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Irish Rail C&E Tool

EFCA 2017

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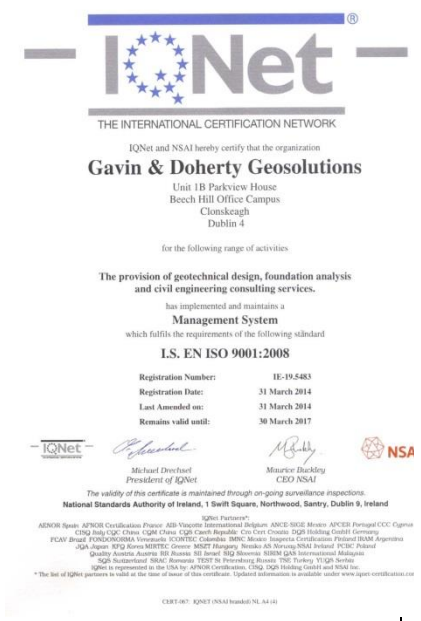
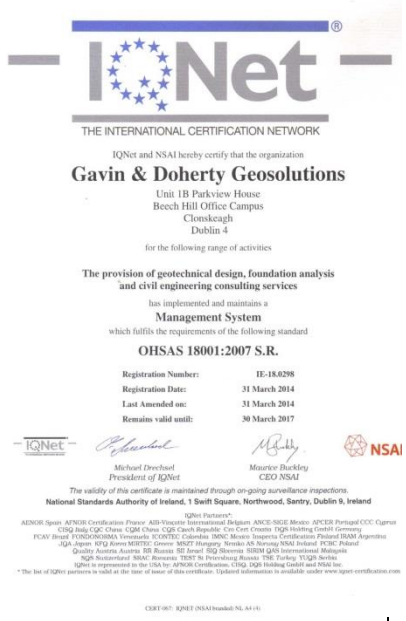
Introduction

- Gavin & Doherty Geosolutions (GDG) is a specialist geotechnical engineering consultancy
- Offices in London, Edinburgh, Dublin and Belfast.
- GDG was formed in 2011 in a challenging market
- Grown throughout the last five years
- Team of 35 highly qualified engineers
- We provide innovative geotechnical solutions across a broad range of engineering problems

