	0.756	0.049932	1.50	1.50	
4	K Clay	0.320	0.748	0.062337	1.54	1.54	12.66
5	K Clay	0.400	0.739	0.072852	1.57	1.57	n2 is only factored in where column passess through the soil layer.
6	K Clay	0.480	0.729	0.081651	1.58	1.58	
7	K Clay	0.640	0.704	0.094828	3.17	3.17	
8	K Clay	0.800	0.677	0.103268	3.11	3.11	
					22.09	22.09	

DESIGN OF VIBRO STONE COLUMNS
WROUGHTON CLOSED LANDFILL

Base dimensions (m):

Breadth	25	L/B=	2
Length	50		

Square (0) or triangular (1) grid?	1
Foundation Pressure (kPa)	38.4
Depth to water table	0
Average length of columns (m)	0
Column spacing between column centres (m	1.5
E' of column (E'c) (MPa)	50
Unit Weight of Column above WT (kN/m3)	21
Buoyant Unit Weight of Column (kN/m3)	11
Angle of Shearing Resistance of stone, ϕ	45
A (m2) (calculated)	1.94856
Ko (calculated)	0.29289
Ka (calculated)	0.17157

Settlement without improvemen	16.80
Settlement with improvement	16.80
Total number of columns	642

GROUND CONDITIONS

Layer	Stratum	z base (m)	Col.dia (m)	E' (MPa)	γ' soil (kN/m3)	poissons ratio Nu soil	spt N	Cu soil (kPa)	t (m)	Ac/A	E'c/E's	Ws	Wc
1	landfill	1.00	0.65	10	6	0.30		45	1.00	0.170	5.00	3	10.5
2	landfill	2.00	0.65	10	6	0.30		45	1.00	0.170	5.00	9	31.5
3	K Clay	3.00	0.65	20	10	0.20		55	1.00	0.170	2.50	17	52.5
4	K Clay	4.00	0.65	20	10	0.20		75	1.00	0.170	2.50	27	73.5
5	K Clay	5.00	0.65	20	10	0.20		95	1.00	0.170	2.50	37	89.5
6	K Clay	6.00	0.65	20	10	0.20		115	1.00	0.170	2.50	47	100.5
7	K Clay	8.00	0.65	20	10	0.20		155	2.00	0.170	2.50	62	117
8	K Clay	10.00	0.65	20	10	0.20		195	2.00	0.170	2.50	82	139

SOIL IMPROVEMENT

Layer	Stratum	n0	(Ac/A)1	d(A/Ac)	(Ac/A)bar	n1	pc/ps	pc	fd	n2
1	landfill	2.310	0.396	1.526	0.135	2.001	8.405	161.30	1.000	1.681
2	landfill	2.310	0.396	1.526	0.135	2.001	8.405	161.30	1.000	1.681
3	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
4	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
5	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
6	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
7	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255
8	K Clay	2.398	0.195	4.131	0.100	1.766	8.661	188.35	1.000	1.255

SETTLEMENT

Layer	Stratum	n	A	B	without imp (mm)	with imp (mm)
			0.766	0		
1	landfill	0.080	0.765	0.018863	2.08	2.08
2	landfill	0.160	0.761	0.035481	2.25	2.25
3	K Clay	0.240	0.756	0.049932	1.50	1.50
4	K Clay	0.320	0.748	0.062337	1.54	1.54
5	K Clay	0.400	0.739	0.072852	1.57	1.57
6	K Clay	0.480	0.729	0.081651	1.58	1.58
7	K Clay	0.640	0.704	0.094828	3.17	3.17
8	K Clay	0.800	0.677	0.103268	3.11	3.11
					16.80	16.80

7.37

n2 is only factored in where column passess through the soil layer.

ANNEX C - GEOTECHNICAL RISK REGISTER

A preliminary Geotechnical Risk Register has been complied in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/03 and CD 622 to assist in the management of the risks and hazards.

The purpose of the Geotechnical Risk Register is to provide and outline a description of the hazards, identify the likely cause, describe the potential impact of the hazard and identify the design construction controls to be implemented in order to minimise the geotechnical risk.

