

PROPOSAL

The Development of Cellular (Foam) Glass Products Utilising Waste Glass and Specific Industrial Waste Materials

COMMERCIAL IN CONFIDENCE

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Prepared by:
Mineral Strategies Pty Ltd
3 Seville Place, Golden Grove
South Australia, 5125
Phone: 61 8 8251 5356
Mobile: 0414 648 754
Email: amgraham@bigbutton.com.au

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1. Overview

This position paper was formulated following correspondence and discussions with Mr. Andrew Pickering, Investment Manager for the Centre for Energy and Greenhouse Technologies (hereinafter CEGT).

The primary aim of this position paper is to outline the nature of a major opportunity identified by Mineral Strategies; demonstrate its congruence to the CEGT investment criteria and establish the capability of the management team to successfully deliver the desired outcomes.

2. Introduction – What is Cellular Glass?

Cellular or foam glass is essentially glass with a high bubble content, produced by adding gases or gas forming substances to a glass or glass-like¹ melt. The resulting cellular glass has a very low density but a high compressive strength and dimensional stability, making it particularly suitable for thermally and acoustically insulating construction materials.

¹ The term “glass-like” melt is added to include those materials which exhibit glass-like properties and behaviour but do not comprise what would be considered true glass chemistry. This is one area of research where Mineral Strategies Pty Ltd expects to make some significant breakthroughs.

Cellular or foam glass, was first commercially exploited as far back as the 1930's. Originally it was only able to be manufactured from a specially formulated glass composition using virgin glass only. However, some European foam glass producers are currently using up to 98% post-consumer waste glass in their product.

The basic principle of cellular or foam glass manufacture is to generate a gas in glass at a temperature between 700 and 900 degrees Celsius. The gas expands the melt producing a structure of cells which form a porous end product with highly consistent characteristics.

Whilst gas can be injected directly into the melt a far more robust mechanism is the addition of an inorganic salt or organic compound to the glass waste prior to the heating (melting) process. The added “reagent” thermally decomposes during the melting phase releasing a gas which in turn is captured in the highly viscous melt resulting in a very predictable aeration process.

Whilst there are some foam glass manufacturers in the United States and Europe, they guard their production methodologies very closely and the patent information that does exist is invariably very vague, such that additional information would be necessary to replicate any process.

3. CEGT Criteria – Project Acceptability

This foam glass project represents an excellent opportunity to investigate and develop an end product that would fall into a number of the CEGT categories. In the United Kingdom, Part L and J of the Building Regulations deal with energy conservation and are primarily

linked to the contribution that heating in domestic and commercial premises makes to carbon dioxide emissions. This is particularly pertinent in the UK as it has a binding obligation to reduce its carbon dioxide emissions under the Kyoto Agreement. Whilst this doesn't relate directly to Australia it does mean that certain bodies in the UK have taken the time to set down minimum performance standards for products and structures in terms of their U value. The U value is the rate of heat loss, expressed in watts per square metre per degree temperature difference (w/m^2K).

An independent study by the UK Government initiated group – WRAP (Waste and Resources Action Programme) has shown that the use of foam glass in the construction of domestic and commercial buildings would greatly reduce the energy consumption and hence the carbon dioxide emissions of newly built structures.

In addition to the potential energy savings from the direct use of foam glass products there are other less obvious, but still relevant, advantages due to the characteristics of the product. These include design flexibility, construction productivity, reduced manual handling and lower transport costs. The lower transport costs are essentially a function of the low product density which enables more square metres of product to be carried per load.

Therefore, foam glass represents a technology that is not only able to increase energy efficiency in the building sector but it will also have an impact on the transportation sector in terms of reduced Greenhouse Gas (GHG) emissions (i.e. reduces NO_x emissions).

In addition, foam glass will save on the extraction of virgin quarry products (sand and aggregate) and thereby impact that industry in a positive manner from an energy consumption point of view.

For the sake of comparison a WRAP report indicated that for glass that is recycled back into container glass the CO_2 emissions are calculated as 351 kg per tonne of recycled glass (including the crushing) whereas for foam glass this value was calculated to be only 43 kg per tonne of waste glass.

