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Nick Warren
Principal Environmental Consultant
R. W. Corkery & Co. Pty Ltd / On Behalf of Bowdens Silver Pty Ltd
68 Maloneys Road,
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By email nick@rwcorkery.com

Dear Nick

Re: Bowdens Silver - Geochemistry Peer Review

Okane Consultants (Okane) have been engaged by Bowdens Silver Pty Ltd (Bowdens Silver) to undertake a peer review of several key aspects of geochemistry studies completed for the Bowdens Silver Project (the Project), located near the village of Lue, approximately 26 km east of Mudgee in central New South Wales (NSW), Australia. Okane understands the NSW Department of Planning and Environment (DPE) commissioned an independent review of acid and metalliferous drainage (AMD) risk associated with the Project. The independent review was completed by Earth Systems Consulting Pty Ltd (Earth Systems) with the review outcomes provided to Bowdens Silver in June 2022. Bowdens Silver submitted a response to the recommendations in October 2022. Earth Systems has subsequently provided an update of their advice, which included a number of potential conditions for inclusion into an approval document.

The scope of this review focuses on three specific review questions, which are listed first. Okane first provide overarching review commentary on each of the review questions, and then provide review commentary in further detail on each review question.

The documentation reviewed in conducting Okane's review is listed.

High-Level Commentary to Review Questions

Bowdens Silver has requested Okane review the available Project geochemistry, various independent reviews and subsequent responses, and provide an opinion on the following three key aspects of Project geochemistry.

1) The recommended sampling regime for static geochemical analysis of one sample for every 10,000 t of material excavated:
   - Okane considers the current number of samples used to determine AMD risk is appropriate for this stage of the Project.
2) The exclusion of other forms of analysis in the development of the waste classification strategy adopted by the Project:
   - Okane considers that the hydrothermal alteration zoning (HAZ) method, developed with consideration also given to other forms of analysis (i.e., hyperspectral analysis, petrology, and XRD), is an appropriate method to develop a waste classification system at this stage of Project development.
1) The general appropriateness of the proposed closure strategies for the Waste Rock Emplacement (WRE) and Tailings Storage Facility (TSF).
   - Okane considers that in respect of managing AMD risk the proposed closure design for the waste rock emplacement (WRE) is quite robust, particularly at this stage of Project development.

Overarching Commentary on Review Questions

The follow provides overarching review commentary on the three review questions.

Review Question #1: Recommended Sampling Regime

Okane considers the current number of samples used to determine AMD risk is appropriate for this stage of the Project. Okane note the following.

- Bowdens Silver has committed to developing an AMD Management Plan prior to commencing mining, within which the sampling frequency must be documented, and based on site specific factors material variability and the prediction/validation objectives of the Project,

Recommendation #1: *Okane recommends that development and execution of such a plan be included as a condition in an approval document, or as a management measure described in the AMD Management Plan.*

Recommendation #2: *Okane recommends that the AMD Classification System be integrated with the Project's mining block model, that the mining block model be updated and reviewed by a qualified professional annually, and that both of these facets be included as a condition in an approval document, or as a management measure described in the AMD Management Plan.*

Further context for the above recommendations is provided in the detailed commentary on review questions section of this report.

Review Question #2: Alternative Analysis Methods for Developing the Project's Waste Classification Strategy

Okane considers that the hydrothermal alteration zoning (HAZ) method is an appropriate method to develop a waste classification system at this stage of Project development. Okane note the following.

- The hydrothermal alteration zoning is a highly influential characteristic of the Bowdens Silver deposit.
- A TS cut-off value of 0.3% is applicable for samples with a TS less than TCC; this represents more than 90% of the samples. However, it is noted that the location of samples used to develop the 0.3% cut-off value deliberately bias towards the boundary of the HAZ for the purposes of defining the NAF/PAF transition zone. This sampling location bias means that the proportion of total waste rock with potential to be misclassified using the 0.3% cut-off is likely far less than the proportion of the current samples identified as having a TS greater than TCC, and subsequently being identified as material with higher AMD risk.
- Additional sampling and analysis is required to demonstrate the above, which can be undertaken post approval. In the interim, until samples are collected and analysed, Okane support the use of a 0.2% cut-off.
- The Ca-Mg algorithm is theoretically sound.

Recommendation #3: *Okane recommends Bowdens Silver utilise a 0.2% TS cut-off for classification, until such a time as sufficient sampling and analysis is completed to increase the cut-off to 0.3%.*

Recommendation #4: *Okane recommends that the Ca-Mg algorithm is not used in illite/smectite rich zones, and correlation analysis of TCC (and TC) with Ca, Mg and Ca+Mg data is completed to confirm Ca and Mg in mine rocks are almost all derived from carbonate, with an acceptable uncertainty (for example, 5%).*

Further context for the above recommendations is provided in the detailed commentary on review questions section of this report.

Review Question #3: Proposed Closure Strategies for the Waste Rock Emplacements and Tailings Storage Facility

In respect of managing AMD risk, Okane considers that the proposed closure design for the waste rock emplacement (WRE) is quite robust, particularly at this stage of Project development.

Okane note the following in respect of the three key design facets of the WRE.

- Bowden's Silver have committed to a geosynthetic product to manage WRE basal seepage;
- Bowden's Silver have committed to a waste rock placement methodology that focuses on source term control of acidity generation by minimising re-supply of advective gas transport within the WRE during and following WRE construction; and
- Bowden's Silver have committed to a WRE 'barrier' type cover system at closure, which has, in Okane's experience, an in-service high probability of achieving a very low annual average net percolation rate and a very low annual average oxygen ingress rate.

> ***Recommendation #5:*** *Okane recommends Bowdens Silver transparently demonstrate that the mine plan (schedule, materials, cost, equipment, etc.,) is reflective of the WRE design as developed, in particular addressing schedule associated with the required quality control and assurance to design specification on each of the three key WRE design facets.*

As the Project progresses in subsequent stages, there is opportunity to develop a clearer rationale for the extent to which each of the WRE design elements are relied upon to manage AMD risk during operations and into closure.

> ***Recommendation #6:*** *Okane recommends Bowdens Silver complete a failure modes and effects analysis (FMEA) that focuses on each of these WRE design facets to ensure there is fulsome understanding of the influence of each facet of the WRE design on managing AMD risk during operations and in closure.*
>
> *Additional studies, whether they be laboratory, modelling, or field studies, can then be prioritised on a failure mode by failure mode basis, and on the basis of mitigating risk through reducing probability, or consequence effect, or both, and over an appropriate time frame. The FMEA results can then be re-visited on a frequent basis to communicate the manner in which AMD risk has been reduced, with risk-based decisions supported by technical studies.*
>
> *In this way, Bowdens Silver's WRE design can be optimised by focusing on risk management and mitigation, informed by technical studies, rather than relying solely on expert technical opinion, which may, or may not, be offered with a common risk profile.*

As the Project matures, there is opportunity to optimise and differentiate between objectives, design criteria, and design for the WRE.

