Australian Geomechanics Society

ENGINEERING GEOLOGY COURSE

TECHNICAL NOTE

WOLLONGONG NSW, SEPTEMBER 2010

A NEW AGS COURSE IN ENGINEERING GEOLOGY
WOLLONGONG NSW, SEPTEMBER 2009

Fred Baynes	Alan Moon	Phil Flentje	Mark Eggers
Consultant Engineering Geologist, Western Australia President of IAEG	Coffey Geosciences Pty Ltd, Adelaide, South Australia	University of Wollongong, New South Wales	Pells Sullivan Meynink Pty Ltd, Sydney, New South Wales

1 INTRODUCTION

The Australian Geomechanics Society will be holding a new course in Engineering Geology to be based in Wollongong, New South Wales, in September 2010. This course is designed for engineering geologists and geotechnical engineers involved in civil and mining projects who have a working knowledge of geology and wish to develop their engineering geological skills. This course is intended to complement the Geology for Engineers course that is run in Adelaide every two years.

The intention of this technical note is to bring the course to the attention of AGS members as part of the call for registrations, which are now open. This technical note discusses the overall aims of the course and summarises the course program. Being a substantially field-based course, the program highlights sites that will be visited and exercises to be undertaken with the aim of providing the flavour of the course to potential participants. Initially the course was scheduled to run in 2009. A decision was taken to postpone the course, in part because of the economic uncertainty of early 2009. During this postponement we have revised the course design and duration.

An important development has been that subject to program rules, the University of New South Wales will now offer up to 6 credit points to their Master of Engineering Science in Geotechnical Engineering and Engineering Geology for students successfully completing either of the Australian Geomechanics Courses 'Geology for Engineers' in Adelaide or 'Engineering Geology' in Wollongong.

2 COURSE DETAILS

The course will be held between Saturday 25th September and Sunday 3rd October 2010, based in Wollongong with daily field trips around the Illawarra and also to the Goulburn area of New South Wales. The course is being developed by Fred Baynes, Phil Flentje Mark Eggers and Alan Moon on behalf of the Australian Geomechanics Society. Alan and Fred have been involved in the Adelaide "Geology for Engineers" course and they will be bringing their Adelaide experience to the development of this new course in Engineering Geology. An important point to note, as for the Adelaide course, is that a teacher to student ratio of 1 to 6 will be maintained throughout this course. The September 2010 course will be presented by Fred, Phil and Mark. Course details including a copy of this Technical Note, a course overview, a registration brochure and the presenters brief cv's are available from the new 2010 website: http://www.australiangeomechanics.org/w10.

3 AIMS OF THE COURSE

The principal objective of this course is to teach students how to apply geological skills in the field to help solve engineering problems. This will be carried out by using guided field exercises, in which the students learn by carrying out realistic project related work in the field whilst being supervised by very experienced practitioners. Students who complete the course successfully should come away with knowledge and skills that will enable them to:

- Understand the engineering geological environment as the product of the total geological, geomorphological and anthropogenic history of the area.
- Observe and understand geo-features, record them on logs and on maps and present them in geological models.
- Describe geo-materials in standardized form using calibrated, field based, quantitative descriptive systems.
- Understand geo-processes and process rates and estimate the probability of geo-processes occurring.
- Interpret aerial photos and other images.
- Use stereographic projection methods to analyse and understand geological structures.
- Understand the nature of geological information and how it should be managed and applied in the project environment.
- Understand the role of the engineering geologist in investigation, design, construction, and throughout the life of the project.
- Communicate more successfully with other geotechnical professionals, designers and constructors involved in ground engineering.

4 COURSE PROGRAMME

The main emphasis of the course will be to maximize time spent in the field and there are a small number of lectures to provide background information to the field exercises that participants will be undertaking. Several workshops are planned to practice desk study techniques and to use data collected in the field exercises to develop engineering geological models to answer specific questions set during the fieldwork.

DAY 0 – SATURDAY 25 SEPTEMBER

L0 - Registration, Welcome and Course Overview (4 - 5pm registration, lecture 5 - 6 pm)

DAY 1 – SUNDAY 26 SEPTEMBER

L1 – Introduction to Engineering Geology, logging & mapping, quantification from observations and interpretations, geomaterials

Overview of engineering geology and fundamental field techniques

W1 - Rock and soil identification and description

OBJECTIVES - Identify and describe rocks and soils, standardized field description, calibration of descriptive terms

F1 – Shoreline mapping and logging of bedrock stratigraphy, mapping a coastal/estuarine complex

OBJECTIVES - Mapping, logging, geological maps and memoirs, stratigraphy, type sections, structure, dips and strikes, defect patterns, weathering, aeolian, coastal and fluvial processes, geochemical environments
EXERCISE - Map, describe and understand total geology of this site between two headlands, draw sections, comment on hypothetical pipeline/communication fibre cable crossing

F – field exercises; L – lectures; W - workshops

Figure 1 Sediments exposed in estuarine complex (F1)

DAY 2 – MONDAY 27 SEPTEMBER

F2 - Mapping and logging a coastal quarry in basalt

OBJECTIVES - Mapping volcanics, assessing strength and defect spacing, suitability for use, resource evaluation, groundwater inflows. Gerringong Volcanics member.
SITE – Bumbo Latite (Basalt) Headland north of Kiama. Abandoned Quarry site, now public land.
EXERCISE - Map, describe, log, assess an extraction plan from floor of quarry, determine armourstone requirements from wave records, and comment on likely block sizes.

