A High Level Mining Review of the Bowdens Lead, Zinc, Silver Project

Report prepared for the Lue Action Group, July 2020.

Michael White

Limitations of this report

This confidential high level review document has been prepared at the request of the Lue Action Group. This document is intended solely for discussion between Michael White and his clients. It should not be regarded as suitable for use by any other person or for any other purpose and cannot be relied upon except as explicitly agreed in writing by the author. No part of this document may be copied without the prior approval of the author.

In preparing this review the author has relied upon publicly available information and his professional experience as a mining engineer. All views expressed are judgements and all projections are estimates and should not be construed as forward looking forecasts. Whilst efforts have been made (within the constraints of the engagement) to confirm that the views and projections are reasonable, the author does not guarantee their accuracy or offer any form of warranty or indemnity regarding their use.

A High Level Mining Review of the Bowdens Lead, Zinc, Silver Project

Contents

Background 3

Executive Summary 3

The Acid Mine Drainage (AMD) Risk 5

The Ongoing challenge of accurate classification and placement of waste rock and ore. 12

Project Economics and Cost Benefit Analysis 12

Project Capital Costs 13

Mine Operating Costs 14

Insufficient External Water Supply to the Project 16

Blasting Issues 16

Background

On 30th May 2018 Silver Mines Ltd (SVL) published an ASX release containing details of the Ore Reserve for the Bowdens Silver Project. On June 14th 2018 Silver Mines Ltd (SVL) released a Feasibility Study for the Bowdens Silver Project.

On Tuesday 2nd June, 2020 as part of the NSW Department of Planning and Environment Project Approval process for State Significant Developments, the Environmental Impact Statement (EIS) for the Bowden Silver Project[1] was placed on public exhibition until 27 July 2020.

A brief high level review of the EIS has been conducted by the author. This high level review considers the overall project issues and risks and the mining related elements of this Project Application as described in the EIS.

The elements considered in this review are:

- Deficiencies with the Project proposal – potential fatal flaws
- Economic Robustness of the Project
- The proposed mining operations – including mine layout and mining method, mining sequence, the mine production schedule, the equipment and infrastructure, waste rock emplacement (WEA) and tailings storage facility (TSF)
- Impacts during and after mine operations
- Mine closure and rehabilitation plan

Executive Summary

The claimed economic benefits of this project are not justified by the risks it creates for the environment and the community. The risks considered in this review are:

1. Acid Mine Drainage escaping to the surrounding environment during mine operation and after mine closure.

   Of the waste rock excavated during the mine life, 57% is classified as Potentially Acid Forming (PAF). The 30 million tonnes of tailings produced over the life of the mine is also classified as PAF and will contain most of the 43,700 tonnes of chemicals added during ore processing. Some of these chemicals are highly toxic. The tailings will also contain 17-20% [2] of the lead, zinc and silver mined due to losses during ore processing. Other metals present in the tailings will include arsenic, antimony, fluorine and manganese.

2. The Project Economics are marginal.

   There are many factors which could make this project uneconomical. Relatively small adverse movements in the silver price and mine operating costs will quickly make this operation unprofitable. Project profitability is a commercial concern rightly resting with the Proponent, however the risk to the environment and community would not be sufficiently mitigated by an environmental bond if the project were shut down prior to planned mine closure and rehabilitation.

[1] Bowdens Silver Project, DPE Major Projects Portal, https://www.planningportal.nsw.gov.au/major-projects/project/9641
[2] Feasibility Study, Bowdens Silver Project, 14 June 2018, p.19 ASX release on company web site

3. The Project Capital costs are understated. They do not include mining equipment or relocation of the High Voltage Transmission Line.

4. Project Operating Costs may be understated if the contractor mining costs have not been accurately included.

5. The Mine Closure and Rehabilitation cost allocation of $39.4M will be insufficient to cover leaking AMD.

6. The mining equipment numbers used in the noise modelling look to be understated.

7. External water requirements for the operation have not been adequately addressed. The proposed pipeline and water supply arrangements with mines near Ulan is only a concept and has no certainty of becoming a viable solution.