Recommendation #7: *Okane recommends Bowdens Silver utilise a hierarchical approach to developing design criteria for the WRE, which arise from the site's closure vision and closure principles, the future land on a domain by domain (and landform by landform) basis, and closure objectives.*

Closure objectives are a qualitative description of what is to be achieved (an outcome) through implementation of closure activities[1]. Objectives are site specific (i.e., site-wide and holistic site), which lead to domain and landform specific objectives. Closure objectives are derived from the overall closure vision and closure principles.

Recommendation #8: *Okane recommends that Bowdens Silver develop fulsome understanding for the final (i.e., post mining) land use for the WRE, which will then allow for simple and transparent communication of alignment with relevant local and regional land.*

A focus on post-mining land use for a landform allows for development of closure objectives and design criteria that are measurable, and connected, to meeting land use expectations, and thus relinquishment, because the acceptable level of residual risk for the future land use can be quantified.

The Project is proposing a compacted clay liner (CCL) for the floor / impoundment of the TSF to mitigate seepage. Okane understands an issue was identified with this approach, related to local topography, and that a bituminous geomembrane (BGM) is being considered, with the extent of the BGM to be determined post-approval. In general, Okane is supportive of this approach; the detailed response section of this report offers advice in optimising this design.

Recommendation #9: *Okane recommends evaluation of the extent of BGM liner utilise two-dimensional (2-D) seepage analysis that includes consolidation induced seepage water, with the 2-D cross sections chosen to represent key sections within the TSF such that some sense of three-dimensional influence can be understood.*

The focus of this review is on geochemical aspects of the WRE design and AMD risk management. As noted, Okane's opinion is that the design is robust in this respect for this stage of the product. As the Project matures, evaluation of geotechnical stability in the context of the WRE's design to manage AMD risk should be refined. For example, a stability analysis on the design as proposed for evaluation of all potential slip failure and sheer failure planes and consideration of pore-water pressure increase in response to loading given that the liner represents a seepage barrier for consolidation seepage waters.

[1] https://www.icmm.com/en-gb/guidance/environmental-stewardship/2019/integrated-mine-closure.

> ***Recommendation #10:*** *Okane recommends Bowdens Silver complete, if it has not already been done so, a landform (global) stability analysis for operational and closure conditions, as well as for near surface (veneer) stability; these must be conducted for static and dynamic conditions, and for the WRE design as proposed.*

Further context for the above recommendations is provided in the detailed commentary on review questions section of this report.

Detailed Commentary on Review Questions

The follow provides detailed review commentary on the three review questions.

Review Question #1: Recommended Sampling Regime

The sample frequency rate recommended in the *Update on Independent Review – Acid and Metalliferous Drainage* (the Review Update)[2] is one representative sample per 10,000 tonnes of waste rock. The Review Update notes the geochemical characterisation work is considered preliminary only. As the recommended sampling rate is provided in a table with the relevant column heading of "Potential Conditions for NSWDPE Approval" it is assumed this sample rate is intended for a sampling program intended for the period between receiving conditional development consent and the commencement of mining activities.

The guidance provided in the *Prediction Manual for Drainage Chemistry from Sulphidic Geology Materials* (Price, 2009)[3] is commonly used by industry for determining an initial sampling rate for geochemical characterisation of mine wastes when sampling without prior information. It should be noted that the Project has been in development for several years and over this time substantial data has been collected on both the deposit and the surrounding waste materials. Hence, the waste classification system developed for Bowdens Silver was completed with the benefit of information gathered over an extensive time frame. The existing geological knowledge base was leveraged during development of the waste classification system. Using this guidance, an appropriate number of initial samples for an anticipated volume of 46.6 Mt of mine rock is 163. The current number of samples on which acid base accounting (ABA) has been completed is 143, only 20 less than the guidance suggests (Figure 1).

An additional 90 samples have been analysed for total sulfur (TS), total carbon (TC) and total carbonate carbon (TCC), using LECO C-S analyser and acid leach, respectively. This data, whilst not a substitute for ABA testing, substantially assists AMD risk classification and is considered valuable data.

[2] Earth Systems, 2022a. Update on Independent Review – Acid and Metalliferous Drainage. Technical Memorandum, dated 23 November 2022.

[3] Price, W. A., 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geology Materials, MEND Report 1.20.1. Mine Environment Neutral Drainage (MEND) Program. December.

Price 2009 notes "*…the final sampling frequency [should] be determined site specifically based on the variability of critical parameters, prediction objectives and required accuracy…*"[4] (pg. 8-8). Therefore, considering the relative homogeneity of TS in each hydrothermal alteration zone, which controls sulfide distribution in space, and as confirmed by the Project's geological block model,

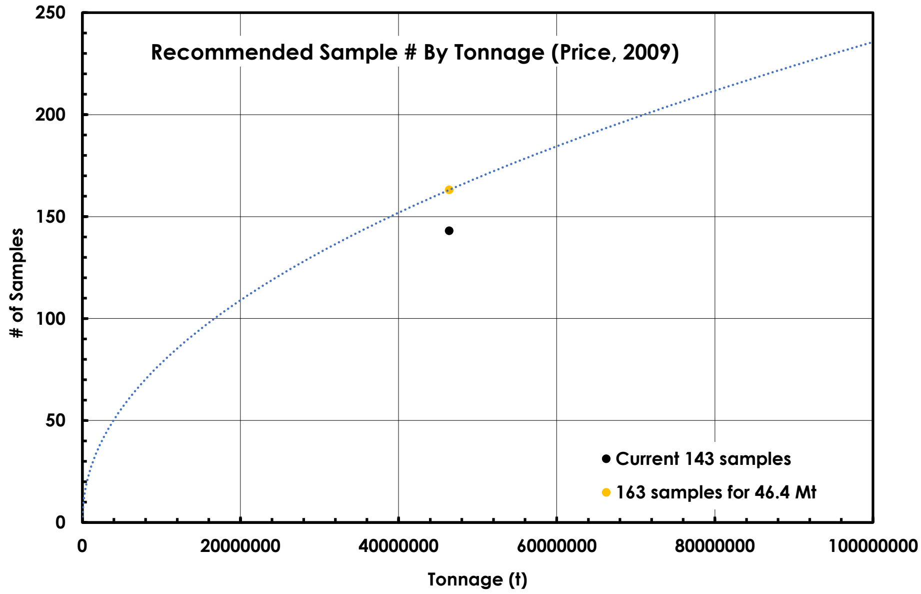

Figure 1: Recommended initial sampling frequency based on tonnage (Price 2009)**.**

Okane considers the current number of samples used to determine AMD risk is appropriate for this stage of the Project.

(1) In the Resources Update Report prepared by H & S Consultants Pty Ltd (HSC, 2017: Table 18-20), the coefficients of variation (CV) for total sulfur in Rylstone volcanics, Coomber formation (basement) and Shoalhaven Group are 0.99, 0.88 and 2.12, respectively. The Shoalhaven group obviously included some hydrothermal alteration samples within it because the pure Sydney basin sandstone could not have total sulfur content up to 1.3%. In terms of less than 1 of CV in the Rylstone volcanics and the basement (the main part of Bowdens Silver deposit), the extent of variability of total sulfur that controls potential AMD risks in Bowdens Silver deposit is thought to be relatively low.

