Independent Review of the

Bowdens Silver Pty Limited

Surface Water Assessment – Updated

(WRM Water + Environment Pty Ltd

February 2022)

Contents

Introduction

This analysis considers the data used in the Bowdens surface water assessment (WRM Water & Environment Pty Ltd) to do the modelling showing the viability of water use and reuse at the proposed mine site.

It considers the rainfall data used and compares it with the known local conditions.

Comparative rainfall data has been drawn from the BOM data from the two closest towns, Mudgee and Rylstone.

Monthly rainfall

Data

From Bowdens surface water assessment:

Figure 3.2 Average monthly rainfall and pan evaporation at the Mine Site - 1889 to 2018 (source: SILO point dataset - Qld Department of Environment and Science)

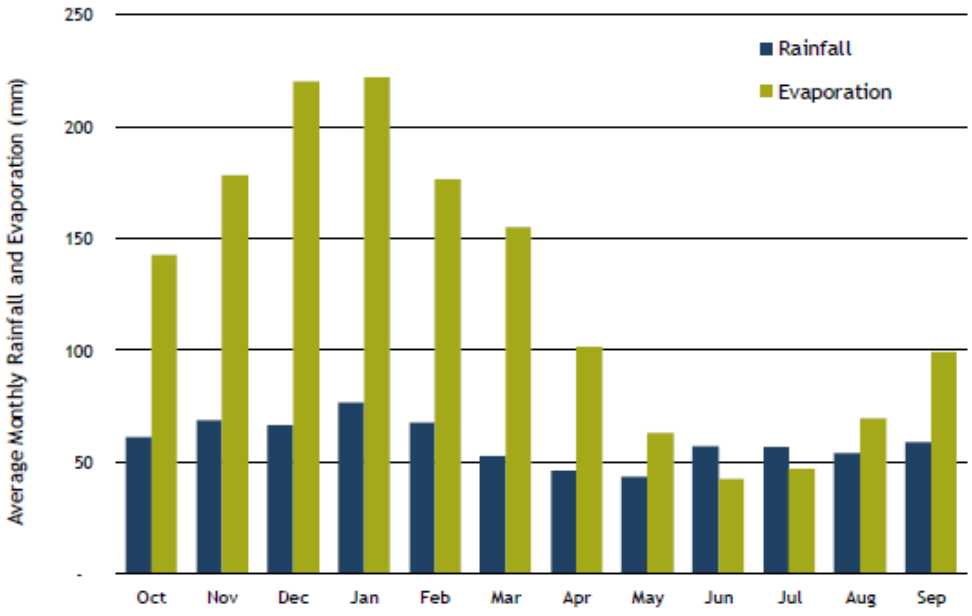

Figure 1 Average monthly rainfall data presented in Bowdens surface water assessment

From BOM site, for Mudgee Airport[1]

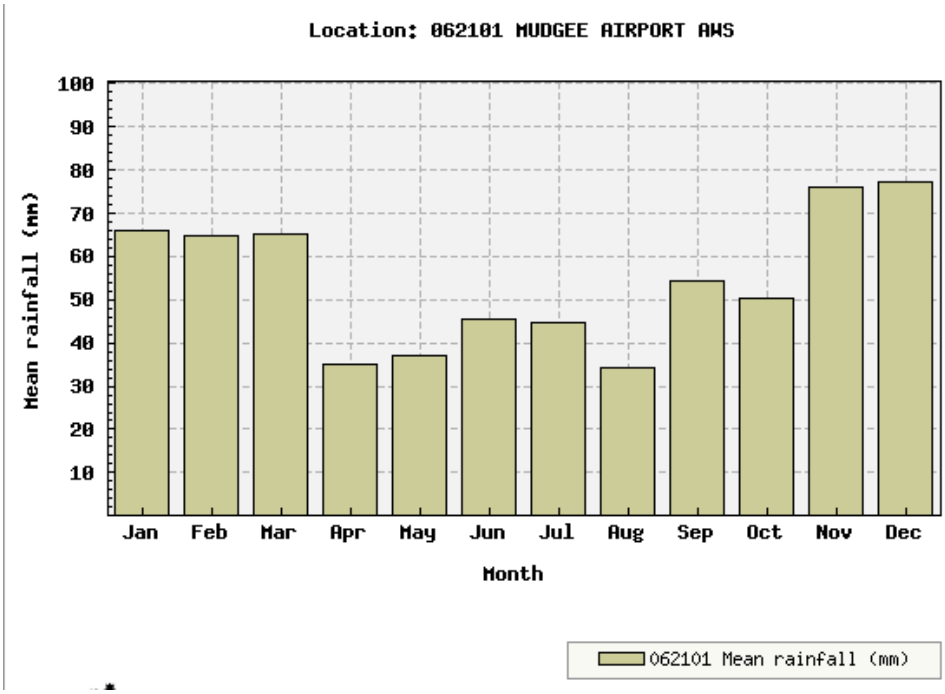

Figure 2 Average monthly rainfall data for Mudgee

1 http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=062101&p_prim_element_index=18&p_display_type=statGraph&period_of_avg=ALL&normals_years=allYearOfData&staticPage=

