Peer Review – Elgin Energy Land and Soil Capability Assessment

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Private and Confidential

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Peer Review – SLR Land & Capability Assessment as submitted by Elgin Energy

Dear Jo,

The report attached summarises my review of the 'Land & Soil Capability Assessment' that was prepared by SLR Consulting Australia Pty Ltd and submitted by Elgin Energy, and my agronomic understanding of the Raglan district, its' soils and productivity.

Should you wish for further clarification of any of the material presented, please do not hesitate to contact me.

Yours sincerely,

David Harbison
Director.

Peer Review Report – Land & Soil Capability Assessment

I, David Harbison, of D R Agriculture Pty Ltd, 2470 Mitchell Highway, Molong, being an independent agronomist / agricultural advisor say;

1. I wish to have noted that my views in my first report, 16th November 2020, have been confirmed by more recent reports, and that the Land Capability Classification of the proposed site, issued by the State of NSW and Department of Planning, Industry and Environment 2022 and its' eSpade service, 'Raglan Soil Landscape' (espade.environment.nsw.gov.au) is Class 2 and 3. eSPADE provides access to soil profile and soil map information published by the NSW Department of Planning, Industry and Environment, including map data, reports and images, primarily sourced from the NSW Soil and Land Information System (SALIS).

2. Noted in the Raglan Soil Landscape document are many soil parameters including general landform with slopes 2 – 6%, with small pockets between 6 – 10%, soil types of Red and Yellow Solodic soils commonly with topsoil of loamy sand to sandy loam texture, and medium to heavy clay, sometimes mottled, subsoil. The base level fertility, like many Australian soils, is considered low in its natural state, with nutrient input and management a key activity for production. Erodibility of the topsoil and subsoil is considered high on the yellow solodic soils thus sound soil management practices are critical to retaining groundcover and soil protection. The sodicity at depth can lead to significant erosion if exposed; it is best not disturbed. Drainage lines are fixed and widely spaced, with actual drainage considered 'moderately well' on the red solodics and 'imperfectly to poor' on the yellow solodics.

3. From collection and analysis of many paddock soils surrounding the proposed site, the general soil health of the locality is in good condition. The Food and Agriculture Organization of the United Nations (FAO) define soil health "as the capacity of soil to function as a living system. Healthy soils maintain a diverse community of soil organisms that help to control plant disease, insect and weed pests, form beneficial symbiotic associations with plant roots, recycle essential plant nutrients, improve soil structure with positive effects for soil water and nutrient holding capacity, and ultimately improve crop production. A healthy soil also contributes to mitigating climate change by maintaining or increasing its carbon content".

Observation

4. I am familiar with the OEH guideline *The Land and Soil Capability Assessment Scheme; Second Approximation 2012* and will make close comparisons between published land class photographs and assessment criteria and the proposed site.

5. Since the drought of 2017 – 2019 broke in early 2020, many areas of NSW have had significant and ongoing rainfall. In the Bathurst district, the 2020 rainfall at the Bathurst Airport (within 5 km of the proposed site) was 791 mm, 24% higher than the long-term average of 635 mm. Figure 1 shows just how wet the profile became with 8 of the last 10 months of the year having greater than average

rainfall. 2021 was even wetter, with a total rainfall of 901 mm, 42% higher than average, with the 2022 year to date total continuing the trend, being 47% higher as at the end of May.

