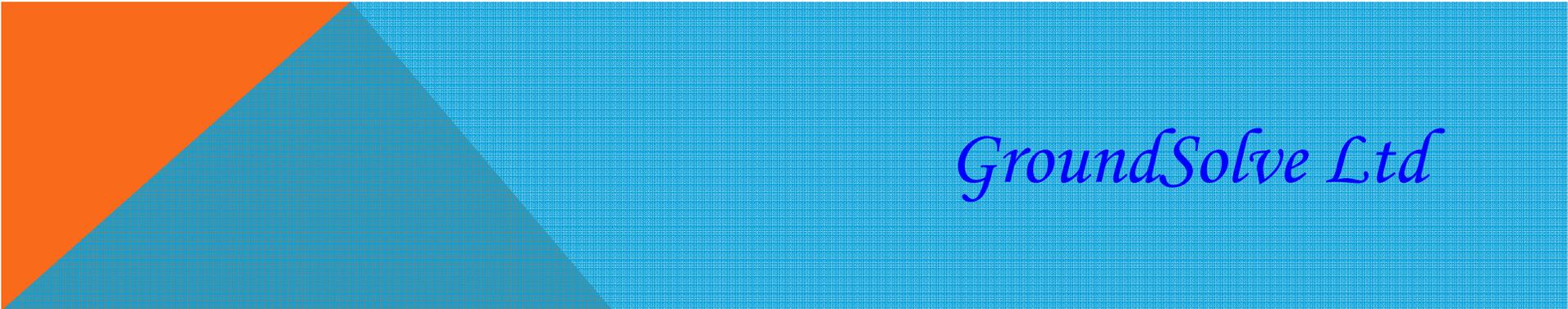


MANAGING RISK

Dr Debbie Scott

Director & Geotechnical Engineer

GroundSolve Ltd



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WHAT IS RISK?

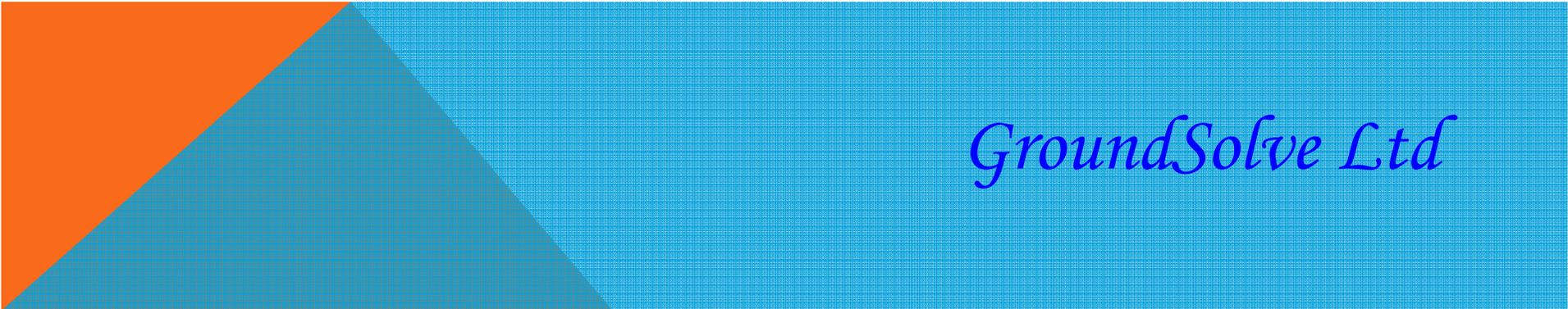
“.....there are known knowns; there are things we know we know.

We also know there are known unknowns; that is to say we know there are some things we do not know.

But there are also unknown unknowns - - the ones we don't know we don't know.....”