(2) The Supporting Evidence provided by Bowdens Silver to Okane (BS, 2022) further confirms this:

a. the Shoalhaven rock has less variability, with a CV of 0.79 in the updated Shoalhaven evaluation using more recent drilling data (Sydney basin sandstone and including weathered zone, WZ1);

b. the domain with TS > 0.3% also has less variability, or relative homogeneity, with a CV of 0.94; and

c. semi-variograms for the domain with TS < 0.3% at 5 m composites points to a relatively homogeneous Bowdens Silver deposit with a variance less than 1.0 and a correlation range around 100 m (Figure 2).

AMD risk management is a progressive activity that continues alongside mine operation for the life of mine (LOM) and potentially even extending for a period post-closure. An ongoing sampling, analysis and validation program for the Project's AMD Classification System must be developed and implemented as soon as material suitable for sampling becomes available. Okane recommend that the development of and execution of such a plan be included as a condition for inclusion into an approval document.

The sampling frequency during this program must be informed by site specific factors, material variability and the prediction/validation objectives of the Project, as recommended in Price 2009, rather than a fixed rate of one sample per 10,000 tonnes of mined waste rock. The sampling frequency must be documented in the AMD Management Plan, which Bowdens Silver has committed to developing prior to mining commencing[4]. Okane also recommends Bowdens Silver integrate the AMD Classification System in the Project's mining block model and the mining block model be regularly updated with the results of the ongoing validation program. Consideration should be given for this aspect to be included as a condition in the approval document or AMD management plan. A mining block model with integrated AMD risk is an effective tool to assist AMD management during operations.

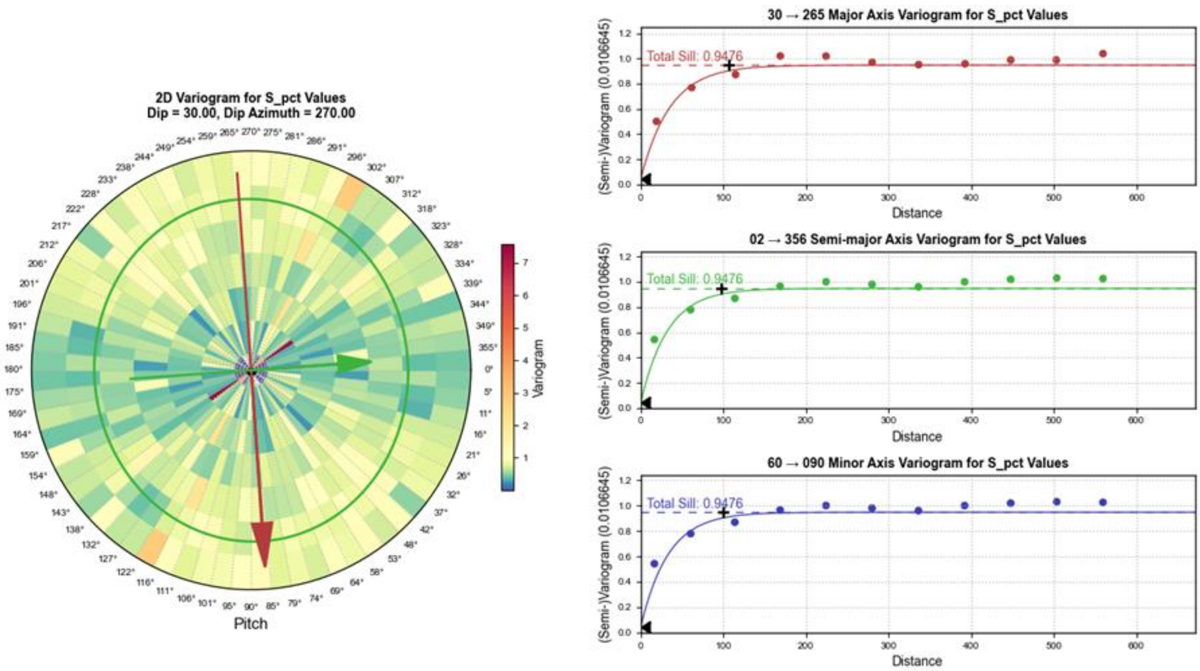

Figure 2: Semi-variogram plotting for the domain with TS < 0.3% at 5 m composites (bench and block scale with additional drilling since EIS), Bowdens Silver, 2022; axis aligned variograms for TS are summarised in the left panel, major and minor axis variograms are plotted in the right panel).

[4] R. W. Corkery & Co. Pty Ltd, 2022. Bowdens Silver Project: AMD Independent Review Outcomes. Letter [DRAFT] dated 30 November 2022.

Review Question #2: Alternative Analysis Methods for Developing the Project's Waste Classification Strategy

Price 2009 recommends a sampling scheme for geochemical characterisation to address all lithological units, alteration, and ores. The number of samples for each lithology, alteration and ores should be in proportion to the anticipated tonnage for each lithology, alteration, and ores. Therefore, Price 2009 recommends a method for developing a waste classification strategy that can be referred to as the lithology method.

Bowdens Silver and Graeme Campbell and Associates Pty Ltd (GCA) have used an alternative method for developing the Project's waste classification strategy. The alternative method has been developed using hydrothermal alteration zones (HAZ), rather than lithological units, alternation, and ores, as recommended by Price, 2009. It is worth noting that previous work from the hyperspectral analysis, petrology and XRD data greatly assisted to shape the HAZ model and provided insight into the controlling factors for distribution of sulfide and carbonates in space during hydrothermal alterations. XRD data also assists with the development of the 0.3% of TS cut-off value due to carbonate coexisting with sulfide.

GCA's HAZ method, broadly stated, can also be considered a type of lithology method. However, the HAZ method uses a sampling scheme aligned to hydrothermal alteration zones and a cut-off value of 0.3% for TS to define non-acid forming (NAF) and potentially acid forming (PAF) materials. The HAZ method also proposed a rapid algorithm that assumes all Ca and Mg are sourced entirely from carbonate. The algorithm is based on Ca-Mg concentration in whole rock analysis, taken in combination with TS, to calculate $S_{equivalent}$ and $S_{residual}$. $S_{residual}$ is then used to classify the NAF and PAF materials.

The major concerns raised in the *Independent Review – Acid and Metalliferous Drainage*[5] and the *Update on Independent Review – Acid and Metalliferous Drainage*[2] in regard to the HAZ method appear to be:

1) Only five samples collected in the northern section of the proposed main pit were subjected to ABA analysis;
2) The use of a TS cut-off value of 0.3% has not been adequately justified; and
3) Inconsistency was observed between the results obtained from the Ca-Mg algorithm and the ABA analysis.

The following points summarise the reasons Okane is of the opinion that the HAZ method is an appropriate method to develop a waste classification system at this stage of Project development.

