



Alaska Department of Environmental Conservation

Waterbody Determination Paper

Tributary Creek, Admiralty Island, Alaska

Lead Determination

Category Recommendation

Waterbody Name: Tributary Creek

Category recommendation: 4b

Water Quality Standard Affected: Toxic and other deleterious organic and inorganic substances for fresh water uses

Designated Use Affected: Aquatic life - chronic

Pollutant: lead

Executive Summary

This document describes the data analysis and conclusions reached in evaluating Tributary Creek for the 2022 Integrated Water Quality Monitoring and Assessment Report (Integrated Report). Based on analysis of dissolved lead data from 2017-2020, Tributary Creek exceeds the impairment threshold for the toxic and other deleterious organic and inorganic substances standard for the freshwater aquatic life (chronic) designated use. Tributary Creek was included in previous Integrated Reports in Category 3.

Tributary Creek is located within the project area for the Greens Creek Mine, operated by Hecla Greens Creek Mining Company (HGCMC). Multiple state, federal and local permits apply to the mine. The Department of Environmental Conservation (DEC) oversees the Division of Water Waste Management Permit (2020DB001, effective February 20, 2020) that applies to this determination.

Tributary Creek is recommended for inclusion in Category 4b of the 2022 Integrated Report. Best management practices enforceable through the Waste Management Permit are expected to result in attainment of Water Quality Standards (WQS) for lead within a 10-year timeframe (by 2030), which is two permit cycles from the effective date of the current Waste Management Permit. This document describes the applicable requirements.

1. Identification of segment and statement of problem causing the impairment

A. Segment description

Tributary Creek is located on Admiralty Island near Juneau in southeast Alaska. Tributary Creek headwaters are located near HGCMC tailings disposal facility (Table 1 and Figures 1 and 2) and the outlet flows to Zinc Creek which terminates in Hawk Inlet.

Table 1. Basic waterbody information

Assessment Unit ID	AK-10204-004
Assessment Unit Name	Tributary Creek
Location description	Admiralty Island, Greens Creek, Alaska; Hydrologic Unit Code 12: 190102040801
Water Type	Stream
Length of impairment	0.83 miles
Time of impairment	Year round
Latitude, Longitude	58.1061, -134.7455

B. Impairment and pollutant causing impairment

Tributary Creek is recommended for placement in category 4b for exceeding the dissolved lead impairment threshold for the toxic and other deleterious organic and inorganic substances standard for the chronic freshwater aquatic life designated use (Appendix A). The pollutant causing the impairment is lead.

There were 17 lead samples collected from 2017-2020 used in the impairment analysis. Concurrent hardness data was used to calculate acute and chronic aquatic life criteria. There were 5 exceedances, for a 29% exceedance frequency, of the chronic aquatic life criteria. There were no exceedances of the acute aquatic life, stock water, or irrigation water criteria. Table 2 shows Tributary Creek's dissolved lead results compared to the chronic aquatic life threshold criterion and Figure 3 shows the instances where lead concentrations exceeded the impairment threshold for the period 2017-2020.

