

## 9.4 Foundations






### 9.4.1 Shallow Foundations

Lightly loaded structures (site cabins, storage structures, electrical substations etc.) and low-rise housing may be constructed on shallow foundations bearing onto the Clay-with-Flints Formation. Assuming pad foundations measuring 1.0m x 1.0m founded 0.5m into the Clay-with-Flints Formation an allowable bearing capacity of 100kPa (factor of safety = 3) may be adopted. For strip footings measuring 0.6m x 4.0m founded 0.5m into the Clay-with-Flints Formation an allowable bearing capacity of 90kPa (factor of safety = 3) may be adopted. Consideration should be given to the presence of potentially desiccated soils and medium volume change potential of the soils of the Clay-with-Flints Formation.

### 9.4.2 Piled Foundations


A preliminary pile design has been undertaken based on the findings of the site investigation. If it is determined that shallow foundations are unsuitable for the development and that piles are to be used, it is assumed that CFA piles will be used and that the existing site levels will remain. As such the pile platform levels have been assumed as +172mOD. It has also been assumed that the piled foundations will be end bearing piles within the White Chalk Subgroup. The preliminary pile designs are presented in Figure 5.


The following design assumptions should be considered by the piling contractor and are assumed for the preliminary pile design:

-  The contribution to pile capacity from the Made Ground or Topsoil is discounted.
-  Pile cut off level of +172mOD;
-  Skin friction on the piles in the Clay-with-Flints Formation has been restricted to 140kPa, shaft friction is ignored in the Made Ground, no allowance is made for negative skin friction;
-  No allowance for pile testing has been made, therefore: Factors of Safety (FoS) = EC7 'Combination 2' factoring:  $\gamma_{sf}$  (skin friction) of 1.6,  $\gamma_{bf}$  (base capacity) of 2.0 and Model Factor of 1.4.
-  In the structured and structureless White Chalk Subgroup, an adhesion value of 0.45 has been taken, in accordance with CIRIA C574<sup>28</sup>, Project Report 86<sup>28</sup>.

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<sup>28</sup> CIRIA, (2003). *Shaft friction of CFA piles in chalk*. Project Report 86.

 A limiting skin friction for structured chalk has been taken as 100kPa, based on CIRIA C574<sup>28</sup>.

 An ultimate base stress of 6000kN/m<sup>2</sup> has been adopted for the structured chalk. Calculated based on multiplying the design SPT values by 200, following CIRIA C574 guidance<sup>28</sup>.

Final detailed pile design and installation method will be undertaken and specified by the specialist piling contractor awarded the work. The piling contractor may show different pile toe levels and greater load capacity based on their design approach, interpretation of the ground model and design parameters, and also their experience with piling in similar ground conditions.

## 9.5 Excavations and Stability

Based on the findings of the investigation, excavations within the Made Ground/ Topsoil/ Clay-with-Flints are unlikely to be stable and will require temporary support of battering back to a safe angle during excavation and construction to prevent instability issues. Localised perched water was identified within the Clay-with-Flints Formation and may introduce instability into the side walls of the excavation. Control of the perched groundwater control is likely to be achieved by localised sump pumping during the excavation. Temporary batters should be constructed at an angle no greater than 1:3.

No operatives should enter un-shored or otherwise unprotected excavations identified as unstable by a competent person, however shallow they are, in accordance with the guidelines presented within CIRIA Report 97<sup>29</sup>.

## 9.6 Floor Slabs

Where ground bearing floor slabs are adopted, they should be constructed above a void former/compressible layer to account for heave/shrink of the cohesive Clay-with-Flints deposits.

## 9.7 Roadways

It is recommended that the Made Ground and Topsoil is stripped from site and roadways/pavements are constructed onto the Clay-with-Flints soils. A CBR value of <2.5% may be adopted for the Clay-with-Flints soils and should be verified through in situ testing prior to construction.

