



BOSS
RESOURCES LIMITED

Boss Resources Limited
Annual report for EL 20/2004
Latrobe Oil Shale Project

Australian Office

Suite 23, 513 Hay St, Subiaco WA 6008

PO Box 1311, Subiaco WA 6904

Tel: +61 (8) 6143 6730

Fax: +61 (8) 9388 8824

ABN 38 116 834 336

Michael Blake, November 2011

Boss Energy: Annual Report, EL 20/2004

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Boss Energy: Annual Report for EL 20/2004, Latrobe Oil Shale Project

Summary

Exploration activities for the year to 26 November 2011 have included re-sampling and analysis of DDH CF15, continuation of water sampling, Phytophthora testing, and rehabilitation works. Rock Eval analysis shows an average calculated seam yield of 150 l/T in DDH CF15 at China Bush. Water sampling confirms that no hydrocarbons are present in runoff waters from the bulk sample site, and suggests that there are no issues with combined discharged water from the site. Testing by Forestry Tasmania returned a positive identification of the root rot fungus *Phytophthora cinnamomi* from the bulk sample site. The area was previously known to Forestry Tasmania to carry Phytophthora. The remaining 900T of oil shale from Bulk sampling stored at China Bush plantation has been removed to landfill following a Mineral Resources Tasmania directive.

Introduction and tenement information

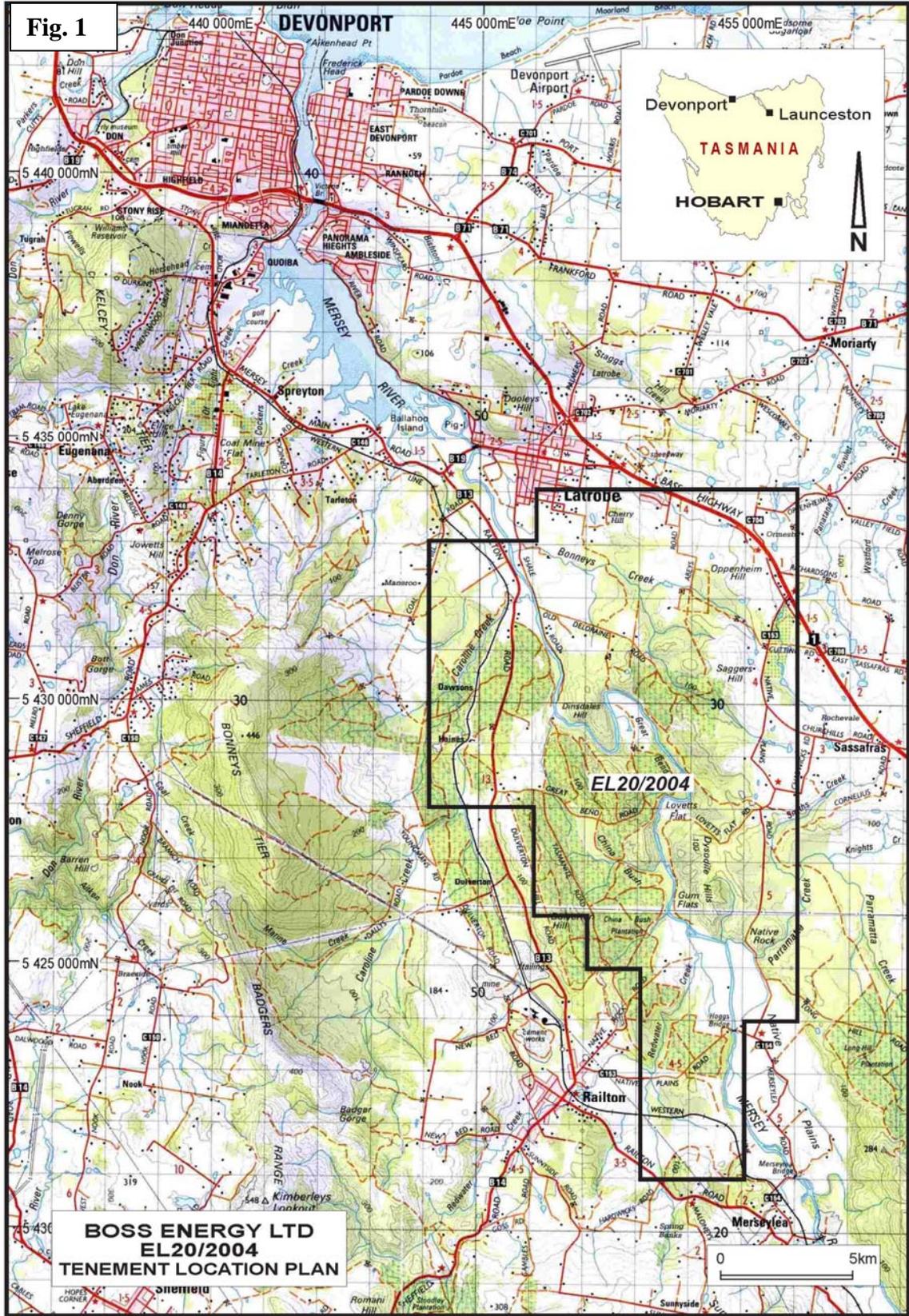
EL 20/2004 is a 61 square kilometer tenement encompassing an area to the east and west of the Mersey River between Railton and Latrobe in North Western Tasmania (figure 1). The tenement was acquired from Daley Resources PTY. LTD. in July 2007. Tenure consists of low density residential areas, freehold agricultural land, forest plantation and forest reserves. Access across the tenement is good with all year round access via established vehicular roads, tracks and short distance walking. The tenement covers the largest area of known shallow oil shale occurrences in Tasmania

