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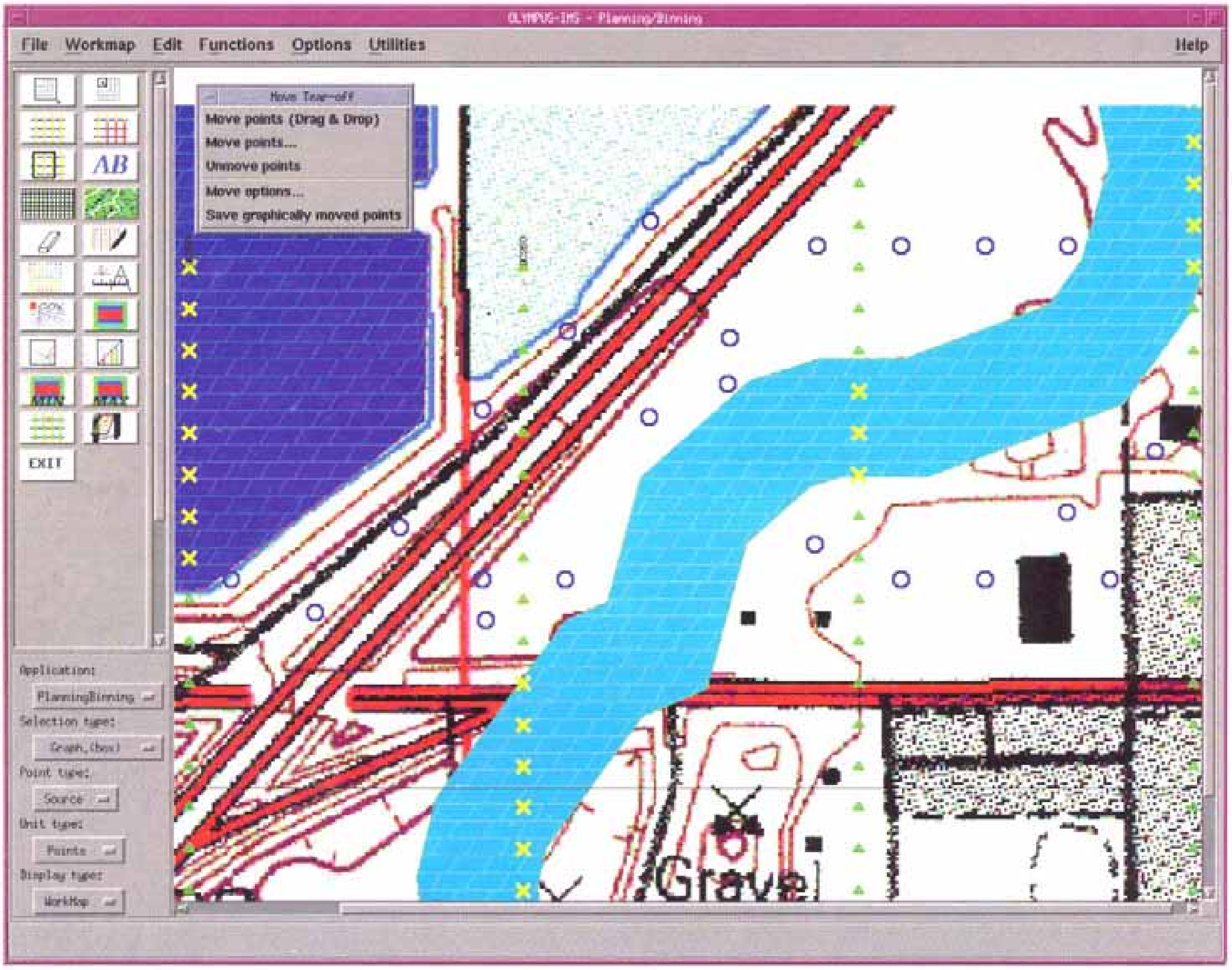
Special Feature:

Information Management Systems and their uses for Modern 3D Land Seismic Acquisition 19-26



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HEAD OFFICE: 411 Tooronga Road, Hawthorn East, Vic 3123
Tel: (03) 9822 1399 Fax: (03) 9822 1711
PRESIDENT: Mr. Henk van Paridon, Tel: (07) 3221 6516
Fax: (07) 3221 2068
HON SECRETARY: Mrs. Robyn Scott, Tel: (07) 3834 7500
Fax: (07) 3839 1235
EDITOR: Mr. Mike Shalley, Tel/Fax: (07) 3369 8004
E-mail: aseg@digicon-brs.com.au
ASSOCIATE EDITORS:
Petroleum: Rob Kirk, Tel: (03) 9652 6750 Fax: (03) 9652 6325
Peter Whiting, Tel: (07) 3878 9900 Fax: (07) 3878 9977
Minerals: Steve Mudge, Tel: (09) 442 8100 Fax: (09) 442 8181
Engineering, Environmental & Groundwater: Derecke Palmer, Tel: (02) 6974275 Fax: (02) 3138883
Academia, Research & Education: Leonie Jones, Tel: (042) 21 3013 Fax: (042) 21 4250
Email: l.jones@uow.edu.au
SECRETARIAT: Ms. Janine Cross, Tel: (03) 9822 1399
Fax: (03) 9822 1711

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Editor's Desk

October is Membership Month

This month we publish our updated Membership List, giving us a chance to review our Society's progress. The current count of members is 1358 including in the major categories 773 active, 344 associate, 192 student members and 29 corporate members. The line up of student members is very heartening as these are the backbone of our future. We trust that they will find the benefits of membership sufficiently attractive that they will decide to persevere and eventually upgrade to active or associate status.

The Federal Executive wishes to thank all of our membership for their continuing loyalty, our corporate members for a significant financial underpinning and also the many companies who contribute indirectly through support to their member employees.

A period of change

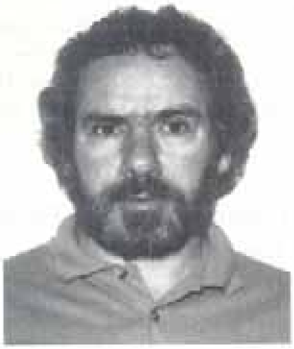
Our Society is now going through a testing period of change as we seek to consolidate the gains of the past and develop a viable structure for the future. Nowhere is this more evident than in the development of our publications which are, in fact, the visible face of our Society and its interface with the great body of research and technical literature which is the life blood of our profession. There are many competing views on where we should go from here and we will not be able to accommodate them all. You can read more about the decisions which have been made and the background behind them on page 15. The objective of all this effort has been to ensure the continuation of high quality publications which serve the needs of our membership and supporters on an equitable basis, in line with established industry standards. There is much to be done yet and we look forward to the continuing challenge.

International Reach

In this issue we broaden our international reach with an article by Roger Henderson on geophysics courses in South East Asian tertiary institutions. There may be arguments about whether we are a South East Asian nation, but we are certainly geographically a part of the area and have exploration interests within it. The article should be of considerable interest to our local academics and to explorers whose horizons extend beyond our shores.

Mike Shalley, Editor

President's Piece



This month the final report of the Adelaide Conference was received. Our thanks to Craig Gumley and Dave Tucker for a good read on top of a good conference.

One issue that keeps recurring in these final reports is the drama associated with getting the Conference Volume of *Exploration Geophysics* published in time for the conference (Steve Hearn will report on publishing matters in the December issue of *Preview*). Since 1985 conference papers have been published in one or two special editions of *Exploration Geophysics*. This has been done to help fill a shortfall of papers in that journal, but the practice has tended to take on a life of its own.

The responsibility for publishing the Conference Volume has been shared between the Publications Committee and the Conference Organising Committee with the former being responsible for publishing and the latter for content. The boundary has tended to blur but, through hard work and co-operation, the job gets done.

The question of who pays for the Conference Volume is tied up with the dual responsibility outlined above. The Volume is seen as more than just a conference matter since it is distributed to all ASEG members and other subscribers. Consequently the costs have been shared between the Federal Executive and the conference with the Executive paying for its share from general revenue, a great deal of which is provided by conference profits. Now this all seems like a pea and thimble approach to accounting but at issue is the declaration of conference profit. The conference guidelines provide for 10% of the declared profit being returned to the local branch that formed the Conference Organising Committee. The policy has been that a nominal amount of money is set aside in the conference budget for publications, profit is declared on that basis, 10% is returned to local branch and then the Federal Executive receives the remaining monies.

The system has seemed to be OK in the past but is now resulting in state branches receiving large cash injections while the Federal Executive looks for ways to raise more funds. At a recent meeting of the federal executive it was decided that, in future (Melbourne '98), conference profit would be declared after the full costs of publishing the Conference Volume were met. Kim Frankcombe is amending the conference guidelines to this end.

One aspect of this new system is that conference 'profits' will be put into true perspective. They will not be large unless income substantially exceeds costs. Our sponsors should know just how expensive it is to run a conference and particularly, how expensive it is to publish the Conference Volume. On the other hand this will result in a smaller share being returned to the state branches. Recent conferences have returned large amounts of money to the convening states, perhaps too much. I know that state branches look forward to their cut from conferences as a reward/incentive for their efforts. But is this the real reason why we participate? I think not.

Now I can hear rumblings of "Those damned Feds are after our money again". But it's not quite like that. There is only one legal entity "The Australian Society of Exploration Geophysicists". All of the money belongs to that entity. The Federal Executive in no way wants to control day to day activities of state branches but we are charged with overall fiscal responsibility and we see that the present system needs changing.

Henk van Paridon
ASEG President

Calendar Clips

November 18-20 1996
Petroleum Network Education Conferences
1st Pacific Rim Conference on New and Emerging Technologies, Singapore

November 27-29 1996
Nickel 96, Mineral to Market, Kalgoorlie WA
Sponsored by AusIMM, AIG and WASM

December 18-20 1996
33rd Annual Convention & Meeting on Geophysical Instrumentation. Hyderabad, India

February 3-5 1997
Karlsruhe Workshop on Amplitude-preserving Seismic Reflection Imaging sponsored by SEG

February 23-27 1997
12th ASEG Conference & Exhibition (see advert. p. 11)

March 12-14 1997
The AusIMM Annual Conference
Ballarat VIC 3353

(Details and more events on Page 41)

Preview - Next issue

- *25 Years of the ASEG – Contributions from members*
- *Gravity Inversion*
- *ASEG Publications*
- *Geophysics and Black Shale – an Historical Perspective*
- *Report on ARC Meeting*

Executive Brief

As previously reported in this column, a great deal of effort has gone into investigating ASEG publications costs by the current and past Federal Executive committees. ASEG publications are the "flagship" of our organisation and their continuing high standard and sustainable costing is vital. I urge members to read the Publications Report in this bulletin and to send feed-back on any of the issues to the Executive committee.

Whilst on publication matters, John Denham is calling on contributions for a special issue of Exploration Geophysics on Borehole Geophysics with John Bishop as Special Editor.

Much discussion at the last Executive meetings has centred on Conference Volume budgeting and conference profit splitting between the state branches and the Federal Executive. The committee proposes that in future, the full cost of the Conference publication be accounted for in the conference budget and that the profit margin be declared after the actual total publication cost is taken out. Currently a nominal figure for the cost of the publication is budgeted and Federal Executive funds cover the outstanding cost, which in the past has been a substantial amount. This matter will be taken up with the Conference Advisory Committee and the Melbourne Conference standing committee so that new guidelines may be set prior to the Melbourne conference.

The SEG conference is to be held in Denver this year and the ASEG President, Henk van Paridon, will attend on behalf of the ASEG. Janine Cross, the ASEG secretariat, has agreed to represent the ASEG at the upcoming Sydney conference despite her wedding being scheduled for the following weekend!

Financial Report

An approximate summary of the status of the ASEG Federal Accounts is as follows:

Cheque Account at 20th August 1996	\$32 091
Cash Management Account at 25th September 1996	\$212 080

Robyn Scott
ASEG Federal Secretary

ASEG People Profiles: The New Federal Executive

This is your final introduction to members of your new Federal Executive as you meet Treasurer Peter Fullagar and Committee Member (in charge of Membership), Andrew Mutton.

Peter Fullagar, Federal Treasurer

Peter Fullagar holds an M. Sc. In Applied Mathematics and Earth Sciences from Monash University and a Ph.D. in Geophysics from the University of British Columbia. He worked with Western Mining Corporation in Australia for twelve years serving as Exploration Geophysicist, Research Geophysicist, Geophysical Research and Processing Manager, and Chief Geophysicist. While with WMC he worked in petroleum exploration as well as mineral exploration, and also developed an interest in the applications of geophysics in mines.

In 1993 he became the inaugural Chair of Borehole Geophysics at Ecole Polytechnique in Montreal. In Canada he initiated research into the application of radar and radio imaging for orebody delineation at Inco Mines in Sudbury. He returned to Australia in 1994 to join the CSIRO/CMTE in-mine geophysics research team in Brisbane, and was project leader for AMIRA Project P436, *"The Application of Geophysics to Mine Planning and Operations"*, which was sponsored by seven major mining companies. He is currently Principal Geophysicist with RTZ-CRA Exploration.

Peter has previous experience as an ASEG officer, having served on the WA Branch Committee in 1982-83, on the Federal Executive as Treasurer in Adelaide during 1987-88, and on the Research Foundation Committee from 1989 to 1992.

Andrew Mutton, Committee Member

After commencing a Science degree at Sydney University in 1970, with no knowledge of geophysics or thoughts of becoming a geophysicist, a chance opportunity to work as a "juggy" on a seismic crew during the University vacation provided Andrew's first encounter with geophysics. Having survived that experience, he went on to major in Geophysics and graduate with a B.Sc.(Hons) in 1973.

During his University course, he was also able to gain further vocational experience working at the Coalcliff colliery in NSW, and on nickel exploration for CRAE in Western Australia.

After graduation, contract work - first as an Electrode Emplacement Engineer on an IP crew in NSW, and later with Lindsay Ingall on the regional gravity survey of Australia - provided Andrew with further invaluable experience prior to his accepting an appointment in mid 1974 as a geophysicist with the Australian Bureau of Mineral Resources (now AGSO). His initial work in the Metalliferous group of the BMR involved applying geophysical methods to geological mapping problems in the Northern Territory and Queensland. From 1976 to 1979 he was a crew manager for regional airborne surveys in Northern Territory, Queensland and New South Wales, before his focus turned to applications research, investigating the use of radiometric and borehole geophysical methods in uranium and mineral exploration.

He left the BMR in 1980 and moved to Perth to work as an exploration geophysicist, initially for Geopeko, and later for BP Minerals Australia. The highlights of his career during this time were his involvement in the discovery of the Abra base metal deposit, and in the geotechnical evaluation of the Rocky's Reward nickel deposit. In 1986, he took on a one year lectureship in Geophysics at Curtin University in Perth, before returning to the exploration industry with CRAE in Brisbane, where he was responsible for geophysical survey work in Queensland. The teams of which he was part were successful in locating several new areas of mineralisation, including the major Century zinc deposit.

