LECTURE SERIES AND WORKSHOPS ON GEOTECHNICAL ENGINEERING IN PRACTICE

Date: 12 – 16, February 2007
Building G30 Room 1.09
Griffith University Gold Coast Campus

Organised by: Centre for Infrastructure Engineering and Management and
Griffith School of Engineering
Griffith University Gold Coast campus

Workshop 1: February 12-13: Ground Improvement Works
Lecturers: Sven Hansbo, Masaaki Terashi, Rainer Massarsch , Masaki Kitazume & Peter Jackson

Workshop 2: February 14: Rock- socketed piles and Dynamic Pile Testing
Lecturers: Chris Haberfield & Julian Seidel

Workshop 3: February 15: Unsaturated Soils & Slope Stability
Lecturer: David Toll

Workshop 4: February 16: Tunnelling Works
Lecturers: Nick Shirlaw, Peter Jackson & Dazhi Wen

See "Registration form" for daily registration.
For additional information please contact

Prof. A. S. Balasubramaniam ,
Ph: 07-55528590 / Fax: 07-55528065, Email: a.bala@griffith.edu.au
Griffith School of Engineering,
Griffith University Gold Coast Campus, PMB 50, Gold Coast Mail Centre,
Queensland 9726, Australia.

Introduction

The major workshops and lectures on Geotechnical Engineering practice for February 12-16, 2007 is now selected with a view to cover the major activities in Queensland and else where in Australia, New Zealand.

For the first two days (February 12-13) the workshop will be conducted on ground improvement works and the experts conducting this activity are Prof. Sven Hansbo, Dr. Masaaki Terashi, Dr. Rainer Massarsch and Dr. Masaki Kitazume. The topics to be covered include ground improvement works with surcharge and vacuum drains and use of pre-fabricated drains. Prof. Sven Hansbo is a Guru on this topic and can present authoritative lectures from his vast experience in the use of vertical drains and will cover topics such as Darcian Flow and Non-Darien Flow, smear effects, well resistance and other phenomena associated with the use of vertical drains. He will also touch upon the use of this technique in organic soils and methods of estimating residual settlement etc which are major concern for engineers associated with such works. Dr. Masaaki Terashi is in internationally well known authority on the use of deep mixing methods and has handled very major projects in Japan and other countries. Prof. Sven Hansbo and Dr. Rainer Massarsch, who were Technical Editor and Chairman of the CEN Eurocode Working Groups, Application Codes on Deep Mixing and Vertical Drainage, will also touch upon the practical significance of Eurocodes. Dr. Rainer Massarsch will also present lectures on vibratory compaction in shallow and deep stabilization works. Dr. Terashi and Dr. Kitazume are international experts on ground improvement methods. Dr. Terashi and Dr. Kitazume are authors of several books and publications on Deep Mixing. A number of interesting case histories, associated with ground improvement projects in major projects on the application of ground improvement will illustrate the practical application of the respective methods.

Rock-socketed and dynamic pile testing are very common in Queensland and are fundamental areas of pile engineering. Drs. Chris Haberfield and Julian Seidel will give authoritative lectures on these topics on Wednesday February 14... These lectures are very timely with many current major projects (e.g. Gateway Bridge) requiring rock socketed piles and dynamic testing. More and more projects are now relying on dynamic pile testing as quick and economic way of testing piles for strength and integrity.

Residual soils and slope stability problems are very common in Brisbane, Gold Coast and other parts of Queensland and Australia. Dr. David Toll has extensive practical experience on unsaturated soil behaviour, slope stability and the behaviour of complex soils with characteristics such as swell/shrinkage etc. He will present lectures with practical emphasis on the role of unsaturated soil behaviour in slope stability and pavement problems. David Toll is chair of Joint Technical Committee 2 (JTC2), the international committee responsible for defining standards for geo-engineering data (a joint committee of ISSMGE, ISRM and IAEG).

He is a core member of the Technical Committee TC6 on Unsaturated Soils of ISSMGE and has been a member of Commission C18 on Collapsible Soils of IAEG (now renamed Problematic Soils). He is Research Supervisor for the European Research Network *Mechanics of Unsaturated Soils for Engineering* (MUSE).

