EARTHWORKS

July 17, 2014

Tracy Stone-Manning
DEQ Director
PO Box 200901
Helena MT 59620-0901
DEQTintinaBlackButteCopperProject@mt.gov

Re: Black Butte Copper Aquifer Test 2014

Thank you for the opportunity to comment on the Expanded Checklist Environmental Assessment for Tintina Resources Inc. Black Butte Copper Aquifer Test 2014. These comments are submitted on behalf of Earthworks, a non-profit organization dedicated to protecting communities and the environment against the adverse impacts of mining.

The proposed project is located at the headwaters of the Smith River, one of the most treasured streams in Montana for its premier recreational opportunities, beautiful scenery and renowned trout fishing. The Smith is heavily promoted by the State to residents and visitors, and it is an important economic engine for the region – generating over $1.7 million in 2011.

The Sheep creek drainage accounts for 55% of the tributary spawning. FWP has documented rainbow trout from the Missouri River traveling 190 miles round trip to spawn in Moose Creek. This discovery demonstrates the importance of Sheep Creek in supporting or sustaining the Smith River and Missouri River trout fisheries.

Tintina's proposal involves the disposal of over 1 million gallons of arsenic-laden groundwater, by using a land application disposal (LAD) system to spray it on 40 acres of land. According to the Environmental Assessment (EA), the LAD system will result in zero discharge to groundwater or surface water. Based on that determination, DEQ has selected the agency-modified alternative that approves the LAD system.

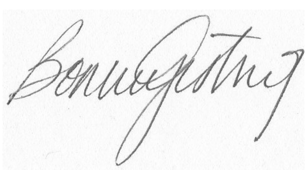
We are concerned about the elevated levels of arsenic in the LAD, and the potential for discharge to groundwater. We are unaware of any metal mines in Montana with LAD systems that have resulted in zero discharge, and most have resulted in impacts to water quality. Even the LAD system at the Stillwater mine, where there is extensive experience at land application, has resulted in the breakthrough of nitrogen into groundwater.

Tintina's proposed land application calculations are inappropriate because they are based entirely on NRCS irrigation requirements for crops, when it appears that the area includes native vegetation. It also appears that the LAD system will need to operate in October, given the 90-day time period requirement for the pump tests. Yet, Tintina's proposal fails to calculate application rates in October when evapotranspiration will be significantly lower due to colder temperatures and shorter days.

It is difficult to predict the chemical and physical impacts of LAD, as we've repeatedly seen at mines across the state. As a result, LAD should always be the last resort – particularly in such an important watershed. LAD is not the best method for disposing of pump test water. It is simply the cheapest.

Given the reasonable potential that a discharge to groundwater and violation of water quality standards could occur, we believe the EA is inadequate and the Department should require water treatment at the site to nondegradation water quality standards using proven water treatment technology (i.e., reverse osmosis), and incorporate a far more rigorous monitoring program.

Please see our more detailed comments below.



Bonnie Gestring
EARTHWORKS
140 South 4th St. West, Unit 1
Missoula, MT 59801
bgestring@earthworksaction.org
406-546-8386

**The EA is insufficient because it fails to consider the potential for a discharge to groundwater from the land application disposal (LAD) system, and incorporate an alternative that requires treatment to nondegradation water quality standards prior to disposal.**

Tintina's pump test proposal calls for the disposal of over 1 million gallons of arsenic-laden groundwater using a land application disposal (LAD) system to spray the LAD water on 40 acres of land at the headwaters of the Smith River. The EA states that there will be no discharge from the LAD system, yet we are unaware of any metal mines in Montana with LAD systems that have resulted in zero discharge.

At the Beal Mountain Mine, land application of process solution initiated in 2001 resulted in adverse water quality impacts. The 2005 Engineering and Evaluation Cost Analysis (EECA) on Beal found that "Springs located within and downhill of the land application area show appreciable increases in cyanide and selenium concentrations since land application began in 2001."[1]

At the Zortman Landusky Mine, DEQ clearly articulated the uncertainties and problems with LAD, stating, "We have learned a great deal about the natural resources of the Goslin Flats and impacts from the land application system in the last two years. Even with all of the work that has been completed, the knowledge base remains fragmentary, far from conclusive, and lacks the predictive level of completeness, accuracy, and precision demanded in planning and management of land application systems."[2]

DEQ further states that, "The effectiveness of the land application system remains limited. The very large volumes of effluent applied to a shallow soil solum prevent the soil from being fully effective in decontaminating the percolating effluent - the residence time is simply too short for the soil system to be effective and volume of soil material too limited for reaching the potential for decontamination.