8. Risks associated with blasting and transport of explosives have not been adequately addressed.

The Acid Mine Drainage (AMD) Risk

> *"Acid mine drainage (AMD) occurs when mining operations result in sulphide bearing ores and waste rock being exposed to oxygen and water. Over time the sulphides react with oxygen and oxidise to form sulphates. These sulphates dissolve in water forming sulphuric acid which then leaches heavy metals from rock exposed by mining. Often this leads to large quantities of water with very low pH having high concentrations in heavy metals such as manganese, iron, nickel, copper and zinc. Unfortunately AMD is expensive and difficult to treat, and as a consequence, large quantities of acid mine drainage is stored at both operational and disused mine sites globally.*
>
> *The United Nations recently labelled AMD as the second biggest problem facing the world after global warming…"*

Engineers Australia Leaflet 2019 [3]

Over 16 years, this project will excavate 46.4 million tonnes of waste rock.

26 million tonnes **(57%)** of this waste rock is classified as Potentially Acid Forming (PAF) because it contains iron sulphide minerals with more than 0.3% Total Sulphur. This PAF waste rock will be stacked above the water table over a 77 ha area called the Waste Rock Emplacement Area (WEA).

Over 16 years, this project will excavate 30 million tonnes of lead, zinc and silver ore in order to produce 310,000 tonnes of lead, zinc and silver concentrates.

Over the mine life 43,700 tonnes of chemicals will be added during ore processing. This includes 2850 tonnes of Sodium Cyanide. Many of these chemicals are toxic. These chemicals will almost all end up in the tailings dam.

The 29.7 million tonnes of toxic tailings left over is also regarded as acid forming. It will be pumped out into a tailings dam which covers 117 ha and will have a dam wall 56 metres high by Year 8 of the Project. This area is described as the Tailings Storage Facility (TSF).

Concerns with the Designs for the WEA and the TSF

The Project proposes to prevent leakage of AMD to the surrounding environment by a "capture and contain" strategy during the life of the mine and after mine closure. The WEA is proposed to be sealed at its base over its entire area of 77 hectares by a 1.5mm thick HDPE (high density polyethylene) liner.

The TSF is proposed to be partially sealed from beneath the tailings over the water ponding area by a 450mm thick compacted clay layer. The 56 metre TSF dam wall is designed to be lined and to have a 40 metre deep grout curtain installed below it.

Leachate drainage from both the WRE and the TSF is planned to be collected and re-used as processing water during the life of the mine.

Mine closure and rehabilitation plans propose to progressively install "store and release covers" on the Waste Rock Emplacement Area (WEA) cells as they are filled and to use the same design to cover the Tailings Storage Facility (TSF) impoundment area several years after mining has finished. These covers are designed to create a seal above the PAF waste rock and tailings.

[3] https://www.engineersaustralia.org.au/event/2019/05/acid-mine-drainage-causes-consequences-and-remediation

In order for the community and government to be satisfied that such designs as contained in this Project proposal are effective, safe and successful in both the short and long term there would need to be evidence of this at similar scale elsewhere.

A brief desk-top review by this author has not found any mine sites where the use of this design and technology at this scale has been successfully employed in either the short term or the long term.

In a paper presented to a Mine Closure Conference in Perth in 2016, "Store and Release" cover trials were being conducted at the tailings dam at Century Zinc in north-west Qld. This mine closed in 2016 after a 16 year mine life. The potential for AMD generation at Century Zinc is described as several hundred years. These trials were conducted on three 0.56 hectare plots. [4] The tailings dam area for the Bowdens Silver Project is 117 hectares.

In 2016 the Australian Government published a mining Leading Practice Handbook titled "Preventing Acid and Metalliferous Drainage" which contains the following statement [5] :

> Because many AMD management technologies are still relatively new (less than 30 years old), there are few long-term cases that can demonstrate success in achieving stable and environmentally safe landforms. In the planning stages leading up to the design and implementation of the AMD closure strategy, the likelihood of success is indicated by results obtained from predictive modelling and from field trials.

This proposed Project is using predictive modelling and small area field trials to claim its containment designs will manage and prevent AMD impacts on the surrounding environment during the project lifespan and for generations to come. There is no certainty that it will be effective.