Donald H. Rumsfeld

Risk is controlling the **known unknowns** and reducing risk is trying to minimise the **unknown unknowns**

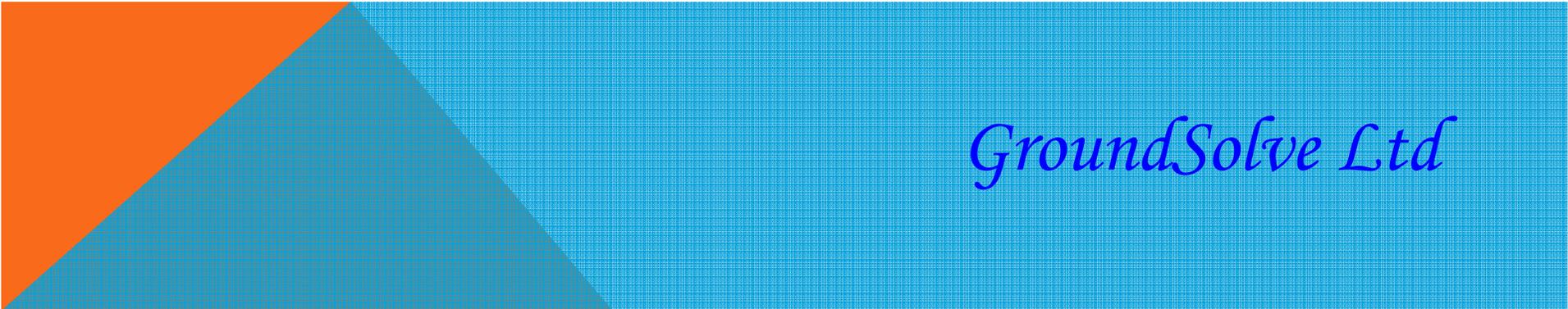


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GEOTECHNICAL RISK

Geotechnical Risk is the risk to building and construction work created by the site ground conditions. Ground related problems can adversely affect:

- Project Cost,
- Completion Times (program),
- Health and Safety,
- Quality and fitness for purpose,
- Environmental Damage.

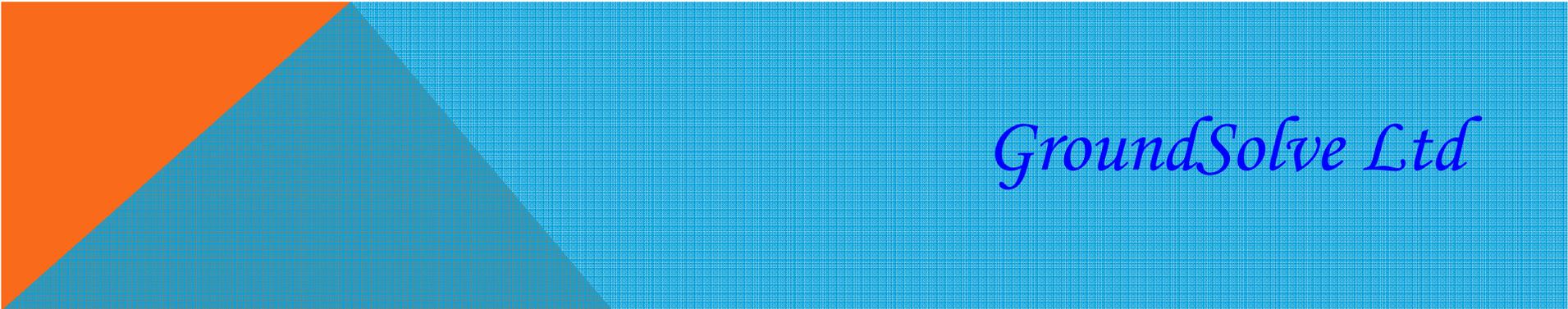


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There are many different types of hazard in the ground, and the consequences of failing to manage the risks they produce are often severe.

In financial terms, minor design changes can add 5% to the cost of construction, and figures as high as 30% to 50% are not uncommon.

If unforeseen ground conditions are encountered during construction, then additional costs as high as 100% of the entire project may be incurred.

