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FROM: Jerry Raisch and Justine C. Beckstrom, Vranesh and Raisch, LLP
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DATE: July 1, 2020

RE: Update on Climax Molybdenum Company's Temporary Modification, Blue River Segment 14 (Upper Colorado River Basin, Regulation 33)

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1. Introduction.

The purpose of this memorandum is to update the Water Quality Control Division (Division) and molybdenum standard stakeholders concerning the Climax Molybdenum Company (Climax) work to resolve uncertainty associated with the 210 µg/L molybdenum water supply standard applicable in Tenmile Creek, Blue River Segment 14 (COUCBL14).

In summary, we are pleased to report that:

- Climax continues to maintain current conditions;
- Independent review of molybdenum science continues to advance, including the finalization of the Agency of Toxic Substances and Disease Registry's (ATSDR's) toxicological profile for molybdenum;
- Climax continues to evaluate potential options for molybdenum source management and treatment; and
- Climax continues to actively inform and engage stakeholders.

2. Background.

The Climax mine facility discharge is the beginning of Tenmile Creek, Blue River Segment 13 (COUCBL13). Segment 13 flows down into Segment 14 (COUCBL14) where it is joined by West Tenmile Creek. Segment 14 then flows into Dillon Reservoir. Segment 13 is not classified as water supply and therefore the molybdenum standard does not apply in Segment 13.

Segment 14 is classified as water supply. The Water Quality Control Commission (Commission) adopted the 210 µg/L molybdenum standard in Segment 14 at the 2014

Colorado River Basin hearing. The Commission also adopted a "current conditions" temporary modification at that time to allow more time for additional information to be developed concerning the standard necessary to protect human health.

A rulemaking hearing to consider revision of the human-health water supply standard for molybdenum (as well as the agriculture standard) was scheduled for December 2017. Ultimately, the Commission continued that rulemaking, and instead extended the molybdenum temporary modification in a January 2018 hearing. Climax supported extension of the temporary modification with its Plan to Resolve Uncertainty (Dec. 13, 2017) (2017 PTRU).[1]

The term of this temporary modification was extended to June 30, 2023 at the December 2019 temporary modification hearing because "the temporary modification is needed due to the delay in the release of the updated version of the Agency of Toxic Substances and Disease Registry's (ATSDR) draft toxicological profile, which will inform development of an updated molybdenum table value standard." *See* Regulation 33, § 33.63(A) (effective June 30, 2020).

3. Impact of the COVID-19 Pandemic on Operations.

The Climax mine has been impacted by the coronavirus and resulting world economic decline. Revised operating schedules are now in place incorporating significant reductions in molybdenum production for the next two years, at least. The development of these revised plans achieved the objectives of meeting lower production and budgetary requirements while continuing to operate in compliance with the "current conditions" temporary modification for molybdenum. Resolution of the molybdenum standard, based on best-available science, remains strategically and critically important to Climax.

4. Update on Plan to Resolve Uncertainty for Water Supply Standard.

Climax provided an update to the Division and interested stakeholders on June 21, 2019, and provided updates as part of the process for the Commission's December 2019 Temporary Modifications rulemaking. In the 2019 Temporary Modifications hearing, Climax submitted an addendum to its 2017 PTRU (2019 PTRU).[2] An update on the tasks included in the 2019 PTRU, as well as included in the Statement of Basis and Purpose (Reg. 33, § 33.63(A)) is included below.

[1] https://drive.google.com/file/d/1Mw33SWcTM-IT5znlrKfRGfzlU9h-kzQh/view.
[2] https://drive.google.com/file/d/1LiAd5ztuoVKZFwkjPsXUyruSAnAnMOJ7/view.

a. ATSDR Toxicological Profile for Molybdenum.

ATSDR released its final Toxicological Profile for Molybdenum, CAS #7439-98-7, on or about May 26, 2020.[3] A copy can be found here: https://climaxmoinco.com/science. Climax and the Division will need to discuss scheduling a hearing to address the molybdenum standard, as well as the process for involving interested stakeholders.

b. Further Analysis of Water Treatment Alternatives.

In its December 2019 Statement of Basis and Purpose, the Commission noted that "Climax will continue to study molybdenum source management and treatment to identify options that are technically and economically feasible." Reg. 33, § 33.63 (eff. June 30, 2020). Climax's 2019 PTRU included an update on ongoing investigations by July 1, 2020.