4. Technology: Development Stage and Potential

Mineral Strategies sees that there are two major opportunities concerning the development of a cellular or foam glass product in Australia:

i). **Waste Glass Utilisation** – there are tens of thousands of tonnes of cullet (post-consumer glass waste) being discarded to land-fill every year throughout Australia. In some states, such as South Australia, the cost of land-fill is still quite cheap and as such there is little incentive for waste glass generators to look at value-added alternatives, particularly given that many have never been presented with such options or do not see it as being a core business issue.

This has created a situation where there is ample opportunity for long-term access to bulk raw materials at either no cost or at most a very low handling fee.

ii). **Other “Glass-like” Waste Materials** – Mineral Strategies extensive involvement with waste products and materials technologies across a wide range of industries has enabled it to develop a large database incorporating the characteristics of many waste products. A study of this database has indicated that there are a number of waste products currently being generated that behave very similarly to glass in terms of their melting characteristics, despite the fact that they do not comprise a true glass chemistry.

To this end, Mineral Strategies sees a unique opportunity to take a technology that has been applied to waste glass (albeit only in Europe and the USA) and tailor it specifically to some of these other waste products.

There is also a strong likelihood, given Mineral Strategies current database and depth of experience with various materials technologies that some hybrid products and / or complementary technologies will also emerge (as has often happened in the past).

The potential of this technology can be summarised in three points:

1. The emergence of a foam glass technology in the Australian market place which may, or may not, reflect the types of products and processes that are currently being undertaken in Europe and the USA, but will certainly have the potential to impact positively on the Australian construction industry. *(It is likely that the focus will be on the potential to develop a panel product which will find ready market acceptance, particularly given that the construction industry is in desperate need of some alternative products);*
2. The emergence of a range of foam glass products based on “glass-like” waste materials currently generated by a number of companies with which Mineral Strategies has a working relationship. *(This part of the investigation could result in some major interest being generated amongst the mining and mineral processing industries); and,*
3. The emergence of some hybrid products or complementary processes that will enable this technology to be further advanced into major organisations, such as global mining companies. *(In conjunction with point 2 above this part of the investigation will also significantly contribute to reinforcing the reputation of the stake holders to deliver innovative and effective solutions).*

5. Management: Skills and Experience

Since its inception Mineral Strategies has been actively involved in the development of a range of innovative materials technologies aimed at delivering real, sustainable value to its clients in the mining, civil construction, industrial and manufacturing sectors.

Initially, the development work was dominated by geopolymer technology, but this is now complemented by a vast array of geopolymer hybrids, pozzolanic binders, oxy-sulphate cements, oxy-chloride cements, Ca and Mg-phosphate cements and other binders, cements and hybrids with industry-specific characteristics (eg. low density, high strength, rapid set, high thermal resistance and sound attenuation properties etc.)

Prior to founding Mineral Strategies, it's Principal, Andrew Graham, was involved in numerous materials technology projects for the private sector, including the development of specific geopolymer products formulated from various waste streams.

Mineral Strategies Pty Ltd currently draws additional skills, in the form of sub-consulting arrangements, from its well established network of specialist consultants. The Principals from the following organisations have been identified as having specialist skills relevant to the success of this particular project:

i). **Peter Graham** – has Bachelors degrees in both science (Building Technology) and Civil Engineering (Honours) and has extensive experience in both the domestic and commercial construction industries throughout Australia. Peter is currently Managing Director of Conceptio Pty Ltd, a specialist engineering consulting firm providing technical expertise to the civil construction industry, with a specific emphasis on trouble shooting and complex problem solving. Peter's highly analytical approach coupled to excellent communication skills and the ability to explain difficult concepts in simple terms makes him an ideal addition to the team. Peter has also developed a strong network of domestic and commercial construction companies, engineering firms, architectural groups, developers and investors from which additional resources can be drawn.

ii). **David Graham** – has a Bachelors degree in Applied Chemistry and has extensive experience in analytical and process chemistry in Australia and overseas. David is currently the Managing Director of DG/MS Consulting Pty Ltd, a specialist consulting firm providing technical expertise to a wide range of industries with a particular focus on trouble shooting, method development and process control. David's highly systematic and analytical approach has resulted in him being involved in training programs for various companies in Australia, Germany, Japan, Canada and the United States and will greatly aid the project in terms of method development and process control.

iii). **Andrew Graham** – is the primary driver behind this project and will be responsible for both undertaking R&D activities and managing the project on a daily basis. Andrew has a Bachelors degree in Applied Geology, a Masters degree in Economic Geology (strong geochemistry focus) and has completed additional studies in quarry and financial management. Andrew has founded a number of businesses, including Mineral Strategies Pty Ltd, and currently provides specialist technical, marketing and strategic planning services to the mining, civil construction, industrial and manufacturing sectors in the Asia-Pacific region.