Following his work on applying geophysics to the evaluation of Century and other deposits, he also worked at several CRA mines and evaluation projects to identify and test geophysical methods to assist the ore evaluation and mining process. This role resulted in his transfer in 1996 to Minenco and subsequently Technical Services Australia with the RTZ-CRA group, where his current position is Principal Consultant - Geophysics. His main areas of interest are in high resolution and borehole geophysics applied to mine evaluation and development, engineering and environmental problems. He has recently completed a Graduate Diploma of Science in Mining and Exploration Geology at James Cook University of North Queensland.

Andrew's association with ASEG goes back to 1972, when Don Emerson told his students they would only pass the exams if they became members. In 1976 at Don's request, Andrew assisted John Moss to form the ACT Branch of the Society, and was the Branch Secretary/Treasurer for several years. He has been an active Committee member for both the WA and Qld Branches, and was Qld Branch President from 1991-93. He also served on the 1987 and 1992 ASEG Conference committees. His role on the Federal Executive is Committee Member with responsibility for ASEG Membership issues.

ASEG Branch News

Queensland

A successful technical meeting was held in August at Oxley's on the River. Owen Dixon from the Queensland Department of Minerals and Energy gave an interesting presentation on a recently completed research project relating to high resolution seismic acquisition techniques applied to shallow coal seam exploration in Central Queensland.

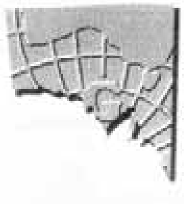
A number of meetings are planned for the coming months. Due to the number of interesting speakers available, the Branch has decided to have two shorter presentations at some meetings. This will allow us to broaden the appeal of meetings and to better cater for the diversity of our members' interests. It also provides scope for the inclusion of less technical topics such as management and environmental issues.

A meeting is planned for mid November, with Terry Higgins from Robertson Research in Perth discussing seismic AVO techniques, and Jessica Kennedy from the University of Queensland giving a management-focused presentation on recently completed research projects.

A combined wine tasting and Christmas dinner has been booked for Thursday 19th December. The venue is the Telopea Function Room on the tenth floor of the Gazebo Hotel in the city. Corporate sponsorship for the function is being sought from local geophysical contractors and exploration companies, as we have done in previous years. Mark the date in your diaries now.

Andrew Davids
Branch Secretary

South Australia



September:

A joint meeting with PESA - SA Branch was held at lunch time on September 17 '96. Dr. Martha Withjack (Mobil Research and Development Corporation and PESA Distinguished Lecturer) presented the results of modelling upward propagating normal faults and the implications for the entrapments of hydrocarbon accumulations.

October:

A technical meeting will be held on October 16 '96 at the Crown and Anchor Hotel. Griffe West, consultant geologist will present "Crude or Just Nude at Maslin's". This presentation will outline the planned offshore wildcat wells, Frijole No. 1 and Enchilada No. 1 which will be drilled by Canyon (Australia) in November. Both wells target Early Cambrian carbonates of the Stansbury Basin, Gulf St. Vincent. These will be the first wells drilled in the main portion of the basin. With such activity occurring so close to Adelaide this promises to be an entertaining and well attended evening.

Speakers include Schlumberger-GeoQuest, Santos, Boral Energy, MIM Exploration, Pitt Research and Dynamic Satellite Surveys. The diversity of speakers will make for both an interesting and informative evening.

Samanda Bell
Branch Secretary

Western Australia

Technical News

At our Technical meeting, on September 18 '96, Richard Bunt of Carnarvon Petroleum NL presented a very well attended talk entitled "The Leatherback Discovery - A Revised Interpretation". Federal ASEG President, Henk van Paridon, was amongst the attentive audience at the meeting.

Interstate visitors are welcome to the WA Branch's Technical Meetings. They start at 6.00 pm on the third Wednesday of the month at the Celtic Club, 48 Ord Street, West Perth.

People News

ASARCO Exploration Vice President, Gerald Van Voorhis, was a recent visitor to Southern Geoscience Consultants. Van Voorhis was a frequent contributor to Geophysics on the subjects of induced polarization and frequency domain electromagnetics.

A work group has been meeting under the chairmanship of Greg Steemson, with a view to establishing a radiometric test range along the coast, north of Perth.

Re-cycling of digital airborne Geophysical data has been the subject of preliminary discussions between Government and the exploration industry.

The PESA / ASEG Corporate Golf Day will be held on November 29 '96 at the Araluen Country Club. On the ASEG side, David Abbot, David Howard and Neil Goodey are planning this event.

Andre Lebel
Branch Secretary

Conferences

The Australian Society of Exploration Geophysicists
12th Geophysical Conference and Exhibition

Co-hosted by:
The Society of Exploration Geophysicists
Petroleum Exploration Society of Australia

Registrations are now pouring in for the 12th Conference and Exhibition to be held in Sydney on February 24 -27. No doubt the full technical programme, the largest exhibition and exciting social events are the cause of the strong interest.

A revised programme will be sent out with the next issue of Preview due out in mid November. A new addition to the programme is a research workshop on Wednesday on the "Status and future of mineral exploration geophysics in Australia". This is being promulgated by the CRC for Australian Mineral Exploration Technologies whose recently appointed Director is Dr Brian Spies. All are welcome to attend and enter into the discussion. This will be followed by a discussion from the Australian Research Council - funded working party, headed by Dr Norm Uren, on the future viability of the education of geophysicists in Australia.

Another addition to the social programme is a Golf and Wine Tasting day on Friday, February 28. This will be held in the Hunter Valley and those who don't wish to play golf can spend the day sampling Australia's best wines. Buses will transport you there and back so you need have no inhibitions.

Keynote speakers for the main programme include such notables as Dr Garry Lowder, Director of the NSW Department of Mineral Resources who will introduce the novel session on Government Initiative to Exploration; Dr Dave McEvoy of Exxon Exploration; Dr Tom Whiting, Exploration Manager BHP Minerals; and for added intrigue, Dr Clark Davenport of NecroSearch International Ltd., Colorado, who will introduce us to some examples of the uses of geophysics for law enforcement and especially in the location of clandestine graves.

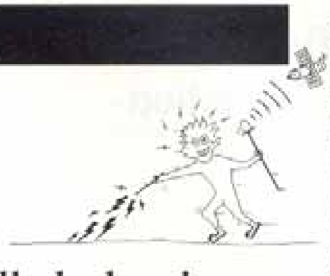
Finally, don't be surprised if you see a 40 tonne vibrator truck, Australia's largest, in front of the convention centre or hear the roar of a geophysically instrumented helicopter landing in front of the exhibition hall.

How can you afford not to be there!

Register now, if you haven't yet done so.

Roger Henderson
Joint Chairman, Conference Organising Committee

EXCITATIONS



Stephen Mudge
RGC Exploration Pty Ltd
PO Box 332
Victoria Park WA 6979

Multiparameter drillhole logging or 'getting in touch' with the rocks.

Down-the-hole logging of drillholes, or downhole logging, is a great way of acquiring in-situ petrophysical data and a great way of getting more value from expensive drillholes. Greater benefits are obtained when several physical parameters are measured continuously down the hole so that a composite geophysical signature can be identified for the various wall rocks comprising the drillhole. Probing the Earth with measurement sensors that acquire petrophysical data as the probe continuously moves along the drillhole is probably the geophysicist's most effective way of really 'getting in touch' with the rocks in their undisturbed in-situ state. However, several fundamental aspects of downhole logging need to be considered to ensure that adequate resolution and precision are obtained from continuous logs.

Introduction

Geophysical measurements can be made in drillholes in-order to understand the physical properties of the wall rocks, or to explore beyond the drillhole by extending the radius of investigation of the hole. Here I will only consider petrophysical measurements and some particular aspects of continuous downhole logging.

Figure 1. A portable computer-controlled drillhole logger operating in NSW. Note the essential support tripod and pulley mounted over the drillhole collar for lowering the probe down the hole.

Continuous downhole logs are becoming more common in mineral exploration programmes to gain further insight into the physical properties of the area drilled. In the past, most petrophysical measurements were made on discrete samples of drill core or on bulk samples of drill cuttings taken from particular depths down the hole. The development in recent times of computer controlled winches and data acquisition systems, and probes for measuring a wide variety of physical parameters, has made high resolution continuous downhole logging available to explorers at affordable cost (Figure 1). The petrophysical measurements are made with a probe/sensor that continuously moves along the drillhole. A single-parameter log provides a limited view of the in situ petrophysics whereas a multi-parameter log often provides a powerful tool for geophysically characterising the drilled rocks. However, there are still some parameters that can only be measured on drill core specimens, such as tensor measurements.

High resolution logging can be a very accurate way of making stratigraphic correlations between widely spaced drillholes. Downhole logging can also be useful for evaluating drill tests of anomalies observed with surface geophysical surveys and for obtaining petrophysical parameters for geophysical interpretation and modelling.

Figure 2. Slotted PVC drillhole casing allows drillholes to be logged below the water table with galvanic electrical probes.

Drillholes

A variety of drillhole conditions govern the effectiveness of the various types of parameter logs. Often drillholes are cased with (plastic) PVC piping to prevent the wall rocks from collapsing and closing the hole. Holes cased with solid-wall PVC piping prevent the use of galvanic electrical probes whereas many other types of parameters can be accurately measured in solid-wall PVC cased holes. These include natural gamma, density, magnetic susceptibility, inductive conductivity and temperature. The galvanic logs require water filled holes to obtain galvanic connection between the probe and the wall rocks and, additionally, they can only be used in un-cased holes or holes cased with slotted-wall PVC pipe (Figure 2). This latter requirement ensures that galvanic connection is to the wall rocks adjacent to the probe. The galvanic logs include self potential (SP), single-point-resistance, resistivity and induced polarisation (IP), and they are restricted to depths below the water table.

Logging Parameters

It is often logistically convenient to 'log up', i.e. to record the measurements as the probe ascends the drillhole. Of course the probe has to be lowered down the hole initially but this provides an accurate determination of the maximum logging depth, which sometimes can be less than the drilled depth of the hole (the wall rocks may have collapsed below a particular depth). The logging run can then be made upward from this depth in the knowledge that the logging interval is clear of obstruction. Also the end of the logging interval is known. This is often the hole collar, or for the case of galvanic logs it is the water table, assuming of course that the upper portion of the hole doesn't collapse during the logging run. It is good practise to run a dummy probe (e.g. a piece of inexpensive steel water pipe) down the hole prior to logging to check hole access and to determine the maximum logging depth.

The logging speed and the measurement interval have a significant effect on the resolution of the logs. Raising the probe too fast can cause aliasing of geological detail of the wall rocks thus severely limiting log resolution. On the other hand, for drillholes intersecting large intervals of a particular (monotonous) lithology, a slow logging speed can make for unnecessarily long logging times and attract unnecessary extra cost. But drillhole logging has one major advantage over other types of ground and airborne geophysical surveys: drillholes can be logged repetitively at little extra cost compared to, say, the large additional cost of re-flying an airborne survey. This situation offers the geophysicist the option to re-log a drillhole, or a portion of it, with different settings of the logging parameters (speed, sampling interval etc.) in order to advantageously change the resolution of the log. In fact, this can be put to good cause when logging a group of holes in an area because the first drillhole can be logged several times with different settings of the logging parameters to determine the optimum settings for the environment. The remaining drillholes can then be logged with the optimised parameters.

Figure 3. A natural-gamma probe being lowered into a calibration hole at the AMDL calibration facility in Adelaide in 1988. Note the various diameter drillholes in the water filled calibration well which contains a known distribution and concentration of uranium ore.

The sampling interval of the measured parameter also needs to be considered when setting the logging speed. For natural gamma-ray probes this is related to the integration time for accumulating counts and for IP/resistivity probes it is related to the polarisation time of the transmitted signal. Also, for electrical logs, the type and size of the electrode array will influence the logging speed. In general, the larger the array, the higher can be the logging speed.

Drillhole radial geometry can be measured with a calliper probe. This mechanical device measures the diameter of the hole at every point along the hole and is required for the reduction (or correction) of some parameter measurements, for example gamma-gamma density logs. In addition, the calliper log is often a good indication of the mechanical condition of the wall rocks. Incompetent units can crumble into the hole and enlarge the drillhole's diameter in that part of the wall rock stratigraphy, and water-logged clay-rich horizons can expand to reduce the diameter of the drillhole (and often to block it).

Some probes/sensors require calibration in order to convert the measured parameter to a true physical measurement of the rocks. For example, gamma-gamma density probes require calibration to convert measured gamma counts to rock density, with correction for hole diameter and gamma absorption and scattering by the ground water. Also, natural gamma-ray probes can be calibrated to give concentrations of radioactive elements in the wall rocks, e.g. ore grade estimates in uranium applications (Figure 3).

Individual logs can often benefit from the judicious application of digital filters to enhance them. In particular, gamma-ray logs often require low-pass filtering to attenuate statistical counting noise, which is exacerbated in areas exhibiting low count levels. Low-pass filters can be applied to all types of logs to attenuate very high frequency noise related to small geological features in the wall rocks. SP and temperature logs often benefit from the application of derivative filters to resolve subtle changes in wall rock properties. The derivatives can be very effective in delineating lithological contacts down the hole.

Single or Multi-parameter Logging

A single-parameter log gives the geophysicist a limited 'feel' for the Earth. We can 'get in touch' better by getting a more comprehensive geophysical signature from a series of logs measuring a variety of physical parameters. The relationship between the various parameters can more uniquely characterise the geological units comprising the wall rocks. In general, the more parameters measured down the hole, the more diagnostic is the characterisation of the individual elements of the wall rocks and the more 'in touch' we are with the rocks. Figure 4 shows a multi-parameter log of a drillhole from the Wagon Pass lead-zinc prospect in WA, from Dentith et al. (1994). Note that several different size electrode arrays were used for the chargeability and resistivity logs.

Several types of measurement probes can be mechanically coupled into a single composite multi-parameter probe to provide a logistical advantage of measuring several physical parameters in a single pass of the drillhole. With the use of modern computer controlled logging winches and digital data acquisition systems a drillhole can be logged for several physical parameters in shorter time for little extra cost.

In addition to the measured parameters, several other parameters can be calculated or derived from the different types of parameters logged to provide further physical characterisation of the wall rocks. Many of these are routinely derived for ground water and petroleum applications and include porosity, permeability and formation factor which, for example, can all be derived from combinations of the resistivity, SP and gamma logs.

We currently don't have downhole probes for measuring tensor parameters such as electrical anisotropy and remanent magnetism. There is no alternative to making laboratory 'single point' measurements of these parameters on oriented drill core specimens. We just have to wait for advances in technology to provide the miniature components needed for instrumentation capable of fitting into the confines of a mineral drillhole, and capable of operating at the very high (water) pressures found in exploration drillholes, before downhole measurements of these parameters becomes a reality.

If you get the chance to log your drillholes then think in terms of multi-parameter logging in order to 'get in touch' with the rocks below. Try to avoid restricting your 'touch' with a single parameter log; after all, the better your 'touch', the greater are your chances of 'getting in touch with the elusive mother lode.

Happy Excitations

Various good accounts of the use of multi-parameter downhole logging for mineral applications can be found in Dentith et. al (1994) and Killeen (1986).

