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Stimulation of private mineral exploration through Government funding of pre-competitive geoscientific data (PCGD) projects

Abstract

This paper demonstrates the value of the TEISA program to South Australia by;

1. Describing what TEISA is
2. Quantifying the contribution that Pre-competitive Geoscience Data (TEISA-type surveys) have made to modern (last 30 years) mineral discoveries in South Australia
3. Detailing three research studies into the impact on private mineral exploration of TEISA-type programs in Australia, and
4. Detailing anecdotal but specific instances where TEISA programs have directly contributed to mineral exploration and discovery in South Australia.

1. **WHAT IS TEISA?
AN INVESTMENT IN THE ACQUISITION OF PRE-COMPETITIVE
GEOSCIENCE DATA TO STIMULATE PRIVATE EXPLORATION
ACTIVITY**

The South Australian Government clearly signalled its continuing confidence in the ability of the resources industry to play a key role in the State's economic growth by committing \$23.2 million (\$13.2 million, ongoing and \$10 million, targeted), to be spent over the years 1998/9-2001/2, on a phased, targeted, regional geoscientific survey to provide baseline data for minerals, petroleum and groundwater exploration.

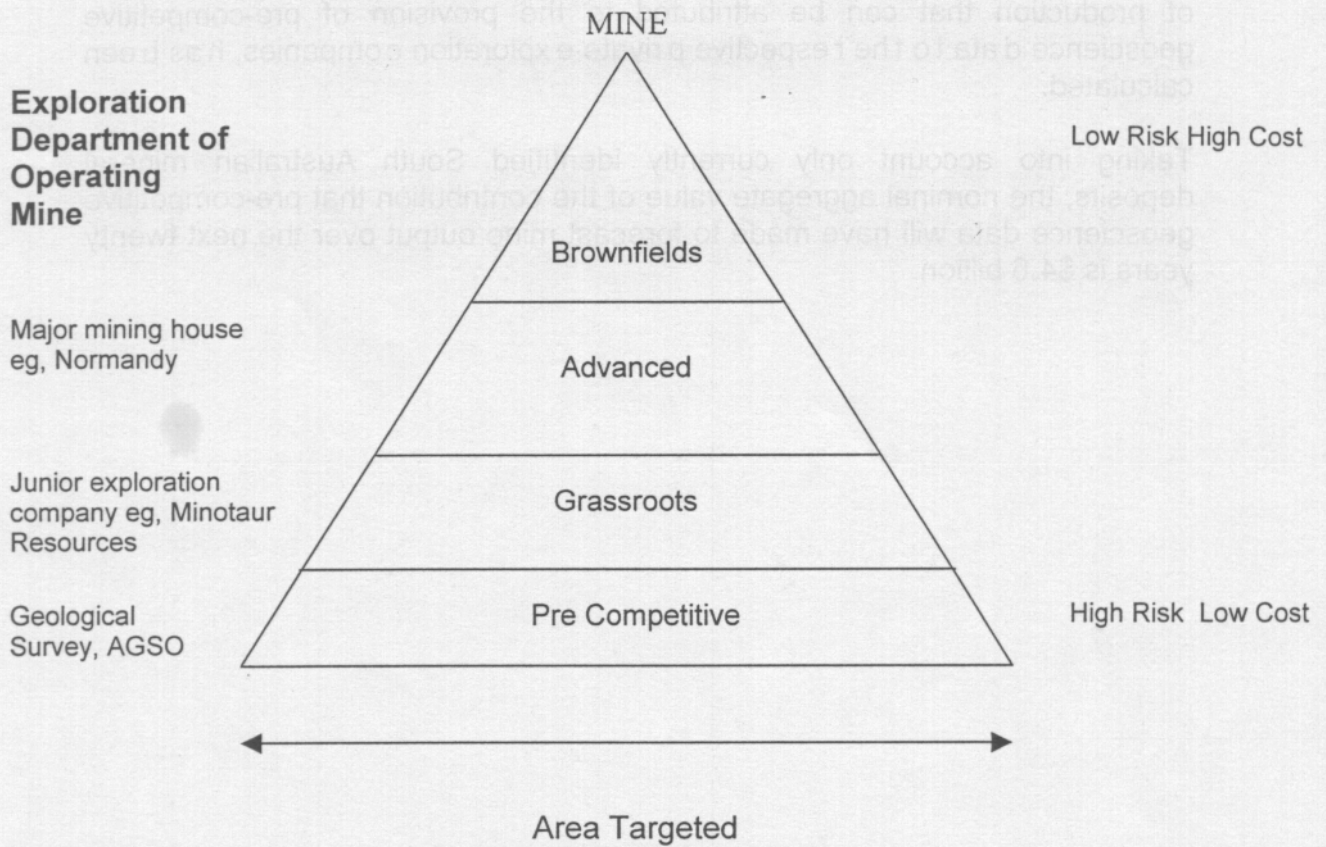
This strategy, known as the **Targeted Exploration Initiative South Australia (TEISA)**, has provided new, low cost pre-competitive exploration data to accelerate the discovery of new resources throughout South Australia. TEISA has refined and expanded the approach adopted by its precursor the South Australian Exploration Initiative (SAEI) which ran from 1992/3-1995/6. The results of the investment by the SA Government through both SAEI and TEISA are becoming increasingly obvious, with some very topical examples.