All pavements and roadways should be designed, compacted and verified in accordance with MCHW Series 600.

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<sup>29</sup> CIRIA. (1992). *Trenching Practice (Second Edition)*. Construction Industry Research and Information Report 97.

## 9.8 Buried Concrete

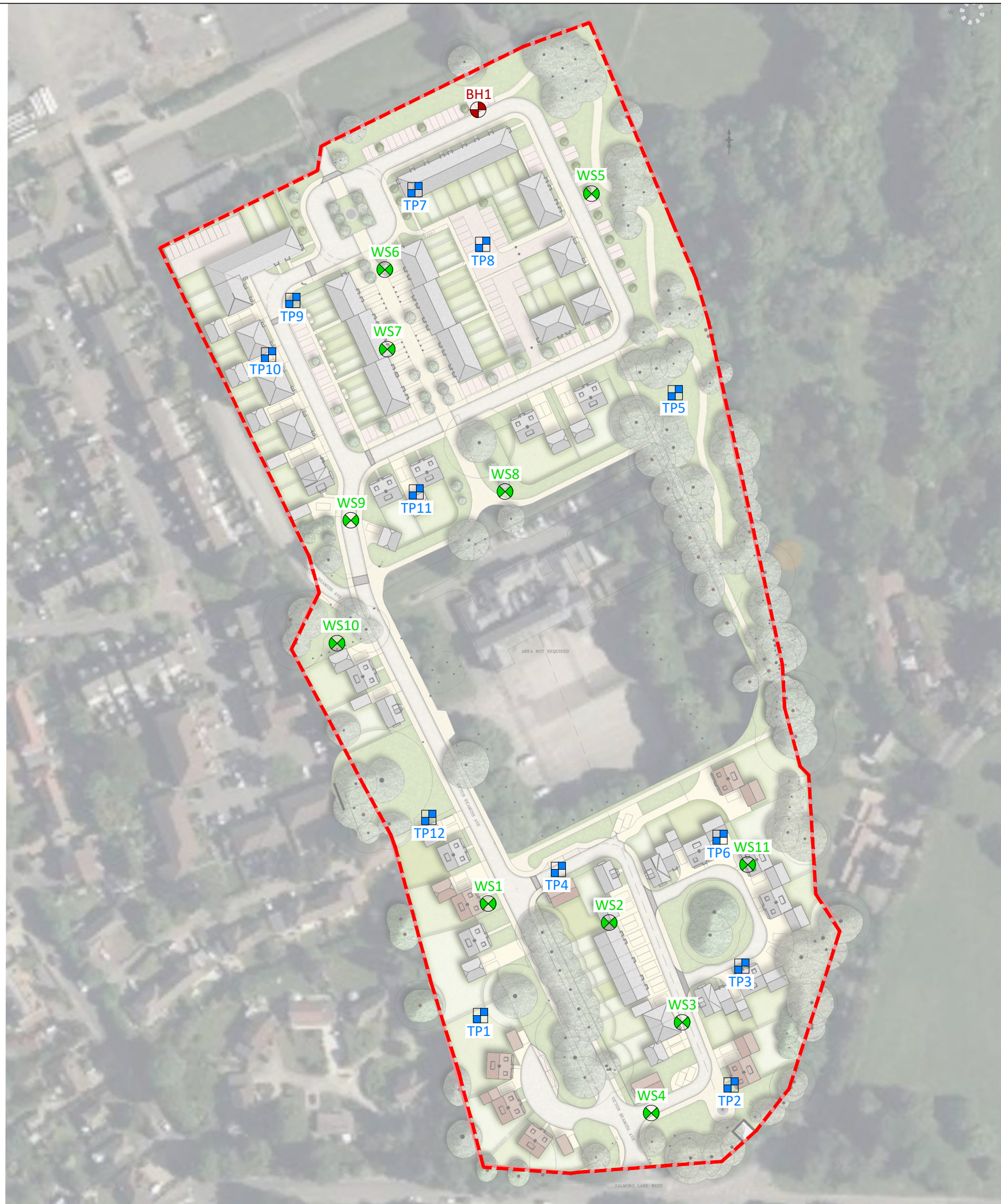
The Design Sulfate (DS) and Aggressive Chemical Environmental for Concrete (ACEC) classes for each stratum are presented in Table 14 below based on the available geotechnical and chemical analysis data.

