

# **The meanings of reclamation “success” in the Yukon:**

## **A discussion paper**



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# Discussion paper: The meanings of reclamation success in the Yukon

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The purpose of this paper is to generate discussion about mine reclamation goals in the Yukon – what does reclamation “success” mean here? It is very difficult to improve reclamation practices if there’s not a shared understanding of what we’re trying to achieve.

This discussion paper is a part of my (Krystal [Reaume] Isbister) PhD research – I’m trying to understand what local expectations of mine reclamation are so they can be more effectively included in reclamation planning and practice. I’ve reviewed and analyzed more than 500 written submissions to recent (2010-2021) Yukon public engagements about mining and land use to create this paper. A list of sources can be found in Appendix 1. Submissions were included based on residency in the Yukon: residents, non-governmental organizations with local boards and staff\*, quasi-regulatory organizations (e.g. renewable resource councils) and local governments (e.g. First Nation Governments and municipalities). Quotes related to reclamation were identified in the submissions, compiled in an Excel spreadsheet and then grouped into themes for analysis.

The discussion paper is organized into two parts: a summary of the themes described by the written submissions and my analysis of what reclamation success means with a recommendation for how to approach reclamation going forward. Please note that the paper is only relevant to places where mining is considered potentially acceptable by Yukon people, recognizing that some places are off limits for social, cultural and/or ecological reasons.

The next step is to invite discussion on the content and analysis – what’s missing, what’s awesome, what’s surprising and what’s been misinterpreted? If you or your organization are interested in discussing the content of the paper with me, participating in the research by providing feedback, or simply have questions about the project, please contact me at [kisbiste@ualberta.ca](mailto:kisbiste@ualberta.ca).

My research has been approved by the University of Alberta Research Ethics Board (Pro#00120109). The study receives funding from the Weston Family Foundation and the Social Sciences and Humanities Research Council.

\* An exception was made to include the Yukon Chamber of Mine’s submissions to YMDS: though some board members are not Yukon residents, several submissions by Yukon residents stated that the Chamber’s comments represented their perspective.

## Executive summary

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Key findings from the submissions:

- 1) Quartz mines are risky business: Mining is generally perceived as a tradeoff between different values. Reclamation can reduce impacts and increase benefits, but there is a risk reclamation won't be funded, feasible and/or meet expectations.
- 2) History matters: Mining's past provides the foundation for assessing tradeoffs and risk; there's no consensus on whether reclamation practices have improved.
- 3) Proper reclamation means:
  - a. First Nations and local people have a prominent role in reclamation decision-making
  - b. The outcomes are acceptable, based on how closely the land is returned to the original state
  - c. Good practices are followed including respecting the land; aligning practices and objectives; progressively reclaiming sites; minimizing perpetual care; and employing local people

The written submissions provide strong evidence that quartz mine reclamation is not meeting local expectations. "*As close as possible to the pre-mining state*" was the most desired reclamation outcome and this is reflected in the Yukon Mineral Development Strategy (YMDS)<sup>1</sup>.

I do not believe "*as close as possible to the pre-mining state*" will result in reclamation practices and outcomes that meet expectations described in the submissions. The original, pre-mine state is a snapshot of ecosystems that developed over long periods of time. Quartz mining is not a reversible process. Vegetation is cleared and soils removed. Landforms such as mountains and valleys are re-shaped to access ore bodies and store materials such as waste rock and tailings. People and animals that used to travel through or make their homes in the area are displaced.

**Quartz mining is transformational and reclamation cannot reverse this transformation.  
Reclamation is a mitigation.**

I recommend we plan for change; there will be a substantial difference between pre- and post-mining conditions. Focusing reclamation planning on reversing the land towards an original state at best distracts from, and at worst denies, the reality of mining. Centering reclamation planning on the needs of future generations offers guidance on whether to approve or deny a mine. The many histories of quartz mining in the Yukon provide the foundation to understand and predict how the landscape will change. The land will not be similar to the original state, but will the new condition be acceptable and sustain life into the future?

