



MANSON CREEK

GOLD MINING IMPACT ASSESSMENT

ELEMENT UNITED | [HTTPS://ELEMENTUNITED.COM](https://elementunited.com)



SUMMARY

Element's report* provides

Placer Mining Environmental Impact Assessment for Manson Creek Gold Mine on Manson Creek and Germansen River, in the Omineca Regions and Liard River areas, Northeast British Columbia, Canada

Element's leadership

Scott Lomu • President

Over 25 years in the precious elements industry. A passionate voice for responsible, humane mining. Leading the digital gold rush to provide access for all.

David Kasteler • COO

FINSERV entrepreneur who has built multiple high-value organizations. Consulted for or represented over \$750M in mining assets.

Element's purpose

Element is bringing the blockchain + metaverse revolution to gold and precious elements. We digitize precious elements by building digital economies on top of mines.

Why is it important to slow mining?

- End Hoarding
- Reduce CO₂ Emissions
- End Exploitation
- Corruption
- Free Access for All

*Document information provided by a 3rd party. Data not verified by Element United.

EXECUTIVE SUMMARY

This report was produced independently and resulted from Element United's ambition to mine differently, support future generations by protecting the planet, and reclaim land once destroyed by harmful practices, ultimately giving power back to the people most hurt by industrial mining.

Research is intended to give the reader of this report an overview of gold and its impact on the sustainability framework surrounding placer gold mining. People, planet, and prosperity underline this report's themes, starting with the introduction of gold, indicating its effects beginning in 1896 when prospectors rushed to Dawson City, Yukon, Canada.

Next, we discuss gold as part of the materials economy, from extraction to processing and refining, followed by gold's variable three-tiered market structure of jewelry, investment, and industrial use. Each link in the chain contains some reference to the frameworks measuring the impact on First Nation people, the land surrounding the claim, and opportunities provided by the mine—or their absence.

In brief, this report introduces the Kaska Dena First Nation, their five groups, territory, culture, language, and one way they continue to achieve resource management on their own. References and keywords are indicated in **bold** for the reader of this report to continue independent research on the rich history of the Kaska Dena people.

We include two relevant and documented instances where lack of government oversight resulted in extreme environmental damage, becoming at once a legal concern and a human rights issue. We follow this by outlining a few mitigative strategies supported by YESAB, but not always with the full attention of the Canadian government.

Closing this report, we offer carbon reduction data related to Scopes 1, 2, and 3. Our team conducted no on-site testing. Instead, we used prevailing and relevant data, professional SME sources to include the airline industry, product retailers, and academics, as well as EPA calculators, and reliable, annotated, public, educational, and generally accepted resources to form estimations or conclusions.

Research notes and resources are provided at the end of this document.



INTRODUCTION

Gold camps and mining spread across Canada from the early 19th century to the outbreak of WWII, when people and resources were reallocated to support war efforts. After, the gold rush continued, but by 1966, large-scale mining had ended; with it, a gold yield of over \$250 million had been unearthed, leaving great poverty and addiction in its wake.

1823	Rivière Chaudière, Québec
1858	Fraser River, British Columbia
1896	Dawson Creek, Yukon
1900s	Porcupine, Timmins, Larder Lake, Kirkland Lake, and Red Lake, Ontario. Bourlamaque, Val d'Or, Chibougamau, and Malartic, Québec.

DAWSON CREEK, YUKON

As with each discovery, before and after, news of the 1896 "Discovery Claim" in Yukon, CA, caused a massive influx of prospectors. Most sailed from California to Skagway, Alaska, trekking across White Pass and "Dead Horse Trail," down 200 miles of river to reach Yukon territory. Those surviving the journey faced starvation and physical violence, shadowed by prevalent diseases, including meningitis, typhoid fever, pneumonia, and infections.

Within a few short years, tens of thousands of people descended on Dawson City, Yukon, causing substantial soil erosion, water contamination, deforestation, and loss of wildlife—integral not only to First Nation people and culture but survival.

So intense was the Alaska-Yukon gold rush to the north that ports like Seattle and Portland felt the impact. Largely transient until then, Seattle's population and timber industry boomed. Just as First Nations in Yukon, Canada, so did the Suquamish and Duwamish tribes face disease, malnutrition, and rampant abuse.

PLACER MINING

MANSON CREEK

Canada's gold placer mining¹² (the mining of stream beds) is primarily located in Canada's Yukon and British Columbia (BC) Provinces. Placer, Spanish for "alluvial sand," refers to the process by which gravity causes the separation of materials (metal and gems) from a particular rock vein source during the sedimentary cycle. These heavy minerals then accumulate at the base of alluvial soil comprised of sand and gravel.



PC: EXPEDITION OUTFITTERS

Manson Creek's claims are found on Manson Creek and Germansen River in the Omineca Regions and the Liard River areas – Kaska Dena³ First Nation land. "Mining sites are off-road, accessible by gravel roads, forestry roads, and trails developed by gold miners to reach placer mining claims, utilizing four-wheel drive vehicles and other off-road vehicles."⁴

Both mining sites operate annually for 300 days, processing roughly 3000 cubic meters (up to 400 meters deep) of alluvial soil daily. Diesel powers fleet vehicles and equipment, including

¹ Hard Rock University. (2021). *A Detailed Look at a Local Placer Mine*. YouTube. <https://youtu.be/AV-R25IIV80>.

² T.V.R. (2020). *Exploring*. YouTube. <https://youtu.be/BQcfX7IwpQY>

³ Author notes various spellings of the Kaska Dena groups, choosing that of First Nation-sponsored ePublications.

⁴ Manson Creek Executive Summary

excavators, skid loaders, sluice boxes, conveyors, and generators⁵⁶.

