

**// LEARNING BY MAKING //**

Exploring possibilities for a local  
construction ecosystem through a  
makerspace in Kangiqsualujuaq

by

Isaac Edmonds

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Susane Havelka,  
“Building with IQ (Inuit  
Qaujimaqatungit): The Rise  
of a Hybrid Design Tradition  
in Canada’s Eastern Arctic,”  
Thesis, McGill University  
Libraries, 2018, 237.

*fig. 0.01* (opposite) Memories  
of Kangiqsualujuaq - Solitary  
hike. Followed by friendly  
sled dog

“Rather than settling in their given government spaces and living in them indifferently, many individuals with the requisite skills and resources, already accomplished builders of traditional houses, have been living actively, as traditional Inuit. By doing so, they have shown what living Inuktitut really is: a continuous transformative building project. They took the houses sent to them, lived in them, corrected them, converted some of them, added to them, and built new ones to bring them back to the land. By combining their own practices with materials and technologies that were brought to them through government planning, they built their own distinctions and introduced personal and traditional qualities, ultimately prompting the rise of a hybrid design tradition in Canada’s eastern Arctic. The question of territoriality and identity in Inuit mobility and life, as discussed by Collignon (1993), suggests that combining references to both modernity and the old way of life makes possible the expression of a new cultural landscape.”



Sheila Watt-Cloutier describing her brothers assembling a qamutiik in *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change*. Minneapolis; London: University of Minnesota Press, 2015, 15.

**fig. 0.02** (opposite) Memories of Kangisualujuaq – Hunters pulling up their boat after a seal hunt

“The precision with which they would prepare the *qamutiik* was fascinating. They first cut damp peat moss from the soil in squares and brought it home, where they checked it for any stone. My brother’s tended to do this the modern way - with their hands - but traditionally hunters would have put chunks of peat moss into their mouth to find and remove the stones. Once the peat moss has been cleaned, they shaped it around the bottom of the sled runners. Then they cautiously dripped small amounts of warm water along the moss. Traditionally, this water would have been warmed in their mouths before being applied. They did all this outside in the freezing cold, the steam rising up in little clouds from the moss as they worked. While the water was forming a layer of ice on the moss, my brothers polished it with a small piece of wet caribou fur until everything was frozen hard. They repeated the process until several layers of ice had built up on the runners, sometimes smoothing the ice further with a plane. Once the peat had a thick, hard surface of ice, the runners would glide easily on the ice and snow. Next, Charlie and Elijah worked on tightening all the pieces of the wooden *qamutiik* by binding them together with strong rope. Finally, they tied all our gear and belongings, as well as the caribou hides we used as seats, to the sled. During the entire process, Charlie and Elijah worked with absolute focus and attention. It was almost mesmerizing watching them labor in the same meticulous way that Inuit had worked for generations.”



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## *ABSTRACT*

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The current construction industry in Nunavik is largely disconnected from the northern communities where the buildings themselves are constructed. Fabrication occurs in Quebec, materials are shipped north via barge and assembly is completed by a visiting southern construction crew. Furthermore, the high cost of housing in combination with rapid population growth has resulted in an ongoing housing supply crisis. Through the expansion of opportunities for local training and innovation, there lies the potential to simultaneously address several of these issues. Spaces for learning by making are an integral aspect to this effort. Inuit are their own makers and they actively continue to exercise these skills. However, vernacular design traditions have historically been ignored for the most part by southern decision makers with an institutional view of what qualifies as accepted building knowledge.

This thesis addresses the question: **how can the design of a makerspace serve as a means to expand local opportunities for a more sustainable, culturally reflective building ecosystem in Kangiqsualujjuaq?** Review of literature on the current building delivery system and possibilities for sustainable solutions, case studies on makerspaces in northern location and an investigation of local material culture form the primary methodology. The comprehensive design of a makerspace is presented that draws inspiration from Inuit making culture with the intent to explore alternative, locally-driven avenues in the sustainable development of Kangiqsualujjuaq's built environment. Lastly, the conclusion reflects on ways to return this work to the community and considers the wider applicability of this makerspace concept across Nunavik.

**Key words:** makerspace, indigenuity, cultural sustainability, local materials, Inuit, Nunavik

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## INTRODUCTION

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Most housing provided to communities in Nunavik is fabricated in Quebec, shipped to the community and then assembled by a southern construction crew that visits during the summer (figure 0.03). Very little revenue generated from construction in these locations is returned to the communities. Furthermore, the high cost of housing in combination with rapid population growth has resulted in an ongoing housing supply crisis.<sup>1,2</sup> To construct a conventional house on site typically costs between \$500,000 and \$1,000,000.<sup>3,4</sup> Shipping building materials over long distances and wages for a southern construction crew are the primary drivers of high cost. In remote communities that have very limited opportunities for salary paying jobs, this makes home ownership inaccessible to many.<sup>5</sup>

Due to the constant (and currently rising) demand for the provision of housing, a small number of models are mass produced with an emphasis on rapid delivery.<sup>6</sup> While speed of production and delivery are both essential qualities for building in northern communities, the root problems are not addressed in this model. Namely, the high cost of building and limited job options restrict the choices available to most people. For these reasons, many people live in social housing provided by the government that is constantly overcrowded due to the ongoing housing supply crisis.<sup>7</sup> Increased autonomy in the construction sector in Nunavik would not only allow for the revenue of construction activities to be returned directly to skilled local workers, it would also increase the agency that these communities have in addressing the current crisis in the supply of housing and expand community influence in shaping the future of their built

1 Camille Pepin, Gina Muckle, Caroline Moisan, Nadine Forget-Dubois & Mylène Riva (2018) "Household overcrowding and psychological distress among Nunavik Inuit adolescents: a longitudinal study," *International Journal of Circumpolar Health*, 77:1, DOI: 10.1080/22423982.2018.1541395

2 Cathleen Knotsch & Kinnon, D. (2011), "If Not Now ... When? Addressing the Ongoing Inuit Housing Crisis in Canada," Ottawa: National Aboriginal Health Organization.

3 Don Procter, "Nunavik Building Sets Foundation for Canadian North Homes Construction - Constructconnect.com," *Journal Of Commerce*, December 3, 2019, <https://canada.constructconnect.com/joc/news/projects/2019/12/nunavik-building-sets-foundation-for-canadian-north-homes-construction>.

4 Société d'habitation du Québec, "Housing in Nunavik: Information Document," Government of Québec, 2014.

5 Inuit Tapiriit Kanatami. *Inuit Nunagat Housing Strategy*, Report, April 2019, 6.

6 Knotsch & Kinnon (2011), "If Not Now ... When? Addressing the Ongoing Inuit Housing Crisis in Canada."

7 Pepin, Muckle, Moisan, Forget-Dubois & Riva (2018) "Household overcrowding and psychological distress among Nunavik Inuit adolescents: a longitudinal study."

environment. The current building delivery model is counter intuitive to a sustainable construction industry framework and works against the objective of long term self-sufficiency. These issues are compounded by low levels of local employment in construction. Through the expansion of opportunities for local training and innovation, there lies the potential to simultaneously address several of these issues. Spaces for learning by making are an integral aspect to this effort. A skilled workforce that can innovate and develop culturally responsive design solutions is a key component to any local construction economy. Inuit are their own makers and they actively continue to exercise these skills. However, vernacular design traditions have historically been ignored for the most part by southern decision makers and scholars with an institutional view of what qualifies as accepted building knowledge. Makerspaces present an avenue for the co-development of sustainable solutions by creating a collaborative learning environment where community-built projects can be generated through the sharing of local knowledge, materials and skills.

This thesis addresses the question: **how can the design of a makerspace serve as a means to expand local opportunities for a more sustainable, culturally reflective building ecosystem in Kangiqsualujjuaq?** Kangiqsualujjuaq is recognized as a unique community in Nunavik due to its strong leadership and openness to innovation. This entrepreneurial spirit is evident in the pioneering Qarmaapik House program, Interpretive Centre and community greenhouse initiatives.<sup>8,9,10</sup> Historically, Inuit in Kangiqsualujjuaq established on their own initiative the first co-operative in Northern Quebec for marketing Arctic char.<sup>11</sup> In the present day, they are the only community to hold annual Parnasimautik meetings (workshops to reflect on community priorities and outline sustainable

8 Sarah Rogers, "Qarmaapik House Emerges as a Model for Family Wellness in Nunavik," December 12, 2018, <https://nunatsiaq.com/stories/article/qarmaapik-house-emerges-as-a-model-for-family-wellness-in-nunavik/>.

