AJ LUCAS GROUP LIMITED

Dealing Desk Note

Known Knowns, Known Unknowns & Unknown Unknowns

- **When it comes to valuing the Bowland shale in the UK, it brings to mind the famous Donald Rumsfeld "known knowns" quote from 2002. That is to say, when it comes to valuing AJL's interest in the Bowland there are things we know we know, and there are things we know we don't know, and there are also things we don't know we don't know. It is the latter category that makes it difficult to value AJL's interest in the UK Bowland shale, or any new shale play for that matter. This note discusses some of the knowns and unknowns and discusses the valuation range for the Bowland shale.**
- **Known known #1: Success in the Bowland could be transformational for the UK.** At present, the UK produces around 43% of its gas needs from the North Sea and the East Irish Sea. A further 44% of gas is sourced via pipelines from Europe (predominantly Russia and Norway), while the remaining 13% is imported in the form of LNG from global markets. With the North Sea supply in decline, success in the Bowland would help to offset some of the decline and provide jobs and a degree of energy security to the country.
- **Known known #2: Drilling will be more expensive and take longer than in the US.** The first horizontal well at the Preston New Road site has now been completed and the second horizontal well has commenced drilling, with fracture stimulation of the two wells to take place in 3Q 2018. Flow testing is then expected in 4Q 2018. Drilling commenced on 18 August 2018, and each well is costing in excess of US$30m. Despite the lengthy drilling time, the work has confirmed the shale rock formation has low overall clay content, and should therefore be conducive to hydraulic fracturing. We estimate that under a development scenario, well costs could reduce to around US$15m/well. This compares to sub US$10m/well in US shale plays.
- **Known unknown #1: the flow rate, and rate of decline.** In order to value the Bowland shale using discounted cash flow analysis we need to know the initial production (IP) of a well and the rate of decline which generates a production type curve for the shale play. Without this information, we are left to make some broad estimates as to what the flow could be. We believe the Marcellus shale in the north-east of the US provides a reasonable analogue for the Bowland given both are relatively deep and thick with good organic carbon content. We have therefore utilised a Marcellus production type curve to generate our Bowland valuation range.
- **Known unknown #2: the recoverable resource.** The gas in place number of over 1,300 Tcf is an extremely large number, but this is unlikely to all convert to a recoverable resource. A 2010 British Geological Society report estimated that the Upper Bowland could potentially yield 4.7 Tcf of recoverable shale gas, while the US Energy Information Administration (EIA) has estimated the Northern UK contains 25.1 Tcf of risked technically recoverable shale gas.
- **Putting it all together and generating a valuation.** For the purposes of valuing the Bowland, we have assumed a Marcellus well production type curve, and assumed a range of. estimated ultimate recovery (EUR) values from 6 Bcf to 10 Bcf per well, and a cost of US$15m per well. Based on these assumptions we estimate AJL's interest in the Bowland is valued at A$3.4bn (US$2.6bn) to A$6.4bn (US$4.8bn) on an ungeared basis, and assuming around 30 Tcf of gas is ultimately recovered. We do however note this range will change depending on the timing of the development of the acreage, and other known and unknown unknowns.

10 April 2018

Price	A$	0.34
ASX		**AJL.ASX**
Shares o/s	m	750.1
Free Float	%	35.5
Market Cap.	A$m	278
Net Cash	A$m	-67.4
Net Debt/Equity	%	0.48
3mth Av. D. T'over	A$m	0.1
52wk High/Low	A$	0.46/0.18

DIRECTORS & MANAGEMENT

Name	Role
Phil Arnall	Chairman
John O'Neill	Non-Executive Director
Julian Ball	Non-Executive Director
Ian Meares	Non-Executive Director
Andrew Purcell	Non-Executive Director

TOP SHAREHOLDERS

Name	Share	%
Kerogen Capital	400m	53.3
Paul Fudge	53.8m	7.2
Roddco Property Holdings	40.5m	5.4

