

September 3, 2021

**Via Email**

Mr. Peter Hays  
Division of Reclamation, Mining and Safety  
1313 Sherman St., Rm. 215  
Denver, CO 80203

**Re: Henderson Mine Point of Compliance Well MNGW-1 Low pH Status Update Response to DRMS Comments, Climax Molybdenum Company, Henderson Operations Permit No. M-1977-342**

Mr. Hays:

Climax Molybdenum Company, Henderson Operations (Henderson) provided a status update on April 7, 2021 regarding low pH measurements and additional water quality monitoring completed in relation to the Henderson Mine point of compliance (POC) groundwater well MNGW-1. In a June 30 response, the DRMS agreed with the report's findings that the low pH values in MNGW-1 and other wells in the vicinity is being caused, in part, by the unlined diversion ditch being a losing stream in the area, and provided some comments and questions. The DRMS comments and Henderson's responses are provided below.

1. DRMS Comment: *Please provide an updated figure that shows the original alignment of the No Name Gulch and state whether or not it originally flowed into the West Fork of Clear Creek.*

Response: The original alignment is shown in the attached 1957 USGS topographic map. No Name Gulch did originally flow into West Fork of Clear Creek (WFCC) upstream of the current location.

2. DRMS Comment: *Are there any surface water samples from the West Fork of Clear Creek down gradient of No Name Gulch prior to the diversion being installed? If so please provide a summary of the results.*

Response: Henderson is not aware of any water quality data prior to rerouting of No Name Gulch.

3. DRMS Comment: *Please comment on the following, the Division believes if No Name Gulch was conveyed into a lined ditch (to prevent it from being a losing stream) or drain pipe the low pH values seen in the monitoring wells would cease.*

Response: Routing No Name Gulch (NNG) to a lined ditch or drain pipe would likely reduce recharge associated with NNG in the area of MNGW-1 and other monitor wells. However, based on the observations and data presented below, Henderson does not believe that the low pH values seen in the monitor wells would cease if NNG were conveyed to a lined ditch or drain pipe.

In 2017, Henderson collected samples from several additional sampling points on the north slope of Red Mountain, including within a separate side drainage located east of NNG (see points G, H, I, J on map below). The water samples from these locations had pH values of 3.6 to 4.05, suggesting that naturally acidic run-off occurs outside of the NNG drainage and are also likely contributing to low pH conditions at the MNGW monitor wells.



It is also noted that sampling has consistently shown that the rate of flow in NNG decreases between the diversion point (upstream of the mine) and WFCC. Additionally, measurements consistently show the pH of water between these points increases. For example, on July 14, 2017 the estimated rate of flow in No Name Gulch decreased from 480 gallons per minute (gpm) at the diversion point (point 12 on the map) to 361 gpm at the point the water flows into WFCC (point 18 on the map). During the same sampling event the pH measured at diversion point 12 was 3.71, while the pH measured just upstream of WFCC (point 18) was 4.06. Bypassing this section of NNG by routing the flow in a lined ditch or drain pipe would result in an increase in the rate of flow into WFCC and it is likely the water would be more acidic than current conditions.

Low pH values at MNGW-1 have also been recorded during low flow/winter conditions, when NNG is dry or frozen, which suggests routing NNG to a lined ditch or drain-pipe may not achieve an objective of increasing pH at the monitor wells. This reflects the influence of other factors such as the aforementioned run-off of naturally occurring low-pH water from other Red Mountain gulches. In any case, directing NNG water directly into the West Fork of Clear Creek as opposed to allowing the water to naturally infiltrate/recharge groundwater and then flowing into WFCC would not achieve improvements to overall water quality. In fact, because the groundwater system has some attenuating capacity, the resulting water quality impact on WFCC could be worse if NNG was conveyed to a lined ditch or drain pipe.

4. DRMS Comment: *What would be the expected impacts to the West Fork of Clear Creek if there was periodic discharge from No Name Gulch?*

Response: Per my conversation with Patrick Lennberg with DRMS on July 14, I understand this question to be asking if there is currently a difference in water quality in WFCC as a result of No

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Name Gulch being diverted around the Mine facilities, in comparison to when NNG flowed directly into WFCC under its natural alignment. Henderson does not believe there is an appreciable difference in the water quality in WFCC due to the change in alignment of NNG.

If you have any questions, please feel free to contact me at 720-942-3255.

Sincerely,



Miguel Hamarat  
Environmental Manager  
Climax Molybdenum Company  
Henderson Mine

Attachments:

A. 1957 USGS Topographic Map of Mine Area

cc (via email):

P. Lennberg, DRMS  
G. Niggeler, Climax

**Attachment A**

**1957 USGS Topographic Map of Mine Area**