9 Sarah Rogers, "Interpretative Centre a Great Introduction to New Park," Nunatsiaq News, October 07, 2010, accessed April 19, 2021, [https://nunatsiaq.com/stories/article/081010\\_interpretative\\_centre\\_a\\_great\\_introduction\\_to\\_new\\_park/](https://nunatsiaq.com/stories/article/081010_interpretative_centre_a_great_introduction_to_new_park/)

10 Makivik Corporation, "Greenhouses in Nunavik," December 23, 2020, accessed April 19, 2021, <https://www.makivik.org/article/greenhouses-in-nunavik/>

11 Makivik Corporation. "Kangiqsualujjuaq." Makivik Corporation, January 16, 2018. <https://www.makivik.org/kangiqsualujjuaq/>.

development objectives that align with local ways of life).<sup>12</sup> In 2019, I had the opportunity to visit this community for a collaborative design project so my familiarity with this place is another important factor in the selection of this site.

Through the review of existing literature, the first chapter of this thesis examines in detail the current building delivery system in Nunavik, its barriers to innovation and considers a conceptual framework for the expansion of a sustainable local construction framework. The second chapter consists of analytical work with the intent to extract best practices for makerspace design that enriches creative agency and expands opportunities for learning by making in these remote locations. Case studies on makerspaces and vocational training centres in remote northern communities have been undertaken with the intent to examine their role as a stimulus for local innovation. A secondary component to this research was investigation into the feasibility of local material use in establishing a local construction economy. This involved the review of literature and the creation of a catalogue of possibilities outlining current uses, sources and potential future applications of local materials. The third chapter includes site analysis in order to sensitively situate the proposed architectural intervention and presents the comprehensive design of a makerspace that draws inspiration from Inuit making culture with the intent to explore alternative, locally-driven avenues in the sustainable development of Kangiqsualujjuaq's built environment. Finally, the conclusion reflects on ways to return this work to the community and considers the potential for a wider network of these makerspaces across Nunavik.

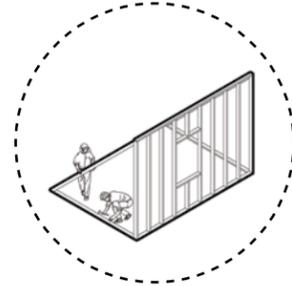
12 "Kangiqsualujjuaq – What Was Said," Parnasimautik, November 24, 2014, <https://parnasimautik.com/kangiqsualujjuaq-bulletin/>.

Very little revenue from construction activities is returned to Nunavimmiut.

CURRENT BUILDING DELIVERY MODEL

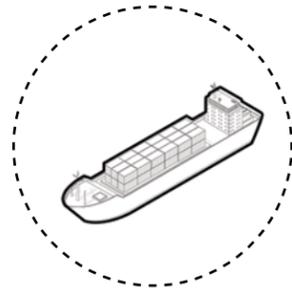
// ASSEMBLY

A visiting Québécois construction crew (sometimes involving some skilled/unskilled local labor) completes assembly. Intense mid-June to mid-July construction season.



// TRANSPORT

Materials are shipped by barge on the first sea lift (usually mid-June). Only two sea lifts occur each year.



// CONSTRUCTION MATERIALS

Materials are sourced from southern manufacturing centres.

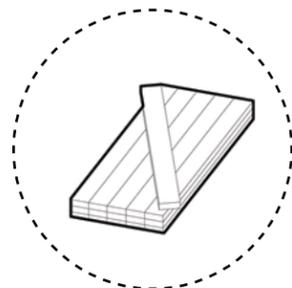


fig. 0.03 Building Delivery to Kangiqsualujuaq

*MOVING BEYOND CRISIS ARCHITECTURE FOR  
HOUSING IN NUNAVIK*

*01*

*1.1. The Formation of Nunavik's Built Environment*

*1.2. Local Leadership and Innovation*

*1.3. Barriers to Local Involvement in Nunavik's Construction Sector*

*1.4. Inuit Making Culture in Nunavik*

The first chapter of this thesis provides a literature review examining the formation of Nunavik's present-day built environment, the problems that this has created and possible paths towards a more sustainable model. In order to understand the flaws in the current housing delivery model in Nunavik, it is first necessary to understand the origins of this system. The first section of this chapter covers the history of southern building delivery to Nunavik and the origins of a crisis response approach. Section 1.2 examines current community advocacy supporting progressive initiatives to increase local capacity in the construction sector. Section 1.3 examines key barriers that face Nunavimmiut who wish to become involved in the construction industry. Lastly, the final section discusses Nunavik's strong local making culture and proposes key tenets for the design of sustainable and culturally reflective makerspaces in Nunavik.

### 1.1 The Formation of Nunavik's Built Environment

Up until the late 1950s, the Canadian government maintained a policy of anti-sedentarization towards Inuit people, believing that sedentarization would introduce dependency (and thus financial cost to the government).<sup>1</sup> They did not encourage self-sufficiency of Inuit on the land, but took steps to discourage Inuit from setting up camps around outposts. For example, under this policy the sale of building materials to Inuit was prohibited.<sup>2</sup> However, due to a number of hardships primarily brought upon Inuit through the process of colonization, living on the land became increasingly difficult. The manipulative market economy of the fur trade encouraged trapping over more traditional long hunting trips. This, in conjunction with a sudden scarcity of caribou and the onset of a tuberculosis epidemic made living on the land increasingly difficult.<sup>3</sup> Trading posts still maintained the government's anti-sedentarization policy, but some forms of work, emergency government assistance and scrap building materials were available to Inuit. The development of semi-permanent camps became increasingly common and in 1959 government policy changed as their primary objective shifted from preventing dependency to the 'civilization' of Inuit people.<sup>4,5,6</sup>

As a primary mechanism of this effort, family allowances were provided to Inuit only if they sent their children to school. Often, this involved separating children from their parents by sending them to residential schools in northern Quebec. During the Cold War, the sedentarization of Inuit people was also useful for the Canadian government since it allowed for a clear land claim over arctic territories that Russia disputed at the time. In an effort to ensure simple census numbers, sled dogs in Nunavik communities were rounded up and shot by the RCMP who later claimed that the dogs had become diseased. In the words of Inuk Sheila Watt-Cloutier:

1 Gérard Duhaime, "La Sédentarisation Au Nouveau-Québec Inuit," trans. Isaac Edmonds, *Études/Inuit/Studies* 7, no. 2 (1983): 25-52, accessed April 19, 2021, <http://www.jstor.org/stable/42869382>.

2 Putulik Ilisituk and Hiram Léa, *Inuinnauvugut = We Are Inuit: Life Stories of the People of Salluit* (Inukjuak, Qc.: Qaqqalik Landholding Corporation of Salluit, 2016).

3 Duhaime, "La Sédentarisation Au Nouveau-Québec Inuit," trans. Isaac Edmonds.

4 Lola Sheppard and Mason White, *Many norths: spatial practice in a polar territory*. New York, Barcelona: Actar Publishers, 2017, 43-44.

5 Duhaime, "La Sédentarisation Au Nouveau-Québec Inuit," trans. Isaac Edmonds.

6 Sébastien Lévesque & Gérard Duhaime, "Inequality and social processes in Inuit Nunangat," *The Polar Journal* (2016), 6. 1-18. 10.1080/2154896X.2016.1173795.

"Certainly no permission was asked of the owners. The dogs were simply shot. In some instances, the carcasses were thrown in piles and burnt. All this happened in view of their shocked owners."<sup>7</sup> This was one of many ways in which Inuit people were systematically disconnected from traditional ways of life. These efforts to separate Inuit people from their culture have resulted in widespread intergenerational trauma that has for the most part never been acknowledged by the Canadian government.<sup>8,9,10</sup>

The built environment as can be seen in Nunavik's communities today came about as a response to criticism raised in the 60s by those who operated posts, missions and military camps on the inhumane state of health and housing that the Inuit populations around settlements were subject to.<sup>11,12</sup> The government response to address this began with the poorly coordinated Eskimo Housing Loan Program followed by subsidized housing (Rigid Frame -model 319 units) that amounted to little more than plywood walls with no toilet, ventilation or heating.<sup>13</sup> During this transitional period towards a policy encouraging sedentarization, homeowners could still choose where they wanted to build their houses, were responsible for assembly and could adapt these structures as they desired.<sup>14</sup> Despite all their deficiencies, these early housing models would later be transported out onto the land and were used as cabins due their modularity and small size. This has noticeably influenced the development of a contemporary Inuit cabin practice in Canada's eastern arctic.<sup>15,16</sup> The next attempt known as "matchbox" units (model 370) were completely unfit for the climate

7 Sheila Watt-Cloutier and Bill McKibben, *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change*. Minneapolis; London: University of Minnesota Press, 2015.

