
Review Outlines New Project Development Strategy for Alpha Oil Shale Deposit, Queensland

Strategy based on delivering a diversified suite of high-quality, value-added products

ASX Release

7 May 2020

Highlights

- Preliminary review of open cut mining and processing options by SRK Consulting indicates that a strategy to produce a diversified range of products including petroleum, bitumen and active carbon products is most likely to offer a commercially viable development pathway.
- The Alpha coal deposit can produce high-value bitumen and active carbon with the potential to deliver high-quality, value-added products through appropriate investment in processing infrastructure. This is in contrast with typical oil shale deposits.
- SRK recommends a revised exploration work program supplementing conventional core drilling with bulk samples from trenches or costeans. The raw materials will be refined to provide product samples for detailed analysis and study.
- If development proceeds, the primary technology required will be a retorting and refining plant, which would nominally be constructed on-site. This is likely to be available from offshore suppliers with established shale oil industries (e.g. China, Russia, Canada and the United States).
- Preliminary investigation indicates that there will be high demand for all products that the Alpha Project would produce:
 - **Refined liquid petroleum products** can be produced and sold domestically, either as an independent brand or in partnership with an established petroleum distributor. There is an ideal opportunity to take advantage of the project's proximity to the Bowen Basin to supply mining operations with diesel and other fuels.
 - **High-quality bitumen products** can be refined on site or sold in pelletized form to domestic and export customers. A local asphalt producer has already indicated an interest in securing the supply of ~20,000 tonnes per annum of refined bitumen.
 - **Active carbon products** derived from spent shale (especially the higher-grade torbanite) can potentially be sold for a range of applications including blending with metallurgical PCI coal, a blended carbon source for the manufacture of explosives, a powdered fuel source and an industrial filtering medium.
- **The alternative exploration work program which aligns to the SRK recommended project development strategy has been presented to the DNMRE, and preliminary feedback indicates the program can proceed subject to procedural and reporting conditions.**

Greenvale Energy Limited (ASX: GRV or the Company) is pleased to provide an update on the proposed development strategy for its Alpha Oil Shale Deposit, located 500km west of Rockhampton in Queensland. This follows the completion of a review, supported by independent consultants, to determine the best commercialisation strategy for the asset moving forward.

Background

The Alpha tenement (MDL 330) is located near Alpha in Central Queensland (see Appendix 1, which shows the location of the Alpha Project, including the likely target areas within the Alpha Deposit).

Update and Overview of the Alpha Project

Why does Greenvale plan to change the project development strategy?

Geological studies and exploration programs to date have focused on characterisation of the deposit based on historical small-scale mining and core sampling, which has provided an overview of the deposit geometry, raw coal quality and potential products.

In order to properly evaluate the commercial viability of the project, it is important to model mining, processing and product quality and quantity with confidence. Accordingly, Greenvale commissioned SRK Consulting (Australasia) Pty Ltd (**SRK**) to review the exploration work program planned originally (core sampling) and advise if this would be sufficient to enable an eventual Feasibility Study and Ore/Coal Reserve estimate to be developed.

To date, sampling and analysis has been limited to laboratory (bench) testing of core samples, which does not enable a sufficient quantity of refined products to be available for detailed evaluation.

SRK concluded that additional core sampling and analysis alone is unlikely to be adequate to model processing and product quality, and will therefore not provide sufficient information for GRV to develop a Pre-Feasibility Study or a Feasibility Study to an acceptable degree of confidence.

In light of this, SRK has recommended that a program of bulk sampling be undertaken using trenches or costeans, where up to one tonne of material is extracted from each point of observation (instead of a few kilograms which is taken with core sampling). Bulk sampling will enable the following parameters to be determined with a higher degree of confidence:

1. More detailed sample analysis can be undertaken with:
 - a. coal processing modelled and alternative processing options evaluated; and
 - b. product yield and quality estimated.
2. Bulk sampling results can be correlated to core sample results:
 - a. with greater confidence in the modifying factors to be applied to the geological model, enabling the development of a more reasonable mine plan and inventory estimate; and
 - b. permitting the design of subsequent drilling and assay programs to ensure correlation between core sample and bulk sample derived data.
3. The commercial viability of the project can be demonstrated with greater confidence, as:
 - a. the program will provide sufficient sample material to potential vendors and customers to evaluate the Alpha raw coal and products; and
 - b. techno-commercial models can be better developed.