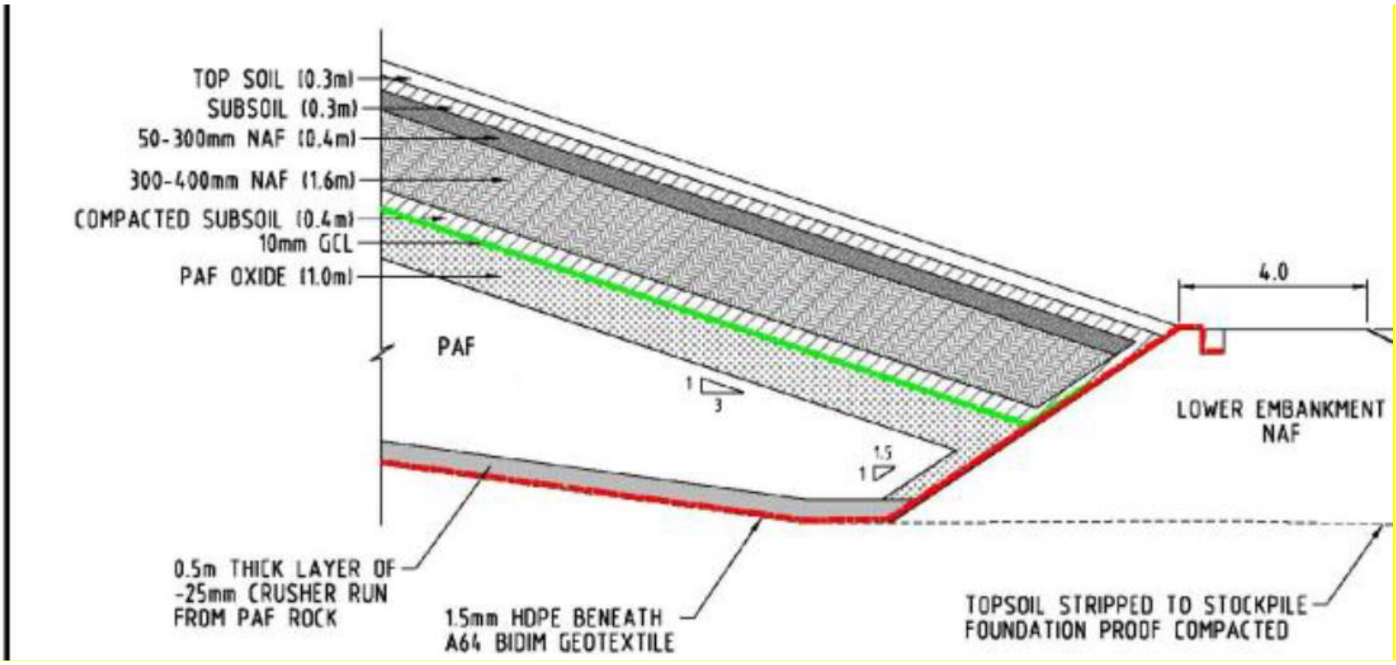
Concerns regarding the construction and operation of the Waste Rock Emplacement Area (WEA)[6]

It is proposed that this area consists of seven cells which are HDPE (high density polyethylene) lined and that the leachate (acid run-off) is captured, contained and re-used.

The success of this design depends on the integrity of the 1.5mm HDPE liner. This liner is proposed to be placed on a geotextile mat, double welded at joins and then covered another geotextile mat and then covered by 0.5 metres of minus 25mm crushed rock. Run of mine PAF waste rock is then dumped on this crushed rock.

[4] https://papers.acg.uwa.edu.au/p/1608_20_Defferrard/, s2.1.2 TSF Chemistry,p.293
[5] https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-preventing-acid-and-metalliferous-drainage-handbook-english.pdf, p.30
[6] EIS Appendices, A5.4 Waste Rock Management, p. A5-19 to A5-25

Part of Waste Rock Emplacement Design Elements Figure A5.4 [7]



Construction and Operational Challenges for the WEA

At the base of the WEA a consistent coverage of crushed PAF rock at 0.5m will be difficult to achieve due to the irregular underlying natural surface. It is proposed to place the liner on a geotextile fabric directly onto the natural surface.

Damage to the liner could occur from sharp material above or below the liner. A sharp rock or remaining tree root below the liner could result in a perforation as weight is applied by loading from above as the waste rock is deposited.

If a large angular piece of run of mine PAF waste rock falls or rolls from height onto the 0.5m crushed rock layer above the liner this could perforate the liner and this would not be necessarily detected during operations.

Damage to the liner will not be detectable as the waste rock is dumped into a cell and if leakage is subsequently detected through water monitoring below the WEA then finding the location and fixing the leak may not be possible.

