June 13, 2019

Mr. Ryan Barry
Executive director
Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay, NU
X0B 0C0

Dear Mr. Barry

Ullakuut

I am writing on behalf of the Pond Inlet Mary River Phase 2 Review Committee.

As you know, Dr. Frank Tester has been working with us on our response to the Phase 2 proposal of Baffinland Iron Mines.

One of our committee members found the article that is attached to this letter. We are deeply concerned about it. While Baffinland is not directly responsible for this article, it has been written about the work of a consultant for Baffinland. It is publicly available on-line.

We asked Frank to look at what it has to say about how Inuit Qaujimajatuqangit (IQ) has been used by a consultant working for Baffinland. It gives some idea about the information they are gathering that becomes part of the reports for the technical hearings. This is an example of how IQ is being used and abused by researchers. We are also concerned about the research reported in this article.

I won't say much more about this because Frank's article, attached to this letter, points out many problems. We agree with what he has said about the article, the way it is written and what it has to say about caribou habitat and the use of IQ. The article misrepresents us and our concerns.

If this is the kind of research that is behind Baffinland's reports, we are worried.

We think that NIRB, if it has the interests of Inuit in mind, needs to be informed about how Baffinland choses the consultants it works with, what rules they must follow and if they should be allowed to write articles like this. Most of them know nothing about Inuit culture and IQ. We cannot look at all the research methods being used by Baffinland, but what is shown here concerns us. This is not good science and it is an abuse of IQ.

This is serious because it affects the understanding that anyone reading this article – people is southern Canada, politicians, researchers and others – have about the Phase 2 proposal, the kind of research that informs NIRB's recommendations and our concerns about the Phase 2 developments.

Qujanamik

Joshua Katsak
Mayor
Mittimatalik

Will Baffinland's Mine Impact Caribou Habitat? **GIS Has the Answer.**

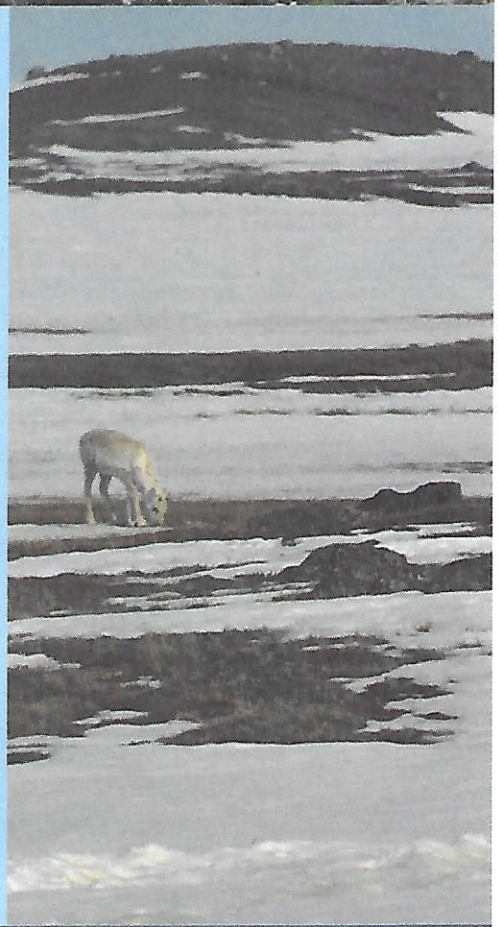
Canada's largest territory, Nunavut, has extraordinary untapped mineral potential—diamonds, gold, uranium and iron, among others. Nunavut, which means "our land" in the local language, is also known for its inhabitants: the Inuit indigenous people and the barren-ground caribou.

Caribou, a species of deer, is an important subsistence animal for Inuit who have been using it for food, clothing, tools, containers, toys and even shelter. Caribou meat, when it can be found outside of northern Canada, is a delicacy in southern restaurants. Contemporary Inuit artists continue to find new ways to use caribou—creating artwork such as carved antler, beaded caribou hide and caribou hair tufting.