A full resume for Andrew Graham is attached in Appendix I and a Brief Project History for Mineral Strategies Pty Ltd is attached in Appendix II.

6. Intellectual Property Issues

Given that there are numerous blending options in terms of the ratio of waste-glass to gassing agent; the choice of gassing agent and the type of process which will be used there is every likelihood that a unique process stream will be created from this investigation. Of course, this is without even considering the unique nature of any foam glass product that would be produced from an industry waste product other than a waste glass material.

Given that there are no foam glass plants currently in Australia and that the process appears to be a relatively simple one (albeit very well controlled) the question of intellectual property becomes interesting. Applying for patents is not only expensive but it also requires the disclosure of information that would normally not have to be disclosed. Mineral Strategies has spent much time in this debate in relation to the geopolymer technology and other materials technologies and has found that small variations in base chemistry reduce most patents to academic exercises. Whilst protecting intellectual property is a major consideration there are a number of ways in which it can be approached.

In a number of cases Mineral Strategies has found that it is of more strategic importance to gain control of the raw material inputs, either directly or through long term supply agreements. This would be particularly relevant in relation to a foam glass product based on waste glass.

In relation to business or site specific non-glass waste materials it will obviously be much easier to negotiate directly with the waste generator and establish a supply agreement that restricts others access to the raw material.

Of course, if it was deemed necessary to have the relevant patents in place then this would need to be considered following the completion of the project and the successful development of a patentable product.

7. Investment Opportunity

i.) **Time period** - it is envisaged that the research and development component will take about nine (9) months to complete. An estimate of the time and major components involved is outlined below:

a. *Primary Research Group:*

Andrew Graham (Principal R&D)	= 36 wks x 30 hrs/wk (equivalent)	= 1,080 hours
David Graham (R&D Expert)	= 36 wks x 12 hrs/wk (equivalent)	= 432 hours
Peter Graham (Civil / Technical)	= 36 wks x 6 hrs/wk (equivalent)	= 216 hours
	Sub-total hours	= 1,728 hours

b. Additional testing services (destructive and non-destructive):

AMDEL Limited (strength, permeability, reactivity, conductivity etc.)	=	250 hours
ANCON Beton (strength, durability, alkali reactivity, chlorides etc.)	=	100 hours
University of SA (thermal conductivity, fire resistance etc.)	=	100 hours
Sub-total hours	=	450 hours

c. Purchase of gassing agents (limestone, gypsum, silicon carbide, fly ash etc.).

d. Preparation of raw materials (primary crushing and milling + storage).

e. Hire or purchase of lab furnace for undertaking trials (up to 1,200 °C max. temp.).

Premix Concrete (SA) Pty Ltd have offered their laboratory facilities for the duration of the project as an in-kind contribution as well as shed space for the storage of any raw materials and finished products. Based on the current commercial leasing price this would amount to approximately A\$10,000 (including GST) over the 36 week period.

In addition, Mineral Strategies is currently negotiating for the lease of a section of the Chemistry Building (complete with lab space) at the University of SA (Mawson Campus) so that it can expand some of its other R&D activities. If this lease is successful this area would be made available to this project as an in-kind contribution from Mineral Strategies Pty Ltd and would be comparable to the value assigned by Premix for their laboratory.

Mineral Strategies is also investigating the purchase of a new laboratory furnace for use in this project and beyond. The furnaces that have been appraised to date range in price from A\$2,500 to A\$6,500.