Geology Overview

The Tasmanite oil shale occurs in Tasmania within the Parmeener Supergroup, which includes marine and freshwater sedimentary sequences of Upper Carboniferous to Early Triassic age (Burrett and Martin, 1989). The sequence was deposited in the Tasmania basin which has a broad axis stretching from Cygnet in southern Tasmania, to Latrobe in northern Tasmania. The Tasmanite horizon is located within Upper Carboniferous to Early Permian Lower Parmeener Supergroup rocks just above the boundary between basal tillites and overlying glacio-marine pebbly mudstones of the Quamby formation and correlates (Bacon Et al, 2000). At Latrobe, the formation is known locally as the Spreyton Beds. The Quamby Formation is overlain by a sequence of richly fossiliferous siltstone, sandstone and minor limestone known as the Bundella Formation, which is in turn succeeded by a freshwater sequence known locally near Latrobe as the Mersey Coal Measures (Bacon Et al, 2000).

The Tasmanite Oil Shale, comprising accumulations of likely algal spore casings, known as Tasmanites Punctatus, occurs in the Latrobe disitric as a horizon of 1.5m average thickness, comprising two to three distinct Tasmanite rich horizons. Tasmanite rich horizons (up to 45% kerogen) are separated by silt rich beds (around 5% kerogen) of 10-20cm thickness. (Clementson, 1981).

The oil shale horizon is known to be generally flat lying to dipping gently at 5-6 degrees. At tenement scale the position of the shale horizon is affected by block faulting resulting in displacements of over 75m, and at local scale over tens of meters is commonly displaced 0.3-6m (Bujtor and Waldrum, 1982). Distribution of the shale may be affected by depositional basin morphology, erosion, gentle folding, and local dolerite intrusions. Permian Shale bearing lithologies may be concealed locally by Tertiary basalt flows, and Quaternary cover.



Previous Work

There is an extensive history of early work conducted on the Tasmanite oil shale, including historical production of 1.13 ML of oil from mines near the Mersey River's Great Bend . Bacon, 1986, and Bacon et al, 2000, should be referenced for an analysis of early work. Relatively recent exploration work is detailed in Table 1 below.

In 1987 the Tasmanian Hydro Electric Commission conducted extensive research and reported on the production of liquid fuels from oil shale in Tasmania. Their study concluded that it is technically feasible to produce a full range of transport fuels at a production rate of 2MT of shale/year over 20 years, yielding 286 megalitres of shale oil per year.

Table 1: Exploration summary

Company	Year	Report	Authors	Work completed	Results/Conclusions
Endeavour Oil Co	1975	EL 4/74	Hunt, F.L.	Feasibility study oil shale as a bitumen resource	Uneconomic at time Recommend further development work for hotmix usage
Endeavour Oil CO	1975	EL 4/74	Nixon, L.G.	drilled 38 holes	possible indication of 42MT of shale
Endeavour Oil CO/CRAE	1981-82	EL 4/74	Clementson, I.M.	drilled 135 holes	42MT of shale indicated
CRAE	1982	EL 4/74	Bujtor and Waldrum	Project evaluation mining and bitumen production	Uneconomic Market penetration issues product acceptance time lag 3 yrs
Endeavour Oil CO/CRAE	1983	EL 4/74	Clementson et al	Investigation of Tasmanite as Anode Carbon source Investigated use as Bitumen binder	Further work recommendation only if economics improve
Boss Energy Pty Ltd	2008	EL 20/2004	Blake, M.D.	14 RC and 2 Dyiamond holes drilled at China Bush Plantation April 2007	Identification of 968,000 tonnes of shale at depth <20m
Boss Energy Pty Ltd	2008	EL 20/2004	Blake, M.D.	1000T Bulk sample of shale extracted At China Bush Plantation	Test work in progress: Dalmat Engineering-South Africa, Fushun Mining-China.
Boss Energy Pty Ltd	2010	EL 20/2004	Blake, M.D.	Test work completed Dalmat Engineering-South Africa, Fushun Mining-China.	Fushun results : 93kg/dry T oil Product directly suitable as fuel oil.