From BOM site, for Rylstone (062026[2])

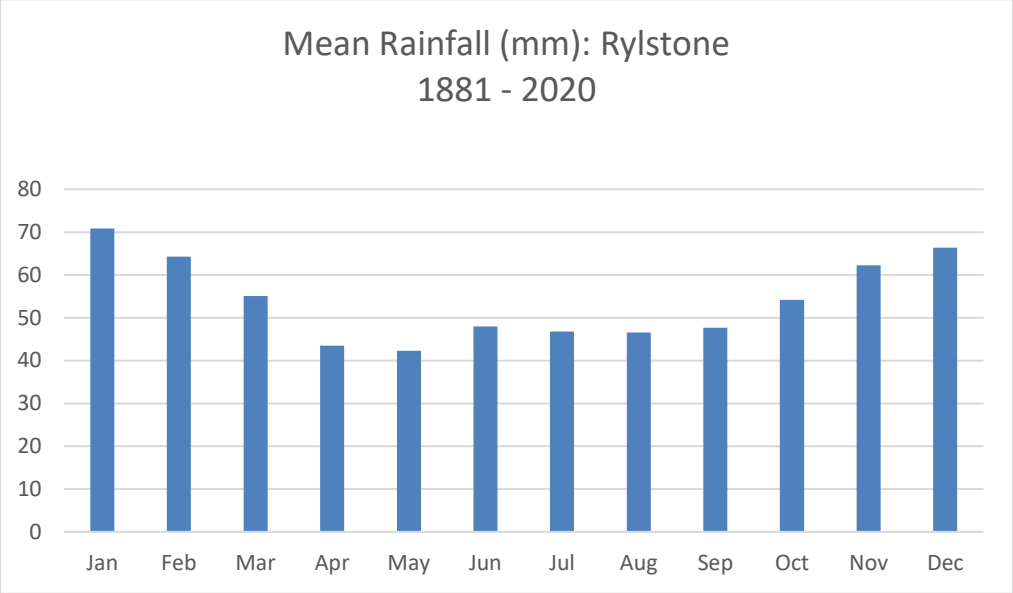

Figure 3 Average monthly rainfall data for Rylstone

From BOM site, for Lue (062062[3])

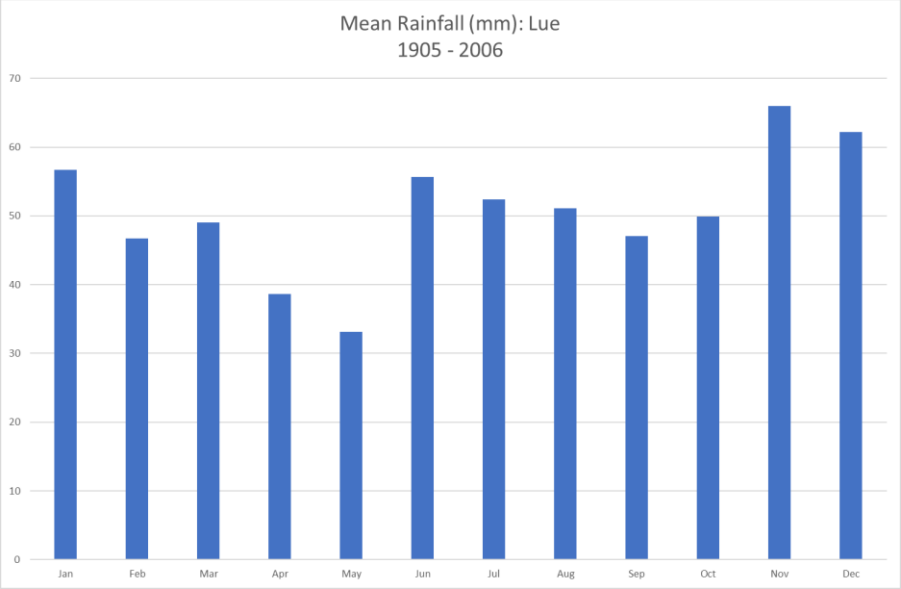

Figure 4 Average monthly rainfall data for Lue

Conclusion

The Bowdens surface water assessment data appears to show a monthly average that exceeds 75mm over summer. This is incorrect, as evidenced by the rainfall data from Mudgee (26km west of the mine site), Rylstone (22km south of the mine site) and Lue.

Many of the other months are also too high when compared to Mudgee, Rylstone and Lue rainfall statistics from BOM. These figures need to be presented as numbers so they can be clearly understood.