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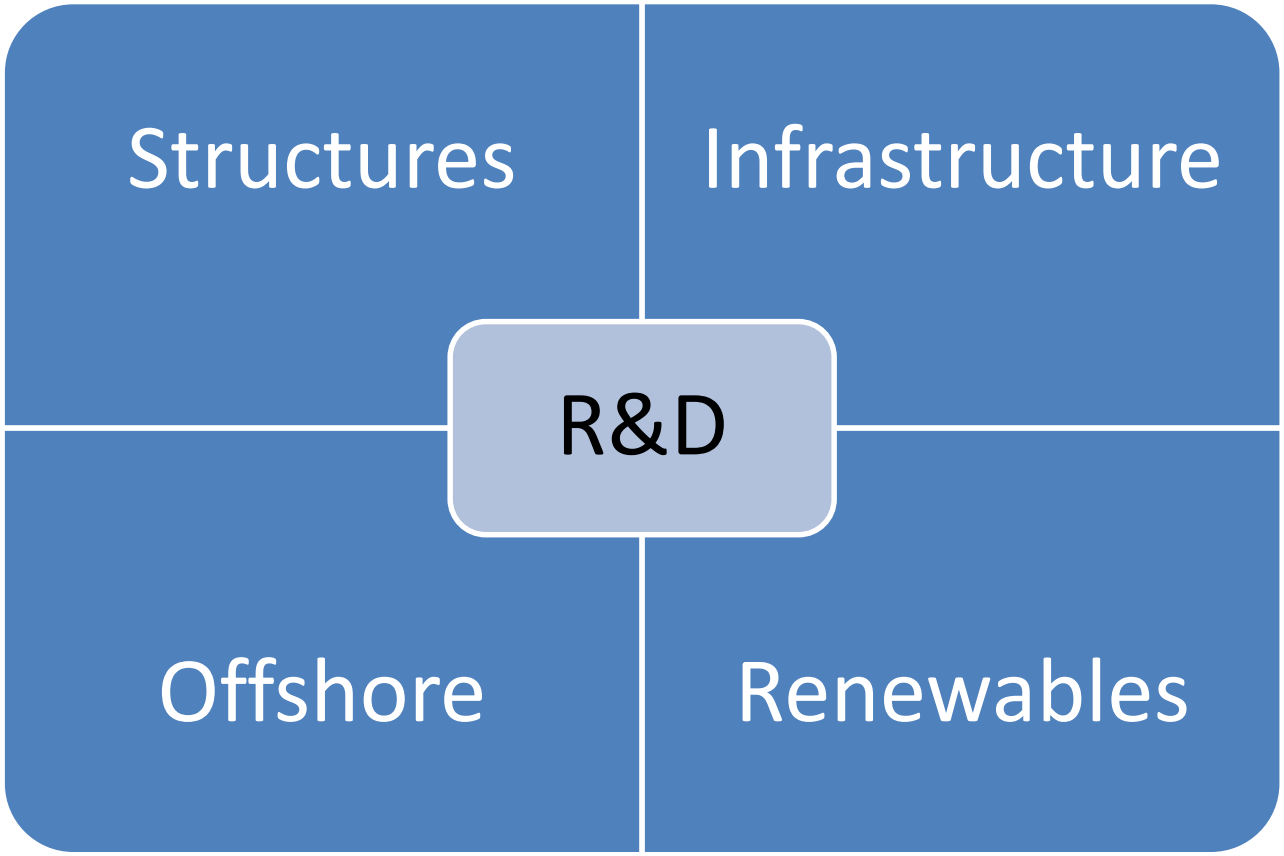
About GDG

INTEGRATED MANAGEMENT SYSTEM

QUALITY	ENVIRONMENT	HEALTH & SAFETY
		
ISO 9001	**ISO 14001**	**OHSAS 18001**

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Engineering Design Services



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Engineering Design Services

- Site Investigation Scoping
- Site Investigation Interpretation
- Soil Parameter Estimation
- Concept design
- Detailed design
- Performance monitoring (CMS)



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Ground Risk

- What is Ground Risk ?



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Design Tools Available

- Analytical – Traditional Theoretical Hand (spreadsheet) Calculations
- Empirical – Traditional Approaches based on experience of empirical evidence
- Numerical – Finite Element (or Finite Difference)
- Observational Design Approaches

Pick the most appropriate tool for your project

(consider the limitations of the tool, the complexity of the project and the accuracy required)