Work Completed for the year to 26 November 2011

Analytical results

Rock Eval analysis was repeated on representative samples of the shale horizon in drillhole CF15. S1 + S2 yields are shown in Table 2, with a maximum of 346.4 mg/g. Using an oil density of 0.91, obtained from the Fushun Mining retort trial of Tasmanite Oil Shale from China Bush, yields were re-calculated as litres per tonne. A length weighted average value of 150.5 litres per tonne was obtained for the whole seam interval recorded in DDH CF15, Based on Rock Eval results. The full Rock Eval laboratory report is provided in Appendix 1.

Table 2: Rock Eval Pyrolysis

sample	from	to	interval	S1+S2 (mg/g)	S1+S2 (l/t calculated)
CF15 20.95-21.28	20.95	21.28	0.33	346.4	380.66
CF15 21.28-21.7	21.28	21.7	0.42	110.6	121.54
CF15 21.7-21.9	21.7	21.9	0.2	35.3	38.79
CF15 21.9-21.96	21.9	21.96	0.06	228.2	250.77
CF15 21.96-22.46	21.96	22.46	0.5	73	80.22
CF15 22.46-22.58	22.46	22.58	0.12	43.7	48.02
Retorted oil density 0.91			length weighted average mg/g		136.97
			calculated yield l/t		150.51

Several authors have referred to relationships between the hydrocarbon yield of the Tasmanite Shale and parameters such as ash content and specific gravity. These properties have been most recently referenced by Clementson 1981, and Maynard, 2007, quoting Kurth, 1932 as source.

Data for specific gravity, and ash content of samples analysed for Rock Eval above, are presented in Tables 3, and 4. Samples were ashed at the School of Earth Sciences, University of Tasmania. Figures 2. and 3. show data presented by Clementson, and Maynard, with results from DDH CF15 to allow a better understanding of relationships. For comparison analytical data is also presented from Clementson 1981, reporting on the drilling program conducted by CRA exploration in that same year.

Table 3 : specific gravity results

Sample	interval	SG
CF15 20.95-21.28	0.33	1.7
CF15 21.28-21.7	0.42	2.0
CF15 21.7-21.9	0.2	2.2
CF15 21.9-21.96	0.06	1.8
CF15 21.96-22.46	0.5	2.2
CF15 22.46-22.58	0.12	2.2
Length weighted average		2.03

Table 4: Ash content (ignition at 500 °)

Sample	interval	Loss %	Ash content %
CF15 20.95-21.28	0.33	36.06	63.93
CF15 21.28-21.7	0.42	14.35	85.65
CF15 21.7-21.9	0.20	6.87	93.13
CF15 21.9-21.96	0.06	24.76	75.24
CF15 21.96-22.46	0.50	9.20	90.80
CF15 22.46-22.58	0.12	7.36	92.64
Tasmanite crushed		16.59	83.41
length weighted average ash content			83.88

