January 23, 2019

Resolution Copper Mining LLC
P.O. Box 1944
Superior, Arizona
85273

Ms. Vicky Peacey
Senior Manager – Permitting and Approvals

Dear Ms. Peacey:

Resolution Copper Project
DEIS Alternative 4 Silver King Filtered - Uncaptured Seepage
Doc. # CCC.03-81600-EX-REP-00010 – Rev. 1

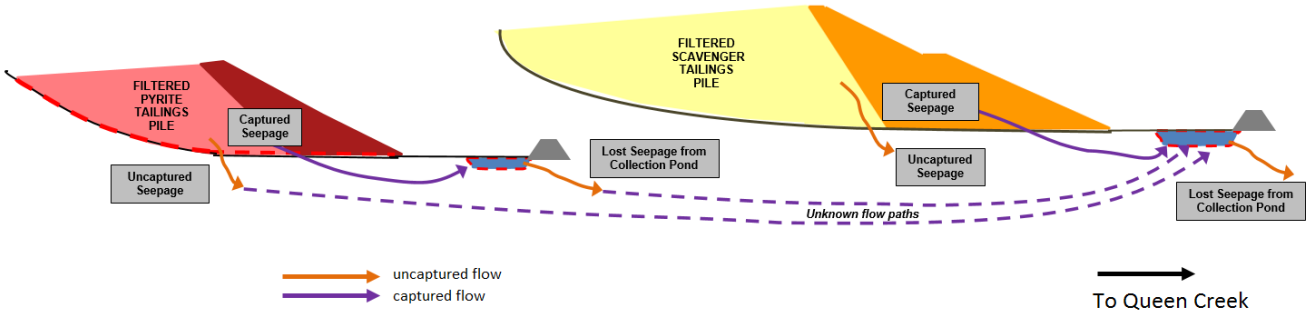
1 INTRODUCTION

The Tonto National Forest (the Forest) is assessing tailings storage facility (TSF) alternatives for detailed analysis as part of the Resolution Copper Mine Plan and Land Exchange Environmental Impact Statement (EIS). As requested by the Forest the potential uncaptured seepage from the TSF alternatives have been estimated for input into contaminant transport assessments.

Alternative 4 Silver King Filtered TSF differs from the other TSF alternatives as the tailings from Silver King are filtered rather than hydraulically deposited, therefore there is limited potential seepage infiltrating from the tailings into the foundation during the life of active operations and construction. However, in order to meet groundwater and surface water standards, a very high seepage capture efficiency would be required, where less than 6 acre ft/year of seepage could be allowed to bypass the collection system (M&A 2019a).

Figure 1.1 schematically illustrates the conceptual seepage pathways for Alternative 4 Silver King Filtered.

Figure 1.1 Alternative 4: Silver King Filtered - Potential Seepage Pathways



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Klohn Crippen Berger Ltd. (KCB) estimated the total potential seepage flows (captured + uncaptured) from the tailings and collection ponds into the foundation (see Appendix III in KCB 2018).

The letter provides the potential range of uncaptured seepage with discussion on uncertainties for the Alternative 4 Silver King Filtered TSF.

2 SILVER KING SITE HYDROGEOLOGICAL CONDITIONS

Based on available information on the foundation conditions at Silver King, summarized in KCB (2018), key observations include:

- The regional groundwater flows from northeast to southwest, draining to Potts Canyon or Queen Creek.
- The proposed TSF sits across the Concentrator, Main and Conley Springs faults. These faults are perpendicular to the regional groundwater flow, and are likely barriers to flow, causing higher groundwater levels to the northeast of the faults. Once the TSF is built, the southeast portion of the embankment may induce seepage flow to the southeast, parallel to the faults. Shallow groundwater is encountered in wells just up gradient of the faults (M&A 2012). Springs downstream of the facility in Gila Conglomerate are likely related to sub-horizontal bedding planes and are not likely connected to the regional groundwater system (M&A 2012).
- Drill hole DH17-31 (GT-34) (KCB 2017a) is located in Happy Camp Canyon, within the footprint of the external water collection dam, and has been tested to show permeabilities of 10^{-4} cm/s to 10^{-5} cm/s in Gila Conglomerate and up to 10^{-1} cm/s in Mescal Limestone. Drill holes in Gila Conglomerate downstream of Silver King showed permeabilities of up to 10^{-4} cm/s to depths of several hundred ft, which differs from Near West. Apache Leap Tuff is also present and has permeabilities of 10^{-4} cm/s.

It is assumed that the alluvial channels provide the pathway for the majority of the surface water and near surface groundwater. At depth, it is assumed that the majority of groundwater flow will be along fractures that have the potential to bypass the proposed Alternative 4 downstream collection dams.

