24 October 2024

ALPHA TORBANITE PROJECT – UPDATE

TEST PROGRAM 5 DELIVERS POSITIVE RESULTS, WITH STRONG BITUMEN RECOVERY AND IMPROVED VISCOSITY

Key Points:

- **Liquefaction Test Program 5 successfully completed by The University of Jordan (UofJ).**
- **Test Program 5 was aimed at improving the viscosity of the final bitumen product to determine the potential to deliver a premium-grade C170 product from the Alpha Project.**
- **Results indicate that, with further fine-tuning of experimental parameters, a viscosity in the range of C170 asphalt could be achieved with Alpha ore.**

Greenvale Energy Limited (ASX: **GRV**, "**Greenvale**" or "**the Company**") is pleased to report positive outcomes from Liquefaction Test Program 5 for its 100%-owned Alpha Torbanite Project in Queensland.

Liquefaction Test Program 5 was undertaken by the University of Jordan (UofJ), a world-class institution with significant expertise in geotechnical/chemical engineering, liquefaction studies and bituminous products.

Test Program 5 was designed to examine the issues raised in Test Program 4 (see ASX Announcement 26 June 2024), which found that, while the shale extract from Alpha could be used for manufacturing standard or modified types of bitumen, it did not meet the stringent specifications required to deliver a premium C170 bitumen product. The main issues identified were the viscosity of product and the lack of elasticity.

Test Program 5 – Overview

Test Program 5 comprised a small, laboratory-scale trial using a blend of the three formations that make up the Alpha orebody, Cannelite L1, Torbanite LT and Cannelite L2 (L1, LT and L2).

The test program took the blended core samples, varied the reaction conditions of temperature and pressure to maximise the asphaltene yield, and then used different catalysts to enhance the quality of the asphaltene for its viscosity and penetration.

A wide range of experimental variables was explored to determine the ideal conditions for maximising both the quantity and quality of bitumen produced.

These variables included the effect of pressure variations, which were tested at 5, 9, and up to 10.7 MPa starting hydrogen overpressure. In addition, the influence of temperature was carefully examined at 400˚C, 425˚C and 450˚C.

The role of catalysts, or the lack thereof, was another significant factor investigated to assess their impact on the liquefaction process and the resulting bitumen yield.

The test program determined that the optimal conditions to achieve maximum yield of bitumen materials, including asphaltenes and pre-asphaltenes, exceeding 30 wt% was at a temperature of 400˚C and the highest pressure. Introducing catalysts (specifically iron and tin) enhanced the conversion process, increasing pre-asphaltene content under optimal conditions.

Product characteristics varied with changes in experimental conditions; asphaltene content remained consistently high, and the density of bitumen materials showed minimal variation. Viscosity increased with pressure, though measurements were limited by sample size and solvent dilution. Due to sample sizes being too small the penetration tests couldn't be carried out and these tests will now be conducted when larger bulk samples are produced.

According to UofJ, the results indicate that, with further experimental investigation, including fine-tuning experimental parameters – particularly pressure, temperature, and catalyst selection – it could achieve a viscosity in the range of C170 asphalt.

UofJ has recommended producing bulk samples under varied reaction conditions after catalyst optimisation to facilitate a more comprehensive study of bitumen properties, specifically viscosity.

The Greenvale Board will fully evaluate the full results of Test Program Five to determine the next steps for the Alpha Project.

Management Comment

Greenvale Chief Executive Officer Mark Turner said: *"These are encouraging results from small-scale lab testing that confirm the potential to achieve good recovery of bitumen products with improved viscosity.*

"We will now work with the University of Jordan to determine the next steps, which may include progressing to a bulk testwork program."

Authorised for Release

This announcement has been approved by the Board for release.

For further information please contact:

Investors: Mark Turner, CEO and Executive Director **P** +61 (0) 459 519 999
Media: Nicholas Read **P** +61 (0) 419 929 046
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Competent Person's Statement:

The information in this report that relates to Exploration Results (Liquefaction Testwork 5 and yield data) is based on information reviewed by David Cavanagh, a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy AusIMM Member number 112318. David Cavanagh is a full-time employee of Core Resources.

David Cavanagh has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'.