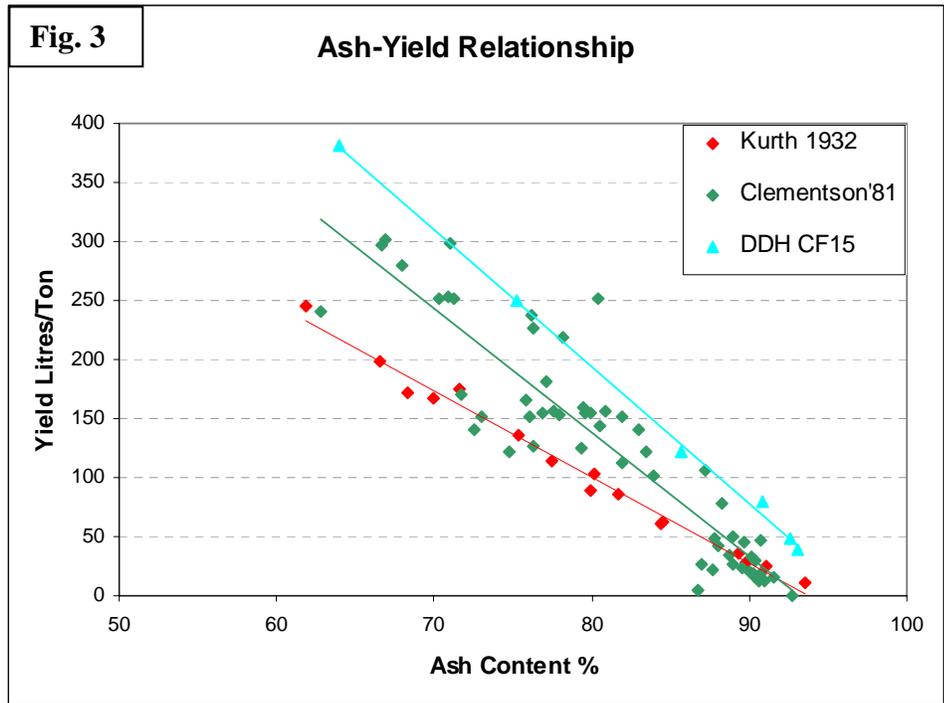
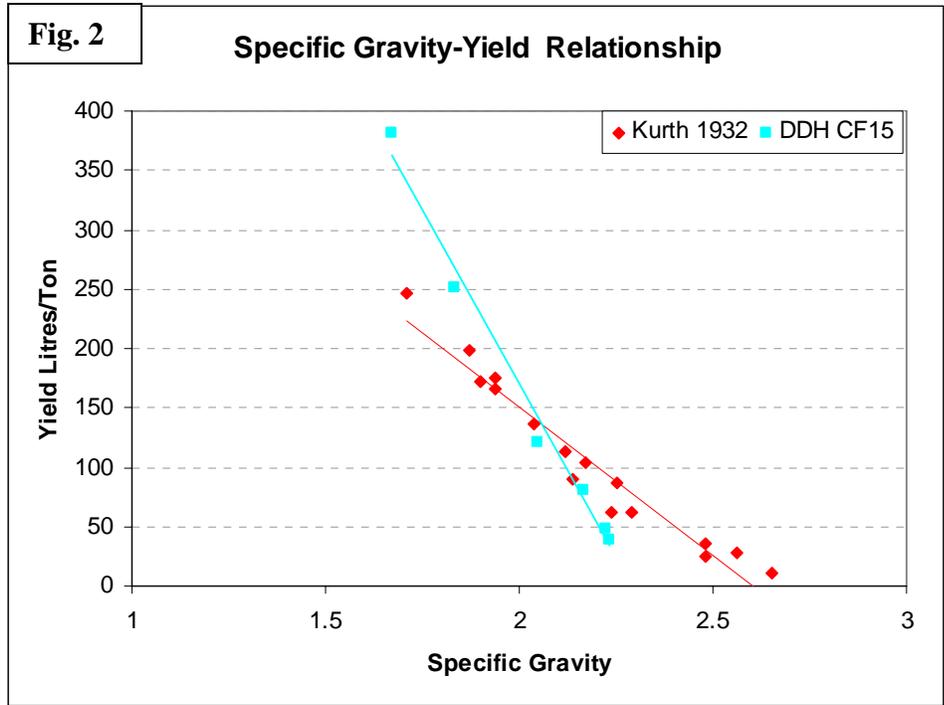
The resulting plots in figures 2. and 3, show that there is a strong relationship between the ash content of samples, and the hydrocarbon yield. The Fischer Estimate technique provides higher yields than the technique used by Kurth, in Clementson, 1981, and Maynard, 2007¹, however the CRA data shows a larger spread, with higher variation in yield for samples of any given ash content. Theoretical yields calculated from Rock Eval are higher than results from Clementson, 1981, however the relationship remains linear.

The relationships are a direct result of variations in the amount of the *Tasmanites Punctatus* spore bodies present in the shale, thus the level of kerogen with hydrocarbon production potential. As the spore content of samples decreases, the inorganic ash content increases. This means that an estimate of hydrocarbon generating potential of any sample of the Tasmanite Oil Shale can be generated by ashing the sample, a much cheaper technique than distillation methods, as noted by Hunt, 1975, and Maynard, 2007.

The relationship between Specific Gravity, and yield, means that in field estimates of hydrocarbon yield can be made from hand samples and drill core. The S.G of samples is directly related to the amount of kerogen present in the sample. This method is relevant to hand samples and drill core samples, but is not applicable to RC samples. The relationship between

¹ Original reference unknown

ash content and yield means that ash content can possibly be used as a proxy for hydrocarbon yield analysis, where large numbers of samples present a prohibitive analytical cost.



Environment

Rehabilitation works

Following an unsuccessful search for an alternative storage location for the oil shale stockpile and protest from plantation managers Timberlands Pacific, a directive from Mineral Resources Tasmania to remove the shale stockpile was given. Removal of the oil shale bulk sample stockpile material to landfill was underway at the time of writing. Post removal of the shale stockpile the log landing site used for storage is to be rehabilitated by re-spreading of stored log waste previously removed and stockpiled. Minor works are to be done on a track used for log snagging, and access to the bulk sample site.

