For personal use only

Atrum Coal
COAL FOR STEEL

ASX Release

5 April 2019

Coke Strength Tests Confirm Tier 1 Hard Coking Coal at Elan South

HIGHLIGHTS

- **Coal quality and carbonisation testwork completed by CoalTech, DMT and INCAR on composite samples from the 2018 Large Diameter Coring program.**
- **Testwork program included large-scale, 550kg movable-wall oven testing.**
- **Results confirm the Tier 1 Hard Coking Coal (HCC) quality of Elan South.**
- **Key clean coal and coking analyses undertaken on seam blends averaged:**
    - ***Coking Properties:* CSR 71%, JIS Drum Index (DI30/15) 94%, Fluidity 160 ddpm, CSN 7.5, RoMax 1.13%, Reactives 68%.**
    - ***Other Properties (air dried):* Ash 7%, VM 25.9%, S 0.65%, P 0.05%.**
- **Elan South HCC expected to be comparable to, and highly competitive with, premium HCC currently exported from Canada and Australia.**
- **Further coring plus coal quality and washability testwork is planned for the 2019 exploration program to establish product specifications and support optimal coal preparation plant design.**

Atrum Coal Ltd ("**Atrum**" or the "**Company**") (**ASX: ATU**) is pleased to provide a further coal quality update for the flagship Elan South area of its 100%-owned Elan Hard Coking Coal Project in southwest Alberta, Canada ("**Elan Project**" or "**Elan**"). The final coking and coke property testing on composite samples representative of Seam 1 and 2 blends from the 2018 Large Diameter Coring ("**LDC**") program has further confirmed Tier 1 HCC quality.

Registered Office
Unit 1B, 205-207 Johnston Street
Fitzroy, VIC 3065
T +61 3 9191 0135
E info@atrumcoal.com
www.atrumcoal.com

Board of Directors

Non-Exec Chairman	C. Blixt
Managing Director	M. Wang
Non-Executive Director	C. Fear
Non-Executive Director	G. Edwards
Non-Executive Director	J. Chisholm
Non-Executive Director	R. Barker
Company Secretary	J. Stedwell

Key Projects

Elan Coal	Ownership: 100%
Groundhog	Ownership: 100%
Bowron River	Ownership: 100%

For personal use only

Non Executive Director, George Edwards, who has more than 40 years of experience in researching and marketing Australian coking coals to global steel mills, commented: "*We are very pleased with the latest test results, which reinforce the Tier 1 quality of the hard coking coal at Elan South. Because these samples were selected to represent the coal seam blends from the 2018 large diameter coring program, and tested in multiple labs, the results give us heightened confidence in the premium coal quality at Elan South. The Elan South development has now evidenced the clear potential to produce a premium hard coking coal product that would be in strong demand by steel mills around the globe and expected to command Tier 1 market pricing.*"

Atrum's VP Marketing and Business Development, Ty Zehir, has been overseeing the comprehensive coal quality testing program. Ty has more than 30 years of technical and marketing leadership experience in Western Canadian coking coal operations, from Grande Cache Coal (now CST Coal), to Teck Resources and Walter Energy (now Conuma Coal), including the product blending strategy for Teck's products.

Ty commented: "*I am very excited by the premium coal quality of Elan South. The coal seams and quality results of Elan South correlate extremely well with regional coal deposits, and Elan South's coal quality attributes are comparable to some of the best hard coking coal products on the global market. Elan South coal ash composition values indicate a high level of acidic ash components and a low level of basic ash components. The resulting Acid-to-Base Ratio of around 11 gives excellent ash properties which positively affect the ash fusion temperatures as well as coke reactivity and, as a result, blast furnace performance and productivity. Combined with thick and shallow coal seams and the high theoretical clean coal yields achieved, Elan South has the true potential to be a very substantial hard coking coal operation in close proximity to critical infrastructure leading to key West Coast ports.*"

Detailed Clean Coal Analysis and Coking Property Testing

The final batch of coal, carbonization and coke property testing was carried out by CoalTech (USA), DMT (Germany) and INCAR (Spain) for clean coal properties, coking rheology and coke properties. This testing included small retort tests and large movable-wall oven coking tests.

The testing was performed on combined composite samples that were proportioned to represent the blend of coal seam constituents intersected (LD Holes 1, 3 and 4) during the 2018 LDC program. As such, these results are highly indicative of the average or blended coal quality from these Elan South LDC locations (see Table 1).

For personal use only

Table 1. Average clean coal and coke strength results on air-dried basis (adb) (1)

R_oMax	CSR	JIS Drum Index (2)	Coke Yield	ASH (3)	VM	Total Sulphur	Phos (4)	Max Fluidity ddpm	FSI/CSN
1.13%	**71%**	**94%**	**77%**	**7%**	**25.9%**	**0.65%**	**0.05%**	**160**	**7.5**

Notes: (1) Average results of 2 small samples for carbonisation tests and 1 large sample for movable wall oven coking test.
(2) JIS DI 30/15 Index.
(3) Clean coal sample is a combination of composites produced at CF1.45 by Birtley (Calgary).
(4) 2014 core samples further north of the 2018 exploration areas showed 0.010–0.020% Phosphorous.