Diversified Product Strategy

Shale oil is a direct substitute for crude oil and the price of shale oil is directly indexed to the international price of crude oil. At times when crude oil prices are low (such as the present market), it is difficult for typical shale oil operations to be profitable.

The Alpha project development strategy will focus on the production of bitumen and active carbon products, both of which are not directly indexed to crude oil price and will account for most of the project revenue.

A Scoping Study including a study of product marketability and revenue options is required. The range of products being considered is shown in

Table 1 below:

Table 1: Alpha products to be considered in the Scoping Study

Product	Nominal Annual Production	Minimum Revenue	Enhanced Revenue
Shale Oil	430 thousand barrels	Crude Oil Index price plus partial refinement and transport premium.	Sale of low sulphur naphthene or fully refined fuels at wholesale prices.
Bitumen	90 thousand tonnes	Mine gate price of approximately \$400 per tonne for retorted bitumen (indexed to international wholesale bitumen price).	Wholesale refined bitumen sale price of \$600 to \$1,000 per tonne.
Active Carbon / Spent Shale	400 thousand tonnes	Sale as a solid fuel with pricing similar to PCI (Pulverised Coal Injection) index pricing.	Sale of premium active carbon products for metals processing, smelting processes and industrial filtration.

Source: SRK analysis and market research. Commodity prices are indicative only, and are subject to review during study preparation.

The nominal annual production rate of 90 thousand tonnes of bitumen is planned as a preliminary production target as this represents around 10% of Australian bitumen consumption and is considered to align to the proportion of market share which can be realised. Greenvale has recently confirmed interest from a local asphalt producer to source over 20 thousand tonnes of bitumen per annum.

How relevant is the Queensland Shale Oil Moratorium to the Alpha Project?

The Alpha Project contains much higher-grade cannel and torbanite than contemporary (shale oil) projects and will produce different products.

- The moratorium has been lifted or expired and was related specifically to the McFairlane deposit.
- The primary products to be produced by the Alpha Project will be bitumen and active carbon.
- Some conventional petroleum products will be produced (semi-refined naphtha or refined products) but production rates will be a fraction of typical large-scale shale oil plant production plants.

On the basis that processing will be undertaken adjacent to the mining operations, the environmental impact of the project will be minimal.

- Alpha material produces a relatively low amount of gas.
- Any gas produced from the processing (retorting) can be captured and combusted with the lower grade spent shale (which will be the primary fuel source for processing).
- Environmental risk is much lower due to the location of the Alpha tenement, which is in a location with relatively low rainfall and with low risk of contamination of water ways.
- The primary processing method being considered is a dry heating process which does not produce contaminated water or require significant amounts of water.
- The scale of the mining operation is likely to be small (aligned to a small quarry) and focused on production of high-value products with a small operational footprint.
- Retort and combustion gas analysis undertaken as part of the preliminary bulk sampling program will identify if any carcinogenic or toxic gases are produced. While it is not anticipated there will be a significant issue with harmful gases, the Scoping Study will enable effective methods to contain and/or combust such gases to be considered during the initial exploration work program phase.

Licence Status and Update

An amendment to the exploration work program prepared by SRK is currently being reviewed by the Queensland Department of Natural Resources Mines and Energy (DNMRE) and the recommendations include:

- That the exploration work program should target the torbanite lens contained within the lower cannel coal seam;
- That no change to the MDL 330 authority is required aside from amendment to the exploration work program, procedural approvals and regular correspondence;
- That the 2020/21 exploration and project development work program will be staged;
- The 2020 program will focus on:
 - Developing a preliminary geological model and mine plan using coal modelling and mine planning software. The plan will be based on historical data and used as the basis to confirm a production target based on an open cut mining and site processing strategy;
 - Selecting the preferred location for the initial (2020) bulk sample;
 - Undertaking the actual bulk sampling and analysis;
 - Advancing development, production, cost and revenue models with increased product marketing input, as preliminary unit rate analysis estimates indicate that the project has the potential to be economically viable if petroleum, bitumen and active carbon products are produced from the high-grade torbanite zone within MDL330; and
 - Implementing a sourcing strategy which will include undertaking due diligence of potential suppliers and customers and then engaging with offshore suppliers and planning sample analysis to be undertaken within Australia and offshore.