Phytophthora

Testing for the root rot pathogen *Phytophthora cinnamomi* (P.C.) was conducted by Forestry Tasmania in March 2011 at the rehabilitated area where the oil shale bulk sample was taken. Results tested positive for the fungus, resulting in difficulty in securing an alternative storage location for the bulk sample material. The China Bush pine plantation was previously known to Forestry Tasmania to be a Phytophthora bearing site, and contamination is not likely to be a result of operations by Boss Energy. The plantation species *Pinus Radiata* is not susceptible to P.C. Wash-down of machinery as specified by the exploration code of practice will continue to be observed. The Phytophthora test report from Forestry Tasmania is provided as Appendix 2.

Water quality monitoring

Water sampling at the China Bush oil shale bulk sample site was extended to monitor runoff waters from the shale stockpile and rehabilitated bulk sample area. Samples have been tested for hydrocarbons and acid mine drainage contaminants. Results detailed in Appendix 3, and Blake 2010, show that no hydrocarbons are present in runoff waters from the shale.

Most acid mine drainage suite elements are within suggested limits for waters discharged from the bulk sample site, however concentrations of Al, Co, Cu, Fe Mn, Ni, and Zn are slightly elevated at site 'Shale4'. Static water adjacent to the shale stockpile has no hydrocarbon contamination, but has relatively elevated levels of metals compared to the waters discharged from the bulk sample area.

The data does not suggest that there is an issue with combined discharged water quality at the bulk sample site. Note that Shale 7 is the discharge point of combined waters into the Mersey River, and that Shale 8 sources waters from a different catchment within the plantation. Selected elements from samples taken in September 2010 are shown in Table 5. Results are presented in detail in Appendix 3.

Table 5 : Water sampling - selected elements

Analyte	Shale1	Shale2	Shale3	Shale4	Shale5	Shale6	Shale7	Shale8	Units
pH	2.7	5.2	4.5	4	5.4	6	6.2	6.3	mg/L
Sulphate	845	1.3	9.5	40.9	1.6	2.1	4.8	2.7	µg/L
Al	45200	905	474	1850	218	586	558	946	mg/L
Cd	6.6	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	µg/L
Co	177	<0.5	4.5	12.5	1.2	1.8	2.2	2.3	mg/L
Cu	137	<1	1	5	1	<1	<1	2	µg/L
Fe	85800	596	1070	2430	260	1190	1290	1500	mg/L
Mn	1810	11.6	96.1	180	21.4	37.6	62.1	47.8	µg/L
Ni	526	1.3	10.2	32	1.3	2.7	3.8	2.2	mg/L
Zn	1680	2	23	84	2	3	7	3	µg/L

Figure 4: Schematic site diagram. Water sampling sites are labeled 1-4

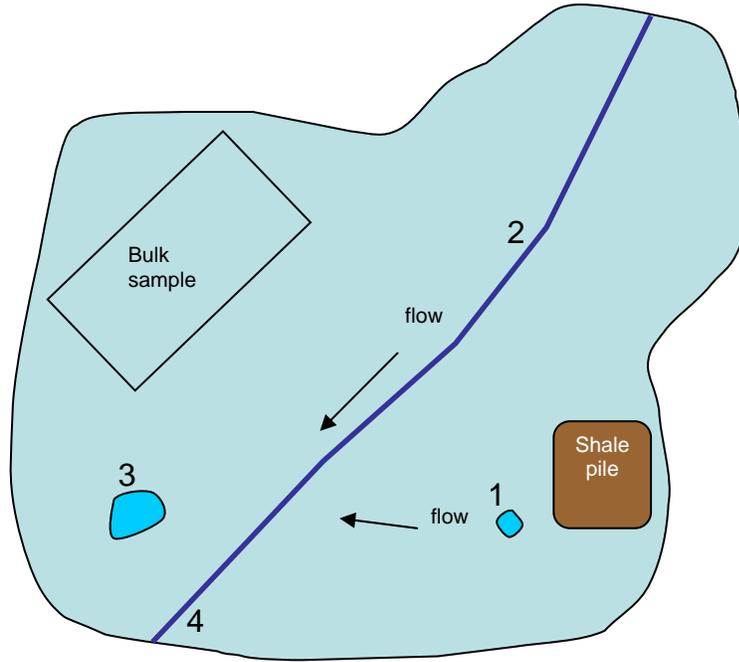


Figure 5: map locations of water sampling sites



Expenditure

The breakdown of expenditure for EL 20/2004 in the report year 1 July 2010 to 30 June 2011 is shown in Table 5 below.

Table 6: Expenditure.

