THE HONG KONG INSTITUTION OF ENGINEERS
香港工程師學會

Geotechnical Division
岩土分部

Working Group on Application of Innovative Technology in Geotechnical Engineering

Geotechnical Computer Program Users Group Meeting No.2

Seminar Room, HKIE HQs, 17th September 2014

Common Pitfalls and Important Points to Note in Using Geotechnical Computer Programs

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Important Points to Note in Validating and Using Geotechnical Computer Programs

Ir Dr Mark H. C. Chan

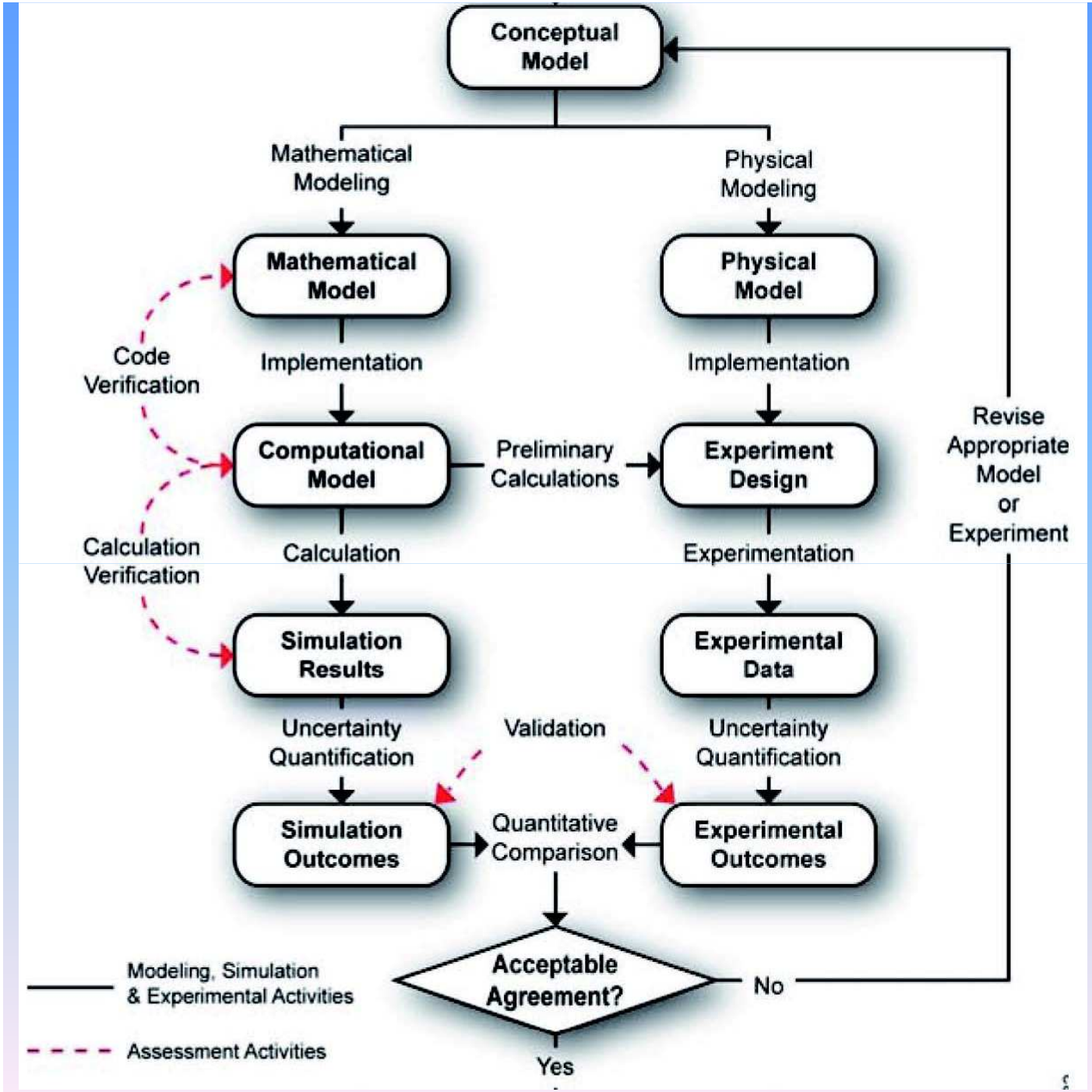
How can one determine whether the theoretical basis of a computer program is acceptable?

