Australian
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Preview

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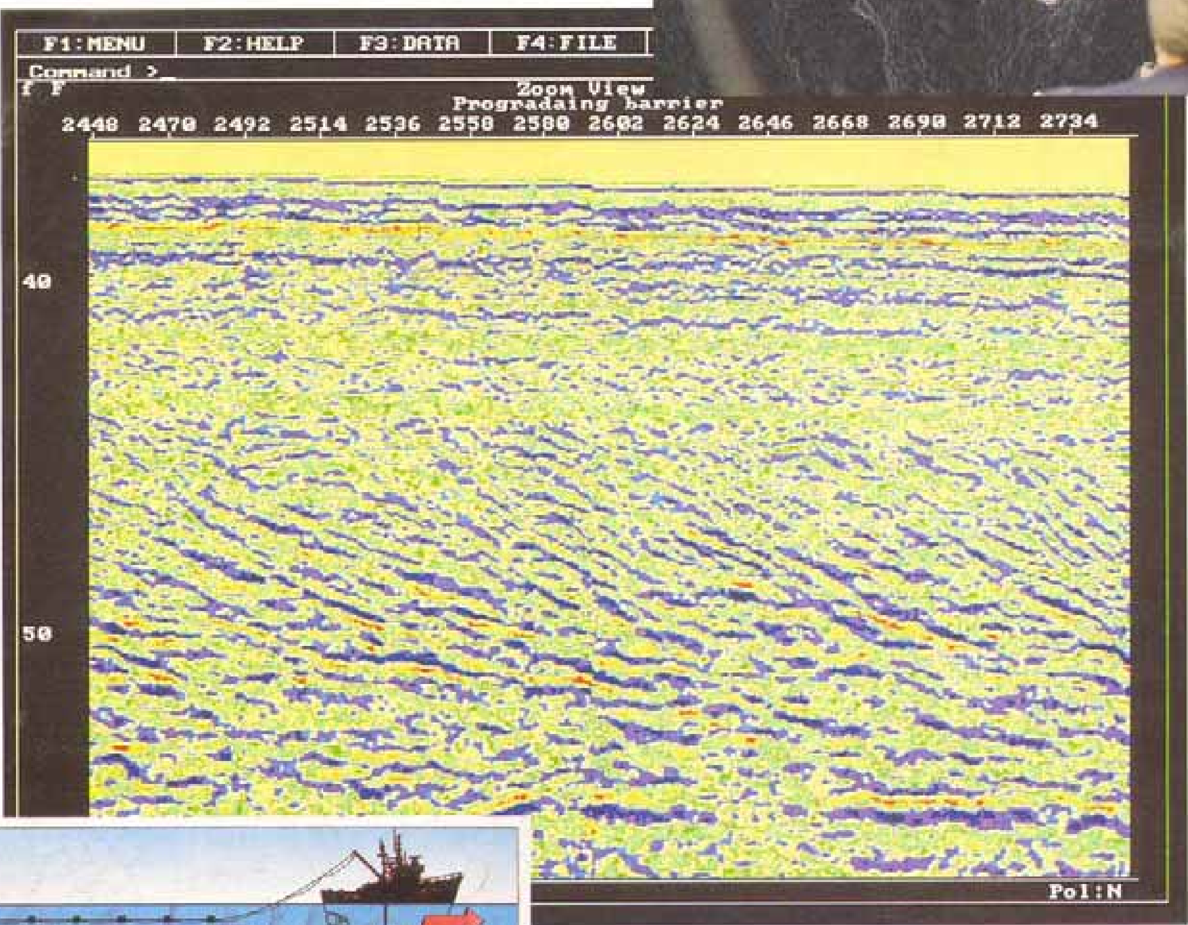
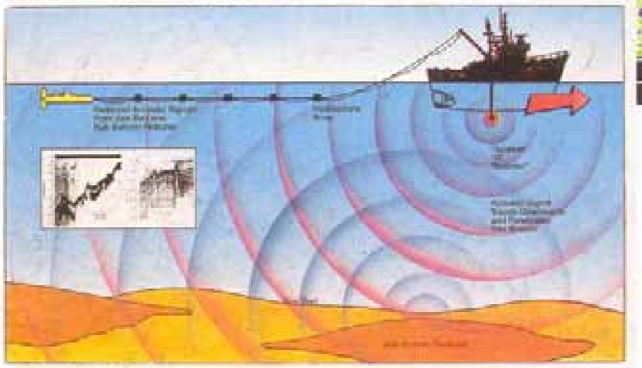
Special Feature:

High Resolution Marine Geophysics 20-26





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Editor's Desk

I approach the task of penning a few thoughts for the editorial, knowing this will be my last as Preview Editor, having started out keen and inexperienced on Issue #37 in April 1992 with the move of the ASEG Executive from Perth to Melbourne. Now 4 years and 24 issues later the Executive caravan will be moving along again, this time to Brisbane and taking Preview with it into the capable hands of Mike Shalley, well known mineral geophysicist now in semi-retirement. The lateness of this issue, for which I apologise, reflects in part the effort in handing over to a new Editor but mostly editorial "burn-out" on my part in an otherwise busy time for me.

Growing Preview from the firm base established by Anita Heath previous editor however, has been a challenging and rewarding past-time for me and I shall miss it. The standard and quality of Preview has been made possible by the constant support of all the ASEG Executive but notably Hugh Rutter, Kathy Hill, Mike Asten, Brenton Oke, Greg Blackburn, Greg Turner, Andrew Sutherland and Lindsay Thomas; and many others including Associate Editors Rob Kirk, Steve Mudge, Derecke Palmer and Leonie Jones;and semi-regular contributors like Roger Henderson and Joe Cucuzza. **Janine Cross** has carried out the typesetting work, battling Corel Ventura - **a special thanks Janine**. Jenkin Buxton Printers and Mark Littler Design have played an important part too.

Mostly though Preview belongs to the many contributors and advertisers who have ensured the content quality has been improving.

My personal thanks go to my family for perservering with the mess of draft layouts and the long after hours work that goes into creating a magazine like Preview.

Many ideas remain to be implemented for Preview and no doubt Mike will bring these to print including the possible move to a new Exploration Geophysics incorporating Preview and the regular refereed research papers starting late 1996 -early 1997 (see more details about this in the next Preview).

For this issue thanks go to Ian Browne for his excellent article on high resolution marine seismic. Behind this story is a tale (yet to be fully told) of Australian innovation in applying digital technology to marine sparker seismic.

The issue of registration which has been "imposed" on geophysicists, looms large in this edition of Preview (pp 5-11) however the implications are important enough to warrant your attention.

BRS continue a focus on petroleum data management (see POSC article in previous Preview) and there is more in coming issues. Finally Steve Mudge excels again with an "electrifying" demolition of the subject of 50 Hertz in mineral exploration!

Thank you all for all your support and please continue to support the ASEG publication efforts as we enter into the next exciting chapter for the Society.

Geoff Pettifer, Editor

President's Piece

Registration/ Accreditation of Geoscientists

There has been an increasing amount of debate over the last few months concerning the need and guidelines for registration of geoscientists. Australia is not alone in considering this issue. Registration is required under certain circumstances in 20 American states and 5 Canadian provinces and will be the topic of a major forum at the AAPG San Diego Conference in May.

Clearly this is an issue for our society at large and the opinions will be as diverse as that membership (as they are amongst the Federal Executive). To provide you with the opportunity to form a more informed opinion, we've invited the AGC to briefly review the AusIMM and AIG schemes and Mike Smith, an ASEG member representing the Australian Institute of Geoscientists, to present some arguments for registration. We plan to invite at least two ASEG members with different opinions to comment on registration in the near future.

In this introduction to the topic, I'll attempt to provide some background. Apparently the need for registration of Geoscientists was raised in the early 1970's following some alleged irresponsible behaviour of individuals concerning mining stock speculation (the longer standing members of the Society will no doubt be able to furnish anecdotes). In 1973 the GSA lobbied for a Commonwealth Bill (which was drafted but not passed) to register Geoscientists.

Registration / Accreditation of Geoscientists will probably be available through *at least* two organisations:

1) The Australian Institute of Mining and Metallurgy endorsed its Chartered Practicing Status (CPS) Scheme in January 1996. The current categories include:

- Geologist (CPGeol)
- Mining Engineer (CPMin)
- Metallurgist (CPMet)
- Environmental Scientist (CPEnv)

Features of the CPS Scheme include (this does not comprise a complete list):

- The intention is to allow registration in one category only, except in special circumstances and full fees will be required for each CP registration. Presumably Geophysicists are intended to register in the CPGeol category. This pigeonholing presents a problem, for example, for Geophysicists working in the environmental area.
- Additional fee of $75 over normal AusIMM membership fee
- Total of 7 years training and experience to attain eligibility to apply
- Code of Ethics breaches can lead to fines of up to $5000 and or expulsion
- Continuing professional development requirements totalling a minimum of 50 hours per year engaged in ongoing training through conferences, courses, reading and on the job training (subject to random audit)

2) The AIG proposal was released in September 1995 and the scheme will probably not be in place for the next year or so. It has the following categories (prefaced by Registered Professional Geoscientist in...), based more on areas of activity rather than skills/training base:

- Mining
- Mineral Exploration
- Coal
- Petroleum
- Geotechnical and Engineering
- Hydrogeology
- Environmental
- Specialist

Features of the proposal include similar requirements for AusIMM Registration but exclude fines. Fees for professional status have not as yet been set.

In addition a third Society, the Institute of Engineers Australia, provides for registration for the engineering or inter-disciplinary categories. Other societies, including PESA, are considering accreditation programs. The current federal executive of ASEG do not see professional registration as part of ASEG's role.

Why Registration?

I do not intend to go into an exhaustive review of the arguments that have been presented for registration but have commented briefly on the more common ones below:

Policing the profession

Repeated arguments have been made for registration by comparisons of the geosciences with the legal, engineering, architecture, accounting and the medical professions (all of which have professional registration as requirement to practice in *some but not all* areas of their fields). Often admission is associated with an internship or articling period somewhat analogous to the three or four years required of post -degree experience prior to applying for full membership to many professional societies, including our own.

The differences between those professions and the Geosciences are numerous and invalidate the analogy to some degree. These differences include:

1) poor or unethical practice is generally far easier to define in the other professions (e.g. bridges fall down if the civil engineer is incompetent or has allowed the use of inadequate materials; critical precedents not presented by a lawyer can demonstrate incompetent

representation; sponges left in bodies by surgeons etc etc) .

2) the consequences of poor or unethical practice are often life threatening in the other professions (with the exception of accounting - perhaps).

With respect to the practice of Geophysics, expulsion or fines (the only punishments with real teeth to them) arising from improper or inadequate work will be invoked rarely, if ever, because there will almost always be a wide range of solutions associated with the "underconstrained matrix" that constitutes a geoscientific assessment.

If a tribunal for example is elected to discipline the membership - I am compelled to ask - who "polices" the police?

Ensuring currency in knowledge

We could all name geophysicists and other scientists who are working with a "dated" theoretical base and are not familiar with recent literature, even that associated with their core discipline. Sometimes these individuals are too busy, too stubborn or too lazy to keep abreast. Quite often these same people also display an independence of thinking and an ability to challenge the latest vogue in the literature. The "transfer fault" and "eustacy correlations" theories spring to mind as historical examples of what could be called geoscientific bandwagons that lost some of their wheels after years of slavish application by a large constituency - including me.

Both the AIG and AusIMM propose an audit process, that compels members to report on what is arguably a quite prescriptive list of requirements to reassure some policing body that an individual is "continuously educating" themselves. I find this a very disturbing concept and an ineffective mechanism of measuring the intended parameter. Mike Smith of the AIG has acknowledged that this is a common criticism. In addition, it is surely an individual's prerogative to read what they want to and attend what conferences they believe are relevant and good value. I would dread to think that anyone went to an ASEG conference, for example, largely to comply with a continuing education requirement.

How is competence measured in any profession? By the education attained by the individual and the body of their work (either directly or through independent referral, if that work is proprietary). How is incompetence punished? Ultimately by the loss of reputation through poor referrals. The more important question for this debate is how does registration measure competence? How does it measure integrity?

Registration Mechanisms - Questions.

Who should be registered?

Clearly *universal* registration for all geoscientists is a nonsense. It comes down to one issue -protecting the public (including investing companies) in areas where exposure to fraudulent or incompetent work could damage their financial security (including their reputation) or physical health. If you accept that protection of our clients is the main goal there is no need for individual registration of research scientists or geoscientists employed by large companies and institutions, as they are carefully and thoroughly vetted throughout their career by their peers and superiors. In addition, if in the rare circumstance a fraud or incompetence case is found, those organisations are capable of absorbing the settlement or damages.

Thus registration should only be considered for those undertakings associated with investment or safety (if even for that) where the public may be inadequately protected for recovery, however rarely that may occur. That largely confines consideration of registration to the growing list of small to medium consultancies who may not be able to pay full recovery, should a case be brought against them.

If you accept that the primary goal of registration is the protection of the users of those services, the applicant for registration should be as carefully vetted by the registering body as a company or institution would vet them, for that registering organisation and its fellow members, by accrediting them, would bear ultimate liability for that member. In effect, it becomes a form of malpractice insurance organisation.