Waste rock placement is planned to be placed in 2 metre lifts and track rolled by a dozer to increase the material density. This is time consuming and expensive. If the planned final density for the WEA of 1.96 tonnes per cubic metre[8] is not achieved then volumetric fit problems may occur (too much PAF rock to fit in the designed containment area).

[7] Figure A5.4 Waste Rock Emplacement Design Elements, EIS Appendices, p.A5-23
[8] EIS Specialist Consultancy Studies, Volume 5, Part 16B, Preliminary Design for WEA, p.8

WEA Covering Challenges

Once a cell is filled it is proposed to seal the cell by covering it with a multi-layered "store and release" cover as shown above in part figure A5.4.

The cover will need to be constructed on a 1 in 3 slope and consists of seven distinct layers which includes a Geosynthetic Clay Liner (GCL)

The following is an extract from the Cover Design document[9]

Table 3 – Material quantities

Material	TSF	WRE (including side slopes)
0.3 m Topsoil	381,177 m^3	199,323 m^3
0.3 m Subsoil	381,177 m^3	199,323 m^3
0.4 m NAF material (0.5-30 cm)	579,086 m^3	254,118 m^3
0.4 m to 1.6 m Oxide material (30-40 cm)	2,316,344 m^3	254,118 m^3 (0.4 m) 508, 236 m^3 (0.8 m) 762,354 m^3 (1.2 m) 1,016,472 m^3 (1.6m)
0.4 m Compacted Subsoil	427,015 m^3	259,580 m^3
GCL	1,125,305 m^2	532,170 m^2

The seventh layer not shown in the table above but included in the design is a 1.0 metre thick PAF oxide ore layer of finer material to protect the GCL from being punctured from below by the coarser PAF waste rock.

Construction to achieve the design will be challenging, time consuming and expensive. It will also be ongoing for the life of mine. Consistently achieving design is seen as a significant risk. The EIS does not consider quality control construction issues or failure to meet design issues.

The design also requires the cover to be kept free of trees and large shrubs.[10]

It is noted that in order to retain the integrity of the store-and-release cover over the surface of the WRE no trees and substantive shrubs would be planted on the final surface of the WRE as roots could penetrate through the cover and potentially be impacted by the underlying PAF waste rock thereby causing impairment or death of the vegetation. Emphasis would be placed upon a seed mix with a suite of pasture grasses to rapidly stabilise the WRE surface and a suite of native perennial grasses for the long-term cover of the WRE.

A5-66 R. W. CORKERY & CO. PTY. LIMITED

It is not clear how this condition would be maintained in the long term.

[9] EIS Vol5_Part 16c_Closure Cover Design, p.21

[10] EIS Appendix 5, p. A5-66

Concerns regarding the Tailings Storage Facility (TSF)

The TSF impoundment area design requires there to be a compacted clay layer with a minimum thickness of 0.45m beneath the maximum possible water level area within the impoundment. The rest of the impoundment area is to be cleared of topsoil and "proof rolled." [11]

The sealing of the base of the tailings impoundment area is totally dependent on the success of this proposed design. The design is based on only 18 test pits dug across the impoundment area.

Construction to achieve the design over an uneven natural surface will be difficult. How will quality control ensure the minimum 0.45m thickness is achieved?

It is proposed that the tailings impoundment area outside the maximum water level area does not have any impermeable layer beneath it. There must be some risk of leachate leaking into the water table when the overlying tailings are saturated in this area outside the maximum water level area.

The EIS does contain the following section[12]:

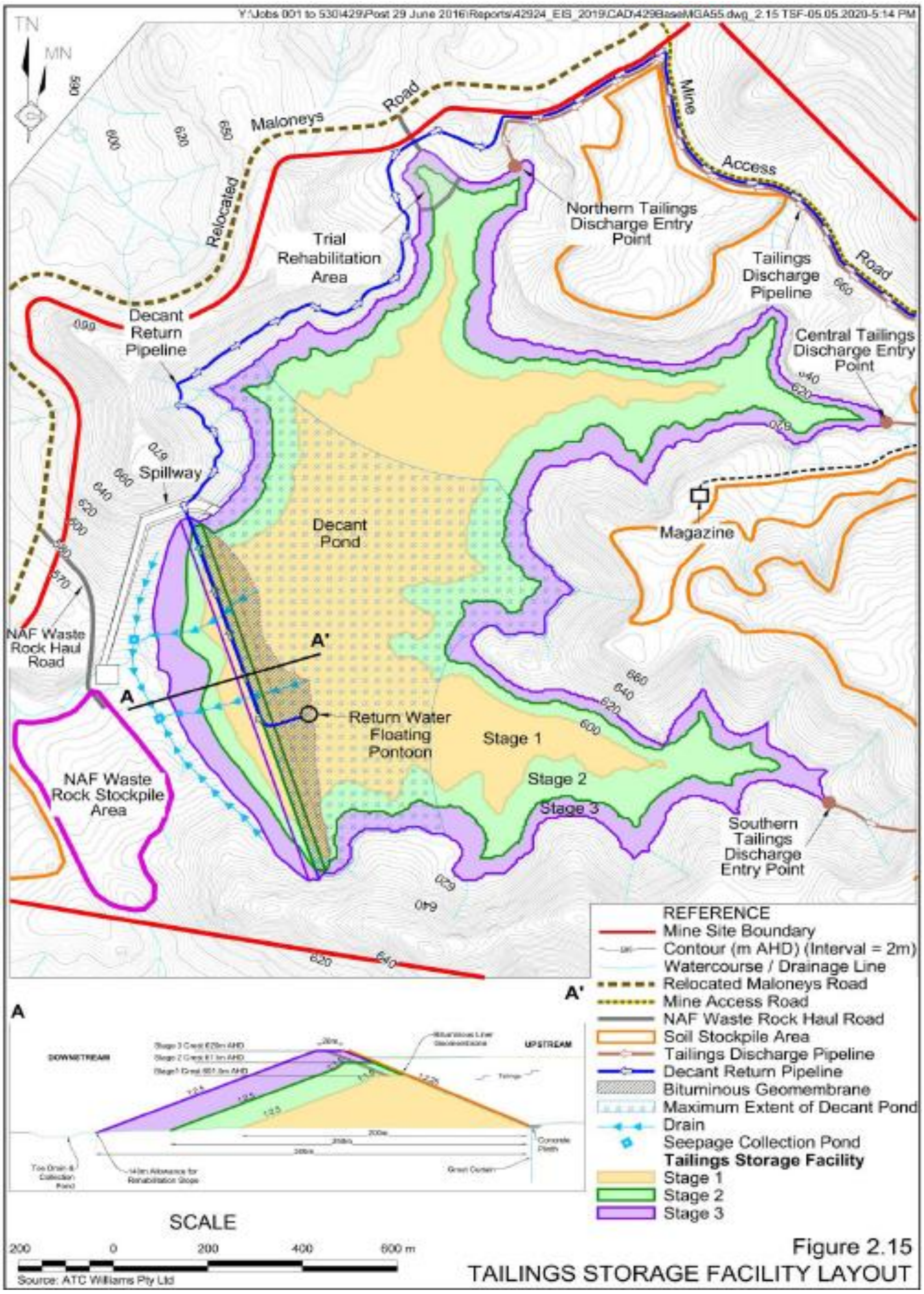
- The TSF impoundment foundation preparation in the area of tailings impoundment (i.e. remote from the decant pond area), including compaction also to achieve the equivalent permeability of 1m at $1x10^{-9}$m/s.

There is no detail provided as to how this reduced permeability target is achieved in the impoundment area remote from the decant pond.

There is no information provided as to how long this will prevent acid water containing heavy metals from seeping into the surrounding environment. There is no information provided as to where this design has been successfully used for an AMD tailings dam in the short term and long term.

[11] EIS Specialist Studies Vol5_Part 16a_TSF Design Report, Table 19, p.23
[12] EIS Appendices, Appendix 5, A5.7.4 Tailings Storage Facility Construction, p.A5-39

EIS Tailings Storage Facility Layout[13]



Proposed TSF Cover at Mine Closure

This type of tailings dam is popular because it is cheaper than a staged cell type tailings dam. It does not allow for any rehabilitation until several years after the mine has ceased operation and the surface of the tailings has sufficiently dried out to allow for machinery to operate on it.

---

[13] EIS, S2.8.2 Fig 2.15, p.2-43

The "store and release" cover design is the same as the proposed cover for Waste Rock Emplacement area. For the TSF the cover will be very large at 112.5 hectares[14]. Due to the smooth surface of the tailings, construction will be more straightforward than the WRE. It will still require a six layer cover including a GCL mat across the entire area.