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[2] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=062026

[3] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=062062

Annual rainfall

From Bowdens surface water assessment:

Figure 3.1 Annual rainfall at the Mine Site - 1889 to 2018 (source: SILO point dataset - Qld Department of Environment and Science)

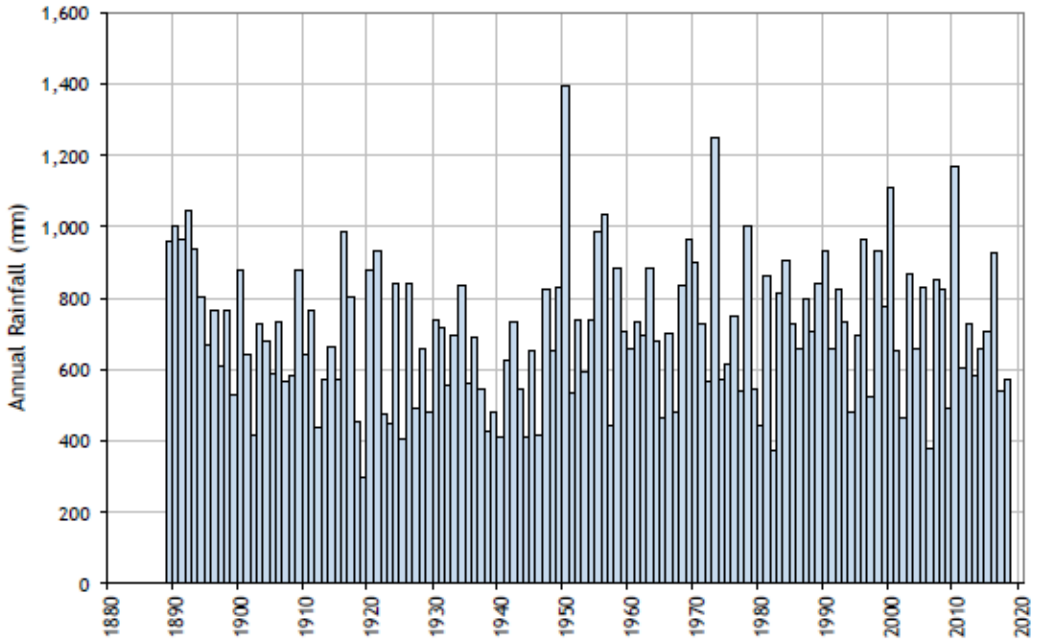

Figure 5 Annual monthly rainfall data presented in Bowdens surface water assessment

Average annual rainfall reported as 673 mm/a.

From BOM site, for Rylstone (062026[4])

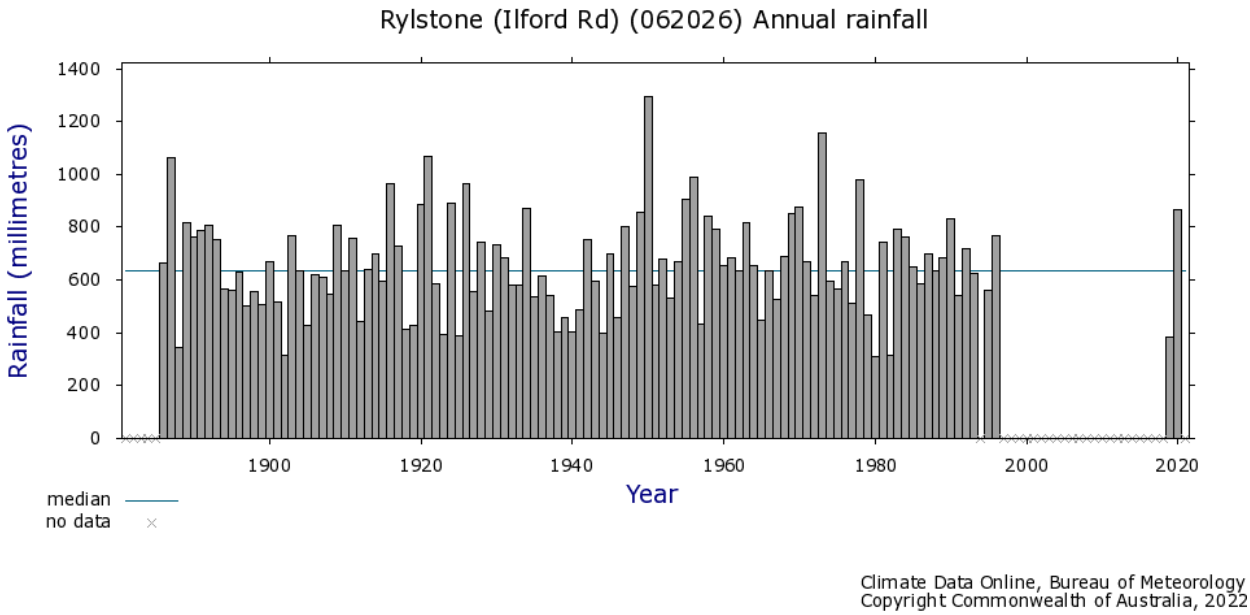

Figure 6 Annual monthly rainfall data for Rylstone

[4] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=062026

Table 1 Rylstone Rainfall Statistics

Station 062026 Rainfall Statistic	Annual
Mean	654
Lowest	309.4
5th %ile	390.4
10th %ile	426.5
Median	635.4

From BOM site, for Mudgee (062021[5])