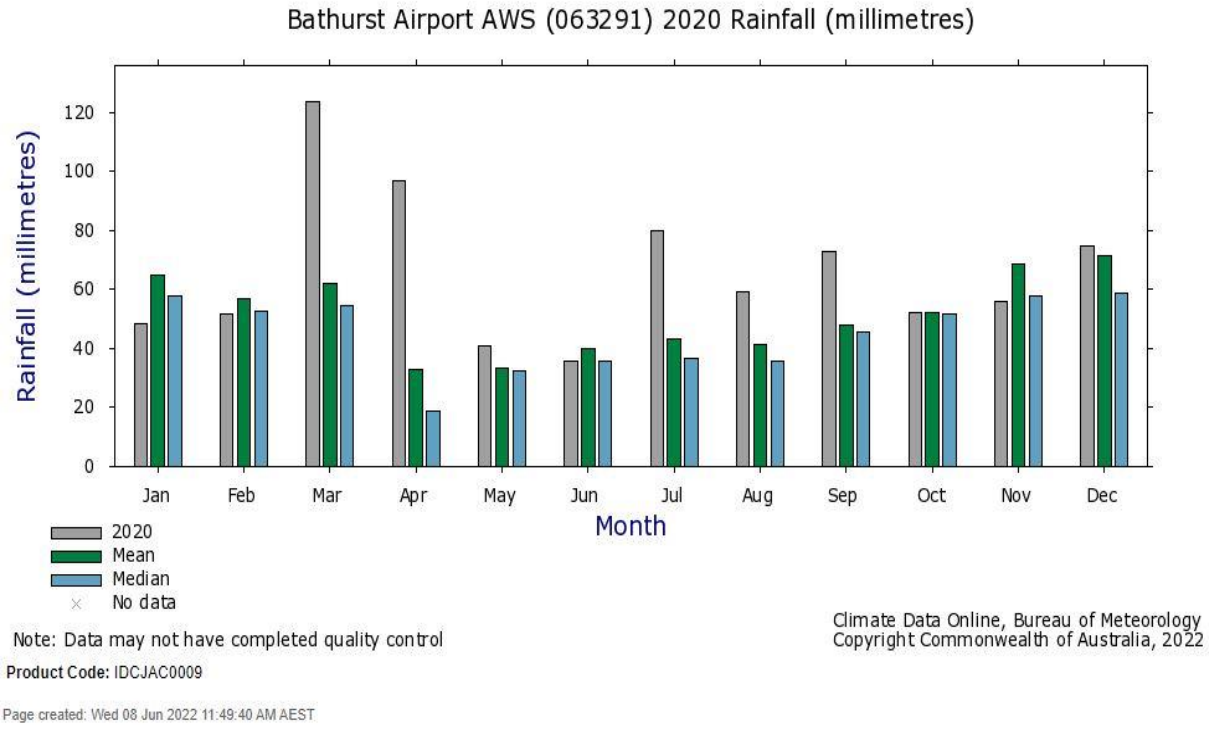

Figure 1 - Bathurst Airport rainfall for 2020 as compared to the long-term average and median (source BOM, 2022)

Despite all this additional rainfall, the management on the proposed site has been able to carry on with timely production activities. The soils, despite the noted 'poor drainage' attributes, have been trafficable by machine to allow all the 2020, 2021 and 2022 production activities to proceed without detriment. At present, all the eastern side of the proposed site is planted to crop that is currently being grazed (figure 2). Production appears good, and there is no visible evidence of any significant land degradation that one may expect from soils with the risk properties listed in the Raglan Soil Landscape document (eSpade). The soil at this particular site, and even those of the neighbouring properties, are obviously draining better than classified or would be expected with such surplus rainfall.

6. Land management and productivity is entirely in the hands of the custodian of the time. As such, sustainability is a true reflection of those management and productivity practices employed. Where only minor occurrences of any land degradation are observed, it shows a truly resilient system of soil and land management that has often been practiced for many years. The proposed site, according to district records and neighbour observations, has been a crop and grazing property for at least the past 60 or 70 years.

7. It is noted that SLR deem nearly 90% of the site to be of less than 10% slope (Land assessment figure 2 of their report), a requirement of BSAL.

Figure 2 - Aerial view of the site looking northwards, showing the eastern half of the site in full production, May 2022 (source – Greerfilms 2022).

Opinion

8. According to Table 2 of *The Land and Soil Capability Assessment Scheme* the general definition of Land and Soil Capability (LSC) Class 3 is;

   High capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.