The long term (we are talking generations) success of encapsulating the tailings and preventing ingress of water is dependent on the long term integrity of this proposed cover. There is no the track record to demonstrate this. In such an environmentally sensitive area as Mudgee this should be required.

Chemicals reporting to the TSF

The EIS states[15]: *"…the bulk of the chemical reagents required for processing would report to the produced silver/lead and zinc concentrates and would not be deposited as part of the tailings stream."*

This stated fate of reagents appears to be in direct contradiction to EIS Table 2.4 which shows that on a tonnage basis most of the chemicals end up in the tailings[16]:

Table 2.4
Processing Plant Reagents

Reagent	Chemistry	Function	Form / Container	Annual Usage (tpa)	Maximum Quantity on Site	Fate of Reagents
Hydrated lime/ soda ash	$CaOH/Na_2CO_3$	pH Adjustment	Powder / 60t silo	1 236	60t	Tailings
Zinc sulphate	$ZnSO_4.7H_2O$	Zinc Depressant	Powder / 1t bulk bag	610	50t	Tailings
Copper sulphate	$CuSO_4.5H_2O$	Activator	Powder / 1t bulk bag	450	40t	Tailings
MIBC	Methyl Isobutyl Carbinol	Frother	Liquid / 800kg IBC	222	20t	Tailings / Decomposed
Sodium cyanide#	NaCN	Zinc Depressant	Pellets / Isotainer	190	20t	Tailings / Decomposed
Flocculant	Anionic polyacrylamide	Flocculation	Powder / 0.8t bulk bag	139	12t	Tailings
Lead collector	Na - diisobutyl dithiophosphinate	Lead Collector	Liquid / 1000L IBC	24	4t	Most to Concentrate / Balance to Tailings
Zinc collector	Na isobutyl dithophosphate	Zinc Collector	Liquid / 1000L IBC	22	4t	Most to Concentrate / Balance to Tailings
Caustic Soda	NaOH	pH Adjustment	Flake / 25kg bag	2.5	1t	Tailings
Antiscalant	Polycarboxylic acid or similar	Antiscalant	1000L IBC	20	4t	Tailings
* IBC = Intermediate Bulk Container				# NaCN would be added with a concentration of 66mg/L		

The risk to wildlife like water birds who are exposed to this leachate in the TSF decant pond or the WEA leachate management dam is not known.

[14] EIS Specialist Studies Vol5_Part 16a_TSF Design Report, Table 19, p.23
[15] EIS Appendix 5, A5.7.2 Tailings Characterisation,p.A5-35
[16] EIS S2.7.3, Reagent Management, p2-37

The Ongoing challenge of accurate classification and placement of waste rock and ore.

Every truck load from the mine on every shift every day and night will need to be accurately classified as either PAF waste rock, NAF waste rock, oxide ore, low grade ore or ore to be processed.

Every truck load from the mine on every shift every day and night will need to be accurately dumped at the correct stockpile. There will be approximately 60,000 truckloads per year.

Incorrect classification of material or incorrect placement of material will have negative economic and/or environmental consequences. For example if a load of PAF (potential acid forming) waste rock is mistakenly dumped on the NAF (non-acid forming) stockpile then acid forming material has escaped from its containment.

The mine operator will be economically incentivised to ensure that ore is correctly classified and placed. There is a risk that the characterisation and placement of waste rock may not receive the same continuing focus.

Project Economics and Cost Benefit Analysis

The Economics of this project are questionable. The Bowdens Feasibility Study, June 2018 contained a Net Present Value (NPV) sensitivity analysis[17] showing that the Project becomes NPV negative with less than 10% movement in silver lead and zinc prices.

The assumed silver price used in the EIS is US$20.91/oz. [18] An online review of silver prices over the last 5 years [19] does not show silver reaching this price at any time in that period.

If operating costs were to increase by 15% above the EIS assumed US$20.91/oz the Project NPV would be negative and the net economic benefits resulting to NSW would be zero[20].

[17] Feasibility Study, Bowdens Silver Project, 14 June 2018, p.29 ASX release on company web site
[18] EIS S 4, Table 4.84 Key Assumptions Underpinning the Economic Assessment, p. 4-373
[19] https://www.macrotrends.net/1470/historical-silver-prices-100-year-chart
[20] EIS S4.19.3, Cost benefit Analysis, p. 4-380

Project Capital Costs

The capital investment value is stated in the EIS as $246 million and a detailed list is provided. [21] This amount is unchanged from the 2018 Feasibility Study.[22]

There is no mining equipment capital cost included which must mean the Proponent intends to utilise a contract mining model whereby the equipment capital is paid off on an increased operating cost per tonne basis.