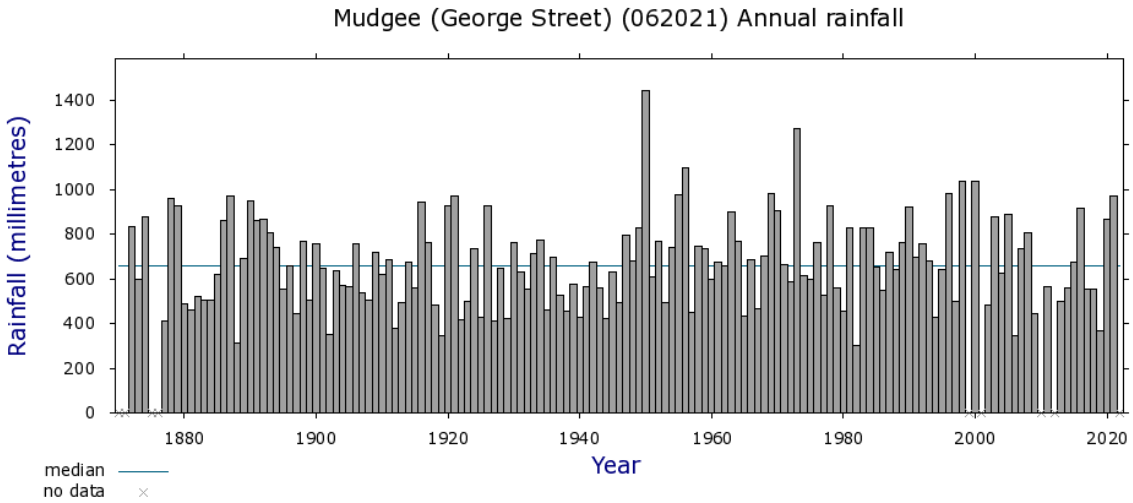

Figure 7 Annual monthly rainfall data for Mudgee

Table 2 Mudgee Rainfall Statistics

Station 062021 Rainfall Statistic	Annual
Mean	671.6
Lowest	302.4
5th %ile	411.4
10th %ile	431.4
Median	656.9

From BOM site, for Lue (062062[6])

Table 3 Lue Rainfall Statistics

Statistic	Annual
Mean	614.5
Lowest	337
5th %ile	375
10th %ile	383.2
Median	616

[5] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_display_type=dataGraph&p_stn_num=062021&p_nccObsCode=139&p_month=13

[6] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=062062

The extract of years in which less than 500mm of rainfall was received in Rylstone[7] and Mudgee[8] is shown in Table 4.

Table 4 Rylstone and Mudgee Dry Years

Rylstone		Mudgee	
Year	Annual	Year	Annual
1980	309.4	1982	302.4
1902	314.9	1888	313.1
1982	315.9	1919	345.9
1888	346.2	2006	347
2019	381.6	1902	349.1
1925	388.1	2019	367.1
1923	391.9	1912	377.2
1944	397.7	1927	411
1940	401.3	1877	413.6
1938	402.6	1922	416.2
1918	414.7	1929	421.6
1919	426.1	1944	422.8
1905	428.2	1994	426.9
1957	435.3	1940	429.3
1912	441.6	1925	430
1965	449.2	1965	434.6
1946	456.8	1897	445.1
1939	458	2009	445.6
1979	465.5	1957	451.7
1929	482.3	1980	457.8
1941	485.2	1938	457.9
		1881	463.6
		1935	463.9
		1967	468.8
		2002	482.6
		1918	484.7
		1880	487.2
		1913	492.8
		1953	494.6
		1946	494.7

[7] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=062026

[8] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_display_type=dataGraph&p_stn_num=062021&p_nccObsCode=139&p_month=13

The percentiles for Mudgee, Rylstone and Lue have been calculated using BOM data and are shown in Table 5 and Figure 8. Based on the data from Mudgee and Rylstone, one in every five years, climatic conditions are akin to a semi-arid environment. The data from Lue shows that semi-arid conditions could be experienced two in every five years.

Table 5 Rylstone and Mudgee Average annual rainfall percentiles

	Rylstone	**Mudgee**	**Lue**
Percentile	Average annual rainfall (mm)		
0	309	302	337
0.1	427	431	383.2
0.2	509	494	425.7
0.3	559	544	438.5
0.4	593	596	510.5
0.5	635	651	616
0.6	679	695	643.5
0.7	745	761	757.3
0.8	800	828	817.2
0.9	875	929	860.7
1	1293	1443	1047