GOLD EXTRACTION, PROCESSING, AND REFINING

Gold is extracted using large earth mover equipment, then processed through rough screening on-site. A notable calculation here is that if one troy ounce (31.10 grams) of gold can be extracted from 15,000 lbs. of low-grade ore⁷, then Mason Creek has the potential to pull 30-31 lbs. of gold ore daily—but by moving several million pounds of earth.

After, the finer sand ships to a warehouse for further extraction and mineral processing before being sent to licensed refiners in Winnipeg, Manitoba, Canada, where it's molded into registered ore bars achieving 999.9 gold purity bullion. From there, the gold is held in secure storage facilities.



PC: HEAP LEACHING, SRK.COM

Though an exceptional amount of energy is consumed upstream during the extraction and mineral processing stage, retrieving refined grains of gold, the grade or size of gold extracted has little impact on the refinery process downstream⁸.

⁵ Gold Claimer Brand Home. (n.d.). <http://www.goldclaimerbrand.com/>

⁶ Gold Miner's tools. (n.d.). *Gold mining tools, equipment, supplies, accessories, machinery*. New and used. Trade and export from U.S.A. <http://goldminertools.com/index.html>

⁷ TheIPMI. (2015). *Gold Refining*. YouTube. <https://www.youtube.com/watch?v=SfQxEKVx4xw>.

⁸ Norgate, T. and Haque, N. *Energy and greenhouse gas impacts of mining and mineral processing operations*. Journal of Cleaner Production, Volume 18, Issue 3, 2010, Pages 266-274, ISSN 0959-6526, <https://doi.org/10.1016/j.jclepro.2009.09.020>.

Refining⁹ requires hydrometallurgy and pyrometallurgy over several steps to separate, concentrate, and purify the gold.

- Heap Leaching (hydrometallurgy) removes gold from ore deposits and tailings with a cyanide concentration in water (spills cause environmental disasters in water supplies and watersheds alike).
- Additional solutions are used to separate and concentrate the gold, with electrolysis and other precipitation methods to return the gold to metallic form. After which, electrolysis plates out the gold. Copper, zinc, and other chemical compounds are likely employed in this process.
- Pyrometallurgy requires thermal treatment such as calcination, oxidation roasting, reactive gas refining, reduction melting, and fusion melting, stripping out silver and other metal alloys.
- Manson Creek's gold target market includes banking, alloy, and pharmaceutical industries, requiring the Wohlwill refining process to achieve 99.99% purity and chloroauric acid - toxic to skin, eyes, and health.

Due to carbon (pollution) taxation, refineries now require carbon reduction emissions at the extraction point, refusing to work with some mining companies¹⁰. Moving away from such things as diesel and toward renewables may advance carbon reduction efforts, but ecological damage, rampant corruption, and social constructs fail to be mitigated, let alone addressed.

Few refineries are willing to advertise the value or impact of harmful environmental “waste liquids” created by hydrometallurgy—fewer still conduct due diligence to identify human rights abuses¹¹, conflict, or corrupt and ecological destruction¹².



GOLD MARKETS

⁹ TheIPMI. (2015). *Gold Refining*. YouTube. <https://www.youtube.com/watch?v=SfQxEKVx4xw>.

¹⁰ *Mining.com*. (n.d.). <https://www.mining.com/>

¹¹ Dunnebacke, A., & Barry, A. (2014, February 25). *Revealed: Why Dubai's First Conflict Gold Audit never saw the light of day*. Global Witness. <https://www.globalwitness.org/en/archive/revealed-why-dubais-first-conflict-gold-audit-never-saw-light-day/>

¹² Global Witness. (2020, July). *Beneath the shine: A tale of two gold refiners*. Global Witness. <https://www.globalwitness.org/en/campaigns/conflict-minerals/beneath-shine-tale-two-gold-refiners/>

Key takeaway: Gold is a unique but volatile market because it relies on mining, refining, travel, and sale – each responsible for a carbon footprint (see p.15).

Of the top ten physically producing gold mines (China, Russia, Australia, U.S., Canada, Ghana, Brazil, Uzbekistan, Mexico, and Indonesia), the final five nations do not retain enough gold internally for top listing on gold reserves.

These and other artisanal or small-scale mining (ASM) operations generate 2500-3000 metric tons worldwide and occupy three markets: jewelry, investments, and industrial, including electronics, medical, and dental applications.

Controlling its value is the London Bullion Market, which trades in veritable secrecy, setting the price of one troy ounce of gold for the entire global economy.

Jewelry (48%)¹³

Gold is a prestige item in many parts of the world, providing generational wealth. The most significant portion of gold is made into jewelry. Other and various cultures equate gold with religious symbology, some with power or office.

Investments (31%)

As stocks plummeted during the COVID-19 pandemic, so did gold, highlighting gold's volatile trading market alongside the most recent pandemic. But with economic shutdowns, gold investments quickly rebounded, climbing above \$2000 for one troy ounce. These quick, abrupt changes to valuation reveal how gold markets adjust to global goods trading—or a lack thereof. Gold has since devalued, but it often fluctuates due to the breadth of the market it occupies.

Industrial (electronics, dental, medical) (21%)

Gold is a noncorrosive conductor, working efficiently with lower voltages. Made less expensive, producers electroplate (bind) palladium with gold using CuSO₄ (Copper Sulfate), which is highly toxic to humans, and our environment.

¹³ Author notes: Some estimations suggest greater percentages for jewelry, and lower percentages for investments and industrial gold markets.



PC: APTN NATIONAL NEWS

KASKA DENA PEOPLE

DESCENDANTS OF FIVE KASKA GROUPS

Before European settlers arrived, each of the **five Kaska nations** had the freedom to travel, hunt, trade, and use resources throughout the territory. Caribou, moose, and sheep were primary food sources, supplemented by berries and fish. In many cases, this remains true to this day.