Some years ago, members of a Canadian bar association paid thousands of dollars per member to settle the affairs of an allegedly fraudulent barrister who left for a protracted holiday abroad and whose firm was unable to make good the loss to the injured party. Could the injured party recover from AusIMM if a similar situation occurred with an AusIMM member (for example)? Would all registered members have to contribute? This is the only real reason for registration - to provide some form of public liability insurance to customers.

"Voluntary" Registration?

Registration is only voluntary if you don't have to register to work in your preferred area and registration is not a requirement of any organisation who might employ you. As authoring a prospectus for submission to the ASC requires membership to the AusIMM it is, in effect, compulsory. If registration is a tender requirement it is compulsory. The discretion may only be who you register with if you want to work in these areas, not if you wish to register (if even that).

An analogous model might be public liability automobile insurance. It is mandatory if you drive among the public. However you can use a variety of approved insurers.

How many registering organisations?

We can consider the various societies offering registration or considering it as insurers. In Canada and most of the 20 States registration is provided by a monopoly. In my own experience in Alberta, as a member of the Alberta Association of Professional Geologists Geophysicists and Engineers (APEGGA), that monopoly arrangement meant that the organisation did not have to compete for my membership and I do not believe that I received good value for my membership fees. In addition the geoscientists were overwhelmed by the much larger engineering numbers and consequently "marginalised".

A balance must be struck between serving the interests of the registrant in his/her area of expertise and not having a proliferation of registering bodies which will confuse clients seeking the credentials of geoscientific consultants. Consistency in requirements between registering bodies is essential, and I believe AusIMM and AIG are working toward this.

How might we best protect the interests of those using our profession and thus our reputation?

Investors must accept that there are risks associated with resource exploration and assessment. Registration in a society only would indicate that certain base level requirements are met and does not indicate that the individual will provide you with an optimum product. The contract of consultancy should address product delivery. More explicit guidelines prepared individually or jointly by the registering bodies for prospectus preparation of data before they are accepted by the ASC (probability data associated with reserves or resource estimation for example) might better serve potential investors than insisting on a "registered" scientist signing off the prospectus.

I would like to make a final point about our profession. We often deal in a numerate analytical science but also many of us also deal in originality and imagination- some of us we share a greater kinship with architects than engineers. If a new exploration play is envisaged using geophysical techniques by someone who can't integrate "x", do we want to exclude them from our fraternity? I know of one highly valued imaginative, play generating, value-adding individual, still employed after multiple downsizings in Canada, who failed to qualify for professional registration to APEGGA. It would be a tragedy if individuals of like creativity were precluded from practice in Australia because we have been too narrow in our perspective of what constitutes a geophysicist.

Kathy Hill
ASEG President

Preview Advertising

Letter to the Editor

Dear Editor,

RE: Registration of Geoscientists in Australia

This issue of Preview contains an update on the Registered Professional Geoscientist (RPGeo) proposal of the Australian Institute of Geoscientists (AIG) which was distributed for comment to learned societies and AIG members in September 1995. The issue also contains a comparison by the Australian Geoscience Council (AGC) between the comparable systems of the AIG and AusIMM.

Members of the ASEG should be aware of the following two important developments:

a) AusIMM's Chartered Practising Status (CPS) was introduced on 1 January 1996, effectively ending debate over the merits of registration. The only relevant debate is "what sort of registration system do Australian geoscientists want?" AusIMM intends that members of the ASEG who practise in the mining industry should be covered by the AusIMM's "Geologist" category, (together with geochemists, structural geologists, mine geologists and other geoscientific practitioners).

b) The AIG has introduced a new Field of Practice entitled "Geophysics". This is in response to representations by officers of the ASEG and individual ASEG members. In addition Registered Professional Geoscientists under AIG's Scheme may elect to nominate "Geophysics" as their primary Field of Practice on the basis of 5 years experience in this field, and also nominate for another Field of Practice (such as mineral exploration, coal , petroleum, hydrogeology, engineering etc) on the basis of a further 3 years of experience in the second Field of Practice. There is no additional cost nor any additional Continuing Professional Development (CPD) obligation relating to nomination in a second Field of Practice. Actual experience as verified by the applicant's referees is the critical criterion for acceptance in both "geophysics" and a second desired field. This proposal is subject to ratification by the Council of AIG.

Yours sincerely,

M. Smith & C. Lane

Registration Subcommittee,
Australian Institute of Geoscientists

Preview Deadlines

April	March 29 1996
June	May 31 1996
August	July 26 1996
October	September 27 1996
December	November 22 1996

Registration - AGC Compares AusIMM and AIG Schemes

Self regulation of professionals is increasingly being considered the preferred option to direct legislation by government and is an important issue for the development of the geoscience profession in Australia. As with other professionals where registration already is in place, the objectives are the:

- establishment of minimum standards of professional conduct
- maintenance of standards of professional conduct, and
- enhancement of professional status and credibility.

The Australasian Institute of Mining and Metallurgy (AusIMM) and the Australian Institute of Geoscientists (AIG) have been progressing the concept of registration of their membership for a number of years and have to a considerable extent, modelled their approach on that of the Institution of Engineers Australia (IE Aust). IE Aust have established a system of registration, and have created a National Professional Engineers' Register that identified those engineers whose academic qualifications, training and experience, commitment to ethical conduct and continuing professional education development, are at standards achieving or exceeding the minimum appropriate for professional practice.

This commentary and the attached tabulation have been compiled by the Australian Geoscience Council (AGC) in order to raise awareness of the issues involved and to facilitate the adoption of standards and procedures for registration that have a high degree of commonality.

The current situation is that the AusIMM has announced that registration will be implemented for their Members from January this year, and a "Chartered Practicing Status Applicant's Handbook" is due for release late February. The requirements and procedures for registration have been compiled in consultation principally with their membership. The AIG released a "Proposal for the Registration of Geoscientists" in September 1995 which discussed the issues and made recommendations on registration requirements and procedures. This document was distributed to the AIG membership as well as all relevant learned and professional bodies in Australia, and geoscience professional bodies in the USA, Canada, UK and South Africa. Responses are currently being analysed.

The attached tabulations compare the requirements and procedures adopted by the AusIMM and proposed by the AIG for registration of geoscientists. Although there is a great deal of similarity between the proposals, there are several areas where differences occur, or where one group has no specific requirement.

These differences include:

- credit for years of postgraduate study
- number of referees
- publication of applicant's name for peer review prior to registration.
- fine for non-compliance

The AGC would like to promote discussion on these topics in particular with the objective of achieving greater compatibility. Your comments and suggestions to either your professional body, or the AGC directly would be welcomed.

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Registration of Geoscentists

GENERAL INFORMATION

	AusIMM	AIG (Proposal)
Title	Chartered Practising Geologist	Registered Professional Geoscientist
Post Nominals	(CP Geo)	(RP Geo)
Relevant Field of Practice	Geology Environmental Scientist	Mining/Mineral Exploration, Petroleum, Coal, Geotechnical and Engineering, Hydrology, Environmental, Other Specialist
Maximum Fields for registration	Normally 1	Normally 1
Prior Membership status	Member or Fellow	Member or Fellow
Formal qualification	As required for above	As required for above
Experience	5 years at a high standard of competence in field of practice	5 years in field of practice, 3 of these of a responsible nature involving the exercise of independent judgement
Experience Credit for years of Post Graduate study	No	x 0.5

	AusIMM	AIG (Proposal)
CPD requirement for initial acceptance	"Satisfactory level" over preceding 3 years	None specified
Initial Fee	$75	$100
Annual Fee in addition to membership	$75	$65
Referees (must be currently practising in appropriate Field or Practice)	4 (minimum 3 to be Registered, and at least 2 AusIMM CP GEO)	2 if already a Member /Fellow, 4 if not
Prior publication of applicants names for peer review	No	Yes
Publication of successful applicants	Yes	Yes

STANDARDS AND PROFESSIONAL CONDUCT

Ethics	AusIMM Member Code of Ethics	AIG Code of Ethics
Corrective action -		
- Inadvertent breach	Specific courses Mentor supervision Suspension Fine of $5000 Deregistration	Specific courses Mentor supervision Suspension
- Wilful breach	Confidential reprimand Public reprimand Suspension Fine of $5000 Deregistration Expulsion	Confidential reprimand Public reprimand Suspension Deregistration Expulsion

CONTINUING PROFESSIONAL DEVELOPMENT

	AusIMM	AIG (Proposal)
Annually	weighted 50 hours	weighted 50 hours
Unstructured	no more than 50%	no more than 50%
Averaged over	3 years	3 years
Registration in 2 categories	100 hours	70 hours (35 in each)
Random Annual Audits	up to 10%	Yes,%age not specified
Weighting		
- Conferences	x1	x1
- Short Courses	x2	x2
- Technical Meetings	x1	x1
- Reading Learned Publications	x 0.5	x 0.5
- "On the job" learning	x2-max 25% of requirement	x2-max 50% of requirement
- Formal education	x2	x2
- Conf/Course Prep	Presentation time x 10	Presentation time x 10
- Technical pubs (reviewed)	50 hours each	25 hours each
- Technical pubs (other)	40 hours each	20 hours each
- Distance learning -		
: Higher degree/grad dip	x2	x2
: Conf/workshops	x1	x1
: Private study	x 0.5	x 0.5
Higher Degree & Graduate Diploma	Equivalent to 3 years CPD	Equivalent to 3 years CPD

Registration of Geoscientists - AIG Viewpoint

The Australian Institute of Geoscientists (AIG) has been interested in advancing the subject of registration since 1991. Debate on the advantages and disadvantages of registration has been covered by publications of the AIG and the Australasian Institute of Mining and Metallurgy (AusIMM). This note does not revisit the fundamental debate, especially as the AusIMM has already introduced its Chartered Practising Status form of registration (effective from 1 January 1996) but it does provide a status report on the AIG's approach to registration.

AIG's goals in formulating a policy for self-regulation of geoscientists are:

- to provide voluntary registration for all eligible geoscientists
- to encourage high ethical standards in professional work
- to encourage geoscientists to maintain and enhance professional skills
- to provide affordable professional liability insurance
- to establish an open and uniform register of practitioners
- to ensure free movement of geoscientists between Australian states
- to facilitate international acceptance of Australian geoscientists
- to increase the status of geoscientists in the community at large
- to anticipate future legislation and eliminate the need for external control of our members.

We look forward to achieving these goals in the interests of all Australian geoscientists.

Introduction

In August 1994 a document entitled *Registration of Geoscientists Discussion Paper* was circulated to the members of the AIG. This provided a summary of the historical background to the registration issue, and contained a questionnaire seeking the opinions of the membership of the AIG on appropriate future action on registration. At that time the AIG also sought to make the wider geoscience community in Australia aware of the intentions of the AIG by presentations to the Australian Geoscience Council (AGC) which is the umbrella organisation for all earth science related professional and learned bodies in the country. Of the 273 questionnaires returned from the 1994 survey, 235 AIG members (86% of respondents) voted in favour of the creation of an additional category of membership entitled Registered Professional Geoscientist. Full details are presented in AIG News Number 38 October 1994.

In September 1995 the AIG circulated a second document titled *Proposal for the Registration of Geoscientists* presenting options and recommendations for various aspects of the registration issue. This text describes registration procedures already in place for other professional groups in Australia (lawyers, accountants, engineers, doctors and pharmacists) and also for other professional geoscientific bodies outside Australia (including those in USA, Canada, UK and Europe). A response form was supplied with the paper.

Multiple copies of this document were provided to the executive of the Australasian Institute of Mining and Metallurgy (AusIMM) being the other professional body involved in providing registration for a sector of the geoscientific community in Australia, viz. those involved in the mining industry. Multiple copies were also provided to the executives of the learned societies in Australia, including the ASEG and GSA. Individual copies were provided to members of the Executive Committee of the Australian Geoscience Council and to all members of the AIG. The response to this document is discussed in detail below.

Response to the September 1995 Proposal

Of the 199 comments received 181 respondents (91%) were in favour of the proposal and 18 were against the proposal. Clearly AIG had a mandate to proceed with refinement of the proposal to generate a final document for registration.

Comments were generally both constructive and positive. The greatest concerns focused on two areas of the proposal. *Fields of Practice* generated responses from 19% of the respondents who favoured the proposal and from 22% of the smaller group not supporting the proposal. *Continuing Professional Development (CPD)* was raised by 17% of respondents favouring registration and also by 17% of those against the proposal.

Fields of Practice

The main comments generally indicate that the proposed Fields of Practice:

- are too restrictive;
- do not provide for all geoscientists - additional fields were suggested
- placed limitations on geoscientists working in several fields; and
- should allow for the generalist as well as the specialist

These views have generated considerable debate among the Registration Subcommittee and several alternative proposals are under consideration.

Continuing Professional Development

There were a wide variety of comments on this issue, which can be broadly categorised as follows:

- Some respondents did not consider CPD to be necessary at all.
- It is difficult to attend seminars and conferences because of:

  -Remote location of work.

  -Budget constraints of individuals.

  -Budget constraints of smaller companies.
- The CPD requirements are too restrictive.
- The CPD requirements are too onerous and should entail less hours.
- Many other activities should be credited for CPD.
- Administration of CPD is impractical.

The most important single conclusion from the members' comments is that a provision for exemption is warranted for certain geoscientists (primarily those based in remote parts of Australia or working overseas).