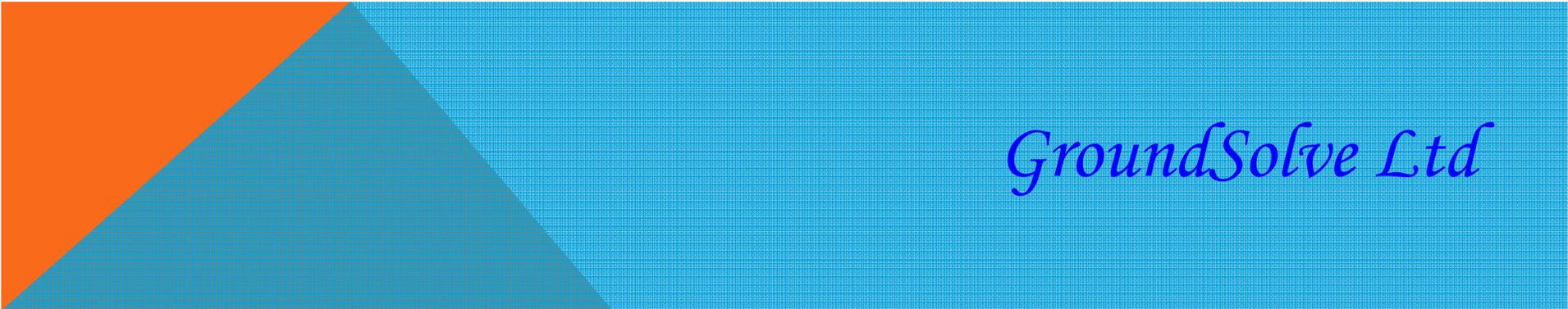


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Extract from Managing Geotechnical Risk: Improving Productivity in UK Building and Construction, Clayton CRI, 2001

“Less than 1% of the total construction tender price is typically spent on site investigation, and the data shows that cost over runs of up to 100% are then possible, even when high levels of skill are used.

Evidence shows that cost over runs are significantly reduced as expenditure on site investigation is increased. However, expenditure would have to reach an unrealistic 7 to 8% of total construction costs to bring additional costs down to less than 10% of the tender price.”



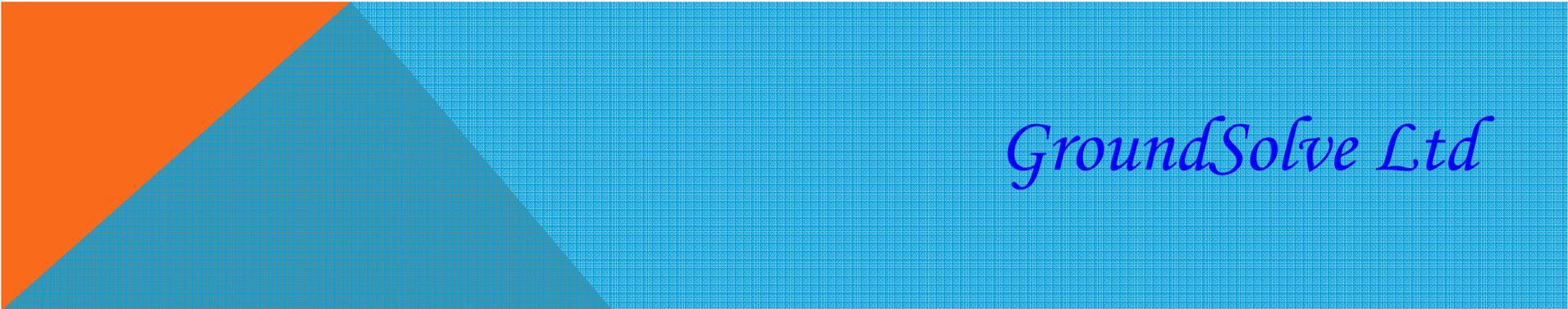
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DOCUMENTATION

There are a number of documents and standards available which provide clear guidance on processes to enable potential geotechnical risks to be identified.

All are based on a simple process:

**DESK STUDY → SITE INVESTIGATION → INTERPRETATION
OF RESULTS**



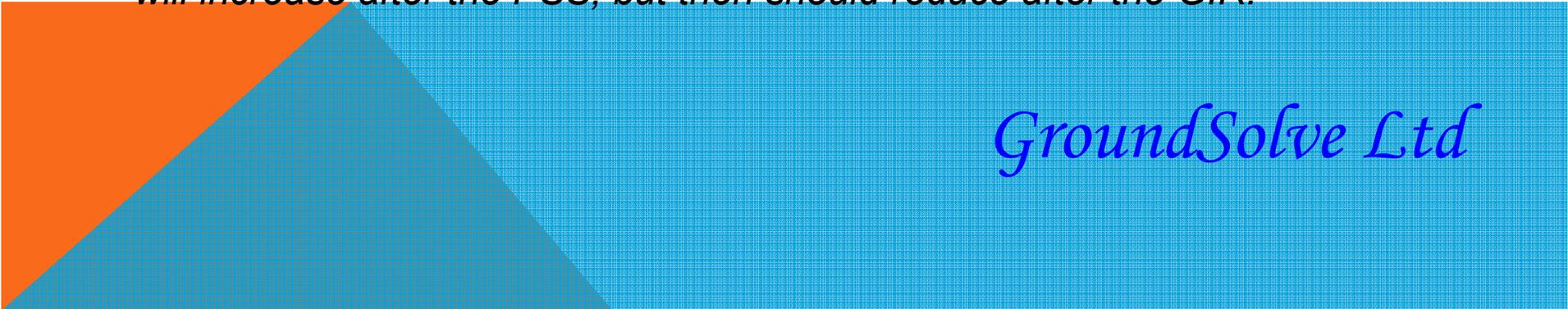
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HD 22/08 Managing Geotechnical Risk (supersedes HD22/02, which superseded HD22/92)