On the eastern margin of the Canadian Arctic Archipelago lies Canada's largest island, Baffin Island, Nunavut. The island's vast mineral wealth has attracted prospectors and mining companies for decades including **Baffinland Iron Mines Corporation** (BIM), whose iron mine—the Mary River Project—operates year-round in the northern part of the island. Considered among the richest iron ore deposits in the circumpolar region, the mine produces and ships more than four million tonnes of iron per year to foreign ports and plans to further increase output in the coming years.

"BIM's operation, from mining through to crushing, trucking and shipping, all takes place on their mine, tote road and port sites. While the Mary River region consists of several high-grade iron ore deposits, BIM has been focusing on Deposit No. 1. Once blasted, they use hydraulic excavators and large front-end loaders to load 90-tonne haul trucks. Ore is delivered to nearby portable crushers. One of their biggest priorities has been to ensure safety as well as minimize any kind of environmental impact from their operations," says Mike Setterington, lead wildlife consultant for BIM.

While the economic impact of mining projects cannot be disputed, it is important to understand their potential impact on local wildlife and its habitat. The process can be



challenging and often involves scrutiny from a variety of stakeholders.

Setterington adds, "caribou are culturally significant to Inuit and provide an important source of food; we had to make sure that operations didn't pose an unacceptable risk to the local caribou population." Caribou are an established traditional resource for Inuit subsistence hunters and since more than half of Nunavut's human population lives on Baffin Island, the presence of a large mine, such as the Mary River Project, poses an important question: Could the mine impact the Northern Baffin Island caribou herd and its habitat?

To find the answer, BIM engaged **Environmental Dynamics Inc.** (EDI), a company that specializes in the environmental assessment of living things and where they live. Founded in 1994 in Prince George, BC, EDI currently has offices in Whitehorse, Grande Prairie, Calgary, Saskatoon, Nanaimo, Victoria and Burnaby. The environmental consultant has been involved in the Mary River Project since 2007 and has conducted several terrestrial wildlife baseline studies and environmental impact assessments in Baffin Island.

> "The tools in ArcGIS, more specifically in Spatial Analyst, were dependable, and results were predictable and repeatable – all important considerations when developing and analyzing data of this scientific nature. In the end, we needed a defensible product that would stand up to scrutiny by, not only by our own biologists, but also regulators and other stakeholders – ArcGIS provided us with the means to create that product."
>
> **Matt Power**
> GIS Manager
> Environmental Dynamics Inc.

When EDI first began working on the project, one of the first challenges it faced was the lack of data available for north Baffin Island—baseline inventories had to be collected first-hand. The team approached local community elders to gather and incorporate traditional knowledge for research and survey activities.

Leveraging Traditional Knowledge

"We started doing workshops with Inuit and developed a series of maps for the people to draw and write on. We visited the communities and sat down with the elders—people who grew up on the land—to find out how they used the land and the importance of wildlife in a traditional and contemporary sense," remarked Matt Power, EDI's GIS manager.

"These workshops focused on caribou migration, calving and other critical habitat areas. We also focused our efforts on hunting areas, travel routes and camps. We wanted to know where the caribou and the people were—we wanted to know how they were connected. This became an important piece of the engagement phase."

Once some traditional knowledge was gathered, the points, polygons and lines that were drawn on the workshop maps by Inuit elders were digitized in **ArcGIS Desktop** enabling a full presentation of all the data across Baffin Island and the herd's range. Based on these results, the team became aware of the added importance of caribou to the people of Baffin Island, so they decided to take the assessment to the next level and develop a Resource Selection Probability Function (RSPF) model.

Using ArcGIS to Determine Caribou's Habitat

The RSPF includes a class of functions that are used in spatial ecology to assess which habitat characteristics are important to a specific species of animal. In this case, the scale they used to model the function was the resource or probability of habitat selection within the caribou's home range. This landscape-based model provided the team with the ability to assess caribou's probability to select certain habitat types; it allowed them to look at where caribou were more likely to be (and not to be) found.

As one of the world's migratory wildlife species, barren-ground caribou are an important terrestrial subsistence resource in the circumpolar arctic/subarctic region.

The goal was to overlay this baseline habitat information with the mine infrastructure to examine the mine's potential impacts on caribou and its habitat. EDI selected ArcGIS to drive the model's development and analysis.