Filtered tailings piles are unlikely to cause mounding of the regional groundwater table at this site due to the limited water placed with the tailings. However, based on filtered tailings case histories a perched water table is expected to form at depth in the filtered pile. TSF seepage is expected to infiltrate vertically downwards to the water table.

3 SEEPAGE ESTIMATES

KCB estimated potential seepage flows from the tailings and collection ponds into the foundation (see Appendix III in KCB 2018). Rio Tinto (2019) reports slightly lower seepage rates for the scavenger (NPAG) pile at the end of operations because the infiltration rate was based on an average annual infiltration rate estimated from the closure cover study (KCB 2016). M&A's initial contaminant transport assessments assumed that the collection ponds would capture 100% of the filter pile's seepage, therefore, only the seepage from the collection ponds were used in the estimates of water

quality downstream. This is considered overly optimistic for capture efficiency and has been updated based on the discussion below.

The filter pile seepage estimates could vary depending on changes in tailings properties (due to ore or milling variability and geochemical alteration), filter plant performance, climate conditions, construction sequencing and methodology, surface water management. Based on case histories of filtered tailings piles, the seepage rates could be higher than reported because:

- a phreatic surface is expected to develop at base of filtered tailings (potentially perched);
- moisture contents from the filter plants are often not achieved, therefore more moisture is added to the system than what is expected; and
- filtered tailings pile surfaces are challenging to construct totally free-draining, it is likely that localized ponding will occur.

KCB estimated potential seepage flows from the tailings and collection ponds into the foundation are provided in Table 3.1 below (Appendix III, KCB 2018). Table 3.1 provides potential levels of seepage control for Alternative 4 Silver King Filtered TSF. To meet water quality standards (i.e., uncaptured seepage less than 6 acre-ft/year (M&A 2019a)) seepage capture efficiency would need to be greater than 95%. Generally, only full geomembrane lining would achieve 95% seepage capture with confidence; however, full lining is not considered feasible at the Silver King site because of the following:

- The topography underneath the proposed piles is rugged and steep, therefore:
  - lining would require major rock and earthworks to shape the ground and would not be feasible or practical at the existing valley slopes; and
  - a liner placed on rugged, steep terrain would have higher than normal deficiencies and imperfections, thus resulting in increased seepage rates.
- A 750 ft- to 1,050 ft-high filter pile constructed on a liner on a steep valley side is unprecedented both in height and placement of filtered tailings on a liner on a steep slope. It is potentially infeasible to meet stability requirements and at a minimum would require stability keys into the bedrock, flatter slopes or a stabilization berm, which would increase the footprint and disturbed borrow areas.

Based on the above considerations, KCB's opinion is that a fully lined facility is not feasible at the Silver King site and, therefore, the seepage control option for capturing up to 95% of the seepage has not been provided in Table 3.1.

Table 3.1 Alternative 4 Range of Uncaptured Seepage Estimates

Level of Seepage Control	Seepage Control Description	Range of Seepage Capture Efficiency (%)	Scavenger (NPAG) Pile Seepage (acre-ft/yr)	Pyrite (PAG) Pile Seepage (acre-ft/yr)	Collection Pond Seepage (acre-ft/yr)	Uncaptured Seepage (acre-ft/yr)
1	Seepage collection as presented in the DEIS report (KCB 2018), which includes pile underdrainage, lined collection ditches and collection ponds that cut-off the alluvium. There is potential that a portion of the seepage would not be collected with this approach. A preliminary estimate of up to 80% capture is assumed because seepage can be collected in the underdrains and the alluvial channels will be cut-off. There is a remaining risk that a large portion of the flow paths would bypass seepage collection.	less than 80%	77.5	1.9	0.6	greater than 17 acre-ft/yr
2	Seepage collection as presented in the DEIS report (KCB 2018), which includes pile underdrainage, collection ditches and collection ponds that cut-off the alluvium, with additional seepage control measures, such as targeted grouting of fractures (potential seepage pathways) in the foundation and pumpback wells for seepage return. A preliminary estimate of up to 90% capture is assumed because of the uncertainty in the foundation conditions. There is a remaining risk that a portion of the flow paths would bypass seepage collection.	up to 90%				greater than 9 acre-ft/yr

4 CLOSING

This letter is an instrument of service of Klohn Crippen Berger Ltd. The letter has been prepared for the exclusive use of Resolution Copper Mining LLC (Client) for the specific application to the Resolution Copper Project. The letter's contents may not be relied upon by any other party without the express written permission of Klohn Crippen Berger. In this letter, Klohn Crippen Berger has endeavored to comply with generally-accepted professional practice common to the local area. Klohn Crippen Berger makes no warranty, express or implied.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Kate Patterson, P.E., P.Eng., M.Eng.
Associate, Project Manager

KP:dl

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