   It is my opinion that this summarises nearly every ha on the proposed site, and is supported by the Department of Planning, Industry and Environment and its' eSpade service's 'Raglan Soil Landscape classification' of LSC Class 2 and 3. Limitations do exist in such soils, and management of those limitations is required. The implementation of today's best management practices of "no-till", "direct drill" and "conservation farming" activities, along with rotational grazing of crops, shows clear evidence of 'careful management'. That is exactly what is occurring at the site with little or no land or environmental degradation evident. There is high likelihood that some small areas of the site could in fact be assessed as LSC Class 2. The SLR classification of this site being LSC Class 4 and 5 contradicts that of the Department of Planning, Industry and Environments' eSpade Service, and myself.

9. From the Land & Soil Capability Assessment report, SLR conclude that at each of the 6 sites assessed, LSC is Class 4. This comes from a matrix of assessments of each of the 8 hazards assessed, with the resulting LSC reflecting the highest hazard rating. I agree with the ratings on many of the hazards but have concerns to the subjectivity and resulting scores of some too.

Using *The Land and Soil Capability Assessment Scheme* guidelines, hazard 2 – wind erosion (5.4, pg 33) quotes "wind erosion tends to be highest in coastal areas and on the inland plains". Figure 6 (on page 35 of the guidelines) appears to contradict that statement showing Orange to Lithgow being in a zone of 'High' wind erosive power, with both the inland plains and much of the coastal region being of 'Low' wind erosive power. Further, in 5.4.2 it cites "in assessing the wind erosion hazard, the assumption is made of land management associated with low surface cover". Of course things will blow if you denude a landscape, but who farms for that goal! Most farmers I know are at or very near the other end of the spectrum, and indeed the proposed site and the neighbouring properties are. That is, aiming for 100% cover, 100% of the time. With such management, wind erosion is very unlikely, and I am not aware of any such sites in the Central tablelands of NSW where wind erosion has occurred to the detriment of the landscape.

Hazard 4, soil acidity is another 'management' issue that has the ability to change LSC class. Described in the guidelines is the pH of the 'natural state' of soil. Nearly all of the Central tablelands, in its 'natural state' is acidic. However management, through strategic practices such as liming, can increase pH and reduce the level of acidity. In table 12 of the guidelines, raising pH alone can shift the classification of a soil from LSC class 4 to LSC class 3. Potentially all the '4' ratings for soil acidification given by SLR could in fact be improved to '3' simply with management.

Lastly, hazard 6 – water logging. I read the guidelines provided and see much subjective opinion possible. Table 14 from the guidelines, highlights such subjectivity.

Table 14. LSC class for waterlogging hazard

Typical waterlogging duration (months)	Return period	Typical soil drainage*	LSC class**
0	every year	rapidly drained and well drained	1
0–0.25	every year	moderately well drained	2
0.25–2	every year	imperfectly drained	3
2–3	every 2 to 3 years	imperfectly drained	4
2–3	every year	imperfectly drained	5
>3	every year	poorly drained	6
Almost permanently	every year	very poorly drained	8

* NCST (2009, p.202–4)
** Based on slope position, climate and length of time soils are wet.

From SLR's report, and the Raglan soil landscape description, we know drainage is an issue at the proposed site. However, as table 14 from the guidelines shows, an "imperfectly drained" soil can be classified in 3 different LSC classes. The difference is simply how long the waterlogging lasts (duration), and how often. Assessment of waterlogging hazard "relies on information contained in soil landscape reports and other natural resource products or knowledge from local soil and land practitioners to determine the waterlogging duration and return period". In my opinion, to be waterlogged for 2-3 months duration is more than "wet feet". This is 'swamp' conditions, and indeed they are present this year in odd places in paddocks, but not over vast ha's of land. Wet for

3-4 weeks maybe, and possibly every year yes, but that still only rates the hazard a 3. I challenge the SLR figure of 4, but understand it is one person's opinion verse another.

10. From *The Land and Soil Capability Assessment Scheme*, pictures of LSC 3 (figure 3) appear very similar to the proposed site landscape presented in Figure 2 above. Not present on the proposed site are any areas described as LSC 4 or degraded LSC 5 (figure 4) as per the scheme document.