"We leveraged Esri ArcGIS Desktop to carry out all spatial functions and processes. More specifically, the **ArcGIS Spatial Analyst extension** became instrumental in providing us with the necessary tools for the spatial analyses and modelling. We used Raster Calculator to create and run map algebra expressions that would output raster datasets. Additionally, we were able to incorporate several processes into one complex tool using **ModelBuilder** – another value-added feature in ArcGIS Desktop," says Power.

For Power and his GIS team, the top consideration for the habitat analysis was the data (and its integrity). In this case, they had limited data to work with; however, with research and assistance from the public, government and private resources, they were able to compile the required data and create the inputs for the model. The Government of Nunavut provided GPS/satellite data from collared caribou, which enabled the GIS team to compile information relating to a caribou's location at a given time across the landscape. Collar data was collected in point format and was used to extract values from landscape data showing what environmental characteristics the caribou were selecting.

The results from the point data extraction were saved as data tables that would lay the foundation for the RSPF model. The data were then handed off to statistical experts to determine which environmental conditions caribou showed an affinity to. The statistical process produced the coefficient input, which provided calculation values for the development of the final RSPF model.

Proactive community consultation has helped lay the foundation for the success of the Mary River Project.

Coefficient Input Table

Coefficient	Estimate	SE	t	p	VIF
Intercept	-3.0999	0.2952	-10.5	<0.0001	NA
Slope	1.6026	0.0747	21.45	<0.0001	2.7
Slope^2	-0.4186	0.0235	-17.83	<0.0001	2.4
Dist_rivers	-1.4366	0.0779	-18.44	<0.0001	1.2
Aspect_North	0.0846	0.1666	0.51	<0.0001	2.8
Aspect_East	0.4593	0.1619	2.84	<0.0001	2.5
Aspect_South	0.5345	0.1595	3.35	<0.0001	3.3
Aspect_West	0.3435	0.1624	2.12	<0.0001	2.7

Each raster layer was multiplied by a corresponding coefficient and combined into a single raster which resulted in a quantifiable habitat layer for selection probability.

With the RSPF, the team was able to establish a clear baseline inventory of the availability and suitability of caribou habitat. From the combination of raster inputs and by applying the coefficients, each cell was assigned a value relative to what's on the land and how suitable it is for the caribou. For instance, a lower value means that the area is likely not suitable for caribou habitat and hence if altered or affected, it is less likely to impact the caribou population. In contrast, higher habitat values, if impacted, would show more affect on caribou. The next step for EDI was to determine the level of impact.

This map shows the final RSPF model to the extent of the North Baffin caribou herd range. Green indicates higher probability for habitat selection by caribou whereas yellow indicates a lower probability.

Assessing Impact

To assess the mine's potential impact on caribou habitat selection, the team performed a Zone of Influence (ZOI) analysis on the RSPF. The ZOI applies multipliers to the RSPF in a gradual, decreasing method to show higher levels of impact close to the operation's disturbance area and lower impact, moving outward from the disturbance. The multipliers are set at specific distances from the mine's disturbance footprint, as detailed in the table below. For example, the footprint itself has a 100 per cent impact on habitat and RSPF values here are multiplied by 0; distances up to 14 km away have a decreased impact and values in these areas are multiplied by 12.5 per cent to 80 per cent, depending on the distance interval; on the other hand, distances beyond 14 km are considered to have no impact on caribou from the mining operations and, therefore are multiplied by 1 (in effect, values are unaltered). This particular ZOI analysis was based on similar studies (as displayed in the Zone of Influence Table; source of information) showing examples of reduced habitat based on distance from infrastructure—the farther away from the infrastructure, the less the impact on habitat.

The result of the ZOI analysis showed the change of scale and amount of habitat selectivity that was directly related to the project. The GIS team leveraged ArcGIS Desktop to perform this calculative process and created a complex set of processing tools in ModelBuilder. These tools allowed the team to run many iterations of the analysis and refine input parameters to get the right results.

On the use of the Raster Calculator tool, Power emphasizes: "Raster Calculator helped us apply the RSPF to the Zone of Influence analysis to understand impacts on the probability of habitat selection by caribou. The purpose of this analysis was to provide us with the means to respond to local community concerns about the project's impact on caribou and its habitat. First, we were able to define baseline values by quantifying the amount and quality of habitat with the RSPF model. Secondly, we were able to assess the impact of the project by showing baseline values [RSPF] compared to impacted values [RSPF x ZOI]."