**Proposed alternative to the YMDS recommendation:** Proponents must provide project proposals that narratively, visually and spatially describe a comparison of pre-mine conditions to the proposed post-mine conditions for each mine component. The proposal must include a detailed descriptions of how the post-mining conditions were estimated and how the conditions will benefit future generations. Proposals must clearly demonstrate how reclamation techniques are designed to produce the post-mine conditions and identify remaining uncertainties that require further research. Reclamation security amounts will be sufficient to cover the costs of a third party achieving the post-mining conditions. An assessment of potential long-term risks will be provided and long-term care included in the costing calculations.

<sup>1</sup> Yukon Mineral Development Strategy and Recommendations April 2021, p. 44

## Acknowledgements

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My heartfelt thanks goes out to all of the people and organizations that put their time, thoughts and energy into participating in public engagements around mining and mine reclamation. I hope this discussion paper provides recognition for your contributions, a broader understanding of other perspectives and a few useful ideas going forward.

## Definitions

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Many of these terms have multiple meanings – these definitions are for the purpose of this discussion paper and not necessarily representative of how the terms are used elsewhere.

**Reclamation:** the entire process of transitioning land from a mine to an alternative state or condition.

**Progressive reclamation:** completing reclamation activities in areas of a mine that are no longer involved in the mining process while active mining continues in other areas.

**Mitigation:** an action that reduces the severity of negative consequences from another action.

**Mine closure:** the point at which a Certificate of Closure is issued by the Government of Yukon to indicate the company has met all the reclamation requirements in the quartz mining license and the company is no longer responsible for the area.

**Abandoned mine:** a mine that has no corporate owner for any reason other than the receipt of a Certificate of Closure from the Government of Canada or Government of Yukon.

**Mine component:** a defined area of the mine that has a specific purpose, e.g. a heap leach facility or tailings pond.

**Soil amendment:** anything added to soil that improves the characteristics of the soil, e.g. compost.

## Abbreviations

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DRLUP	Dawson Regional Land Use Plan
YESAB	Yukon Environmental and Socio-economic Assessment Board
YMDS	Yukon Mineral Development Strategy

## Quartz mines are risky business

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Key finding: Mining is generally perceived as a tradeoff between different values. Reclamation can reduce impacts and increase benefits, but there is a risk reclamation won't be funded, feasible and/or meet expectations.

### Tradeoffs

There is a general perception that mining consists of tradeoffs between different values and there is potential for quartz mines to benefit Yukoners overall. Some believe that mining is already beneficial while others believe that local costs need to be reduced and/or benefits increased.

*"Mining comes with impacts, but impacts can be managed if the willingness is there. Mining also brings significant benefits and if it is done right it can be sustainable."* Individual to YESAB, Q#85

Some submissions refer to the inability to restore the land to its original state as a reason to prohibit mining. Other submissions agree that there is an environmental loss, but this is outweighed by the benefits of mining. Others feel that mining is not financially viable when reclamation costs are factored in. Some submissions directly state "proper" reclamation as a requirement for their support of the mining.

*"It could be said that if the mining company cannot show if and how they will properly reclaim and close the mine then, the project cannot be allowed to proceed. Yukon and Canadian taxpayers are already paying, both financially and environmentally, for inoperative and abandoned major exploration and mine sites. This cannot continue to happen."*

Kwanlin Dün First Nation Government to YMDS, Q#623

### Risk

Tradeoffs are predicted, not guaranteed. There are risks that the benefits will not materialize or the costs will be worse than expected. This is particularly true of reclamation.

*"...I can assure you that Yukoners hate the uncertainty of whether a new mine will be like almost all the rest and leave us with a massive environmental toxic mess to clean up while those investors have called bankruptcy and have left the territory."* Individual to YMDS, Q#1108

References to past mines, both by name (e.g. Faro) and in general, were very common in submissions and often used to validate perspectives on risks of inadequate reclamation. The past performance of the mining company or operator is also considered when assessing risk, especially when international corporations are involved.

*"Why are we risking damage to our environment, an eyesore on our land, negative impact on indigenous communities, and potentially severe consequence for human and animal health for this metal and by a company that has a negative track record when it comes to human and environmental rights ?!"* Individual to YESAB, Q#358

Submissions reflect an awareness that the local financial consequences of mine failure are much higher than in the past. Public awareness of this was significantly heightened by the 2019 abandonment of Wolverine Mine.