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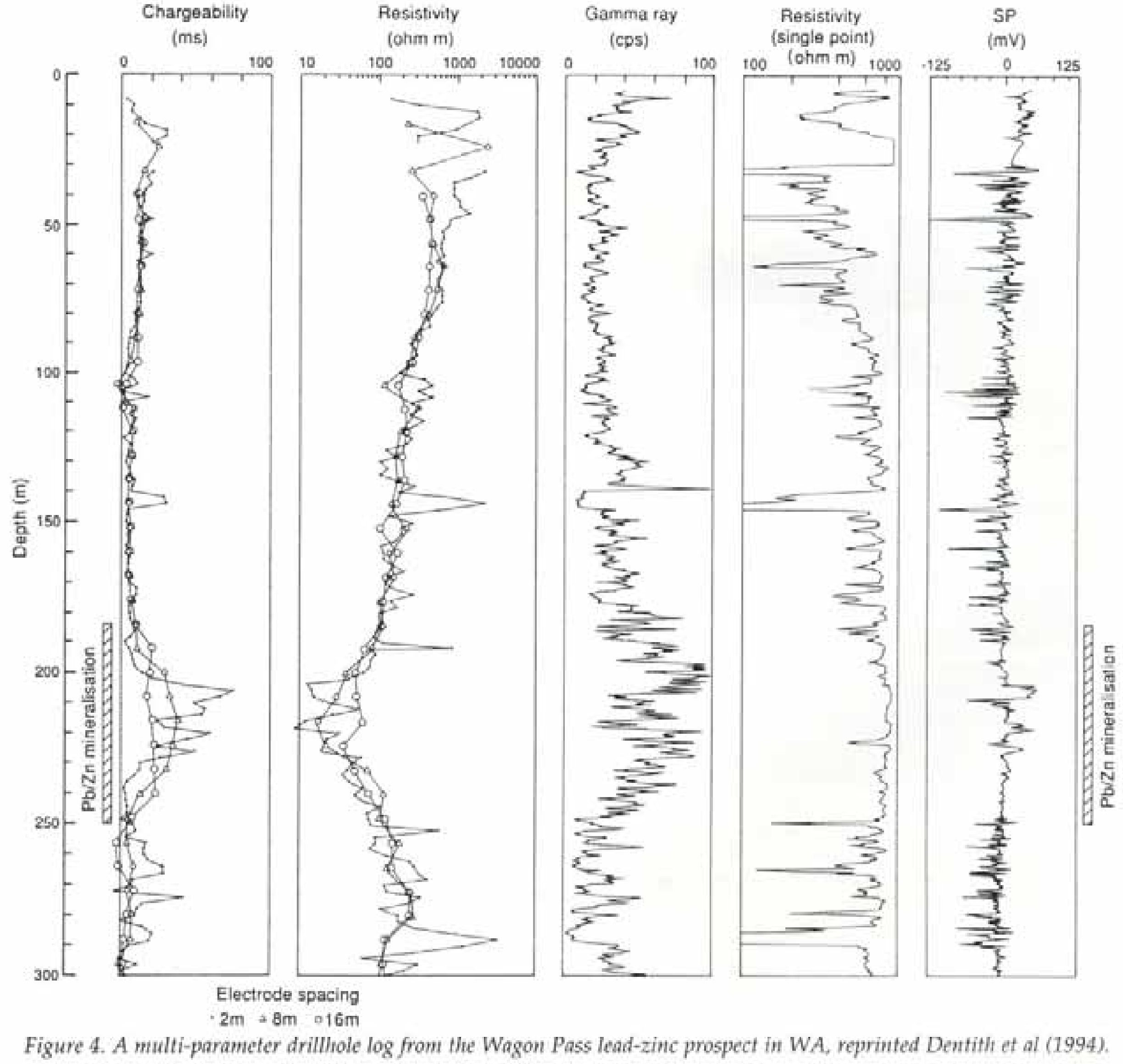


Figure 4. A multi-parameter drillhole log from the Wagon Pass lead-zinc prospect in WA, reprinted Dentith et al (1994).

ASEG Publications

The future of ASEG publications has been debated and planned by two Federal Executives and still more work needs to be done. However, the way ahead is becoming clearer and it is timely now to inform the our membership and supporters of developments.

A decision has been taken not to merge Preview and *Exploration Geophysics* because the cost savings would not be significant. Sacrifice of the individual identities of the two publications is therefore not warranted.

The production of publications will almost certainly be farmed out to a commercial organisation because it is no longer viable to maintain the high quality standards in the long term with what is basically volunteer labour. However there will be additional costs associated with this path so an increase in revenue will be required to fund it. Advertising prices will have to rise, particularly those of black and white ads which are currently well below commercial rates.

ASEG advertising will be treated as a single entity encompassing both *Preview* and *Exploration Geophysics* (including conference publications). Discounts will apply for quantity across both publications. Details remain to be finalised. A full report on the proposed changes will be given by the Publications Review Committee (chaired by First Vice President, Steve Hearn) in the December issue of *Preview*.

Unipulse

with

Leonie Jones
University Of Wollongong

Report on the ARC-Funded Exploration Geophysics "SUMMIT", Perth, October 10-13, 1996

A special ARC-funded meeting to discuss the future of exploration geophysics in Australian universities was held south of Perth on Oct. 10 to 13. The organising committee was Chris Powell (convenor) and Mike Dentith from the University of Western Australia, and Norm Uren and John McDonald from Curtin University, ably supported by Rosemarie Powell. The outcome of the meeting was a draft document which will be discussed at the ASEG 12th Conference in Sydney in February 1997. An executive summary of the document will appear in the December '96 issue of *Preview*. This article concentrates on the personalities and processes involved.

About 25 people accepted the invitation to participate, some of them not even geophysicists, but invited because of their standing in earth sciences and/or leadership position in government organisations and universities. The organisers attempted to bring in a range of people, from the minerals and petroleum industries, from CSIRO, and from universities with both large and small geophysics programmes. Possibly the only under-represented industry area was petroleum geophysics.

Continued p.34

Information Management Systems and their uses for Modern 3D Land Seismic Acquisition

Andy Peters*
Schlumberger Geco-Prakla

Introduction

With land 3D seismic surveys becoming ever larger, more complex and efficiency orientated, the task of acquiring and processing the huge volumes of data quickly and cost effectively is becoming increasingly difficult without accurate, quality assured support data. Support data for the purposes of this article is to be considered as all the information relating to the acquisition of seismic data that has not been collected through a geophone.

This article covers some of the pitfalls of acquiring 3D seismic data sets without an Information Management System and some of the benefits of such a system to the processors, interpreters and financial planners.

History and background of seismic support data management

2D land seismic surveys are relatively straightforward to conduct and to survey. Lines are scouted, flagged and cleared. Survey pegs are placed along the cleared lines at regular intervals to denote the receiver locations and these pegs are surveyed. Receivers are laid, and source points shot or vibrated between the receivers. Very little moves or is changeable, no vehicles need access anywhere except along the cleared line and the data is acquired in a linear fashion from one end of the line to the other. No data management systems were used for 2D data acquisition in the past and only now are they being used for 2D work when the complexity of the program warrants it.

3D seismic surveys are different; they cover an area rather than a straight line. There are many, many more obstacles to get in the way of an areal survey than there are on a 2D prospect, and instead of one line there may be a hundred or more. The source and receiver lines are typically in different directions. The sources may be laid out in a brick, triple brick, orthogonal, zigzag or double zigzag pattern and up to 50% or more of the source points may be offset to avoid wells, pipe lines, roads, other obstacles, permit restrictions, archaeological sites or environmentally sensitive areas.

Data management for 3D surveys first became an issue several years ago when these surveys started to become common place in even the most hostile and logistically challenging of environments. The first data management systems were written for personal computers running in a DOS environment to keep a track of which pegs had been surveyed and where they were.

* *Andy Peters is currently working for Schlumberger Geco-Prakla as the Information Management Systems Product Champion. He has worked in Australia, New Zealand and Papua New Guinea on seismic land crews as a Senior Field Geophysicist from 1990 - 1995 and now currently resides in Hannover, Germany.*

Additional information was then input to determine the shot and receiver type based on planning and actual acquisition information. Systems of this nature became vital for seismic surveys that used multiple source types and multiple receiver types (e.g. geophone groups of different arrays and hydrophones in wetter areas). Knowing which type of source fired into which type of receiver is essential for correct data processing.

Today's 3D surveys are becoming ever larger and more complex, not just in physical size but with respect to the number of data attributes that are available for collection. The number of live channels recorded per shot point has increased to 1200 or greater; the number of source and receiver points can be in the order of 200,000 or more per survey. Vibroseis 3D surveys now typically use two source groups rather than just the one (this enables the sources to be leapfrogged and costly time saved); the receiver types may vary throughout the survey (geophones with various patterns, marsh phones and hydrophones depending upon surface conditions); the source types may also change and vary during the course of the survey (both vibroseis and dynamite are used for access and permit reasons, air guns may be used in wet areas). The need to accurately keep track of the support information (non-seismic trace data) has become impossible using the 'filing cabinet and hand-written notes' way of data storage used not so long ago.

Even on perceived 'simple' 3D vibroseis and geophone only programs, the quantity and speed at which data are acquired is so overwhelming, that some form of database is required to keep track of which vibrator group shot into which live channels, on which lines and at what time. With vibrator cycle times of 30 seconds or less between shot points, and the pressure of production on the seismic observer there is little time to resolve errors correctly in the field, in real time.

With modern vibrator control electronics and the boom in Global Positioning System (GPS) surveying, the amount of additional quality and support data is increasing. If this data is to be used to its full advantage it must be stored in a form that is both meaningful, easily retrievable and capable of being efficiently analysed.

Potential Problems due to lack of data management

The success of almost any project is in the planning. If the plan is incorrect, poor or flawed then the project will fail or go over budget. If the plan is good and efficient then the project will generally succeed. For the planning process itself to be a success, the more data you have to help you the better; maps, satellite images, aerial photography, access routes, contour information, ground conditions, permit restrictions, pipeline locations, pipe crossings, well restrictions and locations, pumping station hazard areas, environmental "no go" areas etc., all play an important part. It is no good having a plan unless it relates to the real world and the actual area the survey will be conducted in. A good data management system should allow input of any and all ancillary data and allow the user to adapt the theoretical survey design to the actual conditions.

A typical modern 3D survey may acquire 1200 shot points per day, 1000 live channels per shot. Each of these 1.2 million traces per day have to be located accurately on the ground to within sub-metre accuracy and its location, channel number, peg number, and position on the recording tape known. Any error in any of the parameters will lead to problems and confusion and subsequent costly delays in processing. If the source of the error cannot be determined and rectified then these data must be scrapped as they may 'infect' good data in other parts of the survey.

The process becomes more complex when shot and receiver locations start to change position during the actual data acquisition phase. Source pegs that have been planned, positioned and surveyed can still be moved just prior to the vibrators arriving at the assigned point. Rain can make the ground boggy (not the best conditions for 26 tonnes of vibrator) so the locations are changed at the last minute to keep production going. Several questions must now be asked:

- Can the old survey positions be thrown away?
- Has the source point been used before?
- What is the new location?
- If the source point is moved, will the new receiver spread be correct?
- Will the move affect the fold of coverage?
- What happens to the offset distribution?

A good data management system comes to the rescue in these circumstances by answering all of the above questions.

The real test of a data management system is to keep track of these 'fluid' source and receiver positions in real time as data acquisition proceeds. Receiver pegs can be in one position one day and they can have a change of position, elevation, static correction and receiver type the next. They may be moved many times during the course of the whole acquisition process. Unless this information is presented to the data processing centre in an understandable manner the processing of the data could be plagued by costly geometry errors and mis-stacking of the data. The new generation of processing support formats such as the SEG recommended Shell Processing Support (SPS) format means that essential geometry and co-ordinate information is conveyed to the processing centres in a consistent automated format.

During acquisition, missing pegs, incorrectly numbered pegs, lost shot holes etc. can slow down production and hence increase the cost of the survey. Today's data management systems combined with GPS technology can ensure that no pegs or points are ever lost and that all data planned to be acquired actually is. Errors and delays in processing have occurred in the past because of similar mistakes. Shots may be written down as being recorded on the observer logs but are not on tape and visa versa, shots may be on tape but there is no record of them on the logs.

If errors in the field do occur during acquisition for whatever reason, then they should be discovered and fixed as soon as possible. Too often in the past, errors have been found at the data processing stage weeks or months after the acquisition of data has finished, at which time it is difficult and sometimes impossible to resolve the mistakes. If they cannot be resolved, the data cannot be used. This slows down the processing, increases the turn around time of the data, increases the cost of the processing and degrades the data set. A good data management system should allow for comprehensive data quality control (QC) such that any mistakes made in the field are discovered, analysed and corrected the same day. Turn around of perfect geometry data for data processing can then be accomplished within 24 hours.

Modern Data Management Techniques

For the success of a modern 3D seismic survey the data management system should be one of the first tools to be used. Even before the bid stage of a project, the survey parameters can be entered into the system and the survey 'modelled' to indicate the fold, azimuth and offset distributions. Basemaps, in conjunction with aerial photography, should be obtained and loaded into the system such that the survey extent with respect to the topography and permit conditions can be assessed easily and quickly. Source and receiver positions can be moved graphically with the click of a mouse to show their new planned position and the fold data recalculated based on this location to ensure that the planning details are still within the technical requirements of the project. Different shooting scenarios can be modelled both geophysically and financially to obtain the best design and shooting plan for the survey for the lowest cost. This can all be done in the office, prior to anyone even venturing out into the field.

Once a plan is given the go ahead, the system is now in a position to generate co-ordinate files for the survey department. The system actually tells the surveyors where to put the pegs with sub-metre accuracy inclusive of the planned offsets. This technique has been proven to cut many weeks off the length of the topographical survey component of the 3D survey as the surveyors can now upload the peg locations as co-ordinates into their GPS receivers and actually navigate to where the pegs have to be placed. In the past, the surveyors would navigate around on compass bearings and then discover at the last minute that a house was in the way. Then they would have to decide themselves where to place the offsets with the potential to be the wrong option for the geophysical integrity of the survey or against some permit restriction. This was an inefficient and costly way to survey.

Once the pegs have been placed and surveyed, the actual peg co-ordinates are then merged back into the data management system. The system automatically checks that the actual locations of the pegs are where the pegs were planned to be. Any discrepancies outside a user defined tolerance will be reported and checked.

The system is now in position to generate access maps and peg location maps. On a dynamite survey for example, these can be distributed to the drill department to aid in finding the pegs and locating the nearest water sources etc. This feature of the system can reduce the cost of drilling by a significant amount as no time is wasted finding the shot point or water or access for the rig trucks.