The Zone of Influence Table

Project Area	Zone of Influence (ZOI)	Habitat Selection Multiplier	Subspecies or Herd	Source of Information	Calving Site Multiplier
All	PDA	0.00	na	na	0.00
Steensby Port, Milne Port, Railway	>PDA–2.0 km	0.25	Central arctic herd (Alaska), woodland (Alberta)	Cameron et al. 1992, Dyer et al. 2001	0.125
	>2.0–4.0 km	0.75	Woodland (Newfoundland), central arctic herd, reindeer (Norway)	Weir et al. 2007, Cameron et al. 2005, Vistnes and Nellemann 2001	0.375
	>4.0–14.0 km	0.90	Woodland (Ontario)	Vors et al. 2007, mayor et al. 2007, 2009	0.45
Milne Inlet Tote Road, Mine Site	>PDA–3.5 km	0.30	Bathurst herd	Boulanger et al. in Press	0.15
	>3.5–7.0 km	0.40	Bathurst herd	Boulanger et al. in press	0.2
	>7.0–10.5 km	0.60	Bathurst herd	Boulanger et al. in press	0.3
	>10.5–14 km	0.80	Bathurst herd	Boulanger et al. in press	0.4
All	>14.0 km	1.00	na	Vors et al. 2007, Mayor et al. 2007, 2009, Boulanger et al. in press	1.00

The Zone of Influence criteria based on distance from the project's potential disturbance area (PDA)

Impact of the Mine on Caribou Habitat

Upon concluding the modelling and analyses, EDI was able to quantify the impact of the mine on caribou habitat. The overall effect from the Mary River Project on the home range of the North Baffin Island caribou herd was 1.72 per cent, which is considered within an acceptable range of risk.

EDI used ArcGIS Desktop for all spatial aspects of the project: data management, geoprocessing and analyses. It relied heavily on the Spatial Analyst extension to create inputs, results and process analyses. "Other third-party spatial tools and software were tested," says Power, "but results from these were often problematic in the sense that they didn't always give us what we needed or desired. The tools in ArcGIS, more specifically in Spatial Analyst, were dependable, and results were predictable and repeatable— all important considerations when developing and analyzing data of this scientific nature.

In the end, we needed a defensible product that would stand up to scrutiny by not only our own biologists, but also regulators and other stakeholders. ArcGIS provided us with the means to create that product."

Nunavut's economy is on the cusp of unprecedented growth spurred by new gold production and the development of new mines. Increased mining production is also expected to help create thousands of new jobs in the coming years. However, to sustain this level of growth, it is equally important to safeguard the natural resources in the region by monitoring any human disturbance caused by mining, construction or related activities. BIM's Mary River Project serves as an example of how human impact can be accurately identified in such areas and how stakeholders can work together to mitigate those impacts.

What's Wrong with this Picture?

Frank Tester, B.Sc., D.Phil., M.E.Des., M.S.W.
for the
Hamlet of Mittimatalik

In the fall of 2018, an article was published in *ArcNorth News*. The title was: *Will Baffinland's Mine Impact Caribou Habitat?* ***GIS Has the Answer****.*

The title looked just like that. "*GIS Has the Answer*" was in larger print than the question that preceded it. My immediate response was that I was likely looking at an article that was trying to sell or convince me of something. That something was 'Geographic Information Systems (GIS)' and what a good job they do of answering difficult questions.

I also looked to see where this article was published. It was published in something called *ArcNorth News*. And *ArcNorth News* is published by a Canadian Company called ESRI Canada. ESRI Canada is a private, for-profit company that makes GIS available to other companies and organizations who want to use it.

GIS are computer-based systems designed to take information (the kind of information that starts with a map of an area), store it, manipulate, analyze, manage and present the information in interesting ways.

ArcNorth News does not contain news. It is not a magazine or newspaper reporting on all aspects of something. It is not, in this sense, a newspaper or news magazine. It contains company news designed to serve the interests of the company by telling the reader about the wonderful things that can, and are being done with geographic information systems. It promotes them as a tool that everyone should be using. *ArcNorth News* is a form of advertising made to look like it was news.