The importance of the Scientific Method which underlies the validation procedures.

The **scientific method** is a body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. To be termed scientific, a method of inquiry must be based on empirical and measurable evidence subject to specific principles of reasoning.

(From Wikipedia, 12.9.2014)

An 18th-century depiction of early experimentation in the field of chemistry.



"What is Verification and Validation?"
By American Society of Mechanical Engineers & National Agency for Finite Element Methods and Standards , UK

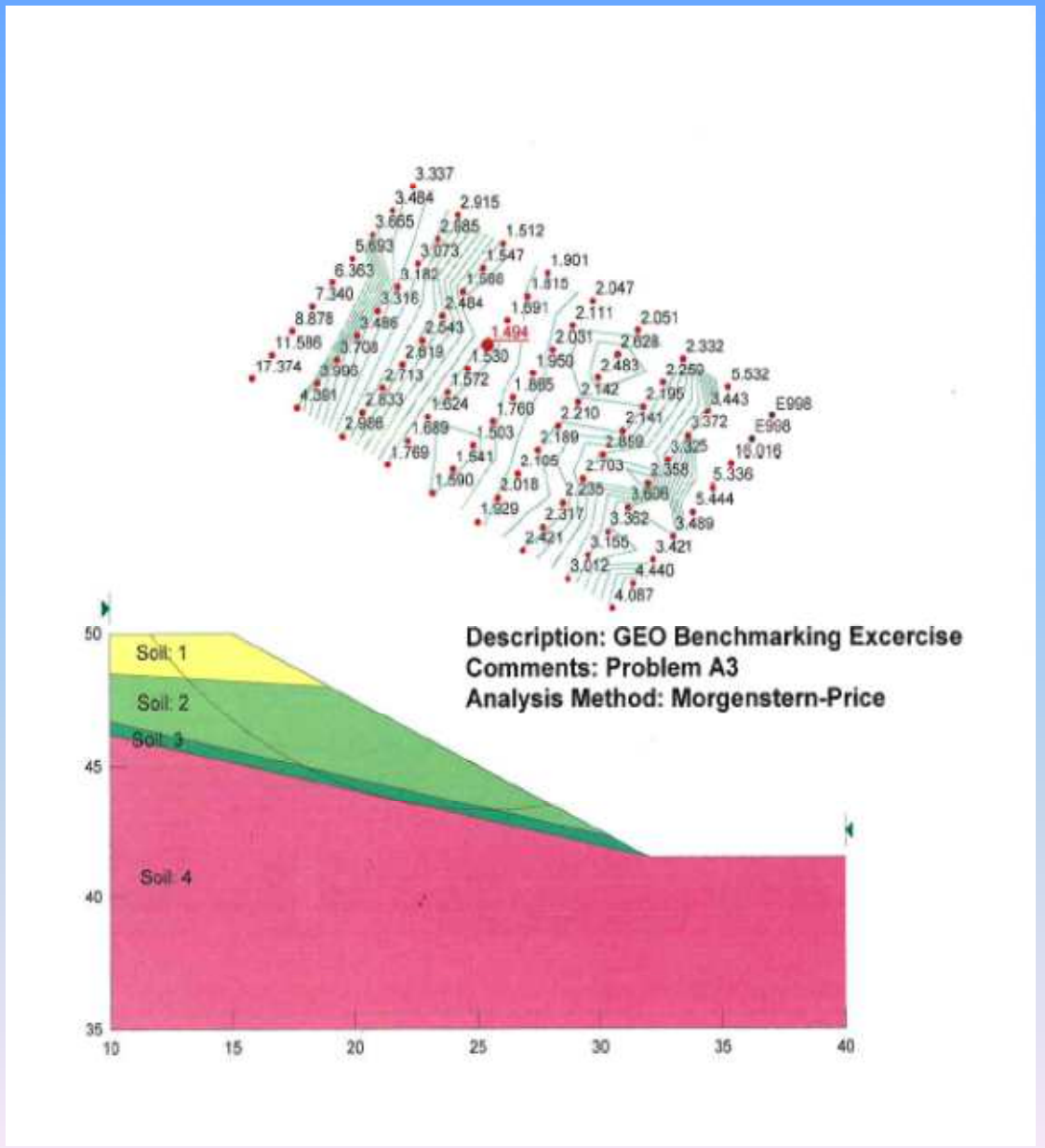
GEO Technical Guidance Note No. No. 18 (TGN 18)
Acceptance of Methods for Quality Control