- ◆ The exciting Olympic Dam look-alike drill intercept announced by Minotaur Resources. This intersection of 107m at nearly 2% copper and 0.66 grams per tonne gold is similar to typical early intercepts obtained by WMC at Olympic Dam in 1975/76. According to Derek Carter, the Managing Director of Minotaur Resources, the Minotaur hole was sited using both TEISA data and other company data drawn from MER archives, and is a graphic example of the value of pre-competitive geoscience data in general and TEISA data specifically. The discovery area falls within TEISA aeromagnetic survey Area D2 flown in 1999.
- ◆ In October Perilya Resources announced the discovery of significant high grade zinc mineralisation (Reliance) located by drilling beneath soil covered areas near Leigh Creek (eg, 19m @ 34.7% zinc and 19m @ 36.5% zinc). The Reliance mineralisation has been recognised as being part of a major structural trend defined by Government geological surveys. The Managing Director of Perilya, Tim Clifton has acknowledged the role of the Government survey in focussing his company's exploration effort and he also endorsed the legacy data archiving program being conducted under TEISA as a valuable source of information which significantly assisted Perilya in its area selection.

TEISA 2020 will continue this successful program of acquiring pre-competitive geoscience data with the aim of attracting high levels of private exploration investment into South Australia.

This exploration is needed to ensure that the targets identified by the Resources Task Force (RTF) of \$3.0 billion minerals value and \$1.0 billion processed minerals value are met by 2020. Figure 1 illustrates the real (2000) value of minerals production over recent years and the 2020 target.

Figure 2: The Exploration Triangle



2. ASSESSMENT OF THE VALUE OF MODERN MINERAL DISCOVERIES AND THE CONTRIBUTION OF PRE-COMPETITIVE GEOSCIENCE DATA (PCGD) TO THEIR DISCOVERY

An assessment of modern South Australian mineral discoveries is presented in Table 1. For each discovery, the proportion of the actual or estimated value of production that can be attributed to the provision of pre-competitive geoscience data to the respective private exploration companies, has been calculated.

Taking into account only currently identified South Australian mineral deposits, the nominal aggregate value of the contribution that pre-competitive geoscience data will have made to forecast mine output over the next twenty years is \$4.6 billion.

3. RESEARCH STUDIES INTO THE IMPACT OF PRE-COMPETITIVE GEOSCIENCE DATA (PCGD) INITIATIVE SPENDING BY AUSTRALIAN GOVERNMENTS

Industry study of SAEI (1996)

A study of the South Australian resources exploration industry by Goreing and Morton (1996)¹ concluded that the State government funded mineral programs of the South Australian Exploration Initiative (SAEI), which provided freely available geoscientific data and reduced investment risk, resulted in private companies spending an **estimated \$9.9 million additional** expenditure on mineral exploration in South Australia. The study also concluded that 256 jobs were created, which in turn delivered \$9.6 million additional household income resulting in an additional return to Treasury of \$1.1 million.

Goreing and Morton (1996) also noted that a number of new exploration companies set up offices in Adelaide during the SAEI to pursue South Australian exploration opportunities, including Minotaur Gold which, in the guise of Minotaur Resources, discovered the Prominent Hill copper/gold mineralisation in 2001.

Centre for Economic Studies assessment of SAEI (1996)

A study undertaken by the SA Centre for Economic Studies (SA Centre for Economic Studies, 1996)², concluded that the SAEI accelerated the application of new technologies in exploration and hastened the development of mining in the Gawler Craton region. The study concluded that a net benefit to the State of bringing forward mine developments was between \$43 million and \$71 million in net present value terms.