Finally on Friday, February 16, Nick Shirlaw, Peter Jackson and Wen Dazhi will give lectures on Tunnelling works. Nick has extensive experience on major tunnelling projects for MRT works in Taipei, Hong Kong, Toronto and Singapore. Peter Jackson will present an interesting lecture on the Busan Geoje Immersed tunnel in South Korea. In this interesting project novel ground improvement techniques were used including sand compaction piles for the soft clay below the tunnel to be improved. These lectures will prove to be very useful for the many projects in Brisbane where tunnelling works are anticipated to be carried out.

These course and lectures will be beneficial to post-graduate students, engineers and those who are in the design and analysis side of Geotechnical Engineering and Practice. It is hope that there will be very active participation from all the various sectors of our catchments of interested parties; Practitioners to Academics to Researchers to Graduate students.

Registration Form / Tax Invoice

Griffith University ABN 78 106 094 461

Workshop & Lectures on Geotechnical Engineering

Griffith University, Gold Coast, February 12-16, 2007

TO REGISTER: email, fax, mail

Email: a.bala@griffith.edu.au | **Fax**: +61(0)7 5552 8065 | **mail**: Prof. A. S. Balasubramaniam, Griffith School of Engineering, Gold Coast Campus, Griffith University, PMB 50, Gold Coast Mail Centre Queensland 9726, Australia

DETAILS OF ATTENDEE

First Name:	**Last Name:**
Organisation:	
Email:	
Phone:	**Mobile:**
Fax:	
Post Address:	
State:	**Postcode:**

WORKSHOP FEES (February 12-16, 2006)

Please indicate day of participation and total amounts

- ☐ **AUD $ 390 (GST included) for Monday- February 12, 2007**
- ☐ **AUD $ 390 (GST included) for Tuesday- February 13, 2007**
- ☐ **AUD $ 390 (GST included) for Wednesday - February 14, 2007**
- ☐ **AUD $ 390 (GST included) for Thursday- February 15, 2007**
- ☐ **AUD $ 390 (GST included) for Friday - February 16, 2007**

TOTAL AMOUNT: [AU $]

PAYMENT METHODS

☐ **CHEQUE ENCLOSED**

All Cheques crossed and payable to Griffith University (Griffith University is GST registered, ABN 78 106 094 461) Mail cheques to Prof. A. S. Balasubramaniam, Griffith School of Engineering, Gold Coast Campus, Griffith University, PMB 50, Gold Coast Mail Centre, QLD 9726, Australia. Please enclose your registration form.

☐ **CREDIT CARD**

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☐ **PLEASE FORWARD ME AN INVOICE**

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Please send your REGISTRATION / TAX INVOICE FORM **by 5th February 2007** that will help us to operate this workshop more efficiently.

***PLEASE NOTE*: THIS REGISTRATION FORM SERVES AS A TAX INVOICE WHEN COMPLETED.**

PLEASE RETAIN A COPY FOR YOUR RECORDS.

PROGRAMME

12 February 2007 (Monday) –Ground Improvement works

Ground Improvement and Soil Engineering Practice (I)

08:30	–	09:00 am	Registration
09:00	–	10:00 am	Vertical drains – from theory to practice Sven Hansbo
10:00	–	11:00 am	Sand Compaction Pile method – for clay soils Masaki Kitazume
11:00	–	11:15 am	Coffee break
11:15	–	12:15 pm	Deep mixing method historical evolution Masaaki Terashi
12:15	–	01:00 pm	Lunch
01:00	–	02:00 pm	European Experience of Deep Mixing Method Rainer Massarsch
02:00	–	03:00 pm	Deformation & failure of DM group columns Masaki Kitazume
03:00	–	03:15 pm	Coffee break
03:15	–	04:15 pm	Evaluation of DM columns from seismic tests Rainer Massarsch
04:15	–	05:15 pm	Process and Geotechnical Design of deep mixing Masaaki Terashi

1 3 February 2007 (Tuesday) –Ground Improvement Works

Ground Improvement and Soil Engineering Practice (II)

08:30	–	09:00 am	Registration
09:00	–	10:00 am	Sand compaction pile method for sand Masaki Kitazume
10:00	–	11:00 am	Deep vibratory compaction Rainer Massarsch
11:00	–	11:15 am	Coffee break
11:15	–	12:15 pm	Improvement of coarse grained soils works Rainer Massarsch
12:15	–	01:00 pm	Lunch
01:00	–	02:00 pm	Case History – New Kitakyushu Airport Masaaki Terashi
02:00	–	03:00 pm	Case Histories - Europe Sven Hansbo & Rainer Massarsch
03:00	–	03:15 pm	Coffee break
03:15	–	05:15 pm	Innovative methods and future trends (1) Emerging Technology – Chubu Int'l Airport Masaki Kitazume (2) Eurocodes on Vertical drains and deep mixing Sven Hansbo (3) Australian Experiences and Way Forward