F3 - Guided tour of major landslides, remedial works and monitoring systems

OBJECTIVES – Wollongong engineering geology, controls on slope instability, major hazards impacting upon infrastructure and housing.
SITE – Selected landslides in northern Illawarra Escarpment. Major landslide sites with various histories, infrastructure implications and performance of remedial works.

Figure 2 Coastal headland & beach environment (F1)

DAY 3 – TUESDAY 28 SEPTEMBER

L2 – Surface Processes geohazards, and risk management

OBJECTIVES - Hazard identification, assessment and risk management

W2 - Aerial photo and image interpretation – dipping strata and rockslides, fluvial studies, karst topography, deeply weathered igneous rock, Tertiary sediments

OBJECTIVES - Interpretation and mapping from imagery, compilation of observations onto a map, sections and model creation, information management, use of GIS.

W3 – Desk study of Site 24

OBJECTIVES - Value of a desk study, review of old documents and maps, compilation of geological information, aerial photo interpretation, monitoring information etc.

Figure 3 Exposures in abandoned Latite quarry (F2)

Figure 4 Coastal slope at Stanwell Park (W3 & F7)

DAY 4 – WEDNESDAY 29 SEPTEMBER

F4 - Mapping of potential dam site and a separate shaft location, inspection of Shoalhaven River system, alluvial deposits, Quaternary Valley infill.

OBJECTIVES - Ground truthing photo interpretation, mapping different rock types, and superficial deposits, the effects of human activity, rock mass grading, fluvial systems, flood risks, acid sulphate soils. Quaternary sea level fluctuations and the impact this has had on the near coastal environment.
SITE – Various locations in Shoalhaven River Valley, upstream of Nowra.

DAY 5 – THURSDAY 30 SEPTEMBER

F5 - Mapping spillway cut in weathered igneous rocks.

OBJECTIVES - Geological mapping and interpretation in deeply weathered granite, collection of information for excavatability and slope stability assessment
SITE – Spillway excavation in Devonian Granite unit
EXERCISE – Map, describe, log, assess rock mass classification, comment on blasting techniques and support requirements for spillway deepening.

F6 - Inspection of karst limestones and weathered metamorphic rocks.

OBJECTIVES - Geological mapping and interpretation in deeply weathered structured rock, collection of information for excavatability and slope stability assessment
SITE – Excavations in limestones near Goulburn
EXERCISE – Map, describe, log, interpret setting, history and hydrogeological implications.

Figure 5 spillway excavation in variably weathered granite (F5)

Figure 6 Water table exposed in base of limestone pit (F6)

DAY 6 – FRIDAY 1 OCTOBER

F7 - Site 24, geological and geomorphological mapping in a large coastal slope and landslide complex.

OBJECTIVES - Total geo-mapping, ground truthing and interpretation, estimating process rates in the field, type sections and critical outcrops, efficient field techniques.
SITE – Site 24 in University Of Wollongong Inventory. Steep coastal slope with concentrated infrastructure development. Includes South Coast Railway, Lawrence Hargrave Drive and an area of dense urban development around perimeter of toe. Also includes large expanse of undeveloped escarpment land that is readily accessible to the public. Complex landslide area and separate rock fall area that requires investigation, mapping and interpretation.

EXERCISE
1. Engineering geological field investigation of Site 24 as studied during W3 on Tuesday. Identify and mark key features onto map.
2. Total Geological interpretation. Map geology and geomorphology of slope complex and adjacent rock fall hazard zone.
3. Analyse existing stability, develop a landslide risk assessment for road, railway and housing developments, implications of AGS LRM 2007.

DAY 7 – SATURDAY 2 OCTOBER

W4 - Site 24 compilation

OBJECTIVES – Complete preparation of; total engineering geology model, cross sections, landslide risk assessments, and document.
SITE – Site 24, Large escarpment coastal slope complex and adjacent rock fall zone.
EXERCISE – Total engineering geology model, anticipating ground conditions, cross section interpretation, landslide risk management.

W5 – Excavation in weathered granite

OBJECTIVES – Complete assessments of weathering profiles, rock slope stability, planar and wedge failure, stereographic projection, and document.

DAY 8 – SUNDAY 3 OCTOBER

Award of certificates, discussion and feedback from participants. Finish before lunch for flights interstate. Please note that Monday 4 October is the Labour Day holiday in NSW, the ACT and South Australia.

5 ENQUIRIES AND FURTHER INFORMATION

This course is still under development and there is potential for some changes in content. To register your interest, provide comment and keep abreast of the developments please contact Phil Flentje via pflentje@uow.edu.au or by telephone on 02 4221 3056. A website is available through the Australian Geomechanics Society website at http://www.australiangeomechanics.org/w10/. Registrations are now open and the course is filling quickly.

To be presented by

Fred Baynes, Phil Flentje and Mark Eggers