General Concerns

The concept of registration triggered concerns that a voluntary system could be made compulsory some time in the future, that it could create two classes of geoscientists -an elite group and an under-privileged group, that it does nothing for people in remote locations and so on. Those with experience of the fragmentary registration processes operating in some states or provinces of the USA and Canada were particularly cautious. Respondents offered suggestions to change the proposed name Registered Professional Geoscientist in a number of ways, to change the recommended post-nominal (RPGeo) and to change the basis of acceptance (years of experience and number of referees). Overseas reciprocity was considered important, as was the level of clout of the ethics committee. It was suggested that fees for registration should kept as low as possible and also that fees should be significantly higher.

Appreciation

The Registration Subcommittee wishes to thank all those who submitted responses. There are far too many participants to reply to individually.

Consultation with AusIMM

For any professional group, a very desirable aspect of registration is the presentation of a coherent and consistent approach so that persons in government, in the investment community and also in the community at large, can have confidence in that registration. With this particular goal in mind, members of the AIG Registration Subcommittee have been meeting with representatives of the AusIMM to discuss various aspects of implementation of a registration process. There is now considerable similarity between the approaches of the two institutes, resulting primarily from the excellent prior work of the Institution of Engineers of Australia (IEAust). The IEAust's National Professional Engineers Register Number 3 (NPER-3) provided a positive basis for the establishment of a method of registration and the AIG has acknowledged the valuable contribution of the IEAust's initiatives. The AIG believes that differences between the AusIMM and the AIG can be reconciled so that the public perceives the approaches developed within the geoscientific community to be consistent and essentially equivalent.

At its Annual General Meeting in June 1995, the Australian Geoscience Council (AGC) adopted registration as its top priority for action in 1996. The aim of the AGC is to facilitate uniformity between registration processes adopted by any geoscientific groups. The AGC has recently made an independent assessment of the current proposals of the AIC and AusIMM which is published in this issue of Preview where readers can assess the similarities and differences (p 8 to 9).

It may not be possible to achieve absolute consistency between the two institutes because of the different constituencies represented. The AusIMM appears to be linking its Chartered Practising Status (CPS) with the *Competent Person* concept relating to specific codes for reporting to the Australian Stock Exchange and it seems doubtful that this is relevant for the majority of professional practising geoscientists. Nevertheless, the AIG certainly welcomes the role of the AGC in presenting an impartial review of the current positions and aspiring towards a consistent approach for presentation to the Australian public and to all interested international observers.

M.J. Smith, President AIG

C. Lane Registration Subcommittee

Preview - Next Issue

- *ASEG Membership Survey Results*
- *Advances in High Resolution Magnetics & Magneto-electrical surveys*
- *ASEG Executive & Preview moves to Brisbane*

Executive Brief

Welcome to the Executive Brief. This is the final edition prior to the Federal Executive moving to Brisbane following the 1996 AGM to be held at the Kelvin Club, Melbourne Place (off Russell Street), Melbourne on Tuesday 30 April 1996 at 6.00pm. The ASEG Nominations Committee has received and accepted the following nominations for the 1996/97 ASEG Federal Executive:

President:	Henk Van Paridon
First Vice President:	Steve Hearn
Second Vice President:	Wayne Stasinowsky
Secretary:	Robyn Scott
Treasurer:	Peter Fullager
Committee:	Noll Moriarty
	Koya Suto
	Andrew Mutton
	Peter Hatherley
	Mike Shalley

The Nominations Committee is seeking further nominations for the abovementioned positions. All nominations including details of and signed by the Nominator and Seconder should be sent to :

ASEG Secretariat
411 Tooronga Road
Hawthorn East VIC 3123
Ph: (03) 9822 1399
Fax: (03) 9822 1711

by 26 April 1996. Please note that consent of all nominated candiates must be included with the nomination.

A formal ballot will only be made if further nominations are received for the positions of President, Vice President's, Secretary or Treasurer.

Membership Statistics

At the close of business in 1995 their were 1303 members (751 active, 317 associate, 3 concessional, 30 corporate, 9 honorary, 185 student and 8 journal exchange).

1995 Financial Return

The Federal Executive is required to submit a 1995 Financial Return. The Treasurer urgently requires the cashbooks from all state branches to compile this return. Due to the late return of information from state branches for the 1994 Financial Return the Society has been fined a total of $250 with costs of $160 and the ASC threatening the ASEG with automatic degregistration on the basis there was no activity in the company. A fine, based on a reduction of the capitation share distributed to each state may be imposed on states who fail to submit their cashbooks by the end of March.

Financial Report

A brief but approximate summary of the status of the Federal accounts is as follows:

Account	March 1996	March 1995
Basic working account	$30,665.05	$59,225.49
Publications account (Adelaide)	(closed)	$35,181.36
Reserve Account	$62,351.00	$125,270.36
Sands Investment Account	$40,000.00	$40,000.00
Sands Working Account	$7,767.39	$4,700.86
Total Cash & Bank Accounts	**$140,773.44**	**$264,378.07**

The Adelaide Conference details have not been finalised, but a surplus of $130,000 is expected.

Greg Blackburn
ASEG Federal Secretary

ASEG Branch News

South Australia

We had our Branch AGM in February. Executive positions were filled unopposed and the steering committee attrition was replenished to maintain the same numbers. An impromptu quiz night compered (and rigged) by **Andy McGee's** table substituted for the guest speaker who did not materialise. **Grant Asser** pedalled at least 20km that night (on the Pianola) and we secretly filmed enough singing acts for a six month series of Red Faces.

The 1996 SA Branch committee comprises of:

		Phone	Fax
President:			
Mark Taylor	BORAL	(08) 235 3827	(08) 223 1851
Secretary:			
Samanda Bell	SANTOS	(08) 224 7703	(08) 224 7710
Treasurer:			
Grant Asser	SANTOS	(08) 224 7626	(08) 224 7145
Committee:			
Alan Appleton	MESA	(08) 274 7630	(08) 373 3269
Steve Busuttil	MIM	(08) 371 4533	(08) 371 4322
Terry Crabb	MESA	(08) 274 7619	(08) 373 3269
Andy Craddock	Western	(08) 234 5229	(08) 234 5876
Robin Gerdes	MESA	(08) 247 7682	(08) 373 3269
Neil Gibbins	SANTOS	(08) 224 7305	(08) 224 7710
Craig Gumley	SANTOS	(08) 224 7682	(08) 224 7710
Richard Hillis	Adelaide Uni	(08) 303 5377	(08) 303 4347
Rod Lovibond	BORAL	(08) 235 3762	(08) 223 1851
Andy McGee	SANTOS	(08) 224 7317	(08) 224 7710
Greg Pass	BORAL	(08) 235 3764	(08) 223 1851
Paul Walshe	BORAL	(08) 235 3779	(08) 223 1851

Our Wine subcommittee is reoffering the **ASEG 95 White Wine.** Order is direct from the St Hallett winery for delivery at your office or home (metro areas). St Hallett have a stock of 85 doz cases with ASEG labels not originally shipped by mistake. See this issue of preview for an order form. Wine is available at this price till ASEG stock is run down.

Samanda Bell, SA Secretary

Western Australia

During 1996, technical meetings will again be held at the Celtic Club, 48, Ord Street, West Perth, on the third Wednesday of each month (except of December's AGM on the 2nd Wednesday). Visitors to Perth, take note of these dates for your WA 1996 ASEG year: 17 April, 15 May, 19 June, 17 July, 21 August, 18 September, 16 October, 20 November and 11 December.

At each meeting, we provide free drinks and snacks from 6pm to 6.30pm before the start of each technical meeting; and, start the technical meeting promptly at 6.30pm.

For the last meeting, on 20 March 1996, our speakers were: **Chris Martin** who gave a talk entitled "How to process Data for maximum information yield" and **Mark Stevens** and **Sergei Shevchenko** from the Geological Survey of WA who talked about "Geophysical Surveying and Stratigraphic coring in the Savory/officer basin, WA.

The 1996 WA Branch committee comprises of:

		Phone	Fax
President:			
Graham Elliott		(09) 530 1230	(09) 530 1335
Vice President:			
Brian Evans	Curtin Uni	(09) 351 7092	(09) 351 3407
Secretary:			
Andre Lebel		(09) 298 8348	(09) 298 8348
Treasurer:			
Andrew Foley	Normandy Pos	(09) 480 3232	(09) 480 3230
Committee:			
David Abbott	Tesla-10	(09) 364 8444	(09) 364 6575
Jim Frazer	WA Petroleum	(09) 263 6400	(09) 263 6699
Bob Groves	World Geoscience	(09) 273 6400	(09) 273 6466
Anita Heath	WMC Petroleum	(09) 367 3827	(09) 442 2077
David Howard	GSWA	(09) 222 3699	(09) 222 3069
Paul Jelley	WA Petroleum	(09) 263 6566	(09) 263 6699
Denis Macneall	Kevron	(09) 417 3188	(09) 417 3558
Greg Street	World Geoscience	(09) 273 6400	(09) 383 7166

Andree Lebel, WA Secretary

Victoria

The holiday season has seen little activity in the Victorian Branch of the ASEG.

The last monthly meeting was held on 13 March 1996 which saw **Alan Willocks** (Manager Geophysics with Energy and Minerals Victoria) speak on the energetic geophysical exploration program which has evolved from the VIMP initiative. He displayed the vast amount of detailed airborne work which has been acquired to date in the western Horsham/Mildura areas and in the eastern highlands around Orbost. Alan indicated new prospective areas within the state as a result of this work, as well as areas targeted for future surveys.

A Victorian branch AGM was opened after the presentation at the March monthly meeting in order to invite nominations for committee members. The AGM was left open due to the lack of notice for these nominations, and elections will take place after the Federal AGM on 30 April 1996.

Shaun Whitaker, VIC Secretary

Excitations

By

Stephen Mudge
RGC Exploration Pty Ltd

Fifty Hertz and How it Hurts

Have you ever stopped to think how the power transmission/distribution system works and how it affects our geophysical surveys? This month I present a very brief description of the power system and why it causes problems for geophysical measurements. Also some thoughts on how we might be able to put the system to good use in geophysical prospecting.

Power Transmission

Electricity generated on the State power grid is transmitted to consumers, who are often located quite large distances from the power station, through a very complex grid network of high voltage balanced, and not-so-balanced transmission lines. It is distributed to the consumer at low voltage through a variety of multi- and single wire circuits. The geophysically interesting aspect of the network is that the fourth (neutral) wire of most three-phase and some single phase circuits is not physically present as a wire conductor, it is instead the ground. The electricity supply authorities use the Earth for their neutral return conductor. So the Earth is continually carrying large AC currents to complete the transmission circuit.

A three-phase AC power circuit (Australia uses a frequency of 50 Hz, some nations use 60 Hz) requires three conductors to carry the individual 120 degree phase-shifted currents. A little bit of elementary mathematics shows that three sine waves of equal amplitude and phase-shifted 120 degrees from each other will balance (or add up to zero) their individual return currents thus obviating the need for a common return neutral conductor. Industrial consumers require the large power delivering capability of the three-phase circuit whereas domestic users require only dual, or more commonly, single phase power. The power authorities split the three-phase circuit into individual single phases for distribution to domestic consumers. Clearly the total power consumption of all users on each of the single phases will not be exactly the same all the time, so we end up with a power balance problem between the phases. This unbalance between the phases appears as a current flow in the common return neutral conductor. A three-phase system designed for perfect balance (remember the non-existing return conductor) is in real strife when an unbalance appears in the circuit: the unbalanced currents appear as out-of-phase voltages and currents across the generators thus causing system instability. The resultant standing waves, with their associated very high peak voltages, ultimately cause destruction of generators and other system components (in reality the system has built-in protection against this catastrophic situation).

So a fourth return conductor is essential to handle any unbalance between the phases, which is nearly always present, despite continual efforts by the power authorities to balance the currents by load sharing and changing circuit capacitance and inductance. These currents are relatively small and they are often required to travel large distances of several hundred kilometres. There is substantial extra cost involved in installing a fourth wire conductor in the transmission line so the Authorities make good use of the Earth as the all-essential fourth (neutral) conductor. Interestingly, it turns out that the linear resistivity of a wire conductor is much greater than that of the ground, it seems that for this application the Earth is truly 'low loss'.

One other electrical aspect of the system is worth considering, and that is the harmonics generated by its various elements, such as the multiplicity of transformers. The prominent ones are the third (150 Hz), fifth (250 Hz) and the eleventh (550 Hz) harmonics. Their amplitude is much less than the primary 50 Hz signal and will probably not be attenuated by 50 Hz notch filters in geophysical instrumentation.

Ground Coupling

The interest to those involved with electrical geophysics is apparent. Firstly there is the 50 Hz return current galvanically coupled to the ground and whose flow is constrained by the electrical properties of the ground. Secondly there is the electromagnetically coupled component from suspended (and buried insulated) wire conductors. However the EM component is not as large as the galvanic component and its effect will only be noticed close to the actual location of the transmission line, it's amplitude being dependant upon the current flowing in each conductor (phase). The relatively small distance between the conductors will also cause a portion of the three phase-shifted magnetic fields to cancel.