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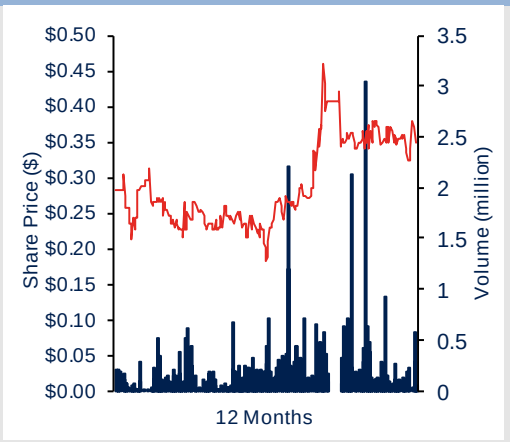
Email:	chardie@psl.com.au

Disclosure: PSL has acted for AJ Lucas (AJL) within the past year and has received a fee for these services.

12 Month Share Price Performance



Performance %	1mth	3mth	12mth
Absolute	-6.7	-14.0	52.1
Rel. S&P/ASX 300	-7.9	-10.9	36.9

PROGRESS UPDATE AT PRESTON NEW ROAD

The vertical sections of the two wells underway at the Preston New Road site have now been completed to a depth of around 2,700m, with core recovered from the Upper and Lower Bowland shales. The drilling of the first horizontal well has now been completed, with a lateral length of approximately 800m extended into the Lower Bowland shale. Work is now set to commence on the second horizontal well in the Upper Bowland shale.

Cuadrilla expects to be fracture stimulate both horizontal wells in 3Q 2018, once it receives formal consent from the Secretary of State for the Department of Business, Energy and Industrial Strategy. Cuadrilla will use up to 46 hydraulic stimulation stages to stimulate the shale.

Initial flow tests are expected to commence in 4Q 2018 and last approximately six months. We note that this timeline is now a six-month delay since drilling commenced in August 2017, and we understand this is attributed to poor weather conditions and other technical issues. We acknowledge that these are exploration wells and a significant amount of coring and monitoring has been undertaken in the drilling undertaken to date, and the time required to drill, fracture stimulate and complete wells in a development scenario would be significantly less given less monitoring/coring would be required, and drilling efficiencies would eventuate.

Figure 1: Preston New Road Drilling Site

Source: AJ Lucas

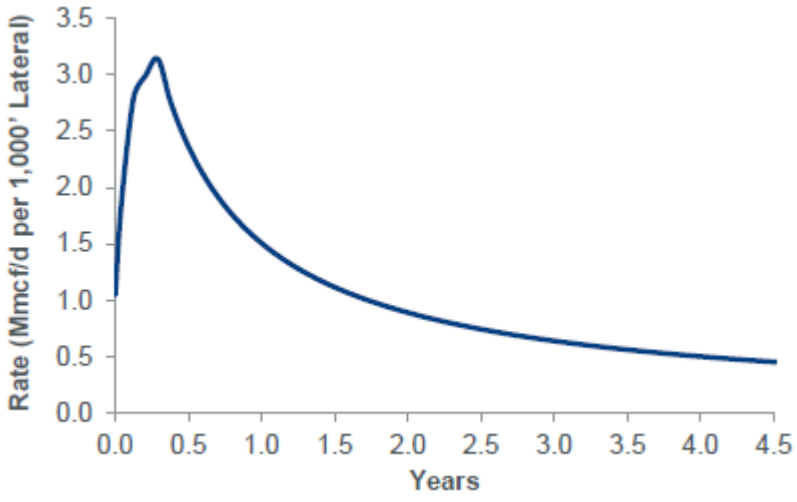
GENERATING A TYPE CURVE & WELL ECONOMICS

With a no production history from the Bowland shale, generating a representative production curve is technically impossible and we are therefore left to assume a production type curve in order to derive a valuation for the Bowland shale. Turning to the US shale plays for reference data, we believe the Marcellus shale in the north east of the US is a good analogy for the purposes of this exercise. The Marcellus shale is similar to the Bowland shale in that it is thick, has good total organic carbon content, and is relatively deep (for a US shale), and the Marcellus is one of the largest producers of natural gas in the US. In 2017, the US Energy Information Administration (EIA) estimates the Marcellus contains around 210 Tcf of technically recoverable natural gas.