1) The hydrothermal alteration zoning is a highly influential characteristic of the Bowdens Silver deposit. Figures 3 and 4 below show the hydrothermal alteration zones are represented by illite

[5] Earth Systems, 2022. Independent Review – Acid and Metalliferous Drainage. Technical Memorandum, dated 31 May 2022.

crystallinity zones (Figure 4) and TS zoning is around the hydrothermal alteration zones (Figure 3). Therefore, using such a prominent nature feature to assist AMD risks classification is a great advantage in material characterisation, also an expression of high level understanding the geological and geochemical characteristics of the Bowdens Silver deposit, which control the sulfide distribution in space.

2) Although only five samples with complete ABA analysis were collected in the northern section of the proposed main pit, there are many other samples in the same hydrothermal alteration zone from the other areas of the main pit, which have had complete ABA analysis undertaken. From the perspective of sulfide (Figure 3), which is controlled by the hydrothermal alteration zone (Figure 3 and 4), all samples collected in the same zone represent and contribute to characterisation of the whole zone. That is, the objective of the HAZ method is to fully characterise each hydrothermal alteration zone. The sample frequency for a certain locality is not as critical as it is when using the lithology method because samples from other localities can provide representative data for AMD risk assessment based on the targeted common feature, i.e., the hydrothermal alteration zone (Figure 5).

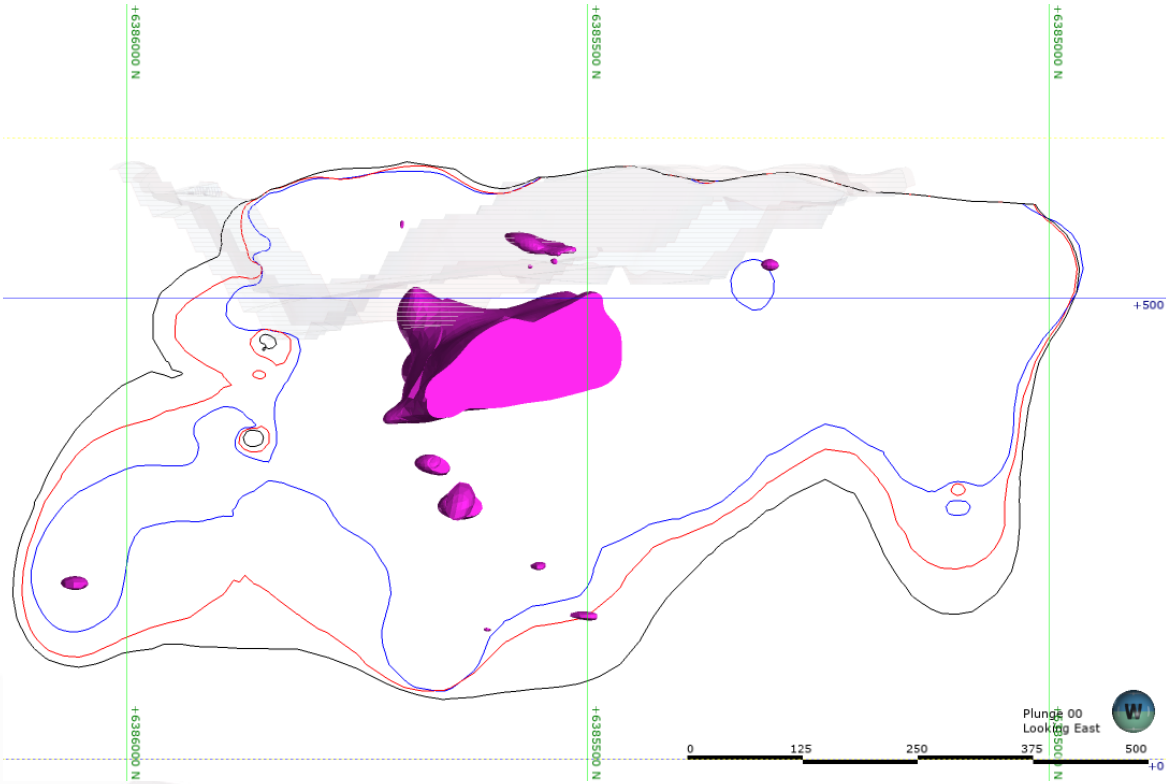

Figure 3: Cross section of the main pit and TS contours (0.1% (black line), 0.2% (red line) and 0.3% (blue line) with pit and dacite (pink) below pit showing the spatial relationship and TS zoning around the dacite, from Bowdens Silver, 2022).

3) The TS cut-off value of 0.3% needs be justified. This cut-off value considers the pervasive hydrothermal carbonate alteration in the Bowdens Silver deposit. A certain amount of carbonate mineral will occur in the hydrothermal alteration zones. Considering a TS of cut-off < 0.3%, even a

low quantity of carbonate mineral (for example, 0.5% volume) will provide some acid neutralising capacity (ANC). This is the key for TS cut-off value set at 0.3%, rather than the common practice at 0.1%. In addition, in the mining block there is always a dilution effect on potential AMD due to a large volume of mine rock that does not contain sulphur.

To provide further justification that a TS cut-off value of 0.3% is appropriate, Okane recommended Bowdens Silver:

- Provide quantitative mineralogy information including sulfide and carbonate in each hydrothermal alteration zone. It is noted that hyperspectral analysis has provided quantitative information on clay minerals, especially illite and smectite, which assisted with developing the HAZ model;
- Compare the quantitative mineralogy information with TC and TCC in each hydrothermal alteration zone; and
- Examine how many samples (as a percentage) are categorised as PAF material under the current AMD risk classification scheme (PAF > 0.3% TS) and compare with how many samples (as a percentage) would be classified as PAF material under an AMD risk classification scheme with a TS cut-off of <0.1% TS. It is expected the difference in percentages will be minor.