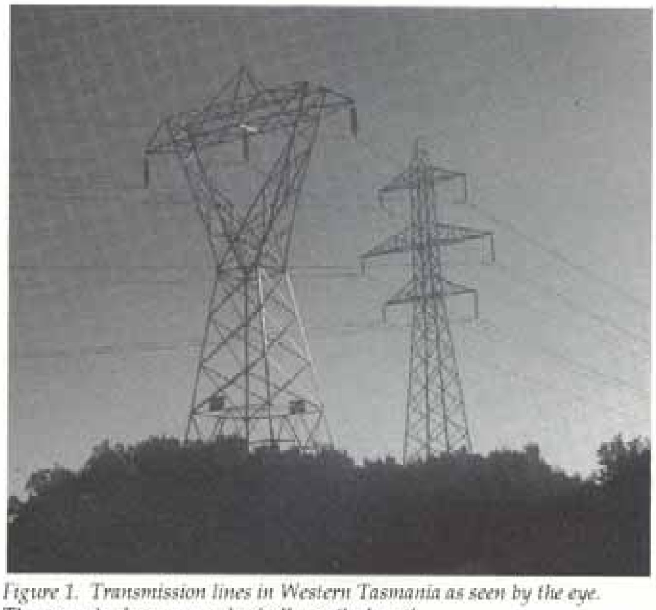

Figure 1. Transmission lines in Western Tasmania as seen by the eye. They can also be seen geophysically, so 'look out'.

A third form of ground coupling is present in the form of an electrostatic field between the wire conductors and the ground. This comes about because of the capacitance between the conductors and the ground. Even when there in no galvanic load coupled to the line (when everyone has turned off their lights) there is still a current flowing in the conductors as a result of this capacitance (the capacitance charging current which in turn has an EM field associated with it). This in fact is one of the important reasons why very high voltage transmission lines (22 kV to 320 kV) are mounted on taller towers: to reduce the conductor-to-ground capacitance and hence the inevitable power loss due to the charging currents.

The electrostatic field, like the EM field, is confined to a distance of several hundred metres or so from the line. On the other hand the galvanically coupled return current will flow by the path of least impedance between the generator and the load, despite the fact that the transmission line may follow an extended and variable route across the countryside.

In reality the actual electrical circuit comprises a network of transformers, switching stations etc, each a source of galvanically coupled ground currents and at the other end of the circuits they are sinks of these currents. Subcircuits transmitting power in various geographic directions, each coupled to time varying loads, ensure that the various ground coupled components are present in continually varying amplitudes and directions.

Most domestic power distribution systems, as found in the average Australian town/city, carry three-phase, three conductor, ground return high voltage (11 kV to 33 kV) circuits as well as transformed 415/240 volts (the transformers are usually mounted up on the power pole with the wires). The later has the fourth conductor suspended on the poles along with the three active conductors of each phase. This helps to saves us from potentially hazardous electric shocks around the house.

In many rural areas, the high voltage (12.7 kV and sometimes 19 kV) power is transmitted to farms as single-phase, single-wire circuits, coupled to a transformers at the farms to transform the high voltage to 240 volts. The return end of the high voltage primary side of the transformer is taken straight to ground to return the primary current to the transmission system. Using the ground instead of wire conductors for large rural distribution networks has enormous economic benefits. One of the problems with this arrangement is the lethal situation one is placed in if you cut the grounded return wire: you are immediately exposed to 12.7/19 kV. These circuits are very common in rural Australia and are a source of galvanically coupled ground currents.

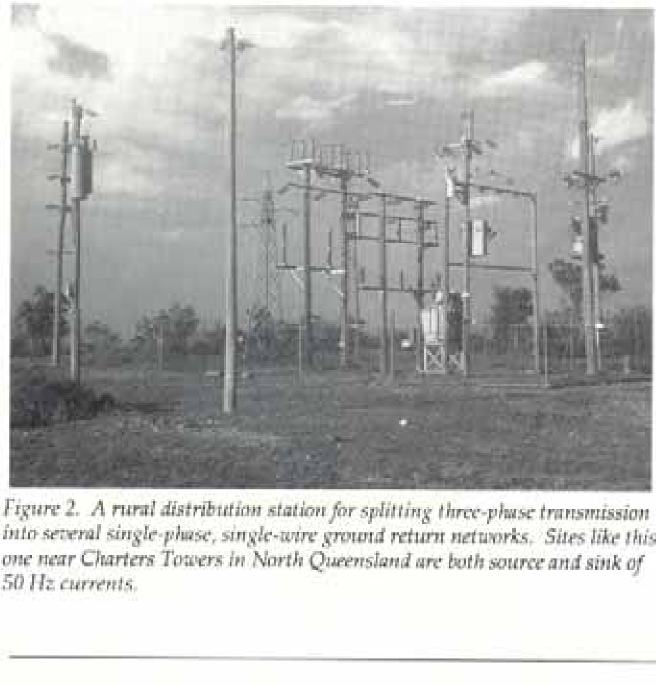

Figure 2. A rural distribution station for splitting three-phase transmission into several single-phase, single-wire ground return networks. Sites like this one near Charters Towers in North Queensland are both source and sink of 50 Hz currents.

How the 50 Hertz Hurts

So we have three mechanisms that couple 50 Hz currents to the ground. The electrostatic field will cause havoc to any instrumentation when the field becomes so large that components in the instrumentation, such as semiconductor devices, begin to malfunction. This situation can be expected close to the transmission line, and probably more critical with higher voltage lines. I wonder how close to the line you have to be, and how high the line voltage has to be, before irreversible damage occurs to semiconductor junctions (in the transistors and integrated circuits)? The electrostatic fields will also couple to the electrode wires and EM loops, so large 50 Hz voltages can appear across instrument inputs. Geophysicists can expect 'funny readings' from their instruments when operating in strong electrostatic fields, so 'look out'.

The EM field from the transmission line will also couple to electrode wires and EM loops, and like the galvanically coupled component, will produce a 50 Hz voltage at the instrument input. The instrument's internal 50 Hz notch filter will attenuate this signal, but like any filter it won't remove it. So the larger the input voltage, the larger will be the 50 Hz signal injected into the following stages of the instrumentation. The increasing amplitude of the 50Hz signal could eventually cause saturation of the semiconductor devices, once again geophysicists can expect 'funny readings' from their instruments, so 'look out'.

Proximity to galvanic current sources and orientation of electrode arrays, which affect the degree of coupling with the interfering 50 Hz currents, is an important consideration when designing geophysical surveys. But the galvanically coupled 50 Hz signal could also be a useful signal source for geophysical prospectors.

Metal-detecting the System

Our geophysical systems can be very effective metal detectors. There is a lot of conductive metal in the construction of power transmission systems and our geophysical surveys are capable of responding very well to this.

There are at least two sources of geophysical anomalies caused by the transmission lines. Firstly the large array of buried conductors surrounding each support pylon/tower/pole that couple the structure to ground potential - the Earthing conductors. These carry the lightning strikes and the 'leakage currents' to ground but give rise to SP, IP and resistivity anomalies by virtue of their metallic substance.

But there is also a more subtle feature of the system: the current-carrying wire conductors comprising the transmission line are themselves very good geophysical conductors. Forget the 50 Hz for a moment and see the large array of conductors coupled via transformers etc to form arrays of conductive closed loops.

In addition, if you take a closer look at the lines you will notice one, and sometimes two wire conductors at the very top of each pylon and unlike the other conductors in the system they are not suspended by large ceramic insulators. Instead these conductors are attached directly to the pylons and are the common Earth wires between every structure and element in the system. They are there for reasons of safety and do not form part of the transmission circuit. So the system is wired up as one enormous grounded loop and there are no generators, lossy transformers or switching stations in this circuit: it forms a gigantic geophysical current filament!

Both EM and galvanic geophysical surveys will detect these elements of the transmission lines. There is no alternative but to keep well clear of the pylons and the wires to avoid these sources of false geophysical anomalies.

Also the long wires form very good radio antennas and standing waves ought to be present on the line right across the radio spectrum. Very strong VLF-EM (20 kHz) anomalies can be observed near most power lines.

So 'look out' for those big anomalies when surveying near power systems, because its likely to be one or more of these power line responses your instruments are seeing. But on the other hand it may even be the elusive mother lode!

50 Hertz as a Geophysical Signal Source

The ground is continually carrying 50 Hz currents. It seems then that we have a source of geophysical signals that, if measured in such a way that the constant variability of amplitude and direction can be compensated for, can be used to make resistivity determinations of the ground. In addition we must not forget mine environments where it is virtually impossible to conduct any form of electrical geophysical surveys because of the (strong) interference from 50 Hz power wires and electrical equipment operating in mines.

A galvanically coupled electrode array that maybe effective is the three (3) electrode dual dipole array utilised in the old fashion potential drop ratio method (PDR array) of the 1920's and 30's, see Figure 3. It comprises two co-linear dipoles with the centre electrode common to each dipole. All three are located along the same survey line and the voltage (drop) across each dipole is measured simultaneously (very important) and their ratio calculated. The ratio is immune to the continually changing amplitudes of the individual dipole voltages. In the original PDR system the actual ratio was measured.

The array is moved along the line by one dipole length so that the trailing dipole occupies the previous position of the leading dipole. Relative resistivities are determined with respect to an initial measurement location: measured ratios are ratioed with that measured at the previous location to return a unity value at the initial location. Phase difference between the two dipoles can also be recorded (provides IP information) and summed for all locations along the line with zero value at the initial location.

You can probably see the short-comings of this arrangement, namely the accumulation of measurement errors along the survey line and, in particular, the changing direction of the electric field in the ground as the currents change in various circuits. The worse-case will be when the current flow is normal to the electrode array then voltages fall to zero. A corollary to this is that the survey line direction must be constant otherwise false anomalies will be recorded due to changes in line direction.

As clumsy as the electrode array may seem, it appears that this may be the simplest way of measuring the time varying voltages inorder to make a static physical property measurement of the ground. A single

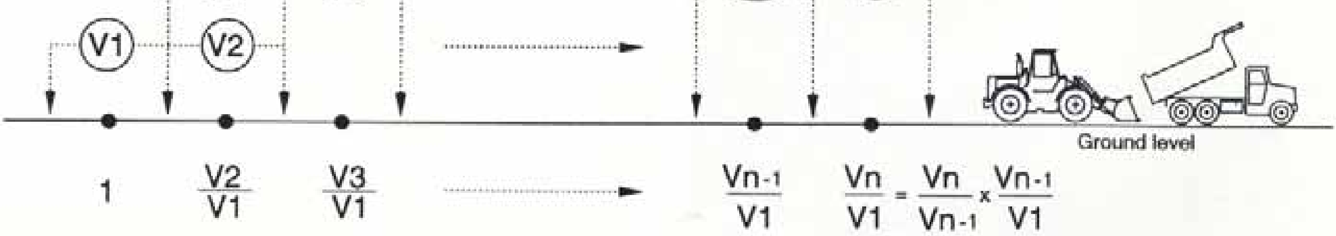

Figure 3. The dual dipole array, from the Potential Drop Ratio method of the 1930's, may be the simplest way of measuring resistivities from time varying power-line ground currents. New life for an old master?

measurement traverse in an 'electrically charged-up' mine could be very effective in detecting the next ore lode!

With some inspiration from phantom Sydney geophysicist Phil McSharry, I named this method FERTZ (Fifty HERTZ, get it!). I passed it onto to Professor Jim Cull at Monash University a couple of years ago and under Jim's capable direction it has been the subject of a research project at Monash University for Honours student Justin Ward. He has spent the last year investigating suitable measurement arrays and instrumentation to record the 50 Hz signal, and it's harmonics, with the hope of making geophysical observations of the ground. Field trials have been conducted with encouraging results. I'll leave it to Justin and Jim to report their results and experiences with FERTZ sometime in the future.

A successful development on this front could have immediate application to mine environments and to regional (broad-acre) geophysics where electrical surveys are currently too expensive to conduct, at least on the scale that we are accustomed to using aeromagnetics, for example.

Interesting accounts of geophysical anomalies observed using power-line ground currents are given by McCollor, 1983, and Strangway, 1984. For a description of the Potential Drop Ratio method see Heiland 1940.

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Applied Science Publishers, London, 107-159.

Happy Excitations.

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The ASEG Research Foundation gratefully acknowledges a donation of $15,000 from the ASEG.

High Resolution Coastal Marine Geophysical Surveys

Ian Browne
Geoplex Exploration Associates

There has been a renewed interest in coastal marine exploratory work principally for diamonds. A number of Australian explorers are also showing an interest in placer gold and mineral sand deposits in coastal marine environments. With the recent formalisation of the Australian Exclusive Economic Zone there is considerable scope to develop the coastal marine mineral potential within the continental margin. The following paper represents an outline of some of the technical issues governing exploration and a brief history of marine mineral exploration in Australia.

Introduction and History

Coastal marine exploration encompasses the Australian Territorial Sea (TS) which roughly approximates a three nautical mile corridor parallel with the coastline. The sea beyond the TS lies within the Australian Exclusive Economic Zone (EEZ) and may also be subject to exploration interest. Australian Commonwealth jurisdiction applies to the EEZ by international treaty. State jurisdiction applies within the Territorial Sea by an Act of the Commonwealth (passed during the early 1980's) which divests authority to exploit mineral resources identified within the TS to the States. Exploration Licences within the TS are granted by the State concerned, and for the sea beyond and within the EEZ the Licences are jointly administered by the relevant State and the Commonwealth. Although exploration licence conditions within the TS usually reflect the mining law of the adjoining State there is presently a collaborative effort by all State governments and the Commonwealth to establish a common code regarding all Licence administration.