Category	Expenditure
Geology	\$67,518
Feasibility/Process Testing	\$17,331
Administration	\$3,864
Other	\$7,200
Total	\$95,913

Proposed forward exploration program

A drilling program will be carried out at the China Bush site to increase the certainty of the presence of shallow oil shale in preparation for JORC compliance and to sample untested areas. This work was not completed in the current year due to issues with the bulk sample stockpile. A proposed drilling program was submitted to Mineral Resources Tasmania September 2011.

References

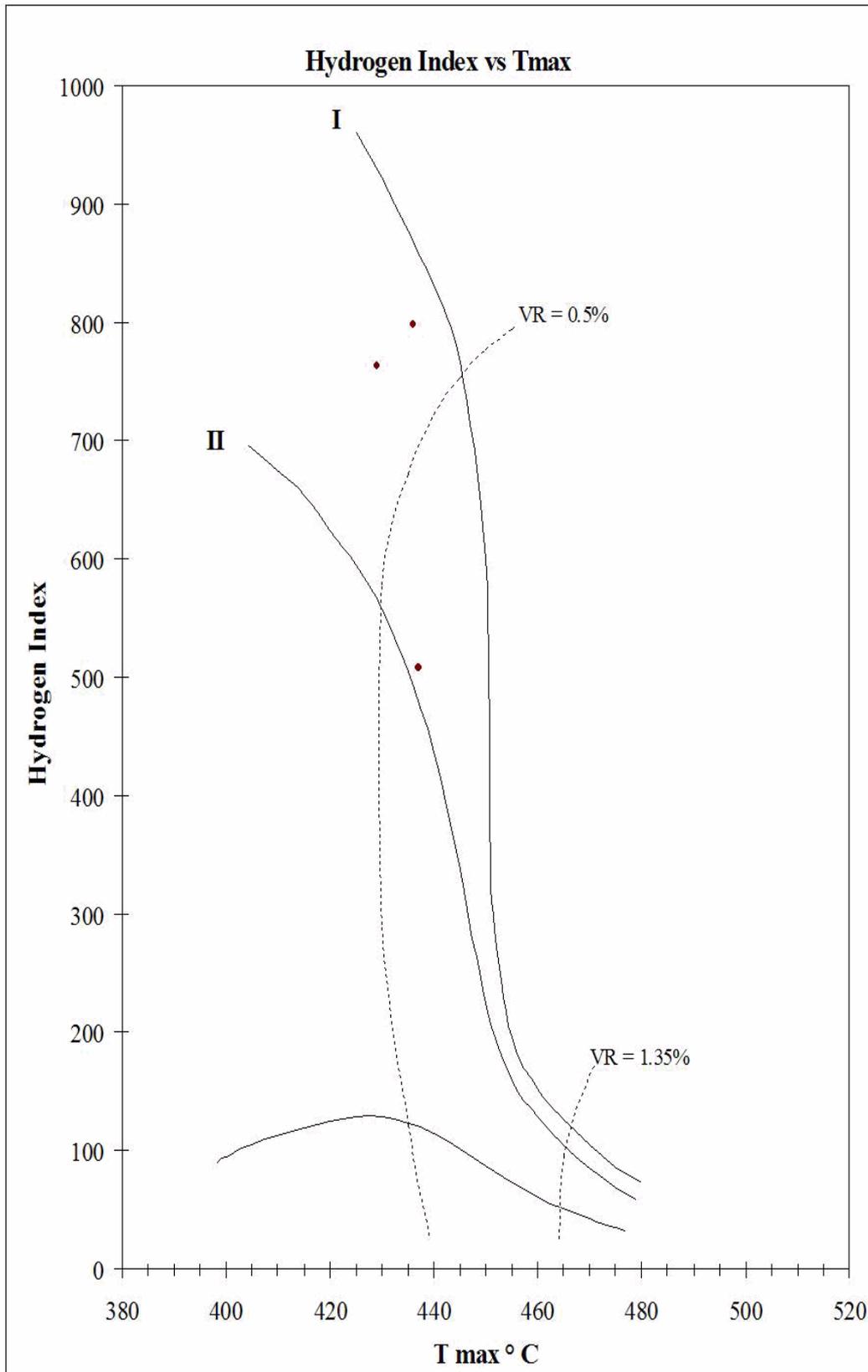
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Appendix 1

Rock Eval Laboratory Report – Bureau Veritas



Customer Sample ID		Tasmanite Crushed
Test/Reference	Unit	
S2- HC Generating Potential*	mg/g	118.95
S3- Organic Carbon Dioxide*	mg/g	0.26
S1 + S2- Potential Yield*	mg/g	122.28
PI - Production Index*		0.03
S2/S3*		457.50
PC- Pyrolyzied Carbon*	mg/g	10.19
HI- Hydrogen Index*		1148
OI- Oxygen Index*		2





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VERITAS**

Authorised By

Carmelina Valente

Chemist

Laboratory Manager

Diane Cass

Operations Manager

Final Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Samples will be discarded after 30 days unless otherwise notified.