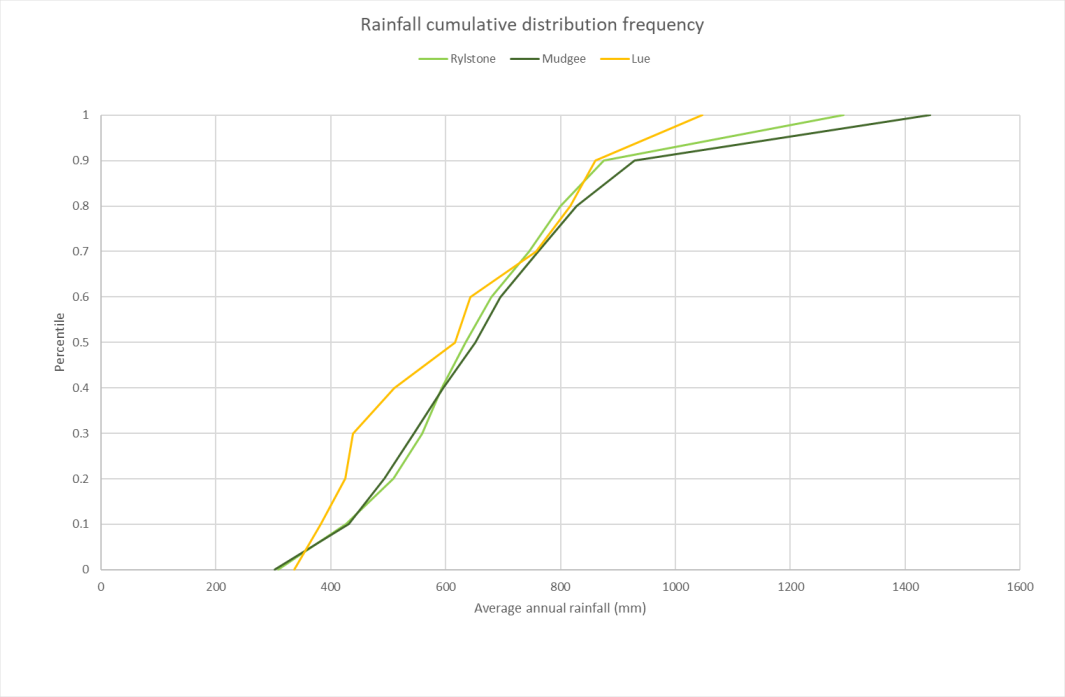

Figure 8 Rainfall cumulative distribution frequency

Conclusion

Exclusion of relevant data

The number of very low rainfall years is clearly not reflected in the Bowdens surface water assessment annual rainfall data, which has only three years of less than 400mm. This in part seems to be a deliberate attempt to distort the data, as it has excluded 1888 and 2019, both of which are very dry years. Given that the community that will be affected by this mine have recently lived through the crippling drought which culminated in the 2019/2020 Black Summer fires, this is viewed very poorly.

Inaccurate data

WRM reported the average annual rainfall as 673 mm/a. The BOM reports the average annual rainfall for Mudgee as 671 mm/a and 654 mm/a for Rylstone. From Figure 8, it can be seen that the average annual rainfall for Lue is much less, at 614 mm/a. Given this, the estimate of 673 mm/a used by WRM for the surface water assessment is considered unrealistically high. Rather, it would be reasonable to use an estimate of 662 mm/a, being the average of the recorded rainfall for Mudgee and Rylstone. However, it should also be noted that the area in which the mine site lies is generally regarded as being within a rain shadow, with the Great Divide lying to the east and another mountain range to the west. Thus, an average annual rainfall of no more than 654 mm/a may be a more realistic estimate.

Impacts on water availability

It is also noteworthy that the median for Rylstone and Mudgee is 635 and 656 mm/a respectively, and the 20th percentile is 509mm/a and 494 mm/a respectively. The 20th percentile for Lue is 425.7mm and the 40th percentile is 510.5mm. The point of this is that in Australia, a semi-arid climate is one where average rainfall is between 250mm and 500mm per year[9]. The analysis here shows that one in every five years, the climatic conditions for Rylstone and Mudgee are semi-arid. The data from Lue, adjacent to the proposed mine site, shows that semi-arid conditions could be experienced two in every five years. This means that any loss of available water in these years severely impacts the land, and the people, plants and animals trying to survive on it.

Climate change impacts will increase the number and severity of the dry years experienced in this region.

The surface water assessment acknowledges that there will be an impact on availability of water to downstream surface water users, and says:

> *The Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources states that water must not be taken under an access licence when there is no visible flow or where an access licence permits take from an in river pool, when the volume in that pool is less than its full capacity.*
>
> *The principal mechanism by which the Project would affect the quantity of water supplies available to other surface water users in the Lawsons Creek Water Source of the Macquarie Bogan Unregulated and Alluvial Water Sources is by reducing flows such that the frequency and duration of cease-to-flow periods is increased.*
>
> *The impact of the Project on the frequency of flows greater than 1 ML/d (approximately 12 L/s), which occur about 81.0% of the time downstream of the Walkers Creek confluence, is expected to be negligible. Therefore, the impact of the loss on the availability of water to downstream water users would be negligible.*

The conclusion drawn by WRM is incorrect. As is shown in the analysis in this paper, it is the other 19 percent of the time when extremely dry semi-arid conditions, are experienced in the affected catchment areas, when water is in desperately short supply. Therefore, the impact of **any** loss of water is critical. It is also expected that in these conditions, one in every five years, that the conditions of the Macquarie Bogan Unregulated and Alluvial Water Sources Water Sharing Plan would be unable to be met.