On a less tangible note Mineral Strategies will also bring its extensive database of materials technologies to the project for the express purpose of fast tracking the process and honing in on a commercially viable outcome. This research work has been conducted and primarily self-funded over a period of ten (10) years and represents a real asset in terms of the project dynamics.

ii.) **Investment Amount** – having taken the aforementioned time contributions and project components into account it has been estimated that the project will require approximately A\$350,000 in funding (not including like-kind contributions) to achieve the desired result.

iii.) **Risk** – as with any technical investigation of this nature there is obviously a considerable risk component. However, given that aspects of this technology (utilising waste glass but not other “glass-like” waste materials) are being commercially exploited in Europe and the USA we have a high level of confidence in relation to a commercially viable outcome for this project.

Whilst it is acknowledged that investigations into some of the waste products with “glass-like” physical properties (but non-glass chemistry) may not yield the results we are hoping for they do only make up a part of the overall project.

Years of materials technology research, extensive on-line and off-line literature research and communications with current waste-glass re-processors overseas have granted this project the greatest chances for success.

iv.) **Exit Strategy** – an exact exit strategy has not been formulated for this project as yet.

v.) **Return on Investment** - an assessment undertaken by the UK Government through WRAP (Waste and Resources Action Programme) resulted in a number of recommendations in relation to a foam glass manufacturing facility. For the UK scenario it was shown that a foam glass plant capable of handling up to 50,000 tonnes per annum of waste glass was the most ideal in terms of both the investment required and the environmental considerations.

A plant of this size would be able to produce around 225,000 m³ of foam glass at a cost of around A\$70 – A\$80 /m³ and still provide a discounted payback period of about 4 years with an internal rate of return (IRR) of 30%. The discount rate used in their model was 10%. Given that foam glass products range from A\$80 – A\$150 /m³ for various lightweight aggregates and up to A\$600 /m³ for pre-shaped blocks, bricks, panels and insulation there is a high level of certainty in relation to the economic sustainability of the business.

8. Market Development

Prior to looking at market development issues it is worth noting the common properties, characteristics and benefits of foam glass products, which include:

- lightweight
- rigid
- high strength
- thermally insulating
- sound insulating (attenuating)
- frost resistance
- non-flammable
- flame resistant
- non-toxic
- inert
- rodent and insect resistant
- bacteria resistant
- easy to handle
- allows quicker construction times
- lower transport cost
- easy to cut and drill
- low water absorption
- readily combined with other products like concrete.

Foam glass can be used to manufacture bulk fill materials, aggregates for civil construction applications, insulating materials, roofing and walling panels, pipe lagging and solid

structures such as storage tanks and bases. Foam glass would also be an ideal material for use in specific ground stabilisation processes and trench back-fill applications.

Despite the range of applications, foam glass is considered to be best suited as a rigid insulation material due to its excellent structural properties. It would be suitable for use as insulation in roofs, walls and traffic areas such as flat roofs or floors, where other insulation products may be compressed resulting in an uneven surface and the loss of insulating properties.

Foam glass would be ideally suited to the manufacture of sandwich panels which would enable it to compete directly with current panel products such as the Hebel Panel (a CSR product) which is essentially an Aerated Autoclaved Concrete (AAC) produced in various panel thicknesses for the domestic and commercial construction market.

This is a very pertinent issue given the amount of interest we have already received in relation to Mineral Strategies other materials technologies, with a view to panel manufacture. This is largely driven by the fact that the building industry is suffering from a massive shortage of bricklayers and this trend will continue over the next few years to the point of economic harm (according to some of the large building companies). Panel systems have the advantage of being able to be installed by unskilled labour – a major advantage in the current building climate.

The Hebel Panel has experienced very significant growth (market capture) over the past couple of years primarily because of this trend. The Hebel Panel most often used for domestic construction currently retails for around A\$65 per square metre (for a 75 mm thick panel). This translates to just over A\$865 per cubic metre. By contrast the current costing parameters for the foam glass panel indicate that it could be produced for around A\$250 per cubic metre, giving ample room for a healthy margin whilst also delivering a product with superior characteristics.

Mineral Strategies and Conceptio have developed an extensive network of potential end users in both the domestic and commercial arms of the civil construction industry and have already received considerable interest in relation to the introduction of a new panel product.

One of these organisations, Premix Concrete (SA) Pty Ltd – a second generation, family-owned concrete business – has indicated its desire to be involved in the manufacturing and marketing of a glass foam panel product and is willing to provide some in-kind support. Frank Femia, a Director of Premix Concrete (SA) Pty Ltd has indicated that he is willing to provide written evidence of his intent to support this project in a like-kind fashion.

