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Where has all the data gone?

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In a recent presentation performed at the Professional Petroleum Data Management (PPDM) conference in Perth, I spoke about the problems exploration companies can have when an exploration area that has previously been out of favour comes back into fashion.

The first thing that all companies entering a previously explored area do is assemble as much pre-existing data as possible. In Australia, effort to source this data from various public sources is usually quite fruitful. However, whilst getting 90% of the data you need is a great start, it can often be the 10% that you *can't* find that will make all the difference to your exploration efforts. The reasons behind this missing 10% are many and varied, but usually fall into two main categories. The first of these two categories is bureaucratic in nature.

As some background, it was not until 1946 that a formal government body called the Bureau of Mineral Resources Geology and Geophysics (BMR) was formed. The BMR had a general exploration view; encompassing both minerals and petroleum. The BMR later came to be known as AGSO, and then became Geoscience Australia. Through these various transitions, and with changes in its degree of control and mandate over exploration activities in Australia, data submission guidelines were created, modified and in many cases then handed over to other agencies. In 2012 a new agency, the National Offshore Petroleum Titles Administrator (NOPTA), was formed and took over administration of petroleum acreage in Commonwealth waters from Geoscience Australia, adding a new layer once again.

As time went on, and overlapping with the changes at the federal level, some states took control over their own state's exploration activities, while others maintained a hands off approach. Data was going in different directions, some to federal agencies and some to states. Sometimes data went to both, and sometimes to neither, creating holes in data sets desperately needed in contemporary exploration programmes. Depending on the state you were exploring in, whether your exploration area was on or off shore, and whether you were looking for minerals or oil and gas, you had a different government body that was interested in your activities and data.

One recent change in the oil industry has opened up a new previously unseen issue in locating historical exploration data. That change is the transition of oil companies to unconventional oil and gas targets like CSG. This transition has seen oil exploration companies looking to review data that might typically be associated with mineral exploration. Vast differences in data submission guidelines between petroleum and minerals, paired with changes in requirements at the state and federal level, means that many data sets needed by exploration companies cannot be found, or there is simply uncertainty about where this data actually resides.

The second category of issue that has created this missing 10% cannot be blamed on bureaucracy and rests firmly on the industry itself. The government, with the best of intentions and much effort, cannot police everything and everyone. Even with the well written and clear submission guidelines in existence today, the government cannot always control issues such as companies going into receivership and not performing their submission, or mergers and acquisitions that created uncertainty as to what had been submitted by one party and who was responsible for it moving forward. I think it would be safe to say that some companies simply ignored the policies and guidelines. Some then took the data overseas when they left or simply kept the data in a storage shed in the event that they might need it again later.

I guess my message to the industry is as follows – data submissions are necessary, good for the industry and are simply not that complicated. Various guidelines and online resources are available to assist with the process in each state and at the federal level. In addition, there are service companies and consultants who can assist where uncertainty in the process is required. As an industry we need to lift our game and get these valuable data assets back to the rightful owners on time. It is likely ourselves that will benefit from this when we need data in the future.

Prospect risking and sparse data

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Most interpreters have been involved in prospect risking meetings where new prospects in the company's portfolio are assigned a chance of success. Prospect risking is one of the black arts of exploration that often involves guesswork and manipulation based on the sometimes biased ideas of the prospect review committee. But, rather than using dodgy brown numbers that have no explanation, maybe there is a way to use the available data.

Last week I was in a meeting which was trying to determine the probability of finding a good porosity reservoir rock at a depth of 5000 m. During the discussion the porosity vs depth plot (Figure 1) was projected on the screen of the meeting room. It showed no well in the area had been drilled to that depth. One of the geologists remarked 'It's a guess – we don't have any data'. Actually there

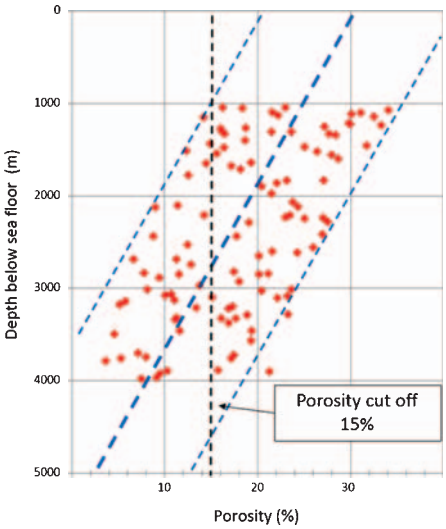


Figure 1. *Plot of porosity vs depth below sea floor using data from a number of wells. (Note: for this article I have not used real data.)*