Climax has continued to investigate options that could be technically and economically feasible. Following the 2019 analyses (including the July 1, 2019 report from Stantec, Analysis of Molybdenum Sources, Water Management and Treatment Alternatives), Climax hired independent experts to further investigate feasibility and cost for "Alternative 1," and to investigate potential options for molybdenum source management and treatment, and to build on the Stantec work.

These further investigations have initially included consideration of the following four alternatives:

- "Alternative 1," construction of a 14,000 gpm capacity molybdenum removal water treatment plant. Further investigations into feasibility and cost showed that this is the most costly alternative that is considered technically feasible, and is the only option currently considered that could achieve the current state water quality standard for molybdenum of 210 µg/L (which applies in Segment 14). However, this alternative ignores the important consideration that there is significant uncertainty concerning the science that serves as a basis for the current standard. Further, while technically feasible, other considerations must be taken into account, such as the standard necessary to protect the use, and the technical and economic feasibility of achieving the standard. *See* C.R.S. § 25-8-201(4). The molybdenum standard necessary to protect the water supply use must be based on sound science. Based on these considerations, it is possible that a standard greater than 210 µg/L may be adopted.

[3] https://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=1482&tid=289.

- "Alternative 1A," a variation of Alternative 1 treating 14,000 gpm that is expected to achieve a molybdenum standard of 1,000 μg/L, and with less capital investments than Alternative 1.
- "Alternative 2," a 10,500 gpm capacity molybdenum removal water treatment plant (i.e., about 75% of the volume of Alternative 1). This alternative would include blending, and is expected to achieve a molybdenum standard of 4,300 μg/L.
- "Alternative 3," a 7,000 gpm capacity molybdenum removal water treatment plant (i.e., about 50% of the volume of Alternative 1). This alternative also includes blending, and is expected to achieve a molybdenum standard of 7,660 μg/L.

The cost of building and operating a molybdenum treatment plant would be a significant effort and expenditure. Costs would increase as the molybdenum concentration goal decreases, with capital costs ranging from approximately $65 million to $95 million, and annual operating costs approaching $3 million. While Climax presents alternatives that could potentially achieve the current water quality standard, Climax notes that this 210 μ/L standard does not have a basis in current science.

Climax wishes to point out that preparation of the cost information based on 210 μg/L standard should not be interpreted to mean that Climax is suggesting that a 210 μg/L standard is appropriate. To the contrary, based on information presented by Climax at the 2017 hearing concerning the molybdenum standard, Climax continues to believe that the appropriate standard to protect water supply should be considerably higher.

A number of additional alternatives have been considered by Climax and the independent experts in detail, but have limitations that suggest they are not technically feasible. The additional alternatives include "Alternative 4," which was originally presented as Option 10a in the Stantec Report, namely modification of the two existing treatment facilities, the Sludge Densification Plant and the Property Discharge Water Treatment Plant. This alternative could cause exceedances of cadmium in the discharge and therefore may not be a feasible alternative. The additional options also include "Option 14," treatment of water within mine tailings impoundments, which has significant limitations that have not been satisfactorily addressed. Further, Climax has also explored an option mentioned by the stakeholders, whether there could be economically beneficial recovery of molybdenum from the discharge water. While this option would be preferred by Climax as it could increase the amount of molybdenum recovered in the milling process, this option is not economically feasible.

Climax notes that there are additional alternatives that may be economically and/or technically feasible, but because of the difficulty associated with planning and designing a treatment facility without knowing the ultimate molybdenum standard, and since ATSDR has issued the final toxicological profile for molybdenum, Climax believes that it is more prudent to focus on the establishment of a scientifically-sound molybdenum standard at this time.

c. Analysis of "Current Conditions."

In the Statement of Basis and Purpose from the December 2019 Temporary Modifications hearing, the Commission established baseline criteria for Tenmile Creek utilizing data from May 2012 to June 2014. Using the ambient standards assessment methodology, the lower confidence limit (LCL) for the 50th percentile for the instream molybdenum concentration was established to be 170 µg/L for baseline. Climax evaluated data from July 2014 to June 2020 at the 3rd Ave Bridge in Frisco, Colorado, and determined the LCL for the 50th percentile for that data set to be 162 µg/L using the N value of 99, as outlined in Division's 303(d) Listing Methodology, Appendix B.

In the same hearing, the Commission also established the baseline LCL for the 50th and 95th percentile for effluent molybdenum concentrations of 490 µg/L and 1,610 µg/L, respectively. Climax evaluated data from July 2014 to June 2020 at Outfall 001A and determined the LCL for the 50th percentile to be 451 µg/L, and the LCL for the 95th percentile to be 1,360 µg/L, using an N value of 72.