After settlement, **traditional boundaries** were redrawn to separate the five Kaska Dena groups, but the Kaska view themselves as **one nation**. Each of the five **Kaska Dena group names** refers to a specific region within **Yukon, British Columbia, and Northwest Territories**, highlighting their connection with the earth¹⁴.

DENA NAME

TU'TCOGOTENA

KI STAGOTENA

ESPATODENA

LAND CONNECTION AND MEANING

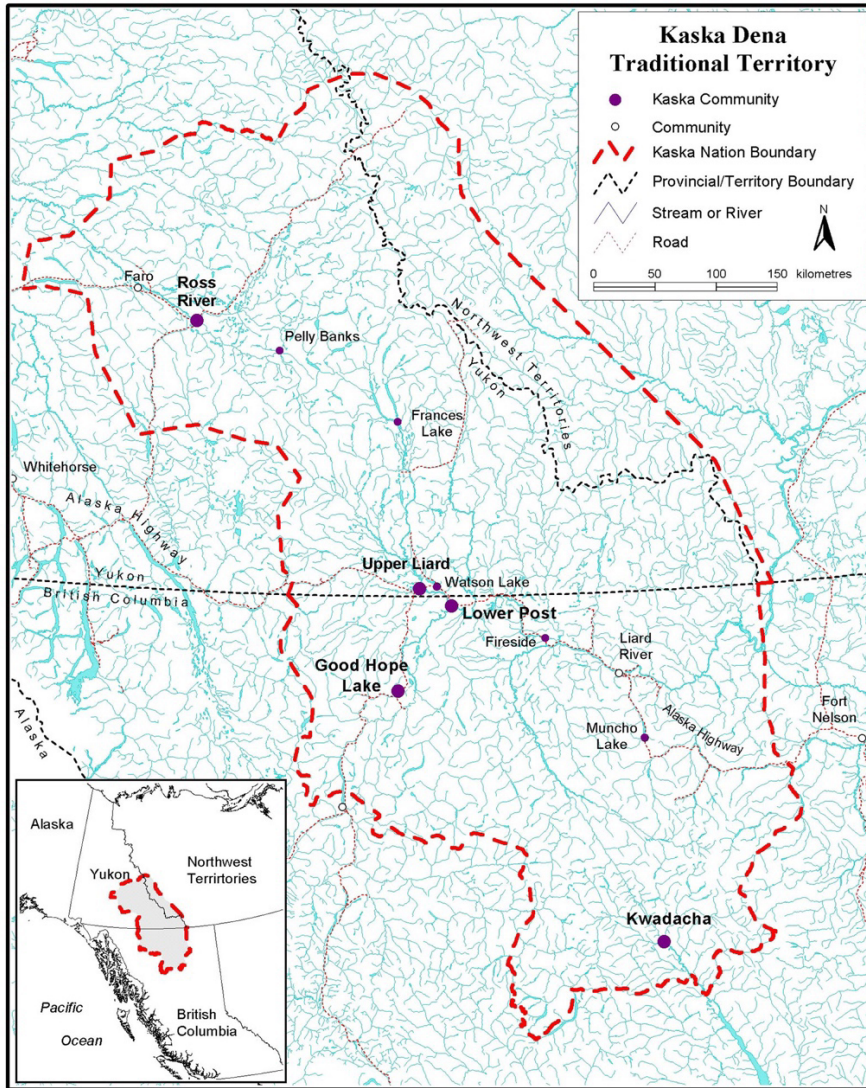
Big Water Dwellers

Mountain Dwellers

Dwellers Among The Wild Goats

¹⁴ Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

KASKA DENA TERRITORY



For over 4,000 Years, the Kaska Dena First Nation has lived in the Canadian provinces of Yukon, British Columbia, and Northwest Territories. Roughly the size of Oregon, their traditional territory spans 24 million hectares or 93,000 acres.

Their **Athabaskan language** indicates wisdom about their land and a connection to their histories. Disruptions such as climate change and mining alter that language pattern, adversely impacting **physical and spiritual health**. Contaminated waterways alter **food sources and security**, **animal behaviors**, and compromise **water security**, impacting **social health and vitality**.

CULTURE

Kaska's art takes inspiration from their **land, history, and heritage**, often comprised of natural elements like hides, wood, and antlers. Equally inspired by their land and history, their culture comes alive in **spiritually meaningful ceremonies: masks in prayers and rituals; drums representing the peoples' heartbeats**—uniting in song.

INDIGENOUS LAND GUARDIANS



Figure 1 THE NARWHAL

First Nation land is constantly threatened by developers, poachers, litter (gear abandonment), Morel mushroom foragers, climate change, and government entities. Kaska Dena initiated a community of **Indigenous Land Guardians**, trained in conflict management, who now protect caribou herds and moose from illegal hunting and even keep watch for fires (natural and otherwise) in response.

“ Such monitoring activities are a vital element to our exercise of jurisdiction and authority over resource uses, including hunting activities, in our traditional area. —Danny Case, Chair of the **Kaska Dena Council**

The **Indigenous Land Guardian's** most significant purpose is as **community builders**, embracing guides and guiding companies onto their land. But they are also **nature's census-takers**, overseeing change to their land and waters that occur in real-time as moose or herds of caribou continue to decrease¹⁵.