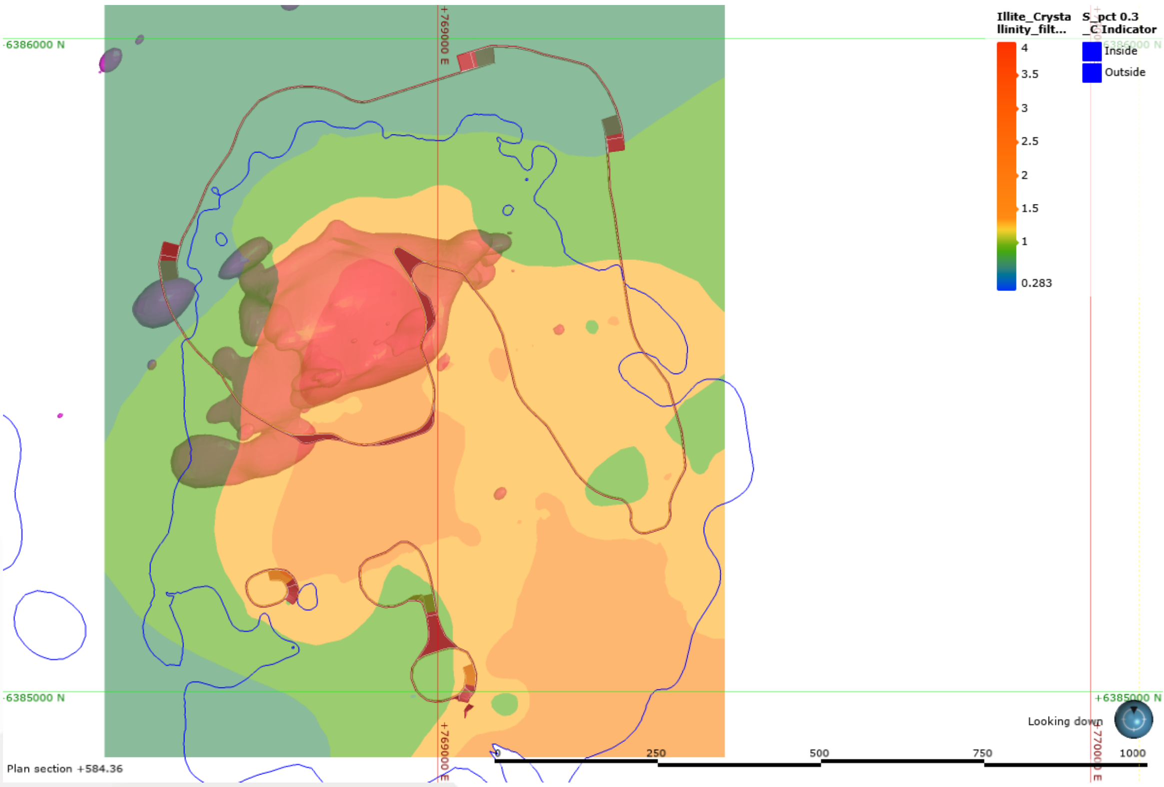

Figure 4: Illite crystallinity zoning overlap with TS cut-off value of 0.3% (the brown line surrounding area is the proposed main pit, the hydrothermal alteration zoning is thus represented by illite crystallinity zoning that presents continual variation in hydrothermal fluid temperature during hydrothermal alteration and mineralisation, from Bowdens Silver, 2022).

Upon receival of additional data from Bowdens Silver relating to this recommendation, Okane examined the correlation between TC and TCC. Figure 6 shows a high correlation between TCC and TC, with trend of almost 1:1. This confirms TCC is the dominant carbon species in TC.

A scatter plot of TCC against TS was generated to examine the relationship between TC and TS (Figure 7). No correlation between the TCC and TS was observed, with TCC content generally much larger than TS for most samples (90% on the right-hand side of the 1:1 line). This means it is reasonable for these samples to use a 0.3% of TS cut-off value is considered reasonable where TS < TCC as the TCC will provide sufficient ANC to buffer acidity generation. Approximately 10% of the total samples had a TS content slightly larger than TCC content (left of the 1:1 line). This indicates these samples with relatively less carbonate (0.09 – 0.18%) and slightly more sulfide (0.14 – 0.24%), are unlikely to provide enough ANC to offset acidity generation, though at very small amounts.

Therefore, a 0.3% of TS cut-off value should only be used for samples on the right-hand side of the 1:1 line for TS and TCC. That is, the 0.3% of TS cut-off value can only be safely used for the samples with TS < TCC, and not for the samples with TS > TCC. A TS < TCC is the safe boundary for applying a 0.3% of TS cut-off value in the Bowdens Silver deposit.

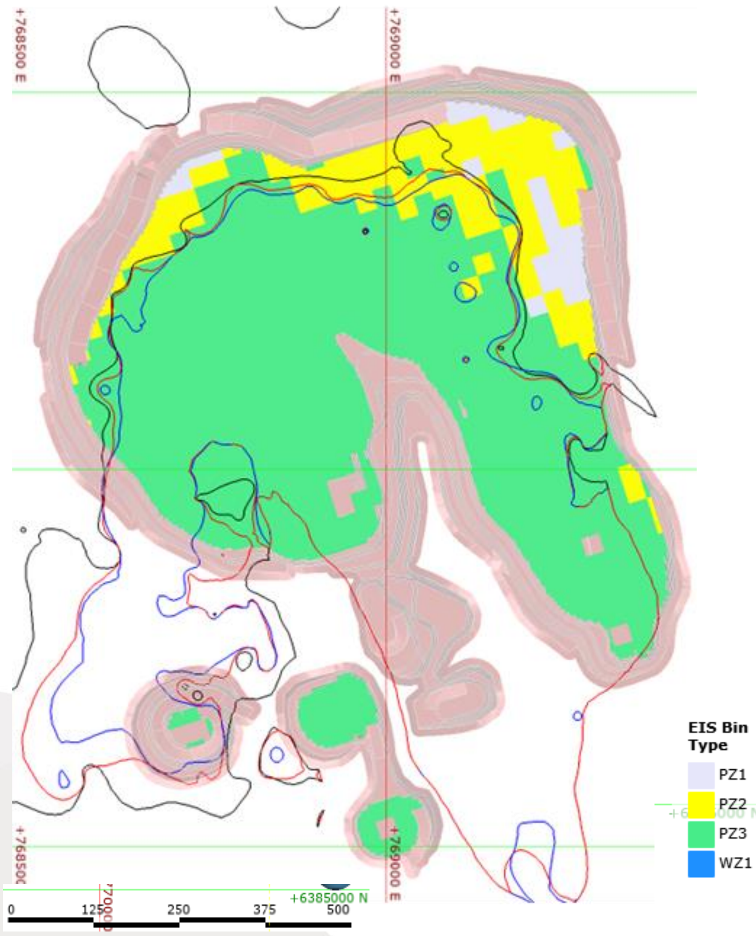

Figure 5: Bowdens Silver sampling scheme followed the hydrothermal alteration zones (the PZ indicates primary zone and WZ for weathered zone, from Bowdens Silver, 2022).

4) The Ca-Mg algorithm is theoretically sound; however, its application conditions and boundaries for use should be clearly defined prior to being used for assessment of AMD risk. The algorithm implicitly assumes that all Ca and Mg are derived from carbonate minerals, and therefore can only be applied to mine rocks with Ca-Mg originating from carbonate minerals. It is not applicable for use where other Ca-Mg-bearing minerals, including illite, smectite, chlorite, plagioclase, biotite, hornblende and pyroxene are found. The presence of other Ca-Mg-bearing minerals in the Bowdens Silver deposit will introduce uncertainty in these locations. On the basis of the petrology completed on the major host rocks in the Bowdens silver deposit, i.e., rhyolites and dacite, which are Ca-Mg-poor rocks, Ca-Mg was generally lost during hydrothermal alteration, or gained due to hydrothermal carbonate and illite alteration. Thus, the algorithm is not suitable for use in the illite-rich zone.