This document lays out the process clearly:

- **Statement of Intent** – *outlines the objectives of the scheme, identifies initial risks and summarises how these are going to be addressed*
- **Preliminary Sources Study** – *basically this is a desk study and the site investigation is scoped up.*
- **Ground Investigation Report** – *the findings of the site investigation and interpretation of the material properties.*
- **Geotechnical Design Report** – *details of the methods of analysis and parameters*
- **Geotechnical Feedback Report** – *details of what actually happened and was found during construction.*

A risk register is produced at each stage. It is likely that the number of risks will increase after the PSS, but then should reduce after the GIR.



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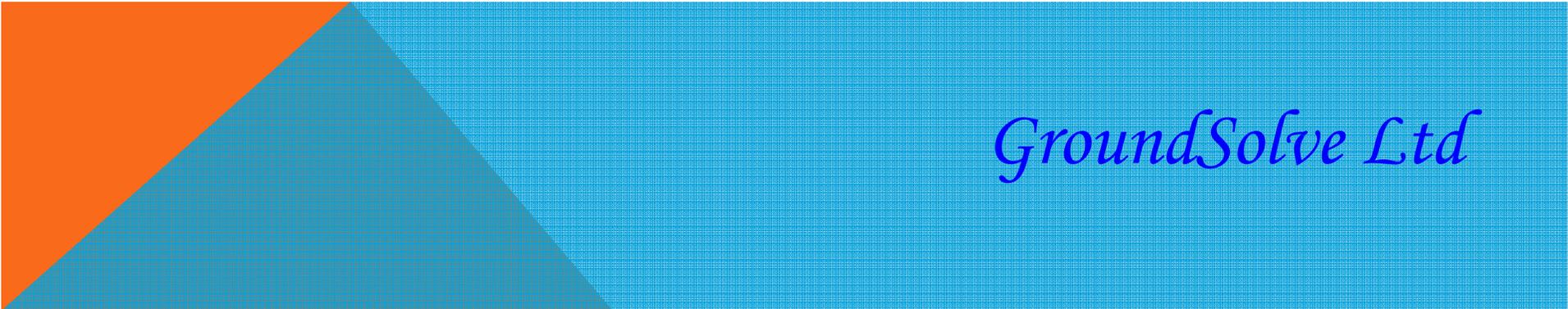
BS EN 1997-1:2004 & BS EN 1997-2:2007 (EuroCode 7)

EC7 Part 2 Section 6 also provides details of the desk study required, but in this case it sits with the Ground Investigation report.

EC7 Part 1 Section 2.8 provides details of the information which should be included in the Geotechnical Design report and adopts the same philosophy as HD22/08.

Clause 2.8(4) which is a principle clause and therefore should be adhered to, states that **“The Geotechnical Design Report shall include a plan of supervision and monitoring**”