8 Erik Anderson and Sarah Bonesteel, "A Brief History of Federal Inuit Policy Development: Lessons in Consultation and Cultural Competence" (2010), *Aboriginal Policy Research Consortium International* (APRCi).

9 Lucie Bigue and Serge Pageau, *Housing in Inuit Nouveau-Quebec* (Quebec: HEMAI, 1980).

10 Duhaime, "La Sédentarisation Au Nouveau-Québec Inuit," trans. Isaac Edmonds.

11 Inuit Tapiriit Kanatami, *Barriers to Sustainable Housing Delivery in Inuit Nunangat*, Report, 2016, 1.

12 Sheppard and White, *Many norths: spatial practice in a polar territory*, 122-123.

13 Ibid, 123.

14 Mark Kadjulik in *Inuinnauvugut = We Are Inuit: Life Stories of the People of Salluit*.

15 Havelka, "Building with IQ (Inuit Qaujimatjuqangit): The Rise of a Hybrid Design Tradition in Canada's Eastern Arctic."

16 Pierre-Olivier Demeule, "Savoir-Faire Locaux Et Autoconstruction Dans La Toundra: Une Lecture Des Cabanes Du Fjord De Salluit," trans. Isaac Edmonds, July 5, 2019.

although they progressed through a series of improvements.<sup>17</sup> This marks the beginning of a crisis response building delivery model with materials being sourced from Quebec, shipped north in the summer and assembled by a visiting southern construction crew. Between 1960 and 1990, several radical and creative proposals were developed by the likes of Ralph Erskine, Moshe Safdie and Frei Otto.<sup>18</sup> The experimental nature of architecture designed in the south for northern communities during this time, while admirable in its intentions, reflected demand for ‘emergency solutions.’

In the present day, positive efforts to move beyond this reliance on government provided social housing include co-developing housing policies in partnership with Inuit organizations and the expansion of housing options (increased co-operative, affordable rental and private rental housing stock).<sup>19</sup> However, the construction industry itself has yet to make the same advances. There are positive efforts, such as the construction vocational training program at the Nunavimmi Pigiursavik Centre in Inukjuak, the efforts of the non-profit, Inuit-run Makivik Corporation to employ local workers in building activities as well as the prioritization of local employment and training by southern architecture firms like EVOQ who have distinguished themselves for their collaborative design process. By and large though, building delivery in Nunavik still occurs through the same mechanisms of outside industry that have existed since the 60s.

### 1.2 Local Leadership and Innovation

Advocacy supporting the development of a more local economy as it relates to construction is plentiful in Inuit produced and co-produced publications. In the words of Inuit Tapiriit Kanatami (ITK), the organization responsible for representing Inuit across Canada on a national level:

Eliminating the housing gap in Inuit Nunangat will require building local skills and trade certification and capacity so

<sup>17</sup> Sheppard and White, *Many norths: spatial practice in a polar territory*, 123.

<sup>18</sup> Ibid, 125-126.

<sup>19</sup> Inuit Tapiriit Kanatami, *National Housing Strategy Submission*, Report, 2016.

that Inuit are better supported and equipped to participate in construction, operations and maintenance projects...It is imperative to ensure that support for capacity development, both direct and indirect, is as accessible and effective as possible and responsive to the unique challenges and opportunities in Inuit communities.<sup>20</sup>

This is reinforced by the findings of the recent Pinasuqatigiitsuta report collaboratively developed under the Sentinel North research partnership. Findings from this study include the importance of supporting local making activities, encouraging self-build and renovation initiatives and establishing new professional education centres to further develop a skilled labour force in Nunavik.<sup>21</sup> On a broader scale, the intent of the Inuit-run Parnasimautik workshops offer an opportunity for all Nunavimmiut, both at the scale of individual communities and the region, to discuss and propose a sustainable model of development that adheres to Inuit values.<sup>22</sup> The outspoken Inuit activist Sheila-Watt Cloutier advocates for the concept of “culture match” in economic development by investing in local industries that protect the land and the Inuit way of life. Examples of industries of this nature include filmmaking, performance art and the export of local craft such as jewellery, clothing and carving among others. These are burgeoning sources of sustainable, local economic growth. The concept of an export-based economy as a means to showcase local talent and maintain traditional ways of life is one that is actively embraced by Cloutier and many Inuit.<sup>23</sup> The Kenojuak Cultural Centre and Print Shop in Kinggait, Nunavut is a proof of concept in this regard, offering a high quality makerspace for local artist and sculptors to create and market their craftwork. This pride in making extends to construction practice as the Makivik Construction Division “trains and actively promotes the hiring of Inuit, thus contributing to economic development in the region.” Adding that

<sup>20</sup> Inuit Tapiriit Kanatami, *Inuit Nunangat Housing Strategy*, Report, April 2019, 21.

<sup>21</sup> Sentinel North, “Pinasuqatigiitsuta - A guideline for community planning in Nunavik (2020),” Accessed September 19, 2020. <https://www.pinasuqatigiitsuta.org/>.

<sup>22</sup> “Kangiqsualujjuaq – What Was Said,” Parnasimautik, November 24, 2014, <https://parnasimautik.com/kangiqsualujjuaq-bulletin/>.

<sup>23</sup> CPA Canada, “Toward a Greener World: A Q&A with Sheila Watt-Cloutier,” CPA Canada, October 4, 2017, <https://www.cpacanada.ca/en/connecting-and-news/blogs/sustainability/qanda-with-sheila-watt-cloutier>.

“these construction practices are helping to create a sense of pride and self-sufficiency for workers and communities in Nunavik and are helping provide communities with the necessary tools to work towards long-term sustainability.”<sup>24</sup> Through this lens it is clear that spaces for making and for learning by making possess multiple dimensions of value in working towards a sustainable local economy based on Inuit values.

### ***1.3 Barriers to Local Involvement in the Construction Sector***

There are several barriers that stand in the way of increasing local involvement and agency in Nunavik’s construction sector. Limited professional training opportunities and a construction working environment that is not seen as desirable are key reasons. As the Inuit Nunangat Housing Strategy (2019) published by Inuit Tapiriit Kanatami outlines: “Federally, there are few housing capacity development programs accessible to Inuit as well as general capacity development programs linked to labour market development.”<sup>25</sup> This is reinforced when the options for professional training opportunities are examined. One option is to travel to a southern city such as Quebec or Montreal to study at a college, university or trade school. For the majority of Nunavimmiut, this is both financially inaccessible and a difficult transition for people who have grown up in small remote communities.<sup>26</sup> There are several vocational training centres across Nunavik, but the Nunavimmi Pigiursavik Centre in Inukjuak is the only program to offer post-secondary training in construction (a 1.5 years carpentry certification).<sup>27</sup> However, due to family situations, relocating to Inukjuak to study is not always an option for Inuit living in other communities. In other Nunavik communities, opportunities to receive the professional training certification required to enter the construction industry are more limited which presents a barrier to

<sup>24</sup> Inuit Tapiriit Kanatami, *Best Practices in Sustainable Housing Delivery in Inuit Nunangat*, 2016, 5.

<sup>25</sup> Ibid.

<sup>26</sup> Selena Ross, “For Young Inuit, Getting an Education Can Mean Choosing between Cultures,” *National Observer*, November 20, 2017, <https://www.nationalobserver.com/2017/11/01/news/which-way-knowl-edge-young-inuit-getting-education-can-mean-choosing-between-cultures>.

<sup>27</sup> Kativik Ilisarniliriniq, “Carpentry,” *Kativik Ilisarniliriniq*, December 6, 2019, <https://www.kativik.qc.ca/adult-education/vocational-training/carpentry/>.