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Appendix 2

Phytophthora test report – Forestry Tasmania



Forestry Tasmania

Phytophthora cinnamomi-status report

Quarry:	Boss Energy Stockpile	Date of inspection:	24/02/2011
Altitude:	60 m	Location:	Tasmanite Spur 2-1
Substrate:	Oil Shale deposit	Type:	Extracted boulders
Grid Ref:	453018 E, 5426022 N.	District:	Mersey

Background:

Forestry Tasmania Mersey staff requested that a stockpile of oil shale material be inspected prior to consideration of it being stored in Native Rock Quarry. The site was visited by Mike Blake from Boss Energy, Barry Parsons from Mersey District and Sue Jennings from FT's Biology & Conservation Branch on 24th Feb 2011. The aim was to determine if there was any reason (weeds, diseases, or other contamination) that this material should not be stored in the Forestry Tasmania quarry.

Inspection notes:

The stockpile itself is neat and shows no obvious weed problems (Figure 1). It has been stored on the side of the spur road for several years without it impacting on the surrounding area.

However, the area from which it was extracted (some 200m to the south west) showed obvious signs of the root-rot pathogen *Phytophthora cinnamomi* (Figure 2).



Figure 1. The stockpile is neat and shows no obvious weed problems after several years.

Samples tested for *P. cinnamomi*:

There are several good *P. cinnamomi* indicator species regenerating on the area of original extraction. These include *Pultenaea gunnii*, native broom spurge (*Amperea xiphoclada*), golden pea (*Aotus ericoides*), trigger plant (*Stylidium graminifolium*), bitter-leaf hop (*Daviesia latifolia*) and common heath (*Epacris impressa*) (Figures 3 – 5).

Scattered dead plants of these species are common in the area and two soil samples were taken for laboratory analysis from the root zones of these plants (Grid Ref: 452999 E, 5425897).

***P. cinnamomi*-status**

The *P. cinnamomi*-status of the stockpile itself is difficult to determine as there are no symptoms to test. However, the source area for this stockpile is contaminated with *P. cinnamomi*, with both soil samples taken returning a positive result.

There are other historical records of *P. cinnamomi* presence within this plantation area.



Figure 2. Scattered dead *P. cinnamomi* indicator plants amongst healthy non-susceptible species are an obvious sign of this pathogenic root-rot.



Figure 3. Dead *Amperea xiphoclada*, a very reliable *P. cinnamomi* indicator species.



Figure 4. Sick trigger plant (*Stylidium graminifolium*) in the source area.



Figure 5. Pultenaea and Epacris were common amongst the dead species.

Comments:

- The source area for the Boss Energy stockpile has tested positive for *P. cinnamomi* root-rot. Forestry Tasmania would not like to see this material moved around on State forest unnecessarily, nor stored elsewhere on State forest.
- Although the stockpile itself is not showing obvious signs of contamination (through lack of evidence), the operation of loading and removing this pile from an area which is *P. cinnamomi* positive is a high risk for contamination.
- The best outcome from Forestry Tasmania's point of view (in order of preference) would be:
 1. To leave the stockpile exactly where it is,
 2. To spread the stockpile back where it came from (however, should this be done then a major washdown process for all machinery involved would be required upon completion of the job).

Sue Jennings
Biology & Conservation Branch
Forestry Tasmania, Smithton

sue.jennings@forestrytas.com.au

Appendix 3

Water sampling results



ANALYTICAL SERVICES TASMANIA

18 St Johns Avenue
New Town Laboratory

Telephone: (03) 6230 7000 Fax: (03) 6230 7001 Email: astproduction@environment.tas.gov.au



To: Mike Blake Boss Energy Limited Address: 516 Palooona Road, Palooona 7310 Fax No: Phone: 6492 3001 Mobile:	Date: 22-Dec-10 Pages: 5 (including this one) From: Amanda Freeman Fax No (03) 6230 7001 Phone: (03) 6230 7000
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Order No

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Stacey Stobaus, Boss Energy Limited, GPO Box 2986 MELBOURNE VIC 3001.