However there is NO particular reference to risk registers within EC7



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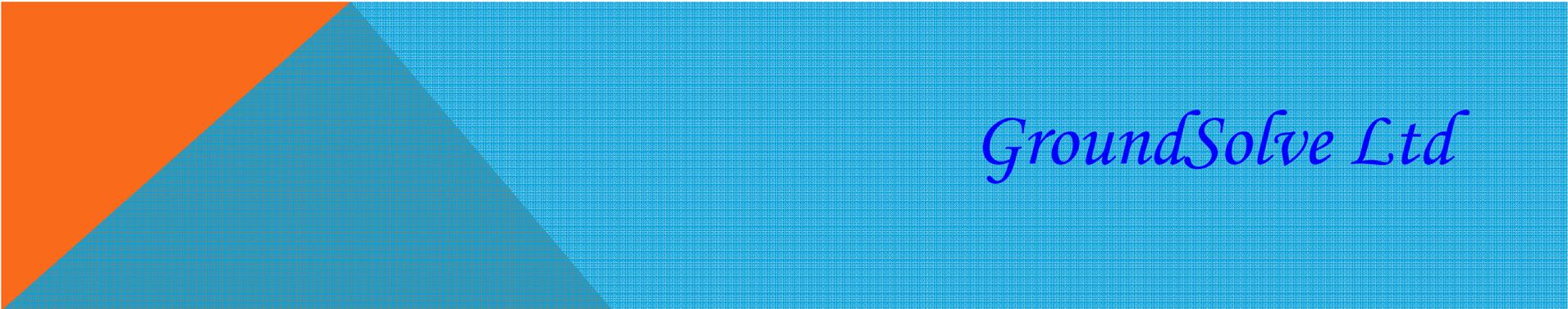
SUPERVISION

Site investigation never stops. As soon as the construction works commence and excavations are undertaken effectively more investigation work is being undertaken.

EC7 Part 1 Clause 4.1 (3) states that the supervision of the construction process should involve:

“identifying the differences between the actual ground conditions and those assumed in the design”

Is the person supervising your project suitability qualified to know if the actual ground conditions are the same as those assumed in the design?

The logo for GroundSolve Ltd is located in the bottom right corner of the slide. It features the company name 'GroundSolve Ltd' in a blue, cursive-style font. The background of the slide is a light blue grid pattern, with a solid orange triangle in the top left corner and a darker blue triangle in the bottom left corner.

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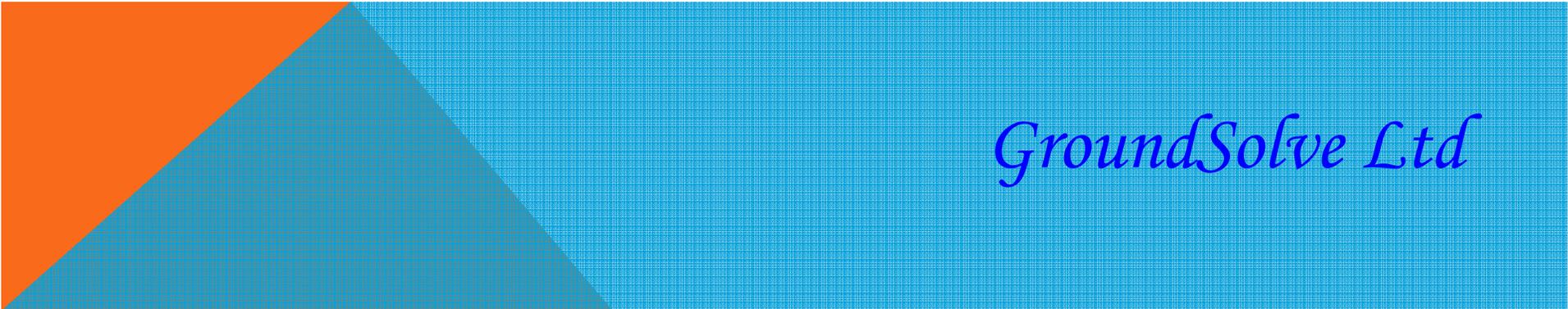
Many sections of the **ICE Specification for Piling and Embedded Retaining Walls (2nd Edition)** state that piling records should be submitted to the Engineer within 24hours of the pile being completed.

WHY?

Because every pile is another borehole – it provides additional information – the more information you have the more informed your decisions.

Who is looking at these records on site and comparing them to the design assumptions? Are the ground conditions as expected? Is the rockhead level as expected? Is the groundwater table as expected?

All these questions should be being answered as the site works are progressing.