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- The 2021 program will be more detailed and focus on:
 - Additional bulk sampling from up to five locations;
 - Planning a confirmation drilling program to increase confidence in the Mineral/Coal Resource model within the target mining area; and
 - Developing a more detailed mine plan techno-economic model, including costs derived from first-principles and with capital and operating cost estimates based on supplier feedback.

Likely funding

- The exploration program expenditure is estimated to be \$600,000 over the 2020 and 2021 periods, with additional confirmation drilling to be planned following the bulk sampling and preliminary mining studies planned to be completed in 2021.
- It is expected that special conditions imposed by the DNMRE will relate to procedural aspects of the bulk sampling program and ensuring that all environmental, native title and stakeholder obligations are fulfilled.

Additional Information

- Supplementary information is included with this market release which provides advice on the project location (Appendix 1) and target mining area (Appendix 2) as well as reporting standard, exploration work program and background information (Appendix 3) on the Alpha Project.
- Further details of the planned exploration work program timeline and budget will be announced in due course.

Board Approval

The announcement has been approved by the Board.

Contact details

For further information, please contact:

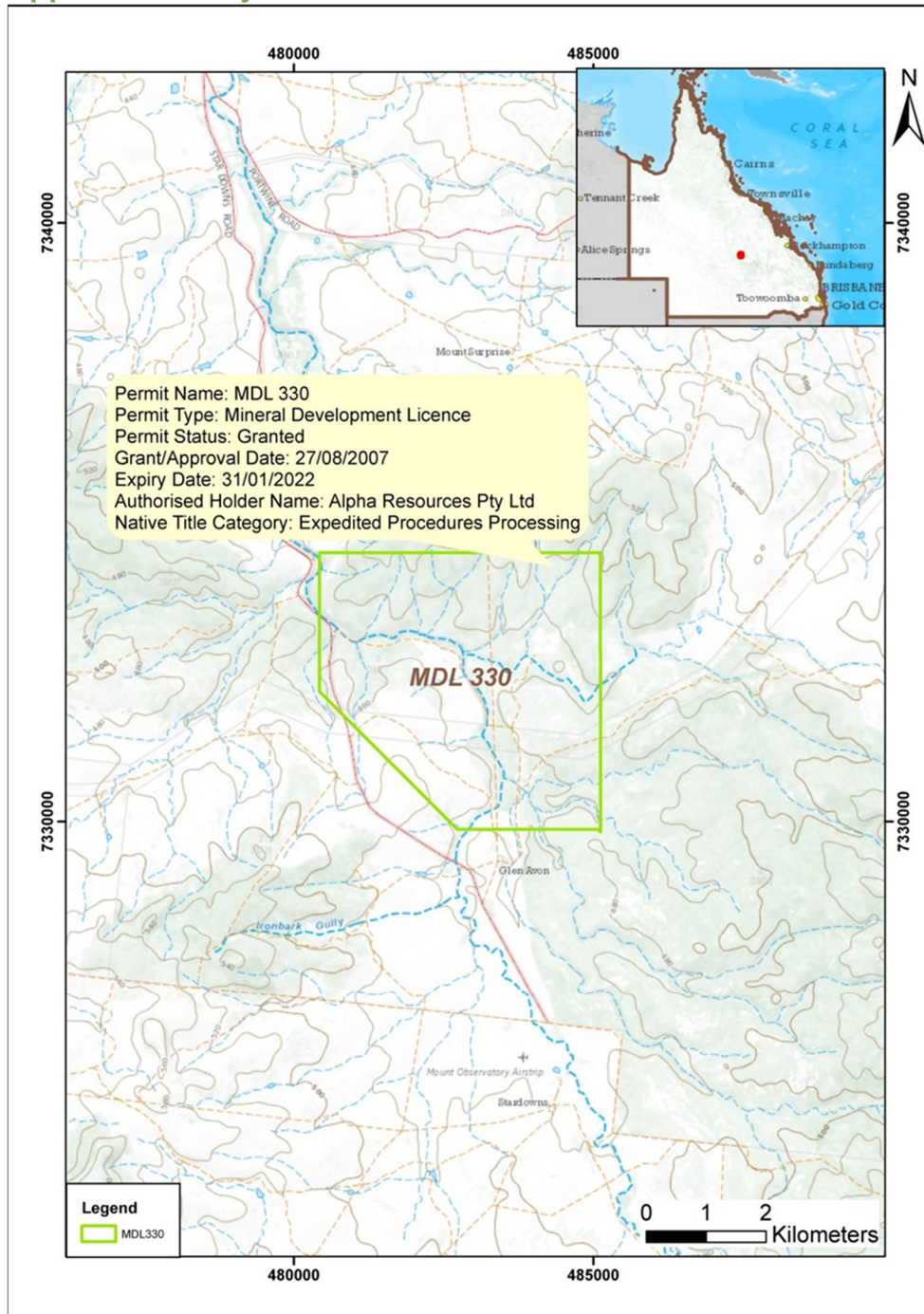
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Appendix 1: Project Location