*“Yukon has a very sorry history of mining companies simply abandoning sites and leaving them to the taxpayer, previously through the federal government (think Faro) and now the Yukon government (the Wolverine mine, for example) to remediate.”* Individual to YESAB, Q#316

The technical ability to reclaim mines even when finances are available is given consideration.

*“The term ‘best practices’ is casually used in promoting projects to allay fears of environmental degradation. In our experience, ‘best practices’ need a whole lot of improvement!”*

Individuals to YMDS, Q#572

Other submissions refer to the promise of reclamation as false because the land can't be returned to its original state – this is not a risk but a tradeoff.

*“...we have all these promises ‘oh yes, we’ll do this and we’ll take care of the land and we’ll put it back the way we found it’. You can’t do that. You’re human, you know. Who do you think you are?”*

Individual to DRLUP, Q#465

Concern about environmental costs echo past experiences: loss of water quality, wildlife, healthy land, etc. Most concerns focus on planned activities, but the risk of accidents is also referenced.

*“In my view, the short and long-term negative impacts of this project far outweigh any positive impacts; and the risk of an environmental accident is far too high.”* Individual to YESAB, Q#296

Submissions often framed environmental risks within the broader landscape. There are concerns that cumulative effects of mining could exceed ecological thresholds and cause irreversible impacts within a region or watershed.

*“It is WTAY’s position that a project of this size is simply beyond the capacity that Yukon’s fragile ecosystem can withstand. While nature has the ability to recover from some level of abuse, if that level is too high or the abuse is too frequent or continuous, a critical threshold will be crossed where recovery is no longer a possibility.”* Wilderness Tourism Association of the Yukon to YESAB, Q#362

For First Nations, degradation of land poses a risk to Aboriginal rights. For Nations without final agreements, there is also risk to Aboriginal title. If the land no longer supports practices such as harvesting, rights cannot be exercised and title can potentially be extinguished. Recognition and mitigation of mining impacts on Aboriginal rights and title was emphasized.

*“Even now, as industry raises concerns about necessary regulatory requirements, Yukon First Nations are placed in a position of having to prove impacts on constitutionally protected inherent rights. In order for balance to truly be achieved, industry must learn to recognize impacts on constitutionally protected inherent rights and plan to mitigate for them.”*

Kluane First Nation Government to YMDS, Q#1002

In the context of reclamation, submissions express a need for frank and open discussion of what the costs and practical limits of reclamation are.

*“We are aware that there may be practical limits to the reclamation, imposed by various factors. We expect to have these reclamation limits fully and frankly presented to us at opportune times throughout.”* Individual to YESAB, Q#221

To highlight the importance of thoroughly considering risks, some submissions emphasize that the outcomes will not only impact today's generation but many to come.

*“A cautious approach to mining preserves society’s options. We can always decide to develop in the future, but once that decision is made, we cannot return to the pristine ecosystems and landscapes that we enjoy today. For the sake of our children and grand-children, it is much better to take a pre-cautionary approach to mining - that preserves our options for the future – and protects and promotes the cultural values and well-being of Yukon Indian People.”*

Tr'ondëk Hwëch'in Government to YMDS Q#1286

## History matters

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### Key finding: Mining’s past provides the foundation for assessing tradeoffs and risk; there’s no consensus on whether reclamation practices have improved.

With history as the foundation for assessing tradeoffs and risks, many submissions called for “truth-telling” and for the “whole picture” of mining histories to be acknowledged.

*“Assessments need to be honest and transparent in identifying historical, current and possible future negative impacts... First Nation women have not always been safe in mining related workplaces or worksites. That history, like the accumulated environmental toxicity of old mine sites such as Faro, provides the “baseline” for new development which is not a neutral beginning. Not all negative effects can be mitigated but truth-telling is the first step.”*

Whitehorse Aboriginal Women's Circle to YMDS, Q#1020

Descriptions of past mine legacies are remarkably consistent in submissions: disasters or messes. More research is needed to understand the underlying meaning of this distinction – possibly a reflection on perceived feasibility of reclamation? Disaster-type terms include “disaster”, “devastation”, “horrific aftermath”, “catastrophe”. Messes are usually qualified with a descriptor such as a “toxic mess”, “big mess”, “environmental mess” or “expensive mess”.