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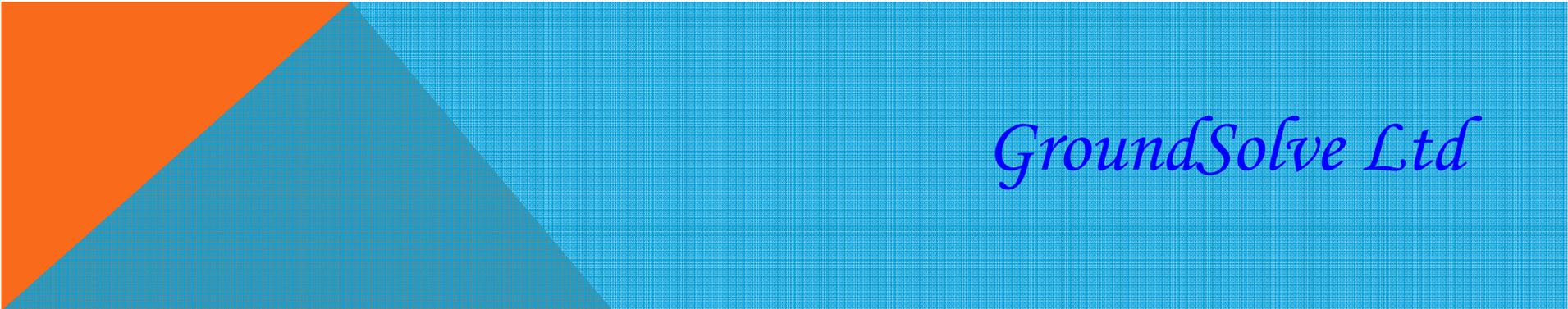
Early identification of differences between the ground conditions assumed in the design and those encountered on site makes managing the risk far easier.

Based on the additional information received / collected through the construction phase, can any risks be removed from the risk register?

Can you define any of the known unknowns with more certainty?

Have you identified any unknown unknowns which need addressing or investigating further?

The risk register should be a 'living' document.

The logo for GroundSolve Ltd is located in the bottom right corner of the slide. It features a blue background with a white diagonal line. The text "GroundSolve Ltd" is written in a blue, serif font. The "G" is large and stylized, and the "Solve" is in a smaller font size. The "Ltd" is in a smaller font size and is positioned to the right of "Solve".

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TRANSFER OF DATA TO SITE

Health & Safety Risk Registers

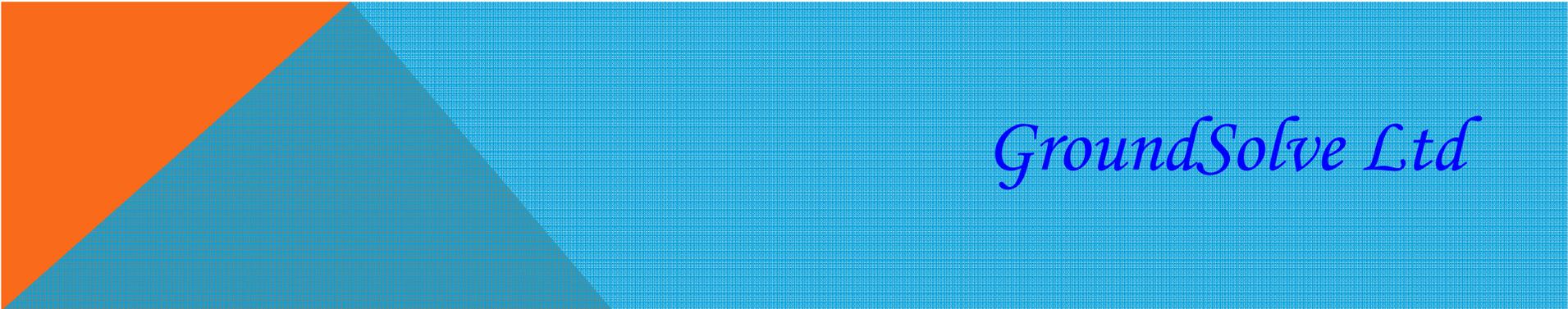
Environmental Risk Registers



More commonplace to see these on drawings

So why are Geotechnical Risk Registers not on drawings?

This could be in the form of notes or in a table.



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THE VIEW OF A DESIGNER TO SUB-CONTRACTORS

Project: Undertake site investigation, design and install piled foundations

Available information: 2No. Boreholes approximately 1km from the site drilled in 1960's. No desk study. No pile loads.