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Irish Rail

- **Risk Modelling on a Large Scale (Rail Network)**







2,800Km Track




4,900 Earthworks





5,100 Bridges




900 Level Crossings

C&E DST

- **Recent Failures**



Portarlington Derailment
Aug 2008



Manulla Junction
Landslide Aug 2007



Wicklow Derailment Nov
2009



Rushbrooke Rock Falls
March 2014

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Waterford Rockfall Dec 2013



Kilkenny Waterford Line Landslip Dec 2013



Tullamore Soil Slips and Rock Falls 2011/2012

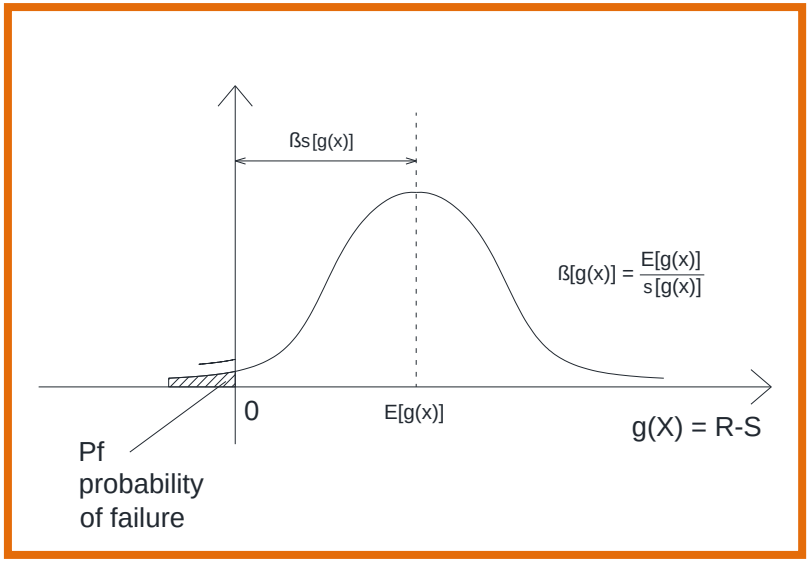


Cabra Slope Failures 2012

C&E DST

PROBABILISTIC MODELLING

- High Level of Uncertainty Across the Asset Characteristics
- Consider COV of input parameters depending on data source
- Develop quantifiable risk profiles
- Hasofer Lind method used to calculate the probability of failure associated with each asset and its coupled limit state
- Outputs: reliability index (β), probability of failure



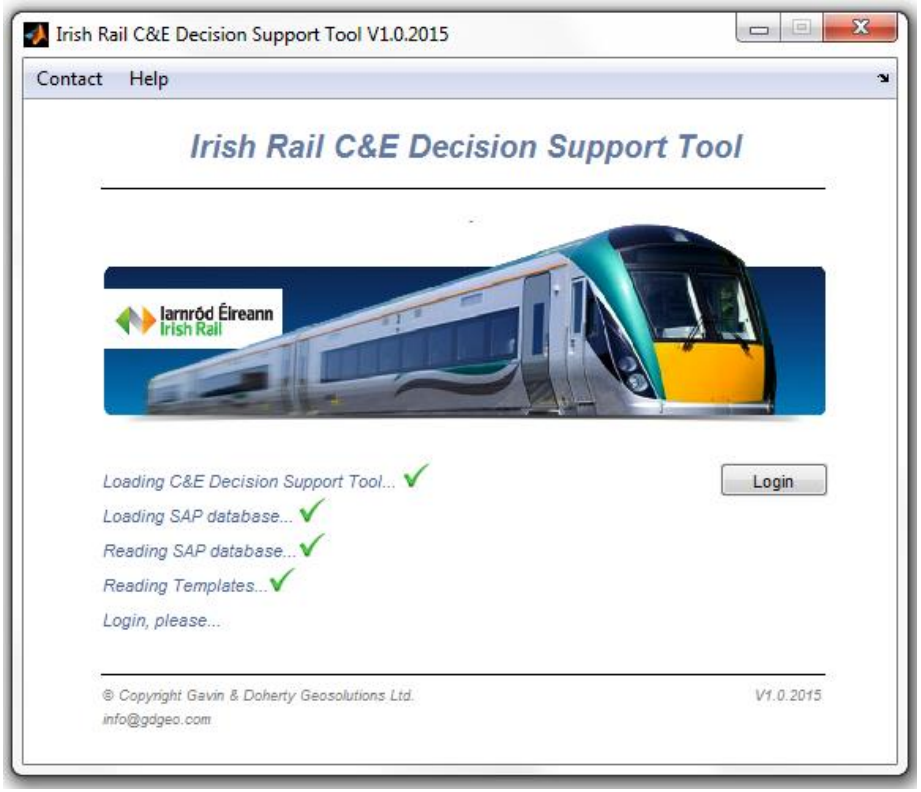
Outputs: reliability index (β), probability of failure

C&E DST

- **Risk Modelling on a Large Scale (Rail Network)**

- Possible to quantify ground risk
- 4000 Assets

- **No excuses for individual sites!**



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Conclusions

- Advanced design tools have a place in some projects
- FEM can allow more efficient design and ultimately save money and decrease risk
- Calibration is critical
- Recommend numerical modelling coupled with observational approach
- Monitoring provides the confidence to allow construction to proceed on time and in budget

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Conclusions

- QUESTIONS ???