*“Given past mining disasters in Yukon..., what guarantees are there that Yukoners will not be responsible for the colossal reclamation that will be required when the project ends?”*

Individual to YESAB, Q#388

*“In my first years in the Yukon, the Faro mine was in full swing... Since then I have been horrified by the expensive mess that the mine leaves here.”* Individual to YMDS, Q#845

Whether disasters or messes, submissions strongly suggest “abandoned” mines remain active in Yukon society. They continue to consume local resources, threaten environmental and human health, and undermine Aboriginal rights and title. The costs and harms of mining continue to accumulate as reclamation remains outstanding. It was also noted that abandoned mines can provide an opportunity to test reclamation techniques and inform future reclamation practices.

*“The closure planning file seems to suffer from a lack of coordinated planning and momentum... so too runs the cut of deleterious and cumulative impacts on public/environmental health and safety while things poke and dither along and known priority issues are left to fester. The longer it takes, the more it is going to cost, among other things.”* Individual to YESAB, Q#251

Submissions often express frustration at the lack of mine reclamation and closure in the Yukon. Many perspectives do not distinguish between current and past reclamation practice; the mining cycle continues to end in abandonment, not closure, at great social, environmental and financial expense. The 2019 abandonment of Wolverine Mine is often used as primary evidence.

*"It is a fool's game to be stuck with the legacy impacts of Faro, Nansen, Wolverine, Whitehorse Copper (to name just a few of many)... The disgraceful record of the industry speaks for itself and there is little evidence that anything has really changed."* Individual to YMDS, Q#915

Frustration was also expressed that narratives often focus on negative legacies not improvements.

*"Yukon's mining industry is maligned with outdated negative perceptions; that mines are dirty, destroy the environment, and don't provide any benefits to the First Nation communities they partner with. In 2020, nothing could be further from the truth, and as the saying goes 'these aren't your Grandfather's mines'."* Yukon Chamber of Mines to YMDS, Q#1288

There are submissions that perceive a strong distinction from past and present reclamation practices. The emphasis in these submissions is on improvements to the Yukon's regulatory regime.

*"The mining industry is already burdened by comprehensive and complicated regulatory requirements, which are effective in making sure mining is done responsibly. The last thing the mineral industry needs is more layers of bureaucracy and more decision makers controlling its destiny."* Individual to YMDS, Q#1092

## Proper Reclamation

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Key finding: proper reclamation means,

1. First Nations and local people have a prominent role in reclamation decision-making.
2. Outcomes are acceptable, based on how closely the land is returned to its pre-mining state.
3. The land is respected and good practices are followed including aligning techniques with stated objectives, progressively reclaiming sites, minimizing perpetual care and employing local people.

### 1. Role in decision-making

Submissions indicate individuals, communities, local organizations and First Nation Governments expect their needs and desires to be included in reclamation planning and implementation.

*"NND peoples' hopes and expectations for the mine clean-up are an important consideration for the closure plan. [The company] needs to understand the expectations of local people so that clean-up will return the land to a condition that people will be happy with. [The company] also needs to understand how local people expect to be involved in the clean-up."*

First Nation of Na-cho Nyäk Dun Government to YESAB, Q#240



If decision-making on closure objectives is not outlined during assessment, the submissions call for the timelines and process for these decisions to be clearly described. The need to treat closure as a long-term process is highlighted; concerns will arise after the initial closure plan is completed.

*“CPAWS Yukon supports excellence in mine reclamation. However, reclamation will never equal restoration, and for this reason we believe it is imperative that the goals and outcomes of reclamation are set by those most impacted: First Nations, communities, and others who value the landscape.”*

Canadian Parks and Wilderness Society (Yukon Chapter) to YMDS, Q#1146

## 2. Acceptable reclamation outcomes

Reclamation does not have a generic goal and the “acceptable” state must be decided for each site. There is much ambiguity in r-word terminology (e.g remediation, restoration, reclamation) and the need for clarity on meaning is mentioned by many submissions. There is a considerable range of how acceptable outcomes are described: *“balanced”, “pre-mining”, “aesthetic”, “clean”, “usable”, “beautiful”, “self-sustaining”, “healthy”, “semi-natural”, “natural”, “former biophysical”, “original”, “how it was or better”*. Occasionally habitat for a species such as caribou is used as a specific goal.