Appendix I

Resume for Andrew Graham

RESUME

Personal Details:

Name: Andrew Morgan GRAHAM

Address: 3 Seville Place, Golden Grove, South Australia, 5125

Contact: Phone - 61 8 8251 5356
Fax - 61 8 8251 5356
Mobile - 61 0414 648 754
E-mail: amgraham@bigbutton.com.au

Date of Birth: September 6, 1968

Memberships:

- Member - Australasian Institute of Mining and Metallurgy.
- Member - Institute of Quarrying.

Company Affiliations:

- Mineral Strategies Pty Limited – Principal

Professional Qualifications:

- Bachelor of Applied Science in Applied Geology – SAIT (1989).
- Master of Economic Geology – CODES Tasmania (1997).
- South Australian Quarry Managers Certificate of Competency No. 454

Other Qualifications:

- Qualified Shot Firer - Blaster's Permit No. 1677.
- Senior First Aid Certificate - Red Cross & St. Johns (1998).

Awards and Commendations:

- Semi-finalist in the inaugural Entrepreneurs Challenge 2001:
Sponsored by Hewlett Packard, Deloitte Touche Tohmatsu, Microsoft, Cisco Systems, Normandy Mining, Corporate Express and Deutsche Bank Group.
- Institute of Quarrying Australia:
Alex Northover Award, 2000 for the best technical paper presented at an Institute meeting, published in the Quarry magazine or presented at an Institute or outside seminar or conference.
- Penrice Achievement Awards, 1997 (Special Commendation):
Penrice Mine Technical Services Group - Outstanding commitment to maintain budgeted profitability at the Penrice Mine.
- Commendation - South Australian Resources Industry Awards for Environmental Excellence in the Minerals and Energy Industry (1996): Penrice Minerals Group – Environmental Management Plan.
- University of South Australia, Alumni Association, 1996:
Nomination for 1996 High Achievement Award - Applying Knowledge, Training Professionals and Community Service.
- Young Australian of the Year Awards, 1996:
Nomination for Outstanding Achievement (Career Achievement).
Nomination for Outstanding Achievement (Regional Development).
- Awarded by the Gartrell School of Mining, Metallurgy and Applied Geology, South Australian Institute of Technology, 1988:
The D. G. Moyer Memorial Prize for Academic Excellence.

Courses and Training:

- Four Quadrant Leadership.
- Interactive Management and Conflict Resolution.
- Numerous Finance Courses – DCF models, P&L's, SA's etc.

- Datamine and Vulcan Mining Software.
- Database Management - Oracle, SQLPlus, MIMS, SAS, 20/20.
- Microsoft Word, Excel, PowerPoint.

- Environmental Training Course - Anne Vale and Associates.
- Penrice Soda Products Environmental Forums (I, II and III).
- Environmental Auditing.

- ETRS Quality Awareness (Team Leader).
- ETRS Quality Auditor Training (Lead Auditor).

- Customer Centred Care facilitator workshops (Internal/External).
- Numerous sales, marketing and HR short courses.
- Numerous technical courses including sampling, geostatistics etc.

Employment History:

February, 2000 – Current.

Founder / Principal

Mineral Strategies Pty Limited

- Business vision, strategic planning & business development.
- Sales & marketing strategies – industrial / mining / extractive / manufacturing.
- Complex problem solving – technical & commercial (mining industry focus).
- Development of investor-ready business plans and financial models.
- Project management – mining start-ups / infrastructural development.
- Technical innovation – materials technology / geopolymers / industrial minerals.
- Product development – R&D / paste backfill / CAF / industrial minerals.
- Resource assessment & geotechnical consulting – mining & extractive industries.
- Environmental and geochemical investigations.
- Environment Management Plans (ISO14001) & compliance issues.
- Quality Management Systems (ISO9000 series).
- Liaison with Government departments – State & Federal / AusIndustry
- Public speaking – technical, materials technology, vision, strategic planning etc.
- Application development for major project and Federal grant funding.
- BFS for a 150,000 tpa magnesia / dolomitic lime (calcining) facility in Tasmania.
- Workshops, keynote addresses and client presentations.