14 February 2007 (Wednesday) – Rock-socketed piles and dynamic pile testing

08:30	–	09:00 am	Registration
09:00	–	10:30 am	Dynamic pile testing – fundamentals, static testing analogies, process, capabilities and limitations Julian Seidel
10:30	–	10:45 am	Coffee break
10:45	–	12:15 am	Rock socketed piles – Introduction to design issues, Factors affecting rock socketed pile performance, construction issues Chris Haberfield
12:15	–	01:00 pm	Lunch
01:00	–	03:00 pm	Dynamic pile testing – requirements, specification, quality assurance and implementation into construction control Julian Seidel
03:00	–	03:30 pm	Coffee break
03:30	–	05:00 pm	Rock socketed piles – current design methods, strengths and limitations, site investigation requirements, case studies Chris Haberfield

15 February 2007 (Thursday) – Unsaturated soils, slope stability, complex soils

08:30 – 09:00 am Registration

09:00 – 10:30 am An introduction to unsaturated soil behaviour:
Definitions and methods of measurement of suction in soils. Role of water retention curves. Shear strength of unsaturated soils(with data for residual soils).
David Toll

10:30 – 10:45 am Coffee break

10:45 – 12:15 pm Engineering Behaviour of Tropical Residual Soils:
Classification schemes for tropical and lateritic soils. Overview of engineering behaviour of "red" and "black" tropical soils. Difficulties with characterisation of tropical materials.
David Toll

12:15 – 01:00 pm Lunch

01:00 – 03:00 pm Rainfall-induced Landslides
The role played by suction and how infiltration changes stability - demonstrated by field data and numerical modelling of unsaturated flow.
David Toll

03:00 – 03:30 pm Coffee

03:30 – 05:00 pm Road construction materials: an unsaturated
Soil Mechanics approach
(i) Use of local materials (laterites) for road base.
(ii) Role of suctions in natural gravels. Data for lateritic gravels

16 February 2007 (Friday) – Tunnelling Works

08:30 – 09:00 am Registration

09:00 - 10:30 am Tunnelling methods for soft ground:
A review of the various tunnelling methods commonly used in soft and mixed ground, with an emphasis on modern pressurized face machines. The general application of these methods to various ground conditions will be discussed. The methods for calculating the required face pressure will be outlined.

Nick Shirlaw

10:30 – 10:45 am Coffee break

10:45 – 12:15 pm The Busan Geoje Immersed tunnel in South Korea with ground improvement techniques in deep soft clay bed
Peter Jackson, COWI Consult

12:15 – 01:00 pm Lunch

01:00 – 03:00 pm Settlements and sinkholes due to tunnelling:
The basis for calculating surface and subsurface settlements and horizontal movements due to tunnelling. How volume loss varies with tunnelling methods and ground conditions, and other construction factors. Exceptionally large settlements and how to control them.
Nick Shirlaw

03:00 – 03:15 pm Coffee break

03:15 – 05:00 Building damage assessments for tunnelling:
Calculating the predicted damage to buildings due to tunnelling. The assumptions implicit in the calculations, and where these are conservative or unconservative.
Dahzi Wen

Biodata:

Dr Sven HANSBO had his civil engineering education at Chalmers University of Technology, Gothenburg, 1945–1949. He was then employed as structural engineer at the Harbour Office in Gothenburg and was, among other things, responsible for the design of the first pre-stressed bridge, type Freyssinét, in Sweden. He was examined Licentiate of Technology in 1956 with a thesis named 'The critical load of rectangular frames analysed by convergence methods'. He was then employed at the Swedish Geotechnical Institute and was mainly engaged in two research projects, one on interpretation of the fall-cone test results and the other on evaluation of results obtained in full-scale field tests. The latter results were published as a Doctoral Thesis, named 'Consolidation of clay, with special reference to influence of vertical sand drains. A study made in connection with full-scale investigations at Skå-Edeby' published in 1960. In 1961, he was employed as head of the new-started geotechnical department at the consulting firm Jacobson & Widmark (J&W), and was elected in 1964 as Professor of Geotechnical and Foundation Engineering at Chalmers University of Technology (CTH).
Dr Hansbo has been one of the leading Swedish consultants in geotechnical engineering during his work as professor at CTH and consultant at J&W. He has published several textbooks, among them 4 in Swedish and 3 in English (Foundation Engineering, 519 pp, Elsevier 75 in 1994; Ground Improvement, 139 pp. Elib. and Fundamentals of Geotechnology, 173 pp. Elib.). He has published more than 100 papers at International Geotechnical Conferences and in Scientific Publications (Géotechnique, Ground Improvement, etc.) and has been engaged as state-of-the-art reporter. He was President of the Swedish Geotechnical Society 1974–1982, Vice President of the Swedish Civil Engineering Society 1980–1982 and President of the Swedish Civil Engineering Society 1982–1985. He was Chairman of the organising committee of the International Conference of Soil Mechanics and Foundation Engineering in Stockholm, 1981.
Dr Hansbo has received the Price of Honour of the Stockholm Building Society for 'A new approach to development of the compensation method applied in foundation on friction piles' and also the Price of Honour of the Swedish Geotechnical Society. He has received 'The golden award of merits of the Academic Senate of the Warsaw Agricultural University' and a Medal for his contribution to the scientific cooperation between Chalmers University of Technology and Polytechnica Gdanska.

Dr Masaaki TERASHI of Nikken Sekkei Ltd., Japan has led a career as a researcher, professor and consultant in geotechnical engineering, working on various problems associated with soft ground and ground improvement projects. He graduated from Tokyo Institute of Technology in 1968. He started his career as a researcher at the Port and Harbour Research Institute, Japanese Ministry of Transport. He has been a leading figure in the R&D of a variety of ground improvement technologies especially of deep mixing since 1970. To study the complicated behaviour of structure and improved ground, he initiated geotechnical centrifuge modelling at PHRI in 1980. He received his doctoral degree from Tokyo Tech on his achievement on deep mixing. He was awarded a special prize on the outstanding research contribution from the Ministry of the Japan Science and Technology Agency in 1988. After twenty-two years service for the government owned institute he moved to Nikken Sekkei Ltd, a leading consulting firm in Japan, to establish a Geotechnical Institute. During 1999 to 2006, he taught graduate students at Tokyo Tech as a Visiting Professor. Along with the research works, he has always been working as adviser and/or consultant for real life projects, covering wide range of infrastructures, domestic and overseas. He is currently a technical advisor to Nikken Sekkei Ltd.

Dr. Terashi has been instrumental in developing technical guidelines to ensure that deep mixing is used properly and effectively throughout the world. He was involved in drafting Eurocode on deep mixing and is currently co-authoring US FHWA technical guide on deep mixing. He contributed to the conceptual design of the deep mixing for the Central Artery in Boston, MA – the largest project of its type outside of Japan. More recently he served as an Independent Technical Reviewer for the US Army Corps of Engineers on the New Orleans canal closure projects for emergent restoration from the disaster caused by Hurricane Katrina.

Dr. Terashi edited, authored and co-authored several books and book chapters and more than a hundred research papers. He has also been active in academic and professional societies. Among them, he served as a Vice President of the Japanese Geotechnical Society from 2003 to 2005. For the International Society, he was a core member of ISSMGE Technical Committee 17 on ground improvement from 1989 to 2001. His academic services have been also for a number of international conferences; among others, he delivered a State of the Art of ground improvement at the International Conference, GeoEng 2000 in Melbourne, a keynote lecture at the 3rd International Conference on Grouting and Ground Treatment in 2003 in New Orleans, and a keynote lecture on design of deep mixing at the International Conference Deep Mixing'05 in Stockholm in 2005.

Dr. K Rainer MASSARSCH is consultant in foundation and earthquake engineering, as well as soil dynamics, working on assignments world-wide. During his professional career as an academic, researcher, consultant and contractor, he became involved in many aspects of geotechnical and foundation engineering. He was responsible for the design and execution of major foundation projects in Europe, the Far East, Australia, South and North America. Dr. Massarsch is the author of over 170 scientific and technical publications and has lectured at numerous conferences and was invited to more than 40 countries.

Dr. Massarsch received his Masters Degree from the Technical University of Vienna, Austria and the Doctor of Technology Degree from the Royal Institute of Technology (KTH) in Stockholm, Sweden. Thereafter, he was visiting scholar at the University of California, Berkeley and the University of Kentucky in Lexington, respectively. He has been professor of soil dynamics at the Royal Institute of Technology (KTH), Stockholm, technical director of an international foundation company and senior consultant with a leading Swedish consulting group. He works now as a private consultant for major clients on assignments world-wide. He is the inventor of several innovative foundation and soil improvement methods, such as resonance compaction, foundation nailing and ground vibration isolation using gas cushions. He has received several awards by Swedish and international professional organisations and in 2004, he was nominated “Inventor of the Year” by the Swedish Development Fund.