There is nothing necessarily wrong with Geographic Information Systems. They can and have been used to do very interesting and important things. But when money is to be made, they can also be promoted as a solution to problems and capable of answering all sorts of questions that they are perhaps not as good at answering as the person selling GIS would like us to believe. It is a bit like someone selling a Jeep, who suggests that it is capable of doing things (climbing over big boulders) that it really doesn't do very well.

My concern here is that the issues that Inuit of Mittimatalik are trying to deal – and Inuit themselves (Elders in this case) are being used in ways that are disrespectful and prejudicial to their interests and the understanding that anyone reading such an article has of Inuit and their concerns. What I am looking at is dishonest, abusive of IQ and prejudicial to Inuit interests and concerns.

Rhetoric

This article 'sets the reader up'. It starts by celebrating the "extraordinary untapped mineral potential" of Nunavut. The word 'untapped' suggests that gold, uranium, iron, etc. are there for the taking. If they

are untapped – whow! Just think of what would happen, and the excitement of untapped them. Rhetorical language is a use of words, intended to persuade or impress the reader. It also assures potential customers (mining or resource development companies) looking for the consultant's services, that they have nothing to fear. The consultant shares their interests.

This rhetorical use of language is a bit too obvious. What is really important – making money by developing these resources - has to be balanced with a bit of concern for the interests of Inuit. The next line covers that nicely. The writer acknowledges that: "Nunavut … is also known for its inhabitants, the Inuit indigenous people and the barren-ground caribou.

This attracted my attention, because later in the article a picture of Inuit Elders working with a map of the Mittimatalik region is presented, with a promotional title that reads: "Proactive community consultation has helped lay the foundation for the success of the Mary River Project".[1] [IK, used in the quote below, is a reference to Indigenous Knowledge.] Who can argue with the good intentions of being "proactive"? The Mary River Project is a success and clearly what the consultant is doing for Baffinland has a lot to do with this.

My interest is in how Inuit Qaujimajatuqangit (IQ) - Inuit traditional knowledge - is used in informing decisions and determining how things are done; including the development and operation, in this case, of the Mary River Mine. Anyone reading the article who knows anything about IQ would be immediately suspicious.[2]

For one thing, it is well known that many Inuit do not like to be referred to as "Indigenous People". They simply want to be known as *Inuit* (the people). The article goes on to list the ways in which Inuit use caribou, emphasizing its economic potential as a delicacy in southern restaurants. The text then returns to celebrating the mineral potential of Baffin Island with its "vast mineral wealth". It continues to describe Baffinland Iron Mines Corporation's operation, but tries to emphasize, in different ways, the deep concern the company has for caribou, recognizing its importance to Inuit. The article claims that half of Nunavut's human population lives on Baffin Island and for this reason the question, "Could the mine impact the Northern Baffin Island caribou herd and its habitat?" is important.

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[1] Writing in *The Sage Handbook of GIS and Society* (London: Sage Publishers, 2011), Laituri states that "… an important caveat is to recognize the inherent bias in the base layers that are often employed in a GIS. These base layers are derived from governmental agencies that reflect the dominant Western paradigm, are the inheritors of the post-colonial geography, and have previously excluded IK (Blaut, 1993; Brondnig and Mayer-Shonberger, 2000; Tripathi and Bhattarya, 2004; Johnson et al. 2006). The challenge is to combine IK with Western technology in order to devise alternative natural resource management and conservation strategies that may be more efficient, and environmentally and culturally sensitive (Laituri and Harvey, 1996). (p.7). (Accessed June 11, 2019 at: http://sk.sagepub.com.ezproxy.library.ubc.ca/reference/download/hdbk_GISsocieety/n11.pdf)

[2] Melinda Laituri, writing in *The Sage Handbook of GIS and Society,* also notes the following. "However, IK is under assault and in danger of becoming extinct due to the forces of globalization that encourage homogenization of culture replacing local knowledge systems with consumerism, capitalism, and westernization (Harmsworth, 2002). For example, pressures for economic assimilation have been identified as one of the reasons for loss of language diversity accelerating the loss of cultural identity" (Razak, 2003). … GST [Global Systems Technology] adoption within communities has repercussions that can affect power relationships and cultural practice. Palmer (2009) warns of the need to recognize both the "marginalizing and transformative impacts of technoscience that can potentially disenfranchise tribal elders." (p. 38)". (p.5).