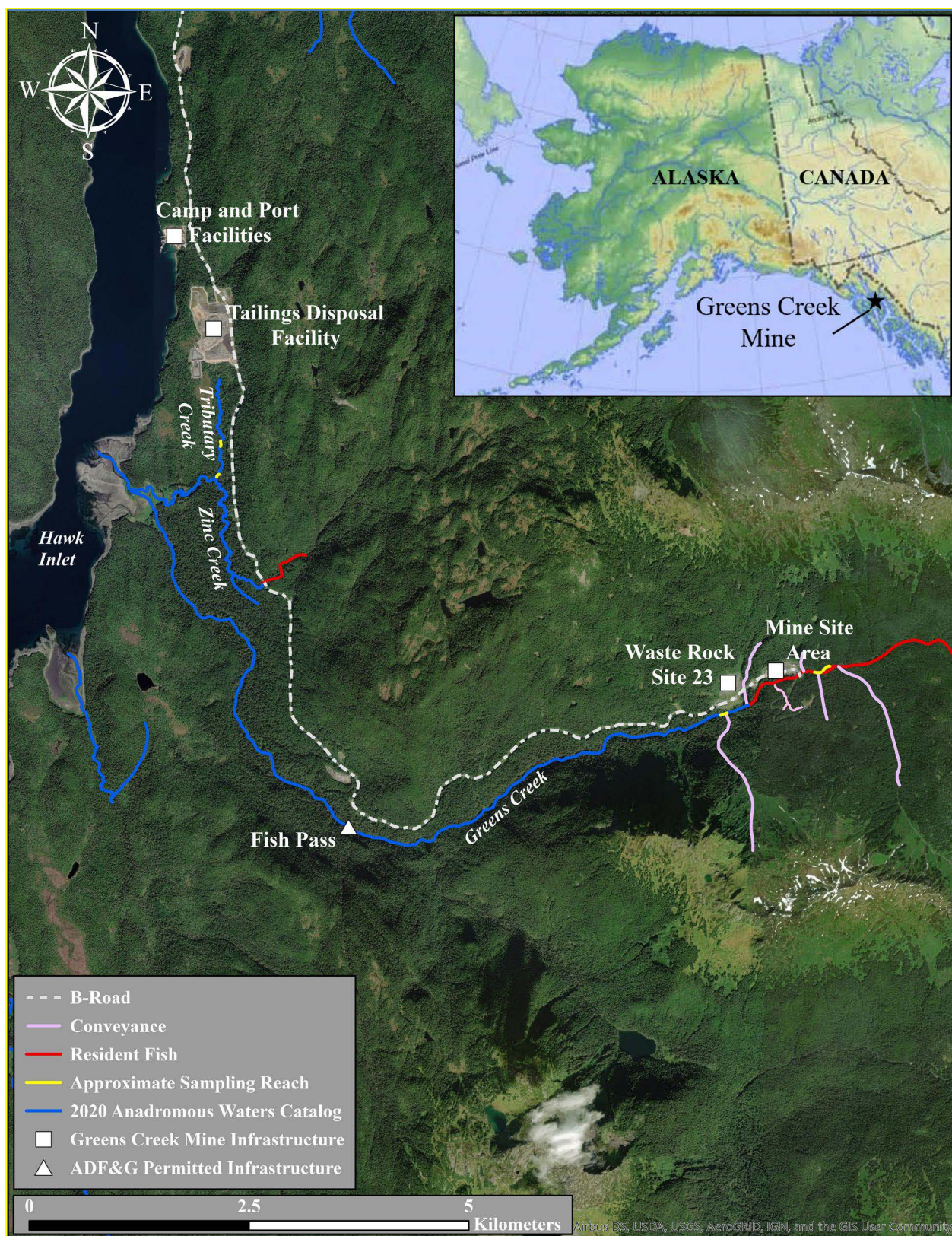


Figure 1. Greens Creek mine and Tributary Creek on Admiralty Island, Alaska



Figure 2. The location of impaired segment of Tributary Creek

Table 2. Chronic Aquatic Life Criteria raw data summary; results exceeding the criteria are in red.

Sample Date	Dissolved Lead($\mu\text{g/l}$)	Hardness dependent calculated Chronic Aquatic Life Criteria ($\mu\text{g/l}$)
5/9/17	0.247	0.691
7/11/17	0.555	0.729
9/11/17	0.505	0.802
11/7/17	0.383	0.955
5/8/18	0.221	0.573
7/17/18	0.713	0.647
9/10/18	0.556	0.832
11/13/18	0.428	0.578
5/7/19	0.526	0.418
7/15/19	1.85	1.027
9/2/19	0.514	0.830
11/4/19	1.4	0.558
3/10/20	0.127	0.602
5/4/20	0.338	0.357
7/6/20	1.17	0.731
9/21/20	0.542	0.681
11/9/20	0.431	0.615