¹⁵ Cox, S. (2019, September 4). *Meet the Kaska Land Guardian*. The Narwhal. <https://thenarwhal.ca/meet-the-kaska-land-guardians/>



TRIPLE BOTTOM LINE

PEOPLE: AT-RISK COMMUNITY

Kaska Dena people are concerned over limited job capacities that only require hard labor, denying pipeline advancements. Additionally, these jobs don't often include post-secondary support or continuing education, further limiting potential. In late 2020 and early 2021, Kaska tribal members voiced concerns over gold mine operations that would:

- **Caribou populations.** Referring to nature as their "grocery store," Kaska Dena members noted that the caribou population numbers declined from a few hundred thousand to just 1500. Neighboring Tahltan First Nation already expressed concern over poaching by miners (See Wheaton Creek Jade impact study).
- **Reclamation capacities.** Two previous mines, Ketza and Cantung mines, either abandoned their claims or went bankrupt. The Faro mine left a legacy as not only the worst environmental disaster but a billion-dollar cleanup for taxpayers.
- **Violence against women¹⁶.** Above all, sexual violence against female tribal members is the most pressing concern. A mining company's resistance to "no-tolerance" and "anti-sexual misconduct" policies leads to harassment and violence.

“ It was common for miners to come into Kaska communities under the influence of alcohol and abuse Kaska women, often causing young Kaska women and girls to hide in the bush when they heard miners' cars approaching¹⁷.

PLANET: THE COST TO PROTECT EARTH

Canada's 'Responsible Metals Program'¹⁸ does little to mitigate Kaska Dena's concerns. For seventy years, prospectors unearthed opportunity mining in the Yukon while First Nation people met poverty and addiction. Men and women still face restrictions, abuse, and worse.

The following two examples focus on contextual geographic and environmental concerns regarding the mining companies and the Canadian government's choice or inability to protect First Nation people, their land, and their culture.

¹⁶ Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

¹⁷ Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

¹⁸ The Royal Canadian Mint. (n.d.). *Responsible metals program*. <https://www.mint.ca/en/storage-and-refinery/refinery/responsible-metals-program>

1 NWT GIANT MINE, operating between 1948 and 2004, highlights the government's failure to protect First Nation People from significant environmental disasters and cultural losses due to gold mining¹⁹.



Figure 2 GIANT MINE, THE NARWHAL

Once an economic driver for Yellowknife and the Northwest Territories, attention focused on the environmental issues left behind upon its closing. As custodians of the land, Yellowknife Dena* were forced to pay for and remove:

- Arsenic trioxide waste by demolishing and removing all buildings on the surface
- Further remediation of surface areas, tailings ponds, water management, and treatment options

2 At two thousand feet deep, glacially fed Quesnel Lake sits within an inland rainforest. Once replete with spawning salmon and trout, a mining disaster filled the lake with 25 million cubic

¹⁹ Davey, P. (2021, September 8). *First Nation signs compensation deal over impacts from N.W.T. giant mine*. Environmental Science & Engineering Magazine. <https://esemag.com/hazmat-remediation/first-nation-signs-compensation-nwt-giant-mine/>

meters of toxic wastewater and mine tailings. The responsible party is Mount Polley Copper Mine, which has done little to amend the damage after eight years.



Figure 3 MOUNT POLLEY COPPER SPILL, BUSINESS INTELLIGENCE FOR BC

Instead, Mount Polley Copper Mine filed with B.C. to continue operations as-is, with the lake now the proposed route for dumping 10 million cubic meters of tailing waste annually instead of building a new discharge pool or attempting to remediate the damage in any way.

PROSPERITY: CARIBOU AS AN INDICATOR

"In its screening report²⁰ for the project, the [Yukon Environmental and Socio-Economic Assessment Board (YESAB)] acknowledged the mine would have "significant adverse effects" on water, traditional land use, and wildlife and will contribute to the "likely decline" of the Finlayson caribou herd, a subsistence food resource for the entire Kaska Nation, spanning the Yukon and British Columbia borders.²¹"

Problematic for Kaska Dena, the Canadian government entities noted that the "size of impact" (i.e., population) deserves only a panel review rather than a complete government assessment²². Canada

²⁰ YESAB Executive Committee. (2020, October 13). *Screening report and recommendation*. The Narwhal. <https://thenarwhal.ca/wp-content/uploads/2021/02/KZK-Final-Recommendation.pdf>

²¹ Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

²² Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

disagreed with Kaska-advised monitoring strategies, concluding no correlation between mining and caribou habitat loss, incurring great tension among the Kaska First Nation people and the Canadian government.

IN CONSIDERATION OF HUMAN RIGHTS

Although Canada partners with Pembina Institute, Environmental Defence Canada, Greenpeace Canada, and First Nations communities, statistics show their pairing needs work. The same chemicals that cause lung disease, skin disorders, stomach cancers, and lower mortality rates in people are killing food resources. Indigenous people witness increased rates of human and sex trafficking and missing and murdered Indigenous women by nonindigenous people.

Accordingly, in 2003, the Yukon Environmental and Socio-Economic Assessment Board [YESAB] was formed to conduct neutral assessment processes and examine projects' environmental and socio-economic effects.