Nevertheless the area of interest is usually determined by the companies perception of the limits of economic mineral recovery. This boundary obviously varies depending on the unit value of the commodity sought but is almost certainly contained within the limits of the continental shelf, or 200 metre water depth. The shallower the water depth the more favourable the chances of an economic resource. For example, the economic recovery of mineral sands is not likely to exceed around 40 metres below sea level under present cost structures, therefore mineral sand deposits buried 20 metres below the sea bed may be beyond economic recovery if the water depth exceeds 20 metres. Marine dredging technology has evolved rapidly since around the 1970's and purpose built methods have been developed to exploit offshore diamonds in Namibia and it is conceivable that as there is currently an evolution in this technology the limits of economic recovery will continue to increase.

Data acquisition for coastal mineral exploration is usually initiated with a marine geophysical programme designed to resolve the depositional regime of drowned sediments and other structures on and beneath the sea-bed. Historically, only small areas of Australian coastal waters have been subject to any detailed mineral mapping programmes. Regional reconnaissance programmes of a research bias have been undertaken by government agencies on the east coast of NSW and Queensland during the early 1970's and also an inter government research voyage around 1980. Based on collation of these results there remains a limited understanding of the geological processes effecting sediments deposited in coastal waters. This is still early days regarding marine exploration.

The level of present interest in the coastal marine minerals can be compared to a similar level of activity during the period around the mid 1960's to early 1970's when a number of junior Australian explorers were actively conducting exploration programmes for placer tin, gold and mineral sands, though detailed field evaluation generally focussed on small areas. Most of this work was located on the east coast and Tasmanian waters but there was considerable interest throughout Australia at the time pertaining to marine minerals.

The concept of placer diamonds within the Joseph Bonaparte Gulf was probably initially visualised by George Alcorn of Fitzroy Diamonds NL. (early 1970's ?) but I am not aware that an active marine exploration programme was commenced at this time. Perhaps someone reading this article could let me know.

This was early days for geophysics and data acquisition was primarily limited to side scan sonar and high resolution seismic profiling using sparker sources linked to an analogue presentation which was replicated on thermally sensitive print media. The quality of data presentation was often severely compromised by inclement sea conditions and it was very rare that areas would be re-surveyed for poor data quality.

Positional information was often highly questionable due to limited technology. One exploration company at least obtained positional fixes by a novel approach of obtaining closures using laser technology based on "line of site" methods from stations located on the coast. In all geophysical data, quality was usually very poor by today's standard. It can be said that the available technology was probably the greatest impediment to exploration success and perhaps through the application of sheer enthusiasm some exploration companies did enjoy limited success. Both enriched lenses of relict marine mineral sand deposits and "blanket type deposits" mineral sand deposits where formally recorded on both the east and west coasts by one company in classical configurations analogous to deposits recognised in modern coastal environments.

This phase of exploration fell into abeyance due to legal argument over Commonwealth and State jurisdiction which was not resolved for about a decade and ended in a High Court ruling which determined that the resources were owned by the Commonwealth.

Geophysics

Today, marine geophysical data acquisition may typically include side scan sonar, marine magnetometry, bathymetry and high resolution marine seismic linked and initialised by a navigation method using the Global Positioning System. Marine geophysical programmes may be complemented by airborne geophysical surveys such as high resolution magnetometer surveys. Attempts to deploy marine IP and spectrometer systems have been made but I do not know how effective these experiments have been. I do not know of the commercial application of the last two methods at this time.

In contrast to the relative high speed of airborne geophysical data acquisition, marine data acquisition averages about 4 knots according to survey practice which translates to around 2 metres per second over the sea-bed. The geophysical methods deployed fulfil certain objectives and the value of the information each method provides should be critically reviewed in terms of the geological objectives. Some methods have been designed to map exclusively the material on the sea-bed whereas the objectives of other geophysical methods may help resolve details of buried sediments.

Side Scan Sonar

Side scan sonar methods (Figure 1) commonly referred to as sea floor mapping operates within a bandwidth of one hundred or more kilohertz and maps details of the topography and material on the sea-bed but does not identify details about buried sediments. The bandwidth of the side-scan sonar signal can often be adjusted depending on the coverage or resolution sought. The record from a side-scan fish deployed at a water depth of a few metres derives from a continuously cycled pulse focussed as a beam or swath angled towards the sea-bed as shown in the diagram. Low powered units are generally suitable for shallow coastal surveys and may generate a beam several hundred metres wide depending on the water depth. Side scan sonar fish for this purpose may weigh less than 10 kilograms and are fairly easily deployed and retrieved by one individual (Figure 2).

Figure 2. Side Scan Sonar fish during retrieval.

The value of side scan sonar data should be considered in terms of what relevance this information has in the recognition of potential host sites for both modern or relict economic placer deposits. Based on observation by some authors and from my own experience the sea bed comprises material and features responding to the present coastal equilibrium and marine dynamics. Placer minerals have been recognised on the sea bed where they are dispersed as "blanket deposits" representing disseminated mineralisation but not as enriched lenses where they would more clearly exhibit a geological "fingerprint".

For buried placers a more thorough investigation will be required as evidence of relict deposits may not be expressed by the present condition of the sea bed. Observation shows that the sea bed in coastal waters is

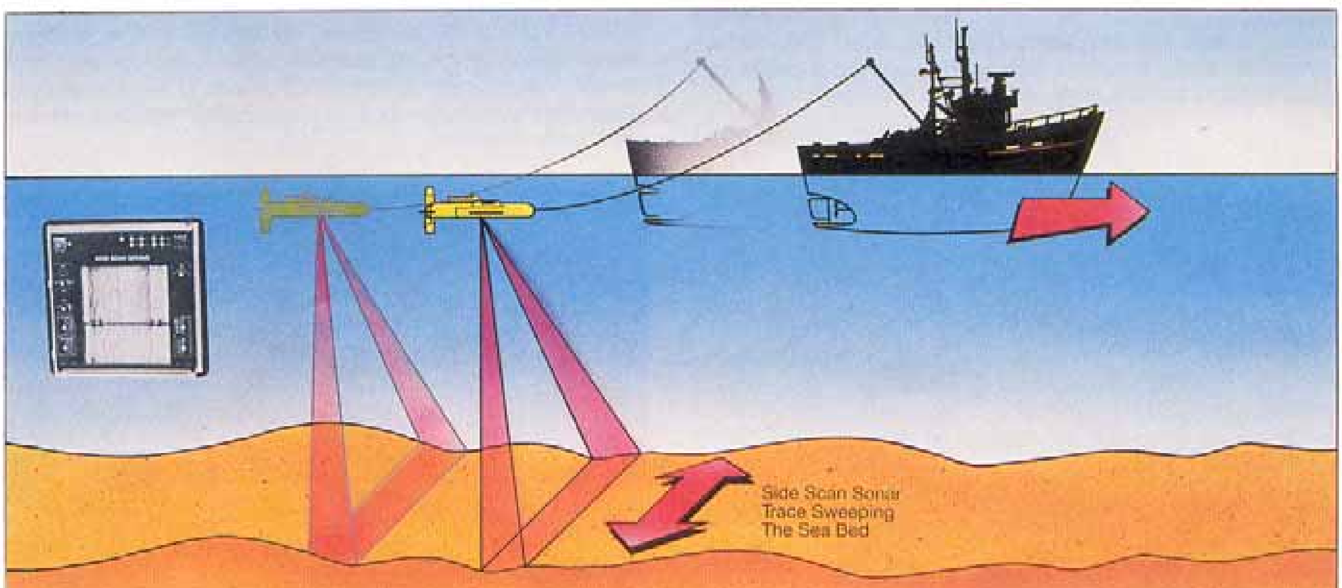


Figure 1. Side Scan Sonar profiling.

most entirely composed of an apron of re-worked Holocene or modern sediments in a constant state of agitation which overly relict deposits which may either be preserved or partly eroded.

Marine Magnetometry

Marine magnetometry is generally ancillary information to other geophysical data. The interest in marine magnetometry derives from the view that magnetically susceptible material such as detrital magnetite and ilmenite may be deposited within sediments as discrete or enriched lenses. Concentrations of these minerals may produce an anomalous magnetic response which can be resolved above the background characteristics of the basement geology, often in close juxtaposition with the target sediments. A marine magnetometer or "fish" is typically an order of dimension more cumbersome than a side scan sonar device as Figure 3 demonstrates (two people are required for redeployment.

Based on survey speeds of around 2 metres per second and using a cycle rate of once or twice a second a proton precession magnetometer provides adequate definition of anomalous responses. Alkalii-vapour type magnetometers are also in current use. Because magnetometry is seen as a method of direct detection of placer mineral deposition it is a popular exploration tool. Magnetically susceptible minerals are often used in a path-finder role to define favourable sites for more valuable commodities such as diamonds, gold and other economic mineral sands. From my experience the effectiveness of marine magnetometry to identify placer deposits may be somewhat over stated. Theory suggests that in regions of low magnetic gradients enriched lenses of placer minerals should be detectable. Perhaps the difficulty in recognising a distinct magnetic signature from remote placer deposits can be explained by the field observation that placer enrichment is often characterised by gradational boundary conditions which premeditates against confident magnetic definition. Detection may also be difficult if potentially anomalous responses rest near shallow topographically irregular magnetic basement.

Figure 3. Magnetometer during employment.

For consideration, the grid for marine surveys (kilometres to several hundred metres) is generally much coarser than for airborne surveys and may severely limit the scope to identify placer deposits which are often conspicuously defined according to their lateral continuity.

In one region I had considerable geological control and the area was known to include an ilmenite placer deposit of almost one million tonnes, the magnetic anomaly attributed to this deposit was very poorly resolved in terms of its lateral continuity. Moreover the anomaly would not have necessarily been attributed to placer deposition in the absence of contrary geological evidence. This begs the view that the value of the method has to be re-evaluated according the added cost and the additional survey risk regarding the smooth operation of the survey. With an unrestricted exploration budget (who has one of those?) I would however not dispute the cumulative value derived by merging information gained from as many geophysical (data) sources as possible.

For the magnetic method to be potentially of any value for placer exploration, reference should be made to the present coastal landscape. If there is no history of magnetite or ilmenite placer deposition or of any other magnetically susceptible material in present coastal deposits then the value of conducting a magnetometer survey may be of limited value.

Marine Bathymetry

Bathymetric methods apply to recording echo-sounding data using a transducer which focuses an acoustic pulse towards and which is subsequently reflected from the sea-bed. Conversion to depth information is based on calculations regarding the velocity of sound in water. Echo sounders operate in the kilohertz bandwidth. Acquisition of bathymetric data is usually a low cost imposition to total survey charges as well bathymetric data can be merged with seismic data for tidal corrections where this is an important criteria. Echo-sounders usually cycle at intervals measured by seconds for the benefit of the helmsman for safe navigation purposes although permanent digital recording is often undertaken over selectively coarser intervals.

Marine Shallow Seismic

High resolution reflection seismic data or sub-bottom profiling (Figure 4) is recorded as frequently as several scans per second using sample rates measured in milliseconds. Multiple scan rates allows for considerable redundancy and permits horizontal stacking to improve the appearance of event continuity. Event continuity can also be enhanced through improved signal to noise by using a multi-channel system which is currently an option with some acquisition systems.

High resolution seismic methods affords sequence analysis of buried sediments and with experienced observation it is possible to select favourable sites as hosts for buried economic placer deposits. High resolution seismic methods are employed to identify deposits within the first 100 metre column or so below the sea floor, and fills a niche between "pinger" or echo sounding technology and multi-channel high energy reflection seismic methods deployed for oil and gas exploration.

With the recent advancements in both high resolution seismic technology and display techniques relict sediments representing Pliocene, Pleistocene and Holocene deposition can be recognised buried beneath the sea floor. The buried sediments may reflect terrestrial deposition, marginal marine-coastal deposits and marine sedimentation in various degrees of preservation following exposure to the cyclic episodes of marine transgressions and regressions. Each of the above deposits contains sites where placer minerals are potentially preserved in transitional states and with the proper selection of exploration parameters these environments are recognisable. Acquisition of high resolution seismic data represents an integral tool to the explorer.

During interpretation of seismic data there is considerable scope to incorporate seismic stratigraphic principals used in the oil and gas industry toward a basin analysis approach and the refinement of placer mineral deposit models. The evaluation of placer deposition has only recently attracted any research and depositional models which define potential host sites for the enrichment of placer minerals in terrestrial deposits have been developed.

Advances In Acquisition Technology

In the most recent round of coastal exploration activity there has been a steady expansion of the options regarding display technology. Most acquisition technologies include provision to display the data in real time on colour monitors and as a hard copy via matrix printers or thermally sensitive paper media. Data can also be stored in digital formats on mass storage media such as helical scan Exabyte tapes or optical disk media. Versatile acquisition systems based on PC technology allow for simultaneous operation of other devices other than seismic acquisition as a "one pass" operation.

It is recommended that as a standard product all acquisition methods should include digital acquisition and archiving in industry standard or modified SEG formats. Data acquisition should anticipate digital processing requirements which may follow and be independent of surveying. Digital data processing as shown in the examples accompanying this paper is one of the great advantages of digital acquisition and allows the interpreter to revisit the data many times long after surveying has been completed in order to enhance and reprocess data in areas of interest.