Based on the recently calculated LCL, which is below the baseline LCL for the instream and effluent concentrations of molybdenum, Climax has preserved status quo and is within current conditions as established in the December 2019 Temporary Modification Hearing.

d. Data Collection and Monitoring.

Climax has continued to monitor at multiple locations including the following:

- Outfall 001A
- Blue River Segment 13 above confluence with Tenmile Creek
- Blue River Segment 14 below confluence with Tenmile Creek
- Blue River Segment 14 at Frisco
- Blue River Segment 17 below Dillon Reservoir

Data is available to the public on the Climax website, https://climaxmoinco.com, under the "Water Standards Resources" tab. Graphs of the molybdenum data to date are included in **Attachment 1**.

e. Stakeholder Outreach.

- June 26, 2019, Climax hosted a stakeholder meeting in Summit County to present and discuss the Stantec Report concerning "Analysis of Molybdenum Sources, Water Management and Treatment Alternatives."[4]
- September 18, 2019, Climax hosted a stakeholder meeting in Summit County wherein Sandra Carey, the Director of Health, Safety and Environment of the International Molybdenum Association (IMOA), gave a presentation concerning molybdenum.[5]
- November 13, 2019, Climax organized and participated in a conference call with the Division and stakeholders in preparation for the December 2019 Temporary Modifications Hearing.

In the coming months, Climax intends to organize a stakeholder meeting or call to discuss, among other things, the final ATSDR toxicological profile, as well as scheduling a hearing in the future.

5. Update on Progress Made on the Agriculture Standard.

Climax, along with Colorado State University (CSU), undertook a two-generation cattle study on-site at the Henderson Mill and at CSU's ARDEC facility, to build on a previous study on the effects of molybdenum on cattle. This two-generation study began in mid-2018.

Climax, along with Dr. Terry Engle from CSU, held a call on March 18, 2020, to discuss progress being made on the ongoing cattle studies. During this call, Dr. Engle informed stakeholders that no chronic effects of molybdenum were observed in cattle in any of the treatments, at concentrations up to 1,000 µg/L molybdenum in the drinking water. The possibility of extending or concluding the cattle studies was also discussed.

On April 2, 2020, Climax contacted the agriculture standard stakeholders to inform them that based on the discussions and comments during the March 18 call, and

[4] *See* https://climaxmoinco.com/wp-content/uploads/2019/07/Mo-Stakeholder-Update-6.26.19.pdf; https://climaxmoinco.com/wp-content/uploads/2019/08/July-2019-Report.pdf.
[5] https://climaxmoinco.com/september-2019-stakeholder-meeting/.

subsequent two-week comment period, it did not appear that extending the study would be necessary or warranted.

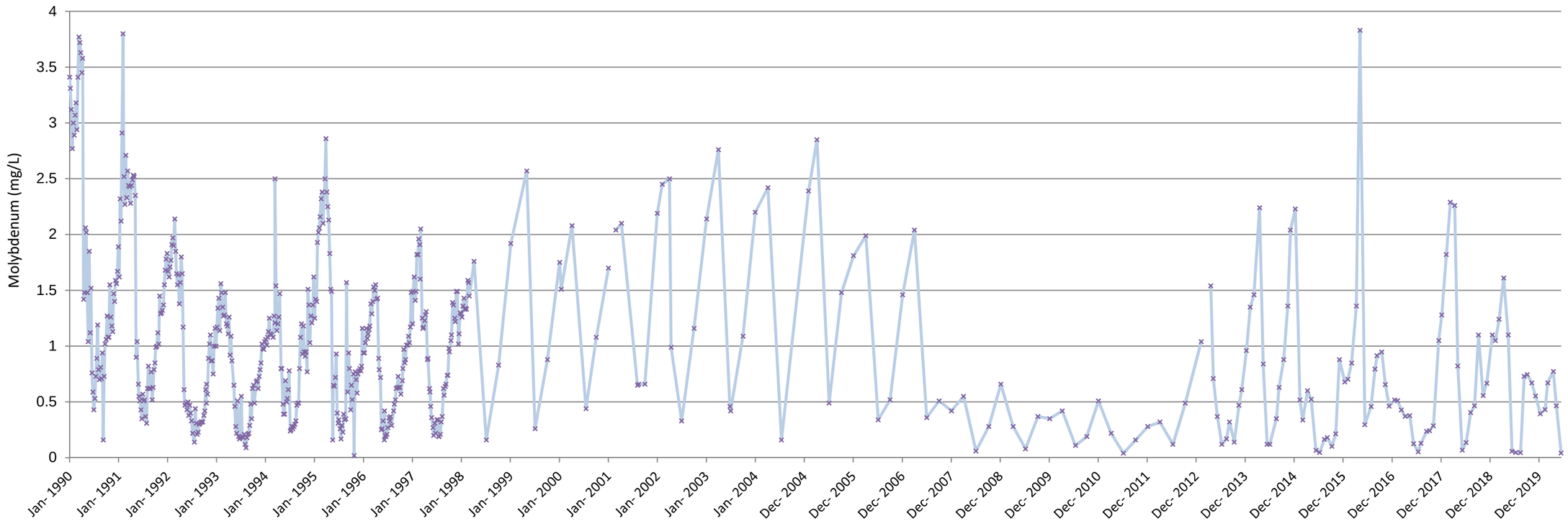
The final study report is expected in the coming months, pending delays associated with the closure of CSU in March 2020 due to the COVID-19 pandemic. After a final report is released, CSU intends to publish several articles regarding findings from the studies. Climax will keep interested stakeholders apprised of the status of any report and/or publications.