[9] https://www.environment.nsw.gov.au/threatenedspeciesapp/VegFormation.aspx?formationName=Semi-arid+woodlands+(shrubby+sub-formation)

Further, the methodology used to calculate the loss of water downstream and the cease-to-flow predictions appears to be flawed. The assessment reports that:

> *The estimated impact of the Project on the frequency of flows at location C in Lawsons Creek that was conducted by comparing the outputs of the AWBM model of the premining catchment areas (described in Section 3.5.3) with the corresponding results of a model with the reduced catchment area* (pg 6 – 128)

This seems to indicate that the catchment area of the mine was subtracted from the AWBM model. However, what is not clear is what area was used. As noted elsewhere in the assessment, the catchment area of the containment system is expected to peak at 550 ha. This equates to an average annual loss of flow of 177 ML/a. From Table 8.1 of the assessment (Figure 9), it appears this is what is used, given the reduction in flows is 175.2 ML/a. However, in actual fact, the reduction of flow must consider all water that is being extracted from the site – including the contiguous area of 2850ha – and used in the proposed mining operations as this is what the downstream flows will be reduced by. As shown in Figure 5.3 of the surface water assessment, at peak requirement, the mean annual flow is 1,955 ML/a (p 6-86).

Table 8.1
Impact of Project on Mean Annual Streamflow in Downstream Waters

		Operations			Post closure		
Reach Number	**Unit**	**1**	**2**	**3**	**1**	**2**	**3**
Watercourse and reach		Hawkins Creek	Lawsons Creek	Lawsons Creek	Hawkins Creek	Lawsons Creek	Lawsons Creek
		P - A	B - C	C - D	P - A	B - C	C - D
Pre-mining catchment area	km^2	61.0	222.3	272.1	61.0	222.3	272.1
Catchment area contained in WMS	km^2	2.50	2.50	5.50	0.53	0.53	0.53
Mean annual flow							
Pre-mining	ML/a	1 958	7 136	8 735	1 958	7 136	8 735
Loss due to Mine Site WMS Capture*	ML/a	80.3	80.3	176.6	17.0	17.0	17.0
Potential baseflow reduction*	ML/a	9.5	5.1	14.0	11.2	8.0	19.3
Total change due to the Project	ML/a	-88.9	-84.9	-189.3	-27.2	-24.3	-34.6
Percent change due to the Project		-4.5%	-1.2%	-2.2%	-1.4%	-0.3%	-0.4%
Note that in low flow the reduction reduces to zero on zero flow days The baseflow losses from each creek would not coincide							

Figure 9 Impact of proposed mine on downstream catchments presented in the surface water assessment.

Even before there was a scheme to use all water from the Bowdens' lands for the proposed mine operations, there was a predicted increase in the cease-to-flow frequency during low flows, but this prediction is buried in the Environmental Impact Statement. It is also unclear where the 'Location C' is as presented in Figure 8.3 of the surface water assessment, which gives the effect of loss on Lawsons Creek streamflow frequency. This is important, as the impact appears to be greatest at Location D, as shown in Figure 9.

A review of the previous surface water assessment[10] found that the numbers in the table above are unchanged. It is extraordinary, and simply unbelievable, that this has not changed under the revised proposal when such an increase in water use from the site it proposed.

[10] https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-5765%2120200514T074713.082%20GMT

Groundwater

The Bowdens surface water assessment makes the following statements:

- *This advanced dewatering would occur via production bores that would provide up to 10L/s and supply between 376 ML/a to 408 ML/a. During mining operations, (after allowance for pit face evaporation) residual groundwater inflows to the main open cut pit are expected to range between approximately 174 ML/a and 662 ML/a.* (p6-13)
- *Due to the impact of drawdown on the local groundwater profile by the open cut pit. The groundwater assessment (Jacobs, 2022) predicts the reduction in baseflow would increase during operations such that at the conclusion of mining operations, the baseflow loss would be up to approximately 14.0 ML/a, increasing to up to 19.3 ML/a post mining. Bowdens Silver has obtained water access licencing to account for this loss*

These statements would seem to indicate:

- Much greater than 376 ML/a to 408 ML/a will be dewatered from the groundwater system, as this is exclusive of what is lost via evaporation once the water is in the pit
- Bowdens appears to be seeking a licence only for a small portion (14.0 ML/a) of the water proposed to be taken from the groundwater system, not the full amount of up to 662 ML/a.

Groundwater is a valuable resource for lands within the Lawson Creek catchment. The statements above relating to surface water hold true for groundwater and its value in this region. It is not acceptable that such a significant loss will be experienced due to the proposed mine.

Water Balance Modelling

The surface water assessment is based on a daily timestep water balance model which is used to assess the site water balance over the proposed mine site under "the range of historical rainfall and evaporation conditions" (p6-86). Figure 5.3 from the assessment presents the average annual main water source inflows. The most significant inflow is the runoff and rainfall. There is no information provided on how this inflow was derived. A sensitivity analysis has been presented, with 'low' and 'high' runoff scenarios. From Table 5.5 in the surface water assessment, average rainfall and runoff is 856ML/a; from Table 5.11, low rainfall and runoff is 740ML/a, and from Table 5.12, high rainfall and runoff is 1109ML/a. These values are summarised in Table 6 below. There is no information provided on what criteria is applied to determine the 'low' and 'high' conditions.