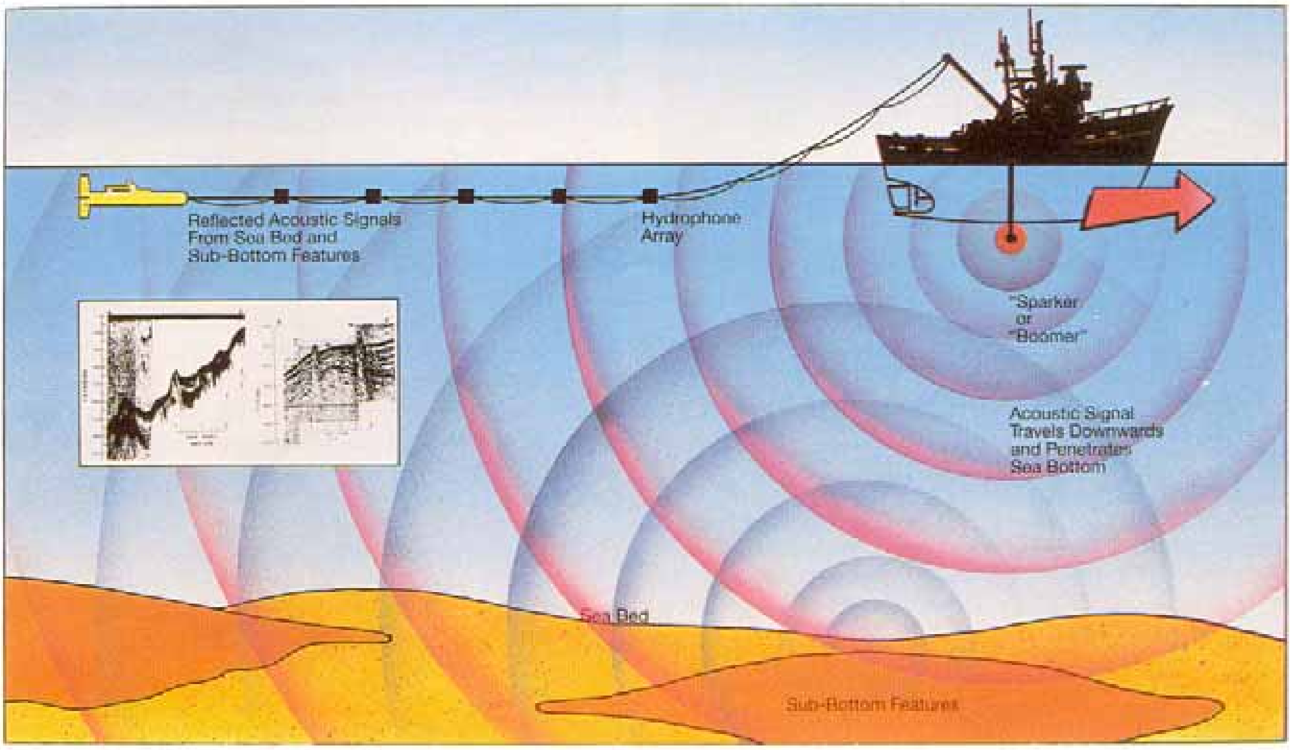


Figure 4. Seismic Reflection Profiling.

Processing Advances

Complementary to digital acquisition there are also several portable seismic processing packages based on a PC platform which enable on-site cost effective analysis of field data for QC purposes and generation of "first pass" processed seismic sections. Some acquisition technologies incorporate basic processing options for improved data displays, though raw data should be available to the client as soon as practical. It is however unwise to consider field displays as the final product.

Figures 4, 5 and 6 show how the advances in processing and display have improved data presentation.

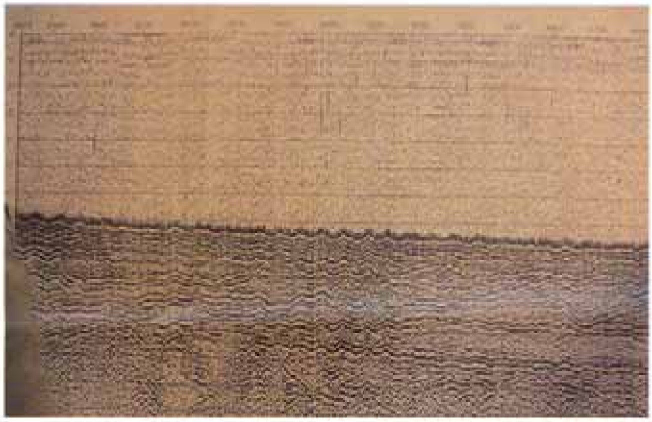


Figure 4. Example of raw digital data (circa 1989) showing white noise and effect of sea swell on seismic traces. Vertical scale is approximately 5 metres per division and section is about 400 metres.

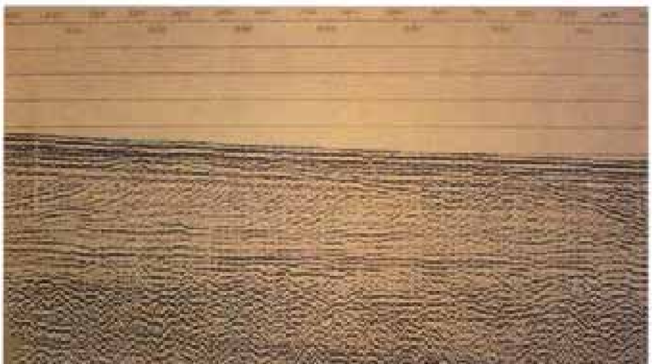


Figure 5. Digital acquisition creates opportunities to further enhance data. In the above section a "first pass" has removed white noise and a swell filter has been used to flatten seismic traces. Predictive deconvolution can attenuate both the 1st multiple and system ringing parallel with the seabed. The "landward" progradation of events has been interpreted as a flood tidal delta corresponding to a Pleistocene transgression.

GPS Navigation

With the development of the Global Positioning System most surveys are conducted utilising GPS technology calibrated in differential mode to provide positional accuracy to a few metres or better. Position

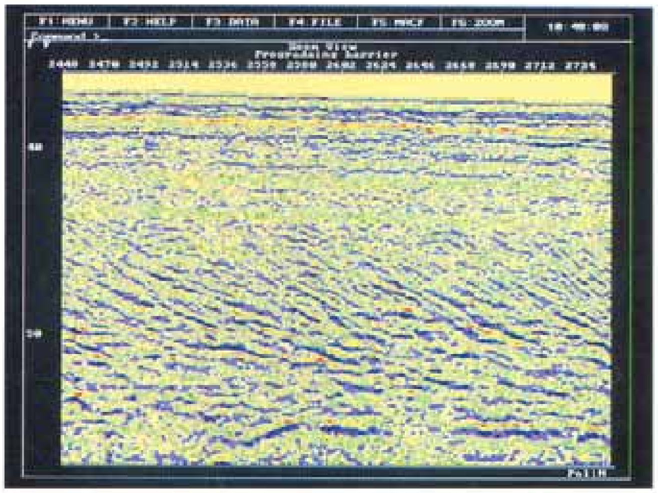


Figure 6. PC based processing methods enable detailed interpretation of seismic data. The above section shows prograding foresets representing a drowned Pleistocene barrier. Vertical scale is 10 metres per division and the section is approximately 100 metres across.

fixes are typically refreshed at intervals of several seconds. Using less control contradicts the objective of the seismic surveying which is to achieve metre to sub metre definition of target beds, and I would argue it is a false economy to consider less precise positional methods. Most contractors operating in Australian waters include in their operational standards provision for a GPS base station in the region of the surveys.

Multisensor Geophysics - Pitfalls

In order to meet budgetary restraints it is worth reviewing the value each geophysical method brings to the survey objectives when balanced against the acquisition charges. Geophysical contractors include in their charges a reasonable expectation as to the operating efficiency of the geophysical instrumentation deployed. The more instrumentation in simultaneous operation the greater the risks that surveying will be interrupted at some time, which almost always occurs at the clients expense. Survey risk can be diluted if it possible to simplify acquisition configuration, this reduces survey charges and as well makes possible expedition of data acquisition.

During the planning phase and in the absence of alternative instructions contractors usually promote all the methods at their disposal without an objective appraisal of their value to the project and with the added advantage of potentially lowering of surveying costs. So surveying may be unnecessarily burdened with acquisition of irrelevant data. It is not the contractor's role to fully comprehend the geological objectives of the survey.

Operating standards

Acquisition dependent data storage formats tend to characterise each contractor's operation. It should be anticipated that it is a cost impost if it is necessary to convert non-standard digital data formats to more user friendly or SEG digital formats.

There are no minimum conventional standards regarding acquisition of marine seismic data, either data presentation or digital data tape formats. Each contractor promotes a certain presentation linked as a product of their operation. Mineral explorers should remember that marine contractors have derived most of their experience by honing their skills conducting geotechnical surveys. The objectives of surveys for mineral exploration purposes represents unique objectives from that of geotechnical programmes.

There is no present provision to define high resolution seismic data according to a measured set of calibration standards by using reference to spectral evidence which can be referred to to confirm the quality or robustness of the seismic signal. Whereas calibration tests are routinely used to confirm the integrity of airborne geophysical data this is not the case for marine work, and the requirement to conduct calibration tests for seismic source characteristics is not actively promoted by the industry.

Marine surveys usually begin with a series of "shakedown" tests to confirm operational performance but the quality of seismic data can vary if there is no preconceived standard. It has been my observation that the quality of seismic data can vary enormously particularly during the conduct of extended surveys which may not be attributed to ambient conditions. The evidence of a deterioration in data quality can be empirically identified with poor seismic resolution. Hard evidence for poor data can be proven by the deterioration of the stability of the spectra. Poor seismic source performance corresponds to pronounced loss of vertical and horizontal seismic resolution with a subsequent loss of target recognition which is a fundamental objective of the surveying specifications.

Mineral exploration activity in coastal marine waters follows irregular cycles with an inevitable impact that the industry is reluctant to continuously invest in improved technology. Long periods of inactivity between relatively brief levels of strong exploration activity result in a break in the continuity of the evolution of methods and standards of acquisition practice. By contrast airborne geophysical survey practice due partly to the continuity in demand for these surveys has resulted in improved survey performance and progressively greater familiarisation by all of survey practice, acquisition capability and standards of data presentation.

With the recent advent of digital acquisition and a trend toward more sophisticated acquisition diagnostics marine geophysical survey practice may be undergoing a process of a rapid improvement.

The plan of the survey grid and acquisition specifications should be designed as to allow for additional or "in-fill" surveying at some latter date, particularly if the initial surveying is known to represent reconnaissance objectives. Digital acquisition makes possible the potential to merge digital data from various data sets representing different surveys thereby progressively expanding the data base. Surveys restricted to analogue data acquisition places severe limitations on the capacity to utilise data from different survey periods.

The portability and the availability of the equipment also creates opportunities to conduct surveying using less than experienced crews. Surveys conducted under these conditions can appear to be extremely attractive according to price, however from my experience unless data acquisition has been scrupulously managed and optimised according to the equipment's full capability then the product may be of limited value. It is a false economy to perform geological evaluations of target environments, which is a high cost exercise, based on geophysical data which has been acquired using questionable standards of survey practice.

Survey costs and logistical issues

Marine exploration has a high entry price to the dismay of many exploration companies. The costs undoubtedly reflect the charges related to vessel mobilisation particularly for Australian waters where maritime practice places a premium on vessel operations.

Vessel dimensions vary depending on whether survey logistics require a 24 hour operation with a long range capability many hundreds of kilometres from re-supply. Alternatively the conduct of the survey may be carried out utilising a daily charter for exploration conducted in close proximity to navigable ports. Larger vessels required for a 24 hour operating capacity usually range in order from 30 to 40 metres in length and easily exceed 2 metres draft due to the requirement to provide accommodation for crew members. The relative lightweight and portability of the equipment allows for the option to use smaller vessels based on liberal port access using 10 to 20 metre length "vessels of opportunity" chartered from the local commercial fleet. Most contractors (plus some clients) though, have horror tales regarding vessels of opportunity and it should be remembered that although vessels in this category are often much cheaper to charter there is invariably the risk of compromising the data quality or survey efficiency when the craft is not ideally configured for survey practice.

For the Australian experience vessel charges alone may consume up to three quarters of the operating costs of a marine geophysical programme with costs directly related to geophysical instrumentation representing proportionally a subordinate amount. There is therefore considerable emphasis on maximising the efficiency of operations to complete the surveying in the shortest possible time. Survey charges incorporate mobilisation costs related to positioning the vessel at the survey site. On average mobilisation charges typically vary between 10 to 30% of the total survey budget depending on the scope of the surveying. Most contractors endeavour to notify potential clients as to their general operational itinerary well before exploration activity is anticipated in order to spread these charges over a number of surveys which may also be conducted in the region.