David Cavanagh consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

Appendix 1: Liquefaction Test Program 5 Results

				Gas Pressure MPa					Hexane (wt %)	Toluene (wt %)	THF (wt %)
Trial number	Sample name	Catalyst	Reaction temperature °C	Initial	Maximum	After	Conversion yield (wt%)	Gas yield wt%	Soluble wt%	Soluble wt%	Soluble wt%
Blend (no catalyst)		Carrier	400	7.1	17.0	6.0	69.1	8.3	48.4	2.0	10.4
0		" Blank"		7.8	18.0	6.5	3.6	-	-	-	-
1	GM 21	-		0.7	6.9	1.2	12.8	8.2	2.3	2.2	0.1
2	GM 21	-		1.1	7.9	1.0	14.8	11.1	1.0	3.0	0.0
3	GM 21	-		5.0	12.1	4.5	28.0	15.1	0.8	9.8	1.0
4	GM 21	-		5.0	14.1	3.9	27.6	15.9	0.2	11.1	0.8
5	GM 21	-		8.7	17.0	6.0	32.0	17.8	0.2	13.0	1.0
6	GM 21	-		9.4	20.5	8.1	32.9	16.3	0.1	14.7	2.0
7	GM 21	-		8.9	20.3	7.6	34.0	17.4	0.0	16.5	1.4
8	GM 21	-		10.0	26.4	8.4	33.3	17.5	0.2	15.3	0.7
9	GM 14	-		10.7	26.0	9.3	49.0	18.3	1.0	29.2	1.8
10	GM 14	Fe_2O_3		9.8	24.0	8.8	56.6	24.3	0.2	30.0	2.1
11	GM 14	Sn		10.2	24.0	8.6	57.4	23.5	0.6	28.1	5.2
12	GM 21	-	425	1.3	12.0	1.2	17.0	13.4	0.2	4.7	0.1
13	GM 21	-		5.4	18.4	4.0	32.9	22.7	0.3	10.1	0.3
14	GM 21	-		5.1	17.7	3.6	33.1	19.7	0.1	13.4	0.1
15	GM 21	-		8.5	22.2	6.1	36.1	20.4	1.4	15.3	1.4
16	GM 21	-		9.0	22.0	7.5	37.6	20.5	0.1	16.3	0.7
17	GM 21	-		9.9	26.7	9.3	45.8	21.6	0.1	23.5	0.9
18	GM 21	-		10.1	26.0	8.5	46.1	21.6	0.1	22.9	1.2
19	GM 21	-	450	9.2	24.0	7.7	51.3	27.6	0.2	23.2	0.7
20	GM 14	-		9.1	28.0	7.5	58.1	37.7	0.8	20.3	0.2

Appendix 2: Summary of calorific value of residues and asphaltene (SARA), density and viscosity of bitumen

Reaction conditions					
Temperature (°C)	Pressure (MPa)	Asphaltenes (wt%) ASTM D3279	Bitumen density g/mL at 25 C	Calorific value (MJ/Kg) ASTM D240	Viscosity at 60 C (Pa.s)
400	5	94.8	0.878	23.9	11
	9	83.2	0.860	22.5	139
	Max.	87.6	0.845	21.0	426
425	5	89.9	0.892	23.7	9
	9	94.6	0.875	22.3	221
	Max.	91.3	0.873	20.8	494

400^{o}C 5 Mpa results based on average of trials 3&4 (sample GM-21)

400^{o}C 9 Mpa results based on average of trials 7&8 (sample GM-21)

400^{o}C 9 Mpa results based on average of trial 9 (10.7 MPa starting overpressure) (sample GM-14)

425^{o}C 5 Mpa results based on average of trials 13&14 (sample GM-21)

425^{o}C 9 Mpa results based on average of trials 15&16 (sample GM-21)

425^{o}C 9 Mpa results based on average of trial 17&18 (10 MPa starting overpressure) (sample GM-21)

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	Nature and quality of sampling (e.g., cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling. Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done; this would be relatively simple (e.g., 'reverse circulation drilling was used to obtain 1 m sample from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g., submarine nodules) may warrant disclosure of detailed information.	The samples refer to in this announcement were taken from the 2021 partly cored (4C – 100mm diameter) hole drilling program on a nominal 250 x 250m grid for the purpose of obtaining torbanite and cannel coal quality samples from the Upper and Lower seams. Refer to ASX Announcement date – 9 March 2022.
Drilling techniques	Drill type (e.g., core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g., core diameter, triple or standard tube, depth of diamond tails, face-sampling bit, or other type, whether core is oriented and if so, by what method, etc.).	Not applicable to this announcement

Criteria	JORC Code explanation	Commentary
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed. Measures taken to maximise sample recovery and ensure representative nature of the samples. Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	Not applicable to this announcement
Logging	Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography. The total length and percentage of the relevant intersections logged.	Not applicable to this announcement

Criteria	JORC Code explanation	Commentary
Sub-sampling techniques and sample preparation	If core, whether cut or sawn and whether quarter, half or all core taken. If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry. For all sample types, the nature, quality and appropriateness of the sample preparation technique. Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples. Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling. Whether sample sizes are appropriate to the grain size of the material being sampled.	8 Core samples from different holes in total have been prepared and held as sub 200 micron by ply. Subsamples have been cut from the separate sub 200 micron samples of each ply which have been held in refrigeration for test program 5 including samples to University of Jordan. Only 2 core samples were used as part of test program 5 GM 14 and GM 21.
Quality of assay data and laboratory tests	The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total. For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc. Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	Test Program 5 involved repeating the tests conducted on core material in test program 4 but only for the blends of L1, LT, L2 A detailed range of tests have been performed to understand the core material and liquefaction tests using oil and water-based carriers have been conducted on the subsamples using standardised test procedures. Refer to ASX Announcement date – 13 March 2024.
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel. The use of twinned holes. Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols. Discuss any adjustment to assay data.	Torbanite and cannel coal quality results were verified by experienced SRK personnel before inclusion in the geological model and resource estimate and representative samples provided. Core samples from 8 wells has now been used from Greenvale storage sites and split by Greenvale contractors, prepared as sub 200 micron for each ply and held in closed labelled plastic bags and stored in a freezer.
Location of data points	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	The wells chosen are 9, 14, 21, 28 for the initial work and further supplemented by wells 19, 128, 137, 138.