In one report, "the YESAB acknowledged [a mine] would have "significant adverse effects" on water, traditional land use, and wildlife and will contribute to the "likely decline" of the Finlayson caribou herd, a subsistence food resource for the Kaska Nation, comprised of five Dena-speaking First Nations spanning the Yukon and British Columbia border.²³"

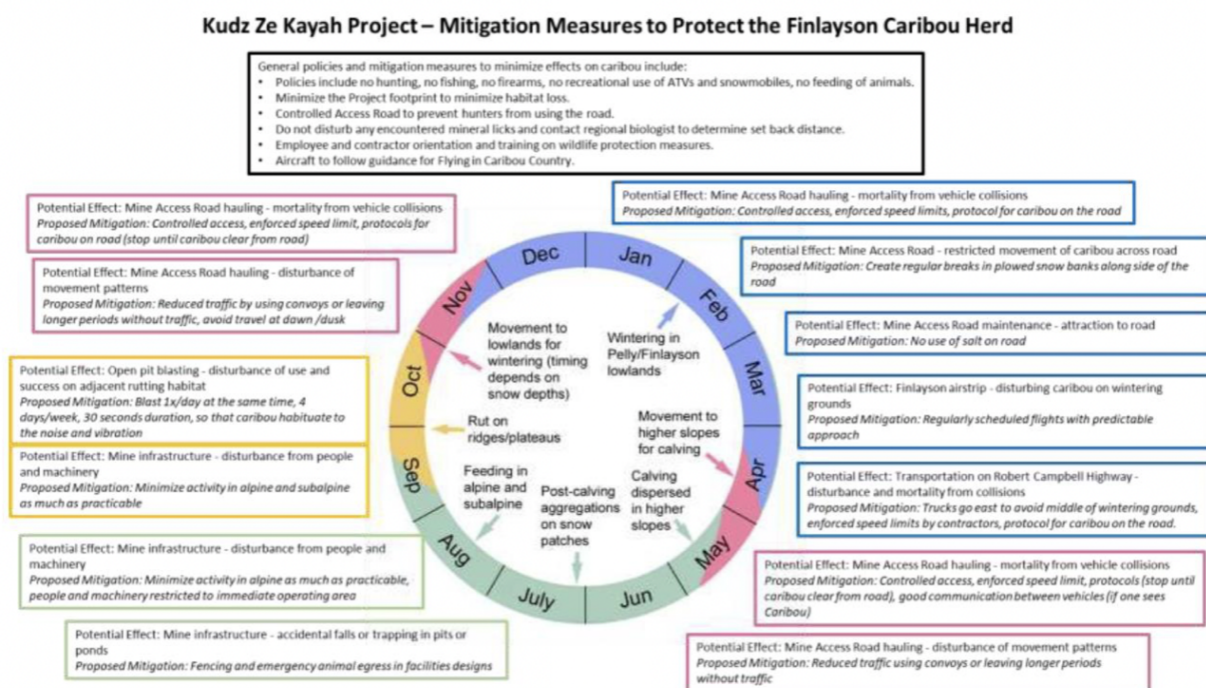


Figure 4 YESAB SCREENING REPORT, CARIBOU PROTECTION MEASURES

Citing legal codes (including federal harassment policies), the YESAB outlined monitoring

²³ YESAB Executive Committee. (2020, October 13). *Screening report and recommendation*. The Narwhal. <https://thenarwhal.ca/wp-content/uploads/2021/02/KZK-Final-Recommendation.pdf>

strategies based on relevant historical points and research, some of which are included here²⁴²⁵:

1) The proponent shall update the geomodelling during operations to inform the detailed design of the cover to reduce reducing acid production and COPI loadings from storage facilities.

14) The Proponent shall sponsor on-the-land cultural activities that promote sharing of Traditional Knowledge and practices in the Project area for the duration of the construction and operation of the mine. The camp details, location, and structure will be developed by potentially affected First Nations and span the project's construction, operational, and closure phases.

30) The Proponent shall develop standards for behavior at work and codes of conduct against sexual harassment and gender-based violence on the job site and in the broader community, including standards/codes of conduct concerning the sex trade, and shall distribute education and awareness campaign material on gender-based violence.

In response, the mining agency recognized in this report agreed to many mitigative opportunities surrounding air quality, surface water quality, groundwater quality, noise, aquatic ecosystems, terrain and soils, wildlife and habitat, heritage resources, health and wellbeing, economy, community vitality, and more²⁶. But that's not always the case.

²⁴ Kaska Dena Council. (2022, February 2). <https://kaskadenacouncil.com/>

²⁵ Author notes: changes to syntax not notated

²⁶ YESAB Executive Committee. (2020, October 13). *Screening report and recommendation*. The Narwhal. <https://thenarwhal.ca/wp-content/uploads/2021/02/KZK-Final-Recommendation.pdf>