Although the application rates were set to prevent runoff at Zortman (Spectrum Engineering, Inc., 2006), the LAD system has resulted in surface and groundwater impacts. According to the 2012 Landusky Total Maximum Daily Load (TMDL), past application has caused elevated cyanide, nitrate, selenium and other metals in shallow groundwater and inchannel seeps, springs and ponds In Ruby Creek below the Goslin Gulch confluence.[3]

There are 43 selenium results for current condition sites on Ruby Creek, with 30 of these coming

---

[1] Draft EECA, Beal Mountain mine Engineering Evaluation/Cost Analysis, Prepared for USFS Northern Region, September 2005.
[2] MTDEQ, Memorandum from Scott Fishery, EMB – DEQ to Warren McCullough, et al., Goslin Flats Summary and 2003 Field Work Program., 6.25/7.28, 2003.
[3] Montana DEQ, Landusky Metals TMDL and Framework for Water Quality Improvement plan – Appendix F. p. F-45.

from monitoring site R-22, a spring discharging into the channel bottom. All results from site R-22 exceed both the Chronic Aquatic Life and Acute Aquatic Life criteria, and the Human Health criterion for selenium, requiring a selenium TMDL for Ruby Creek. The water quality for site R-22 probably reflects that of the shallow aquifer beneath the LAD area.[4]

At the Kendall Mine, a 1991 LAD event occurred to dispose of excess process water caused by rainfall. Over chlorination of the water killed the trees in this area. Hillside slumping occurred as a result of over saturation of the soils and death of the trees. A new LAD area was selected in Mason Canyon to avoid the slumping. Monitoring at KVSW-7 below the LAD area in 1994 indicated discharge to surface water from LAD into Mason Canyon.[5]

Even at the Stillwater mine, the LAD system has resulted in the break through of nitrogen into groundwater.[6] According to the Revised Water Management Plan, "When the LAD system operated, water may have been applied at greater than agronomic rates. The nitrogen concentrations in ground water monitoring wells fluctuated about 1 mg/L seasonally, with higher concentrations corresponding to the flushing of nitrogen from the subsoil beneath the root zone to the ground water system. These fluctuations indicate that during operations some nitrogen from LAD seasonally accumulated in the root zone and subsoil. Nitrogen also likely accumulated in the subsoil during operations from use of the percolation ponds. At one point, the increased nitrogen and salts content in ground water monitoring wells down gradient of the percolation pond was up to 4 mg/L nitrate-nitrogen and 150 µmhos/cm conductivity. Since the Hertzler Ranch LAD system was commissioned in 2003, LAD at the Stillwater Mine has ceased and use of the percolation ponds has decreased. Recent ground water monitoring data indicate that nitrogen concentrations have returned to near baseline levels at the mine (SMC 2011b. The agencies have concluded that the return of water quality to near baseline levels demonstrates that any accumulated nitrogen from percolation and LAD has flushed through the subsoils and ground water. The agencies believe that a similar response between soils and ground water would occur at the Boe Ranch if the Boe Ranch LAD system is implemented and used as the primary water disposal system for the East Boulder Mine during operations and closure."

If DEQ believes that LAD with zero discharge can be achieved in the proposed Tintina pump test, it should provide an authoritative report that provides that data. The Montana Environmental Policy Act (MEPA) requires disclosure of all known and reasonably foreseeable impacts of proposed actions affecting the human environment. The EA should consider the potential for discharge to groundwater, and incorporate an alternative that requires treatment of pump water prior to disposal.  LAD should only be used as a polishing agent. It shouldn't be the primary treatment for toxic pollutants such as arsenic.

**Tintina's proposal contains insufficient baseline data to determine the potential affects of land application from the YNL-B zone.**

---

[4] MTDEQ, p. F-47
[5] CR Kendall, DRAFT EIS, 3/25/2009.
[6] MTDEQ and U.S. Department of Agriculture, Final Environmental Impact Statement for Stillwater Mining Company's 352 Revised Water Management Plans and Proposed Boe Ranch LAD, May 2012.

The EA states that PM-10 will be completed below the mineralized zone in the portion of the formation known as the YNL-B, and that no wells have been completed in this geologic unit. This provides considerable uncertainty as to the water chemistry that will be discharged via the LAD system from this pump test. As a result, the EA contains insufficient baseline data to determine the potential effects of land application.

**Tintina's proposal uses inappropriate data to calculate LAD application rates, and the EA contains insufficient information to identify the potential impacts of LAD.**

Tintina's proposal states that 90 days will be necessary to conduct the two pump tests to accommodate a 30-day recovery period between the two tests. This will clearly take the pump tests into October, when cooler weather will occur and the potential for evapotranspiration will be significantly less. Tintina's proposal doesn't provide data on the peak daily ET inches for October (Table 6), and Tables 7-10 only calculate the LAD design parameters through September. The EA should analyze the potential impacts associated with inadequate plant uptake. More importantly, Tintina's proposal provides inadequate details for a scenario that includes over-winter storage of LAD water as a primary component.