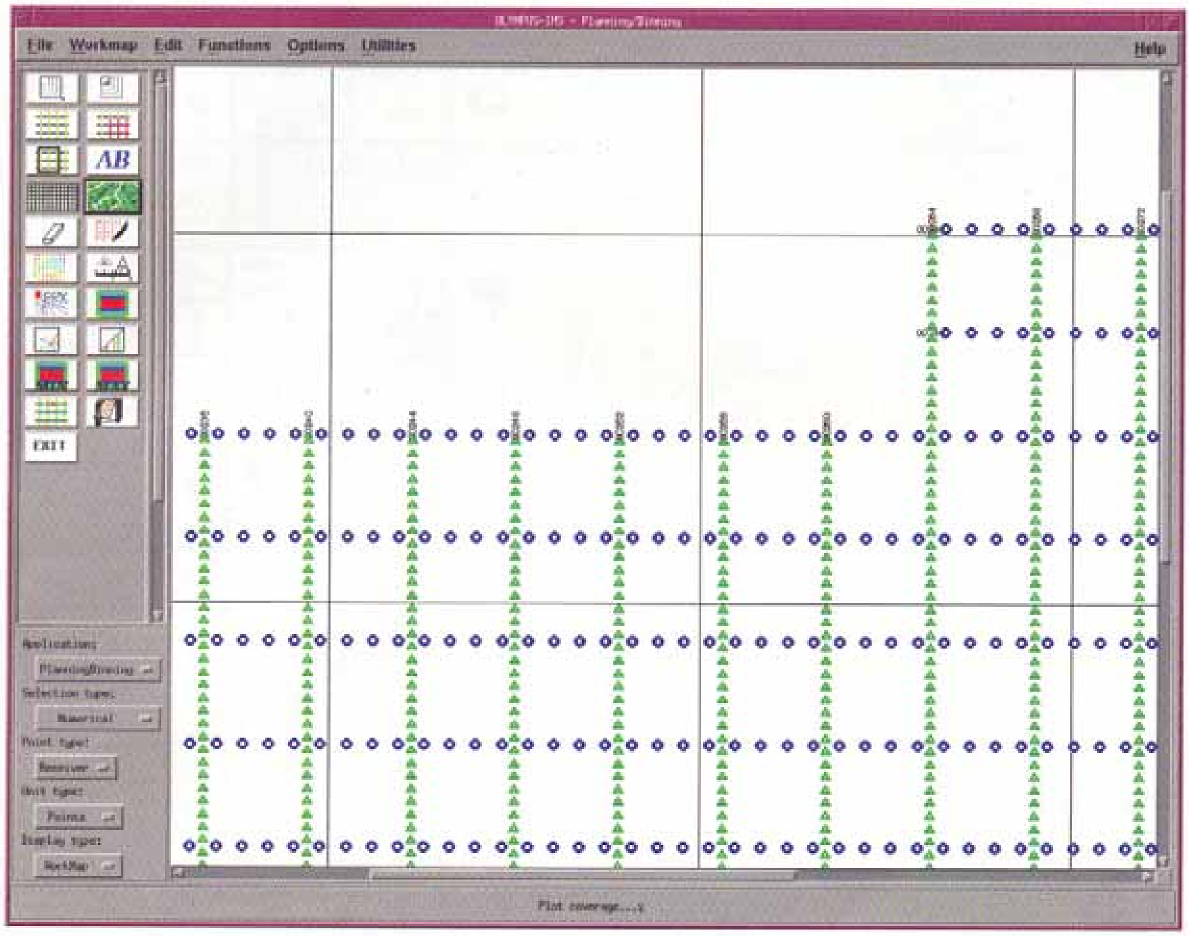


Figure 1. Base grid of source and receiver lines, the 'ideal' survey design.

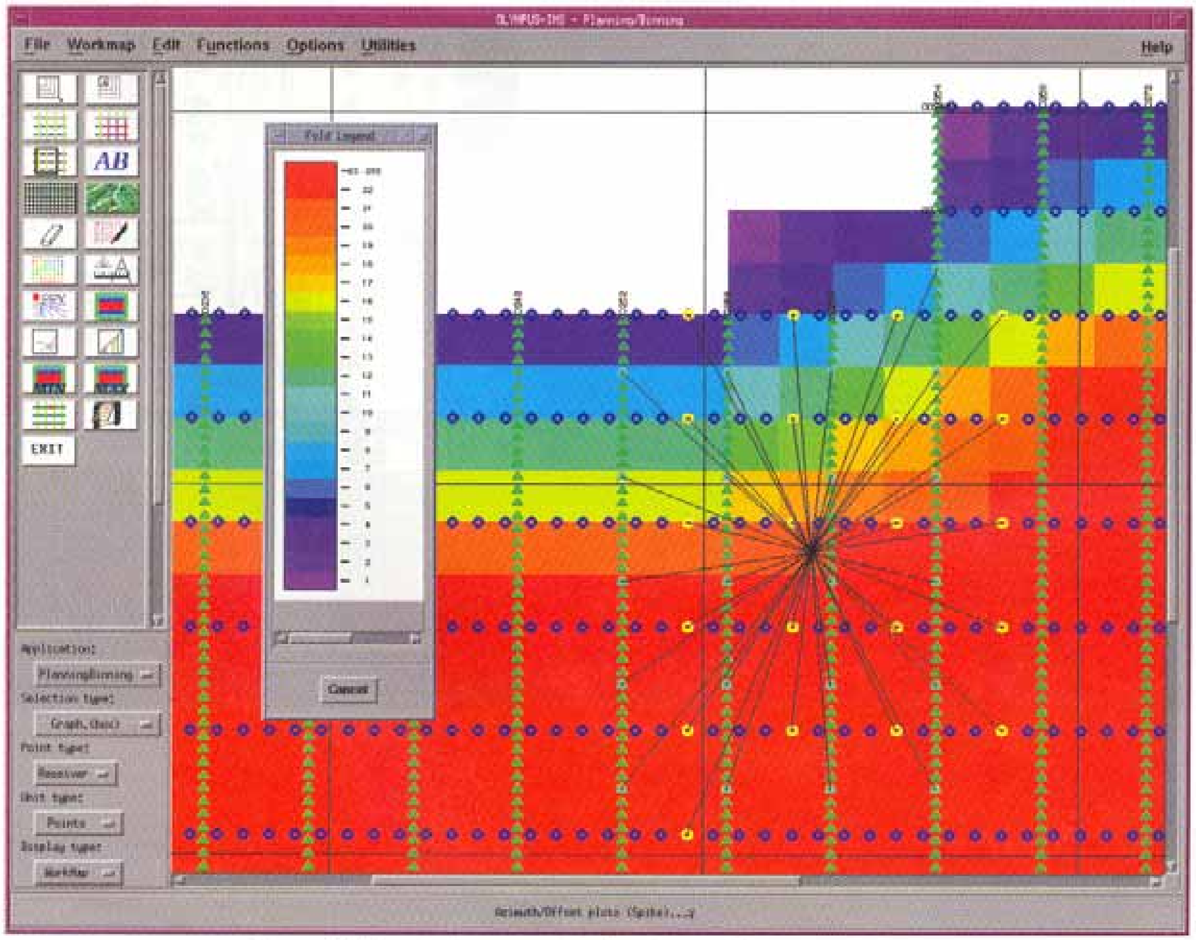


Figure 3. Theoretical coverage plot showing an offset/azimuth 'Spider'.

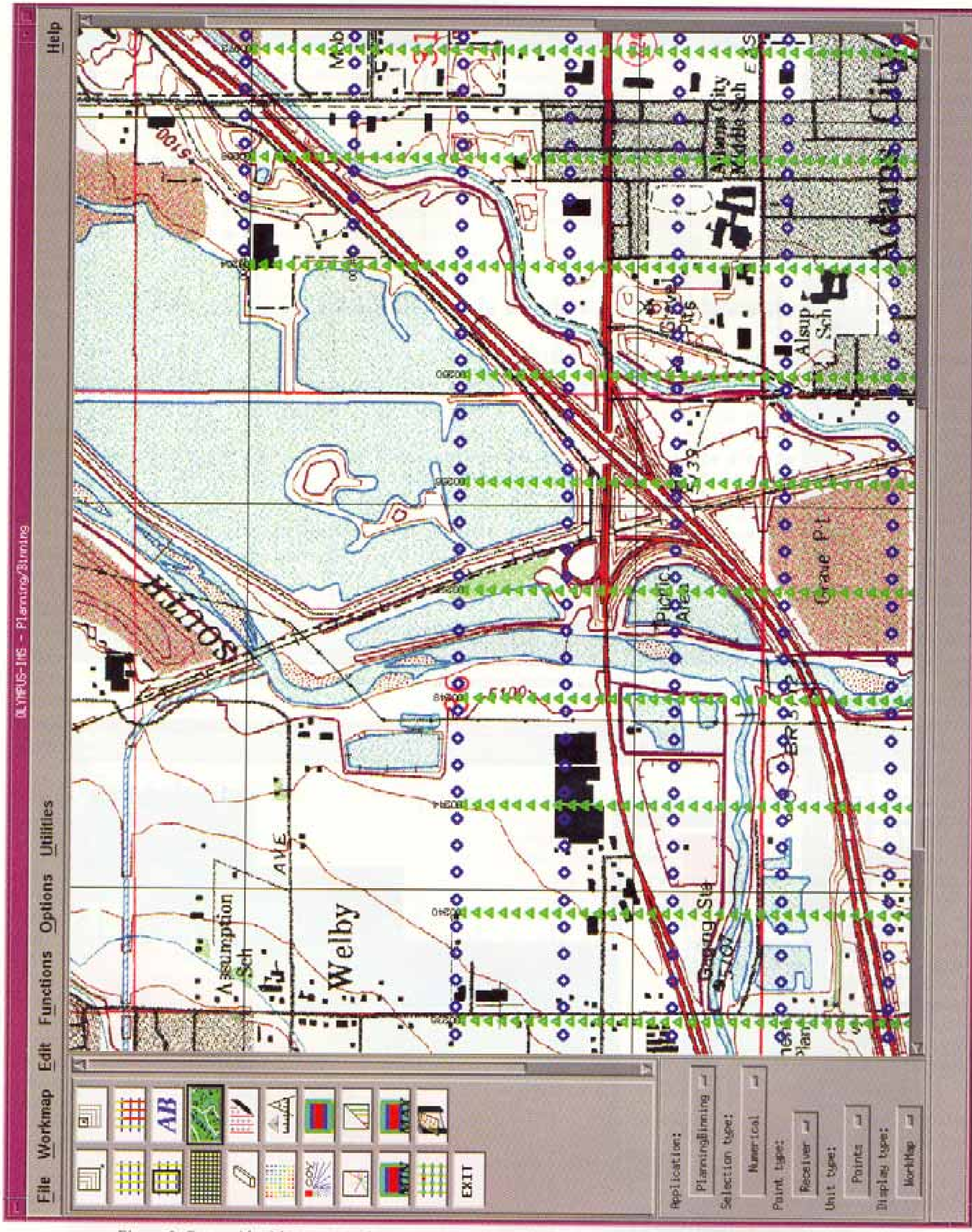


Figure 2. Base grid with a topographic map overlay. Ortho-corrected aerial photography may also be used.

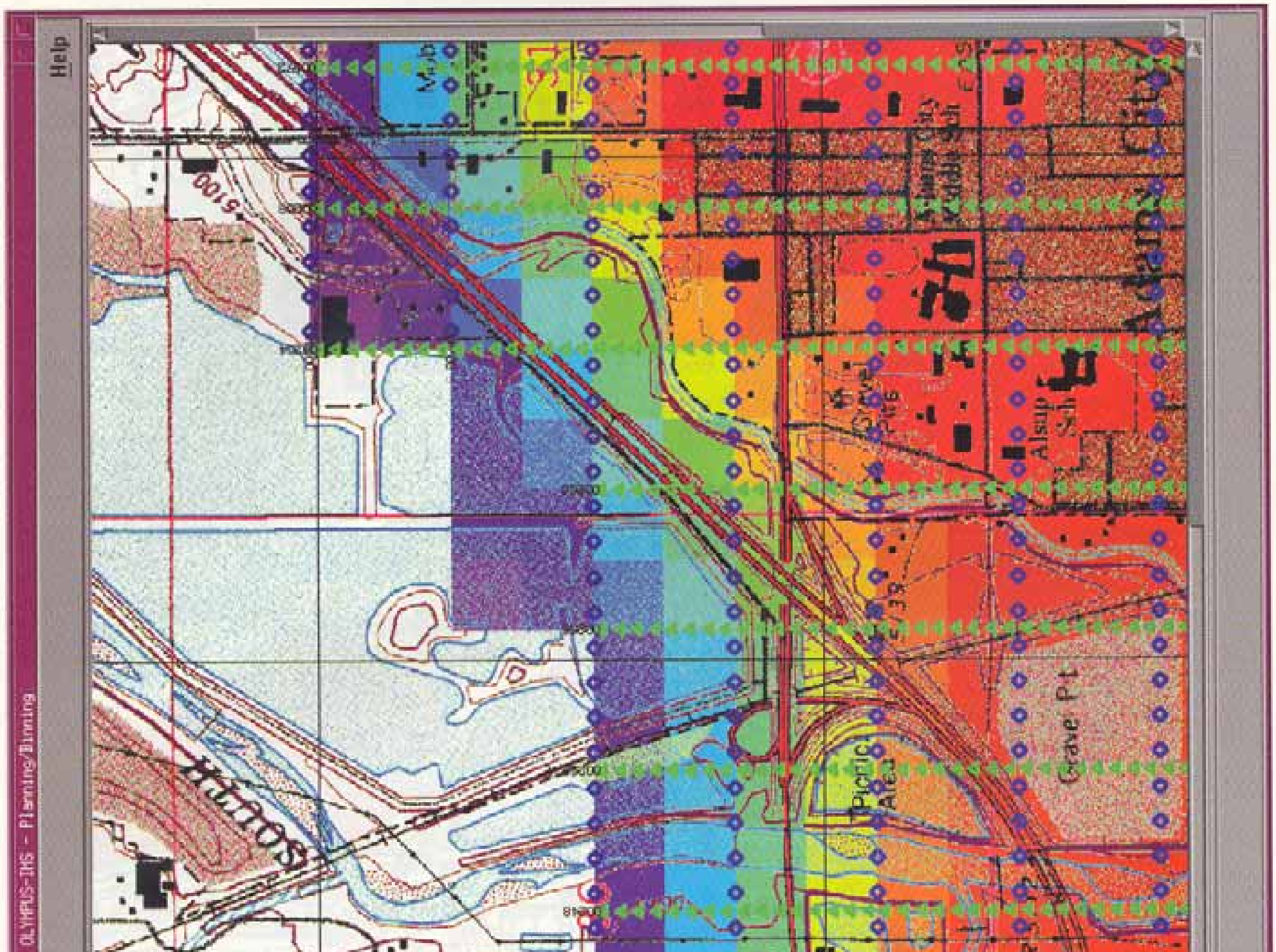


Figure 4. Coverage overlaid on topographic map.