The study's benefit-cost analysis concluded that the SAEI was unlikely to deliver a dramatic financial return to the State. However, a weakness in the Centre's analysis was that the study had assumed unrealistically short lead times for the advancement of exploration, and the subsequent discovery, development and commencement of new mines, and simplistic success/failure scenarios. Further, its benefit estimates were based on the development of limited scale mining operations that would probably be uneconomic. Employing these inaccurate assumptions in the Centre's analysis led to a significant understatement of the projected benefits to the State emerging from mineral initiative-type government spending.

Time has shown that mines resulting from the SAEI and subsequent TEISA work are likely to be larger scale operations (eg, Minotaur's discovery) with the potential to deliver commensurately higher order returns to the State (see Table 1).

Research study into impact of pre-competitive exploration

Research into the impact of pre-competitive exploration is the subject of PhD thesis by Margaretha Scott of the University of Queensland (Scott,2000)³.

Using the Yarrol region as a study area Scott's study found that by upgrading the PCGD by a factor of two, prospectivity was elevated. Results from this prospectivity modelling show that the number of targets identified using the upgraded data increases **more than five fold**. As well, a significant **reduction in discovery risk** was found to correlate with the upgraded data set.

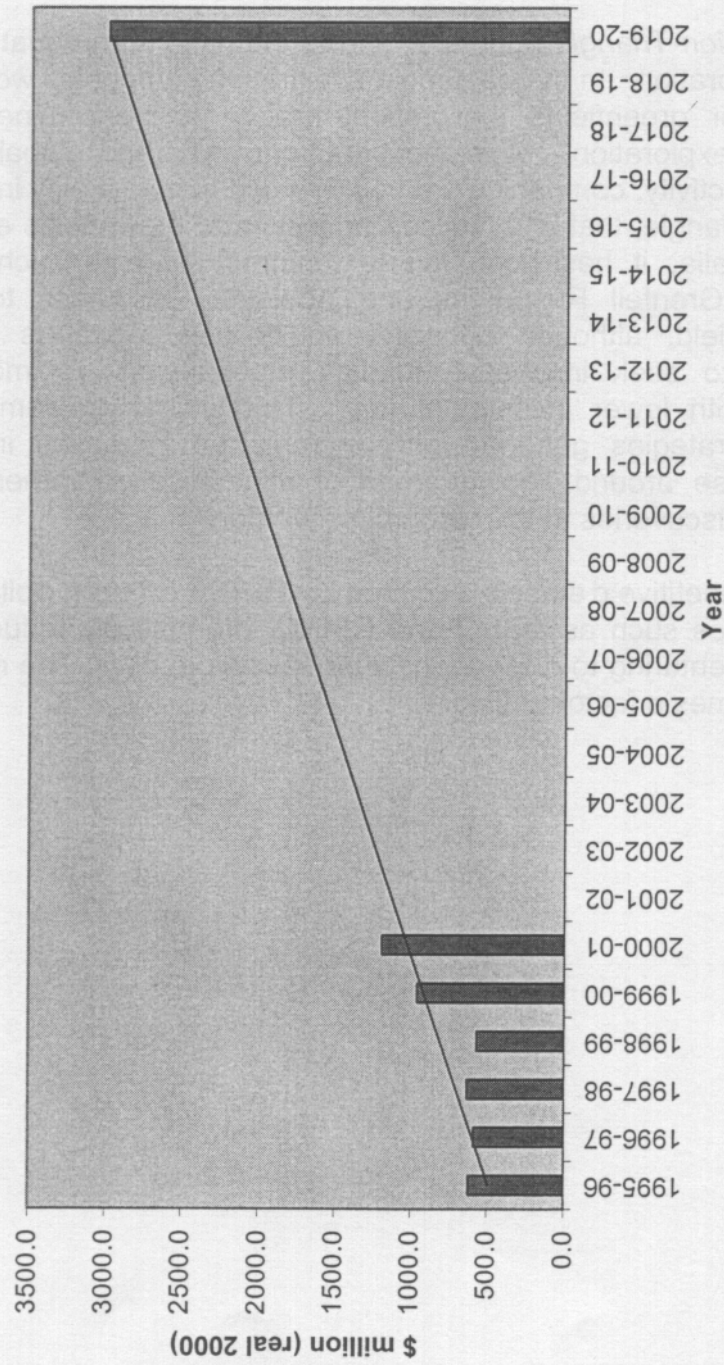
Scott's study shows that effective mineral exploration resources management is significantly influenced by the provision of new Government geoscientific information. Results from the Yarrol study suggest that the contribution deriving from the use of **upgraded geoscientific data is about 3 times** that of first-pass data. In terms of potential future royalties, modelling of programs involved in upgrading geoscientific data in the Yarrol region showed that stimulation of exploration investment of net present value \$55 million would in turn generate royalties having a net present value of \$148 million.