GOLD EMISSIONS CLASSIFICATIONS²⁷

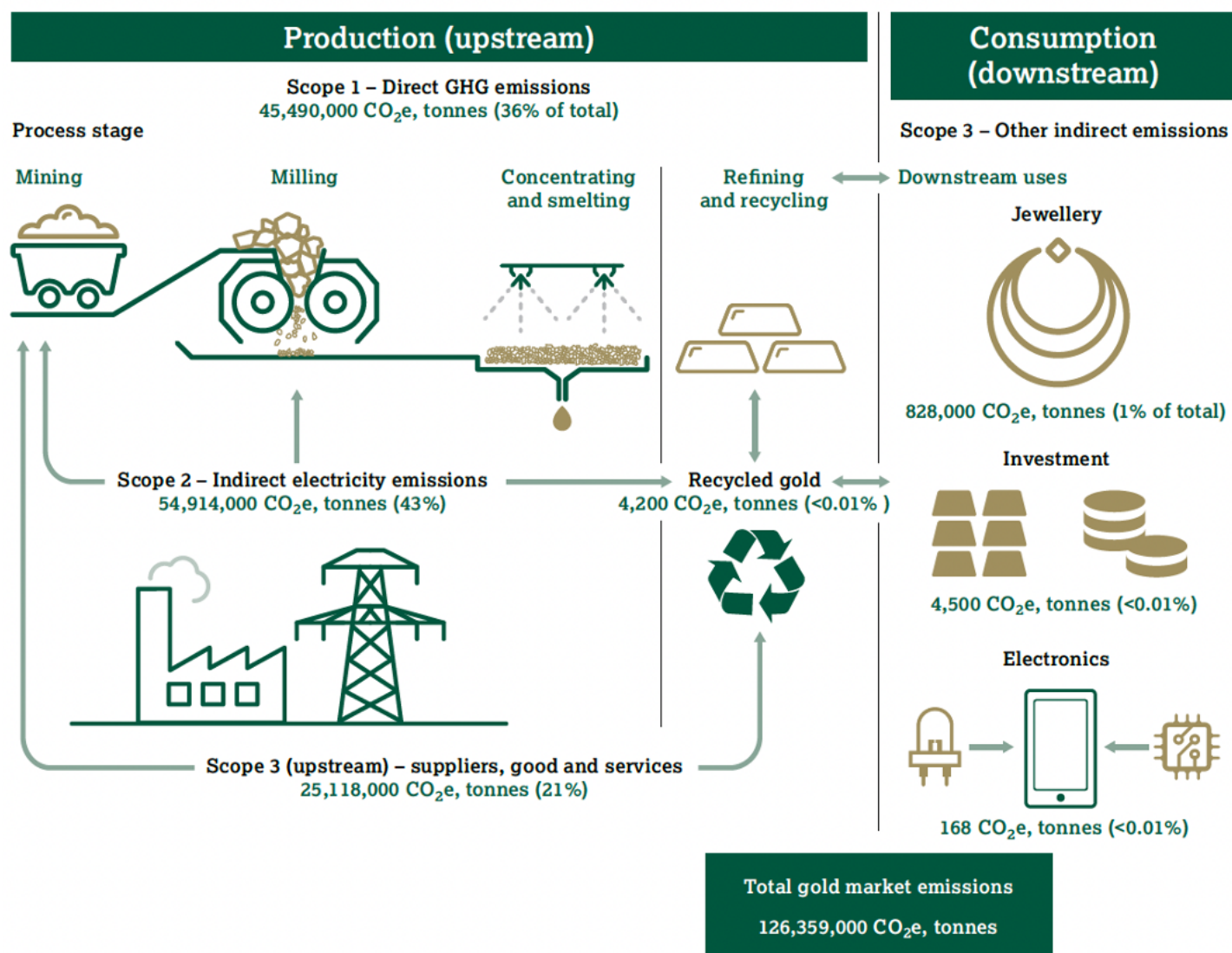


Figure 5 WORLD GOLD COUNCIL VIA KITCO NEWS

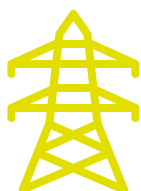
²⁷ Greenhouse Gas Protocol. (n.d.). <https://ghgprotocol.org/>

MEASURE: LIFETIME



SCOPE 1

- 190,003,968 LIFETIME MtC



SCOPE 2

- 226,949,184 LIFETIME MtC



SCOPE 3

- 116,219, 094 LIFETIME MtC

CARBON VALUE LIFETIME*

SCOPE 1

CAT 330B
KOMATSU D65-E
REFUELING TRUCK
ADDITIONAL MINING EQUIPMENT, I.E., GENERATOR
MILLING MACHINES
REFINING AND SMELTING
BIOMASS DISTURBANCES

SCOPE 2

INDIRECT ELECTRICITY

SCOPE 3

UPSTREAM
SUPPLIERS
GOODS
SERVICES
(INCL. BUSINESS TRAVEL)

(DOWNSTREAM - CONSUMPTION)

JEWELRY
INVESTMENT
INDUSTRIAL (TECH, DENTAL, MEDICAL)

MANSON CREEK MINE'S
TOTAL CARBON PRODUCTION
OVER A LIFETIME:

527,788,800 MtC

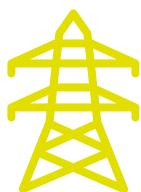
* See legal notes, pg. 23

MEASURE:
HALTED
AFTER ONE
SEASON



SCOPE 1

- 189,651,546 MtC AS A SHUTTERED MINE



SCOPE 2

- 226,528,128 MtC AS A SHUTTERED MINE



SCOPE 3

- 110,630,016 MtC AS A SHUTTERED MINE

CARBON VALUE MINE HALTED*

SCOPE 1

CAT 330B
KOMATSU D65-E
REFUELING TRUCK
ADDITIONAL MINING EQUIPMENT, I.E., GENERATOR
MILLING MACHINES
REFINING AND SMELTING
BIOMASS DISTURBANCES

SCOPE 2

INDIRECT ELECTRICITY

SCOPE 3

(UPSTREAM)

SUPPLIERS
GOODS
SERVICES

(DOWNSTREAM - CONSUMPTION)

JEWELRY
INVESTMENT
INDUSTRIAL (TECH, DENTAL, MEDICAL)