Nunavimmiut who may wish to pursue this career (figure 1.01). Another important consideration is the typical construction working environment. People in Nunavik who are entirely capable of building construction sometimes choose not to participate due to a lack of interest in the frenetic work schedule required during the most enjoyable summer months. Due to the limited summer construction season and the incredibly high demand for housing, visiting Quebecois crews often work 7am to 7pm, 7 days a week from mid-June to mid-July. In the words of Maxime Heroux, a construction project manager in Nunavik, “construction workers have a 7-day, 65-70 hours/week schedule, and I believe these conditions might scare off potential construction workers from Nunavik.”<sup>28</sup> In conversation with a carpentry teacher in Inukjuak:

Most graduates try their luck on the construction sites...but the majority stay in Nunavik and end up on maintenance for all woodworking duty (repairing and installing doors and windows, repairing walls and insulation) etc.. The pay is more stable, the schedule is not as horrible as the construction and they can work all year long instead of short burst of long hours. We are still trying to figure out exactly what needs to be done in order to have better retention on construction sites, but usually the companies don’t care much about retention and just want to get the job done and move on, which is a big issue.<sup>29</sup>

For many, it is preferable to spend time out on the land during this time and pass up this work opportunity. Envisioning a local construction industry framework cannot be done without critical reconsideration of schedule.<sup>30</sup> Makerspaces that can facilitate alternative schedules whereby (pre)fabrication can occur during the winter at a less frenetic pace could potentially provide a construction work environment that is more closely aligned with Inuit values and has a higher level of seasonal stability.

<sup>28</sup> Maxime Heroux (Construction Project Manager in Nunavik), in discussion with the author, November 25th, 2020.

<sup>29</sup> Philippe Lagadec (Carpentry Teacher in Inukjuak), in discussion with the author, December 4th, 2020.

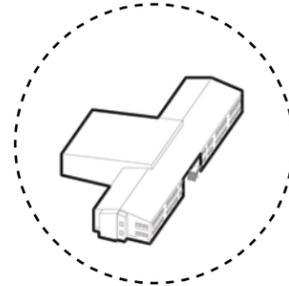
<sup>30</sup> Heroux, in discussion with the author, November 25th, 2020.

Limited opportunities exist for Nunavimmiut who wish to acquire the training certification necessary to work in the construction industry.

ACCESS TO CONSTRUCTION TRAINING

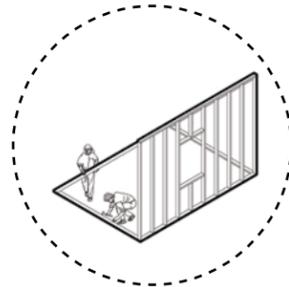
// INUKJUAK VOCATIONAL TRAINING CENTRE  
Program in construction/carpentry (1.5 years)

Due to family situations as well as the high cost and limited availability of housing, relocating to Inukjuak to study may be inaccessible to people living in other communities.



// LIMITED SEASONAL TRAINING OPPORTUNITIES

The Makivik Construction Division and the Kativik vocational training branch work with limited resources to provide seasonal workshops and opportunities for construction experience.



// TRAVEL TO A SOUTHERN CITY  
to study at a college, university or trade school

This option is often financially inaccessible and the experience of transitioning from a small remote community to a large city can be difficult.

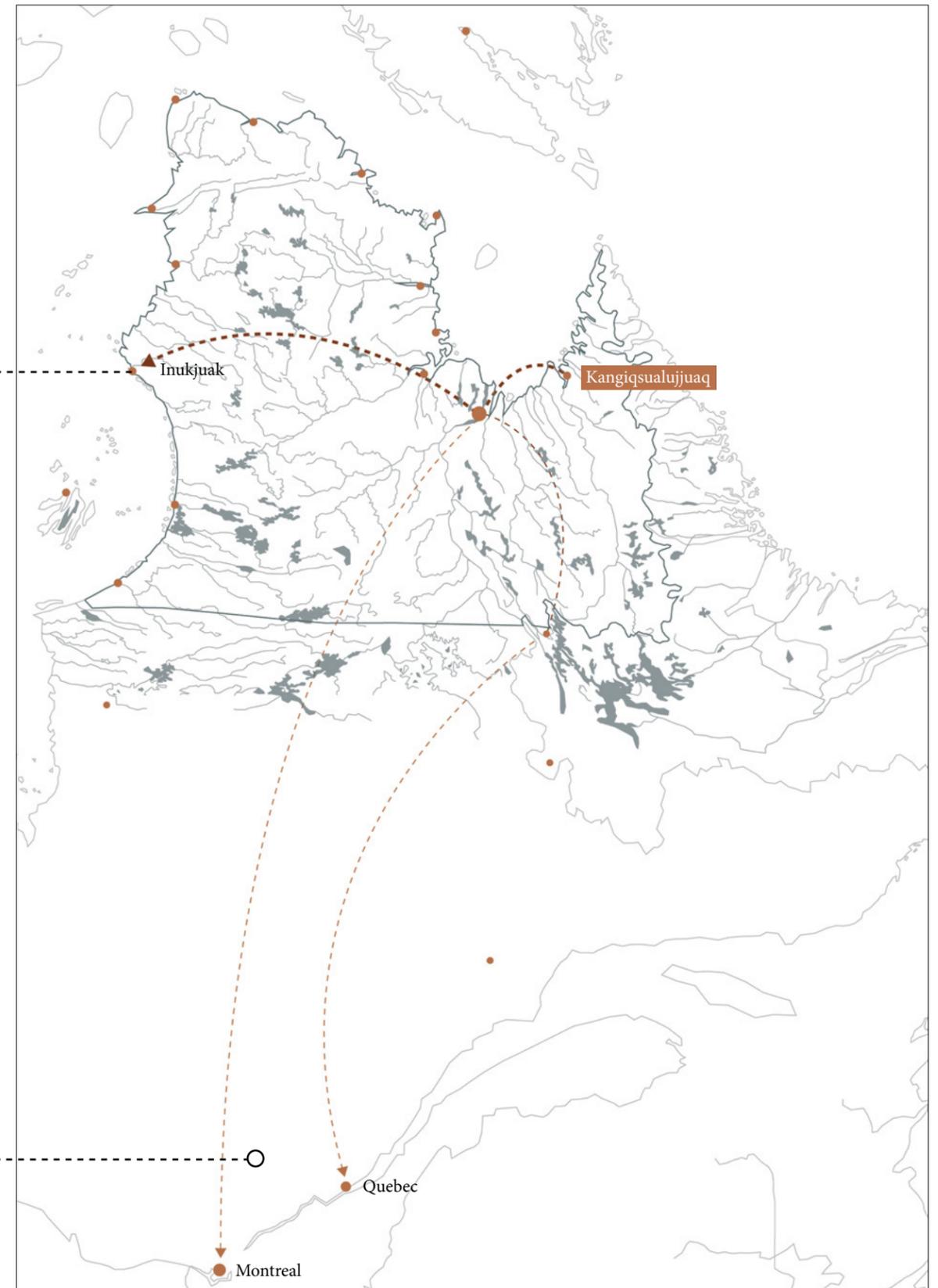


fig. 1.01 Access to Construction Training from Kangiqsualujuaq

### 1.4 Inuit Making Culture in Nunavik

fig. 1.02 (opposite) Inuit Making Culture

A strong making culture exists in Nunavik that is characterized by creative ingenuity, knowledge of living on the land, highly skilled craftwork expertise and a tradition of knowledge sharing (figure 1.02). This is evident in the principles of *Inuit Qaujimagatuqangit* (often abbreviated to IQ): Inuit knowledge and values encompassing all aspects of life, place and their interconnectedness.<sup>31</sup> A series of 8 principles that embody IQ were proposed by an Inuit sustainable development working group (formed in 1999) with the principles of *Piliriqatigiingniq* (collaborative relationships or working together for a common purpose, *Avatimik Kamattiarniq* (environmental stewardship and respecting all living things) and *Qanuqtuurunnarniq* (resourcefulness, to seek solutions through innovative and creative use of resources, demonstrating adaptability and flexibility to prepare for the future) possessing particular relevance to the discussion of Inuit making culture.<sup>32</sup> Inuit are their own makers and they actively continue to exercise these skills although vernacular design traditions have been largely ignored by southern decision makers and scholars with an institutional view of what qualifies as accepted building knowledge. This has resulted in local making practices being disregarded in the discussion of sustainable community development. However, through closer examination, it can be seen that these practices “embody a deep-rooted way of being and offer a civilization’s worth of practical knowledge.”<sup>33</sup> Anthropologist Tim Ingold argues that inhabiting goes beyond simply living in a place and includes the capacity to build the material and cultural structures that ensure a symbiotic coevolution with the environment.<sup>34</sup> As Havelka articulates:

Rather than settling in their given government spaces and living in them indifferently, many individuals with the requisite skills and resources, already accomplished builders of traditional houses, have been living actively, as traditional Inuit. By doing so, they have shown what living Inuktitut really

31 “Inuit Qaujimagatuqangit,” Inuit Qaujimagatuqangit | Nunavut Impact Review Board, accessed April 19, 2021, <https://www.nirb.ca/inuit-qaujimagatuqangit>.