Contract: NEC2 Option A Priced Contract with Activity schedule

99 'Z' clause in the sub contract

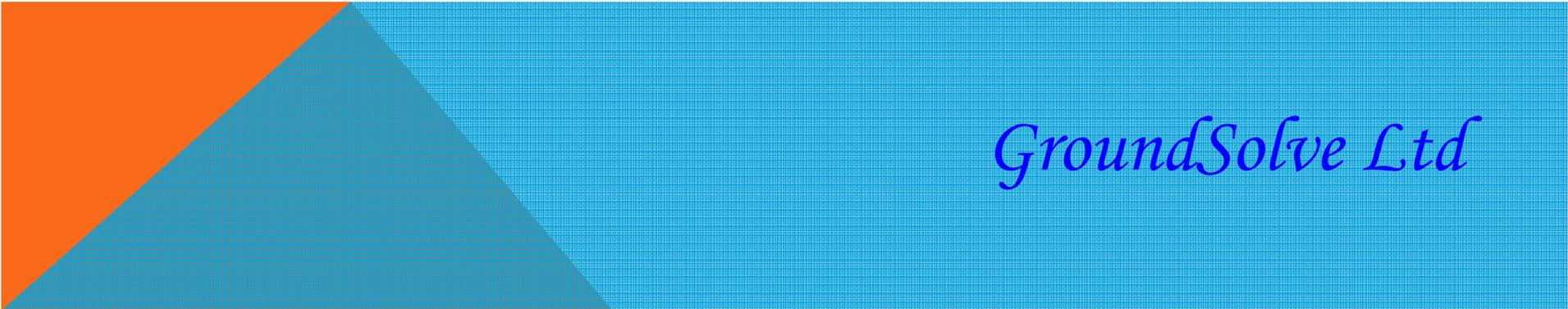
45 'Z' clauses main contract which the sub-contract also has to adhere to.

Clauses 60.1 (12) physical conditions and 60.1(13) weather are both excluded.

Clause 60.2 judging physical conditions excluded

Clause 60.3 Sub-contractor assumed conditions most favourable for the work excluded.

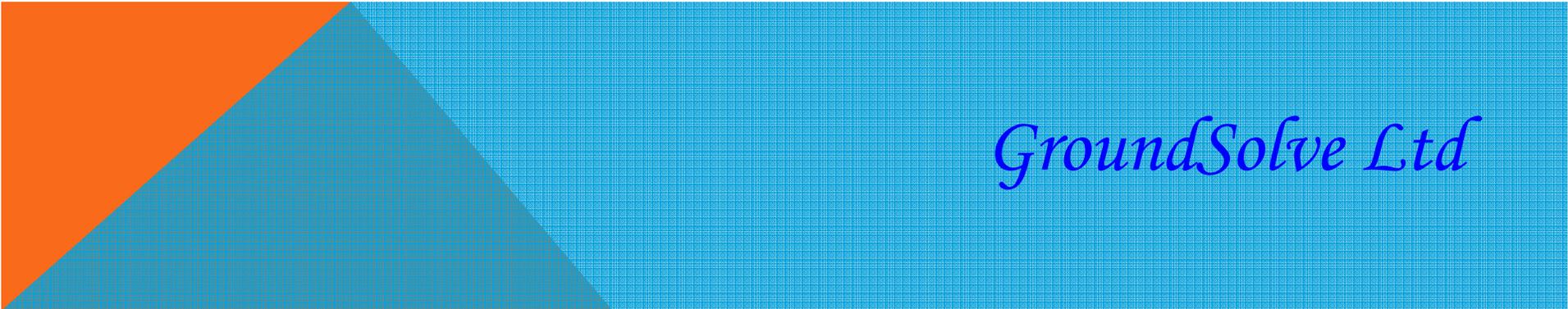
Who is taking the risk? Is this risk management or risk transfer? who is paying for it?

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THOUGHTS TO TAKE TO THE DISCUSSION

- Is the lead consultant managing the risk or just passing it onto the Main Contractor by using the phases “contractor design”?
- Is the Main Contractor managing the risk or just passing it onto the sub-contractor via onerous ‘Z’ clauses in the sub-contract?
- Is it fair for the party least able to manage the risk ending up carrying all the risk?
- How much extra is the Employer paying for the Main Contractor to carry all the risk? If the Employer is a public body, is this good use of public money?
- There is a lot of good documentation available ,which describes in detail the processes for minimising risk, why is this documentation being ignored in the industry?
- Is the supervision of the work by a suitably qualified Geotechnical Engineer really an expense when compared to the money which could be saved by the early identification of difference in the ground conditions?



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