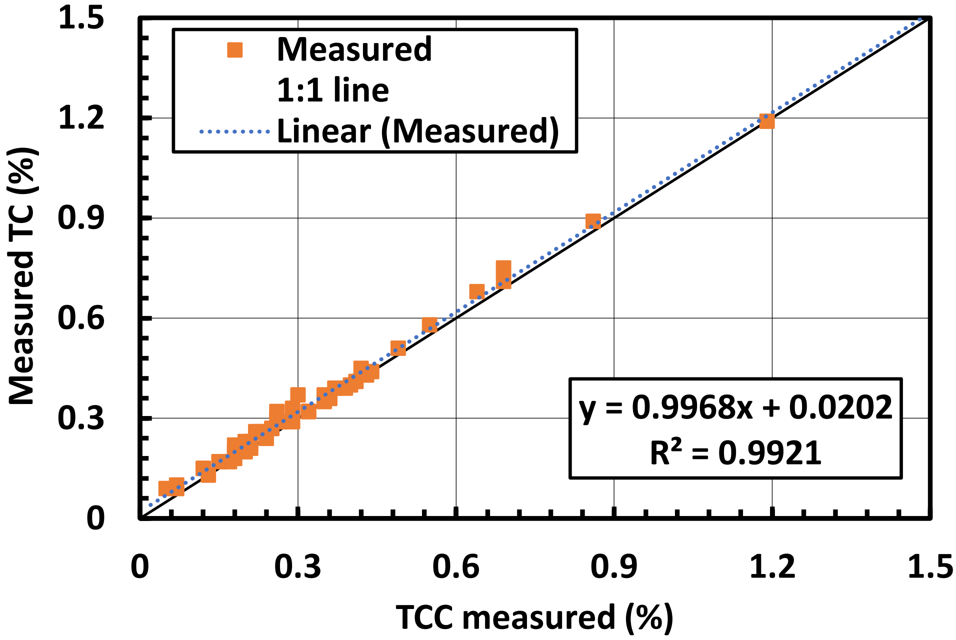

Figure 6: Correlation of TC and TCC for the samples with TS < 0.3% (new data provided by Bowdens Silver (2022) confirms that TCC comprises the dominant carbon species in TC).

5) In order to justify the application of the Ca-Mg algorithm as a supplementary tool within the Bowdens Silver deposit, Okane recommend:

- The Ca-Mg algorithm is not used in illite/smectite rich zones; and
- Correlation analysis of TCC (and TC) with Ca, Mg and Ca+Mg data, or of calculated TCC with measured TCC, is completed to confirm Ca and Mg in mine rocks are almost all derived from carbonate, with an acceptable uncertainty (for example, 5%).

The correlation analysis between TCC and whole rock Ca, Mg, or Ca+Mg indeed show positive correlation among these items with a correlation coefficient R^2 around 0.6 to 0.7 (Bowdens Silver, 2022). On the other hand, based on the new data provided by Bowdens Silver (2022), the correlation between measured and calculated TCC was examined in Figure 8, where calculated

TCC is well correlated with the measured TCC, with 0.71 of correlation coefficient R^2, whilst nearly half of the samples are plotted to the right side of 1:1 line. This implies that the Ca-Mg algorithm seldom overpredicts the measured TCC. Therefore, it confirms the Ca-Mg algorithm is useful in AMD risks assessment for the Bowdens Silver deposit.

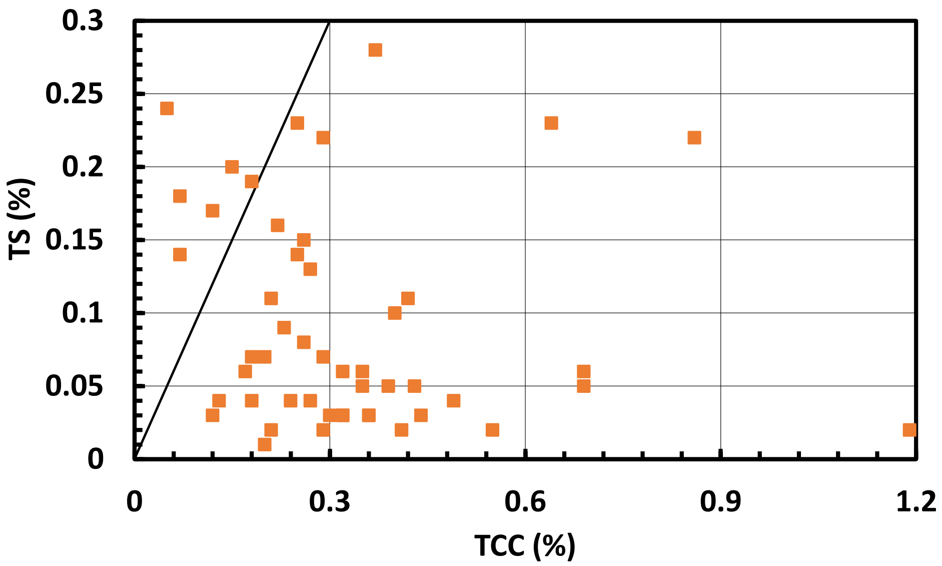

Figure 7: Scatter plot of TCC vs. TS for samples with TS < 0.3% (new data provided by Bowdens Silver (2022); black line in the range of 0 to 0.3 % stands for the 1:1 line between TCC and TS).

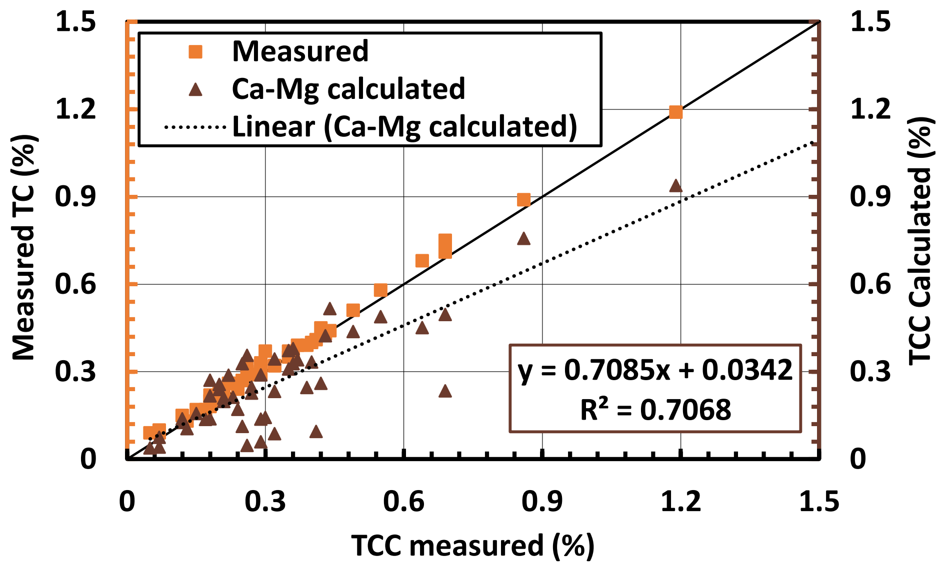

Figure 8: TCC Calculated by Ca-Mg algorithm are well correlated with TCC measured (also highly correlated with measured TC; black line is the 1:1 line for the measured TC and TCC measured, dashed line is the trend line for TCC calculated and TCC measured).

Review Question #3: Proposed Closure Strategies for the Waste Rock Emplacements and Tailings Storage Facility

The proposed closure strategies for the WRE and TSF are described in Bowdens Silver Project Preliminary Design of PAF Waste Rock Emplacement, Oxide Ore Stockpile and the Southern Barrier[6] and Bowdens Silver Project TSF and WRE Closure Cover Design[7].