Most often, the descriptions of desired reclamation outcomes are framed as a return or recovery to what existed prior to mining or reversibility of impacts. Submissions frequently acknowledge that complete restoration of all pre-existing landforms and ecosystems is not achievable and promote outcomes “as close as possible” to this original state.

*“Once an area becomes decommissioned and reclaimed, fish and wildlife should be permitted to return, and the sites should be returned to as close to their original state as possible.”*

Yukon Fish and Wildlife Management Board to YMDS, Q#811

A few submissions suggested considering alternatives to the original state. Agricultural use as a suitable outcome was highlighted, as was reclaiming to a state that facilitates re-mining in the future. Other submissions expressed the need to protect sites from re-mining because any reclamation efforts would then be wasted.

Some submissions described characteristics that indicate reclamation success. These generally focused on how to measure recovery to the original state. Common indicators include:

- |   |   |
|---|---|
| - Restoration of the original contours      | - Return of fish and wildlife                                       |
| - Geotechnical stability of landforms       | - No lasting harm or concerns                                       |
| - Water is safe for people/animals to drink | - Visually pleasing   |
| - Remediate soil to parkland standard       | - People return to harvest and have the same success rate as before |
| - Establishment of natural vegetation       |   |

## 3. Reclamation in practice

The need to be respectful to the land and people when conducting reclamation was highlighted and respect requires thoughtful consideration of how reclamation is practiced in each context.

*“I think that when it comes to thinking about the land, we need to be really careful both in natural things that are already there and if you want to go and use that area, maybe take the time to take those natural things and move them somewhere else”* Individual to DRLUP, Q#456

The importance of ensuring reclamation practices are explicitly designed to achieve stated objectives is emphasized. Comments in YESAB assessments are often generated where practices and outcomes are out of alignment.

*"[The company] lists aesthetics (i.e. restoration outcomes are visually acceptable) as being one of its fundamental mine reclamation and closure objectives (Table 1.3-1). Zero attempt at revegetating the [waste rock storage facility] does not meet that objective."*

White River First Nation Government to YESAB, Q#308

Progressive reclamation is widely supported as a way to reduce the amount of disturbance at any one time and improve reclamation practices over time. Many expect reclamation plans to be based on proven techniques, however, the need for site-specific research is acknowledged. Ensuring the research is directly tied to reclamation objectives is highlighted. Integrating research trials into progressive reclamation is also recommended.

*"Mineral legislation should include a requirement for any mineral exploration or development plan to identify progressive reclamation of exploration sites and/or the means by which a developed mine may be closed, subject to later monitoring."*

Carcross/Tagish First Nation Government to YMDS, Q#556

The limitations of reclamation and potential for long-term or perpetual care and maintenance of mines is discussed. Some express that projects that require perpetual care should not be permitted. Others feel this practice should be minimized, but can be managed through planning and financing.

*"YCS totally agrees with ending the practice of accepting perpetual care and maintenance of a mine site as part of any mine closure plan... However, if Yukon mining history is any guide it would be prudent to plan for such a scenario that some mines could require perpetual care and maintenance."*

Yukon Conservation Society to YMDS, Q#1263

Reclamation can be one of the longest stages in the mine cycle and many submissions express interest in being involved in reclamation activities and monitoring. This may also be an avenue to uphold Aboriginal rights and title within the mining process.

*"My main thing to go in [to land use planning] is wanting to bridge the gap between the miners and the environmentalists and start something to ensure that reclamation actually happens and then maybe even doing something so that we can go back and plant trees and you know help the land grow faster, but it's going to be a long process too."* Individual to DRLUP, Q#522

Only two submissions directly referenced examples of successful mine reclamation. Unfortunately the sites in Yukon were not named and it is unclear whether they reference placer or quartz operations. The reclamation effort near Sudbury, Ontario, is the only named example of reclamation success.