6. Conclusion.

Climax will work with the Division on next steps advancing a proposal for a scientifically-sound water quality standard for molybdenum.

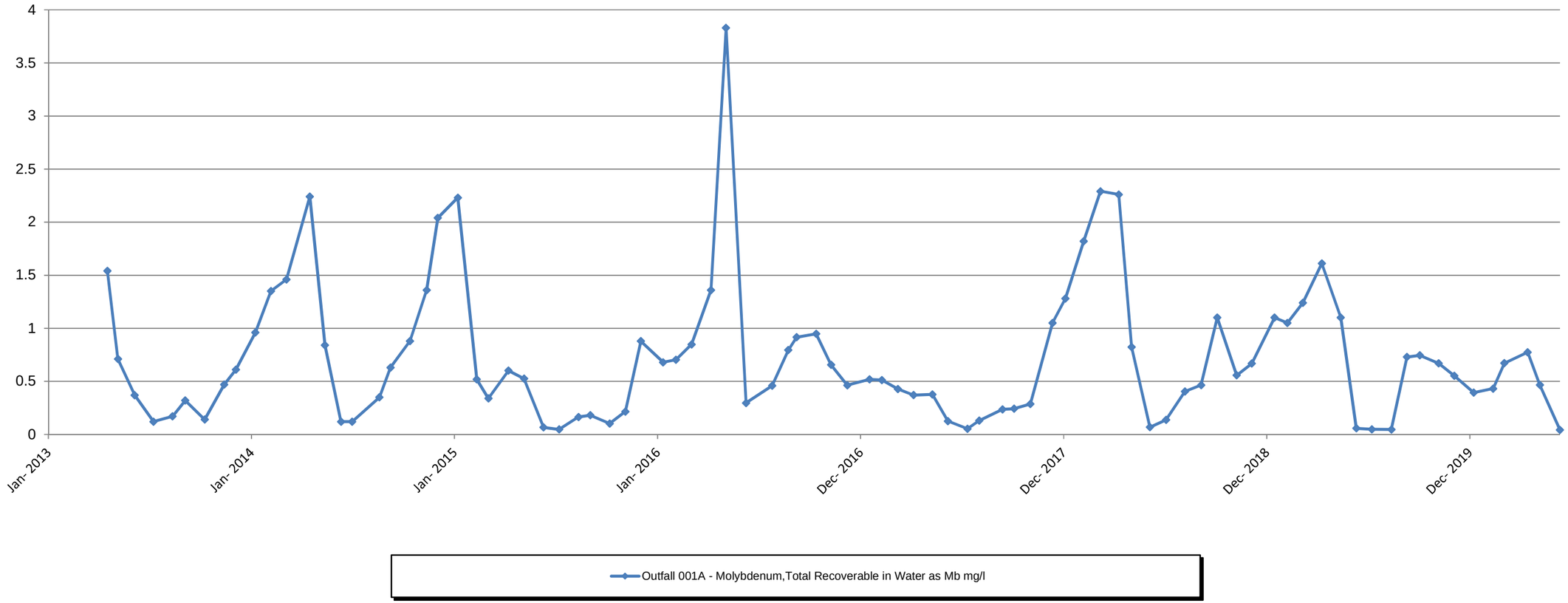
Attachment 1

Graph 1