February, 2000 – July, 2002

Consulting General Manager

Agricola Mining Pty. Limited (Industrial Minerals / Minerals Processing).

- Strategic planning and business development.
- Market development – market capture and growth strategies.
- Customer database development (>2,500) and management.
- Financial management – budgets, capex, maintenance & product pricing etc.
- Technical innovation and management – full R&D responsibility.
- Problem solving for customers – chemical, industrial, mining, agricultural etc.
- Mine planning, geochemical modelling, grade control.
- Waste management & minimisation strategies.

- New product development - materials technology.
- Project management – mine development and storage facility construction.
- HR Management – board reporting, contractors, OH&S, planning & development.
- Logistics management.

May, 1998 – February, 2000.

Sales and Marketing Manager - Penrice Minerals Group.

Penrice Soda Products Pty. Ltd. (Industrial Minerals / Chemical)

- Achieve budgetary targets for mine sales (\$11.5 M in 1999 – record).
(civil construction, chemical, manufacturing and agricultural industries)
- Provide timely and effective customer support (technical and commercial)
- Development of strategic plans for the Minerals Group.
- Development of short to long term marketing strategies.
- Development of contingency plans for major customers/contracts.
- Facilitate customer care workshops and external customer focus groups.
- Undertake targeted market growth initiatives.
- Manage sales team and associated contractors (varied from 3 – 10).
- Technical development projects – calcining trials / kilns performance etc.
- Undertake company wide internal quality system audits (lead auditor).
- Technical advice to Minerals Group – mine planning, EMS, QS, geotechnical etc.

February, 1996 - April, 1998.

Project Manager - Minerals and Marketing Groups.

Penrice Soda Products Pty. Ltd.

- Development of strategic plans for the Minerals Group.
- Responsible for research projects (including budgetary control).
- Responsible for product and business development.
- Provision of technical support to both internal and external customers.
- Responsible for all mine planning and production scheduling.
- Responsible for all geotechnical and geochemical investigations.
- Facilitation of project teams and management of critical objectives.
- Manage project teams (3 – 10 people) – OH&S, QS, EMS & KPI's.
- Technical support for Osborne Plant, Saltfields and major customers.
- Development and coordination of the Environment Management System.

January, 1995 - January, 1996.

Mine Manager - Penrice Minerals Group.

Penrice Soda Products Pty. Ltd.

- Responsible for achieving financial targets and gross profit goals.
- Lead & coach team of 25 people + contractors.
- Responsible for operating, capital and major maintenance budgets.
- Responsible for meeting the zero performance requirement for customer service, safety and environment.
- Responsible for maintaining the quality system to ISO9002 requirements.
- Responsible for short to long term mine plans and production schedules.
- Responsible for strategic planning and business development.
- Provision of technical support to both internal and external customers.
- Project management and problem solving team leader.
- Development and coordination of the Environment Management Plan.

January, 1993 - December, 1994.

Quality Control Geologist - Penrice Minerals Group

Penrice Soda Products Pty Ltd

- Responsible for maintaining the quality system to ISO9002 requirements.

- Responsible for developing and maintaining the sampling system.
- Responsible for mine planning, quality control, stockpiling & blending methods.
- Project facilitator with Adelaide Brighton Cement (Angaston).
- Technical liaison to ABC (Angaston) – raw material quality & specialty cements.
- Project management and problem solving project team leader.
- Calibration and management of the bulk sample analyser.
- Technical input into the drill and blast function – design aspects.
- Photogrammetric study into grade distributions and blasting methodologies.
- Geochemical modelling for 2 Mtpa carbonate resource.
- Technical support for Osborne Plant and especially kiln operation.

September, 1989 - December, 1992.

Mine Geologist - Raw Materials Planning and Development

BHP Long Products Division

- Responsible for mine planning, quality control, stockpiling & blending methods.
- Geological & geotechnical groundwork for the Iron Duke Development.
- Geological & geotechnical work at Iron Monarch / Iron Knob
- Technical liaison with the team conducting the drilling at Iron Duchess
- Responsible for major drilling program at Ardrossan and resource definition.
- Responsible for the Iron Princess discovery and pre-development.
- Technical liaison to BHP LPD laboratories on pellet plant & blast furnace blends.
- Maintenance of the grade control system – Datamine.
- Blast design based on geotechnical & geochemical grade models.