<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td></td><td>Specification of the grid system used.
Quality and adequacy of topographic control.</td><td>
<table>
<tr><th>Well</th><th>Easting</th><th>Northing</th></tr>
<tr><td>9</td><td>482757</td><td>7333602</td></tr>
<tr><td>14</td><td>482872</td><td>7333231</td></tr>
<tr><td>21</td><td>483334</td><td>7332843</td></tr>
<tr><td>28</td><td>483813</td><td>7332150</td></tr>
<tr><td>19</td><td>482251</td><td>7332674</td></tr>
<tr><td>128</td><td>484816</td><td>7331276</td></tr>
<tr><td>137</td><td>480843</td><td>7332637</td></tr>
<tr><td>138</td><td>481532</td><td>7333468</td></tr>
</table>
There is high confidence in the location of data points associated with this announcement.
Refer to ASX Announcement date – 27 December 2023.</td></tr>
<tr><td>Data spacing and distribution</td><td>Data spacing for reporting of Exploration Results.
Whether the data spacing, and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.
Whether sample compositing has been applied.</td><td>The wells were chosen to span the resource and intersect both seams and all 4 ply.</td></tr>
<tr><td>Orientation of data in relation to geological structure</td><td>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.
If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.</td><td>All drill holes were drilled at 90° to the surface and are assumed to be vertical. Downhole verticality survey is available for all drill holes.</td></tr>
<tr><td>Sample security</td><td>The measures taken to ensure sample security.</td><td>Samples have been stored in dedicated freezers from the time the sample was acquired.</td></tr>
</table>

Criteria	JORC Code explanation	Commentary
		Sample transfer documents have been provided by the core holding laboratories and have been prepared to sub 200 microns and stored separately in labelled plastic bags in a Freezer.
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	No audits have been undertaken.

Section 2 Reporting of Exploration Results

(Criteria listed in section 1 also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings. The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	MDL 330 is held by Alpha Resources Pty Ltd, a subsidiary of Greenvale Energy Limited. MDL 330 was first granted on 1 February 2002. An application for a renewal for an additional 5-year term was submitted in July 2021 and approved in July 2022. The current 5-year term expires on 31 January 2027. MDL 330 covers an area of 1,904.5 ha.
Exploration done by other parties	Acknowledgment and appraisal of exploration by other parties.	Refer to ASX Announcement – 9 March 2022 and 13 November 2023.
Geology	Deposit type, geological setting and style of mineralisation.	The Alpha deposit lies within the axis of the Glen Avon Syncline, a southwest plunging fold structure that occurs on the eastern flank of the Galilee Basin. The deposit is part of the Permian Colinlea Sandstone, which contains 150 m of cross-bedded sandstones with minor conglomerates, siltstones and mudstones. The geology of the deposit consists of an Upper and Lower seam of cannel coal with a torbanite lens present in the lower seam. The Colinlea Sandstone is thought to be a lower delta plain deposit with the coal deposited in swamps and shallow lakes in this near shore environment. The torbanite is thought to have been deposited from algae in a lacustrine environment when water entering the system held little sediment or organic material.
Drill hole Information	A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: easting and northing of the drill hole collar elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar dip and azimuth of the hole	Not applicable to this announcement

Criteria	JORC Code explanation	Commentary
	downhole length and interception depth hole length. If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	
Data aggregation methods	In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated. Where aggregate intercepts incorporate short lengths of high-grade results and longer lengths of low-grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. The assumptions used for any reporting of metal equivalent values should be clearly stated.	Liquefaction tests are being conducted using samples from each seam, and blend samples representing the seams within a given borehole. The blend samples are prepared in portions relative to the thickness of each seam within a specific borehole.
Relationship between mineralisation widths and intercept lengths	These relationships are particularly important in the reporting of Exploration Results. If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. If it is not known and only the downhole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').	Not applicable to the announcement
Diagrams	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.	Not applicable to the announcement
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high	Not applicable to the announcement

Criteria	JORC Code explanation	Commentary
	grades and/or widths should be practiced avoiding misleading reporting of Exploration Results.	
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	Tests have been undertaken at 400C, 425C, 450C and 5, 9 and up to 10.7 MPa starting hydrogen overpressure. Sample sizes are approximately 10 grams and 2 wt % catalyst also added, in 30 grams of carrier oil with residence time of 60 minutes generally (after target temperature reached). Full tables of test program 5 results are shown in Appendix 1 & 2 Also Refer to ASX Announcement – 17 May 2023
Further work	The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling). Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Bulk testwork is being considered to further optimize results and measure bitumen properties. .