MANSON CREEK FULL
CARBON SAVINGS AFTER
SHUTTERING MINE

526,809,600 MtC

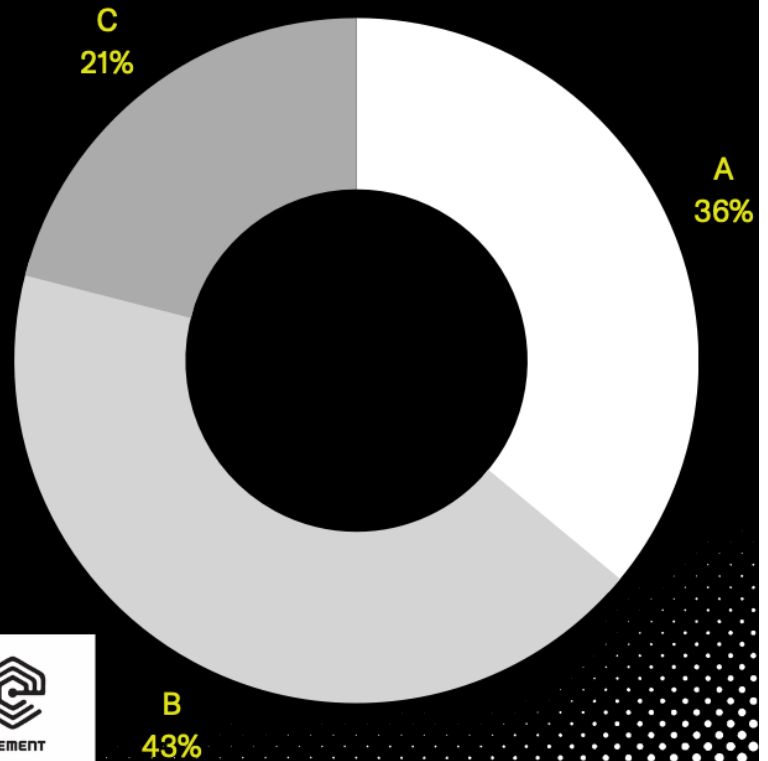
* See legal notes, pg. 23

EST. **979,200** METRIC
TONS OF CARBON
PRODUCED PER ACRE²⁸

Manson Gold Mining

Each acre produces 979,200
MtC - by activity

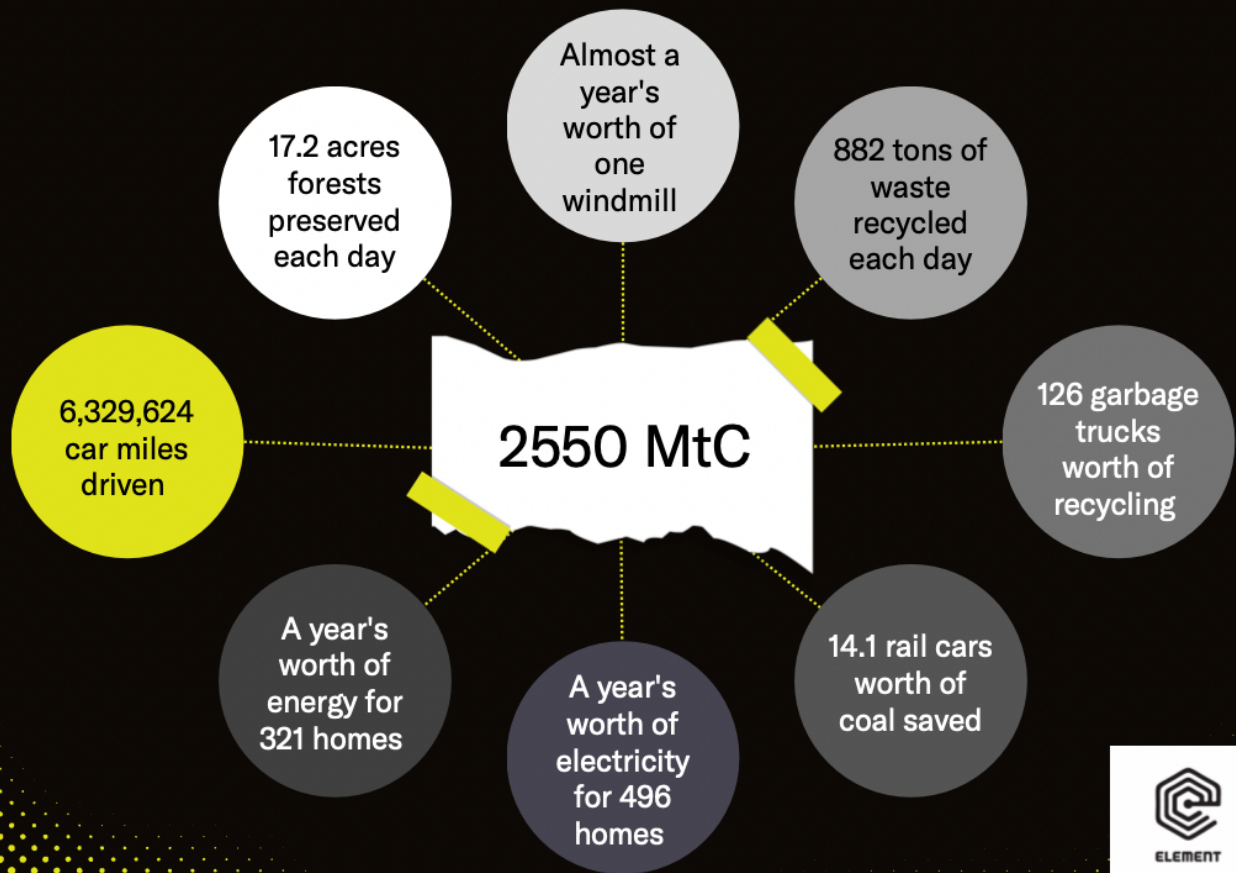
- A Scope 1 - Mining
- B Scope 2 - Electricity
- C Scope 3 - Consumption