The high value is 30% greater than the average value, while the low value is only 14% lower than the average. It would seem reasonable that a decrease of 30% from the average should also be considered to derive the low value for rainfall and runoff, but there are grounds for this to be greater than 30% given the implications of dry conditions on both the viability of the proposed mine operations as well as on downstream lands.

Table 6 Rainfall and runoff

Scenario	ML/a	%
Low	740	14%
Average	856	-
High	1109	30%

Conclusion

It is probable that the SILO data presented for historical rainfall data has been used in the water balance model. This will overestimate the water available for use across the site, in dust management and processing. It is highly questionable that 740 ML/a of rainfall and runoff would be available as an 'inflow' in a low rainfall scenario.

Given this question mark, there are concerns regarding the validity of the conclusions of the modelling and the assertions that water requirements for the site can be met.

Further, the sensitivity analysis appears to be fundamentally flawed, in that it considers only a 14% reduction in 'rainfall and runoff' to derive the low 'rainfall and runoff' value. It is considered that the reasons for this are that a true assessment of the low rainfall and runoff' would show there is insufficient water to meet the proposed mine's water demands for an unacceptable duration.

Harvestable Rights and Water Access Exemptions

The surface water assessment makes the following statements in regards to sediment dams:

- *Water captured in sediment dams would be released in accordance with best practice, and would therefore be exempt from licensing….In the event that (even after the addition of a flocculant) the quality of water captured in the Containment Zone was such that it could not be released it would be contained on site. No sediment dams would be constructed on a major stream. Therefore, these dams would be used "solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority to prevent the contamination of a water source", and the captured runoff would be exempt from licensing*.(p6 – 123)

- *However, Bowdens Silver may choose to also utilise the water stored in one or more of the sediment dams. This water, and that collected for dust suppression, would be stored under the maximum harvestable rights provisions of the NSW Water Management Act, 2000*. (p 6-14)

Conclusion

The second statement appears to contradict the first one, indicating that the basins will form part of the water sources for the proposed mine site. Given this, it appears unlikely that it is correct to assert that the water access licence exemptions will not apply.

Downstream impact

The surface water assessment makes the following statements in regard to sediment dams:

> *The catchment area of this containment system would vary over the Project life, and is expected to peak at 550 ha (comprising 300 ha in the TSF catchment and 250 ha in the remainder of the water management system) or 2.0% of the Lawsons Creek catchment (of 272 km^2 downstream of the Walkers Creek confluence) would be removed over the Project life. Based on the estimated average undisturbed area runoff in the local catchment, this equates to an average annual loss of flow of 177 ML/a.* (p 6-14)

Conclusion

This assertion overlooks the fact that the water requirements for the whole project is being drawn from within Bowdens' land, both that within the 'containment system' as well as the Bowdens'

contiguous land holdings. As shown in Figure 5.3 of the surface water assessment, at peak requirement, the mean annual flow is 1,955 ML/a (p 6-86), comprised of:

- Clean water harvesting: 48 ML/a
- Runoff and rainfall: 917 ML/a
- Additional groundwater extraction from the pit: 612 ML/a
- Advanced dewatering (bore water extraction): 378 ML/a

Putting aside the fact that a portion of the groundwater becomes baseflow for the creek downstream, and taking just the surface water flows, the surface water extraction by the proposed mine will be 965 ML/a. This would equate to a loss of flow from 10.9% of the Lawsons Creek catchment. It is an enormous and unsustainable impact on the water resources within this catchment and a significant impact on all land downstream of the proposed mine site. The loss of baseflows must be considered in addition to this.

Further, it is not clear where the 917ML/a is going to come from, given the catchment area of this containment system is only going to yield 177 ML/a. This is well short of the required water and its source has not been explained.

Impact on Biophysical Strategic Agricultural Land (BSAL)

Downstream of the proposed mine site, there is BSAL present (Figure 10). The surface water assessment has not considered the impacts of using water from within Bowdens' holdings on this land.

DPIE's provided the following information on BSAL[11] (DPIE 2014):

> This land has the best quality soil and water resources and plays a sustaining role in the State's $12billion agricultural industry.
>
> Agricultural land across the state was assessed against specific scientific criteria-levels of soil fertility, land and soil capability classes and access to reliable water and rainfall levels.
>
> It is the inherent values of the land itself, rather than the agricultural activity it supports, which determine the BSAL classification.

Given the climate variability experienced in this country, the water resources are a critical part of this equation. As DPIE itself says (above), BSAL is that land which has the best quality soil and water resources and plays a sustaining role in the State's $12billion agricultural industry.

As has been demonstrated in the analysis in this paper, the catchment in which the mine site is proposed has a high variability in rainfall and frequently experiences dry years. The water that supports the BSAL land moves through the upstream catchment and then is available to support agriculture in the mapped areas. Any mining within the supporting catchments threatens the water resource in the BSAL areas. The proposed mine will interrupt both groundwater and surface water flows, and as such, the BSAL area is at risk of losing the critical water which underpins its inherent value.