Outfall 001A Molybdenum Concentrations - 1990 to 2020

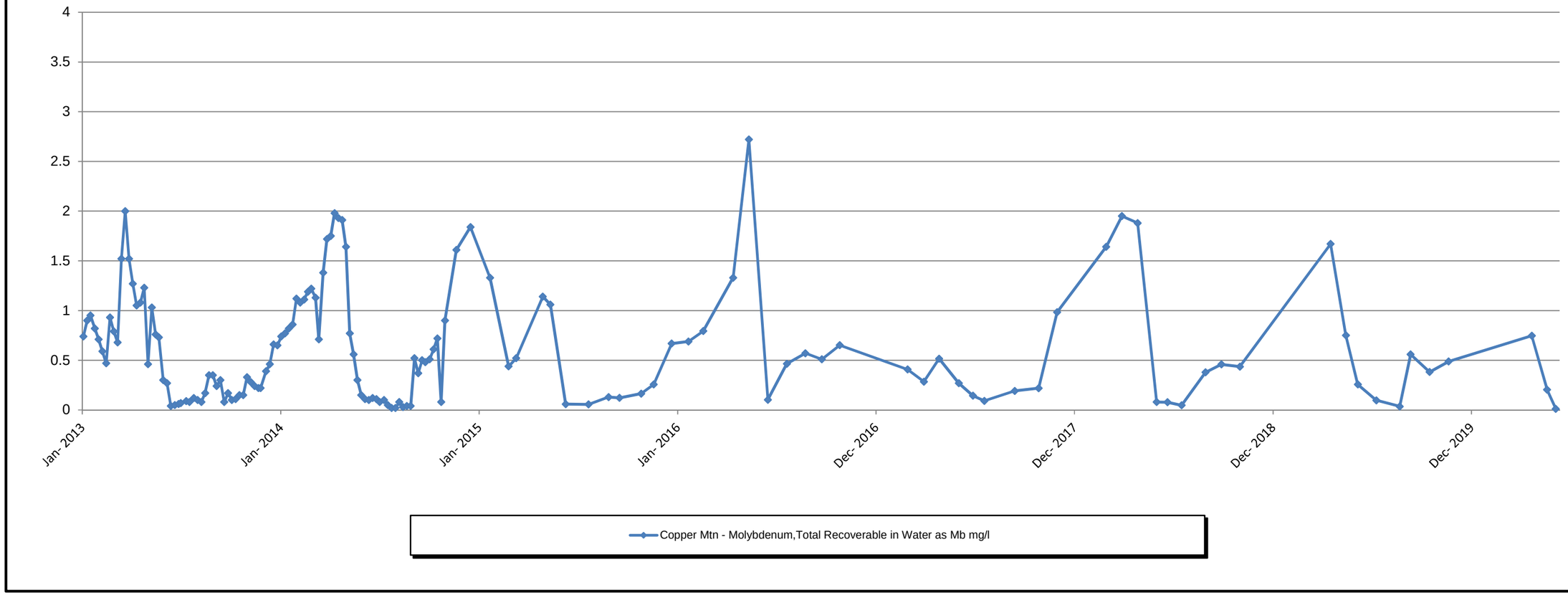


*Results shown are Total Recoverable from 1990-2001, Total from 2001-2013, and Total Recoverable from 2013-Present