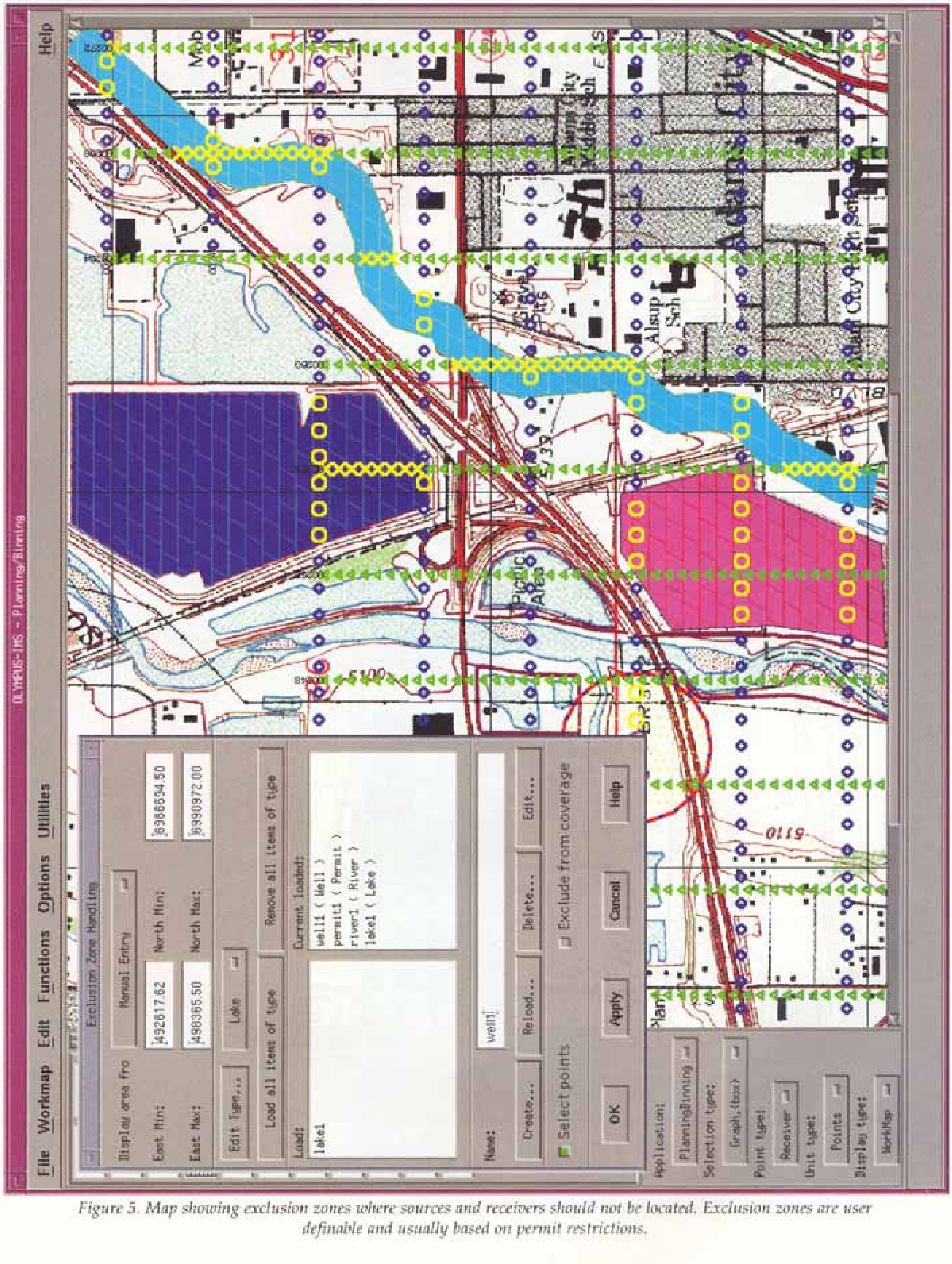


Figure 5. Map showing exclusion zones where sources and receivers should not be located. Exclusion zones are user definable and usually based on permit restrictions.

Once the pegs have been planned, surveyed, drilled and checked, the power of today's management system really comes in to play. The operator is now in a position to actually generate the shooting instructions for the various types of recording instruments being used. These "shooting scripts" are generated automatically by the information management system according to the description of the planned recording spreads in the database. These scripts are used by the seismic observers in the recording truck to set the live channels on the ground for each shot. Different shots require different live channel sets. This part of the operation used to be the area most prone to error. Given the complexity of most modern 3D surveys and the production orientated environment for the seismic observer, generating shooting scripts in the field tended to occasionally produce shot records with the incorrect channels sets allocated to them. Today, using a data management system, these errors can be eliminated.

Modern recording systems generate their own electronic observer logs. Hand written reports are hard to read, usually inaccurate and tend to miss out important information. Electronic logs keep a track of all parameters for every shot as recorded by the instrument. They can be loaded automatically into the data management system and the live channels actually used by the system can be checked against the channels planned for each shot in the database. This is obviously a computer intensive task for a 1000 shot per day crew, shooting into 1000 or more live channels per shot, over 10 active lines. It is impossible to do this on paper in areas where complex shot offsets and non standard spreads are used, especially during the roll-on and roll-off stages of a survey, but can be handled effectively by a data management system.

Other problems that can occur are missing or duplicate file numbers. Each shot that is taken is allocated a unique file number on the recording medium by the acquisition system. Sometimes, if the system develops a temporary fault these numbers can skip or be reset. If this problem is not detected in the field then more lost time can be expected during data processing looking for files that may or may not exist on the data tapes. Part of a good data management systems suite of QC checks is to look for duplicate or missing file numbers both on a day by day basis and on a project basis. Any discrepancies found can then be resolved in the field and reported to the data processing centre before they have to find them themselves.

Additional data can also be analysed by the system. Modern quality control software enables the collection of vibrator output data such as the ground force, phase error between the pilot and ground force signal and harmonic distortion generated by every vibrator for every shot. These data can be analysed to check for out of specification equipment or spot other factors affecting poor performance. It has been proven in some desert areas that vibrator average phase is directly related to ground surface conditions. The magnitude of the phase error can be colour coded and posted over a near surface geology map on the data management system to see if a correlation between the two attributes is present.

Once all the data are present and correct it can be transferred with the data tapes to the in-field processing computer or the processing centre. The SEG standard for 3D support data is the SPS (Shell Processing Support) format. Data can be sent in this format (or any free format) to describe which shots on which tapes, fired into which receivers, at what locations and on which lines.

Collecting data for the sake of it is of limited use. The power of a flexible database comes into its own when the data is analysed and trends or patterns between related attributes are determined. Analysis of the imported electronic observer logs can yield cycle times for each shot for production planning and values for detours, tape changes, equipment tests or down time and the like.

From dynamite surveys, the analysis of uphole time data against shot hole depth and charge depth can yield information about the accuracy of the charge depth data from the drillers and loaders, and the near surface velocity of the weathered material.

Analysis of signal and noise levels in the data using Quantified Quality Assurance (QQA) processing techniques can be correlated against vibrator force output measurements, to statistically check if an increase in power really is affecting the data at target.

Future Requirements

The future holds a lot in store for data management systems; they will be used to further enhance the planning stage of the survey both for the client and the service company. Information Management Systems will be available to both the client and service company so that ideas and designs can be tested, checked and approved quickly and easily.

Permit data will be stored in the data base. This has implications for the scheduling and the peg locations and so naturally belongs in a database form. Shooting scripts will be generated only after a thorough permit check to ensure compliance with known restrictions.

Enhanced attribute analysis features will allow complex but quick analysis of all attributes in the system to spot trends and generate statistical information that will help with the processing of the current job or the bidding of future work in the same area.

Better financial planning will be a part of such systems. The data will be used to optimise the survey design further in these times of reduced budgets and subsequent efficiency drives.

Conclusion

Attempting 3D land seismic surveys today without an Information Management System is not to be recommended. Such a system can significantly aid in the planning and QC of all data acquired, speed up the entire turn around cycle for the data and ensure that no points get lost or misplaced along the way. The system can also yield accurate statistics on how the job was conducted and give indications for how to plan for future work.

Acknowledgements

The author would like to acknowledge Schlumberger Geco-Prakla for providing Figures 1 through 6 and SANTOS Ltd for Figure 7 which were produced using the Geco-Prakla Olympus - IMS software.

See p. 26 for Figures 6 & 7.

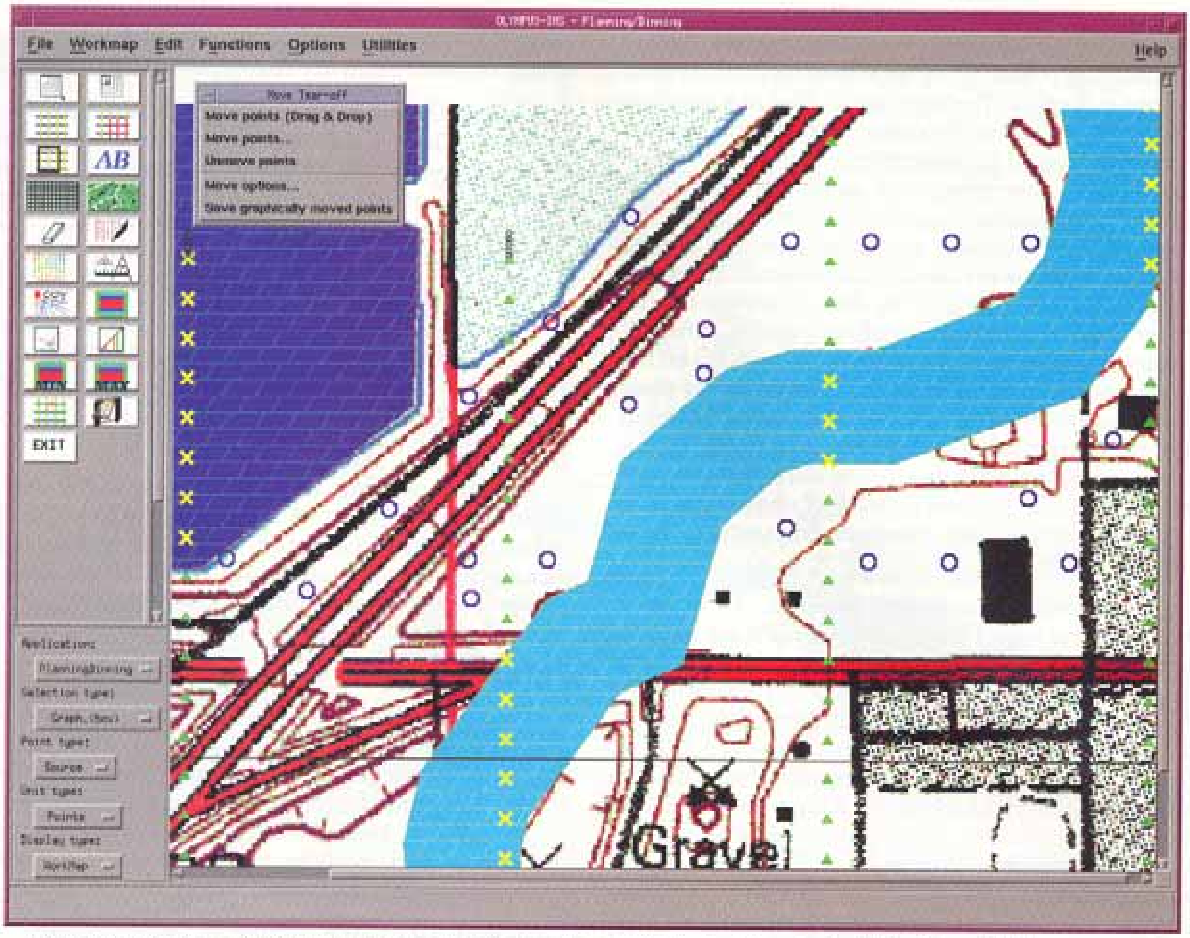


Figure 6. Indication of how source points may be moved to avoid obstructions indicated by the exclusion zones and the topographic features of the area.

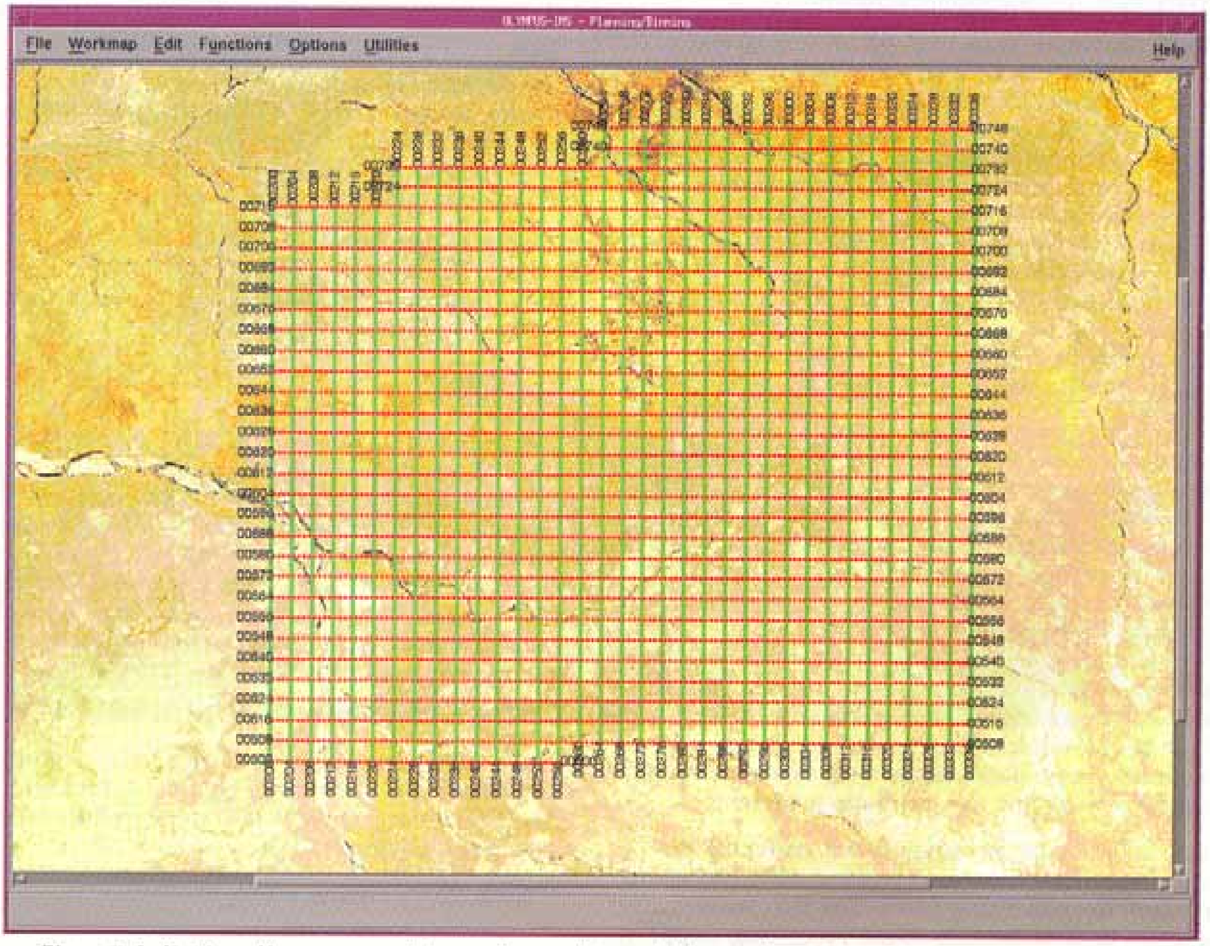


Figure 7. Indication of how source points may be moved to avoid obstructions indicated by the exclusion zones and the topographic features of the area.