**The EA doesn't analyze the potential for a large storm event to cause a release from the holding pond or contingency pond; nor does it provide a primary plan for over-winter storage of LAD water.**

According to the EA, the holding pond is designed for 110% of the maximum volume pumped during a 24-hour period. Tintina's proposal also says that it may build a larger holding pond (a contingency pond) to store water over the winter if it can't complete the pump test this summer (p. 4-20). This is inadequate, and doesn't meet modern design standards. The risks associated with storing water over the winter and into spring are considerably more significant than the temporary storage during the summer months. The large storm event that occurred in 2011 resulted in flooding conditions around White Sulphur Springs, and the overflow of the capture pond at the Zortman Landusky Mine. Montana DEQ has given technical presentations on the need for mine operations to be designed to withstand these types of occurrences.[7] It is reasonable that a large storm event could occur, and the EA should analyze the potential for an overflow of the holding pond or contingency pond, and require that these ponds be designed to withstand these events. The pond should require a double liner, and leak detection system, and enough freeboard to withstand a major storm event. The EA should also incorporate additional specification for the proposed lined ponds or included any apparent measures to ensure QA/QC (Quality Assurance/Quality Control).

**The proposal contains inadequate requirements for monitoring strontium.**

The proposed pump test indicates that the LAD water will contain elevated levels of strontium. Table 11 does not include strontium within the range of constituents that must be monitored.

**The EA contains insufficient baseline data to characterize the vegetation in the LAD area, and evaluate impacts.**

[7] McCullough et al., Zortman: Dealing with Extreme Weather, Presented at the MT Tech, Mine Design, Operations and Closure Conference, May 1, 2012

Tintina's proposal states that the LAD application rates were calculated using the NRCS Irrigation Water Requirements software program for pasture grass (p. 4-11). Yet, it appears that the area also consists of native vegetation, whereby the sole use of crops for calculating application rates is inappropriate. This system is designed for crop management. No justification or rationale is provided for the use of the NRCS IWR program including importantly any examples of its successful use elsewhere to manage a LAD system to achieve zero discharge.

Collection of the following data is needed in order to determine the potential of the vegetation for removing excess water by evapotranspiration, and attenuating dissolved metal concentrations by phytoremediation.

- a map of vegetation types, percent shoot cover, percent bare ground (including rocks)
- sensitive plant species
- noxious weeds
- tree density (number per hectare/acre), average tree girth, canopy height
- average rooting depth (from profile pits)

**The proposed pump test application and EA do not include baseline data on soils within the LAD area. Without this data, the EA cannot evaluate the potential impacts of land application or determine whether any of the contaminants in the LAD (e.g., arsenic) will break through to groundwater.**

Soil Properties
a. soil morphological properties
- soil types
- soil profile horizon characteristics

b.soil physical properties
- texture
- infiltration rates
- available water holding capacity
- porosity
- bulk density
- hydraulic conductivity

c. soil chemical properties
- chemical composition
- paste pH and electro conductivity
- cation exchange capacity
- total exchangeable bases
- total organic carbon content

Soil Attenuation Capacity for Metals and Non-Metals

Theoretical calculation of the cation and anion exchange capacity is the method commonly used by the mining industry to estimate the soil's ability to reduce contaminants by LAD. However, calculation of the soils capacity for the sorption of dissolved metals (cationic) and non- metals (anionic) constituents is simplistic in that it does not address changes in chemical composition or equilibrium over time, either in rock drainage or soil solution. Changes in the chemistry and thermodynamics of both solutions will occur, altering the solute loading characteristics and soil attenuation potential. Chemistry of metalloids like arsenic is not taken into account. Calculations of soil attenuation capacity should be validated by column leach tests, and the calculation of ion adsorption isotherms for LAD soils.

**The EA provides insufficient baseline data and monitoring requirements to evaluate the potential adverse affects of dewatering and LAD.**

The proposed aquifer tests would be conducted on wells located north of Dry Creek. Tintina proposes to pump up to 1.2 million gallons of groundwater from PW-8 over the course of the 30-day period. According to the EA, water monitoring locations on Dry Creek include springs SP-2 and SP-6. It appears that there are no surface monitoring sites until the confluence of Dry Creek with Coon Creek. Additional surface and groundwater monitoring sites are needed to evaluate the potential impacts of the proposed actions.

Tintina's proposal calls for five lysimeters to be located throughout the LAD area as monitoring devices. However, in the event there is water in the lysimeters, a discharge to groundwater will have occurred. This approach does not prevent a discharge from occurring, it simply identifies an impact after it has occurred.

**The EA fails to consider cumulative impacts.**

The EA states that there are no cumulative impacts, yet Tintina's proposal states that it may also do further pump tests at PW-6 and PW-7 from its previously approved exploration permit, and use the disposal plan analyzed within this EA (p. 4-6 of Tintina's proposal). The EA should disclose the location of these additional wells, the amount of water that could be pumped from these wells, and any potential cumulative effects.