It should be noted that this is not consistent with the ASX released 2018 Maiden Ore Reserves statement [23] which used an owner operated mining model as can be seen here:

SILVER MINES LIMITED

Criteria	JORC Code Explanation	Commentary
	labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.	• Power and water supply studies have identified appropriate solutions for mining operations.
Costs	• The derivation of, or assumptions made, regarding projected capital costs in the study. • The methodology used to estimate operating costs. • Allowances made for the content of deleterious elements. • The derivation of assumptions made of metal or commodity price(s), for the principal minerals and co- products. • The source of exchange rates used in the study. • Derivation of transportation charges. • The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc. • The allowances made for royalties payable, both Government and private.	• Capital estimates have been based on lump sum quoted budget prices. • Operating cost estimates were developed by Silver Mines from first principles, based on an owner operated mining model, and bench marked against similar current mine operating costs.
Revenue factors	The derivation of, or assumptions made regarding revenue factors including head	• Revenue assumptions are based on long-term metal pricings of:

What this means is that the mining costs now will be increased as compared to the Ore reserves statement and Feasibility Study.

Lack of 132kV Power Supply to the Project

The Bowdens Feasibility Study [24] identified the need for a 40km 132kV power line to be constructed from Ilford.

The EIS does not commit to a route but identifies several potential connection locations with a minimum of approximately 20 km of new line required.

Project capital allocates $24.4 M for this 132kV supply.

No allocation for the re-alignment of the 500KV HV line[25]

This re-alignment is required by year 3 of the Project. The new line will be at least 3km in length and involve the construction of 10-14 new towers. This cost does not appear to be included in the project capital costings.

[21] EIS Appendix 8, p.A8-3 and p.A8-4
[22] Feasibility Study, Bowdens Silver Project, 14 June 2018, p.26
[23] https://www.asx.com.au/asxpdf/20180530/pdf/43vdmsm9ksc2hr.pdf
[24] Feasibility Study Bowdens Silver Project, 14 June 2018, p.21
[25] EIS S2.11.3.2, Re-alignment of 500kV Power Transmission Line, p.2-75

Mine Operating Costs

The Project has a number of high risk areas when it comes to negatively impacting operating costs.

These include:

- An owner-operated cost model was used for generating the 2018 Maiden Ore Reserves statement and the 2018 Feasibility Study. The EIS does not have mining equipment capital included so a there will be a higher operating cost per tonne to reflect contract mining costs which include capital amortisation and the contractor's margin.
- Truck cycle times being longer than expected requiring more trucks to haul the same tonnage. This directly impacts operating costs and noise and dust generation.
- Requiring more equipment than planned to meet the design requirements for placing PAF waste rock in 2 metre lifts and track rolling it.
- Requiring more equipment than planned to meet the design requirements for constructing the cover for the PAF waste rock cells.
- Not achieving pit design due to geotechnical and blasting problems. This can negatively impact ore reserves and production rates.
- Lack of water reducing mining or processing tonnages.
- The cost of external water.
- Actual noise or dust emissions above modelled predictions resulting in mandatory reduced equipment activity and productivity.
- Grade control issues resulting in less concentrate being recovered.
- Metallurgical issues in the plant resulting in less concentrates being recovered.

The responsibility for profitability of a project does not lie with the Department of Planning. That said, Government does have the responsibility to protect the environment and the community and to not allow the creation of preventable long term liabilities and negative impacts on the people of NSW and the environment.

An environmental bond will not protect the community or the environment. It will only assist to partially mitigate the ongoing negative impacts this project would create.

This proponent is not a mine operator and has no experience in responsibly, safely and profitably running an operation like this.

There look to be many situations where negative impacts could occur either to productivity/costs or to staying within consent conditions. The proximity to Lue means there is virtually no buffer land and hence no margin for error.

Mine Closure and Rehabilitation Costs

The mine rehabilitation and closure costs are estimated in the EIS to be $39.4M.[26]

Spend is identified as 1% per year for years 2-15. 21% in the final operations year (Year 16) and 51% in Year 17 when the tailings facility would be capped.