This is a strange connection. While acknowledging the role of caribou in subsistence, it draws attention to its economic potential in restaurants in a southern market. It suggests that attention to the impact of the mine on caribou is important because half of Nunavut's population lives on Baffin Island. It does not say half of Nunavut's *Inuit* population. In fact, the population of Baffin Island includes a significant non-Inuit population working for the Nunavut government and other agencies based in Iqaluit, and having nothing to do with the northern Baffin population of caribou.

The article reports on work done by a company called **Environmental Dynamics**, for Baffinland. The company name and later, the reference to **ArcGIS Desktop**, are in bold lettering in the text, reminding the critical reader that what they are reading is a promotion and advertisement, disguised as a factual report.

After advertising the company by noting where its many offices are located and its established history working for Baffinland, it goes on to discuss something called "Leveraging Traditional Knowledge". The text doesn't contain a lot of information important to evaluating how traditional knowledge was collected. We don't know how many Elders were involved. Those participating are unnamed. We don't know what questions were asked, or what information was given. We don't know if they were fully aware of the purposes to which their knowledge might be put. We don't know if they gave permission for the photograph that helps identify them. We don't know if the study received licencing and approval from the Nunavut Research Institute. We don't know if discussions with Elders took place in Inuktitut and were translated. We don't know who did the translation. The Qallunaat working with the Elders and visible in the photo accompanying the article is unnamed.[3]

<u>What is IQ and how is it Used?</u>

My suspicions about how IQ was collected and what it is understood to be were reinforced by a statement made by the GIS manager for the company, Environmental Dynamics. He is quoted in the article as saying: "We visited the communities and sat down with the elders – people who grew up on the land – to find out how they used the land and the importance of wildlife in a traditional and contemporary sense." He goes on to say that the focus was on caribou migration, calving and other critical habitat areas, hunting areas, travel routes and camps and how people and caribou were connected.

[3] The problem in translating what Elders have to say is that translators often do not understand the terms used by Elders in reference to land and particular places. Elders often use words that have not been used by Inuktitut speakers – particularly a younger generation born and raised in settlements – for decades. Translating what they have to say is often a very difficult job. Working with traditional knowledge is not something that Qallunaat researchers are often very good at. Just because one has a degree in social sciences, geography or anthropology does not mean that one has a good understanding of traditional knowledge, how it is formed, presented and is to be understood. There are many well-documented issues with using traditional knowledge in this way, many of them outlined in Chapter 11 'Indigenous Peoples' Issues and Indigenous Uses of GIS' in *The Sage Handbook of GIS and Society* (London: Sage Publishers, 2011). Were those conducting the research informed by this text or information comparable to this? The art of asking questions and of listening are often taken for-granted skills. Story telling is an important way of conveying a lot of important information, in distinction to the way interviews are conducted when Qallunaat are doing research.

It is not simply or necessarily the case that all Elders grew up on the land. In fact, given the passage of time, it is likely the case that in Mittimatalik, many Elders spend years in Federal Day School in the community, even while their families were still on the land. The Federal Department of Indian and Northern Affairs opened a school in Mittimatalik in 1961 and two 8 bed hostels two years later.[4] Anyone between 63 and 73 years of age is likely to have been sent to live in Mittimatalik in order to go to school. The relationship between this experience and land-based knowledge acquired at the time by most young people, from their parents, living, hunting and trapping on the land, is nowhere mentioned in the article. What exactly was done – and how – to collect traditional knowledge is unexplained.

This reality does not diminish the importance of what Elders have to say. But it is a colonial legacy that deserves to be noted and appreciated in any work with Inuit Elders. It is not surprising that this level of detail is not found in this promotional article. The problem is that this treatment of the subject matter is designed to have a particular impact on the reader. Everything is okay, well-done, no problems and therefore credible and important.