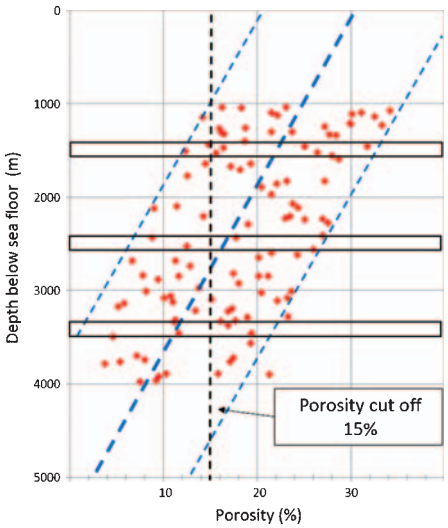


Figure 2. *Porosity vs depth plot showing linear trend lines extrapolated to 5000 m below sea floor and the porosity cut off (15%). The extrapolated trend lines indicate that at 5000 m no effective reservoir is expected. Also shown are three windows around 1500, 2500 and 3500 m that are used to calculate probability of a reservoir sand with greater than 15% porosity.*

is a lot of data – it's not obvious, but maybe we can analyse the data we have and calculate the chance of finding an effective reservoir.

I have devised a method that yields a chance of success based on extrapolating the data available.

Let's assume that an effective reservoir requires at least 15% porosity. The most common technique, extrapolating the data bounds of the plot of porosity vs depth, suggests that there is no chance of finding an effective reservoir at 5000 m below sea floor (Figure 2). But this conclusion is based on a linear trend. Is the cloud of data on a straight line or curved trend?

I suggest that we calculate the probability of finding effective reservoir in a number of different depth windows and create a probability vs depth plot. For example, in the depth window 1400–1600 m there are ten data points, two are below the porosity threshold and eight are above it so the probability of good reservoir is 0.8 or 80%, which is plotted at the midpoint depth of 1500 m. Taking two further windows gives probabilities of 60% (3 out of 5 points) and 50% (2 out of 4 points) at 2500 and 3500 m respectively

By plotting these three points and fitting a curve through them (Figure 3) we

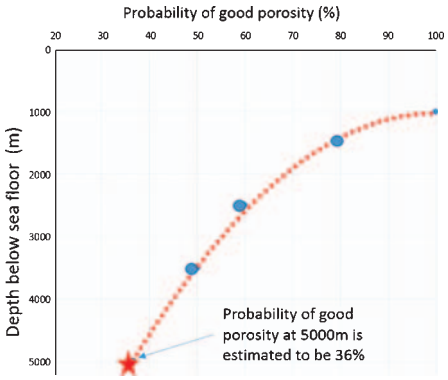


Figure 3. *Probability of effective reservoir (>15% porosity) vs depth below sea floor. A line of best fit is calculated from data points at 1500, 2500 and 3500 m (blue) and extrapolated to 5000 m. The extrapolated point (red star) gives a 36% chance of finding a reservoir with more than 15% porosity.*

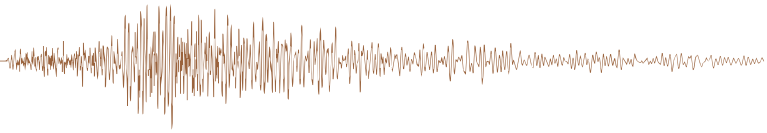
can estimate the probability of effective reservoir at 5000 m to be 36%. This is far better than the zero chance obtained by linear extrapolation and the prospect lives on.

So how does this method compare to the prospect review team? Well they chose 30%. But none of the review team could explain why.

Addendum: Following the June article on negative time I found this clock in the meeting room in the office of Total Depth Pty Ltd.

I don't know if it proves the existence of negative time but it does show how it is easy to be confused if common standards are ignored. Is it still the morning or is it the afternoon?