¹ Goreing, Bob, and Morton John (1996) Economic Impact of the SAEI, *MESA Journal* No 3, October 1996.

² The SA Centre for Economic Studies (1996) *Examples of MESA's contribution to the South Australian Economy*, The SA Centre for Economic Studies (unpublished)

³ Scott, Margaretha (2000) *Valuing Australian State Geological Surveys: Quantitative Analysis for Strategic Planning*, unpublished PhD thesis, University of Queensland.

**Figure 1: RTF Target Real Minerals Production Value (2000 \$)
Actual values in 2000 \$ to 2000 - 2001**



What are pre-competitive geoscience data (PCGD)?

Pre-competitive geoscience data are “non-rival” – meaning that their use by one explorer does not reduce the value or use of the same data by another explorer. This information is usually of a regional nature and, because it is not efficient for companies to duplicate the collection of this type of information, it makes good economic sense for the information to be acquired by a single source and then made available to all explorers.

The Exploration Triangle (Figure 2) shows the risk/return equation that drives mineral exploration. In the past most exploration companies would undertake grassroots or greenfields exploration through to near mine or so-called brownfields exploration. With the paradigm shift (and global downturn) in exploration activity, companies are being forced to invest only in the lower risk part of the triangle, that is advanced projects and brownfields exploration. In South Australia, it has been left to junior companies such as Minotaur Resources, Grenfell Resources and Adelaide Resources to occupy the grassroots field, although shrinking equity risk capital is forcing these companies to seek innovative funding mechanisms, or more advanced properties with lower investment risk. The critical problem is that such corporate strategies generate only incremental increases in the mineral resource base around known areas of mineralisation rather than adding wholly new discoveries to the resources inventory.

The pre-competitive datasets acquired by PIRSA often in collaboration with other agencies such as AGSO and CSIRO, dramatically reduce the risk for companies venturing to discover new prospects/deposits. The risk factor then largely becomes a factor of time.

Table 1: Modern Mineral Discoveries in South Australia

| DISCOVERY | Date | Est value (\$A) over next 20 years | Discovery history | Relationship between Discovery and Precompetitive Geoscientific Data | Total % Contribution of PCGD | Estimated value (\$A) of PCGD over next 20 years |
|---------------------------------|------|------------------------------------|---|--|------------------------------|--|
| Olympic Dam Gold/Copper/Uranium | 1975 | \$20.0b | 1975 WMC discovers Olympic Dam. The initial drill target was a coincident magnetic/gravity anomaly along a crustal lineament defined by early 1970's BMR aeromagnetics, PIRSA geological mapping & conceptual ideas for the Stuart Shelf. | Geological Mapping/Concepts Gravity Aeromagnetics Legacy Data | 2.0% 2.0% 2.0% 0.5% | 6.5% \$1 300m |
| Mine opened in 1988 | | | | | | |
| Challenger Gold | 1995 | \$0.25b | 1973 -1993 PIRSA geological mapping on Western Gawler Craton provided regional framework for subsequent exploration activities. 1992 Dominion takes out licences over region based on 1991 PIRSA Tarcoola-Tallaringa bedrock drilling results;1992 SAEI aeromagnetic data play major role in identifying Challenger look-alikes and tenement acquisition;1995 Challenger Au anomaly identified. | Bedrock Drilling/Geochemistry Aeromagnetics Geological Mapping/Concepts Legacy Data | 5.0% 2.0% 1.0% 0.5% | 8.5% \$21.25m |
| Mine opening in 2002 | | | | | | |
| Reliance Zinc | 2000 | ?\$0.375b | Previously identified mineralisation located along part of major faults defined by legacy data and PIRSA mapping enabled Perilya to focus its exploration/geochemical program. Its 2001 drilling identified Reliance deposit, near Leigh Creek. | Legacy Data Geological Mapping/Concepts | 3.0% 2.0% | 5.0% ?\$18.75m |
| Mine opening in ?2003 | | | | | | |