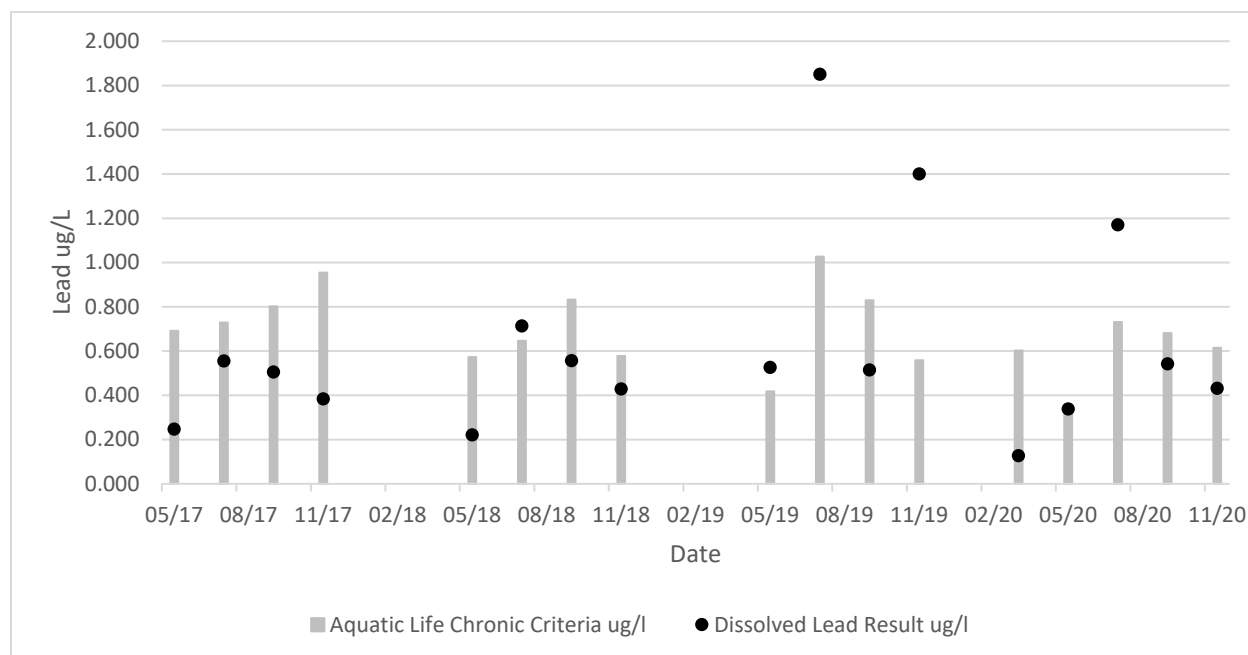


Figure 3. Tributary Creek data results and exceedances for 2017-2020 monitoring period; hardness dependent criteria are shown with bars and sample results are shown with points.

C. Sources of pollutant causing impairment

Air and water quality monitoring analysis suggest that the deposition of fugitive dust from the HGCMC tailings disposal facility is a potential source contributing to the dissolved lead concentrations observed in Tributary Creek.

HGCMC has acknowledged that fugitive dust from the tailings disposal facility may be a potential source contributing to the dissolved lead concentrations detected in Tributary Creek. However, the potential contribution from other anthropogenic and/or natural sources has not been thoroughly investigated and cannot be ruled out.

Fugitive dust are particulate emissions made airborne by forces of wind, anthropogenic activity, or both. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust. Fugitive dust is a type of fugitive emission. Fugitive dust from the mine's tailings disposal facility operations settles onto surrounding land, wetland areas, and eventually runs off into Tributary Creek. Figure 4 shows the tailings disposal facility components. Monitoring indicates that dust loss from the tailings disposal facility occurs when dry, windy conditions persist at the site. These conditions typically occur for short periods between mid-November and late March when high-pressure systems produce cold, dry weather and strong northerly winds. The correlation of excessive fugitive dust with elevated lead in water quality concentrations appears to have a lag response time and continues to be evaluated as new data becomes available.

2. Description of pollution controls and how they will achieve Water Quality Standards

A. Water quality target

The water quality target is to meet WQS for the chronic aquatic life criterion for dissolved lead within a 10-year timeframe (by 2030) from the effective date of the Waste Management Permit (February 20, 2020).

B. Point and nonpoint source loadings that when implemented will achieve Water Quality Standards

Fugitive dust emissions from HGCMC's tailings disposal facility will be reduced through source controls and best management practices required by the Waste Management Permit. There are no other permitted facilities discharging to Tributary Creek.

C. Description of controls to achieve Water Quality Standards

The proposed implementation strategy applies the controls detailed in the Greens Creek General Plan of Operations (GPO).¹ The Waste Management Permit incorporates by reference the Appendix 1 Integrated Monitoring Plan, Appendix 03 Tailings Disposal Facility Management Plan, Appendix 07 Integrated Waste Management and Disposal Plan, Appendix 11 Waste Rock Management Plan, and Appendix 14 Reclamation and Closure Plan.