32 Havelka, “Building with IQ (Inuit Qaujimagatuqangit): The Rise of a Hybrid Design Tradition in Canada’s Eastern Arctic, 239.”

33 Ibid, 240.

34 Tim Ingold, *Making: Anthropology, Archaeology, Art and Architecture* (London: Routledge, 2013).

// CREATIVE INGENUITY //



// KNOWLEDGE OF LIVING ON THE LAND //



// SKILLED CRAFTWORK EXPERTISE //



// A TRADITION OF KNOWLEDGE SHARING //

is: a continuous transformative building project.<sup>35</sup>

Since the initial provision of houses by the government to communities in Nunavik, Inuit have converted and expanded these spaces, occupying them in ways different than the original intentions of the southern designers. References to traditional ways of life merged with modern materials and technologies to prompt the “rise of a hybrid design tradition in Canada’s eastern Arctic.”<sup>36</sup> Pierre-Olivier Demeule’s graduate work explores cabin culture as a distinctive element of local making culture that embodies Inuit knowledge of living on the land and reflects cultural values. “Considered as informal from a western perspective, northern cabins mark the evolution of a way of life inherited from the Inuit tradition and reveal a know-how capable of offering innovative solutions to the housing crisis in Nunavik.”<sup>37</sup> These building practices represent a desire for self-determination in the ways Inuit occupy the territory and demonstrate creative ingenuity in their realization. Despite the fact that new buildings in Nunavik typically make use exclusively of materials imported for Quebec, the use of local materials in present-day building activities is commonplace. This can be seen in the self-built houses, hunting cabins, hunting food caches, storage sheds and mobile ice-fishing shelters visible throughout communities. These structures typically make use of a mix of locally harvested and recycled building materials. A do-it-yourself making culture exists with informal building and repair activities taking place frequently in sheds and backyards. Often these personal workshop spaces will make creative use of shipping by-products with shipping containers, wood cable spools, crates and pallets acting as makeshift workshop tables or storage. Traditionally, Nunavimmiut were adept craftspeople with a wealth of material knowledge. Craft knowledge is still maintained and passed on in some communities varying from qamutiik (sled), kayak and umiak (boat) fabrication to paddle and sculpture carving techniques to name just a few. In some communities, the sale or export of intricate craftwork such as carving, drawing or printmaking

35 Havelka, “Building with IQ (Inuit Qaujimajatuqangit): The Rise of a Hybrid Design Tradition in Canada’s Eastern Arctic,” 236.

36 Ibid.

37 Demeule, “Savoir-Faire Locaux Et Autoconstruction Dans La Toundra: Une Lecture Des Cabanes Du Fjord De Salluit,” trans. Isaac Edmonds.

carries forward traditional making knowledge while providing a legitimate source of income. Accurately stated:

Supported by IQ (Inuit Qaujimajatuqangit) Inuit building today is resourceful, serves as a knowledge transfer, responds to the environment, and prepares for the future. For the sake of collective wellness, it is essential to harness these principles in the conception of the built environment.<sup>38</sup>

These qualities should be embodied in the design of makerspaces in Nunavik. The term *makerspace* can be defined as a collaborative learning environment where people come together to share materials and learn new skills. “They are not necessarily born out of a specific set of materials or spaces, but rather a mindset of community partnership, collaboration, and creation.”<sup>39</sup> *Makerspace* as a concept developed in response to the rapidly growing gap in access to information for everyday people in the modern era. The idea of empowerment through knowledge sharing is integral to this idea and it is one that is highly relevant to the sharing of building-related knowledge in Nunavik today. The concept of *indigenuity* refers to a holistic approach describing the types of initiatives that can integrally develop sustainable solutions based on indigenous knowledge and ingenuity.<sup>40</sup> Sami architect Joar Nango’s refers to it as “the ultimate connection between man, building, and context or place” and “a means of reclaiming control over the technology and systems that indigenous communities have had little control over since colonization.”<sup>41</sup> This is another idea of relevance in the discussion of sustainable construction practices in Nunavik. The resourcefulness, craftsmanship and knowledge of living on the land embedded in Inuit making culture presents a wealth of knowledge that should be mobilized towards sustainable building solutions through the provision of shared makerspaces in these communities.

38 Havelka, “Building with IQ (Inuit Qaujimajatuqangit): The Rise of a Hybrid Design Tradition in Canada’s Eastern Arctic,” 237.

39 Library As Incubator Project, s.v. “Makerspace,” accessed November 19, 2020, <http://www.libraryasincubatorproject.org/?p=4594>.

40 Lili Boesen, Stephen Hinton and Stephen Freeman, (2016), “Indigenuity: Reclaiming our Relationship with the Land,” 10.1016/B978-0-12-801231-4.00032-X.

41 Mimi Zeiger, “Interview: Joar Nango On Indigenous Architectures And Slippery Identities,” Pin-Up Magazine, accessed November 21, 2020.



*2.1 Case Studies: Makerspaces in Remote Northern Communities*

*2.2 Local Materials: Catalogue of Possibilities*

*2.3 Design Objectives: Principles for Makerspace Design in Nunavik*

This chapter consists of analytical work with the intent to extract best practices for makerspace design that enriches creative agency and expands opportunities for learning by making in these remote locations. In the first section, case studies have been undertaken in order to gain a better understanding of the programming, spatial qualities, site strategies and architectural objectives that facilitate a successful makerspace in similar contexts. The next section investigates the feasibility of local material use in establishing a local construction economy. This involved the review of literature and the creation of a catalogue of possibilities outlining current uses, sources and potential future applications of local materials. The final section reflects on key conclusions from the first two chapters and presents a series of design objectives illustrating best practices for sustainable makerspace design in Nunavik.

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### ***2.1 Case Studies***

The following projects represent a diverse variety of makerspaces in remote northern locations. These case studies consist of programmatic analysis through the review of project briefs and architectural drawings in order to examine strategies for stimulating local innovation as well as mapping the context of each makerspace relative to other important buildings in its community.

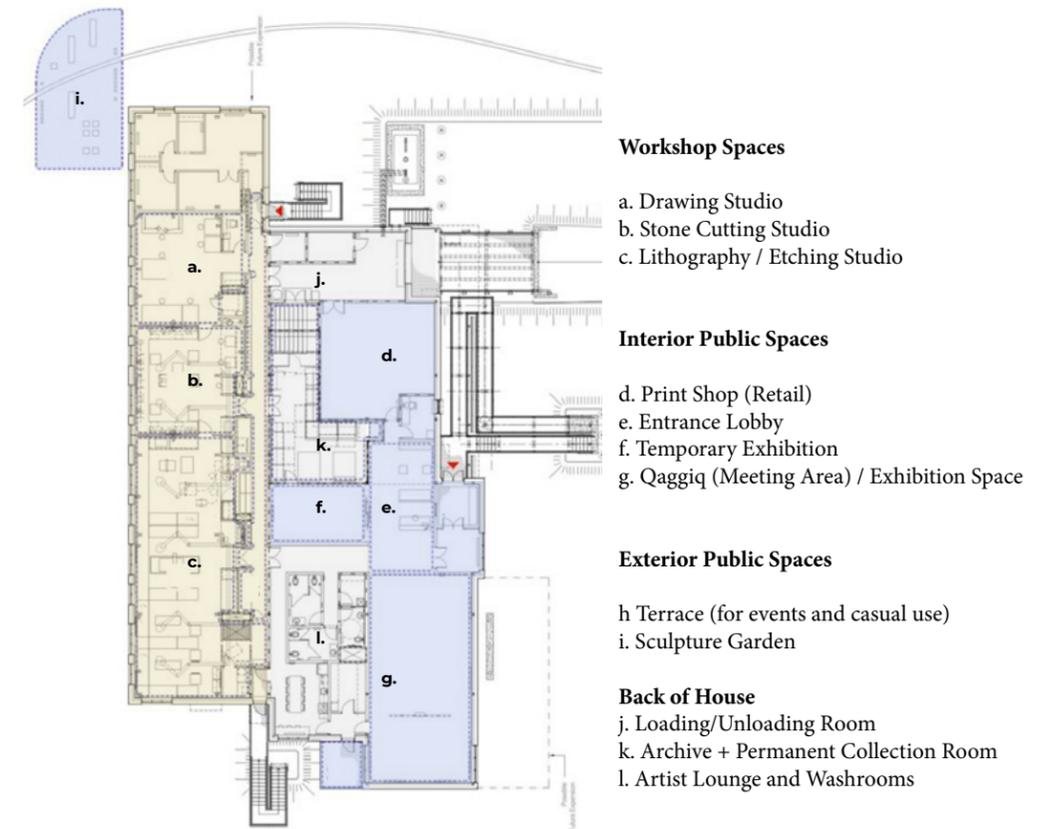
**Kenojuak Cultural Centre & Print Shop**

