STATE OF COLORADO

Simmons - DNR, Leigh <leigh.simmons@state.co.us>

M2014045, AM-1, Review memo

1 message

Simmons - DNR, Leigh <leigh.simmons@state.co.us> Fri, Jul 23, 2021 at 2:00 PM
To: Elliott Russell - DNR <elliott.russell@state.co.us>

Elliott,

My memo is attached. I will be on annual leave from now until the week beginning August 2, but will be happy to discuss it further with you when I return to work.

Leigh Simmons
Environmental Protection Specialist

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

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2 attachments

M2014045_AM1_LDSMemo_1.docx
158K

M2014045_AM1_LDSMemo_1.pdf
183K

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

Interoffice Memorandum

July 23, 2021

From: Leigh Simmons
To: Elliott Russell

Subject: Mineral Mountain Mine (Permit No. M-2014-045)
AM-1

As you requested, I reviewed the material submitted with the AM-1 application to assess the proposed plan for the handling and storage of mill chemicals. In order to familiarize myself with the site I also reviewed the archive of documents associated with M-2014-045.

AM-1 seeks to revise the operating plan for the mine to allow the use of an underground mill and associated processing chemicals, some of which are considered "designated chemicals".

There is no list of designated chemicals given in the Rules, but Rule 1.1(13) defines the term "designated chemicals" to mean:

> *…toxic or acidic chemicals used within the permit area in extractive metallurgical processing, the use of which, at certain concentrations, represents a potential threat to human health, property or the environment.*

The term "xanthate" refers to any of a group of metal salts where the anion is an ester of dithiocarbonate. The general formula is $ROCS_2^-M^+$, where R is an alkyl group and M is a metal cation. All members of the group have similar properties, including some hazardous ones such as:

- production of toxic/flammable decomposition products (primarily carbon disulfide)
- spontaneous combustion that creates toxic combustion products
- acute harm if ingested or absorbed in significant amounts through skin
- acute irritation if inhaled or absorbed through skin

As the operator has stated, xanthates have long been used in the processing of metal ores. In principle, the anionic portion of the salt adsorbs to the metal ore which increases its hydrophobicity and allows the ore to be separated from the process water and waste rock. Since the xanthate is bound to the ore, it would not be expected to be present in the waste in high concentrations (this has been borne out by the testing completed by the operator). Xanthates break down readily under typical environmental conditions to environmentally benign degradation products.

The hazardous properties of xanthates are such that they meet the definition of Rule 1.1(13), and are thus considered "designated chemicals" by the Division.

I recommend that the following items be included in an adequacy letter:

1. The tone of the proposed revision to Exhibit C is unprofessional in places. In particular: Exhibit C, introduction, paragraph 2, sentence beginning "Additionally…". The sentence is irrelevant, and misleading. Elements from the first three rows of the periodic table are found in hazardous substances too numerous to list.

   Please revise Exhibit C, introduction, paragraph 2, to remove the sentence beginning "Additionally…"

2. Exhibit C(1)(e) states:

   The site continues to avoid the use Crydermans

   Please clarify the meaning of Exhibit C(1)(e)

3. In Exhibit C(1)(m), paragraph 5, the proposed text states:

   …Should chemicals that are different from these families already listed be used, then the operator shall send copies of the SDS sheets to DRMS, so that they can be added to the DRMS list for the site. Per discussion with DRMS personnel, in the future this process will merely consist of a letter describing the chemical, along with its SDS sheet, and will not require a technical review or amendment of the permit

   The proposed text is not acceptable. The rule requires a description of the chemicals to be utilized. The nature of the permitting process is such that a change to the operating plan (in this case a change to the chemicals used in on-site ore processing) must be proposed before it is implemented. Depending on the nature of the change, it is likely that the proposal should be in the form of a technical revision to the permit, which will require review before it is approved.

   Please revise the text of Exhibit C(1)(m), paragraph 5 to reflect the requirements of the permitting process.

4. The tone of the proposed revision to Exhibit U is unprofessional in places. In particular: Exhibit U, Brief Discussion of Amendment, paragraph 3, states that:

   Xanthate is a simple organic compound…

   This statement is neither precisely true, nor relevant. Many simple organic compounds are hazardous.

   Please revise Exhibit U, Brief Discussion of Amendment, paragraph 3, to remove the sentence beginning "Xanthate is a simple organic chemical…"

5. The tone of the proposed revision to Exhibit U is unprofessional in places. In particular: Exhibit U(5), paragraph 3, states that:

   …As this definition was written in fairly nebulous terms, nearly any existing chemical compound, including tap-water, could meet the criteria. While xanthate was not considered a designated chemical in 2015 when the original Environmental Protection Plan (EPP) was approved, it has since been added.

This statement is neither true, nor relevant. The definition of "designated chemical" has not changed since 2015, and does not include tap-water.

Please revise Exhibit U(5), paragraph 3 to remove the quoted passage.

6. Rule 6.4.21(7) requires an evaluation of the expected effectiveness of each proposed and existing Environmental Protection Plan facility.

   Please revise Exhibit U(7) to describe how the risk of fire and/or explosion will be mitigated in the Environmental Protection Facilities.

7. The Material Safety Data Sheet for xanthate appears not to have been included in Exhibit U, Attachment A.

   Please revise Exhibit U, Attachment A to include the MSDS for xanthate.

8. The following chemicals* have been included in Exhibit U, Attachment A, Table 2, but have sufficiently hazardous properties such that they meet the definition of "designated chemicals" and should be shifted to Table 1:
   a. Danafloat
   b. Clariant EF NA-77 or -78

   Please revise Exhibit U, Attachment A, Tables 1 and 2 to properly categorize designated chemicals.

*I have not been able to review the full list of chemicals included in Table 2 at this time. It's possible that this list should include more items. I can complete my review later in the adequacy process of AM-1.

References:

Emergency Response Guidebook, 2016. ID number 3342, Guide number 135

Gold Ore Processing (Second Edition), R. Dunne, Chapter 20 - Flotation of Gold and Gold-Bearing Ores, Elsevier, 2016, Pages 315-338, ISBN 9780444636584
https://www.sciencedirect.com/science/article/pii/B9780444636584000207

Queensland Department of Natural Resources and Mines, Mines safety bulletin no. 132, 27 March 2013.
https://www.rshq.qld.gov.au/safety-notices/mines/xanthates-in-mining

SNF Mining, product description: https://www.snf.us/markets-served/mining/xanthate-safety/