²⁸ See legal notes, pg. 23

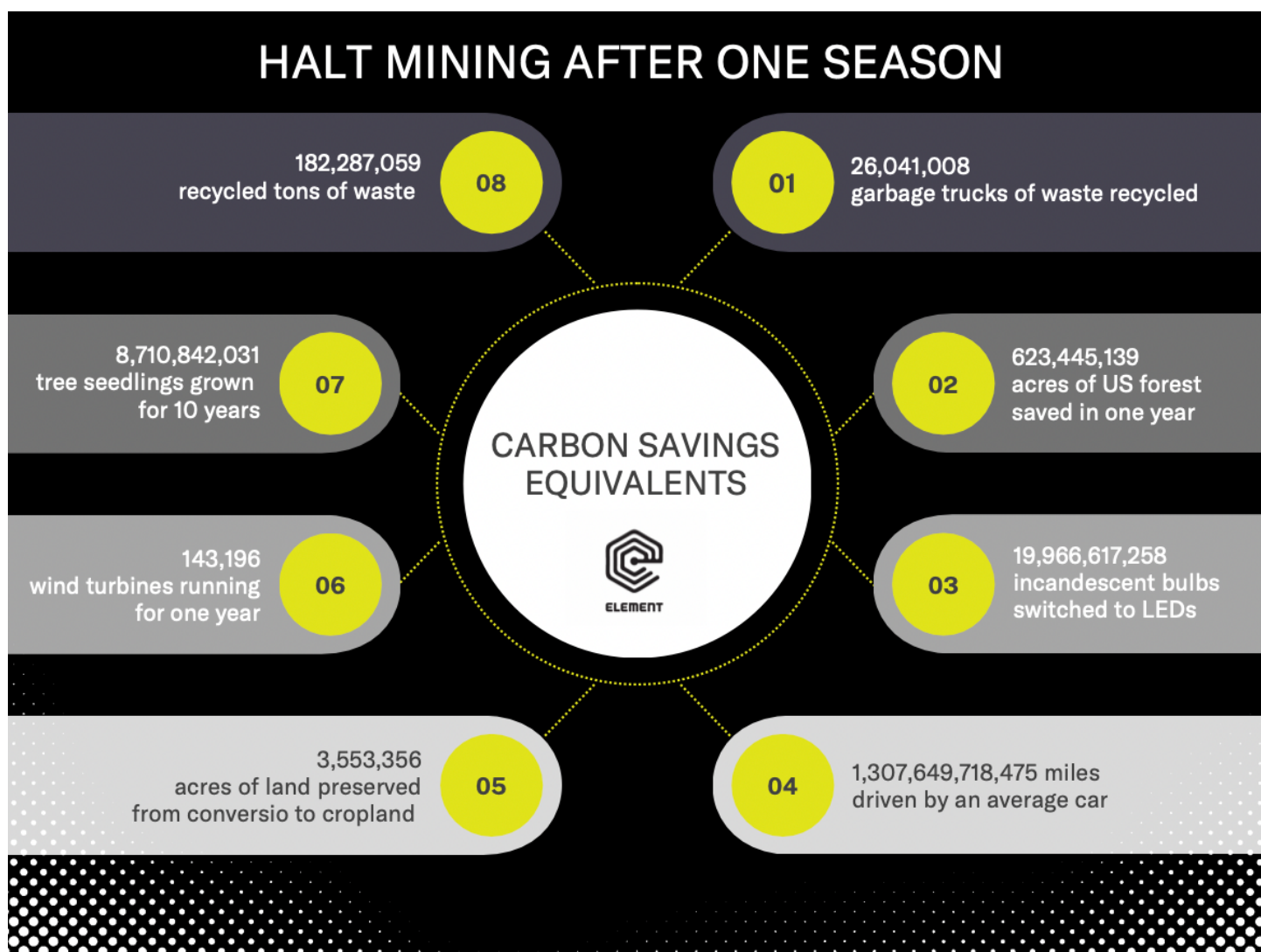
EST. 2550 METRIC TONS OF CARBON SAVED EACH DAY²⁹

DAILY SAVED CARBON EQUIVALENCIES



²⁹ See legal notes, pg. 23

SHUTTERED MINE SAVES EST. **526,809,600** METRIC TONS OF CARBON³⁰



³⁰ See legal notes, pg. 23

LEGAL NOTES

FORWARD-LOOKING STATEMENT

This presentation may contain forward-looking statements that involve substantial risks and uncertainties. Forward-looking statements discuss plans, strategies, prospects, and expectations concerning the business, operations, markets, risks, and other similar matters. There may be events in the future that we cannot accurately predict or control. Any forward-looking statement in this presentation speaks only as of the date on which it is made. Factors or events that could cause our actual results to differ may emerge from time to time, and it is not possible for us to predict all of them. We do not plan to update or revise publicly any forward-looking statements except as required by law.

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ELEMENT



RESEARCH NOTES

SITE DETERMINATION

Data was collected from the Manson Creek executive summary to make site determinations.

LAND SIZE AND MINING OPERATION

Calculations based on 539 acres of land

Significant annual potential for mining equals 900,000 metric tons, 3000/day for 300 days.

Maximum 10 tons carrying weight per load via trucking @ rate of 6.5 mpg fuel burn.

PREVAILING DATA

Mining, extraction, refining, prime retrieval rate, and all other environmental estimations used prevailing data and gathered evidence from the U.S., Canadian, and other global agencies offering similar or general findings.

Scopes 2 and 3 percentages taken from S&P Global averages, merged with estimated Scope 1 data.

SME FINDINGS

SMEs were contacted for earth mover equipment fuel capacity verification - Local Caterpillar Dealership

Diesel carbon burn was calculated at 22.38 lbs. carbon/gal. Aviation SME contacted (Pilot – Captain David Parlotz)

OWNER'S MANUALS

Where such data as a fuel burn on Caterpillars and Komatsu earth moving machinery was unavailable, a general estimation of 7.5 diesel gallons per hour was used given retrievable owner's manuals.

CALCULATIONS

Maximum machine/vehicle daily run times measured @ 12 hours.

Diesel carbon burn was calculated at 22.38 lbs. carbon/gal.

Online conversion calculators use for kWh to CO₂; Btu to kWh, Lbs. to MtC

E.P.A. calculators were employed for compiling all other CO₂ scopes.

Airplane CO₂ data was retrieved directly from booking agencies.

RESOURCES

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