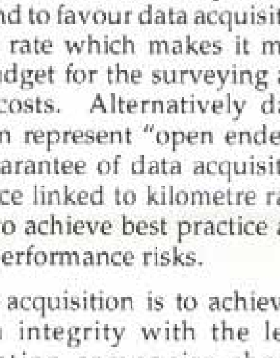
Vessel charges are a direct function of the capability and size of the vessel. Consideration should be given to mobilising a small vessel if surveying is to be conducted within reasonable steaming distance from a suitable port site (up to 2 to 3 hours ferry time), as on balance equipment failure or inclement weather which may invoke standby clauses has a much lower impact on the survey budget. Large vessel operations provide scope to conduct a continuous 24 hour operation with productivity averaging around 100 line kilometres per 24 hour period. These operations are manned by two rotating crews. Small vessel operations commonly achieve 40 to 50 line kilometres of production per day and may reach the same efficiency as a large vessel operation regarding cost under some circumstances.

Often there are few alternatives as exploration is usually conducted in remote regions and the operation will require the use of a large vessel where the operation must be unencumbered by logistical limitations.

Survey charges are also a function of the survey layout. Wide survey line transects of many kilometres will mean that considerable time will be spent re-positioning the vessel at the expense of data acquisition. Industry convention determines that most contractors promote their services on a daily charter basis. For large surveys I tend to favour data acquisition costed on a line kilometre rate which makes it more reasonable to estimate a budget for the surveying and also manage acquisition costs. Alternatively daily charter rates by implication represent "open ended" clauses and there is no guarantee of data acquisition whereas survey performance linked to kilometre rates encourages the contractor to achieve best practice and to be more mindful of the performance risks.

Finally the aim of data acquisition is to achieve a satisfactory level of data integrity with the least financial pain. Exploration companies should familiarise themselves with both current acquisition and data processing technology which adequately achieves the survey objectives and which acknowledges the dynamics on which contractors balance the survey risks in order to achieve a fair compensation.

About the Author



Ian Browne is a geologist and a strong advocate of the integration of geophysics into the geologists mind-set. This paper reflects a keen interest by the author to see exploration for placer minerals and for exploration in Quaternary geological landscapes evolve as a predictive science through a combination of applying conceptual geological settings using recent advances in high resolution geophysical methods.

Getting the Most From Public Seismic Field Data - BRS Petroleum Data Management Project

Paul E. Williamson, Eugene Petrie and Sandy Radke
Bureau of Resource Sciences

In late 1993 the Bureau of Resource Sciences (BRS) began a major initiative to optimise management of and access to the half million digital and analogue seismic field tapes at Villawood Archives in Sydney. The exploration data on these tapes has been lodged by the petroleum industry under Commonwealth legislation. The data is publicly available and BRS loans an average of 15,000 tapes per year mainly to industry for exploration programs.

.....public availability of petroleum data was legislated in Australia to stimulate exploration......

Public availability of exploration data in Australia under the Petroleum (Submerged Lands) Act (P(SL)A)and under the prior Petroleum Search Subsidy Act (PSSA) is an uncommon boon to explorers when compared to other areas around the world. In most countries exploration data must either be collected, bought or traded. However, in Australia to encourage petroleum exploration, most basic exploration data over two years old and interpretive data over five years old and lodged under the Acts can be obtained from government for the cost of transfer of data. Publicly available offshore data from the Commonwealth includes geophysical data such as digital and analogue seismic field records, well log records and reports, drillstem test data, geological samples and the results of specialist studies. Ready access to such exploration data is cited by companies as a factor which makes Australia more attractive to explorers. This is largely because public availability of the data can be a substantial benefit in looking at new areas. It provides a useful initial database to evaluate the attractiveness of areas for more detailed exploration either through using the original data or reprocessed data (Figure 1).

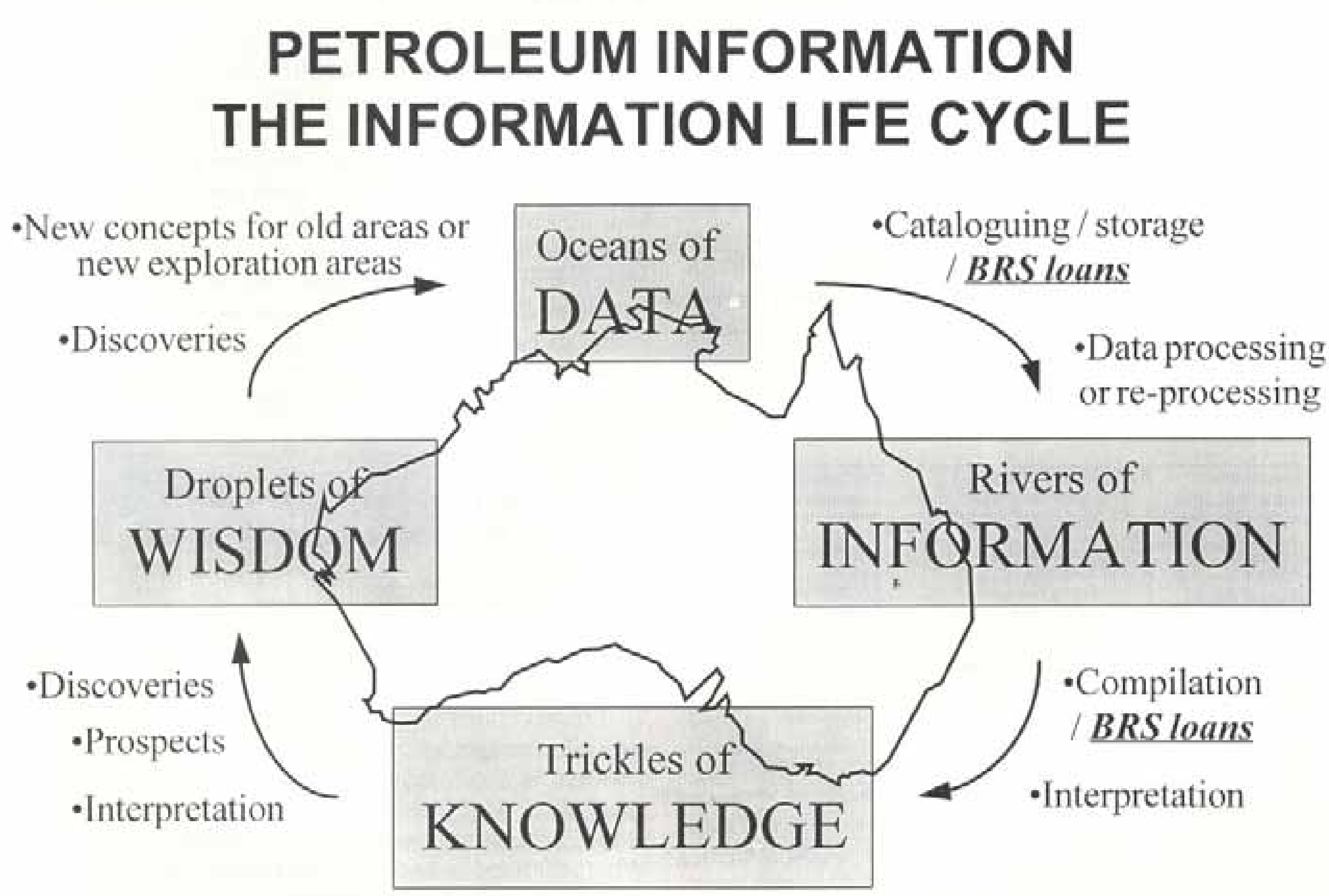


Figure 1. Function of publicly available in the petroleum information life cycle.

History

In Australia public availability of petroleum data was initially legislated in December 1957 under the PSSA. At that time Australia was considered to be unprospective for petroleum. The PSSA covered all Australia and was enacted to stimulate petroleum exploration. It remained in force until the end of June 1974. Under the PSSA exploration for petroleum was subsidised by the Commonwealth Government on condition that basic and some interpretive data obtained during exploration be lodged and promptly become publicly available. The earliest commercial discoveries that stimulated further exploration in the early 1960s such as Barracouta and Marlin (Gippsland Basin), Moonie and Cabawin (Bowen/Surat Basins), Barrow Island (North West Shelf), Gidgealpa (Cooper Basin) and East Mereenie (Amadeus Basin) were made in subsidised wells (Passmore, 1994). The PSSA was followed in 1967 by the Petroleum (Submerged Lands) Act dealing with offshore Australia outside the three nautical mile limit. The P(SL)A also requires that most basic and interpretive exploration data be lodged and subsequently be made publicly available. Copies of basic and interpretive data are supplied to both Commonwealth and State government agencies. Similar provisions apply under State/Northern Territory legislation for the lodgement of data obtained from within the three mile coastal waters.

.....over half a million publicly available seismic field tapes are managed by BRS at Villawood Archives......

A summary of Commonwealth petroleum databases containing data lodged under the Acts and derived digital databases is given as Figure 2. While information technology had little role initially in dealing with publicly available data it is now heavily utilised for management of both digital and older data forms. The Petroleum Data Management Project (PDMP), a substantial recent IT initiative, has been targeted by BRS at modernising management and facilitating access for digital and analogue seismic field data lodged under the Acts at Villawood Archives, Sydney.

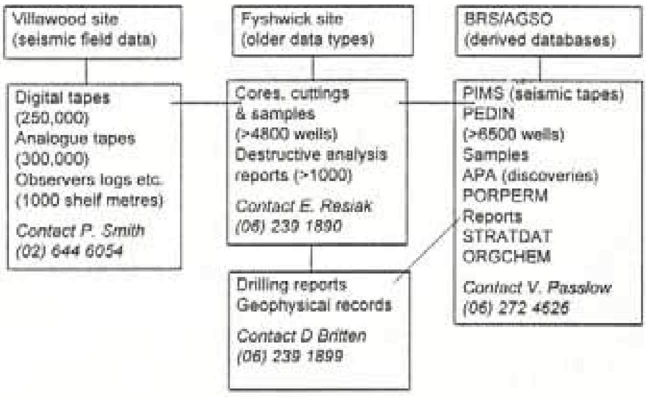


Figure 2. Petroleum data available under Commonwealth Acts (PSSA and P(SL)A).

Villawood Archives

Analogue and digital field data and their associated support information lodged under the two Acts are deposited with Australian Archives at Villawood in Sydney by a June 1971 decision of the Advisory Committee of the Australian Minerals and Energy Council and by arrangement with the then Bureau of Mineral Resources (BMR) and Australian Archives. Currently the total petroleum data holdings at Villawood Archives are over half a million magnetic tapes from over 500 seismic surveys collected at a cost of billions of dollars and representing about 20 Terabytes of data. The holdings take up approximately 13,500 shelf metres of space. These tapes, and other tapes retained by companies but eligible to be lodged under the Acts, are loaned to petroleum companies for reprocessing. On 12 June 1995 management of petroleum data at Villawood Archives was transferred to the Bureau of Resource Sciences (BRS) from Australian Archives under a memorandum of understanding. BRS now provides a technical focus to management of the petroleum data at Villawood Archives. BRS seek to provide optimum management and public accessibility for the data in cooperation with Australian Archives who continue to store the data. The major initiative (PDMP) currently being undertaken by BRS to modernise digital management of the petroleum data at Villawood Archives also includes a program of culling, disposal, copying, preservation and transfer of data (Radke and others, 1995).

PDMP

The Petroleum Data Management Project was initiated by the Commonwealth Government to seek to better manage, preserve and make accessible publicly available seismic field data. In the 1993-94 Commonwealth Budget $1.5 million was allocated to BRS to address problems associated with storage, management and accessibility of the digital and analogue seismic field data at Villawood Archives. Using that funding a digital Petroleum Information Management System (PIMS) was set up to replace the previous card-based system (Table 1). PIMS is an oracle database under PEDIN the umbrella relational petroleum database at BRS/AGSO.

.....data on field tapes suffering from stiction has been preserved to high density media......

In addition, over 22,000 tapes either suffering from stiction or in danger of being affected by stiction were preserved and/or copied to high density media (Table 2). Preservation/copying to high density media also results in major savings in storage space (Figure 3). Stiction is a worldwide phenomenon. It involves absorption of moisture by the milar which binds the oxide coating to the film base of seismic field tapes. When the tape is exercised this results in shedding of oxide and loss of data. Various preservation processes exist, mainly involving heating to drive out the moisture.

A Terabyte high density data storage system was also put in place at BRS in Canberra to accommodate the high density media, and a scanning capability was established at Villawood to preserve deteriorating seismic observer reports and other support data. The observer reports are often notes on paper which are critical for processing and reprocessing, particularly of onshore data.

The expenditure of the $1.5 million budget allocation for the PDMP was completed in 1994-95 but the transfer of the data management function to BRS has allowed the PDMP to continue. The initial PDMP was evaluated by the Department of Primary Industries and Energy, the Department containing BRS. The project was found to be appropriate and to have been carried out effectively and efficiently. Such evaluations are carried out to ensure value for money for the taxpayer.

Table 1. Data at Villawood Archives registered in the Petroleum Information Management System (PIMS).

Type	Tapes	Surveys
Field data	264,157	616
Processed data	5007	203
Navigation data	930	328
Observers logs	7589	197
Well logs	1595	369

Consultative Group

Active cooperation between government and industry has occurred since the inception of the PDMP and continues to be a feature of planning for the project. The Consultative Petroleum Data Group which advises on the project consists of representatives from BRS, the Australian Petroleum Production and Exploration Association (APPEA), the APPEA Seismic Operators Subcommittee, Petroleum and Fisheries Division (Department of Primary Industries and Energy), AGSO, Australian Archives and the States and Northern Territory.

.....Consultation with industry has been important in shaping the data management program......