What should be of concern is a failure to recognize that traditional knowledge is not simply a matter of data, information and statistics. It is, what is often referred to in English as a cosmology; a complete way of making sense, a relationship between Inuit and their environment that is complete, a way of bringing meaning and importance to life and the relationship between Inuit and their environment, one in which everything is part of life, including elements that Euro-Canadians regard as 'things'.[5]

To suggest that data on where caribou hang out, or the routes they travel, constitutes - in and of itself - IQ, is misleading. The reduction of IQ to data that can be fed into a computer program is a misuse of Inuit Qaujimajatuqangit. At the same time, it is an understandable misuse as the world view – a "landscape of untapped mineral wealth" - is one seriously challenged by IQ, properly understood. It cannot be easily accommodated by the purposes to which GIS is directed. All of this raises serious questions about the knowledge and understanding of IQ – what it is and what it means – held by the staff pf Environmental Dynamics and the Qallunaat researcher doing field work for Baffinland.

That this article is little more than an advertisement for GIS and a celebration of the fact that GIS proves that the mine has no impact on caribou habitat, is abundantly clear from the box insert on page 33. Here the tools of ArcGIS are celebrated as "dependable" with results that were "predictable and repeatable – all important considerations when developing and analyzing data of this scientific nature." Who would dare question such a claim? The results are beyond question. As the GIS manager for Environmental Dynamics goes on to note, what they got was a "defensible product" that would stand up to scrutiny by

[4] Qikiqtani Truth Commission (2013) *Pond Inlet*, Toronto and Iqaluit: Inhabit Media. The Qikiqtani Truth Commission has published excellent and accessible histories of all the communities impacted by the development of the Mary River mine. Yet no-where have I seen these referenced, or evidence of their use to orient the staff of Baffinland and the employees of the mine to a history that is absolutely essential in understanding the colonial experiences of Inuit – the lived realities and legacies of those with whom one is working.

[5] Karetak, Joe, Frank Tester & Shirley Tagalik (2017) Inuit Qaujimajatuqangit: What Inuit Have Always Known to be True, Halifax & Winnipeg, Fernwood Publishing.

"regulators and other stakeholders". What Inuit got (and Inuit of Mittimatalik all have on-line access to this article) was an exercise in intimidation.

Presented to a politician, in support of the further development and expansion of the Mary River mine – a politician having no detailed understanding of the limits of GIS methods and the abuse of IQ that this study represents – would they then be likely to question the claim that consultations had taken place and that the results are based on the wisdom and traditional knowledge of Inuit Elders?

The Limits of GIS

Much of the rest of the article discusses the technology and methods used to process the data in order to decide the degree to which expansion of mine operations might interfere with caribou habitat. Data from collared caribou is included along with information from Elders about migration, calving "and other critical habitat areas".

The wording of the technical part of the article is not unlike what is found in the box on page 33, noted earlier. The language used is what we refer to in English as 'rhetorical'. Here are a few examples (in italics).

- "the ***ArcGIS Spatial Analyst extension*** became *instrumental* in providing us with the *necessary* tools …." The computer software is highlighted to draw attention to it. Furthermore it is i*nstrumental* and *necessary*. This works like an advertisement. My attention is drawn to something that is *necessary* and i*nstrumental*. Clearly I can't do without it, and I should check into getting this for whatever work I am doing, as soon as possible! It is obviously sophisticated, as I don't really know what the label "spatial analyst extension" refers to.

- "we were able to incorporate several processes into one *complex* tool using ***ModelBuilder*** – another *value-added* feature …." This clearly reads like an advertisement. It isn't just any ordinary tool. It is a *complex* one - and a *value-added* one as well.

- "the team was able to establish a *clear* baseline inventory …" It wasn't any old baseline inventory. It was a *clear* one – hopefully above questioning.

The end result, some of which is presented in a table on page 36 called the 'Zone of Influence Table', is inaccessible to anyone other than someone familiar with the technology and method. What is contained within the columns of the table remains something of a mystery, particularly the column that names herds that are located elsewhere. Presumably these are sources from which something called the habitat selection multiplier was taken.

The results are intimidating to anyone who might like to know what is going on but who doesn't have the background or education to access the results. The result is that someone might be inclined to just accept that the results are accurate and 'okay'. Challenging them is an invitation to look foolish, having been impacted by the rhetorical language used throughout the article and intimidated by the apparently sophisticated methodology (which is anything but sophisticated). What role IQ ultimately plays in the results is entirely unclear.