Key players in the Marcellus include Chevron (CVX.NYS), Cabot Oil & Gas (COG.NYS), Antero Resources (AR.NYS), EQT Corporation (EQT.NYS), Rice Energy Inc (acquired by EQT in November 2017), and Range Resources Inc (RRC.NYS).

Marcellus wells have an estimated ultimate recovery of between 1.4 and 3.8 Bcf per 1,000 ft of lateral length, at a cost of US$800k to $950k per 1,000 ft of lateral length. A typical well in the Marcellus may have a 7,000 ft lateral length, which would therefore cost US$5.6 to $6.7m per well, with an estimated ultimate recovery (EUR) ranging between 9.8 and 27 Bcf. We believe that Bowland well costs will be significantly higher cost than the Marcellus given the location, environmental impediments and current lack of depth in the UK services market for the type of drilling and fracture stimulation required to develop the Bowland shale.

Figure 2: Marcellus Type Curve



Source: Cabot Oil & Gas, Patersons Securities

At the UK shale conference held in London in November 2017, Cuadrilla estimated the two wells currently drilling will cost in the order of US$30m each to drill, frack and complete. While not quantified, the recent AJL capital raising presentation suggests this cost might be higher with AJL stating “costs to complete Phase I are expected to be higher than initially budgeted due to unforeseen weather and technical issues delaying the drilling timetable”. Regardless, Cuadrilla believes the cost of production wells could be reduced to around US$15m each. Given the lower competitive environment when compared to the US market, and the higher regulatory requirement, we estimate US$15m is a reasonable estimate for well costs in the Bowland.

For the purposes of deriving a valuation, we assume that Bowland production wells would have a 1,000m lateral length (ie 25% longer than the first horizontal well recently completed), although we do acknowledge that wells in the US can be twice this length. Using the Marcellus analogy implies a 1,000m lateral well will have an EUR ranging between 4.6 Bcf and 12.4 Bcf. For the purposes of our analysis we have assumed 6 to 10 Bcf in our sensitivity analysis below.

While any full development plan is conceptual in nature at this stage, Cuadrilla has suggested each drilling pad could contain 30 wells, so therefore a US$450m cost per pad. Maximising the number of wells per pad helps with the development as expenses can be amortised over a larger number of wells, and in theory it minimises impacts to the broader environment. However if a tool gets stuck in the well, or completion issues arise in the

drilling program, this could have significant impact on the well economics and productivity of the pad. US shale plays typically have up to seven wells per pad as operators' consider this to be the optimum number of wells to minimise costs and maximise cash flows. We estimate that a 30-well pad would cover around four acres in order to facilitate access to wells for workover equipment, etc.

Single Well Economics

In order to generate a valuation for the Bowland shale, we have utilised a typical Marcellus shale type curve which gives us the rate of decline for individual well production. That then leaves us to make assumptions around the initial production flow rate, the estimated ultimate recovery per well, and the cost to drill, frack and complete a well. For the purposes our valuation analysis, we use a UK gas price of US$6.5/mmbtu (please refer to the next section for detail on UK gas price).

Figure 3: Single Well NPV (US$m)

		Well Cost (US$m)				
		10	**12**	**15**	**18**	**20**
EUR (Bcf)	**6**	3.3	2.0	0.1	-1.9	-3.1
	8	6.5	5.2	**3.3**	1.3	0.0
	10	11.1	9.9	7.9	6.0	4.7

Source: Patersons Securities estimates

Based on the above, we estimate that at US$15m per well, around 8 Bcf would need to be produced from each well for the Bowland to be a commercial success. Based on our analysis this suggests an initial production (IP) rate of around 11 mmscf/d/well.