This is not consistent with the EIS TSF closure plan [27] which has an estimated 3-5 years of time to cover the TSF post the final year of processing.

[26] EIS Specialist Consultant Studies, Part 15 Economic Assessment, p.15-40
[27] EIS Appendix 5, SA5.10.7.5, p.5-73

Questionable Accuracy of Equipment Numbers used in Noise Modelling

The EIS has identified the mining excavator as an Hitachi EX1900 and the rear dump haul trucks as CAT 777s (nominal 100t capacity). The annual total material movement for the project is scheduled at a maximum of 6 million tonnes per year.

Digging and hauling of ore and is scheduled for day, evening and night shifts for the life of the mine. Waste rock haulage is scheduled for day shift and evening shift for the life of the mine. There is no waste rock scheduled for haulage on night shift.

The Hitachi Ex 1900 excavator is capable of moving 6 million tonnes per annum if it is not waiting on trucks.

Mine Haul Trucks

The mine haul truck numbers used for noise modelling look to be unachievably low.

The EIS uses a maximum of four Cat 777 rear dump haul trucks in its mine plan. It also states [28] it will only be running three trucks when operating the water cart. This is neither practical nor feasible. Dust suppression is required as and when environmental conditions require it. Haul cycles for trucks must remain independent of water cart operation to run a productive, safe and environmentally compliant operation.

The 15 metre wide WEA perimeter haul road [29] is planned as a two-way haul route. This will not work with Cat 777 haul trucks. Haul road design at mines require two-way haul roads to be a minimum 3 times the maximum vehicle width. Cat 777 trucks are 6.7 metres wide requiring a minimum haul road width of 20.1 metres.

Note: This is confirmed elsewhere in the EIS by direct reference in the pit design to two-way haul road width being 25 metres.[30]

This means that the Waste Rock Emplacement Area haul road needs to be widened and the WEA footprint increased or the planned haulage routes need to be re-designed as one way which will increase cycle times.

Scheduling of Dozer Operation on the Waste Rock Emplacement Area

Waste rock is hauled to the WEA on both dayshift and evening shift. Dozer operation on the WEA is scheduled for dayshift only. The design of the WEA requires waste rock to be spread and track rolled in 2 metre layers. There is a risk that dozer spreading on dayshift only may not keep up with truck haulage and tipping on both day and evening shifts. This may require dozer operation on evening shift which is not included in the noise modelling.

[28] EIS Appendix 5, Table A5.7, p.A5-19
[29] EIS Appendix 5, p.A5-24
[30] EIS S2.4.2, p.2-18

Insufficient External Water Supply to the Project

The impacts of this project on surface and groundwater resources is a significant risk and is being covered in detail in other reports. The project as described does not have sufficient water without relying on external supply**.**

The EIS proposes a water supply agreement to source water from Ulan and or Moolarben mines via a 58km pipeline. The EIS in Section 2 states[31]:

> Considerable reliance would be placed upon water pumped from external supply during the first 2 years of operations as:
>
> - regular volumes of return water from the TSF would not occur at the long term rate until approximately 6 months after processing commences; and
> - groundwater recovered from the base of the open cut pit would not achieve the projected sustained inflows until about the end of the second year of operations.

There are no commercial agreements in place for guaranteed external supply. It is considered naïve to assume that the Ulan mines would be prepared to commit to a guaranteed supply arrangement for Bowdens regardless of seasonal conditions. The Ulan area mines' own water requirements will always come first and particularly in drier periods.

The EIS makes no reference to any potential difficulties in gaining approvals for the proposed pipeline corridor and associated infrastructure.

Operationally the costs of water treatment and pumping operations will be considerable.

Blasting Issues

Proposed daily transport of Explosives and oxidising agents

The project proposes to bring 5-16 tonnes of both explosives and oxidising agents like AN (ammonium nitrate) to the mine site daily along the Mudgee –Lue road.[32]

Blast Fume Risk[33]

Blasting can produce toxic orange fume when water affects non-waterproof explosives in the blast hole. Given the proximity of the mine to Lue managing this risk is inadequately dealt with in the EIS.

[31] EIS S2.10 Water Supply, p.2-62
[32] EIS S2.4.3.2 Drill and Blast, p.2-23
[33] EIS S 4.4.2.4 Assessment Methodology, Blast Fume, p. 4-87