| | | | | | | | |
|---|-------------|---------------|---|--|---------------------------------------|--------------|----------------|
| Mindarie Heavy Mineral Sands Mine Opening 2002/3 | 2000 | \$1.3b | BMR stratigraphic studies stimulate HMS exploration, 1976. Aberfoyle Resources delineate resource 1989; PIRSA geological mapping identifies regional extent of strandlines, 1978 - 1993. Southern Titanium (formerly Murray Basin Minerals) acquires Mindarie-Mercunda prospect in 1998 following assessment of legacy data. TEISA aeromagnetic survey 1999 increases HMS resource potential of region. | Radiometrics/DTM/Aeromagnetics Legacy Data Geological Mapping/Concepts | 2.0% 2.0% 2.0% | 6.0% | \$70.0m |
| Beverley Uranium Mine Opened 2001 | 1969 | \$0.6b | Discovered by Oilmin-Transoil-Petromin Group 1970 while searching for hydrocarbons based on PIRSA mapping, drilling and promotion. Vital legacy data included geophysical surveys dating back to 1945. Heathgate acquires leases in 1990. | Geological Mapping/Concepts Bedrock Drilling Legacy Data | 1.0% 1.0% 1.0% | 3.0% | \$18.0m |
| Honeymoon Uranium Mine opening 2002 | 1972 | \$0.4b | Discovered in 1972 by Minad-Teton-CEC Joint Venture. PIRSA mapping, drilling, hydrological, geophysical and palaeogeographic interpretation contributed to defining resource. Vital legacy data included, drilling, gravity radiometrics and resistivity surveys. | Geological Mapping/Concepts Bedrock Drilling Legacy Data | 1.0% 1.0% 1.0% | 3.0% | \$12.0m |
| SAMAG Magnesium Planned Mine Opening 2004 | 1999 | \$4.0b | 1998, PIRSA mapping & sampling of deposits, ore characterisation, mineralogical studies and HyMap survey used to define deposit and resource feasibility. Legacy data include mapping, company resource and production information. 1998 - 1999 SAMAG commences drilling programs at Mt Hutton, Witchelina: 2000 Mt Hutton deposit selected for mining. | Geological Mapping/Concepts Legacy Data Resource Feasibility Hyperspectral | 20% 10.0% 10.0% 5.0% | 45% | \$1800m |
| SASE - Auiron Iron Ore Planned Mine Opening 2005 | 1996 | \$6.0b | PIRSA geological mapping provided regional framework for iron ore and coal resource exploration. 1992-95 SAEI gravity, aero/ground magnetics data used to assist in identifying prospective deposits. 1995 PIRSA commences iron ore field investigations on Gawler Craton with detailed drilling and gravity programs. Legacy data include substantial company data. | Resource definition drilling Aeromagnetics Geological Mapping/Concepts Gravity Legacy Data | 10.0% 5.0% 5.0% 2.0% 0.5% | 22.5% | \$1350m |

