KCB Consultants Ltd.

May 26, 2020

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

Ms. Victoria Peacey
Senior Manager – Permitting and Approvals

Dear Ms. Peacey:

Resolution Copper Project
Skunk Camp Tailings Storage Facility
Response to Action Item WR-23: TSF Storage Contingency
Doc. # CCC.03-81600-EX-LTR-00019 – Rev. 0

1 INTRODUCTION

Resolution Copper Mining LLC (RCM) is proposing to develop the Resolution Copper Project, an underground copper mine, using the panel cave underground mining method. The mine site is approximately two miles east of the town of Superior in the Pioneer Mining District, Pinal County, Arizona. The project mine plan includes generation and safe storage of approximately 1.37 billion tons (Bton) of tailings over a 41-year mine life. Processing will generate two physically, mineralogically, and geochemically discrete tailings streams known as “scavenger” tailings and “pyrite” tailings; scavenger tailings will account for approximately 84% of tailings produced by weight and pyrite tailings will account for the remaining 16%.

Tonto National Forest (Forest) issued a Draft Environmental Impact Statement (DEIS) for the proposed Resolution Copper Project and Land Exchange in August 2019 (Forest 2019). The DEIS identified the preferred Tailings Storage Facility (TSF) alternative as the Alternative 6 – Skunk Camp. The USFS has created a water working group to collaboratively work through issues from pubic scoping and comments on the DEIS. Water work group participants include representatives from the USFS, SWCA, RCM, ADEQ, ADWR, EPA, San Carlos Apache tribe, and USACE.

During a working group meeting on March 26, 2020 a question was raised about what contingency is included in the Skunk Camp TSF design to manage variations in the expected mine plan (i.e., split between scavenger tailings and pyrite tailings). An action item (WR-23) was assigned to KCB Consultants Ltd. (KCBCL) to summarize the flexibility/contingency in the TSF design.

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The Skunk Camp TSF design incorporates several contingencies at this stage of design to account for uncertainties in mine plan, tailings properties, and TSF operations. These include:

- variability in ore body characteristics (e.g., the characteristics and ratio of scavenger to pyrite tailings produced in the mill) and mining plan (e.g., active panels and behavior of paneling);
- In situ tailings dry density, including cycloned sand compaction density and effects of consolidation on slurry deposited tailings; and
- TSF operation, including site water management and deposition strategy for both the scavenger and pyrite tailings.

The objective of this letter is to address WR-23 and describe and quantify (where possible) the embedded and adaptive contingencies incorporated into the Skunk Camp TSF design and to demonstrate the design robustness to the above uncertainties.

2 CONTINGENCIES INCORPORATED INTO DESIGN

Contingencies in sizing the TSF and its structural components (e.g., starter dams, cycloned sand dams) include independent construction of the pyrite cells and the scavenger impoundment, storage contingency in the pyrite cells, conservative estimates of dry densities, and conservative estimates on cyclone availability. If tailings storage requirements were to increase, the contingencies currently included in the design can accommodate the extra storage allowance so the TSF can continue operating without any significant design changes.

- **Independent construction of the pyrite cells and the scavenger impoundment:** The pyrite cells are contained by downstream raised cycloned sand dams. Although they are adjacent to the scavenger beach, the pyrite cell dams are independently stable resulting in independent construction that does not rely on the scavenger:pyrite split.
- **Pyrite cell storage contingency:** A 15% contingency is added to the total required pyrite storage to account for potential variations in the expected scavenger to pyrite ratio (84%:16%) and potential upset conditions during operations.
- **Design tailings dry densities:** lower bound dry densities with limited consolidation were used for tailings areas that require storage (e.g., pyrite tailings in pyrite cells and scavenger beach). These assumptions result in an upper bound estimate of the required TSF storage volume. As such, potentially higher densities are expected in the tailings impoundments during operations due to consolidation, which would result in a smaller storage volume requirements. Thus, there is potentially additional storage for future operations with the same size facility, or the ultimate facility would be smaller.
- **Cycloned sand density and availability:** The assumed availability on the cyclone system was assumed to be 80%, which is conservative considering the experience in the region and ability to include redundancy in the cyclone system design. The cycloned sand density was taken as the upper bound from industry experience which implies that the mass of cycloned sand required to raise embankments is also an upper bound. If the actual placed density is lower,

