Lue Action Group
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ATTACHMENT 1

MSW Comments on Bowdens Response to Submissions and the Proposed Amendment (Michael White, March 2022)

MSW Comments on Bowden's Response To Submissions Report and the Proposed Amendment

Response To Submissions Report (RTS)

The overall tone of the Bowdens RTS Report to the valid technical risks raised in Submissions across a range of the proposed Project elements is one of dismissive arrogance and general themes of:

- *"The board and management of Silver Mines have substantial technical and operational experience in exploration, delineation, financing, development and management of minerals projects in Australia and abroad."*[1]
- Bowdens use consulting experts and we know what we are doing (See example 1)
- Predictive modelling and technical studies can be relied upon (See example 2)
- If our designs don't work we will use "adaptive management strategies" to fix it. (See example 2)

Example 1 Mining Equipment Capacities

Representative Comment(s)
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 it will only be running three trucks when operating the water cart. This is neither practical nor feasible.
Lue Action Group, NSW (Submission SE-8654995) – Attachment 1

Response
AMC Consultants Pty Ltd (AMC), a highly experienced and internationally recognised mining consultancy, were commissioned by Bowdens Silver to undertake the mining studies for the Project's Feasibility Study. During these studies, AMC conducted detailed analysis of the mining cycle times to the run-of-mine (ROM) pad and respective waste rock destinations TSF and WRE to establish mining fleet requirements. From this analysis, AMC identified an initial requirement
for three Cat 777 trucks, rising to four in the eighth year of operation and returning to three in the 14th year. The restriction of only operating three trucks when operating the water cart would only apply at night (10:00pm to 7:00am). Given the short distances to be watered during this period, the proportion of time required for water cart operations would be comparatively small. [2]

Representative Comment(s)
The Hitachi Ex 1900 excavator is capable of moving 6 million tonnes per annum if it is not waiting on trucks.
Lue Action Group, NSW (Submission SE-8654995) – Attachment 1

Response
As noted in the response above, AMC undertook the mining studies for the Project's Feasibility Study. AMC estimated the productivity of the Hitachi EX 1900 in combination with Cat 777 G trucks for handling both oxide and fresh

[1] Bowden Submissions Report,,s.5.8.2,p.120
[2] Bowden Submissions Report,,s.5.16.4, p.197

rock material. AMC determined annual productivity to be 4.37 million bank cubic metres (Mbcm) of oxide material (9.77 million tonnes (Mt)) and 4.05Mbcm (9.58Mt) of fresh rock. That is, the equipment would have the capacity to move 19.35Mt per annum.
Based on the Project's mining schedule, operations would require the maximum annual movement of 6Mt, meaning a Hitachi EX 1900 excavator (or similar) would have approximately 60% surplus capacity.[3]

Example 2 Encapsulation of Acid mine drainage forming material

5.3.3 Leachate Management Dam
Representative Comment(s)
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 for a TSF or WRE.
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.
Lue Action Group, NSW (Submission SE-8654995) – Attachment 1
Response
As noted in Section 3.1 of Advisian (2020b), one of the main objectives of placing a cover system over reactive waste material is to protect the downstream receiving environment following closure of the mine. This is achieved by reducing the net percolation of water into the reactive mine waste materials, thereby reducing effluent seepage volumes. In addition to limiting contaminant release via seepage, the aims of cover systems includes chemical stabilisation of the waste material by limiting the ingress of atmospheric oxygen, limiting the upward movement of process water into the cover, and provision of a suitable medium for the establishment of sustainable vegetation.
Whilst the author of this submission notes that a brief desktop review could not identify the use of the proposed cover system, attention is drawn to Section 5.3.1, which identifies numerous technical studies undertaken and that the cover system proposed by Bowdens Silver is considered "state of the art" when assessed against current industry practice (e.g. DFAT, 2016).
Predictive modelling is a valid and robust means to inform the preliminary design of the cover system to achieve long-term (modelled) performance. As the WRE would be progressively developed and rehabilitated, the effectiveness of the proposed closure and rehabilitation measures would be trialled and monitored during operations, with the performance of these measures evaluated via comparison with modelled results. This would provide Bowdens Silver with the opportunity to apply adaptive management strategies, if required, to improve the effectiveness of the proposed closure and rehabilitation measures. [4]

[3] Bowden Submissions Report, s.5.16.4, p.198
[4] Ibid s.5.3.3, p.70

MSW Comments on Bowden's Submissions Report

Mining Equipment Capacities (Example 1)

The statement that one Hitachi EX1900 has the capacity to move 19.35 million tonnes per annum is egregiously incorrect and this should be obvious to any person with technical competency.