WRE Construction

The nominated design criteria relevant for construction of the proposed WRE require[6]:

- Full encapsulation of PAF waste rock on closure;
- The flood level envelopes from Hawkins Creek and Price Creek to be avoided;
- The final WRE landform to blend with the natural topography;
- The progressive rehabilitation of the WRE;
- Provision for temporary storage of internal runoff during construction; and
- Collection of leachate from incident rainfall percolating through the placed PAF waste rock.

It is not clear whether the above are design criteria, objectives, or perhaps design that arises from specific design criteria. For example, the design noted in bullet point #2, above, would arise from the specific design criteria (return period) for each of the creeks. Design criteria must arise from landform objectives, which are in turn developed from site wide closure objectives, land use, and a closure vision.

These design criteria require context, if in fact the argument is made that they do reflect the WRE's design criteria. For example, what does 'progressive rehabilitation of the WRE' mean, quantitatively, such that it can be monitored, and communicated to have been achieved as per the intent?

The subsequent WRE preliminary design can be described as follows[6]:

- A WRE comprising eight individual cells constructed in sequence that will allow progressive rehabilitation as each cell is completed.
- PAF waste rock placed in 10 m lifts with 4 m wide berms. Berms will be graded back towards the WRE at 2%. The upper surface will also be graded at 2% away from the crest.
- PAF waste rock embankments constructed to a maximum grade of 1V:3H.

[6] Advisian, 2020. Bowdens Silver Project Preliminary Design of PAF Waste Rock Emplacement, Oxide Ore Stockpile and the Southern Barrier. Rpt No. 201010-00790--REP-002. May.

[7] Advisian, 2020a. Bowdens Silver Project TSF and WRE Closure Cover Design. Rpt No. 201012-00683-SS-REP-0001. May.

- PAF waste rock paddock dumped and spread flat by a dozer in layers not exceeding 2 m in height until a full 10 m lift has been constructed. Each 2 m thick layer will be traffic compacted as the next 2 m layer is paddock dumped over the previous layer.

- A low permeability high density polyethylene (HDPE) basal liner will be placed below the PAF waste rock to capture seepage from each WRE cell.

- A 'barrier type' cover system will be constructed over the PAF waste rock at the completion of each cell. The cover system design comprises a minimum of 1.4 m of topsoil, subsoils and NAF waste rock overlying a geosynthetic clay liner (GCL). A layer of finer-grained PAF oxide will placed between the PAF waste rock and GCL to provide a suitable subgrade for on which to install the GCL.

- The outer cover system slope will be constructed to a grade of 1V:3H. No berms will be constructed into the cover system. The thickness of the PAF oxide layer below the GCL will vary in thickness so as to create a constant 1V:3H slope on which the cover system is to be constructed.

- The cover system will be revegetated.

Caution is required here, in respect of the above list, in that it must be demonstrated that these design features correlate with design criteria; i.e., that the design meets the design criteria. Design must be transparently connected to, and arise from, design criteria. The following questions are offered.

1. What does 'good look like' in respect of managing seepage from the base of the WRE? 100% capture of seepage; 99%. 98%, etc.?

2. Why was an HDPE product chosen?

3. There are many types of HDPE; what are the specifications for the HDPE?

4. Is choosing a specific geomembrane product at this stage of the Project appropriate?

5. Why is the 'barrier type' cover system required for each cell?

6. Has a physico-chemico evaluation been completed on the use of a GCL product such that cation exchange will not adversely influence performance of the GCL?

7. What will be acceptable erosions rates (slope average and discreet), and when, such that vegetation can be shown to support such erosion rates?

8. With what vegetation that meets what post-closure landform land use?

9. Does the cover material provide sufficient water holding capacity for plant water use, for vegetation that provides for the above?

WRE and TSF Cover System Design

The nominated cover system objectives for both the WRE and TSF are[7]:

- Contain all PAF materials by full encapsulation so as to limit sulfide oxidation and control the release of acidic seepage from both facilities;
- Protect the final landform surfaces from erosion;
- Minimize ingress of oxygen and percolation of rainfall into the encapsulated tailings and waste rock material thus reducing the potential for seepage from both facilities; and
- Meet the Project's long-term closure objectives and regulatory requirements.

The subsequent recommended cover system design for both the WRE and the TSF comprises[7]

- A minimum 0.3 m thickness of topsoil; underlain by
- A minimum 0.3 m thickness of subsoil; underlain by
- A minimum 0.4 m thickness of NAF material (0.5-30 cm particle diameter); underlain by
- 0.4-1.6 m thickness of NAF material (30-40 cm particle diameter); underlain by
- A minimum 0.4 m thickness of compacted subsoil; underlain by
- A GCL; and
- Cover system to be revegetated.

It is anticipated that opportunities for design optimisation (both in terms of closure outcomes and cost and operational efficiencies) will be presented as improved material knowledge is gathered. However, provided the current mine plan and financial assurance calculations have been developed to capture the time and costs expected by the level of design nominated in the *Bowdens Silver Project Preliminary Design of PAF Waste Rock Emplacement, Oxide Ore Stockpile and the Southern Barrier* and the *Bowdens Silver Project TSF and WRE Closure Cover Design* reports, then these strategies are considered to be generally appropriate for this stage of the Project's development and reasonably reflective of what final closure strategies for this Project are likely to be.

The design detail provided in the documents is sufficient for this stage of the Project's development, and arguably there is additional detail above what should be offered. The designs must be refined as improved knowledge of material properties becomes available. It is anticipated this will occur as mine construction progresses and blasted waste rock becomes available to validate design assumptions through the use of further laboratory and field testing along with construction of field trials. In Okane's experience, should this design represent the design for the Project, then risk of materials availability and cost / schedule to place the materials as proposed and construct the cover system as proposed, must be evaluated.

As opportunities do arise for design optimisation, the following questions could be considered; noting that in Okane's experience these 'sorts' of questions are best addressed using an FMEA, as described previously, in order to prioritise any studies. This approach will allow for the questions to be addressed using Bowdens Silver's risk profile for the Project.

1. Placement of rock, as planned in the WRE, is meant to manage re-supply of oxygen and hence sulfide oxidation; therefore, why is the cover system also required to fulfill this role?

2. More specifically, to what extent is oxygen ingress required to be reduced as associated with waste rock placement and as associated with the cover system?

3. The material within the WRE will become wetter and wetter as it is placed and wets up in response to rainfall. Hence, provision of sufficient lateral drainage capacity over top of the underlying liner is required to limit pore-water pressure build up in the material and towards the toe of the facility. Is there an understanding for how this facility will function hydrologically?

4. Once the cover system is placed, the pore-water pressure regime will change, and the water table may subside. It is the position of the water table, or more specifically the pore-water pressure regime above the liner in the WRE material, which drives seepage from the facility. The cover system will determine the position of the water table.

5. Note that the above can even be more so for tailings material (i.e., the relationship between cover system performance, water table position, and seepage rates).