Dr. Massarsch has been involved in the design, implementation and supervision of many major foundation projects world-wide, such as earth dams, airports, and harbours, tunnels and industrial projects. Recently, he has been involved in the analysis and design of high-speed railway lines and associated problems. He has been actively involved in the development and standardization of several ground improvement methods, such as vibratory compaction, deep mixing, vertical drainage etc. He is an internationally recognized authority in seismic and geophysical testing and has worked with different types of soil dynamics and earthquake engineering projects, associated with soil compaction, pile driving and blasting, vibration isolation solutions etc. He was also responsible for the salvage and remediation efforts for several major historic monuments in Egypt, such as the Tomb of Nefertari and the Memnon Colossi etc. Dr. Massarsch also specialises in risk assessment related to construction projects

and forensic work, such as the review and evaluation of effects of earthquakes and blasting damage etc.

Dr. Massarsch has been actively involved in national and international professional societies. He is past Chairman of ISSMGE Technical Committee 10, Geophysical Testing, chairman of the Swedish committee on ground vibrations and Chairman of two European Standardisation Committees (CEN/TC 288), preparing standards on Deep Soil Mixing (WG 10) and Vertical Drainage (WG 11).

Dr. Chris HABERFIELD: Chris is a Principal with Golder Associates Pty Ltd in their Melbourne Office and an Associate of Department of Civil Engineering at Monash University.

Chris is well known internationally for his work in soft, weak and weathered rocks and in particular the performance of socketed piles in these materials. During the 1990s Chris led the research team at Monash University into the analysis, design and performance of piles in weak rock, from which the analysis program ROCKET is based on. Other innovations during this time were the continued development of advanced constant normal stiffness direct shear testing equipment, development of laser based equipment for automatic measurement of socket roughness and socket inspection (SOCKETPRO) and the use of expansive cements to enhance rock socket and anchor performance.

Since joining Golder Associates in 2000, Chris has implemented ROCKET based pile design in numerous large building projects within Australia and the Middle East.

Dr. Julian SEIDEL: Dr. Seidel is a Melbourne-based geotechnical engineer, specializing in all aspects of deep foundations, with particular expertise in both dynamic pile testing and rock-socketed pile design. During his career he has had periods of employment with both general and specialist geotechnical consultants, the government sector, a deep foundation contractor, a specialist testing agency, and in the higher education sector as lecturer and researcher in geotechnical engineering. Since 2001 Dr. Seidel heads Foundation QA, a specialist foundation engineering consultancy, and has also continued as an honorary Associate of Monash University. Dr. Seidel authored the rock-socket design program ROCKET as the culmination of his PhD studies, and has continued his research interest through international collaborative research programs.

As a result of his wide experience in different sectors, Dr. Seidel is uniquely placed to appreciate both the theoretical and practical aspects of the commissioning, design, installation and testing of deep foundations. He provides expert design and review advice on foundation projects in Australia throughout the Asia-Pacific region, Middle East and United States.

Dr. Seidel has authored in excess of 80 papers to conferences and journals, and has continued his educational role with special lectures in foundation engineering at Monash University, as well as regular international workshops on foundation issues, seminars and invited lectures to the engineering fraternity.

Dr Seidel has a strong commitment to promoting better understanding and proper quality practices in the field of dynamic pile testing. The need for better understanding is at both the level of general engineers and specialist testing engineers, and Dr. Seidel provides educational opportunities for both audiences. He has developed a High Strain Dynamic Pile Testing Certification program which is recognized and endorsed by the US Federal Highways

Authority (which recommends the certification as a proficiency requirement for all US State Departments of Transportation) and other international agencies.

Dr David Toll (Durham University, UK): David Toll is a Senior Lecturer in the School of Engineering at Durham University, UK. He is currently Visiting Professor at the National University of Singapore (on leave from Durham University). He graduated with a BSc in Civil Engineering from Cardiff University before going on to work for Soil Mechanics Ltd and Engineering Resources Consultants (ERCON) in the UK. He then joined Imperial College, London as a Research Assistant where he gained his PhD. He has had two periods working in Singapore, at Nanyang Technological University (1998-2000) and NUS (2006-2007).