ESTIMATING THE SIZE OF THE RESOURCE

The former UK oil and gas regulatory body, the Department of Energy & Climate Change (DECC), commissioned the British Geological Society (BGS) to complete a study of the geology and resource estimation of the Bowland shale. The July 2013 DECC/BGS report estimated that there was a significant 1,329 Tcf of gas in place in the Upper and Lower units of the Bowland-Hodder shale. Of this, the majority (1,065 Tcf) is attributed to the Lower unit, while 264 Tcf is estimated to be in the Upper unit. Cuadrilla has previously stated that its licences contain approximately 25% (approximately 330 Tcf) of the total gas in place. This equates to around 300 Tcf net to AJL.

Figure 4: Bowland-Hodder Gas In Place Estimates (Tcf)

	Low	**Central**	**High**
Upper Unit	164	264	447
Lower Unit	658	1,065	1,834
TOTAL	**822**	**1,329**	**2,281**

Source: British Geological Society

The 2013 BGS report did not provide an estimate of the recoverable resource volume as the BGS did not believe there was enough information to estimate a recovery factor. An earlier 2010 DECC commissioned BGS report estimated that the Upper Bowland could potentially yield 4.7 Tcf of shale gas, based on a relatively simple scaled basin analogy. Applying the Upper Bowland recoverable volume estimate and directly extrapolating it to the Lower Bowland equates to around 24 Tcf of potentially recoverable gas in the Upper and Lower Bowland.

The US Energy Information Administration (EIA) published a report on UK shale in 2015 highlighting that the Northern UK petroleum system (i.e. the Bowland shale), is much more complex than in the US, stating "faults are numerous, geologic data control is weak, and shale wells are costlier to drill". The major faulting suggests that, unlike the US, the depth to the shale varies significantly across the play. The EIA report estimated the Northern UK contains 25.1 Tcf of risked technically recoverable shale gas.

While every play is different, we typically work within the bounds of 1% to 10% of an in-place resource is ultimately recoverable (while acknowledging we normally have more information to work with), implying 3 Tcf to 30 Tcf net to AJL. At a 10% recovery factor, this implies a valuation ranging between US$2.5bn and US$4.8bn for AJL's net interest.

Figure 5: Valuation of AJL's Net Interest in the Bowland Shale Using a 10% Recovery Factor

EUR per Well	Wells Required	NAV (US$m)	NAV (A$m)
8	3,750	2,564	3,419
10	3,000	4,776	6,368

Source: Patersons Securities Estimates

Even at 1% recovery, 3 Tcf of gas is still a significant volume and is approximate to the requirement for one LNG train in Queensland. However the value is significantly reduced and ranges between US$704m to US1.25bn if this amount is recovered.

Figure 6: Valuation of AJL's Net Interest in the Bowland Shale Using a 1% Recovery Factor

EUR per Well	Wells Required	NAV (US$m)	NAV (A$m)
8	375	704	938
10	300	1,251	1,668

Source: Patersons Securities Estimates

We note that these valuation estimates are ungeared and will depend on the timing of the development of the acreage. One issue some investors have had with shale plays in the US is that they remain cash flow negative for a significant period of time before enough wells are drilled to fund the future drilling requirements. The Bowland shale development would be no different in our view, and we forecast ten years of negative cash flow before it becomes cash flow positive, however this will depend on the pace of development.