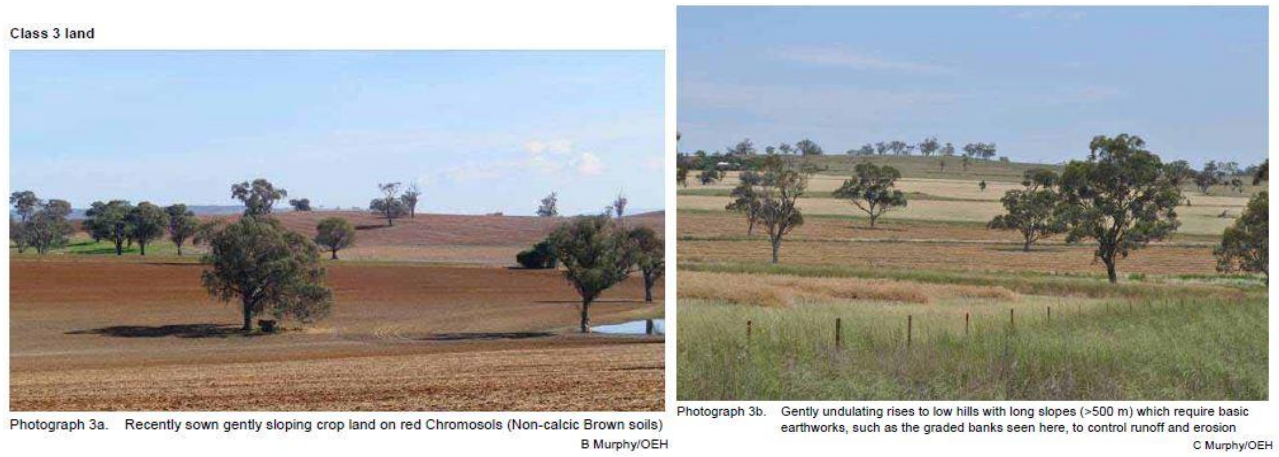

Figure 3 - Images from *The Land and Soil Capability Assessment Scheme* of Class 3 (top left and right) land as compared to images of the proposed site (bottom left and right) taken 2020 and 2022, almost identical (sources – *The Land and Soil Capability Assessment Scheme* and D. Harbison 2022).

Class 4 land

Photograph 4a. Moderately sloping land capable of occasional cultivation showing evidence of stubble burning

J Young/OEH

Photograph 4b. Undulating to rolling low hills which have increased risk of soil erosion and are unsuitable for regular cultivation

A Murrell/OEH

Class 5 land

Photograph 5a. Drainage plain with highly concentrated run-on, sodic subsoils and gully erosion

F Townsend/OEH

Figure 4 - Images from *The Land and Soil Capability Assessment Scheme* of Class 4 (top left and right) and Class 5 land (bottom) that cannot be found anywhere on the proposed site (source – *The Land and Soil Capability Assessment Scheme* 2022).

One only has to visit and inspect the site to see the productivity and suitability of such land and the contribution it can make to food production in the Bathurst region. A key piece of Land and soil class classification, also noted in *The Land and Soil Capability Assessment Scheme,* is the validation of the main components of land capability assessment. Figure 5, from that document, highlights where the validation occurs, taking into consideration all the land use, characteristics and limitations. As the Department of Plannings eSpade report of the Raglan soil landscape says, this is Class 2 and 3 land, and that remains my opinion too.