HGCMC will implement BMPs to reduce fugitive dust; monitor fugitive dust, water quality and aquatic biota; report results and evaluation of effectiveness; and modify BMPs as needed if monitoring and data analysis indicates the fugitive emissions are not decreasing and the chronic aquatic life criterion for dissolved lead continues to be exceeded. Examples of actions include:



Figure 4. Tailings disposal facility

¹ Greens Creek General Plan of Operations (June 2020), see <https://dnr.alaska.gov/mlw/mining/large-mines/greens-creek/pdf/HGCMC-GPO-June-2020.pdf>

- Monitor fugitive dust generated from the tailings disposal facility
- Install wind breaks, such as wind fencing and/or other appropriate mechanical controls, on the crest of the tailings disposal facility to reduce wind speed and dust dispersal
- Limit the snow removal to active tailings disposal placement areas only, with no disturbance to the snow cover on the nonactive tailings disposal facility areas
- Cover the interim slopes with rock or other cover materials (e.g., mulch) as practicable
- Hydroseed the outer slopes, where appropriate
- Use dust suppression aids, where approved/appropriate
- Use water for dust suppression in all seasons

If the monitoring and analysis show the fugitive dust emissions are decreasing without the accompanying water quality improvement, HGCMC and DEC will pursue an adaptive management process to further investigate potential sources and modification of controls. HGCMC will discuss with DEC before modifying BMPs.

D. Description of requirements for implementing controls

Failure to implement controls described above will be deemed a violation of the Waste Management Permit. DEC may elect to enforce violations of permit conditions and controls through a variety of actions approved under state law. DEC has authority to administer National Pollutant Discharge Elimination System permits for certain sectors as required under the Clean Water Act §402(b) and 40 CFR §123.22. The Alaska Pollutant Discharge Elimination System Program Description specifies the procedures for implementation, including compliance and enforcement (chapter 9).²

If the chronic aquatic life criterion for dissolved lead continues to be exceeded in Tributary Creek, HGCMC will propose alternative fugitive dust mitigation measures biennially and submit them to DEC for approval. DEC may consider reassigning Tributary Creek to Category 5 if the WQS exceedances persist beyond the water quality target date.

3. Projection of the time when WQS will be met

Compliance with WQS at Tributary Creek is expected to be achieved within a 10-year time frame (by 2030) from the effective date of the Waste Management Permit (Table 4).

² Alaska Pollutant Discharge Elimination System Program Description. ADEC. 2011.

4. Schedule for implementing pollution controls

HGCMC operates and maintains fugitive dust mitigation management practices described above and detailed in the GPO. All pollution controls, except for monitoring, are evaluated by the mine operators during the regular operating practice. The monitoring, reporting, and mitigation schedule is summarized in Table 4 and a detailed description of fugitive dust, water quality, and aquatic biota monitoring is provided in Section 5.

Table 4. Monitoring, Reporting, and Mitigation schedule

Action	Schedule
HGCMC will conduct water quality monitoring of Tributary Creek.	Monitor the water quality of Tributary Creek as per the monitoring schedule in the approved Integrated Monitoring Plan.
HGCMC will conduct fugitive dust monitoring.	Monitor fugitive dust emissions from the tailings disposal facility as per the approved Integrated Monitoring Plan.
HGCMC will complete aquatic biota monitoring or contract with the Alaska Department of Fish and Game to complete the monitoring.	Annually
HGCMC will provide a report biannually on the water quality results and the fugitive emissions BMP effectiveness.	Twice a year (period of January to June, and July to December)
Meet WQS at Tributary Creek within a 10-year timeframe.	Water Quality Target Date (by 2030)

5. Monitoring plan to track effectiveness of pollution controls

The monitoring plan to track effectiveness of the pollution controls focuses on fugitive dust, water quality and aquatic biota.

The fugitive dust monitoring plan includes monitoring at three distinct scales (monthly, real-time, and daily) to determine fugitive dust deposition. Details are available in the GPO Integrated Monitoring Plan. Dust monitoring locations are based on predominant wind direction and are shown in Figure 5.

Visual and statistical temporal analyses will be conducted using the data collected, and if statistically significant negative changes are identified and corroborated by other monitoring data, HGCMC will conduct additional dust control measures with DEC review and approval.

HGCMC monitors Tributary Creek water quality bi-monthly (every two months), following the DEC-approved Fresh Water Monitoring Plan within the Integrated Monitoring Plan, and reports

to DEC twice yearly. A single surface water site is monitored bi-monthly for field parameters (conductivity, pH, temperature) and laboratory analytical tests (hardness, sulfate, total alkalinity, dissolved arsenic, dissolved cadmium, dissolved copper, dissolved lead, dissolved mercury, dissolved zinc). Figure 6 shows the monitoring location, Site 9.