This group advises on future developments of the program. This consultation also serves to ensure the technical and IT practices within the project are consistent with the practices and standards applied in the industry.

Industry standards for digital petroleum data are progressively becoming those applicable worldwide. This is necessary for a highly mobile worldwide industry. An indication of this trend is the work of the Petrotechnical Open Software Corporation (POSC). The trend facilitates the movement of petroleum companies from exploring in one area of the world to exploring in another. The Commonwealth in its database activities is seeking compatibility with these emerging worldwide data standards as an effective way of facilitating entry by overseas companies to Australian exploration.

Table 2. Field data from offshore seismic surveys preserved onto high density Exabyte cartridges.

Survey	Company	Lines	Kms
Arafura Basin			
1980 Melville	Magnet	14	430
NT/P34 DS-81	Diamond Shamrock	34	1593
Bass Basin			
BBS-81	Bass Strait	25	731
BC Seismic 81	Cue	16	551
Octopus	Perthshire	22	522
Bonaparte Basin			
Bonaparte Gulf	Shell	35	1517
H283A	BHP	51	1475
H2683A	BHP	46	1078
Marie	Western Mining	19	1491
NT/P33 1981, 1983 & 1984 (3 surveys)	Tricentrol	87	2835
1984 NT/P34	Diamond Shamrock	26	616
Browse Basin			
Adele Island	Oberon	9	157
Churchill 1980	Brunswick	42	851
Carnarvon Basin			
Cape 1980	Canada Northwest	4	108
Capricorn 1982	Canada Northwest	13	365
Dampier-Broome (10 projects)	Woodside	98	2382
Exmouth Dampier	Hudbay	65	3527
Goodwyn	Woodside	23	259
Ningaloo R2	Canada Northwest	23	595
Tantabiddi Detail 1980	Canada Northwest	38	595
Victoria Detailed	Otter	16	222
Vlaming Head 1980	Canada Northwest	18	426
WA-93-P 1980	Hudbay	26	526
Wilcox North	Woodside	14	278
Wilcox	Woodside	29	449
Gippsland Basin			
Flinders 1980	Otter	18	400
GA-82B	Aust Aquitaine	23	431
GA-83A	Aust Aquitaine	36	217
GC80	Cultus	24	509
Great Australian Bight Basin			
1983 Duntroon	Getty	51	2035
1984 Duntroon	Getty	45	955
Otway Basin			
UA-82	Ultramar	35	1068
830T1 Breaksea Reef Site	Ultramar	23	80
Perth Basin			
Helga	Mesa	18	307

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New Data Requirement

Under an agreement by the Subcommittee on Petroleum Legislation of ANZMEC on 6 April 1995, it was agreed that from that time the Petroleum Director of each State/Territory Designated Authority will require seismic field data collected to be copied onto high density media at the time of processing. This will mean that data will be copied in demultiplexed SEG-Y format since long field records cannot be copied on cartridge. The data on high density media will then be lodged as the obligation under P(SL)A rather than the low density field tapes. The same requirement applies to data being reprocessed under the terms of a work program for a Petroleum Exploration Permit under the P(SL)A. These measures are aimed at increasing accessibility to the data, reducing the ongoing costs to

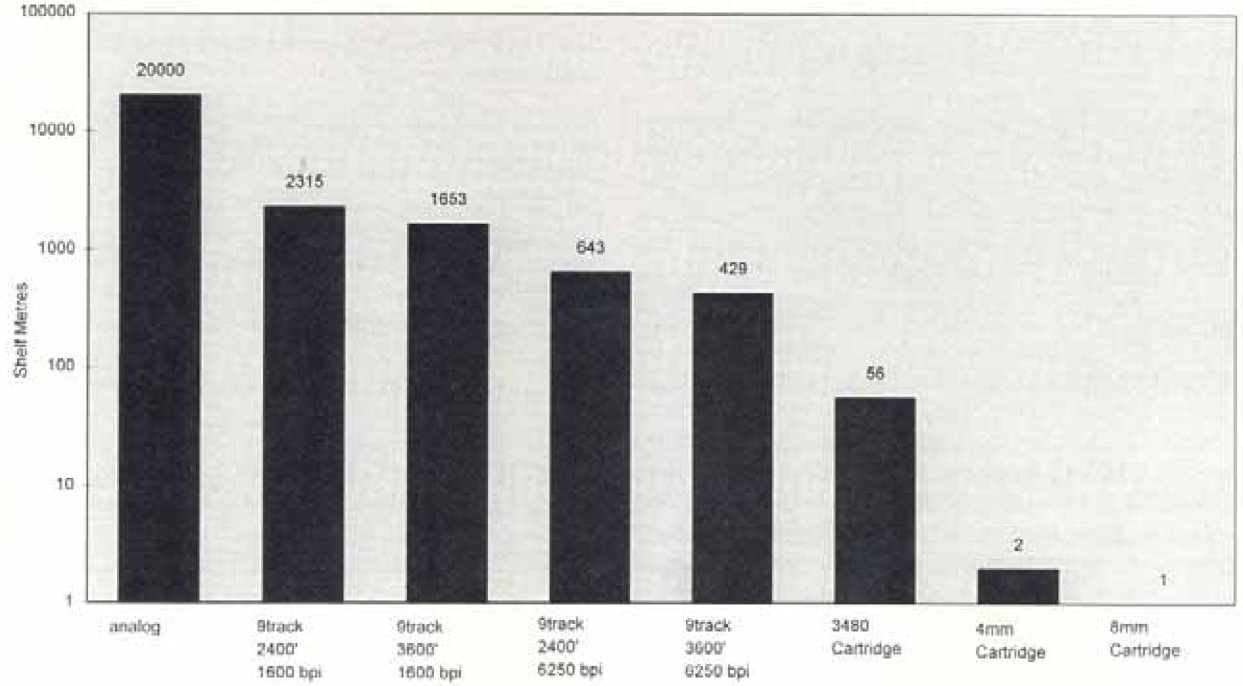

Figure 3. Shelf metres required by different media to equal 1 shelf metre of data capacity of 8mm cartridges.

both industry and government, and controlling the volume of data lodged at Villawood Archives on low density media particularly with the advent of 3D data.

Future Plans

The optimum route of the PDMP from an IT perspective is to migrate all data that needs to be retained to high density media. Data that is either redundant or useless can be culled after due consultation. Preservation of data on high density media will facilitate access to the data, and future management including migration to more advanced established high density media when they become available. The use of high density media for such archival purposes is necessarily restricted to well established media. Thus while high quality 8mm tapes are currently used in the PDMP they will certainly be superseded by other magnetic or optical media in the future. To pursue the route of data preservation to high density media will require additional funding. Steps are being taken to seek that funding.

Other Initiatives

South Australia has recently undertaken an initiative to manage and preserve their digital data and Queensland has initiated the PRINCE Project which includes the same aim. Worldwide there have been a number of similar initiatives, in particular in Canada, Norway and the UK. BRS is maintaining knowledge of these projects to glean ideas which may help in the future development of the PDMP. Benefits for Exploration Data managed under the PDMP has several benefits for exploration. The first benefit is that the data can provide coverage in an area where a particular explorer may not have sufficient data for a required assessment. In that instance an explorer can draw together a data set from previous surveys and wells to allow for or augment an initial assessment (Williamson and others, 1995).

A second use of the data is from specialised reprocessing which may significantly enhance the information available from the basic data. Reprocessing of seismic data for petroleum exploration is common because of the continued development of new algorithms to improve the quality of the processed data. An example is the advent of the DMO (Dip Move-Out) algorithm to better process information from highly dipping strata. This and other algorithms have been applied to data sets that have previously been processed with less sophisticated techniques and have obtained better seismic definition in the reprocessed data. Original data sets that have been well collected can thus be reprocessed (even several times) using new algorithms and increased computing power to provide new information. Such algorithms are continually being developed or improved and can represent an important exploration opportunity from utilising stored seismic data.

.....15,000 tapes per year are loaned to industry for reprocessing......

A third use of public domain data is as a basis for regional studies which can lead to more detailed exploration and drilling of wells.

The initial question that a company looking at an area around Australia can ask is whether part or all of their needed assessment can be carried out effectively using existing public domain data including that managed under the PDMP, or by processing or reprocessing elements of that data. The next question is whether this approach is more cost effective than collecting or buying new regional data sets. The average reprocessing of 15,000 tapes of seismic field data from Villawood Archives per year suggests that many companies come to the conclusion that reprocessing of existing seismic field data is a most cost-effective option.

Public availability of exploration data is of course both in the interest of the industry and in Australia's national interest in that it serves to sustain petroleum exploration levels. The success of the Australian public domain data strategy is in part attested to by the maintenance of a sustained level of offshore exploration around Australia at a time when the price of oil has fallen significantly, and at a time when an associated decrease in the exploration effort could be expected.

Conclusion

Australia is considered by companies to be attractive for petroleum exploration. It is considered to have low to good prospectivity depending on the area, attractive title and taxation regimes and political stability. The availability of public domain data is considered important in underpinning exploration efforts.

In making data collected under Commonwealth Acts most useful to the Australian and worldwide petroleum industry, it is critical that government manage this data in a way compatible with the interests of the industry. This includes aiming to provide optimum access to the data through effective management and ensuring that data is not lost through deterioration of field tapes and utilisation of appropriate technology. The challenge for the PDMP is to achieve these ends.

Acknowledgments

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Exploration '97

4th Decennial International Conference on Mineral Exploration. Toronto, Canada, September 14-18, 1997

Invitation

Exploration '97 builds on the successes of earlier conferences covering forty years of development of mineral exploration technology, - Exploration '67 in Niagara Falls, '77 in Ottawa and '87 in Toronto. These meetings were each attended by up to 1,000 delegates from as many as 60 countries.

The Exploration conferences are oganised by committees of the Canadian mineral exploration community to present the state of the art of exploration techniques, particularly geophysics and geochemistry.

Papers are by invitation only, in order to ensure a consistently high quality, conformance to the theme and eventual publication. The published proceedings of the previous three conferences have become important references for practioners in mineral exploration

The organising committee of Exploration '97 invites their colleagues from around the world to convene in Toronto in September of 1997 to build on their technical knowledge and skills and to celebrate another 10 years of advancement of the exploration geosciences.

Theme

Exploration '97 will review the current state of the art in geophysics and geochemistry, the achievements made over the past 10 years, and provide an outlook to the future of these methods in mineral exploration and mine development.

Emphasis will be placed on recent advances in methodology applied to contemporary mineral exploration, important case histories, and developments in the assessment and monitoring of exploration and mining related environmental problems.

These themes will be elaborated through a program of invited papers, poster sessions, a trade exhibition and workshops. Post conference visits to instrument manufacturers, geoscience laboratories and service companies will be offered to interested delegates.

Who should attend

The activities of Exploration '97 will be of interest and value to a wide variety of earth scientists, including geologists, geochemists, geophysicists, as well as managers, academics and government scientists involved with mineral exploration and mining related environmental problems.

Technical Program

Leading international authorities have been invited to present papers in their areas of specialisation. The following sessions are included in this technical program:

- Plenary Session - State of the Art
- Exploration Geochemistry
- Applications of Regional Geophysics and Geochemistry
- Integrated Exploration Information Management
- Exploration and the Mine Environment
- Mine Site Exploration and Ore Delineation
- Seismics in Mineral Exploration
- Integrated Exploration Case Histories

No overlaps are planned in the technical program. This will permit delegates to attend all sessions, to broaden their knowledge of all of the technologies presented.

As many as 75 poster papers are anticipated. Each will be displayed for one day to complement the aural papers of that day. Such presentations must pertain to the theme of Exploration '97 and be in line with one of the above eight topics. The committee invites you to offer a poster paper.

Geophysical, geochemical and Geographical Information Systems (GIS) workshops, up to five days each will be offered in the week preceeding Exploration '97.

Exhibition

An international group of selected exhibitors have already committed to display the latest technology in exploration instrumentation, software and services. Other interested organisations should contact Exploration '97 organisers.

Publication of Proceedings

The publications from the Exploration '67, '77, and '87 conferences have unique and important references for geoscientists. The participation of highly expereienced individuals from international organisations in Exploration '97 will contribute t oan even more important volume which will be available to delegates at the time of the conference.

Visits to Manufacturers, Consultants & Service Companies

The Toronto area is the base for many internationally known exploration consultants, contractors and instrument manufacturers who will welcome delegates to visit individually or in organised tours after the close of Exploration '97. Participating companies will provide on-site registration at their booths in th exhibit area.

Accommodation

Exploration '97 will take place in the Metropolitan Toronto Convention Centre which is ideally suited for both the technical sessions and the exhibition near downtown Toronto. Blocks of rooms have been reserved in nearby hotels for the use of delegates.

Social Program

As is tradition for the Exploration conferences, there will be a full program of activities after conference hours for delegates and spouses, and daily programs for spouses. Events will include tours of Toronto and Niagara Falls, art galleries, theatres, the Ontario Science Centre, shopping, luncheons and a formal dinner.

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

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Calender of Events

July 23-27 1996

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Sept 30 - Oct 3 1996

6th Int'l Conference on Ground Penetrating Radar
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November 10-15 1996

SEG Annual Meeting
Denver, USA
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February 23-27 1997

12th ASEG Conference & Exhibition
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September 14-18 1997

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