fig. 2.01 (opposite, top left) Kenojuak Cultural Centre and Print Shop interior 1.  
 fig. 2.02 (opposite, top right) Kenojuak Cultural Centre and Print Shop interior 2.  
 fig. 2.03 (opposite, bottom) Kenojuak Cultural Centre and Print Shop plan with overlay by author.

Kinngait, Nunavut  
 Population (2016): 1,441<sup>1</sup>  
 Completed in 2018  
 EVOQ Architecture

Artists in the community of Kinngait (Cape Dorset) have produced exceptional prints and carvings for over half a century. This contemporary facility was designed to replace the outdated space previously used by the artists. The Kenojuak Cultural Centre provides a strong model for what contemporary Inuit makerspace can look like in a small community. A high percentage of glazing in the workshop space provides connectivity to the land and community through sweeping views. This is offset by minimizing glazing on the opposite face of the building. The interior of the building makes extensive use of exposed wood (figures 2.01 and 2.02). This again connects the interior space to the land and provides natural warmth to these spaces. The programming of the makerspace includes a drawing studio, print-making facilities and a cultural hub with retail and exhibition space for both residents and visitors (figure 2.03).<sup>2</sup> All workshop spaces can be easily reconfigured to suit the users' needs with walls only present to separate major activities (prints, stone cutting and drawing). These dividing walls are almost entirely glass to provide visual continuity throughout the workshop. The exhibition/meeting hall is intentionally designed to be reconfigurable to provide a comfortable space for elders and community groups to meet.<sup>3</sup> Additionally, exterior spaces have been envisioned with the intent to enhance the community's personal contribution to the project. A sculpture garden spans the nearby walking path, showcasing local artwork while providing a place to sit and rest. Furthermore, large metal panels designed by local artists are mounted on the building facade (near the entrance) to tell the story of the centre's mission.<sup>4</sup>

<sup>1</sup> "Census Profile, 2016 Census," Statistics Canada, Retrieved 2017-03-03.  
<sup>2</sup> EVOQ Architecture, "Kenojuak Cultural Centre and Print Shop," EVOQ, August 10, 2020, <http://evoqarchitecture.com/en/kenojuak-cultural-centre-and-print-shop/>.  
<sup>3</sup> Kenojuak Cultural Centre and Print Shop, "About the Centre," Kenojuak Cultural Centre and Print Shop Campaign, accessed October 20, 2020. <http://kenojuakcentre.ca/about-the-centre/>.  
<sup>4</sup> Kinggait Studios, "Kinngait Studios," West Baffin Eskimo Co-Operative Ltd., accessed October 20, 2020, <https://www.westbaffin.com/kinngait-studios>.



**Pinnguaq Makerspace**

fig. 2.04 (opposite, top left) Pinnguaq Makerspace.  
 fig. 2.05 (opposite, top right) Pinnguaq Makerspace Exterior  
 fig. 2.06 (opposite, bottom left) Inuit Uppirijatuqangit game 1  
 fig. 2.07 (opposite, bottom right) Inuit Uppirijatuqangit game 2

Iqaluit, Nunavut  
 Population (2016): 7,740<sup>5</sup>  
 Founded in 2018 by Pinnguaq (tech startup)  
 Makes use of existing building

In Iqaluit, a successful small tech startup has founded a hub for creativity, knowledge sharing and innovation. The space is primarily used as a creative hub for teaching children contemporary science and computer-based learning skills that interweave with traditional arts and crafts learning (figure 2.04). The current space in use was formerly a yoga studio (figure 2.05). The centre operates on a drop-in model with coding, carving, sewing and family workshops.<sup>6</sup> As a result of the coding camp, several youth have gone into game development, releasing their own video games and working to develop the community curriculum at the makerspace (figures 2.06 and 2.07).<sup>7</sup> Once the pilot program is more developed, there are plans for a project workshop that mixes carving skills with 3D modelling.<sup>8</sup> By making tools and technology that would normally not be possible for locals to access publicly available, unique opportunities for youth creativity are generated. There is a strong Inuit artistic history and present which can provide new opportunities and synergies when access to novel tools is increased.



<sup>5</sup> “Census Profile, 2016 Census,” Statistics Canada, Archived from the original on 4 March 2017, Retrieved 2 March 2017.  
<sup>6</sup> Pinnguaq, “Iqaluit Makerspace,” Pinnguaq, March 25, 2020, <https://pinnguaq.com/work/makerspaces/iqaluit>.  
<sup>7</sup> Beth Brown, “Tech Startup Launches Nunavut Makerspace,” Nunatsiaq News, September 25, 2018. [https://nunatsiaq.com/stories/article/65674tech\\_start-up\\_launches\\_nunavut\\_makerspace/](https://nunatsiaq.com/stories/article/65674tech_start-up_launches_nunavut_makerspace/).  
<sup>8</sup> Ibid.