Professional Interests:

- Professional speaking and lecturing.
- Author – *'Vision – Seeing the Invisible. How to dramatically impact your life and business.'* (in final draft).
- Consulting - Vision creation, strategic planning & business development
 - Wealth creation strategies, entrepreneurial development
 - Company resurrection strategies
 - Technical innovation and environmental remediation
- Geopolymer technology and technical development.
- Materials technology – MPCs, MOSCs, MOCs
- Mentoring and coaching of young professionals in entrepreneurial pursuits.

Other Interests:

- Cycling, bush walking, gardening, family interests
- Public speaking - church groups, high schools, community groups, tertiary institutions, youth groups.
- Involvement with local church - >15 years in leadership and group facilitation (involved with groups of 10 – 200 people).

Appendix II
Brief Project History
(Mineral Strategies Pty Ltd)

Brief Project History

- Preliminary research and development work relating to the development of a range of unique cellular glass material from various waste glass streams and vitreous industrial waste materials.
- Research and development work in relation to a non-cementitious cemented aggregate fill (CAF) to replace the current system at Western Mining Corporation's Olympic Dam Operation.
- Extensive industrial minerals brokerage with China, United Arab Emirates, Malaysia, India and Korea.
- Independent research and development culminating in a report on the potential to use dolomite and / or limestone fines for acid-neutralisation in the gold mining industry, including the major challenges / barriers to entry.
- Extensive research and development project culminating in an award winning paper entitled: "Turning Waste Into Waste-not or What on Earth Are Geopolymers?" Winner of the Alex Northover Award (National) in 1999.
- Numerous research and development projects in relation to geopolymer technology and associated hybrid binders for applications in the mining, quarrying, civil construction environmental and industrial industries. Commercialisation opportunities being investigated.
- Extensive independent research and development resulting in two internal technical reports on the observations, research results and recommendations in relation to magnesium phosphate cements, magnesium oxy-sulphate cements and magnesium oxy-chloride cements.
- Development of an extensive database of materials technologies incorporating 1,000's of recipes / formulations for the stabilisation of numerous waste materials / streams.
- Full working business plan including discounted cash flow model, sales contracts, etc. for the establishment of a 150,000 tpa state-of-the-art magnesia (MgO) plant in NW Tasmania. Funding through merchant banks and private companies currently being negotiated.
- Investigations into the extraction of rare earth oxides (REO) from discarded tailings associated with the Port Pirie Uranium Treatment Plant including the development of a full working business plan for an extraction and upgrading facility.

- Numerous investigations into the development of small to medium scale mining operations and associated mineral processing facilities for copper, gold, numerous industrial minerals, cobalt, rare earth oxides, titanium dioxide, uranium oxide and magnetite .
- Preparation of Proposal in Respect of Contract No. SR-13-02: Raw Dolomite / Raw Magnesite Supply to Hlsmelt Kwinana Plant Project. Competed 1st, 2nd and 3rd pass bids for the supply of 70,000 tpa of dolomite. Status: second preference bid with option to re-bid in Q4 2005.
- Preparation of Proposal for the supply of high grade limestone for the Hlsmelt Kwinana Plant Project. Completed a tripartite bid for the supply of 160,000 tpa of high grade limestone from one domestic and two international suppliers. Status: preferred bid.
- Preparation of Proposal for the purchase of granulated blast furnace slag (GBFS) from the Hlsmelt Kwinana Plant. Status: preferred bid.
- Comprehensive investigation culminating in the report: “Assessment of Mid-North (SA) Quarrying Operations and Establishment Opportunities.”
- Comprehensive investigation culminating in the report: “Assessment of Potential Quarry Products Resources in the South-East, South Australia.”
- Independent report: “A Discussion on the Major Liming Agents in South Australia and the Associated Commercial Opportunities.” Revisions completed in 2001, 2002 & 2003.
- Preliminary investigation culminating in the report: “Preliminary Report – Domestic and Export Sales Opportunities for Dolomite Fines from CSR Readymix (S.A.) Operations (Riverview and Montacute Quarries).”
- In-depth investigation and marketing study culminating in the report: “Stage One Report – Domestic and Export Sales Opportunities for Dolomite Fines from CSR Readymix (S.A.) Operations (Riverview and Montacute Quarries).”
- Investigation culminating in the report: “Clinton Sands – Sand Quarry Report – Overview and Initial Recommendations for Optimising Clinton Sands’ High Grade Sand Operation at Port Clinton (S.A.).”
- Research and Development project culminating in the report: “Placer Dome – Alternative Binders for Raleigh Paste Fill. Preliminary Investigation Report.” Additional R&D work was commissioned culminating in three additional follow-up reports. Technical focus on geopolymers and alternative binding agents. Commercial take-up of technology likely.
- Comprehensive investigation culminating in an 8-part, 500 page report and associated development strategy entitled: “Kulpara Mines – Market Investigation and Development.