Geophysics Courses in South East Asian Tertiary Institutions - A Survey

R J Henderson
General Manager, Geo Instruments Pty Ltd, Sydney, Australia

An article in the Asian Journal of Mining September/ October 1995 (Ghose 1995), titled "Training and Education of Mining Engineers in Developing Countries in Asia"# caused me to think that something similar on geophysical education in the region would be of interest to members of our society. It may also have some uses such as in gauging the likely attendance from these countries at our conferences or helping members posted to the region to know what standard of knowledge they might expect from locally trained geophysicists.

The bibliography of the above paper included an article by Dr M Katz of the University of NSW Key Centre for Mines, who gave me a copy of another publication listed in the bibliography of Ghose. This book titled "University Training Programs for Minerals and Energy in the Asia / Pacific Region" (McDivitt, 1993) tabulates the fields of study in each institution it surveys and while geophysical engineering (applied geophysics) was one of the categories included in its list of fields of study, in none of the eight South-East Asian countries that I will deal with did it give any information on geophysics. This is to be expected somewhat as the book was concentrating on those institutes teaching mining engineering. It did, however, give me some addresses of institutes to include in my compilation.

The remainder of the institutes in my survey were mainly derived either from personal knowledge or through contacts with key academics and other acquaintances in particular countries. In some cases respondents provided other addresses.

From my personal experience, the standard of geophysical learning in such countries as Japan and China* is quite high but that of our closer neighbouring countries is not so clear. By writing to all known institutions and some key academic contacts in PNG, Indonesia, Singapore, Malaysia, Thailand, Vietnam, Hong Kong and the Philippines, I received information that has enabled me to make a compilation that, to my knowledge, has not been published elsewhere.

In all, twenty-four individuals or institutions were written to and responses were received from all except three Full details of all those contacted are given in Appendix 1. In all but one, replies were in the form of a letter or facsimile. The exception was from Dr Lee of U.S.M. Malaysia who included a 57 page photocopy of the relevant handbook which provided detailed outlines of the course contents (see Appendix 2). Detailed contents of courses were also described in replies from: Universiti Malaya (see Appendix 3); Prince of Songkla University, Thailand (see Appendix 4); N.I.G.S.; Adamson University; and Mapua Institute of Technology, Philippines and by Dr Untung on the institutes in Indonesia. The remainder are as given in Table 1.

The National University of Singapore, Department of Physics and the University of Hong Kong, Department of Geography and Geology advised that they do not teach any geophysics. Should any readers wish to see the actual replies received, they may contact me.

There is always a danger in such a survey that vital information has been missed or left out. I would be pleased to hear from anyone that has knowledge that would add to my information.

References

Ghose, A.K. (1995). 'Training and education of mining engineers in developing countries in Asia.' Asian Journal of Mining, September / October 1995, 31-35

McDivitt, J.F. (1993). 'University Training Programs for Minerals and Energy in the Asia / Pacific Region.' Minerals and Energy Forum. PECC. 188pp.

Bibliography

Santoso, D., Hendrajaya, L. and Untung, M., 1996. 'Geophysical Education in Indonesia'. The Leading Edge, April 1996 p.277-8.

For Table 1 see p. 30
For Appendix 1 see p.29
For Appendix 4 see p. 32

Appendix 2

Details of Courses in Geophysics offered at Universiti Sains Malaysia – School of Physics

ZGT 366/3 Solid Earth Geophysics I

Earthquakes, what and where. Properties of elastic wave propagation. Knott's and Zoeppritz's equations. Seismic waves at distances of 1-10°, 10-30°, >103°. Travel time tables and the IASPEI 91 velocity model. Recording systems, instrument frequency properties and seismometry. Strong motion analysis.

Structure and composition of the crust, mantle and core: crust, Mohorovicic discontinuity, mantle, transition zone and core. Earth rheology: effect of stress, mantle viscosity, shock wave experiments. Thermal history of the earth: submarine and terrestrial heat flow, temperature distribution. Geochronology: radioactivity, age determination methods such as Rb-Sr, K-Ar, U, Th-Pb, Pb and Carbon-14 methods.

Prerequisite: (S) ZGT 262/4 Geology II

 # which, incidentally, concluded that given the potential for mining in the region, the training and education of mining engineers needed to be upgraded.

** McDivitt (1993), for example, lists 76 institutions in China.*

ZGT 367/3 Solid Earth Geophysics II

The earth and the solar system, Kepler's laws, sunspots, solar flares, prominences, photosphere, chromosphere, corona. Fundamentals of potential field theory. Rotation, gravity field and shape of the earth. Principles of isostasy. Earth tides. Geomagnetism, secular and diurnal variations, dynamo theory, paleomagnetism, rock magnetism.

Prerequisite: (S) ZGT 262/4 Geology II

ZGT 368/3 Exploration Geophysics I

Introduction to seismic methods: seismic waves, reflection, refraction, diffraction. Geophones, hydrophones, energy sources, recording equipment. Position-fixing methods. Seismic reflection method: data acquisition on land and offshore, data reduction, processing, velocity determination, interpretation, applications. Seismic refraction method: data acquisition, reduction, processing, interpretations, applications.

Prerequisite: (S) ZGT 366/3 Solid Earth Geophysics I

ZGT 369/3 Exploration Geophysics II

Theory and practice of potential field methods for geophysical exploration, including the gravity method, the magnetic method and electrical methods. For each method details covered include a description of equipment used, field procedures, nature of data acquired, methods of data processing and interpretation and applications.

Prerequisite: (C) ZGT 367/3 Solid Earth Geophysics II

ZGT 393/2 Geophysics Practicals I

Experiments in geophysics.

Prerequisite: (S) ZGT 290/2 Geology Practicals.

ZGT 394/2 Geophysics Practicals II

Experiments in geophysics and Geophysical Field Camp.

Prerequisite: (S) ZGT 393/2 Geophysics Practicals I.

ZGT 493/4 Advanced Geophysics Practicals (Project)

Advanced practicals in geophysics or related fields.

Prerequisite: (S) ZGT 394/2 Geophysics Practicals II.

ZGE 471/3 Potential Field Interpretation

Interpretation of gravity and magnetic data: 2-dimensional and 3-dimensional models. Kernal function in resistivity sounding; modelling, inversion and interpretation. Introduction to non-linear optimization methods, linear inversion, generalized inverse method.

Other optimization methods: simplex, least squares and steepest descent.

Prerequisite: (S) ZGT 369/3 Exploration Geophysics II

ZGE 473/4 Seismic Data Processing

Basic mathematics for Fourier Transform. Aliasing and phase considerations. Operations in the time domain and frequency domain. Preprocessing. Main processing sequence. Velocity analysis. Factors that influence velocity. NMO. Dipping cases. DMO. Velocity spectrum.

Deconvolution. Convolution model. Inverse filtering. Minimum phase. Optimum-Wiener filters. Predictive deconvolution. Migration in space and time: Kirchhoff, finite-difference and frequency-wavenumber. Introduction to partial migration before stack.

Land and sea acquisition geometry. 3-D seismic data processing. Radon transform and taup processing. Hilbert transform and complex trace analysis. AVO.

Prerequisite: (S) ZGT 368/3 Exploration Geophysics I.

ZGE 475/3 Selected Topics in Geophysics

Topics discussed to be selected from the following:
Seismic stratigraphy; direct detection of hydrocarbons.
Advanced seismology.
Borehole logging and its interpretation.
Electromagnetic methods; magnetotelluric sounding.
Environmental geoscience.

Other advanced topics may be introduced from time to time in response to student and staff interests and current needs.

Prerequisite: (S) ZGT 368/3 Exploration Geophysics I (S) ZGT 369/3 Exploration Geophysics II.

Appendix 3

Details of Courses offered at Universiti Malaya ' Dept. of Geology

Geophysics in Applied Geology or Geology B.Sc. degree

COURSES	CONTENT	DEGREE	credit
SG2102 Geophysics	Introduction to gravity, magnetic and seismic method of exploration. Basic aspect of data collection, processing, analysis and interpretation	year 2 for Applied and Geology	2
SG2382 Geological Data Analysis	Quantitative methods of analyzing geological laboratory and field data. Computational and display methods using different programmes and statistical procedures. Includes interpretation of remote sensing images and short field visits. (note a part of geophysical work will be done here)	same	3
SG3121 Applied Geophysics	Theory and application of refraction, reflection and electrical method of exploration. Includes detail of data collection, data processing, analysis, modelling and interpretation. A few days of actual field data acquisition and followed by laboratory processing (reduction, modelling and interpretation).	Year 3 Applied	3
SG3192 Applied Geology Project	The project involves some 4 weeks of field mapping of a given area with applied geological aspect (note: those taking geophysical projects normally includes geophysical mapping/work using one or two of these equipments; gravity meter, magnetometer (total or vertical field), seismograph and resistivity meter) and lab studies.	Year 3 Applied	6

Geophysics in Applied Geology or Geology M.Sc. course work degree (probably starts in 1997/98)

Some geophysics courses or topics will be given in the proposed M.Sc. course work degrees.

Examples are:

Deep seismic exploration and Geophysical logging in the Petroleum M.Sc. Degree. Shallow geophysical method of surveying in the Engineering Geology M.Sc. Degree. Geophysical exploration for economic materials in the Economic M.Sc. Degree.

Appendix 1

Contact Details of Institutions

Institution and Address Details	Reply Received	Contact
1. Papua New Guinea		
a) Head. Dept. of Geology University of PNG PO Box 414 University Port Moresby Papua New Guinea Fax: 675 - 3260369	Yes	H.L. Davies - Professor & Head of Geology
b) Dept. of Mining Engineering University of Technology Private Mail Bag Lae Papua New Guinea Fax: 424067	Yes	Paul Iriogen -Lecturer - Applied Geology
2. Indonesia		
a) Bandung Institute of Technology (ITB) Bandung Indonesia		
b) University of Gajah Mada (UGM) Yogyakarta Indonesia	See adja-cent	Information fropm Dr Untung, Chairman of geophysical education committee of HAGI Jl Situ Batu 111/2 Bandung, 40265, Indonesia Fax: 22 301339
c) University of Indonesia (UI) Jakarta Indonesia		
d) University of Pajajaran Bandung Indonesia		
3. Malaysia		
a) School of Physics Universiti Sains Malaysia 11800 Minden Penang Malaysia Fax: 60 4 6579150	Yes	Dr C.Y. Lee Chairman - Geophysics Programme
b) Dept. of Geology Universiti Malaya 59100 Kuala Lumpur Malaysia Fax: 60 3 7566343	Yes	Dr Samsudin Hj Taib Lecturer in Geophysics
c) Dept. of Geology University Kebangsaan Malaysia 43600 UKM Bangi, Selangor Malaysia Fax:	No	Dr Hamzah Mohamad
4. Thailand		
a) Dept. of Geology, Faculty of Science Chulalongkorn University Bangkok 10330 Thailand Fax:	Yes	Dr Punya Charusiri
b) Dept. of Physics, Faculty of Science Prince of Songkla University PO Box 3 Khohong, Hatyaj, Thailand 90112 Fax: 66 74 212817	Yes	Dr Warawutti Lohawijarn Head of Department
Continued next Column		
From previous Column		
Dept. of Mining & Metallurgical Engineering Faculty of Engineering Prince of Songkla University PO Box 2 Khohong 90112, Hat Yai Thailand Fax:	Yes	Asst Prof. Dr. Danupon Ponnayopas Responsible of Engineering Geology Course, Dept. of Mining & Metal-lurgical Engineering
c) Dept. of Geological Sciences Faculty of Science Chiang Mai University Chiang Mai, 50200 Thailand Fax: 66 53 892261	Yes	P. Asnachinda Head of the Department
d) Institute of Res. Technology Suranaree Univ. of Tech. 111 University Avenue, Muang District Nakhon Ratchasima 30000 Thailand Fax: 66 44 256376, 254843	Yes	Dr Chongpan Chonglakmani Head, School of Geotechnology
e) Dept. of Geotechnology Faculty of Technology Khon Kaen University Khon Kaen, 40002 Thailand Fax:	Yes	Mr Winit Youngme Head, Geotechnology Dept.
5. Philippines		
a) National Inst. of Geol. Sciences College of Science University of the Philippines Diliman, Quezon City, 1101 Philippines Fax: 63 976061 (86 Harvard Street, Cubao, Quezon City, Philippines)	Yes Yes	Carla B. Dimalanta Instructor in Geophysics Ernesto P. Sonido Retired Professor
b) Adamson University 900 San Marcelino Street Ermita, Manila Philippines Fax:	Yes	Maximo T. Maturan Chairman Mining, Geology & Ceramic Eng. Dept.
c) Office of the Dean School of Mining, Geology & Metallurgy Mapua Institute of Technology Manila Philippines Fax:	Yes	Gil G. Cardiel Instructor School of Mining Geology & Metallurgical Engineering
6. Vietnam		
a) Hanoi (Technical) University of Mining & Geology (HUMG)	Yes	Information from Dr Tang Muoi, Geophysical Society of Vietnam
b) Hanoi University for Natural Sciences (HUNS)	Yes	Information from Dr Tang Muoi, Geophysical Society of Vietnam
c) University of Ho Chi Minh City (UHCMC)	Yes	Information from Dr Tang Muoi, Geophysical Society of Vietnam
7. Hong Kong		
a) Dept. of Earth Sciences University of Hong Kong Pokfulam Road Hong Kong Fax: 852 2517 6912	Yes	Lung S. Chan Lecturer in Geophysics