Detailed results of clean coal and coking characterisation tests conducted by CoalTech, DMT and INCAR on this batch of samples are presented in Tables 2 to 4 below. These latest results further validate Atrum's view of Elan South as a Tier 1 HCC asset.

Table 2. Chemical analysis (adb) on clean coal composites by CoalTech (at CF1.45)

Sample Description	Ash (%)	VM (%)	Sul (%)	Pho (%)	Total Alkali	B/A Ratio
DMT 10kg Retort & 550kg MWO	6.9	25.8	0.68	0.047	0.64	0.09
INCAR 17kg Koppers MWO	6.7	26.1	0.63	0.053	0.61	0.09
AVERAGE	**6.8**	**25.9**	**0.65**	**0.050**	**0.63**	**0.09**

Table 3. Rheological and petrographical analysis on clean coal composites by CoalTech

Sample Description	FSI	Contr (%)	Dial (%)	Max DDPM	Plastic Range	RoMax	Total Inerts
DMT 10kg Retort & 550kg MWO	7.0	-20	26	164	59	1.13	31.9
INCAR 17kg Koppers MWO	7.5	-18	28	160	58	1.13	31.8
AVERAGE	**7.3**	**-19**	**27**	**162**	**59**	**1.13**	**31.9**

Table 4. Coke Strength Properties by DTM and INCAR (in %, unless noted)

Sample Description	CSR	CRI	JIS DI 30/15	JIS DI 150/15	IRSID I 40	IRSID I 10	Wall Press (psi)	Coke Yield
DMT 10kg Retort	73.5	19.6	94	83	49.7	22.5	0.2	77.3
DMT 550kg MWO	69.5	21.4	94	81	51.7	22.4	0.2	76.7
INCAR 17kg Koppers MWO	69.0	20.5	NA	NA	NA	NA	0.7	NA
AVERAGE	**70.7**	**20.5**	**94**	**82**	**50.7**	**22.5**	**0.37**	**77.0**

For full test results on individual raw coal and clean coal composites for the 2018 LDC program refer to Atrum's 4 February 2019 ASX announcement entitled "*Initial Coal*

Atrum Coal Ltd ACN 153 876 861 – Unit 1B, 205-207 Johnston Street Fitzroy, VIC 3065 **T** +61 (0) 3 9191 0135 **E** info@atrumcoal.com
www.atrumcoal.com

Quality Results Confirm Premium Hard Coking Coal at Elan South" and 25 February 2019 ASX announcement entitled *"Additional Clean Coal Quality Results Reinforce Premium Hard Coking Coal Quality at Elan South"*.

A Tier One Hard Coking Coal

These composite sample results further illustrate the potential for Elan South to produce a high quality, medium-volatile HCC product. Table 5 shows the Elan South coking properties, as compared with typical HCC properties from the region and from Australia.

Table 5. Indicative coal specifications relative to Canadian and Australian comparables

Mine / Project	Operator/ Index	VM % ad	Ash % ad	TS % % ad	CSN	RoMax %	Fluidity ddpm	Phos % % ad	CSR	Reactives
Elan South	**Atrum Coal**	**25.9**	**7**	**0.65**	**7.5**	**1.13**	**160**	**0.050**	**71**	**68**
Teck Premium	Teck	25.5	9	0.50	7.5	1.14	350	0.090	72	71
Grassy Mountain	Riversdale	23.5	9	0.50	-	1.19	150	0.040	65	-
Peak Downs HCC benchmark	Platts	20.7	10.5	0.60	8.5	1.42	400	0.030	74	71
QLD Premium Low Vol	TSI / Platts	21.0	10	0.45	8	1.35	600	0.050	71	68
HCC 64 Mid Vol Benchmark	Platts	25.5	8	0.60	-	-	100	0.050	64	55
Moranbah North	AAMC	24.0	8.5	0.60	8	1.20	1200	0.040	65	60
Goonyella C	BMA	22.8	9	0.55	8	1.20	500	0.040	70	58
Hail Creek	Glencore	20.4	10	0.31	8	1.35	160	0.070	68	50
Illawarra	South 32	23.2	9.5	0.45	7.5	1.25	1200	0.060	73	53

Notes: (1) Elan South coal quality results are based 2018 LDC samples from two locations at Elan South.
(2) Grassy Mountain specification sourced from Nov 2015 company presentation.
(3) Platts index specifications source from:
https://www.spglobal.com/platts/plattscontent/_assets/_files/en/our-methodology/methodology-specifications/metcoalmethod.pdf
(4) Other comparable HCC specifications sourced from:
https://www.platts.com/im.platts.content/productsservices/products/coaltraderintl.pdf.
(5) Test on 2014 core samples further north of the 2018 exploration areas showed 0.01–0.02% phosphorous.

Western Canadian Mist Mountain formation coking coals are some of the highest quality coking coals traded on the global market with high coke cold strength (DI 30/15) and strength after reaction with CO_2 (CSR) values within a typical rank range of 1.10 - 1.35% RoMax.