Source: SRK March 2020 review

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Appendix 3: Supplementary Information

Reporting Standard

This market release is developed from is an Independent Technical Assessment undertaken by SRK Consulting (Australasia) Pty Ltd (SRK), by Ashley Ginn (SRK Principal Consultant – Mining) who is a Mining Engineer with over 20 years’ experience. The content of this market release is based on work undertaken by SRK between March and May 2020.

SRK has not provided, nor has been requested to provide, a Valuation Report and does not express an opinion as to the value of mineral assets, nor to the ‘fairness and reasonableness’ of any transaction.

Aspects of this market release include discussion on a strategy to develop a Feasibility Study and associated Mineral/Coal Reserve estimate, and include discussion on mining, processing, products, product prices, socio-political issues, environmental and stakeholder considerations. However, SRK does not express an opinion regarding the specific value of the assets and tenements involved.

SRK has undertaken preliminary research and has recommended an annual production rate which aligns to anticipated market demand for bitumen products (being around 10% of Australian bitumen consumption), although more detailed evaluation may result with a significant change (increase or decrease) in proposed annual production rates.

There has not been a Mineral/Coal Resource or Ore/Coal Reserve estimate developed by SRK for Alpha and recent work undertaken to date has been to develop the most reasonable exploration work program.

The revised work program has been developed to enable principal risk aspects to be understood and ensuring modifying factor assumptions are reasonable. This will be essential to demonstrate the viability of the project and justify ongoing investment in an exploration work program. The scope of the SRK engagement is also to support Greenvale to refine the overall business development strategy for the Alpha concession.

A preliminary evaluation has been undertaken using assumptions and methods which broadly align to techniques used to model coal deposits although it has not been determined if the project will be evaluated within a JORC Code (2012) framework or alternative framework such as PRMS.

Summary of historical exploration and project development work

Company	Work	Year	Remarks
Local Syndicates	Shaft	1939-1945	Prospecting, not systematic and not recorded
Queensland Department of Mines	Series QDM drilling	1942-1944	Government geological supervision; 15 holes
International Mining Corporation (IMC)	Series GA/ RDH drilling	1979-1981	McElroy Bryan & Associates; supervision 16 holes
JFH Murray & Associates	Survey	1980	Establish benchmarks and survey for drilling
Greenvale Esperance	GE 1-8	1980-1984	Resource definition with geological supervision
Queensland Nickel	Analyses	1981	Oil shale as chemical reductant in nickel ore processing
Petrobras Brasil	Analyses	1981	Retorting studies on 100 kg sample
Tosco USA	Analyses	1981	Retorting studies on 100 kg sample
BKS Surveys	Survey	1983	Benchmark survey and drill collars for ARL
Rankin & Hill	Resource estimation	1984	Engineering study
Greenvale Esperance	GE 9-38	1985-1987	Resource definition with geological supervision
Coal and Carbon Industries	Analyses	1987	Retorting studies produced gasoline, kerosene,
Bitumen Study	Market study	1987	Used for road surface, Alpha deposit could supply Queensland's Annual requirements
CSIRO	Analyses	1988	Bench-scale retort tests
Inland Oil Refineries	Microstill	1989	Mini refining concept for remote fuel supply
Daniel Madre	Open pit study	1990	10-year preliminary mine plan to produce 200,000 Barrels oil/year
Northlake Industries Inc.	Analyses	1992	Retorting tests
University of Kentucky	Analyses	1994	Production potential for activated carbon

Source: Madre, D A, 2016. EPM25795 Annual Report of Exploration Work from 22 December 2014 to 21 December 2015, report prepared for Alpha Resources Pty Ltd (internal report)