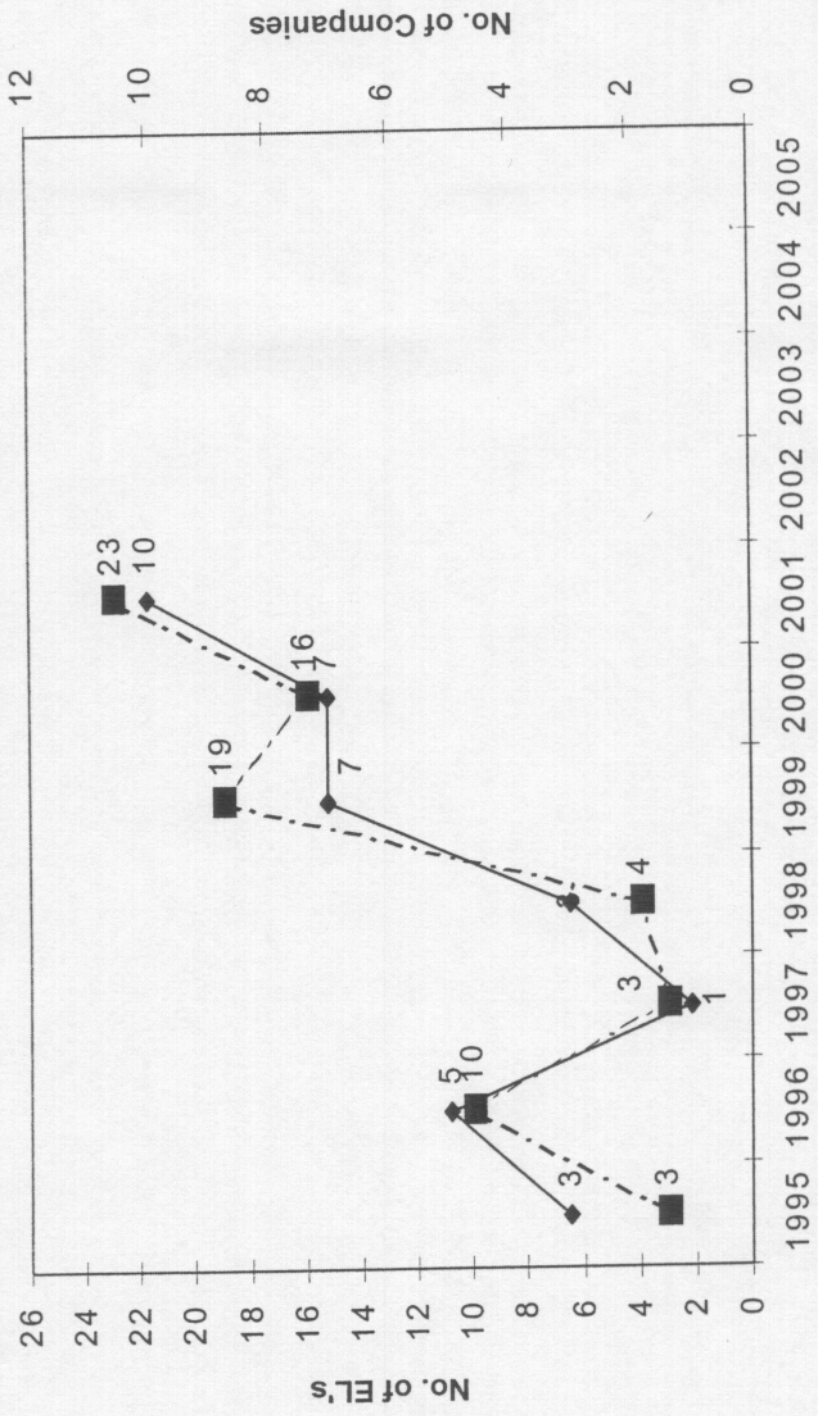
4. IMPACT OF TEISA PROGRAMS – EXPLORATION ACTIVITY INDICATORS

Significant levels of exploration activity, as indicated by licence statistics and anecdotal evidence, can be attributed to the leverage applied to private companies by TEISA

- Increased exploration for nickel and platinum on the Gawler Craton and Musgrave Block. The identification in 1998, following a TEISA survey, of new greenstone belts on the Gawler Craton has resulted in refocussed company activity, a greater number of ELs and companies exploring for nickel and platinum (Figure 3)
- Greater activity in TEISA airborne magnetic survey areas. There has been an increase in expenditure, number of ELs and area under licence. Discovery of the Prominent Hill copper/gold prospect by Minotaur Resources within TEISA Area D2.
- Rejuvenated exploration for zinc resulting in a new economic zinc intersection (Reliance) in the Leigh Creek area, partly as a result of legacy data captured under TEISA programs.
- Diamond discovery potential enhanced by airborne magnetic surveys over Flinders Island and surrounding regions, resulting in increased exploration and participation of a major international diamond company.
- Copper-gold exploration in the waters of Spencer Gulf (Gawler Craton) based on aeromagnetic targets defined by joint industry/TEISA survey.
- Joint industry-TEISA programs have successfully investigated and developed new exploration methods and techniques specific to SA circumstances, for iron ore, diamonds and coal
- Increased exploration in deep sediment covered areas east of the Peake and Denison Ranges targeting TEISA aeromagnetic anomalies.
- Rejuvenated HMS exploration in the northern Murray Basin resulting in part from a TEISA airborne survey, stratigraphic drilling and evaluation of legacy data.
- Aeromagnetic surveys (AGSO/TEISA) over the Musgrave Block have significantly improved definition and prioritisation of targets for companies holding tenements awaiting processing in AP Lands.

Figure 3: TEISA Greenstone/Ni/Pt Program

- - - No. of EL's
 - - - No. of Companies



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