Domestic and Export Sales Opportunities for the Kulpara Dolomite and Associated Value-Added Products.”

- Research and investigation culminating in the report: “An Overview of Dolomite and Dolomitic Quicklime as Fluxing Agents in the Steel Industry and the Implications for the MSP Group Pty Ltd.”
- Various investigations into the processing, stabilisation and value-adding of waste materials such as tailings, residues, quarry fines, silts, clays, contaminated products etc. with a view to presenting commercially viable options for sustainable resource management.
- Preliminary investigation and executive briefing paper on gypsum suppliers in South Australia.
- Research and investigation culminating in the report: “Sustainable Management of Cotton Industry Trash. Domatex International Pty Ltd.” Materials technology focus (value adding).
- Investigation culminating in the report: “Carbonate Resources and Associated Market Development Issues in Relation to High Grade Limestone, Dolomite and Magnesite Deposits in North West Tasmania.”
- Initial investigation culminating in the report: “Holcim (New Zealand) Limited – Kiln Dust Project – Preliminary Investigation Report (Report One).” Followed up with a comprehensive research and development project and three major reports. Materials technology focus utilising geopolymers, magnesium based cements and various binders.
- Comprehensive environmental investigation culminating in the report: “Nuleaf Organics Pty Ltd – Environmental Management Plan – Proposed Composting Facility at Mannum, S.A.”
- Comprehensive research and development project on the development of a nodulised, carbonate boosted, organic fertiliser including a full working business plan (c/w financial), market development study, quality management system (SQF2000), environmental management plan, Federal Government grant application and investor presentations.
- Comprehensive environmental investigation culminating in the report: “Natures Fertilizer Pty Ltd – Environmental Management Plan – Proposed Composting Facility at Mallala, S.A.”
- Comprehensive environmental investigation culminating in the report: “Nuleaf Organics Pty Ltd – Environmental Management Plan – Proposed Composting Facility at Reeves Plains, S.A.”

- Environmental and operational investigation culminating in the report: “SA Mining Resources Pty Ltd. Additional Information in Relation to the Kanmantoo Copper Leach Proposal.” Submitted to and accepted by Primary Industries & Resources SA.
- Combined investigation into the development of palygorskite, montmorillonite, biotite, sillimanite and garnet resources currently held by a mining company diversifying into industrial minerals.
- Development of a working business plan and financial projections for the Australia-wide agency rights to the corporate training programs produced by LPI (Malaysia) Pty Ltd.
- Various independent and commissioned projects in relation to materials technology, waste minimisation, waste management, environmental management, value-adding strategies.
- Various independent and commissioned projects on business development, strategic planning and market development.
- Various independent and commissioned projects on carbonates, sands, soda ash, quicklime, dolomitic lime, cobalt oxide, diatomaceous earth, various clays, garnet, feldspars, calcined alumina and flyash in both the domestic and international markets with a particular emphasis on export opportunities.
- Independent mediator / adviser on the formulation of MoU’s and Confidentiality Agreements between various corporate entities where there is a technology focus.
- Major investigation into the establishment of a Pattison Process plant in either South Australia or Tasmania utilising a dolomitic feed stock. Included financial models and full marketing documentation for the sale of magnesium oxide, magnesium bicarbonate and basic magnesium carbonate products.
- Full working business plan (c/w financials) for the establishment of a 40,000 tpa magnesium metal plant in Tasmania utilising the Mintek Thermal Magnesium Process (MTMP).