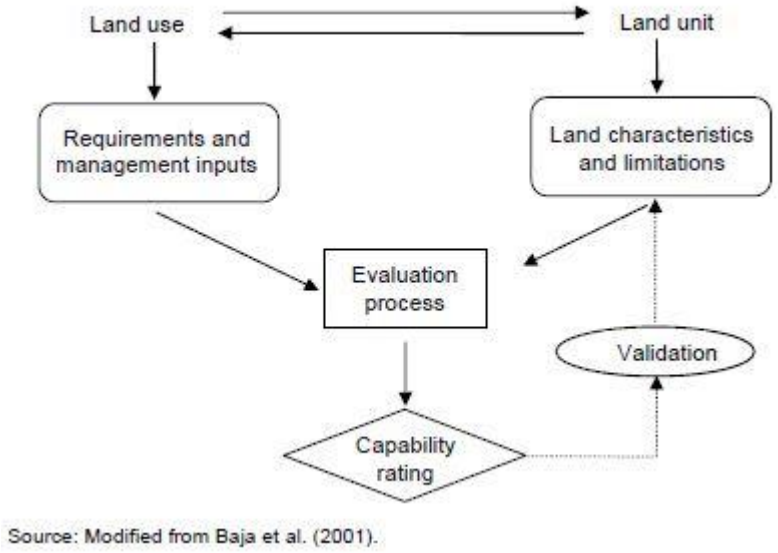

Figure 5 - The main components of land capability assessment (source - *The Land and Soil Capability Assessment Scheme* 2022).

11. Soil sampling of neighbouring properties to the proposed site has occurred, with key production results presented in table 1.

Table 1 – Summarised soil test data analysed at the laboratory from ten 0 – 10 cm samples collected from adjoining properties (June 2022)

Site	pH (CaCl2)	Aluminium %	CEC cmol/kg	Nitrogen mg/kg NO3	Phosphorus mg/kg (Colwell)	Potassium cmol/kg	Sulphur mg/kg (KCl40)
B 1	5.4	< 1	6.0	8.7	15	0.62	7
B 2	5.8	< 1	5.7	12	13	0.47	6
C 1	5.9	< 1	4.0	2.5	25	0.26	7
C 2	5.8	< 1	6.3	7.3	24	0.39	8
C 3	6.3	< 1	5.8	6.3	30	0.26	7
W 1	5.5	< 1	5.9	7.4	29	0.48	8
W 2	5.6	< 1	3.6	6.8	15	0.35	5
W 3	5.6	< 1	3.0	4.5	14	0.35	4
W 4	5.7	< 1	5.3	10	19	0.47	4
W 5	5.9	< 1	7.0	15	24	0.76	5

Of significant difference to the above results are those of the proposed site. Significant acidity is present on the proposed site, however pleasingly, aluminium presence on the site is at a low level with little or no impact on production. There is a clear difference in acidity management between the proposed site and the neighbouring properties as no such limitations are found in table 1. Such

acid soil management is to be expected between owned and leased land. Reducing acidity is an easy management decision, but one that needs a long term view. Leased land does not usually offer that long term perspective, thus tenants are reluctant to invest in acidity reducing activities (ie.liming). As for the balance of the results in table 1, yes there are individual opportunities to raise productivity, but on the whole, there are no major limitations that management cannot remedy. Given the cropping history of the proposed site, I suspect some of the key nutrients, from a production perspective, would in fact be higher than those reported here of the neighbours properties (no data is presented in the SLR report to compare those numbers).

12. In the assessment of Biophysical Strategic Agricultural Land (BSAL) for this site, some key parameters stand out; land slope at the site is mostly < 10% so it passes the BSAL test, however SLR note poor drainage and moderately low inherent fertility as determining factors deeming the site Non BASL. I have commented already on both the waterlogging assessment process and believe soil fertility can be easily managed for better productivity and food production, both of which would challenge the Non BASL classification.

    In my opinion, if one delves far enough into many agricultural soils, many would be deemed Non BASL, but that does not rule them out from being agriculturally important. Many factors can be managed, and production can still occur at significant levels. Take for example the Australian rice industry. “Poor drainage” is a feature and desired attribute of rice production soils, contributing some $800 million to the Australian economy. Approximately 2000 farming businesses are involved, farming Non BASL soil!! Is that strategic agricultural land that the Australian economy, and those families, can do without? I say no, and not always are our means of describing soil and land class ‘fit for purpose’.

References

13. State of NSW and Department of Planning, Industry and Environment (2022) ©. Raglan Soil Landscape - from espade.environment.nsw.gov.au

14. FAO (2015). Healthy soils are the basis for healthy food production. 2015 International Year of Soils. Food and Agriculture Organization of the United Nations, Rome, Italy.

15. NSW Office of Environment and Heritage (2012). The Land and Soil Capability Assessment Scheme, Second Approximation. Sydney: NSW Office of Environment and Heritage.

16. Rice Growers Association of Australia (2022).