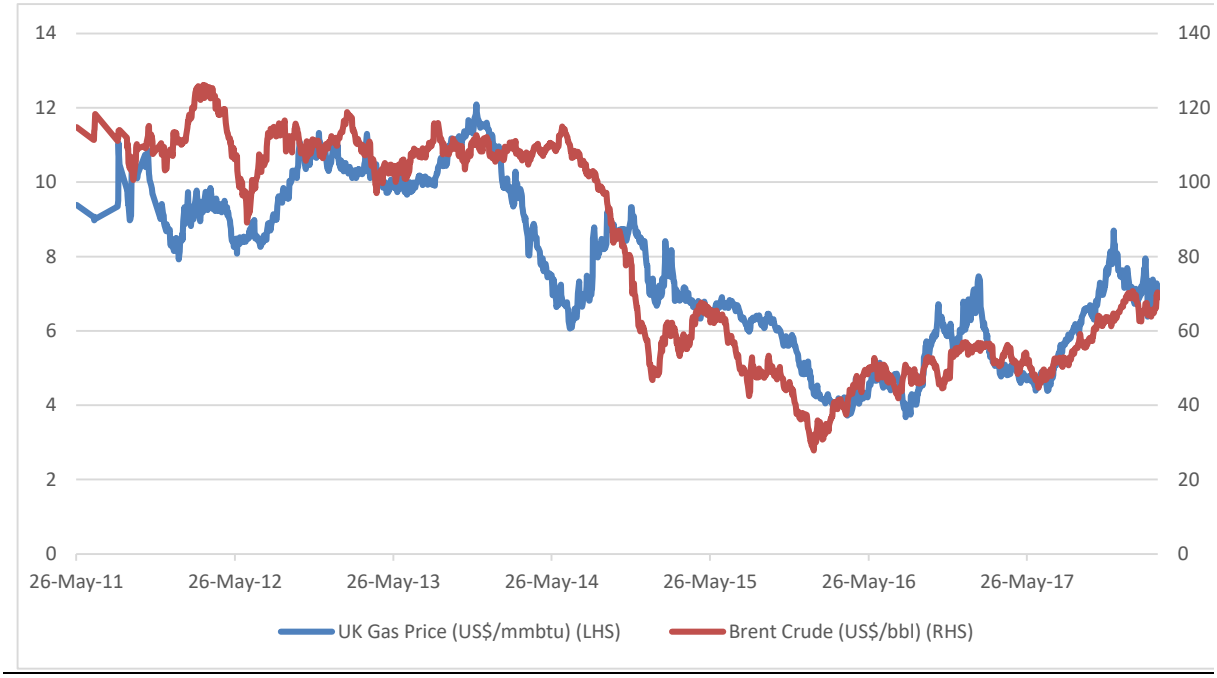
UK GAS PRICE

The UK currently produces around 43% of its gas needs from the North Sea and the East Irish Sea. A further 44% of gas is sourced via pipelines from Europe (predominantly Russia and Norway), while the remaining 13% is imported in the form of LNG from global markets. It is acknowledged that the North Sea supply is in decline, and therefore in future more gas will be required from other sources.

The UK gas price typically quoted is the price at the virtual delivery point in the UK called the National Balancing Point (NBP). Gas at the NBP trades in pence per therm, and it is a similar concept to the Henry Hub in the US, except the NBP is not an actual physical location. While the UK gas price is not officially tied to the crude oil price, Figure 7 shows that, other than a few short term periods, it has been highly correlated to the Brent crude price. This is likely due to LNG pricing typically being tied to a crude oil products pricing basket, and as such domestic gas and European sourced gas competes with LNG. We have also seen this dynamic play out in the east coast Australia gas market where there is a perceived shortage of domestic gas which has led to gas price increasing to around the current LNG price at the gate in Queensland.

For valuation purposes, we assume a UK gas price of US$6.50/mmbtu which is equivalent to a price slope of 10% on our long term Brent crude oil price of US$65/bbl.

Figure 7: UK Gas Price Versus Brent Crude Price



Source: Bloomberg, Iress, Patersons Securities

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SYA	Patersons Securities have acted for Sayona Mining Limited (SYA) within the past year and have received fees for these services.
UUV	Patersons Securities have acted for UUV Aquabotix Ltd (UUV) within the past year and have received fees for these services.
WKT	Patersons Securities have acted for Walkabout Resources Ltd (WKT) within the past year and have received fees for these services.
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