"One criterion for assessing acceptability of new techniques for quality control should be the presence of a known consistent basis for the interpretation of test results, …"

The basis of interpretation should not be personnel or case dependent.

It is importance to understanding the theoretical basis of the program.

FOS = 1.49


Description: GEO Benchmarking Excercise
Comments: Problem A3
Analysis Method: Morgenstern-Price
Soil: 1
Soil: 2
Soil: 3
Soil: 4
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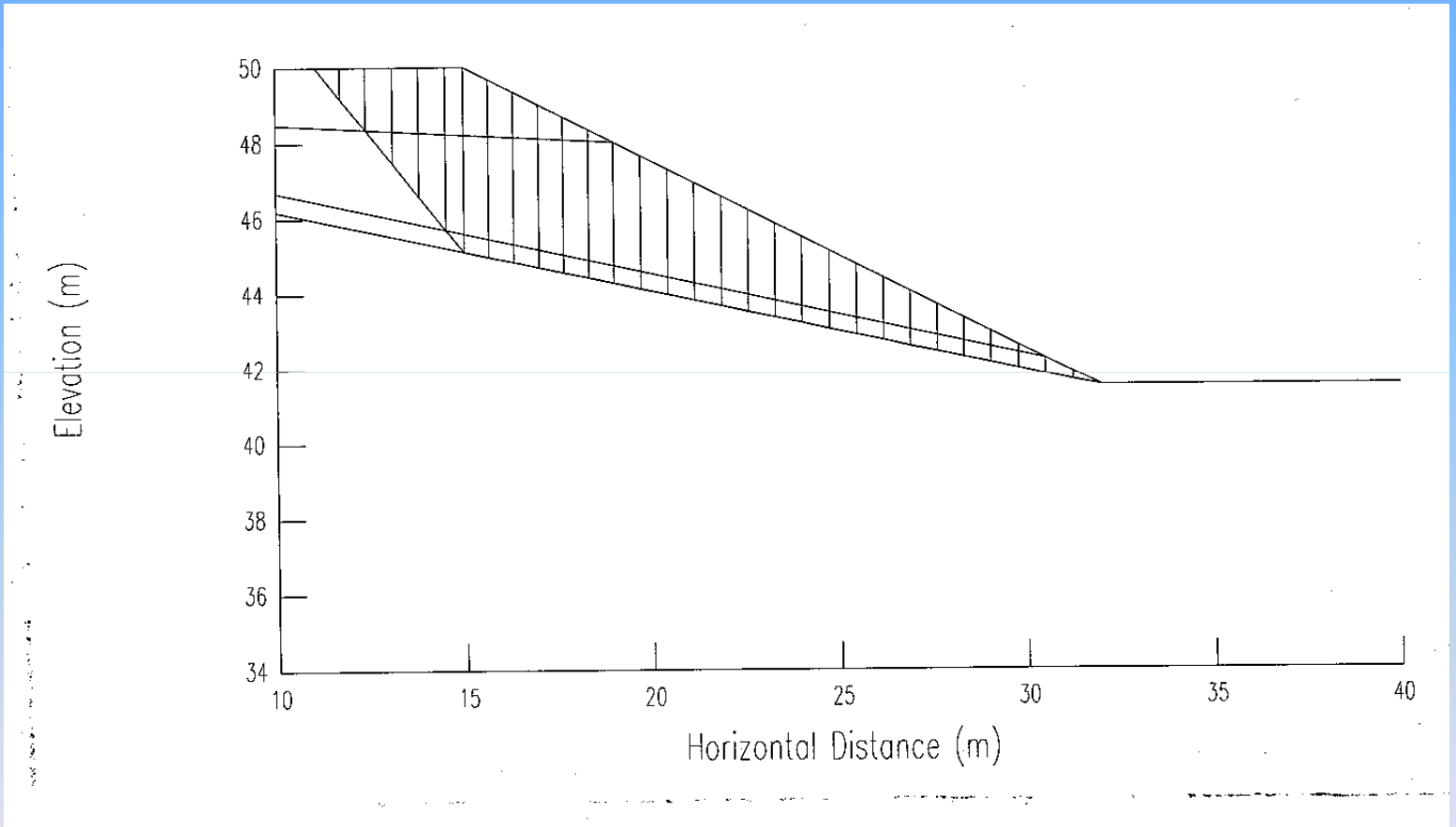
FOS = 1.14