TABLE 1
SUMMARY OF GEOPHYSICS COURSES OFFERED

INSTITUTE[1]	TITLE/CONTENT	LEVEL	HRS/YR	REMARKS
Papua New Guinea				
University of Technology, Lae -Dept. of Mining Engineering	Mining Engineering Degree emphasis on mineral exploration and site investigation	3rd year	6	
Indonesia				
Bandung Institute of Technology (ITB) -Dept. of Geology*	Geophysical Engineering Program Exploration geophysics	1st degree - 4 yrs Masters-some course work Doctorate	36 2 yrs 3-5 yrs	100 students in 1995 20 in 1995 3 in 1995
-Dept. of Meteorology* and Geophysics	solid earth	1st degree and post grad.		100 students in 1995
-Dept. of Physics * to be merged in 1996 under Faculty of Mineral Technology	physics of earth	post grad.		
University of Gajah Mada (UGM) -Dept. of Physics	geophysics (strong in volcanology)	undergrad post grad	-	20 students in 1995
University of Indonesia (UI) -Department of Physics	mainly hydrocarbon, some earthquake seismology			
University of Pajajaran -Dept. of Physics -Dept. of Geology	applied geophysics applied geophysics	undergrad. undergrad.	3 yrs 3 yrs	
Malaysia				
Universiti Sains Malaysia -School of Physics	B. Applied Science with honours - geophysics -solid earth geophysics -expln. Geophysics -geophysics practicals (see details in Appendix 2)	3rd year		One Professor and 7 Assoc. Prof. indicate geophysics as their specialty. Three including the Professor are global.
Universiti Malaya -Dept. of Geology	B.Sc. in Applied Geology or Geology M.Sc. in Applied Geology or Geology (see details in Appendix 3)	2nd & 3rd year	38	12% of degree Starting in 1997/98
Thailand				
Chulalongkorn University -Dept. of Geology	B.Sc. in Geology 'Major geophysics course' 'Advanced geophysics course' airborne geophysics and gravity	3rd year 4th year "higher level" mineral exploration	36	Started in 1972 Compulsory
	Note: This respondent claimed that similar courses were offered at the Uni. of Khon Khaen & Songkla Chiang Mai.			
Prince of Songkla University Faculty of Science -Dept. of Physics	B.Sc. (physics) M.Sc. (physics) M.Sc. (geophysics) (see details in Appendix 4)			selective since 1978 since 1992 starting 1997
Faculty of Engineering -Dept. of Mining & Metallurgical Engineering	B.Eng in Engineering Geology geophysics for site investigations	2nd year	3 hrs	Continued next page

[1] for full contact details see Appendix 1

INSTITUTE[1]	TITLE/CONTENT	LEVEL	HRS/YR	REMARKS
Thailand (cont'd)				
Chiang Mai University Faculty of Science -Dept. of Geological Sciences	exploration geophysics	3rd year	30 hrs lectures 45 hrs practical	
	M.Sc. in Applied Geophysics -all methods	graduate	30 hrs lectures 45 hrs practical	
Suranaree Univ. Technology -School of Geotechnology	Geophysical Exploration	undergrad.	40 hrs	
Khon Kaen University Faculty of Technology -Dept. of Geotechnology	Geophysical Expln. (all methods) Engineering Geophysics (seismic, resistivity, well-logging)	undergrad. undergrad.	42 hrs	All relevant text books All relevant text books
Philippines				
University of the Philippines -National Institute of Geological Sciences (NIGS)	B.S. Geology Exploration geophysics (introductory)	undergrad.	48 hrs & 48 hrs lab	geophysics is taught in U. of Phil for 40 yrs, In N.I.G.S. for 30 yrs
	Geophysical exploration I (gravity & magnetics)	graduate	28 hrs & 3 hrs lab	
	Geophysical exploration II (refraction & reflection seismic)	graduate	28 hrs & 3 hrs lab	
	Geophysical exploration III (electrical and EM)	graduate	28 hrs & 3 hrs lab	
	Solid Earth Geoph. (seismology)	graduate	3 hrs	
	Geophysical Prospecting	graduate	2 hrs + 6 days field work	
Adamson University -Mining, Geology and Ceramic Engineering Department	Geochemistry and Geophysics Part II Geophysical Expln. (all methods)	under-graduate	2 hrs & 3 hrs practical per week	Pre-requisite: Principles of Geology
Mapua Institute of Technology -School of Mining Geology and Metallurgical Engineering	Geophysical Exploration Part II Geophysical Expl (all methods)	under-graduate	2 hrs & 3 hrs practical per week for 1 semester	Pre-requisite, Principles of Geology
Note: Cebu Institute of Technology and Mindanao State University are also said to offer	an introductory course at undergraduate level			
Vietnam				
Hanoi (Technical) University of Mining & Geology (HUMG)	Introduction to geophysics		30 hrs	
	Field theory		60 hrs	
	Radioactive Expln. (sic)		60 hrs	
	Electrical Expln.		75 hrs	
	Seismic Expln.		120 hrs	
	Well logging		120 hrs	
	Magnetic Expln.		60 hrs	
	Gravimetric Expln.		60 hrs	
	Geophysical Devices		45 hrs	
Hanoi University for Natural Sciences (HUNS)	Gravimetric Expln.		45 hrs	
	Magnetic Expln.		45 hrs	
	Electrical Expln.		60 hrs	
	Seismic Expln.		50 hrs	
	Well logging		40 hrs	
University of Ho Chi Minh City (UHCMC)	Gravimetric Expln.		45 hrs	
	Magnetic Expln.		45 hrs	
	Electrical Expln.		60 hrs	
	Seismic Expln.		50 hrs	
	Well logging		40 hrs	
Hong Kong				
University of Hong Kong Dept. of Earth Sciences	Global geophysics	2nd year core course	36 hrs	
	Applied geophysics (all methods)	3rd year elective	24 hrs & 36 lab	Text: Kearey & Brooks 1991

[1] for full contact details see Appendix 1

Appendix 4

Details of Courses offered at Prince of Songkla University-Dept of Physics

For B.Sc. (physics) who are interested to do senior project in geophysics, there are 4 courses available, namely: 1) Exploration Geophysics I (2 Cr.); 2) Exploration Geophysics II (3 Cr.); 3) Practical Work in Exploration Geophysics (2 Cr.); 4) Physics of the Earth (3 Cr.). In addition, students are recommended to sit in a general geology course which is lectured by staffs of the Mining Engineering and Metallurgy Department, Faculty of Engineering.

Note: 1 Cr. of lecture is equivalent to 1 hr of lecture/wk for a period of 15 week (1 semester). 1 Cr. of practical/laboratory work is equivalent to 2-3 hr of practical work/wk

For M.Sc. (physics) students who are interest to do his/her thesis work in geophysics, there are 9 selective courses in geophysics available but physics students will take only 10 Cr. which are associated with his/her thesis work from the following lists: 1) Geophysics I [3 Cr.]; 2) Geophysics II [3 Cr.]; 3) Field Theory [1 Cr.]; 4) Rock Magnetism and Palaeomagnetism [3 Cr.]; 5) Gravity and Magnetics [3 Cr]; 6) Introduction to Seismology [3 Cr.]; 7) Geoelectrics and Well-logging [3 Cr.]; 8) Seismics [3 Cr.]; 9) Physics of the Earth [3]; 10) Special Topics in Geophysics I [3 Cr.]; 11) Special Topics in Geophysics II [3 Cr.].

For planned M.Sc. (Geophysics) in 1997, students will take the following compulsory courses: 1) Physics of the Earth [3 Cr.]; 2) Gravity and Magnetics [3 Cr.]; 3) Geoelectrics [2 Cr.]; 4) Seismics [3 Cr.]; 5) Rock Properties and Geophysical Well Logging [1 Cr.]; 6) Field Work in Geophysics [2 Cr.]; 7) Geophysical Data Processing [2 Cr.]; 8) Airborne Method and Interpretation [1 Cr.]; 10) Seminar in Geophysics I [1 Cr.]; 11) Seminar in Geophysics II [1 Cr.] and 12 Thesis [15 Cr.]. For student who has a basic degree in Physics, they are required to take additional courses in Geology for Physicists I [3 Cr.] and Geology for Physicists [3 Cr.]. On other hand, Student who has a basic degree in Geology will be required to take additional courses in Geophysical Mathematics I [4 Cr.] and Geophysical Mathematics [2 Cr.].

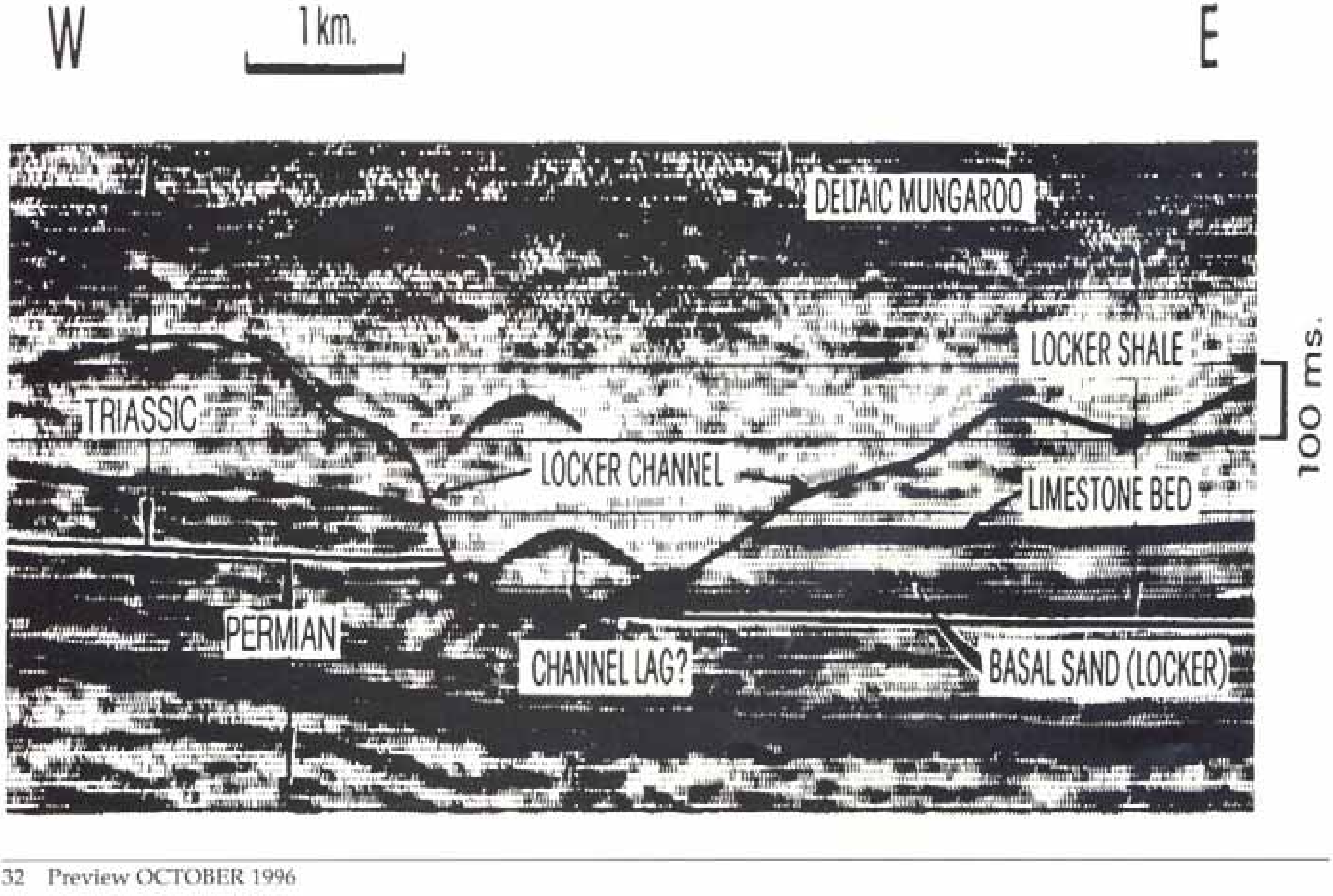
Seismic Window

with

Rob Kirk
BHP Petroleum

The following Example is taken from the Carnarvon Basin, Western Australia.

Carnarvon Basin, Western Australia - Triassic. Note slump induced (?) 600m+ deep canyon cut into Locker Shale. Were clastics transported down this conduit and where are they now - under Barrow Island? (See previous two Previews for other lines in this area).



News Briefs

Chile: Geophysics is alive and well in Chile. The Santiago geophysical group is meeting on 16 October '96 and will be addressed by none other than our own John Bishop. Our South American Correspondent, Terry Harvey will be reporting on the meeting and other activities in time for inclusion in the December issue.

Europe: Our Past President, Kathy Hill has surfaced in England and has agreed to watch the European geophysical scene for us from there. We hope to hear from her soon. Kathy is in England with husband Kevin (on his sabbatical) and children and will take the opportunity to enjoy family life for a while.

Unipulse *(Continued from p.15)*

We were cloistered at the Mandurah Gates Resort with the threat that no one would be allowed to leave until a draft document was produced. The introductory session began with an overview by Chris Powell in his role as "floating facilitator". Background papers were presented by Norm Uren (university perspective), John McDonald (international perspective), Bob Smith (industry perspective) and Stewart Greenhalgh (ARC funding). Then we divided into four groups for discussion, supported by a mix of technologies from butcher's paper to laptop computers. Each discussion period was followed by a plenary session, where areas of consensus and disagreement were identified. In addition to the scheduled sessions, meal times were used for informal discussion and networking - no such thing as a free lunch (or breakfast or dinner for that matter).

The first day was devoted to defining the problem(s) and the second to outlining possible solutions. Discussions ranged over a variety of topics, but could easily have been hijacked at the outset by the definition of exploration geophysics, its relationship to geophysics in general, and solid earth geophysics in particular. Some of the major problems included under-performance in obtaining ARC grants, the lack of a critical mass of geophysicists in most places, the paucity of geophysicists in influential positions, failure to attract the best students and the problems associated with high costs and low student numbers. A new threat identified was the current government budget cutbacks coupled with the economic rationalists in university administrations. Other topics concerned the use of outdated equipment ("the best that money can't fix"), the plight of the sole geophysicist in an earth science department, and improving the image of geophysicists

It was pointed out that the original brief for the meeting to design "A Strategy to Make Exploration Geophysics Viable by the 21st Century" could be seen as an admission that exploration geophysics in Australia was in decline. Concentration on ARC grant figures may be misleading without including other funding sources. A more positive vision was sought - one of Australia as a world leader in geophysics some 10 to 15 years hence. It was generally acknowledged that Key Centres and Special Research Centres in geophysics were needed. Given the importance of geophysics to exploration and to the Australian economy I, for one, would like to see more of the wealth channelled back into geophysics education and research.

On industry perceptions, Mike Asten produced the results of a survey of mineral exploration companies, literally hot off the press, with responses being faxed to the meeting. The issues of needs versus hobbies in research were raised, as were the concepts of education versus training. It was generally accepted that both academia and industry would benefit from exchange of staff. One point that kept being reiterated was the importance of communication and that the meeting itself was a step in the right direction.

Given the integration of geophysics into the exploration industry, it was recognised that all geologists need to know a little geophysics to be effective, and should be included in the education process. On the question of numbers of exploration geophysicists, there was some consensus that present levels are sufficient. But, the suggestion was made that more professions, e.g. science teaching and the public service, would benefit from a geophysics education, as would the profile of geophysics in the community.

The third morning was used to coalesce and refine recommendations, with Barry Drummond steering the procedure from his laptop computer. Then armed with a rough draft of recommendations, it was time for delegates to return home. They left with a consensus that much had been achieved in a short time.

A preliminary draft of recommendations will be completed within two weeks of the meeting and circulated to attendees. An executive summary will be published in the December issue of Preview and a draft report will be prepared between December and February for discussion at a special session of the ASEG 12th Conference in Sydney on Wednesday February 26, and possibly the following day. Please address queries, comments or recommendations to Professor Chris Powell (cpowell@geol.uwa.edu.au).