One Hitachi Ex1900 excavator fully trucked would struggle to move even half this amount. This 190-tonne class excavator typically operates with a 12 cubic metre bucket.

Shown below is an extract from a paper published in 2012 by Dr Graeme Lumley [5] of GBI Mining Intelligence (now part of PwC) showing worldwide performance of excavators in tonnes per cubic metre of bucket capacity.

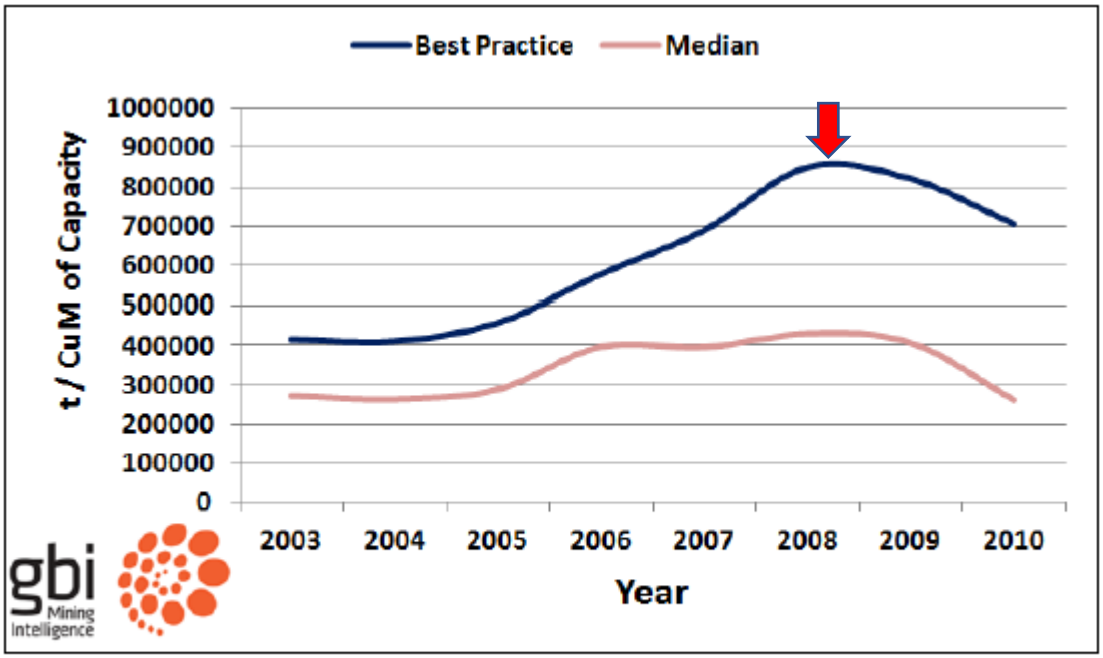

Figure 18. The median performance rises from Worldwide Hydraulic Excavator Annual Unit Production (t/CuM of Capacity) 2003-2010 by Performance

If one uses the 2008 world's best practice highest value of 850,000 tonnes per cubic metre and applies this to a 12 cubic metre bucket the annual capacity for the world's best 190 tonne excavator is **10.2 million tonnes per annum**.

Bowden's state 19.35 million tonnes per annum which is almost twice the output of the world's best performing excavators.

[5] Trends in Performance of Open Cut Mining Equipment, Dr Graeme Lumley, GBI Mining Intelligence, https://www.scribd.com/document/80604395/White-Paper-Trends-in-Performance-of-Open-Cut-Mining-Equipment

A Further Confirmation of Excavator Capacity

A Mine Operations Manager in the Hunter Valley currently runs Hitachi EX3600 excavators (360 tonne with 23 cubic metre bucket). Maximum annual production rates on these machines are:

Hitachi EX 3600: 1150 bcms/hr at 6500hrs X 2.4 tonnes/bcm = **17.9 million tonnes per annum**

This model is almost twice the size of the EX1900 in the Bowden's fleet. This clearly demonstrates that the stated Bowden's fleet capacity of 19.35 million tonnes per annum is greatly overstated

If this technical error is indicative of the level of technical rigour in this Project application overall, then the DPIE should refuse this application.

Encapsulation of acid mine drainage forming material – no track record of success

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.

The Proponent has not identified any other 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. [6] The tailings dam area for the Bowden's 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 [7]:

> 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.