The last paragraph of the article is full of rhetoric and celebratory language. “Nunavut’s economy is on the cusp of unprecedented growth …mining production is also expected to help create thousands of new jobs …”. This is followed by a nod to protecting the environment (in the name of sustaining this level of growth). Therefore “… it is equally important to safeguard the natural resources in the region …”.

The impossibility of having a constantly growing economy (celebrated by the verbal excitement that is noted in this article), and all the environmental impacts that go with it, and expecting the planet to survive the experience, is a much larger topic. It is a reality that can’t be accommodated by the logic underlying the further development of the Mary River mine. However, it is something addressed by IQ and the relationship that Inuit developed to their surroundings – in total.

Wrapping things up

There is much wrong with the results and any importance that might be associated with this study. I have already noted that it is an abuse and misuse of Inuit Qaujimajatuqangit. However, whatever the results suggest – the idea that the mine only disturbs 1.72 percent of the home range of the North Baffin Island caribou herd and that this is within an ‘acceptable range of risk’ - are more than questionable.[6]

Since the early 1990’s, caribou on Baffin Island have been in serious decline. By some estimate, the population has declined by an incredible 98%. There is much speculation as to the cause of this decline, including such factors as disease - bacterial (brucellosis) and a number of parasites - climate change and extreme weather events, the hunting of a population at a constant rate in the presence of a decline in numbers, road access and increasing access related to the use of high-powered snowmobiles. Caribou also experience natural fluctuations in their population sizes, with some Elders indicating that this can involve cycles of up to 60 years.[7]

There are problems with using data from collared caribou data to determine habitat use. Most of the caribou that are collared are females. Data used in any GIS is limited in terms of the period of time it covers. If numbers change, the relationship to and the use of habitat by caribou changes with those numbers. Differences in the use of calving areas have been noted within a diminished herd, as have changes in movement and migration. These patterns are likely to be considerably impacted by climate change in years to come. In fact, given what is currently happening to Arctic climates, in the immediate future.

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[6] Laituri, writing in *The Sage Handbook of GIS and Society* (London: Sage Publishers, 2011), further states in relation to research done on different ways in which GIS has been used with Indigenous peoples that “the general categories of this body of research includes: (1) land claims and land tenure; (2) resource management; (3) conflict and conflict resolution; (4) equity issues; and (5) community awareness. Embedded in this body of literature is the contentious nature of participatory mapping activities and the questions that surround access, control, and ownership of the process and the output (Dunn, 2007). Fundamentally, these research categories speak to power relationships within and between Indigenous communities, between Indigenous groups and government agencies and external groups, and between Indigenous Peoples and researchers or outside experts” (p.10).

[7] There have been very many studies conducted on barren-ground caribou. The most recent and thorough publication, from which this information is drawn, was published in 2016 by the Committee on the Status of Endangered Wildlife in Canada: COSEWIC, Canadian Wildlife Service of Environment and Climate Change Canada, *Assessment and Status Report on the Caribou Rangifer tarandus, Barren-ground population in Canada*.

Caribou are affected by noise and may be affected by different kinds of noise. What the study report reviewed here fails to consider in relation to caribou is remarkable.

In the case of Baffinland, access to habitat, if caribou populations are to recover, is likely to be highly affected by a railroad that cuts across the entire northern tip of Baffin Island, from Milne Inlet to Steensby Inlet to the south, shown on a map included on page 35 (below) of with the *ArcNorth* article.

The article reads as if the railway were not there. There are no guarantees that the measures being proposed to deal with this problem will work. The railway and its raised bed, act as a very significant barrier to caribou migration.

Access to the entire habitat to the west of the rail line is of concern, and makes the figure of 1.72% of habitat as the area affected by expansion of the mine, contestable and utterly meaningless. This is not addressed in the study reported on in this article. Someone looking at this article without doing more research or reading further on the topic - something highly likely, given where it has been published and the purpose it is intended to serve - ends up with a false impression of what the impact of expansion of the Baffinland mine on caribou is likely to be.

Will Baffinland's mine impact caribou habitat? GIS definitely doesn't have the answer.

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