## Analysis: quartz mining is not reversible, plan for change

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There is strong evidence that quartz mine reclamation in the Yukon is not meeting local expectations. After 18 months of extensive public engagement, the Yukon Mineral Development Strategy Panelists released the following recommendation for improving reclamation:

*“End the practice of accepting perpetual care and maintenance of a quartz mine site as part of any mine closure plan. Project proposals must show how proponents are planning to return the mine site to conditions that are as close as possible to the pre-mining state with minimal environmental degradation and no ongoing risk to the environment. Final closure plans must be fully costed and reclamation security amounts sufficient to return the mine site to a balanced environmental state.”*

Yukon Mineral Development Strategy and Recommendations April 2021, p. 44

While I also found that a return to “the pre-mining state” was desired most, I do not believe this approach will result in reclamation practices and outcomes that meet expectations described in the submissions. The original, pre-mine state is a snapshot of ecosystems that developed over long periods of time. Quartz mining is not a reversible process. Vegetation is cleared and soils removed. Landforms such as mountains and valleys are re-shaped to access ore bodies and store materials such as waste rock and tailings. People, plants and animals that used to travel through or make their homes in the area are displaced.

**Quartz mining is transformational and reclamation cannot reverse this transformation. Reclamation is a mitigation.**

In general, submissions recognized that complete restoration of the original state is not achievable and thus, “as close as possible” is desired. How do we know what is possible and when we have achieved it? What is possible is highly subjective and based on values, knowledge and experience, so each person will have a unique understanding of what this means. This begs the question then, what is close enough?

There was a large range in perspectives on what “acceptable” reclamation outcomes are within submissions. It is reasonable to expect that those who are closely connected to the land will define “close enough” differently than the company (or regulator) who pays for the reclamation. Nearby communities and First Nations have input but not authority in decision-making, so “as close as possible” will not be directly accountable to local expectations.

I propose an alternative approach to the YMDS recommendation based on the perspectives shared in the written submissions and my experience studying and working in northern reclamation:

**Proposed alternative to the YMDS recommendation:** Proponents must provide project proposals that narratively, visually and spatially describe a comparison of pre-mine conditions to the proposed post-mine conditions for each mine component. The proposal must include a detailed descriptions of how the post-mining conditions were estimated and how the conditions will benefit future generations. Proposals must clearly demonstrate how reclamation techniques are designed to produce the post-mine conditions and identify remaining uncertainties that require further research. Reclamation security amounts will be sufficient to cover the costs of a third party achieving the post-mining conditions. An assessment of potential long-term risks will be provided and long-term care included in the costing calculations.

I recommend we plan for change; there will be a substantial difference between pre- and post-mining conditions. Decades of reclamation research in boreal ecosystems have not recreated the land after large-scale disturbance such as mining [1-3]. Focusing reclamation planning on restoring the land towards the original state at best distracts from, and at worst denies, the reality of mining.

Reclamation can't recreate the original landscape, but it can modify the land to support different outcomes [4,5]. The shape of landforms, type of cover soil, vegetation species selection, etc., can all be adjusted to influence reclamation outcomes [6]. There will be technical limitations. For example, if the reclamation goal for a mine component is a spruce forest, soil quality that supports tree growth is required. If topsoil isn't available or amendments like compost are prohibitively expensive, the goal is not feasible. Predicting future limitations is critical and needs to be prioritized to ensure goals and technical feasibility are aligned. Well-intentioned promises don't grow trees.

Equally important to understanding reclamation limitations is identifying opportunities. Focusing on reversing to the original state suppresses creative, forward thinking. Submissions referenced the need to consider future generations, of all species – how can reclamation create a state that sustains life now and in the future? Maybe the post-mining conditions can provide habitat for culturally important species or grow trees better adapted to a warmer climate? It's important to be cautious of human hubris when “designing” landscapes [7], but with humility, reclamation can assist the development of healthy land. There is also the opportunity to consider re-purposing the site for an alternative human use [8]. For example, the SunMine in B.C. is a section of a mine reclaimed to a solar farm. By acknowledging the land will change, more ideas can be explored and considered.

When envisioning the future, reclamation can also be an opportunity for healing relationships between each other and the land. Treating reclamation as a purely scientific/technical activity devalues the social context of reclamation [9]. People are part of places and their relationships to a place are profoundly altered by mining. Reclamation can mitigate some social impacts of mining. For example, reclamation can create an opportunity for people to work together on a shared goal and reconnect with the land in a powerful way [10]. This can include learning about and recognizing the colonial context of mining as part of the social healing, reconciliation and decolonial processes desired by many Indigenous communities [11-13].