Calendar of Events 2014–17



October			**2014**
21–23	131th SEGJ Conference http://www.segj.org	Shizuoka	Japan
26–31	SEG International Exhibition and 84th Annual Meeting http://www.seg.org	Denver	USA
27–29	KazGeo 2014: From Challenges to Opportunities http://www.eage.org	Almaty	Kazakhstan
December			**2014**
3–4	1st SEG/SBGf Workshop on Near Surface Geophysics Applied to Exploration, Engineering and Environmental Studies http://www.seg.org/meetings/Salvador2014	Salvador	Brazil
10–12	The 8th International Petroleum Technology Conference (IPTC) http://www.iptcnet.org	Kuala Lumpur	Malaysia
January			**2015**
11–14	3rd South Asian Geosciences Conference and Exhibition http://geo-india.com/	New Delhi	India
February			**2015**
15–18	ASEG–PESA 2015: *Geophysics and Geology together for Discovery* 24th International Geophysical Conference and Exhibition http://www.conference.aseg.org.au/	Perth	Australia
March			**2015**
18–21	PACRIM 2015 http://www.pacrim2015. ausimm. com.au	Hong Kong	China
May			**2015**
17–22	20th Caribbean Geological Conference http://www.thegstt.com	Port-of-Spain	Trinidad and Tobago
June			**2015**
1–4	77th EAGE Conference and Exhibition 2015 http://eage.org	Madrid	Spain
July			**2015**
7–10	2nd Near-Surface Geophysics Asia-Pacific conference (NSGAP) (website TBA)	Waikoloa Village (Hilton), Hawaii	USA
October			**2015**
18–23	SEG International Exhibition and 85th Annual Meeting http://www.seg.org	New Orleans	USA
December			**2015**
7–9	The 9th International Petroleum Technology Conference (IPTC) http://www.iptcnet.org	Doha	Qatar
October			**2016**
16–21	SEG International Exhibition and 86th Annual Meeting http://www.seg.org	Dallas	USA
July			**2017**
2–17 (TBC)	3rd Near-Surface Geophysics Asia-Pacific conference (NSGAP) (website TBA)	TBA	Australia

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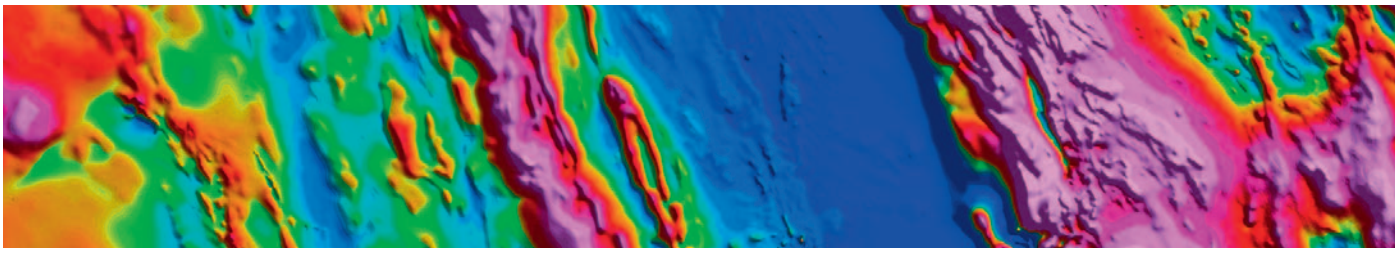

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Preview

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The ASEG SA/NT Branch is pleased to be able to present the following wines to ASEG members. These wines were found by the tasting panel to be enjoyable drinking and excellent value. The price of each wine includes GST and bulk delivery to a distribution point in each capital city in early December. Stocks of these wines are limited and orders will be filled on a first-come, first-served basis.

Please note that this is a non-profit activity carried out by the ASEG SA/NT Branch committee only for ASEG members. The prices have been specially negotiated with the wineries and are not available through commercial outlets. Compare prices if you wish but you must not disclose them to commercial outlets.

2014 ASEG WINE OFFER

orders close Friday 7th of November 2014

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"Totally opaque black purple red colour with deep dark purple red hue. The nose offers up scents of liquorice over black-berry, dark plum and vanillin confectionary with some black pepper end notes. The palate is packed with richness and possesses an explosive power that belies its meagre price point yet has a more structured fruit profile than previous releases. Mouthfilling flavours of liquorice, black pepper, black cherry and blackberry with some underlying toasty vanillin oak. The black pepper persisting long into the aftertaste. Fine grained tannins but with plenty of structure. Superb persistence with long aftertaste of liquorice, black pepper and toasty vanillin oak."

ASEG PRICE $150/dozen (RRP $185)

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Please order online at www.aseg.org.au (click on "Wine Offer") and pay by credit card, or fill in below order form

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[ ] Visa [ ] Mastercard Card Expiry date: __ __ / __ __

Card Account number: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ Signature: _____

Number of dozens	Wine	Price per Dozen	Total
	2012 Reillys Shiraz	$150	
	2013 Hemera Riesling	$120	
		TOTAL	

Order and payment to:

secretary@aseg.org.au **T: 02 9431 8622 | F: 02 9431 8677 | PO Box 576, Crows Nest, NSW 1585**

(Please follow up any faxes with a phone call to ensure the form has been received)