[11] Department of Planning Industry and Environment 2014. Strategic Regional Land Use Policy. Frequently Asked Questions Biophysical strategic agricultural land mapping across NSW https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/faqs-biophysical-strategic-agricultural-land-mapping-across-nsw-2014-01.pdf?la=en

Figure 10 Regional Biophysical Strategic Agricultural Land (BSAL)

Summary

The Bowdens surface water assessment data appears to show a monthly average that exceeds 75mm over summer. This is incorrect, as evidenced by the rainfall data from Mudgee (26km west of the mine site) and Rylstone (22km south of the mine site).

Many of the other months are also too high when compared to Mudgee and Rylstone rainfall statistics from BOM.

The number of very low rainfall years that has been experienced in this region is not reflected in the Bowdens surface water assessment annual rainfall data, which has only three years of less than 400mm. This in part seems to be a deliberate attempt to distort the data, as it has excluded 1888 and 2019, both of which are very dry years. Given that the community that will be affected by this mine have recently lived through the crippling drought which culminated in the 2019/2020 black summer fires, this is viewed very poorly.

The surface water assessment reports the average annual rainfall as 673 mm/a. The BOM reports the average annual rainfall for Mudgee as 671 mm/a and 654 mm/a for Rylstone. Given this, the estimate of 673 mm/a is considered unrealistically high. An average annual rainfall of 654 mm/a would be more realistic estimate.

It is also noteworthy that the median for Rylstone and Mudgee is 635 and 656 mm/a respectively, and the 20th percentile is 509mm/a and 494 mm/a respectively. The analysis here shows that one in every five years, the climatic conditions between Rylstone and Mudgee, which covers the proposed mine site, are semi-arid. This means that any loss of available water in these years severely impacts the land, and the people, plants and animals trying to survive on it.

It is probable that the SILO data presented for historical rainfall data has been used in the water balance model. This will overestimate the water available for use across the site, in dust management and processing. It is highly questionable that 740 ML/a of rainfall and runoff would be available as an 'inflow' in a low rainfall scenario.

Given this, there are concerns regarding the validity of the conclusions of the modelling and the assertions that water requirements for the site can be met.

Further, the sensitivity analysis appears to be fundamentally flawed, in that it considers only a 14% reduction in 'rainfall and runoff' to derive the low 'rainfall and runoff' value. It is considered that the reasons for this are that a true assessment of the low rainfall and runoff' would show that there is insufficient water to meet the proposed mine's water demands for an unacceptable duration.

Climate change impacts will increase the number and severity of the dry years experienced in this region.

At one point, the assessment attempts to quantify the loss of water to the downstream catchment, stating there would be an average annual loss of flow of 177 ML/a. This assertion is misleading as it relates only to the estimated flow from within the 'containment system' and overlooks the fact that the water requirements for the whole project are being drawn from within Bowdens land, both that within the 'containment system' as well as the Bowdens' contiguous land holdings. The mean annual flow is 1,955 ML/a comprised of 965 ML/a surface water and 990 ML/a ground water.

Putting aside the fact that a portion of the groundwater becomes base flow for the creek downstream, and considering only the surface water flows, this would equate to a loss of flow from **10.9% of the Lawsons Creek catchment**. It is an enormous and unsustainable impact on the water resources within this catchment and a significant impact on all land downstream of the proposed mine site.

This flawed presentation of the data also means that the cease-to-flow estimates are also incorrect. These appear to be based on a reduction in flow of 175.2 ML/a, rather than up to 1,955 ML/a. Even before there was a scheme to use all water from the Bowdens' lands for the proposed mine operations, there was a predicted increase in the cease-to-flow frequency during low flows, but this fact is buried in the Environmental Impact Statement. A review of the previous surface water assessment has found that the numbers in the table above are unchanged. It is extraordinary, and simply unbelievable that this has not changed under the revised proposal when such an increase in water use from the site it proposed.

Further, it is not clear where the 'rainfall and runoff' component of the surface water inputs – a significant 917ML/a – is going to come from, given the catchment area of this 'containment system' is only estimated to yield 177 ML/a. This is well short of the required water and its source has not been explained.

It cannot be concluded that the impact of the loss on the availability of water to downstream water users would be negligible. The impact of **any** loss of water in the frequently experienced dry times is critical. Further, it is also expected that in these conditions, one in every five years, that the conditions of the Macquarie Bogan Unregulated and Alluvial Water Sources Water Sharing Plan would be unable to be met.

Groundwater is a valuable resource for lands within the Lawson Creek catchment. The statements above relating to surface water hold true for groundwater and its value in this region. It is not acceptable that such a significant loss will be experienced due to the proposed mine.

In conclusion:

- the surface water assessment has some serious shortcomings, as it does not rely on valid data, has not presented appropriate modelling and contains a number of misleading statements; and
- the proposal to use water sources from within the Bowdens' land holdings to supply the water for the proposed mine is fundamentally flawed. Not only does the analysis within this document demonstrate this finding, but a cursory review of the extreme dry periods experienced by the landholders within the Lue region would show that the water is simply not available. To use what little there is not a viable option and, while the surface water assessment has failed to properly consider a dry year scenario, the fact is mine will not be able to operate in dry periods.
- There are a number of the statements made in the 'Summary of Assessment Outcomes - EIS and Amended Project' in relation to water impacts which are quite simply incorrect.

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