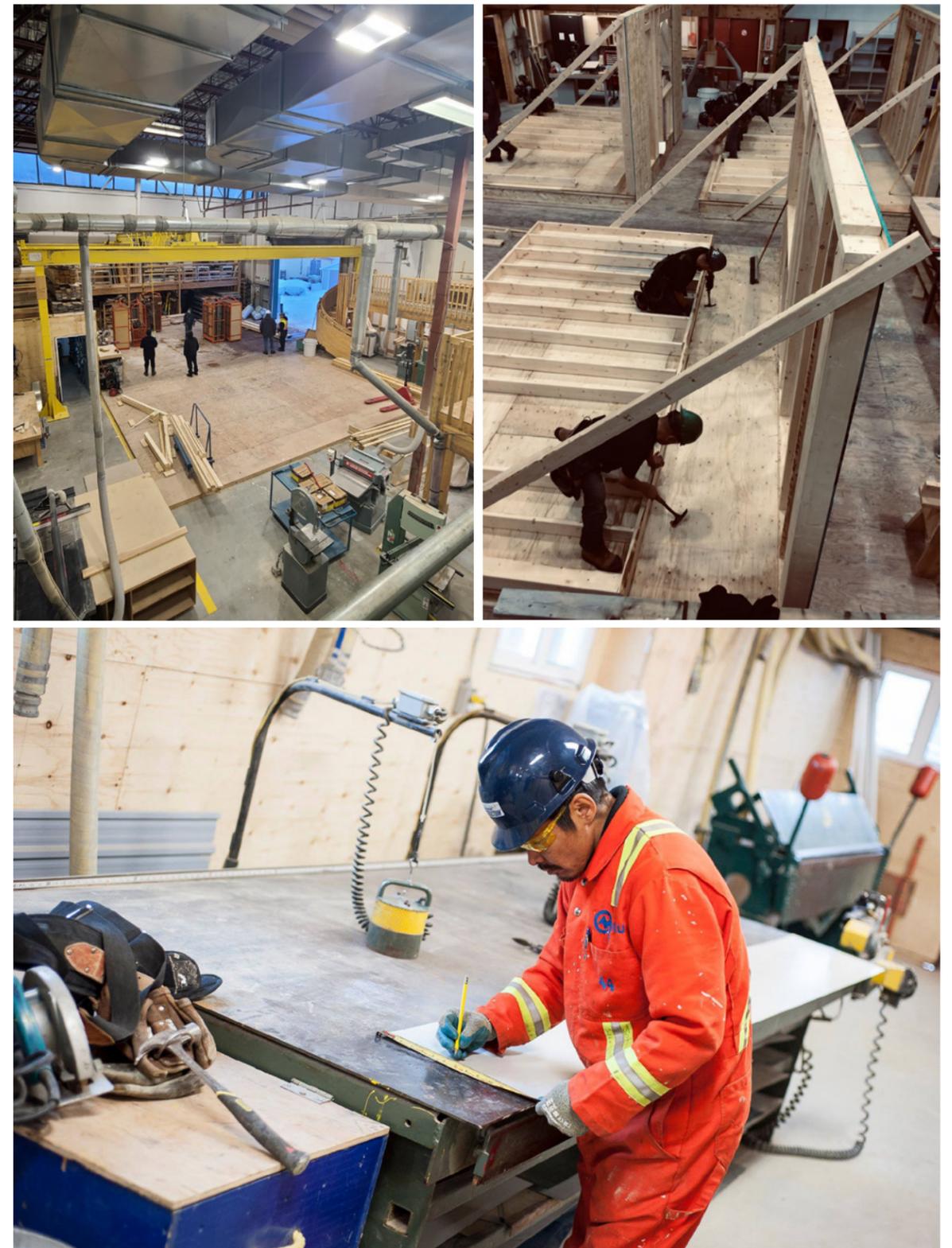
*Nunavimmi Pigiursavik Centre*

fig. 2.08 (opposite, top left)  
NPC vocational training  
centre workshop  
fig. 2.09 (opposite, top right)  
NPC carpentry class  
fig. 2.10 (opposite, bottom)  
NPC vocational training  
centre workshop 2

Inukjuak, Nunavik  
Population (2016): 1,757<sup>9</sup>  
Architect: Unknown

Several vocational training programs exist in Nunavik through the Kativik school board. Typically, a given program will only be offered in one community with students coming to visit for their studies. The vocational training centre in Inukjuak offers hands-on carpentry and construction training through a 1.5 year program. The construction curriculum involves opportunities to build a small cabin, learn concrete formwork, roofing, interior finishing and exterior finishing among other things (figures 2.08-2.10).<sup>10</sup> At the moment, options to develop abilities in a specialized profession or trade can be difficult to access in Nunavik without travelling south to a university or trade school in Quebec. Vocational training centres go a long way towards addressing this issue by provide programs in a familiar local context. Increasing the range of design and construction related skills that are available for professional study through these vocational training centres is a critical component to building a robust local construction sector.

<sup>9</sup>“(Code 2499085) Census Profile,” 2016 census, Statistics Canada, 2017.  
<sup>10</sup> Kativik Ilisarniliriniq, “Carpentry,” Kativik Ilisarniliriniq, December 6, 2019, <https://www.kativik.qc.ca/adult-education/vocational-training/carpentry/>.



**Ger Innovation Hub**

fig. 2.11 (opposite, top) Ger Innovation Hub class activity  
 fig. 2.12 (opposite, bottom) Ger Innovation Hub aerial view

Ulaanbaatar, Mongolia  
 Rural Urban Framework + University of Hong Kong

The Ger Innovation Hub is a pro-bono project developed by architecture practice Rural Urban Framework for a low income community in Mongolia (figures 2.11 and 2.12). The history of Mongolian communities is similar to that of many Indigenous groups around the world with a rapid transition from nomadic practices to settlements. Similar to Nunavik, Ulaanbaatar receives extremely cold winters dropping below -40 °C. This community also lacks running water and sewage disposal. The hub acts as a community training and gathering space, built primarily with local materials.<sup>11</sup> The Hub features vocational training, educational workshops, performance space and after-school programs.<sup>12</sup> Exterior social spaces have not been neglected with spaces such as exterior seating with integrated planting beds, a small plant nursery and space for a traditional Ger hut demonstration. The primary structure is comprised of two locally-sourced materials: mudbrick and wood (figure 2.13). The interior of the building is quite flexible in its layout with large portions of the exterior polycarbonate panels able to fold up, creating a fluid indoor-outdoor space during the summer. The separation between the interior mudbrick walls and the polycarbonate shell creates a heat buffer zone in winter. Heat from the central hearth is captured in the mudbrick walls of the interior core, keeping it warm. The wood members are simple dimension lumber that have been doubled or tripled up to form beams and columns. This allowed for the local sourcing of wood and construction entirely by locals without heavy machinery since the wood members are light. Simplicity, ease of assembly and local sourcing materials allowed the community to be heavily involved in the construction process.<sup>13</sup>

11 Rural Urban Framework, "Ger Innovation Hub," January 2020, <http://www.rufwork.org/index.php?project/ub-ger-innovation-hub/>.

12 Ibid.

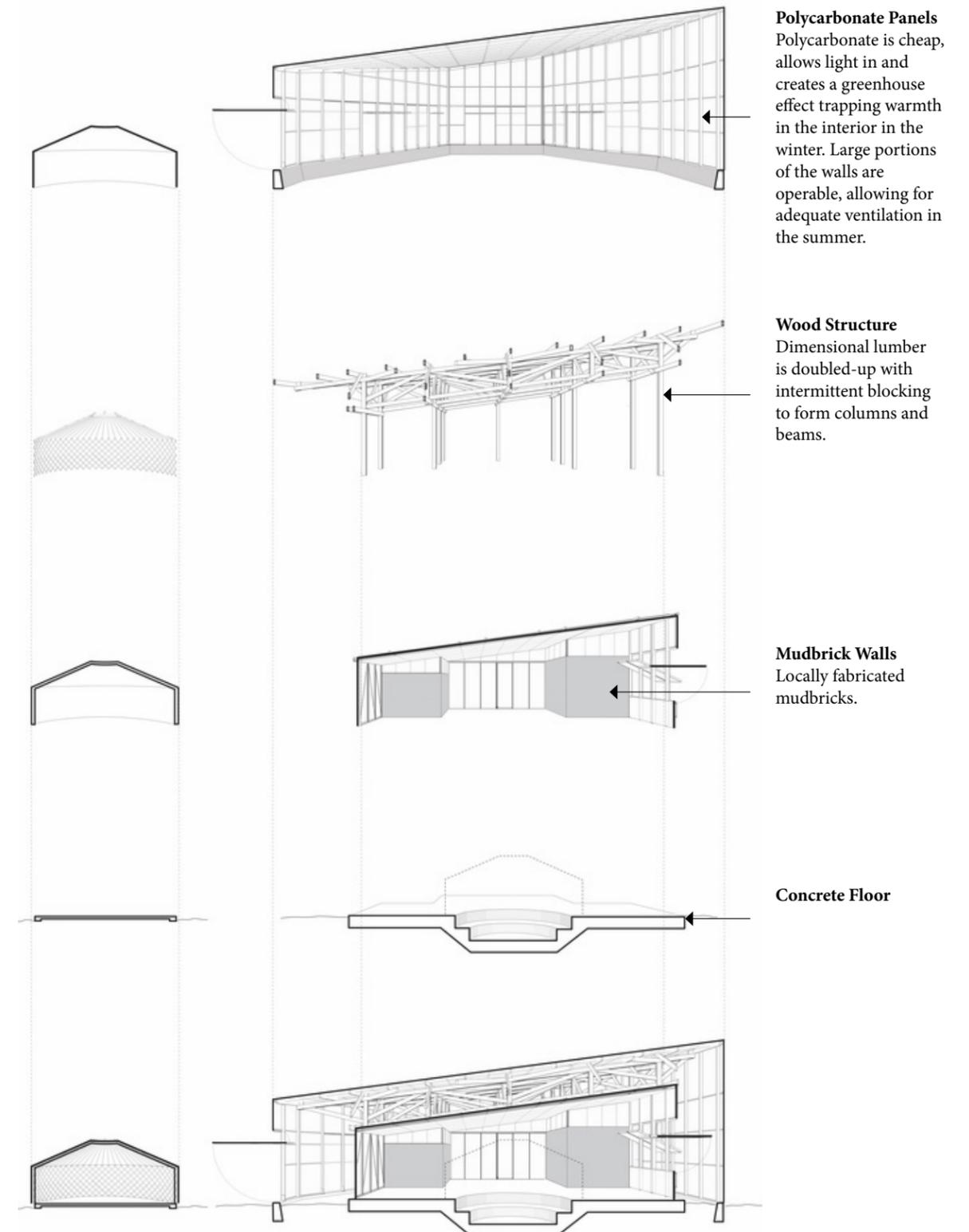
13 Ibid.