As identified in the Lue Action Group EIS submission there are many factors in these proposed designs which could compromise the integrity of encapsulation both during construction and in the longer term. The design is complex and difficult to construct and difficult to monitor for integrity until after leachate has escaped into the surrounding environment.
Finding and repairing leak locations would also be problematic.

On that basis the precautionary principle should apply and this Project Application should be refused.

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[6] https://papers.acg.uwa.edu.au/p/1608_20_Defferrard/, s2.1.2 TSF Chemistry,p.293
[7] https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-preventing-acid-and-metalliferous-drainage-handbook-english.pdf, p.30

Tailings Storage Facility Lining of Impoundment Area

The Proponent now proposes to line the floor of the entire TSF impoundment area with a bituminous geomembrane liner (BGM). However, the wording used in the Assessment Report indicates this is not a binding commitment:

> It is considered that the assessment undertaken to date is sufficiently detailed and conservative to permit approval of the conceptual design of the TSF for the Project. Notwithstanding this, in the event Development Consent is granted for the Project, Bowdens Silver would further assess the effectiveness of these design elements aimed at seepage mitigation as part of detailed TSF design undertaken to the satisfaction of DPIE and/or EPA. This process would be used to confirm the optimal configuration for seepage mitigation (i.e. full or partial BGM with underdrainage) to achieve the TSF design intent and limit potential impacts to surface water and groundwater resources from seepage with regards to current and future beneficial uses, as defined by published water quality guidelines.[8]

This discretionary decision making should not be given to the proponent.

On the DPIE Major Projects web site a review of EPA advice [9] on Bowden's Response to Submissions shows the current EPA position on this matter is as follows:

> **EPA Recommended condition of consent**:
> All water storages containing non-potable water must have a liner that achieves a hydraulic conductivity of $1x10^{-9}$ m/s or less with a constructed clay liner of at least 1000mm or a geosynthetic liner providing equivalent or better protection.

The Bowdens Project Tailings Storage Facility has a footprint of approximately 112.5 hectares and the construction of a continuous geosynthetic impermeable liner base over this large area that will provide full impermeability for centuries seems to be an improbable and unachievable control.
Has a TSF base liner of this scale been successfully constructed and operated at other operations over an extended period?
The low permeability (hydraulic conductivity of $1x10^{-9}$ m/s or less) constructed clay liner with at least 1000mm thickness would be simpler to construct, and more robust and more forgiving to minor impacts and minor thickness variations.

This clay liner should be mandatory requirement as the Bowden's TSF impoundment base liner over the entire impoundment area.

[8] Bowden Submissions Report, s.3.3.7, p.31
[9] https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=PAE-24168116%2120210812T003829.070%20GMT

MSW Comments on the Application Amendment

Paste Thickening of Tailings

The proponent has now included the addition of a paste thickener plant to the tailings stream to increase water recovery. The amendment states that the paste thickener plant would thicken the tailings stream from the processing plant to produce tailings with a 63% w/w solids content.[10]

The solids content of tailings in the EIS was assumed to be 56% and this was one of the design parameters used in the design of the Tailings Storage Facility (TSF)[11].

7 TAILINGS TONNAGE AND DEPOSITION RATE

The preliminary design has been based on the deposition of 2 Mt of tailings per annum with a total of 30 Mt deposited over the 15-year LOM. A discharge solids content of 56 % for the tailings has been adopted on the basis of the thickener study carried out by mining equipment supplier Outotec on the CT tailings sample produced for testing in February 2017 [Ref. 5].

8 DENSITY

Based on the initial tailings testing [Ref. 3], the tailings parameters adopted for this study are presented in Table 1.

TABLE 1

TAILINGS DENSITY PARAMETERS ADOPTED FOR DESIGN

Discharge Solids Content (%)	Initial Settled Density (t/m³)	Final Settled Density for Start-up Deposition (t/m³)	Final Settled Density for after Start-up Deposition (t/m³)	Over-all Tailings Density at the End of LOM (t/m³)	Soil Particle Density (t/m³)
56	1.[illegible]4	1.35	1.6	1.5	2.7

The solids content of the tailings has increased from 56% to 63%. This 12.5% relative increase in solids content is significant. The impacts of this proposed change do not appear to have been assessed by the proponent.

There is no updated information provided regarding the materials handling characteristics, the tailings beach slope predictions, beach slope design or tailings emplacement methodology for the paste thickened tailings.

On that basis this application should be rejected.

[10] Bowdens Water Supply Amendment Report, p.15
[11] Bowdens EIS Specialist Studies Vol 5 Part 16A TSF Design Report, p.5