Elevation (m)
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Horizontal Distance (m)

Do not over-rely on foreign program developers

- Obtain all necessary documentation and program manuals
- Understand and confirm the theoretical basis and acceptability of the program for local use
- Re-run some of the validation examples and add more where appropriate

When attempting to improve the accuracy of the analysis, keep in mind the possible types of errors in the numerical modelling

(1)Modelling error
(2)Coding error
(3)Human error
(4)Discretization error
(5)Errors originating from inappropriate boundaries and boundary conditions (and initial conditions where applicable)
(6)Errors originating from inaccurate input parameters
(7)Computation error.

Keep and practice QA procedures on computer programs

ISO 9001:2000, Quality management systems – Requirements, ISO, 2000.

A supplement:
NAFEMS QSS 001:2007 : Engineering simulation – Quality management systems – Requirements, NAFEMS, 2007.

GEO Circular No. 6 - Computer Use in The Geotechnical Engineering Office

Computers in the GEO shall be used and managed in such a way as to eliminate duplication of effort and promote effective utilisation of computing resources.

Good practice in software procurement/development, documentation, validation, release, training and competence assessment of operators, auditing and updating, as well as in digital data management, shall be maintained.

Unchecked geotechnical computer programs or unverified digital data shall not be used where errors could have safety or financial implications.

GEO Circular No. 35 - Prior Acceptance of Computer Programs for Use in Geotechnical Engineering

This Circular sets out the policy and procedures adopted by the GEO in the checking of geotechnical computer programs for the purpose of their prior acceptance for use in geotechnical engineering.

<PNAP ADM-6 (79)>

GUIDELINES FOR APPLICATION SOFTWARE TESTING [G20]

Version : 1.7, Jul 2012,

Office of the Government Chief Information Officer

Maintenance of computer programs

- Keep list of bugs reported by program developers – regularly view the website of the program developer, request and receive updates, or join maintenance programmes

- Keep list of bugs found during use

- Keep track of updates on program versions

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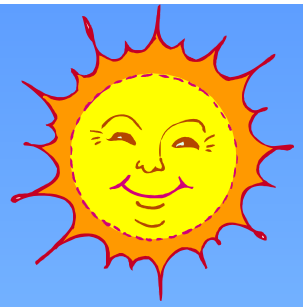
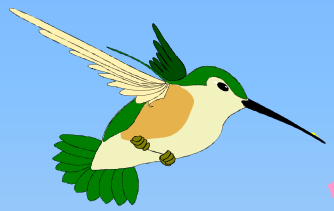
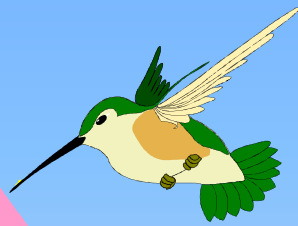




Thank you



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