Aquatic biota monitoring is performed annually. The monitoring occurs at the middle and lower extent of the creek, and includes sampling periphyton, benthic macroinvertebrates, and juvenile fish. Specifically, the abundance and condition of juvenile fish, whole body concentrations of silver, cadmium, copper, mercury, lead, selenium, and zinc, periphyton biomass, estimated by chlorophyll *a*, and abundance and community composition of benthic macroinvertebrates.



Figure 5. Dust monitoring, including Atmospheric Depositional Container (ADC) and real time monitoring locations



Figure 6. Water Quality Monitoring locations

6. Commitment to revise pollution controls, as necessary

DEC will determine whether the implementation of fugitive dust control BMPs are effective in reducing the lead load and achieving the chronic aquatic life criterion for dissolved lead by the water quality target date. If fugitive dust and water quality monitoring of Tributary Creek show the fugitive dust controls are insufficient to attain and maintain the criterion by the target date, DEC will consider requiring additional reduction measures.

DEC commits to working with HGCMC to improve water quality through evaluation of BMP effectiveness and an adaptive management process if progress towards meeting WQS is not being demonstrated. For example, in the event fugitive dust emissions reduction does not lead to improvement in water quality, other lead sources and alternative actions will be investigated and considered.

Appendix A Water Quality Criteria for Lead

Designated Use	Water Quality Criteria	Toxics Criteria	Status
(A) Water supply (i) drinking, culinary, and food processing	The concentration of substances in water may not exceed the numeric criteria for drinking water and human health for consumption of water and aquatic organisms shown in the Alaska Water Quality Criteria Manual (see note 5) ³ . Substances may not be introduced at concentrations that cause, or can reasonably be expected to cause, either singly or in combination, odor, taste, or other adverse effects on the use.	No drinking water criteria; No human health criteria	Not applicable
(A) Water supply (ii) agriculture, including irrigation and stock watering	The concentration of substances in water may not exceed the numeric criteria for drinking and stockwater and irrigation water shown in the Alaska Water Quality Criteria Manual (see note 5). Substances may not be introduced at concentrations that cause, or can reasonably be expected to cause, either singly or in combination, odor, taste, or other adverse effects on the use.	Stockwater: 50 ug/L Irrigation Water: 5,000 ug/L	Supporting Stockwater and Irrigation water
(A) Water supply (iii) aquaculture	Same as (11)(C).	Same as (11)(C).	Supporting Acute aquatic life for fresh water Not supporting Chronic aquatic life for fresh water
(A) Water supply (iv) industrial	Concentrations of substances that pose hazards to worker contact may not be present.	No criteria	Not applicable
(B) Water recreation (i) contact recreation	The concentration of substances in water may not exceed the numeric criteria for drinking water shown in the Alaska Water Quality Criteria Manual (see note 5). Substances may not be	No criteria	Not applicable

³ Note 5. Wherever cited in this subsection, the Alaska Water Quality Criteria Manual means the Alaska Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances, dated December 12, 2008, adopted by reference in this subsection.

	introduced at concentrations that cause, or can reasonably be expected to cause, either singly or in combination, odor, taste, or other adverse effects on the use.		
(B) Water recreation (ii) secondary recreation	Concentrations of substances that pose hazards to incidental human contact may not be present.	No criteria	Not applicable
(C) Growth and propagation of fish, shellfish, other aquatic life, and wildlife	The concentration of substances in water may not exceed the numeric criteria for aquatic life for fresh water and human health for consumption of aquatic organisms only shown in the Alaska Water Quality Criteria Manual (see note 5), or any chronic and acute criteria established in this chapter, for a toxic pollutant of concern to protect sensitive and biologically important life stages of resident species of this state. There may be no concentrations of toxic substances in water or in shoreline or bottom sediments, that, singly or in combination, cause, or reasonably can be expected to cause, adverse effects on aquatic life or produce undesirable or nuisance aquatic life, except as authorized by this chapter. Substances may not be present in concentrations that individually or in combination impart undesirable odor or taste to fish or other aquatic organisms, as determined by either bioassay or organoleptic tests.	Aquatic life for fresh water acute & chronic criteria: for information on calculating the criteria see Appendix A of the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances	Supporting Acute aquatic life for fresh water Not supporting Chronic aquatic life for fresh water Not applicable: Human health for consumption of aquatic organisms and/or water: no criteria

Appendix A. Alaska's Water Quality Standards at 18 AAC 70 (11) toxic and other deleterious organic and inorganic substances, for fresh water uses