When thinking about the future, history matters. History provides the baseline from which to measure and understand change. If local approval for quartz mining is a consideration of tradeoffs, a robust understanding of what will be lost and gained is required during the environmental and socio-economic assessment process. An understanding of the likely long-term changes to the land is also needed to achieve Free, Prior and Informed Consent, a foundation of the United Nations Declaration on the Rights of Indigenous Peoples [14] and the Truth and Reconciliation Commission's Call to Action #92 [15]. The difference between what companies promise for reclamation outcomes and what is delivered is a matter of social and environmental justice.

History also teaches us where our predictions require improvement. For example, it was highlighted that past mines have required perpetual care and maintenance so it is prudent to plan for this, even if the proponent claims otherwise. The costs of reclamation also illustrates where past predictions have been inaccurate. For example, the reclamation of Mt. Nansen was estimated to cost \$4-8 million in 1999 and in 2020, \$40 million had been spent and a further \$110 million of work was estimated [16]. Learning from the past requires consistent monitoring to track progress between reclamation predictions and outcomes to refine predictions over time.

## Conclusion: Learn the histories, plan for the future, and prioritize predicting post-mining conditions

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Reclamation is not absolution for our extractive sins. Setting the overarching reclamation goal to “*as close as possible to the pre-mining state*” masks or denies the transformation caused by quartz mining. Quartz mining is not reversible.

Choosing whether to approve quartz mines are difficult and necessary decisions that Yukoners need to make. These choices are further complicated by interactions with other urgent concerns such as climate change (e.g. metals for renewable energy technologies) and biodiversity loss (e.g. woodland caribou). With decisions about mines based on assessing tradeoffs, Yukoners need to know likely reclamation outcomes, not ambiguous or aspirational ones. An improved understanding of the changes between pre- and post-mining conditions, with the acknowledgement of some uncertainty, may provide better informed decisions that lead to “proper reclamation” if a mine is approved.

Centering reclamation goals on the needs of future generations of all species may provide the guidance required for these difficult decisions. The land will not be the same, but will the new condition be acceptable and sustain life into the future? The histories of quartz mining in the Yukon provides the foundation to understand and predict how the landscape will change.

There were no examples of successfully reclaimed Yukon quartz mines named in the 500+ submissions reviewed. I am unsure if proper reclamation can be achieved within a system where reclamation is motivated by a regulatory obligation not genuine care and responsibility for the land. Further research will investigate alternative governance/decision-making models where those that care for and are connected to the land have greater authority over reclamation practices and outcomes.

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## Appendix 1. Data sources for the discussion paper.

<b>Engagement Process</b>	<b>Year(s)</b>	<b>Number of Submissions</b>
Beaver River Land Use Plan	2019	33
Coffee Gold Mine Assessment 2017-0211	2018-2021	74
Dawson Regional Land Use Plan Alternatives	2014	6
Dawson Regional Land Use Plan Issues and Interests Phase 1	2011	10
Dawson Regional Land Use Plan Issues and Interests Phase 2	2018-2019	3
Dawson Regional Land Use Plan Phase 2: Gathering Information	2019-2020	26
Dawson Regional Land Use Plan Presentations to Committee	2019	8
Eagle Gold Mine Assessment 2010-0267	2011-2012	16
Kudz ze Kayah Assessment 2017-0083	2018-2021	58
Mine Closure and Reclamation - Former Wellgreen Mill and Tailings Assessment 2020-0138	2020	5
Minto Expansion IV Assessment 2010-0198	2010-2011	4
Minto Expansion V-VI Assessment 2013-0100	2013-2014	10
Recommended Peel Regional Land Use Plan Final Consultation	2018	27
Sä Dena Hes - Post-reclamation Phase Assessment 2014-0179	2014	1
United Keno Hill Mines Reclamation Project Assessment 2018-0169	2019	9
Whitehorse Copper Tailings Reprocessing and Reclamation Assessment 2011-0064	2011-2012	14
Yukon Mineral Development Strategy	2019-2021	282
<b>Total</b>	<b>2010-2021</b>	<b>586</b>