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ANALYTICAL SERVICES TASMANIA

New Town Laboratory

18 St Johns Avenue

New Town, Tasmania, Australia, 7008

Telephone: (03) 6230 7000 Fax: (03) 6230 7001

Email: astproduction@environment.tas.gov.au



Laboratory Report

Report No: 46866

Issue No: 1

Report Date 22-Dec-2010 22:15

Status: Full Report

Site Description:

Received: 29-Nov-10

Submitted to: New Town Laboratory

Submitted By: Mike Blake

Client Order No:

Report To: Stacey Stobaus

Client: Boss Energy Limited

Address: GPO Box 2986 MELBOURNE VIC 3001

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ANALYTICAL SERVICES TASMANIA

Report No: 46866 **Issue No:** 1 **Report Date:** 22-Dec-2010 22:15

Method	Analyte	Units / Sampled On :	Lab.No.:	182647	182648	182649	182650
			Sample Id.:	SHALE1	SHALE2	SHALE3	SHALE4
1001-Water	pH			<u>2.7</u>	<u>5.2</u>	<u>4.5</u>	<u>4.0</u>
1103-Water	Sulphate	mg/L		845	1.3	9.5	40.9
1311-Water	Al Total	µg/L		45200	905	474	1850
	As Total	µg/L		2	<1	<1	<1
	Ba Total	µg/L		11	16	28	26
	Cd Total	µg/L		6.6	<0.1	<0.1	0.3
	Co Total	µg/L		177	<0.5	4.5	12.5
	Cr Total	µg/L		69	3	2	3
	Cu Total	µg/L		137	<1	1	5
	Fe Total	µg/L		85800	596	1070	2430
	Mn Total	µg/L		1810	11.6	96.1	180
	Mo Total	µg/L		<0.5	<0.5	<0.5	<0.5
	Ni Total	µg/L		526	1.3	10.2	32.0
	Pb Total	µg/L		1.1	1.0	0.6	0.9
	Se Total	µg/L		<5	<5	<5	<5
	U Total	µg/L		10.0	<0.1	<0.1	0.2
	Zn Total	µg/L		1680	2	23	84
1406-Water	Benzene	µg/L		<1	<1	<1	<1
	Ethyl benzene	µg/L		<1	<1	<1	<1
	o,m&p Xylene	µg/L		<2	<2	<2	<2
	Toluene	µg/L		<1	<1	<1	<1
	Total BTEX	µg/L		<5	<5	<5	<5
	TPH	µg/L		<40	<40	<40	<40
	TPH C06-C09	µg/L		<10	<10	<10	<10
	TPH C10-C14	µg/L		<10	<10	<10	<10
	TPH C15-C28	µg/L		<10	<10	<10	<10
	TPH C29-C36	µg/L		<10	<10	<10	<10

Results underlined indicate the recommended sample holding time before analysis has been exceeded.

ANALYTICAL SERVICES TASMANIA

Report No: 46866 **Issue No:** 1 **Report Date:** 22-Dec-2010 22:15

Method	Analyte	Units / Sampled On :	Lab.No.:	182651	182652	182653	182654
			Sample Id.:	SHALES	SHALES	SHALES	SHALES
1001-Water	pH			<u>5.4</u>	<u>6.0</u>	<u>6.2</u>	<u>6.3</u>
1103-Water	Sulphate	mg/L		1.6	2.1	4.8	2.7
1311-Water	Al Total	µg/L		218	586	558	946
	As Total	µg/L		<1	<1	<1	<1
	Ba Total	µg/L		15	19	17	31
	Cd Total	µg/L		<0.1	<0.1	<0.1	<0.1
	Co Total	µg/L		1.2	1.8	2.2	2.3
	Cr Total	µg/L		1	3	2	4
	Cu Total	µg/L		1	<1	<1	2
	Fe Total	µg/L		260	1190	1290	1500
	Mn Total	µg/L		21.4	37.6	62.1	47.8
	Mo Total	µg/L		<0.5	<0.5	<0.5	<0.5
	Ni Total	µg/L		1.3	2.7	3.8	2.2
	Pb Total	µg/L		<0.5	0.8	0.8	1.2
	Se Total	µg/L		<5	<5	<5	<5
	U Total	µg/L		<0.1	<0.1	<0.1	<0.1
	Zn Total	µg/L		2	3	7	3

Results underlined indicate the recommended sample holding time before analysis has been exceeded.

ANALYTICAL SERVICES TASMANIA

Report No: 46866 Issue No: 1 Report Date: 22-Dec-2010 22:15

Test Method(s) :

Test Date

Inorganic Testing

1001-Water:	pH in Water Work Conducted at: New Town	30-Nov-2010
1103-Water:	Anions by Ion Chromatography Work Conducted at: New Town	08-Dec-2010
1311-Water:	Metals in Water by ICPMS Work Conducted at: New Town	13-Dec-2010

Authorised By:



John O'Reilly
Section Head - Inorganic
(Metals)

Organic and Nutrient Testing

1406-Water:	TPH and BTEX in Water by GC-FID Work Conducted at: New Town	07-Dec-2010
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Authorised By:



Neil Kerr
Chemist

1406-Water:	TPH and BTEX in Water by GC-FID Work Conducted at: New Town	07-Dec-2010
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Authorised By:



Tim Jordan
Chemist



Accreditation No. 5589

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