6. How will water landing on the top, or flatter surfaces of each of the landforms, be directed off the landforms?

7. How will the design accommodate differential settlement and potential ponding conditions on any flatter surfaces?

8. The cover system as proposed is complex, where Okane would consider a 3 layer cover system complex, and noting that the proposed cover system is 6 layers; is this level of detail warranted at this phase of the project?

9. To what level of oxygen ingress and net percolation does the WRE and the TSF require?

10. Is there value in reducing the complexity in design until there is further information with respect to what the cover system needs to achieve?

    a. For example, will the 0.4m thick compacted layer provide sufficient lateral drainage capacity for infiltration waters over top of the GCL?

    b. Or, what is the purpose of the 0.4m-1.6m thick NAF layer?

c. Does the mine plan (and/or the closure plan) include identification, stockpiling, and placement of all of these materials in the volumes and characteristics as identified?

11. What is the basis for the cover systems for the two different landforms being the same (i.e., the WRE and the TSF)?

    a. Does the waste rock or tailings surface need a layer on it before placement of the GCL?

    b. Does the tailings having sufficient bearing capacity; or is ground stabilization required?

Evaluation of Proposed Closure Strategies

The following general comments are provided in regard to the proposed closure strategies for the WRE and TSF, with consideration given to the current stage of project development.

- The cover system designs can only be considered acceptable in the context of the level of net percolation control, oxygen ingress control, erosion control, and plant available water is required to meet the future / end / post-mining land use.

- The cover system design is a barrier type cover system comprising a low permeability GCL and store-and release component supporting vegetation establishment and growth. The anticipated conceptual level of performance for a barrier type cover system in the prevailing climate for the Project site is one of 'low to very low' net percolation (NP) (<5-10% annual rainfall) and 'very low' O_2 ingress (1 mol/m^2/yr)[8].

- Waste rock placement is by paddock dumping with traffic compaction every 2 m. Paddock dumping will minimise segregation of materials and assist in reducing advective gas transport within the PAF waste rock. Similar waste rock placement techniques are one of the several techniques recommended by the *Rock Placement Strategies to Enhance Operational and Closure Performance of Mine Rock Stockpiles; Phase 1 Work Program – Review, Assessment & Summary of Improved Construction Methods* guidance released by INAP[9]. The approach can only be considered acceptable in the context of the level of oxygen ingress control required, in order to meet water quality guidelines (within the approvals process), and water quality to permit, in the context of operations and closure.

- Ongoing design refinement and optimisation based on improved information obtained post approval stage would be expected. It is understood this natural progression of design will be facilitated by the recently implemented NSW rehabilitation reforms, and more specifically,

[8] International Network for Acid Prevention (INAP), 2017. Global Cover System Design Technical Guidance Document. November.

[9] International Network for Acid Prevention (INAP), 2020. Rock Placement Strategies to Enhance Operational and Closure Performance of Mine Rock Stockpiles; Phase 1 Work Program – Review, Assessment & Summary of Improved Construction Methods. January.

the requirement to develop, and maintain, a Rehabilitation Management Plan and supporting annual rehabilitation reports and forward works programs.

The Project is proposing a compacted clay liner (CCL) for the floor / impoundment of the TSF to mitigate seepage. Okane understands an issue was identified with this approach, related to local topography, and that a bituminous geomembrane (BGM) is being considered, with the extent of the BGM to be determined post-approval. Okane is supportive of this approach; and offers the following advice in optimising this design.

- The presence of a lower hydraulic conductivity layer at the base of a TSF impoundment will typically result in a mounded water table condition, over and above that which would have existed without the presence of such a layer; this water is a result of gravity driven seepage and consolidation driven seepage.
- The mounded water table has the potential to influence basal seepage conditions in two ways. First, to enhance the driving head for lateral seepage, and second, to increase the vertical hydraulic gradient across the lower hydraulic conductivity layer; all depending on seepage rates and the saturated hydraulic conductivity of the liner.
- Lateral seepage capacity above such a layer will need to be carefully considered in order to provide sufficient capacity to dissipate pore-water pressure; and, its influence on vertical seepage rates and geotechnical stability.
- For every order of magnitude increase in hydraulic head as a result of mounding, seepage rates will increase accordingly, all while still holding saturated hydraulic conductivity of the layer in question, the same (i.e., simple application of Darcy's Law).
- Evaluation of CCL performance should consider the above hydrologic behaviour, particularly when introducing a BGM, which is likely 2-3 orders of magnitude lower in hydraulic conductivity than a CCL. Care is required to ensure that the increased propensity for mounding over areas lined with BGM, does not inadvertently result in increased seepage rates over areas lined with the CCL, as a result of the mounding's lateral extent.

Documentation Reviewed

This review has been informed by the following documentation:

- Advisian, 2020. Bowdens Silver Project Preliminary Design of PAF Waste Rock Emplacement, Oxide Ore Stockpile and the Southern Barrier. Rpt No. 201010-00790--REP-002. May.
- Advisian, 2020a. Bowdens Silver Project TSF and WRE Closure Cover Design. Rpt No. 201012-00683-SS-REP-0001. May.
- Earth Systems, 2022. Independent Review – Acid and Metalliferous Drainage. Technical Memorandum, dated 31 May 2022.
- Earth Systems, 2022a. Update on Independent Review – Acid and Metalliferous Drainage. Technical Memorandum, dated 23 November 2022.
- Graeme Campbell and Associates Pty Ltd, 2022. Bowdens Silver Project: Clarification of Key Items in GCA (2020) Report on Environmental Geochemistry and Implications for Mining-Stream Management. Memorandum dated 6 July 2022.
- Graeme Campbell and Associates Pty Ltd, 2022. Bowdens Silver Project: Computational Approach Employing %S, %Ca, and %Mg Assays in Geological Database for Mining-Stream Classification - Input to Modelling of Sulphur Occurrences in Context of Carbonate-Alteration for Refining Volume Estimations. Memorandum dated 11 August 2022.
- Graeme Campbell and Associates Pty Ltd, 2022. Materials Characterisations Assessment. Vol. 1, Part 3 Specialist Consultant Studies Compendium (May 2020).
- Graham, I., 2022. A note on Bowdens Deposit Mineralogy as of 15-9-22. Personal note dated 15 September 2022.
- R. W. Corkery & Co. Pty Ltd, Graeme Campbell and Associates Pty Ltd & Bowdens Silver Pty Ltd, 2022. Response to Earth Systems Review – Acid and Metalliferous Drainage. Ref No. 429/42. October.
- R. W. Corkery & Co. Pty Ltd, 2022. Bowdens Silver Project: AMD Independent Review Outcomes. Letter [DRAFT] dated 30 November 2022.
- H & S Consultants Pty Ltd, 2017. Resource Update for Bowdens Silver Project, Mudgee, NSW.
- Bowdens Silver, 2022. Supporting Evidence sent to Okane Consultants dated on 9 December 2022.

Information has also been gathered during discussions with Nick Warren and Paul Ryall of R. W. Corkery & Co. Pty Ltd (RWC) and David Biggs of Bowdens Silver.

Closure

Please do not hesitate to contact me at +61 477 959 803 or aosborn@okc-sk.com should you have any questions or comments.

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