This is partly due to the ash chemistry of the Mist Mountain formation coals, seen as one of the most important variables in determining CSR. The Mist Mountain coal seams were formed during the lower Cretaceous geological period, in an

For personal use only

Atrum Coal Ltd ACN 153 876 861 – Unit 1B, 205-207 Johnston Street Fitzroy, VIC 3065 T +61 (0) 3 9191 0135 E info@atrumcoal.com
www.atrumcoal.com

For personal use only

environment of large deltaic complexes with very little marine influence, resulting in mineral matter which is rich in quartz and kaolinite. Ash chemistry testing of the blended composite samples at Elan South returned a low basicity index of 0.09. The alkalinity index of ash is an indicator of the catalytic or refractory nature of chemical constituents in the ash, and has an important positive role in the CSR properties of the Western Canadian coals.

Figure 1 below illustrates where Elan South hard coking coal and other Canadian hard coking coals sit relative to globally traded coking coals with respect to CSR and JIS drum index.

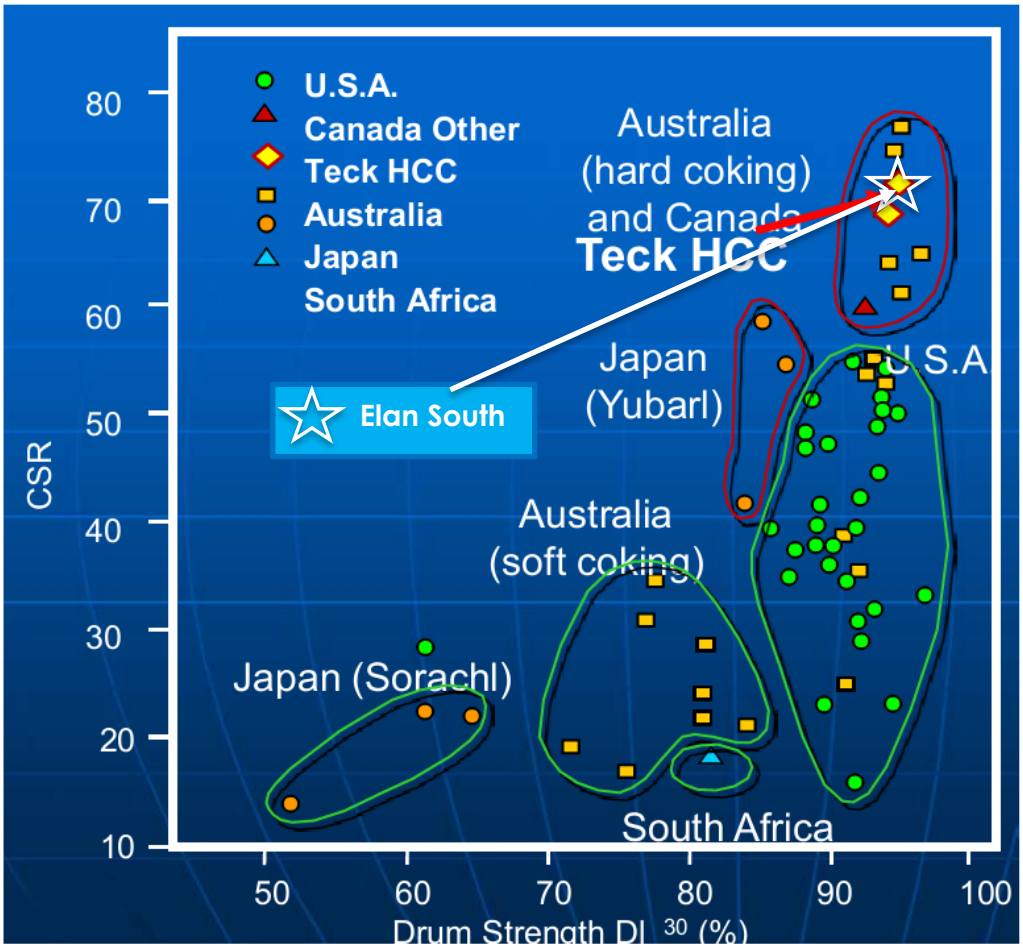

Figure 1. Elan South HCC quality position among other seaborne coking coals

(Figure adapted from Teck Resources, Investors Presentation, January 2019)

Further Coal Quality Testing in 2019

Extensive further drilling, sampling and coal quality testing have been planned as part of the recently announced 2019 exploration program. This work is set to fully confirm coal quality, washability and clean coal coking properties across a wider range of

Atrum Coal Ltd ACN 153 876 861 – Unit 1B, 205-207 Johnston Street Fitzroy, VIC 3065 T +61 (0) 3 9191 0135 E info@atrumcoal.com
www.atrumcoal.com

locations at Elan South. It will establish product specifications for Elan South and drive optimal coal preparation plant design.

For further information, contact:

Max Wang
Managing Director/CEO
M +1 403 973 3137
mwang@atrumcoal.com

Justyn Stedwell
Company Secretary
P +61 3 9191 0135
jstedwell@atrumcoal.com

Michael Vaughan
IR Advisor, Fivemark Partners
P +61 422 602 720
michael.vaughan@fivemark.com.au

For personal use only