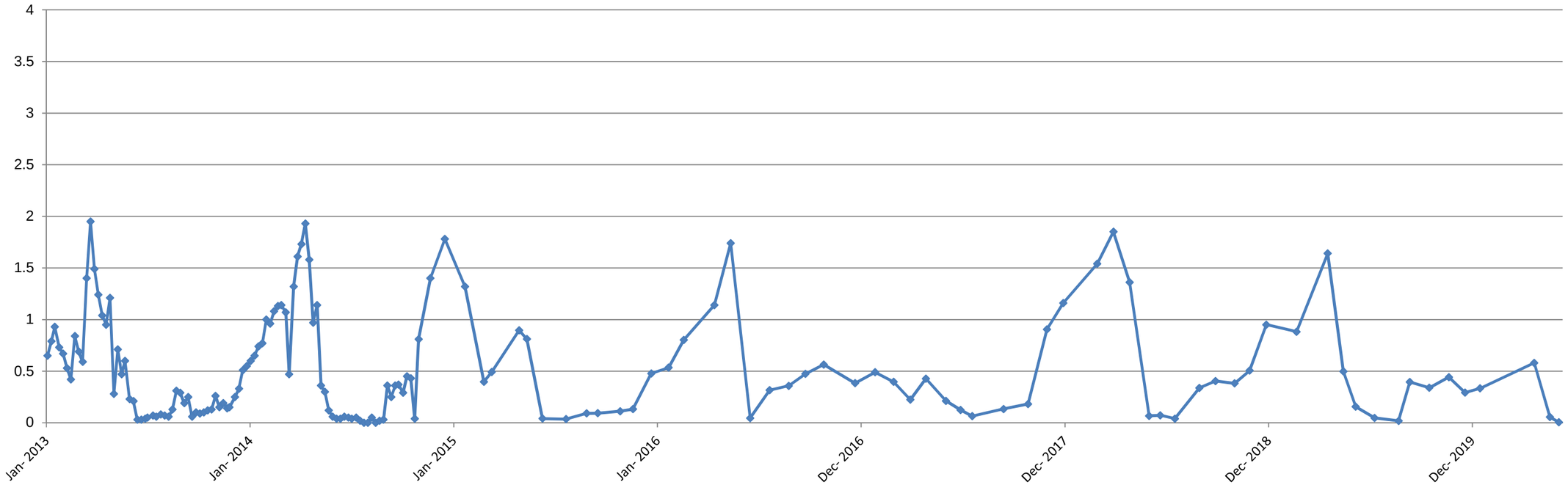
Graph 2
Outfall 001A



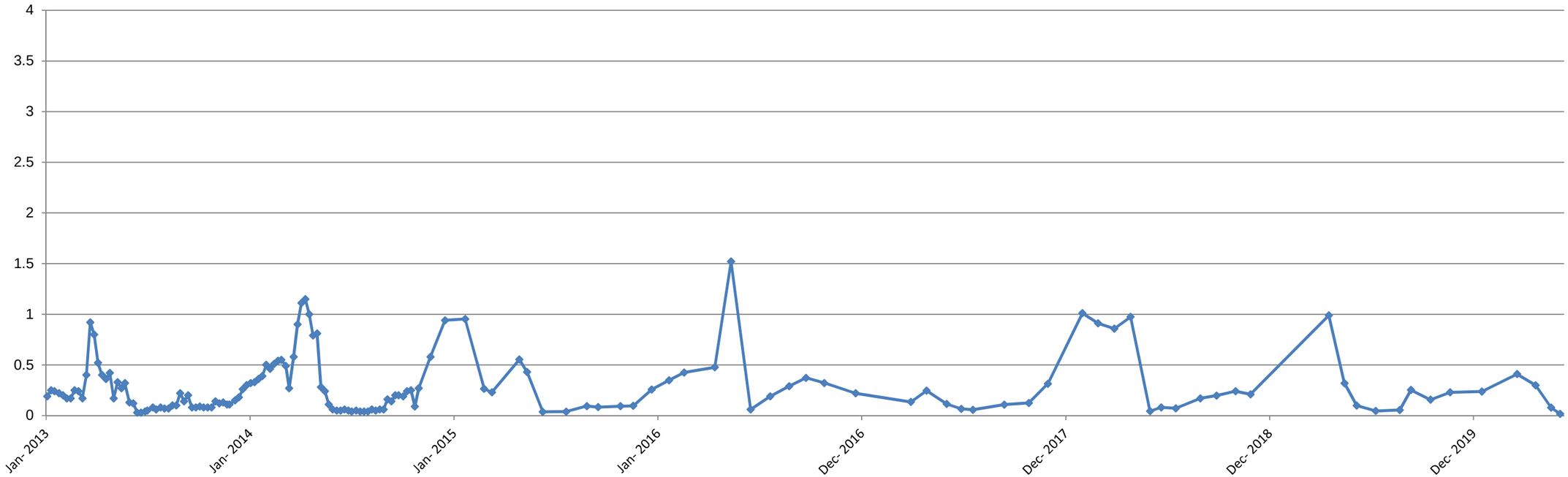
Graph 3
Blue River Segment 13 above confluence with West Tenmile Creek



Graph 4
Blue River Segment 14 below confluence with West Tenmile Creek



Graph 5
Blue River Segment 14 at Frisco



Graph 6
Blue River Segment 17 below Dillon Reservoir