David Toll is chair of Joint Technical Committee 2 (JTC2), the international committee responsible for defining standards for geo-engineering data (a joint committee of ISSMGE, ISRM and IAEG). He is a core member of the Technical Committee TC6 on Unsaturated Soils of ISSMGE and has been a member of Commission C18 on Collapsible Soils of IAEG (now renamed Problematic Soils). He is Research Supervisor for the European Research Network *Mechanics of Unsaturated Soils for Engineering* (MUSE). He was the founding editor of Geotechnical and Geological Engineering and has served on the editorial boards of Geotechnique and Electronic Journal of Geotechnical Engineering.

His work has focused on the behaviour of unsaturated, tropical and bonded soils with applications to rainfall-induced landslides and the use of natural gravels in roadbase construction. He also carries out research into information technology applications including knowledge-based (expert) systems and data exchange via the World Wide Web.

J. Nick SHIRLAW (Golder Associates, Singapore) Nick Shirlaw graduated from Bristol University in 1973, and obtained an MSc degree from the same University in 1990. He is a Chartered Engineer (UK) and a licensed Professional Engineer (Ontario). He has thirty four years of experience in geotechnical and tunnel engineering. The first six years of his career were with geotechnical companies of the Cementation group in the UK and Middle East. He then moved to Hong Kong to work on the construction of the Mass Rapid Transit system there, specializing in chemical grouting and tunnelling. This was followed by senior geotechnical posts on the development of the Singapore and the Taipei Rapid Transit Systems. In 1991 he moved to Canada, and worked for Golder Associates as the geotechnical project manager for the St Clair River tunnel and the Toronto Rapid Transit Expansion Scheme. In 1997 he returned to Singapore, as Design Manager, then Technical Advisor (Geotechnical and Tunnels) for the Land Transport Authority, involved in all of the subway and road construction in the country. In 2004 he rejoined Golder Associates, opening and managing their Singapore office. He has appeared as an expert witness in a number of civil cases and mediations in Singapore. In addition to his work for Golder Associates, Nick lectures, part-time, on soft ground tunneling at the National University of Singapore and the Nanyang Technological University.

Peter Jackson

Peter Jackson has a BSc in Physics and a MSc in Geotechnical Engineering from Surrey University in the UK and works in fields of tunnelling and geotechnics for a major Danish consulting company (COWI). Prior to joining COWI he has worked as a contractor, formerly with Bachy Soletanche where he has been involved in a number of major tunnel projects both in the UK and Scandinavia. These include the Limehouse Link, the Jubilee Line Extension and

the Copenhagen Metro. During this time he was manager for the geotechnical works on the Copenhagen Metro for the Contractor and was responsible for the ground treatment works and tunnel face support measures.

He joined COWI in 2001 and since then has been involved in a number of major tunnel projects in Denmark and Sweden including the Malmø City tunnel and the Halandsas tunnel. He is also involved in a number of immersed tunnel projects and is currently involved in immersed tunnels in Ireland, Greece, Norway, the Netherlands and Korea. His major areas of interest are ground treatment for tunnels and soil structure interaction.

In the past two years he has been responsible for the foundation works on the Busan-Geoje Immersed Tunnel project in Busan Korea. This project is the world's deepest and one of the most challenging immersed tunnels to be built and it has required the application on a large scale of deep soil mixing and sand compaction piles to improve the foundation conditions.

Dr. Dazhi WEN. Dr. Wen obtained his Ph.D. in Geotechnical Engineering from the University of Newcastle upon Tyne, UK in 1988 after graduating from Ho Hai University, Nanjing, China in 1983. He is a Chartered Professional Engineer of Engineers Australia and a registered Professional Engineer in Singapore. Dr. Wen has more than 15 years of experiences in underground construction, specialising in the design and construction of deep excavations and tunnelling in soft ground, soil improvement and foundations. He worked on many underground infrastructure projects in Singapore, including the North East Mass Rapid Transit (MRT) Line, the MRT Circle Line and the Kallang Paya Lebar Expressways and advised on geotechnical and tunnel issues for all MRT and road projects carried out by the Singapore Land Transport Authority. He has published many technical papers on geotechnical aspects of the projects that he worked on in Singapore. He has joined Golder Associates (Brisbane) since August 2006 and is currently involved in the North South Bypass Tunnel project in Brisbane.