**Table 14. Summary of DS and ACEC Classes**

<i>Stratum</i>	<i>Water Soluble Sulfate (Non-Pyritic Soil)</i>	
	<i>DS Class</i>	<i>ACEC Class</i>
Made Ground	DS-1	AC-1s
Clay-with-Flints Formation	DS-1	AC-1s
White Chalk Subgroup	DS-1	AC-1s

Based on the above results, DS-1 would be applicable to the Made Ground, Clay-with-Flints Formation and White Chalk Subgroup.

## FIGURES



**KEY**

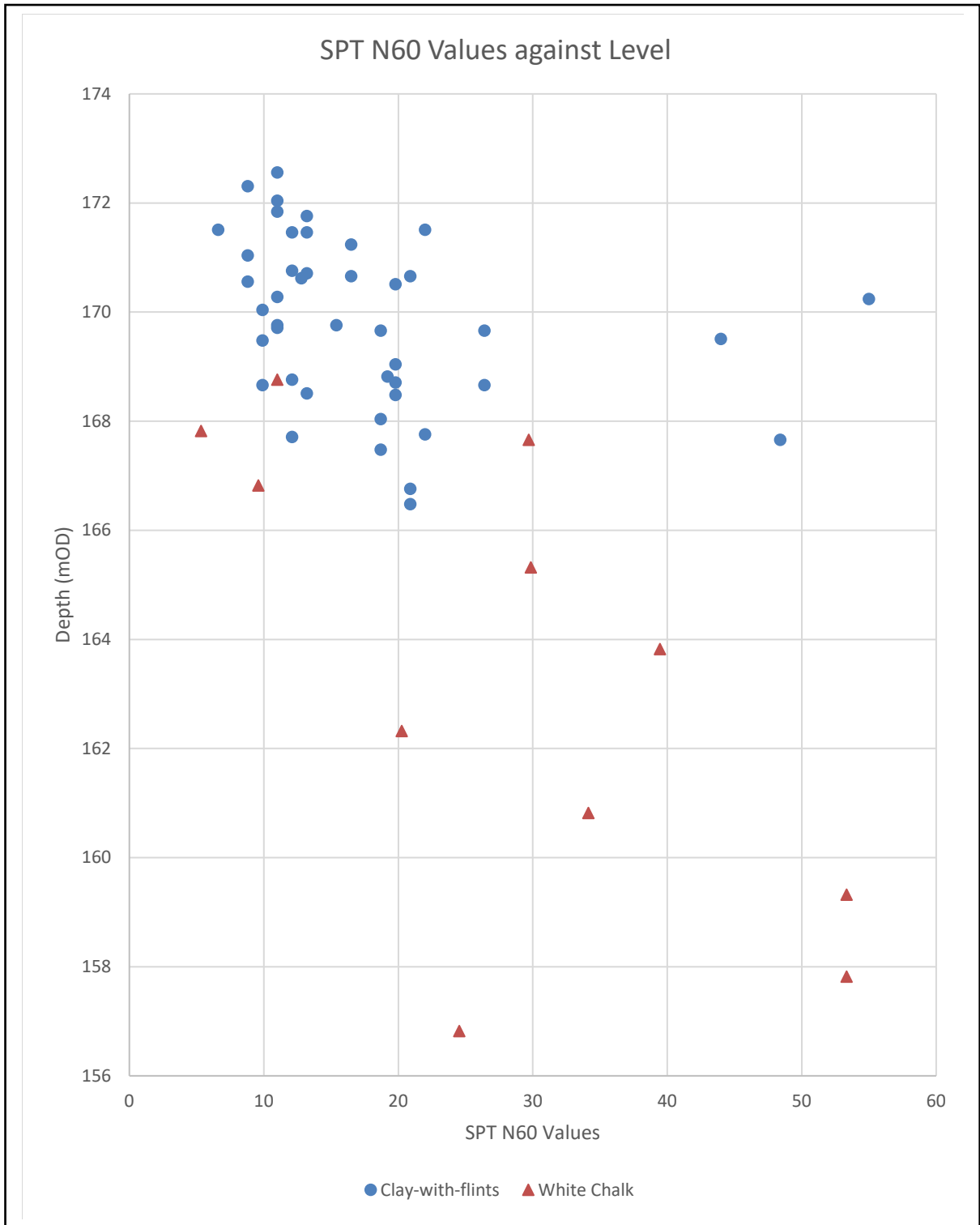
- - - Approximate Site Boundary
- CGL Borehole (December 2022)
- CGL Window Sample (December 2022)
- CGL Trial Pit (December 2022)


**Notes**

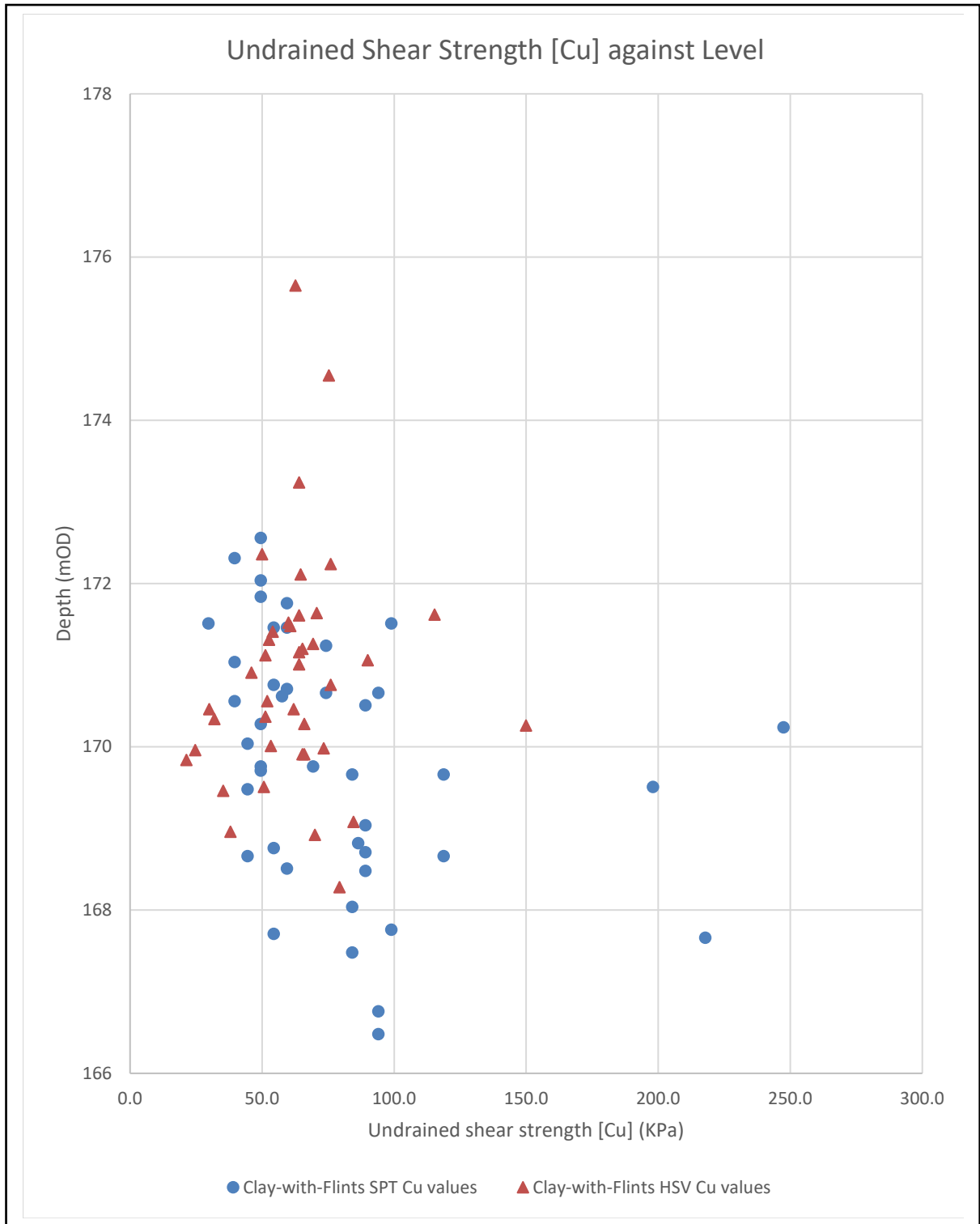
1. Do not scale from this drawing.
2. Proposed Development Plan taken from OSP Architecture drawing '21125-C101' (March 2022).

0	30/01/2023	First issue
Rev	Date	Comments
		Card Geotechnics Ltd 4 Godalming Business Centre Woolsack Way Godalming Surrey GU7 1XW T: 01483 310600
Project		<b>Kenley Campus, Caterham, Surrey</b>
Client		<b>Daniel Watney LLP</b>
Drawing title		<b>Exploratory Hole Location Plan (Proposed Development)</b>
Scale(s)		Job No. <b>CG/39415</b>
<b>NTS</b>		
Drawn	TSB 30/01/2023	Dwg No. <b>CG/39415-004</b>
Checked	HUG 17/02/2023	Rev. <b>0</b>
Approved	RNS 17/02/2023	

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Client <b>Daniel Watney LLP</b>	Project <b>Kenley Campus, Caterham, Surrey</b>	Job No <b>CG/39415</b>
	Title <b>SPT N60 against level</b>	<b>Figure 2</b>

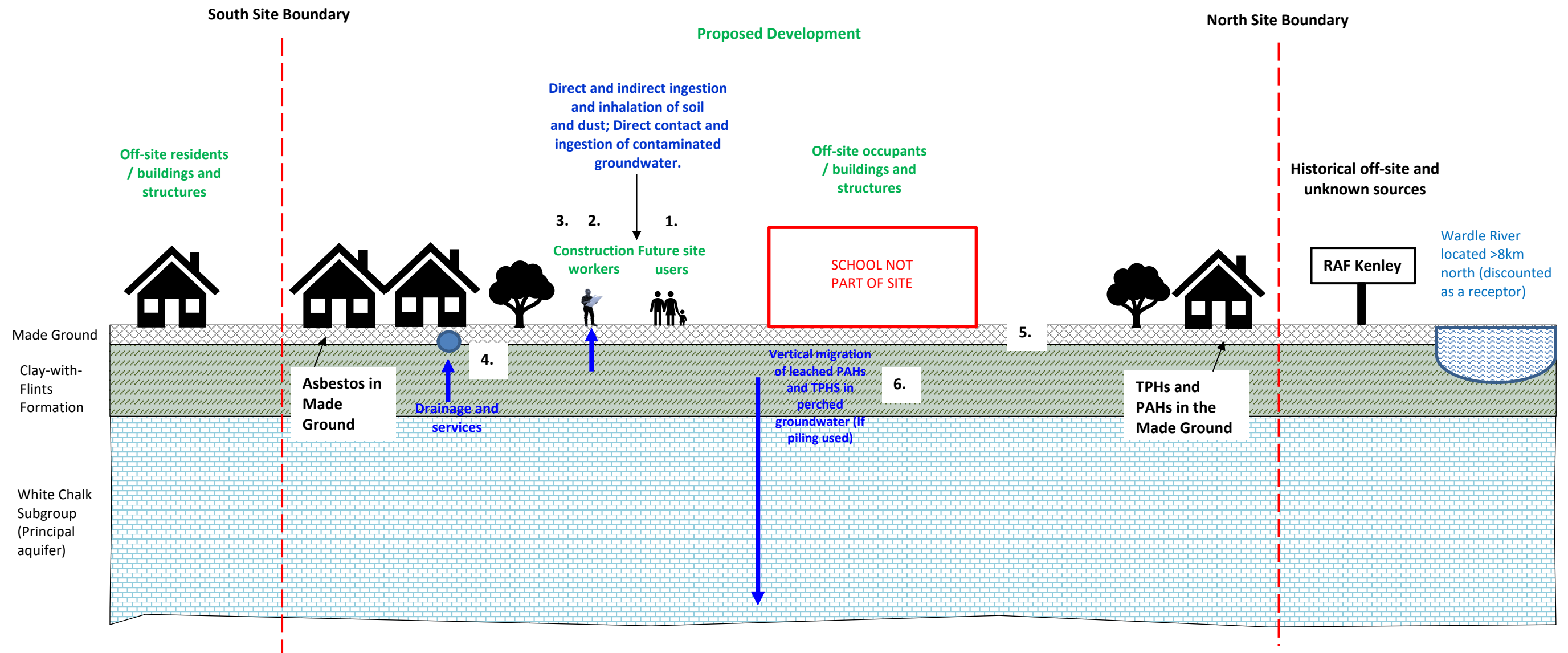


Client <b>Daniel Watney LLP</b>	Project <b>Kenley Campus, Caterham, Surrey</b>	Job No <b>CG/39415</b>
	Title <b>Undrained Shear Strength against Level</b>	<b>Figure 3</b>



Contamination Linkages:

1. Direct contact with contaminated soils by future site users → Moderate/ Low → Elevated concentrations of petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons and asbestos recorded in the Made Ground. Capping layers will be required in areas of soft landscaping where Made Ground remains at formation level.
2. Direct contact with contaminated soils by construction workers → Low → Assuming use of appropriate PPE and good hygiene to mitigate against contamination in the shallow soils.
3. Direct contact and ingestion of contaminated groundwater construction workers → Moderate/ Low → Use of appropriate PPE and safe practices should mitigate against contamination in the perched groundwater.
4. Direct contact with underground services and structures → Moderate/Low → Barrier pipes may be required where Made Ground remains at formation level, however the water supply company should be contacted to confirm their requirements for water supply pipes
5. Explosive/ asphyxiating gases/vapours from underlying soils (Made Ground) → Low → No significant gassing sources have been identified on site. From the monitoring undertaken to date, the site confirms to Characteristic Situation 1 where gas protection measures are not required.
6. Vertical Migration of organic contaminants with perched groundwater → Moderate/ Low → Pathway to aquifer is currently restricted due to predominantly cohesive Clay-with-Flints. However, risk should be reassessed if piling adopted.



Client  
**Daniel Watney LLP**

Project  
**Kenley Campus, Caterham, Surrey**

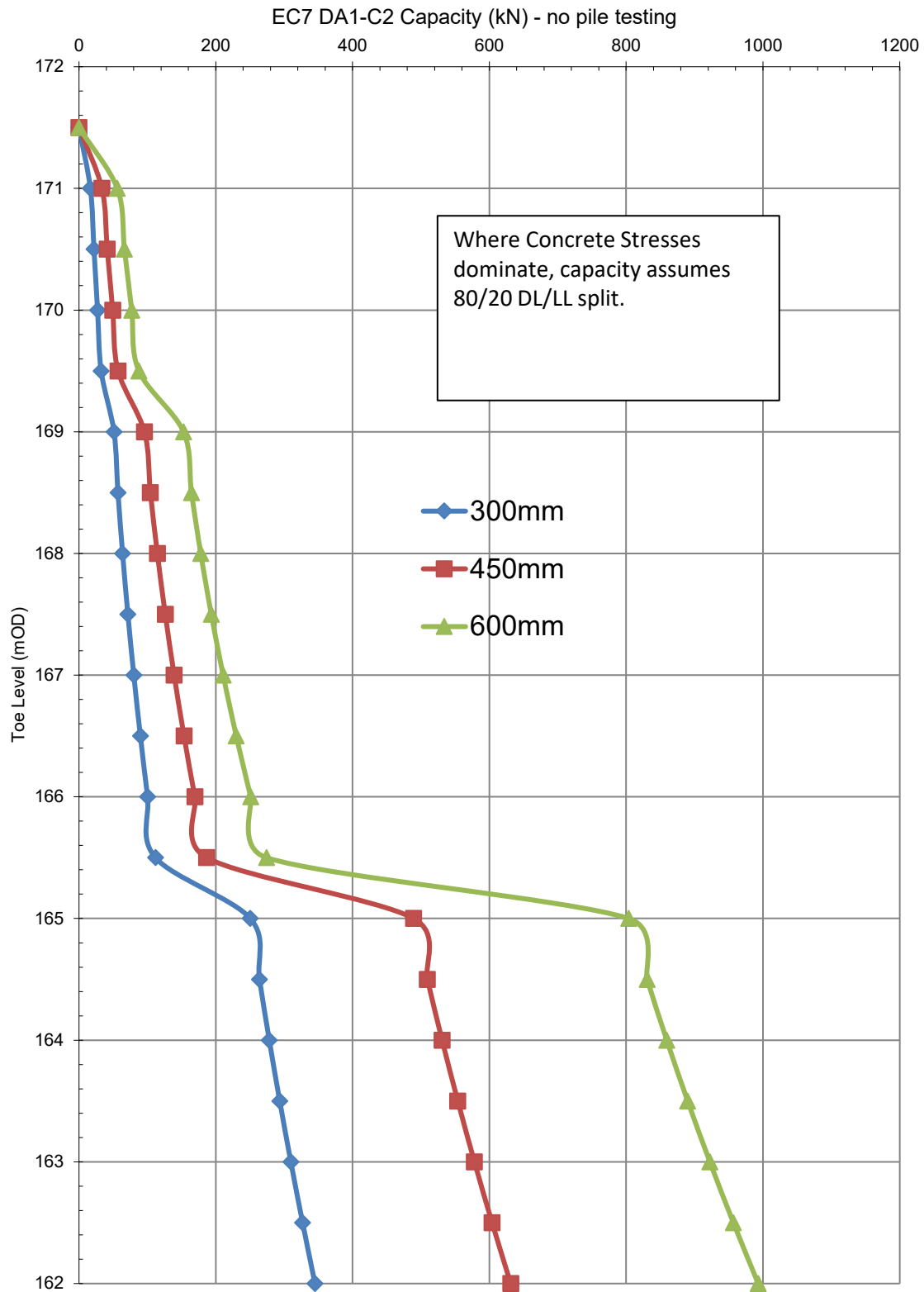
Job No  
**CG/39415**



Title  
**Conceptual Site Model**

**Figure 4**





Client

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Project

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**CG/39415**



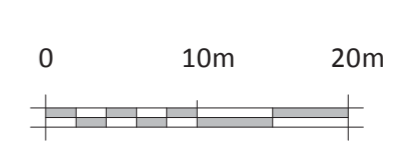
Title

**Preliminary Pile Capacities**

**Figure 5**

# **APPENDIX A**

*Proposed Development Plans*



Colour Site Layout  
Kenley Campus  
**21125 / C101**

Scale 1:500 @ A1 March 2022

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