

Santa Cruz Technical College, Nogales
South32 Advisory Panel Meeting
April 28, 2025

Schedule

3:30-3:40 – CAP overview and meeting rules

3:40-5:30 – South32 hydrology presentation by Dr. Tomas Goode and Q&A discussion with Dr. Ty Ferre and CAP

Attendance

Meeting Facilitators (Acorn International): Ranay Guifarro (online)

South32 Hermosa Advisory Panel Members Present: Linda Shore, Trina De La Ossa, Fritz Sawyer, Jonathan Lutz, Daniel Gutierrez, Josh Rubin, Gerry Isaac, Francisco Padilla, George Wise, Lou Jeong, Eva Zuniga, and Guillermo Valencia

South32 Hermosa Advisory Panel Members Absent: Maureen De La Ossa and Michael Young

South32: Sandra Moraga, Troy Kimball, Dr. Tomas Goode

Guest: Dr. Ty Ferre

Minutes

3:30 – Greetings

Meeting is called to order

3:35 – South32 Hydrology Presentation by Dr. Tomas Goode and Q&A Discussion with Dr. Ty Ferre and CAP

- Summary preview of what will be found in the DEIS
 - Seeps and spring monitoring (85 sites)
 - Groundwater sampling and monitoring
 - VWP installation/monitoring program >125 instruments
 - Isotope studies, precipitation, spring, and well sampling
 - Understand when, how, and where water comes into the watershed
 - Spring inventory- wet/dry mapping of drainages and flow monitoring of springs
 - Ecology assessment on a biannual basis
- The preferred model is Alternative 3- Direct discharge
- The Town of Patagonia's current municipal well would increase (according to modeling)

- East of town (Patagonia) would see an increase of water levels over the first few years
- South32 is currently contacting potentially impacted well owners
 - Not all wells in the area will be impacted
- Monitoring and Mitigation Plan
 - Includes monitoring and mitigation of potentially impacted USFS wells, springs, and seeps.
 - Once there is a record of decision, South32 can engage with the Forest Service to monitor the Forest Service land
- All the water that South32 pumps out will be treated through the water treatment plant

Follow-up Questions for Dr. Ty Ferre

Question 1:

Has surface water modeling been incorporated into groundwater modeling to better understand flooding issues and potential groundwater mounding issues?

What does the modeling show regarding flooding and mounding in and around the Town of Patagonia?

A: I would say no, Clear Creek did surface water modeling that is not coupled with groundwater. The current water "routes" water using the best MODFLOW routing package, but I wouldn't say that it is a great representation of surface water processes for flood analysis.

We are where we were 2 (?) years ago. The Clear Creek model shows that the impacts of discharge into Harshaw are unlikely to have significant impacts on larger floods. Laurel's model shows that the discharge will increase the frequency of smaller events.

The Forest Service's preference for direct discharge rather than basins may limit South32's options when flooding occurs - they may have to discharge into a flooded stream.

Question 2:

Is there a potential that discharge into Harshaw Creek will mobilize naturally occurring arsenic and increase arsenic concentrations in the drinking water supply for the Town of Patagonia and surrounding communities?

A: This seems unlikely given that the added water will be high-quality after treatment. Also, the increased flows will be relatively small, so it is unlikely that there will be an increase in total mass flux.

Question 3:

How will dewatering change regional groundwater levels and groundwater flow directions over time (including at maximum drawdown and maximum area of impact) in the San Rafael Valley, in the Patagonia Municipal Watershed, and in the Santa Cruz Active Management Area?

A: There were several detailed plots addressing dewatering and mounding. Here are some key takeaways:

- Low K helps to confine the effects relatively close to the mine. Exceptions relate to mounding beneath discharge channels.
- Low storage results in relatively large water table elevation changes compared to volume of water extracted.
- Discharge near and upgradient from the extraction speeds recovery.
- The predictions appear well-founded, but the uncertainties are probably optimistically small.

Question 4:

After dewatering, how will groundwater and surface water quality in the Harshaw Creek watershed change as groundwater flows upwards, around, and through the mine workings?

A: The chemical analyses seem convincing to me. Only antimony was found to leach, this was due to the oxidative conditions at the beginning of refilling.

- Antimony has a high retardation coefficient, meaning that it "sticks to" solids and doesn't move far.
- During mine dewatering, flow is toward the mine, which means that water is captured and treated.
- Antimony transport is limited in the shallow aquifer, which will result in minimal impacts on Harshaw Creek water quality.

Question 5:

If discharge to Harshaw Creek is maximized, will the rapid infiltration basins (RIBs) be used to accommodate additional pumping?

A: It seems that the Forest Service prefers not to have RIBs. It is worth considering options in the case of dewatering during active flooding.

Question 6:

Dewatering of the mine has been on-going since approximately October 2023. Are the regional and mine models in agreement, and what areas, springs, water wells, etc., will be dried?

A: The stated plan is to update the model every five years. I propose the following between updates:

- As suggested in my review, PEST with Null-Space Monte Carlo analyses should be used to provide a more representative ensemble of models for uncertainty quantification.
- Likelihood weighted predictions should be generated using this ensemble.
- Model weights should be updated and key L-weighted predictions recalculated annually.