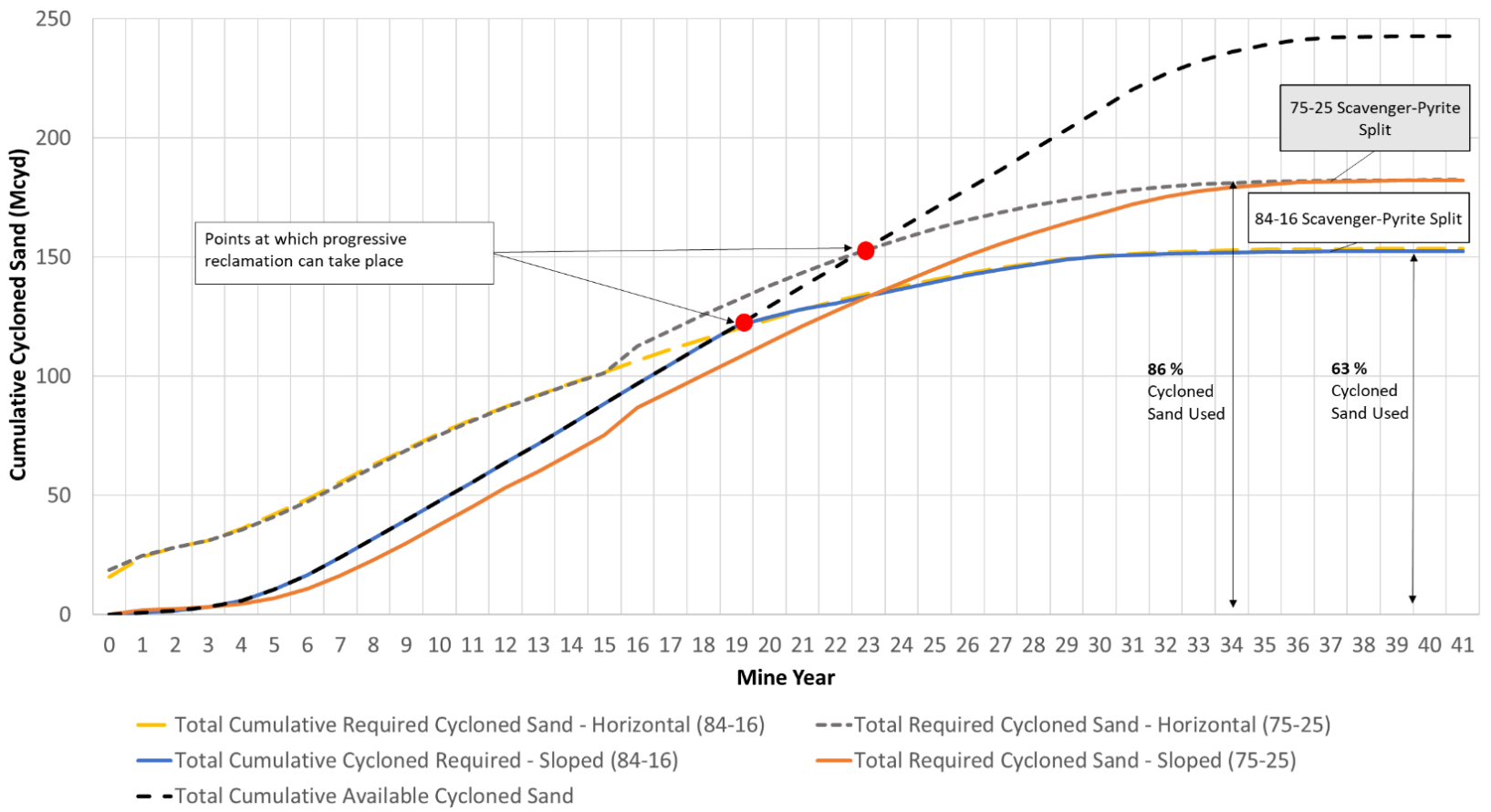
there will be more cycloned sand available for construction than estimated from the TSF staging. This provides operational flexibility in meeting cycloned sand volume requirements, particularly in early operations when cycloned sand availability may be more limited.

3 ADAPTIVE CONTINGENCIES AVAILABLE DURING OPERATIONS

Over and above the conservative design approach and contingency already built into the existing TSF design, additional potential adaptive contingencies that are available during operations and are not directly included in the design assumptions (e.g., TSF sizing) but could be utilized, if needed. Several scenarios were evaluated to determine the additional flexibility in the Skunk Camp TSF design:

- **Scavenger to pyrite mass ratio of 75%:25% (from 84%:16% included in the DEIS):** a mass balance on a less advantageous ratio was completed to assess if it would result in a cycloned sand deficit. It was estimated that 86% of available cycloned sand (by volume) would be required for a scavenger to pyrite ratio of 75:25 (compared to 67% for the 84:16 ratio used for design) (See Figure 1), but there was still adequate cycloned sand to construct the TSF.
- **Insufficient cycloned sand for embankment construction:** in a scenario where there was insufficient cycloned sand (e.g., unanticipated tailings processing issues, such as inexperienced operators, mechanical problems at the mill, or shutdowns of the cyclone house or other facilities may result in fluctuations in the cycloned sand production volume and periods of lower cycloned sand availability), there are several local borrow sources at the Skunk Camp site that are suitable for embankment construction during periods of insufficient cycloned sand availability (KCBCL 2019). During periods with a surplus of cycloned sand, the sand could be stockpiled for future use or used to build a portion of the following years' raise.

Figure 1 Cycloned Sand Requirements for Scavenger to Pyrite mass ratio of 75%:25% Scenario[1,2]



Notes:
1. "Horizontal" refers to embankments being constructed in horizontal raises that extend to the ultimate downstream face. Horizontal construction allows progressive reclamation to take place on the downstream embankment slope.
2. "Sloped" refers to embankments being constructed using sloped construction, where the downstream slope of the embankment is always maintained. The volume required for this construction methodology represents the minimum amount of cycloned sand that must be placed annually to meet the crest elevation requirement.
3. Although there is enough cycloned sand for embankment construction, progressive reclamation of the Main Embankment will be delayed in the case where the scavenger-pyrite split is 75-25.

4 CONCLUSIONS

The Skunk Camp TSF includes s conservative design approaches that are already incorporated into design that gives flexibility and additional contingency. There are also several adaptive contingencies available during operations that could be incorporated, if required. The Skunk Camp TSF design is robust and resilient so the facility can accommodate physical and operational uncertainties as well as adapt to changing conditions throughout its operating life.

5 CLOSING

This letter is an instrument of service of KCB Consultants Ltd. (KCBCL). The letter has been prepared for the exclusive use of Resolution Copper Mining LLC (Client) for the specific application to the Resolution Copper Project, and it may not be relied upon by any other party without KCBCL's written consent. KCBCL has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCBCL makes no warranty, express or implied.

Yours truly,

KCB CONSULTANTS LTD.

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

KP:dl/vb

REFERENCES

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