Whilst the probability and impact of the hazard occurring can be reduced to a minimum by geotechnical design, the impact cannot be reduced below very low. The probability and impact of a hazard have been judged on a qualitative scale as set out in Table 1. The degree of risk (R) is determined by combining the assessment of the probability (P) of the hazard occurring with an assessment on the impact (I) of the hazard and associated mitigation it will cause if it occurs (R = P x I). Impact is considered to cover by cost and time and is a subjective assessment.

P = Probability			I = Impact			R = Risk Rating (P x I)		
1	Very unlikely	(VU)	1	Very Low	(VLw)	1 – 4	None / negligible	(N)
2	Unlikely	(U)	2	Low	(Lw)	5 – 9	Minor	(Mn)
3	Plausible	(P)	3	Medium	(M)	10 – 14	Moderate	(Md)
4	Likely	(Lk)	4	High	(H)	15 – 19	Substantial	(Sb)
5	Very Likely	(VLk)	5	Very High	(VH)	20 - 25	Severe	(Sv)

Project Name:	Wroughton Closed Landfill	Project Number:	C-02753	Date:	08/04/2022

Hazard	Location	Who/what is at Risk	Consequence	Risk Before Mitigation			Mitigation Measures			Residual Risk		
				P	I	R	Preliminary Design	Detailed Design	Construction Team	P	I	R
Bearing Capacity Failure	Site wide	Structures and infrastructure	Embankment failure	3	3	9	Hydrock GDR includes the details acceptable slope stability angles for temporary works. This risk primarily relates to temporary stockpiling.	No further assessment required with respect to permanent works slopes.	Stockpiles to be maintained at less than 3m above original ground level, with appropriate temporary works checks to be completed.	2	3	6
Excessive settlement of site infrastructure highways, paths drives, services etc (poor stiffness of underlying soils and engineered fill)	Site wide	Infrastructure highways, paths drive's, services	Failure of buried services, excessive maintenance costs for surfacing etc	5	5	25	An options appraisal to address the risk of excessive ground settlement.	Selection of suitable option and validation of design	Construction in accordance with earthwork specification for engineered fill.	1	5	5
Excavations	Site wide	Construction staff and adjacent infrastructure and structures.	Risk of collapse of excavation or inducing excessive settlement of adjacent ground through dewatering.	3	5	15	Temporary works design to be completed by appointed contractor.	Temporary works design to be completed by appointed contractor.	Contactor to determine safe method of work	1	5	5
Groundwater ingress into excavations	At location of open excavations	Construction staff and adjacent infrastructure and structures.	Risk of collapse of excavation	3	5	15	Temporary works design to be completed by appointed contractor.	Temporary works design to be completed by appointed contractor.	Contactor to determine safe method of work	1	5	5
Stability of temporary slopes	Site wide	Construction staff and adjacent infrastructure and structures.	Embankment failure	3	3	9	Temporary works design to be completed by appointed contractor.	Temporary works design to be completed by appointed contractor.	Contactor to determine safe method of work	2	3	6
Self settlement of landfill materials	Site wide	Infrastructure highways, paths drive's, services	Failure of buried services, excessive maintenance costs for surfacing etc	3	4	12	Post construction settlement monitoring points to be implemented to check potential excessive settlement.	A plan showing the layout of the proposed settlement monitoring points shall be produced in collaboration with the Contractor once the haul	Contractor to liaise with Hydrock with regards locations of settlement monitors.	1	4	4

Hazard	Location	Who/what is at Risk	Consequence	Risk Before Mitigation			Mitigation Measures			Residual Risk		
				P	I	R	Preliminary Design	Detailed Design	Construction Team	P	I	R
								road / construction traffic plan is better understood.				
Limited geotechnical data and testing	Site wide	Unexpected ground conditions	Service limit state failure highway	3	3	9	Conservative lower bound values used in design. Adoption of published values.	Geotechnical testing to be undertaken by Contractor in accordance with an earthworks specification.	Sub-formation to be inspected and approved by Hydrock. Contractor to inform Hydrock before filling commences to ensure sub-formation is acceptable. Allowance for removal of unsuitable fill materials.	3	1	3

Prepared By:	Lynne Llewellyn	Signature: