

Appendix 14.1 F: Geotechnical Risk Register

Appendix F

Geotechnical Risk Register

A geotechnical risk assessment has been undertaken for the site to identify geotechnical hazards that may impact the design and construction. The aim of the assessment is to identify the risks and hazards, quantify them in relation to the proposed works and the site conditions and provide mitigation measures to help eliminate or reduce them.

The risk assessment has been undertaken in accordance with the following:

- Clayton C.R.I (2001), "Managing Geotechnical Risk", Institution of Civil Engineers.

The risk register is a means of documenting perceived risks and their importance and recording actions taken to manage them. The key elements of a geotechnical risk register are as follows:

- Identify the geotechnical risks.
- Identify the methods of construction that may be incorporated into the project.
- Scale the risks according to probability and impact.
- Based on the severity of each risk, decide on the type of action.
- Identify how each risk should be managed.
- Record the actions taken to manage the risk.
- Reassess the severity of each risk after action has been taken.
- Review the risk register at regular intervals and communicate.

The risk register is a live document and should be reviewed on a regular basis and at the end of each stage of the project.

The probability (P) that a given event will occur is given by the following:

Scale	Likelihood	Chance per section of work (Amend to suit local conditions and to be agreed with the Client)
1	Negligible	< 1 in 100
2	Unlikely	1 in 100 to 1 in 10
3	Possible	1 in 10 to 1 in 5
4	Probable	1 in 5 to 1 in 2
5	Almost certain	> 1 in 2

The impact (I) of a given event is given by the following:

Scale	Effect	Chance per section of work (Amend to suit local conditions and to be agreed with the Client)
1	Negligible	< 1%
2	Very low	1% to 4%
3	Low	4% to 8%
4	High	8% to 15%
5	Very high	> 15%

The risk after the application of risk control measures should be reviewed in the light of the following table:

Degree of Risk	Risk Level	Action Required
1 - 4	Trivial	None
5 - 9	Tolerable	Consider more cost-effective solutions or improvements
10 - 15	Substantial	Work must not start until risk has been reduced
16 - 25	Intolerable	Work must not start until risk has been reduced. If risk cannot be reduced, project should not proceed.

The risks and their potential impacts may vary between the various stages of the project, such as the risk to and from buried services, where the impact can be much higher during a ground investigation than during a desk study.

Stage	Risk No.	Hazard	Prior to RCM			Risk Control Measure (RCM)
			Probability (P)	Impact (I)	Risk (R = P x I)	
Desk Study	1	Limited information on ground and groundwater conditions. Existing information is more than 20 years old.	5	4	20	Undertaken ground investigation to establish ground conditions and to obtain geotechnical parameters to facilitate the safe and economic design of the proposed development.
	2	Significant thicknesses of Made Ground and potential for soft or loose deposits that do not provide a competent founding stratum	5	4	20	Undertake ground investigation to establish Made Ground thickness and composition. Investigation to extend well into bedrock to identify competent stratum. Selection of appropriate foundation solution for proposed future structures based on geotechnical properties of the underlying ground conditions. A piled foundation solution is likely to be required.
	3	Made Ground is likely to contain significant proportions of slag that is both potentially expansive and fused into large obstructions. There is the potential for unacceptable settlement of foundations and structures as well as difficulty during construction.	5	4	20	Undertake ground investigation to establish Made Ground thickness and composition. Ground investigation to include trial pitting to physically identify obstructions and slag expansion testing to characterise the properties of the site. The investigations may also include non-intrusive methods to identified areas of dense or hard ground.
	4	Made Ground is likely to be present at variable thicknesses and compositions due to historical features such as embankments. This may result in differential settlement of foundations.	5	4	20	Undertake ground investigation to establish Made Ground thickness and composition where historical mapping identifies features.
	5	Obstructions (relict concrete / foundations etc) encountered during excavation works and foundation construction.	4	3	12	Undertake ground investigation to establish whether historical obstructions are likely to be present beneath the site in key locations. The investigations may also include non-intrusive methods to identified areas of dense or hard ground.

Stage	Risk No.	Hazard	Prior to RCM			Risk Control Measure (RCM)
			Probability (P)	Impact (I)	Risk (R = P x I)	
	6	Instability of deposits and made ground during construction and deep excavations.	4	5	20	Undertake ground investigation to establish the ground conditions in key locations. Appropriate design of temporary works to stabilise excavations.
	7	Limited information on groundwater rest levels at the site. Shallow groundwater is likely which may result in excavation flooding and instability. The site is possibly tidally influenced.	4	5	20	Undertake ground investigation and post works monitoring to establish the groundwater depths in key locations. Appropriate design of temporary works to stabilise excavations and dewatering of excavations as necessary. In situ groundwater monitoring is recommended to establish whether groundwater levels are tidally influenced.
	8	There is limited information on the aggressivity of the ground concrete	4	4	16	Undertake ground investigation including sampling and analysis for ground aggressivity. Design concrete in accordance with BRE Special Digest.
	8	Disturbance or damage of recorded and unrecorded existing utilities.	5	5	25	Up to date utilities plans to be obtained from the statutory suppliers, landowner or tenant prior to the commencement of any investigation and redevelopment works. As built drawings for all infrastructure to be obtained. Undertake a PAS128 Type B survey to non-intrusively detect buried utilities. The proposed development design should ensure prevention of any impact on utilities, particularly those intended for retention.