PARTICIPANTS:

Prof. James Applegate (Uni. of Adelaide), Dr Mike Asten (BHP Research), Professor James Cull (Monash Uni.), Dr Mike Dentith (Uni. of WA), Dr Barry Drummond (AGSO), Mr Tom Eadie (Pasminco Expln.), Prof. Stewart Greenhalgh (Flinders Uni.), Dr Peter Hatherly (CSIRO Div. of Expln. & Mining), Dr Steven Hearn (Uni. of Qld./Digicon), Dr Richard Hillis (Uni. of Adelaide), Dr Leonie Jones (Uni. of Wollongong), Prof. Brian Kennett (ANU), Prof. James Macnae (Macquarie Uni.), Prof. Ian Mason (Uni of Sydney), Prof. John McDonald (Curtin Uni.), Professor Suzanne O'Reilly (Macquarie Uni.), Mr Derecke Palmer (Uni. of NSW), Prof. C. McA. Powell (Uni. of WA), Dr Michael Roach (Uni. of Tas.), Mr Nick Sheard (MIM Exploration), Prof. Fred Smith (La Trobe Uni.), Mr Bob Smith (CRA Exploration), Dr Brian Spies (CRC, Macquarie Uni.), A/Prof. Norm Uren (Curtin Uni.), Dr Keeva Vozoff (formerly Macquarie Uni.), Dr Adrian Williams (CSIRO Division of Petroleum Resources).

Australian Geoscience Council President's Quarterly Report September 1996

This report is presented from material provided by the Secretary of the Council, Mr. Geoff Wood on 10th October 1996. Space considerations have imposed the necessity for minor editing.

Following my election as President at AGC's Annual Meeting in June, I identified five issues as likely priorities for the incoming Committee: registration of geoscientists, funding cuts to geoscience research and education, development of marine science policy, school and community education and access, and the need to put issues to FASTS and monitor its performance. I can report progress on four of these issues.

Registration and Accreditation of Geoscientists

At its 1996 Annual Meeting, the Council affirmed that the issue of registration and accreditation of geoscientists should remain a priority. The new Executive is now developing plans for a major forum on geoscientist registration to be held within six months in either Adelaide or Melbourne.

The forum will seek to inform geoscientists about the broad range of issues related to professional registration, to work towards a common national registration scheme and to examine international reciprocity in registration.

AGC is also aware of the wider community's need for a common national professional standard which can be recognised by clients, employers, educators and government. This year, AGC will continue its national facilitating role on the registration issue by promoting discussion between the respective professional organisations so that registration can involve as many common features as possible.

Funding Cuts to Geoscience Research and Education

Under the Coalition Government's 1996 Budget, national geoscience development has been downgraded. Budget cuts to funding for universities are expected to bite deeply across many earth science departments. The new differential HECS charge, with its higher rate for science students, is a major blow which will serve to discourage promising people considering a science career. The HECS and university funding-cut decisions, in conjunction with reduced funds for pre-competitive R&D, will inevitably diminish Australia's global competitiveness in specialist geoscience services, and become a negative factor in assessments of our national attractiveness for exploration investment.

One bright spot for the geosciences in this year's budget was government's decision to retain a national marine geoscience mapping and research capability. Following sustained lobbying by key groups, including AGC, the Government decided to continue funding over the next two years to enable basic mapping by AGSO of the Australian Ocean Territory.

Marine Science Policy

In September, Science Minister McGauran announced the formation of an expert Working Group to assist development of Australia's National Marine Science and Technology Plan. AGC nominees are already contributing to the development of a draft FASTS marine science policy. It is hoped the draft policy will be available later this year for comment by AGC member societies.

FASTS Developments

AGC is a member of a national science federation representing 40,000 scientists - FASTS, the Federation of Australian Scientific and Technological Societies. Our FASTS membership enables geoscientists to maximise their access to and influence on national science decision-makers.

The government has recently announced that FASTS will be a member of the new Prime Minister's Science and Engineering Council (PMSEC). FASTS' participation in PMSEC will enhance AGC's opportunities to lobby government more effectively on issues of major concern to geoscientists.

New Executive Committee in Adelaide

Following the 1996 Annual Meeting, the AGC Executive Committee has moved to Adelaide for a period of two years. The new committee includes experienced geoscientists from industry, the universities and government.

Office bearers are:

President
Dr Geoff Hudson, Australian Mineral Foundation

Vice President
Dr Graham Taylor (AEG), CSIRO Minesite Rehabilitation

Past President
Professor Chris McA Powell, Department of Geology & Geophysics, University of Western Australia

Secretary
Mr Geoff Wood, AGSO

Treasurer
Dr. Clinton Foster, AGSO

Public Officer
Dr Gordon Burch

Executive members are:

Mr Andrew McCulloch, Mr Bill Shaw, Dr Richard Hillis, Mr Hamish Paterson, A/Prof Jim Jago, Dr John Cann, A/Prof Bob Bourman, Mr Andy McGee, Mr Don Cameron, Mr Jim Durrant.

Contribution by Perth-based Committee

I want to thank our Past President, Professor Chris Powell and all members of last year's committee for significant contributions to the work of developing geoscience in Australia.

Dr Geoff Hudson
President, Australian Geoscience Council
Tel: (08) 8379-0444, Fax:(08) 8379-4634

Membership

New Members

We welcome the following new members to the Society. Their details need to be added to the relevant State Branch databases.

Western Australia

Rod FOWLER
Newcrest Exploration
73 Dugan St.
Kalgoorlie WA 6430

Gregory CANT
Newcrest Mining Ltd
Level 2 Hyatt Centre
30 Terrace Road
East Perth WA 6004

Simon BARRETT
8 Copley Street
Bayswater WA 6053

Troy LANTZICE
334 kingsway
Landsdale WA 6065

Duncan COGSWELL
11Dugan Street
Kalgoorlie WA 6430
Tel: (090) 218 015
Fax: (090) 912 012

Neil DUNSFORD
RGC Exploration
PO Box 322
Victoria Park WA 6100
Tel: (09) 442 8100
Fax: (09) 442 8181
E-mail:
ndunford@rgc.com.au

New South Wales

Frank RENTON
16 Ilford Avenue
Buttaba NSW 2283

Bension SINGER
CRCAMET, E5A
Macquarie University
North Ryde NSW 2109

Alistair Mc MILLAN
3/268 Penshurst Street
Willoughby NSW 2068

Kristan REIMANN
21 Heights Cres.
Middle Cove NSW 2068

Kanglin LU
CRCAMET
School of Earth Sciences
MacquarieUniversity
North Ryde NSW 2109
Tel: (02) 9850 9282
Fax: (02) 9850 8366
E-mail:
klu@laurel.ocs.mq.edu.au

Jiuping CHEN
CRC, E5A
School of Earth Sciences
Maquarie University
North Ryde NSW 2109
Tel: (02) 9850 9280
Fax: (02) 9850 8366
E-mail:
jchen@laurel.ocs.mq.edu.au

Victoria

Andrew THOMPSON
4/1 McMaster Crt.
Toorak VIC 3142

Queensland

Peter ROWSTON
2/31 Taringa Pde.
Indooroopilly QLD 4068
Tel: (07) 3214 9164
Fax: (07) 3214 9155
E-mail: rouston@ibm.net

South Australia

Graham BUBNER
c/- Iron Duke
BHP Steel
PO Box 21
Whyalla SA 5600
Tel: (086) 404 740
Fax: (086) 404 727

Glen PALAMOUNTAIN
PO Box 3078
Rundle Mall SA 5000
Tel: (041) 222 2430

Trevor DHU
3/73 Churchill Road
Prospect SA 5082

International

Timothy LOGAN
Works Consultancy Services
Central Laboratories
Box 30845
Lower Hutt NZ

Esben AUKEN
Dept. of Geology and
Geotechnical Engineering
Technical University of
Denmark, Build. 204
DK-2800, Lyngby
DENMARK
Tel: +45 4525 2172
Fax: +45 4588 5935
E-mail:
iggsa@unidhp.uni-c.dk

Change of Address

The following changes need to be made to the relevant State Branch databases:

Queensland

Richard LANE
From: CRA Exploration
33 Commercial Road
Mounr Isa QLD 4825
To: 2 Kilroe Street
Milton QLD 4064

Victoria

Annette McILROY
From: 3A Glenelg Street
Mount Hawthorn
WA 6016
To: 54 Hulme Drive
Wangarrata
VIC 3677

Lisa VELLA
From: PO Box 471
Mount Magnet
WA 6638
To: C/- WMC Resources Ltd
GPO Box 860K
Melbourne VIC 3001

Maurice CRAIG
From: CSIRO
Bldg 180 Labs
DSTO
PO Box 1500
Salisbury SA 5108
To: PO Box 264
Clayton South
MDC VIC 3169
Tel: 61 3 9545 4600
Fax: 61 3 9561 6709

New South Wales

Bill ROBERTSON
From: CRA Exploration
33 Commercial Road
Mount Isa QLD 4825
To: North Limited
Cnr. Clarke & Alluvial Streets
Parkes NSW 2870

Kathleen OLIVER
From: 271 Welling Drive
Mt. Annam
To: ADI Ltd
Locked Bag 80
Lidcombe NSW 2141
Tel: (02) 9350 9279

Western Australia

Ian SIMON
From: CRA Exploration Pty Ltd
37 Belmont Avenue
Belmont WA 6104
To: 4 Northolt Street
Lesmurdie WA 6076
Tel.: (09) 291 7134
E-mail: ians@iinet.net.au

ACT

Anthony MEIXNER
From: 23 Wearing St.
Higgins ACT 2615

International

Terry CRABB
From: 4 Robertson Place
Marino SA 5049
To: 37 Golf Links Drive
Aurora, Ontario
CANADA L4G 3V4

George ASIAMAH
From: BHP Minerals Expln.
11 Kakramadu Road
East Cantoments
Accra GHANA
To: PO Box 18161
Airport - Accra
GHANA

Where are they?

Does anyone know the new address of the following members? Last known addresses are given below:

Stuart NIELSON
27 Alleyne Avenue
Nth Narrabeen NSW 2101

Rebecca DENNE
4/8 Munro Street
McMahons Point
NSW 2060

Sudhir PAUL
Flinders University
School of Earth Sciences
Bedford Park SA 5042

Angus GOODY
BHP Petroleum
120 Collins Street
Melbourne VIC 3000

Resignations

The following members have resigned from the society and their details need to be deleted from the relevant state branch databases.

GEOPHYSICS
Geological Survey of PNG
Private Mail Bag
Post Office
Port Moresby
PAPUA NEW GUINEA

Calendar of Events

November 10-15 1996
SEG Annual Meeting
Denver, USA
For further details:
SEG, Tulsa USA
Fax: 0011-1-918-493 2074

November 18-20 1996
Petroleum Network Education Conferences
1st Pacific Rim Conference on New and Emerging Technologies
For further details:
Philip C. Crouse and Associates Inc
Suite 440, 400N St. Paul
Dallas Texas 75201
USA
Phone 214 220 9091

November 27-29 1996
Nickel 96, Mineral to Market, Kalgoorlie WA
Sponsored by AusIMM, AIG and WASM
For further details:
G. Drew, C/- CRAE Pty Ltd
21 Wynyard Street
Belmont WA 6104

December 18-20 1996
33rd Annual Convention and Meeting on Geophysical Instrumentation at National Geophysical Research Institute, Hyderabad, India
For further details:
Dr. P. R. Reddy,
Hon Secretary
Indian Geophysical Union
NGRI Campus, Hyderabad
500 007 India

February 3-5 1997
Karlsruhe Workshop on Amplitude preserving Seismic Reflection Imaging co-sponsored by SEG at the Lufthansa Training Centre Seeheim Germany
For Further Details:
P. Hubral, Geophysical Institute
Karlsruhe, Germany
Fax: 49-721-71173
email: workshop@gpiwap1.physik.uni-karlsruhe.de

February 23-27 1997
12th ASEG Conference & Exhibition, Sydney Convention & Exhibition Centre, Australia
Sponsored by ASEG, SEG & PESA
For further details:
ASEG Conference Secretariat
Conference Action Pty Ltd
PO Box 1231
North Sydney NSW 2059
Australia
Tel: +61-2-9956 8333
Fax: +61-2-9956 5154
E-mail: geoins1@ibm.net

March 12-14 1997
The AusIMM Annual Conference
Ballarat VIC 3353
For further details:
Conference Secretary
R.M. Croggon, Univ. of Ballarat
PO Box 663
Ballarat VIC 3353
Tel: +61-53-279 113
Fax: +61-53-279 137

July 7-10 1997
Instanbul '97International Conference and Exposition
Instanbul, Turkey
Sponsored by SEG, Chmb. of Geoph. Engineers of Turkey and EAGE

September 14-18 1997
Exploration '97 4th Decennial
Toronto Canada
For further details:
CAMESE
101-345 Renfrew Drive
Markham Ontario
Canada
L3R 9S9
Tel: 0011-1-905 513 0046
Fax: 0011-1-905-513 1834
Email: 103214.545@compu-serve.com

If you wish to place your event in our Calendar contact Janine Cross at the ASEG Secretariat
411 Tooronga Road
Hawthorn East, VIC. 3123
AUSTRALIA
Tel: +61 3 9822 1399
Fax: +61 3 9822 1711

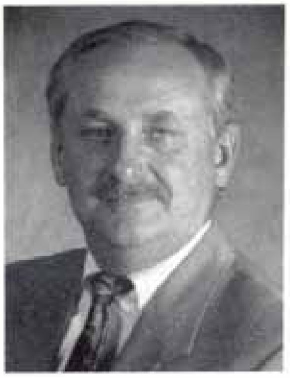
SEG News

Paul E. Hummel, Associate Director of Programs and Shared Services of the SEG has been named the organization's Deputy Executive Director. He will assume the leadership of the Society's Tulsa based Business Office in mid 1997 upon retirement of the current Executive Director, F. Don Stoddard.

Hummel's promotion, effective June 1, was announced by SEG's Executive Committee at its recent meeting in The Netherlands.

Hummel, a native of California, earned a bechelor's degree in geology (geophysics emphasis) from San Diego State University with the assistance of a scholarship from the SEG Foundation. He also had one year of graduate study in business management at the University of Oregon.

Hummel spent 21 years in the resource exploration industry befor joining the SEG Business office in 1994. Much of his career was spent outside the U.S. including assignments in London and Singapore and 11 years as Regional Manager in the Far East and Australia for Grant-Tensor Geophysical. He held a senior marketing position for Mercury International Technology and also worked for Ladd Petroleum, ARCO, and Western Geophysical.



Another major change is the appointment of Jack L. Ingram, CPA, as Associate Director for Administration and finance. This position has been vacant since the promotion of Stoddard to Executive Director in 1995.

Ingram received a bachelor's degree in business administration from the University of Kansas and a bachelor's degree in accounting from the University of Washington. He has more than 20 years of experience at all levels of management in finance and accounting. He also spent five years as an officer in the U. S. Army where his duties primarily involved background investigations for high level security clearances. Prior to joining the Business Office, Ingram operated his own accounting firm for 12 years.

Advertisers Index