**Case Study Conclusions**

fig. 2.13 (opposite) Ger Innovation Hub exploded axonometric (annotations added by author)

From this research, several recurring themes are evident for makerspaces that enrich creative agency and expand opportunities for learning in these locations. By making tools and technology that would normally not be possible for locals to access publicly available, unique opportunities for creativity are generated. Additionally, providing dedicated spaces where rich traditional craft-based practices can be maintained and explored further allows for the inter-generational transfer of expertise to youth in the community. Shared spaces and resources that can promote self-build initiatives, local prefabrication and entrepreneurship are key instruments in increasing local agency. Additionally, providing opportunities for professional skill certification is an important element in increasing community autonomy through the creation of opportunities for the development of a skilled local workforce. Engaging the community through locating makerspaces in proximity to the centre of the community, indoor and/or outdoor social spaces, ability to host small community events and display/retail of craftwork are all strategies employed to maximize local impact in the case studies examined. Youth engagement is another important aspect in this regard. Spaces that are flexible in nature and can be reconfigured for community event and activities are valued since spaces of this nature are uncommon in these communities.



**Polycarbonate Panels**  
Polycarbonate is cheap, allows light in and creates a greenhouse effect trapping warmth in the interior in the winter. Large portions of the walls are operable, allowing for adequate ventilation in the summer.

**Wood Structure**  
Dimensional lumber is doubled-up with intermittent blocking to form columns and beams.

**Mudbrick Walls**  
Locally fabricated mudbricks.

**Concrete Floor**

**Case Study Mapping**

The Kenojuak Cultural Centre is located at the centre of the community within easy walking distance of the school and community learning centre (figure 2.14). The building is sited on a slight hill with the workshop studios viewing out over the community. While the Nunavimmi Pigiursavik Centre does not have any obvious adjacencies to other educational or maker space facilities, it is sited with a view out over a natural hill to the water (figure 2.15). The Pinnguaq Makerspace is in a relatively central location in Iqaluit. It has adjacencies to other maker spaces - a carving studio, sculpture park, hunter's market and the Pirurvik Centre (an Inuit-owned learning centre). These spaces for cultural expression complement each other well and benefit from their mutual proximity (figure 2.16).

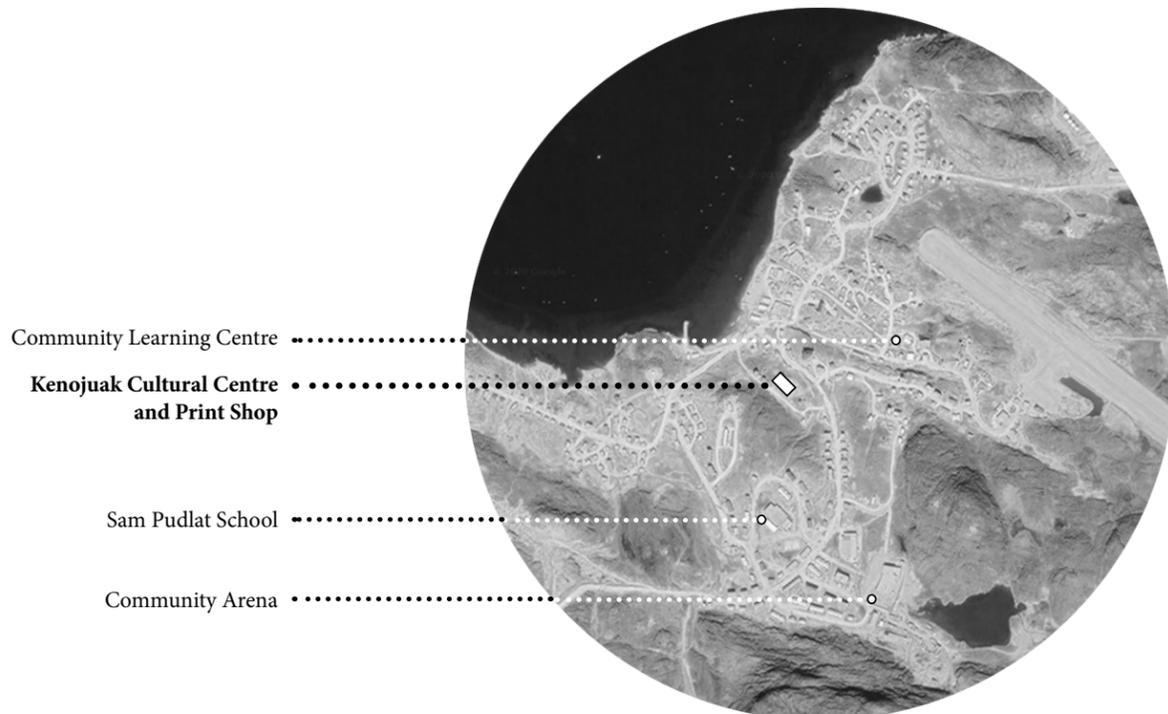


fig. 2.14 Kenojuak Cultural Centre & Print Shop Map

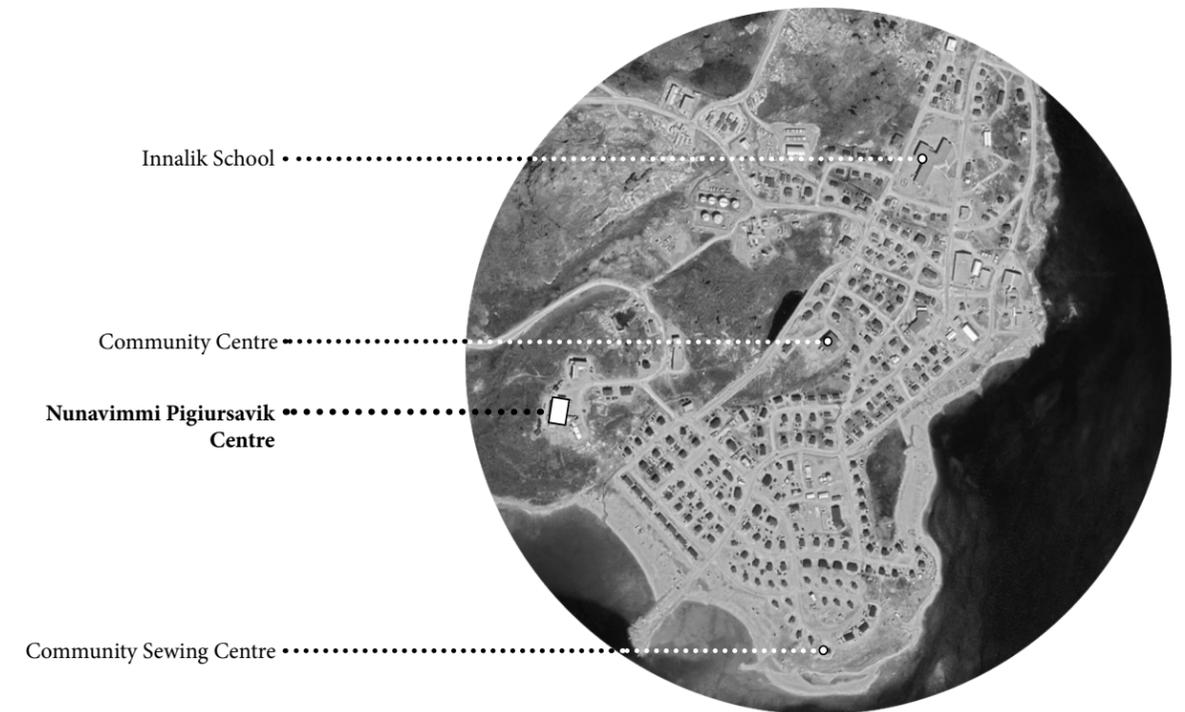


fig. 2.15 Nunavimmi Pigiursavik Centre Map

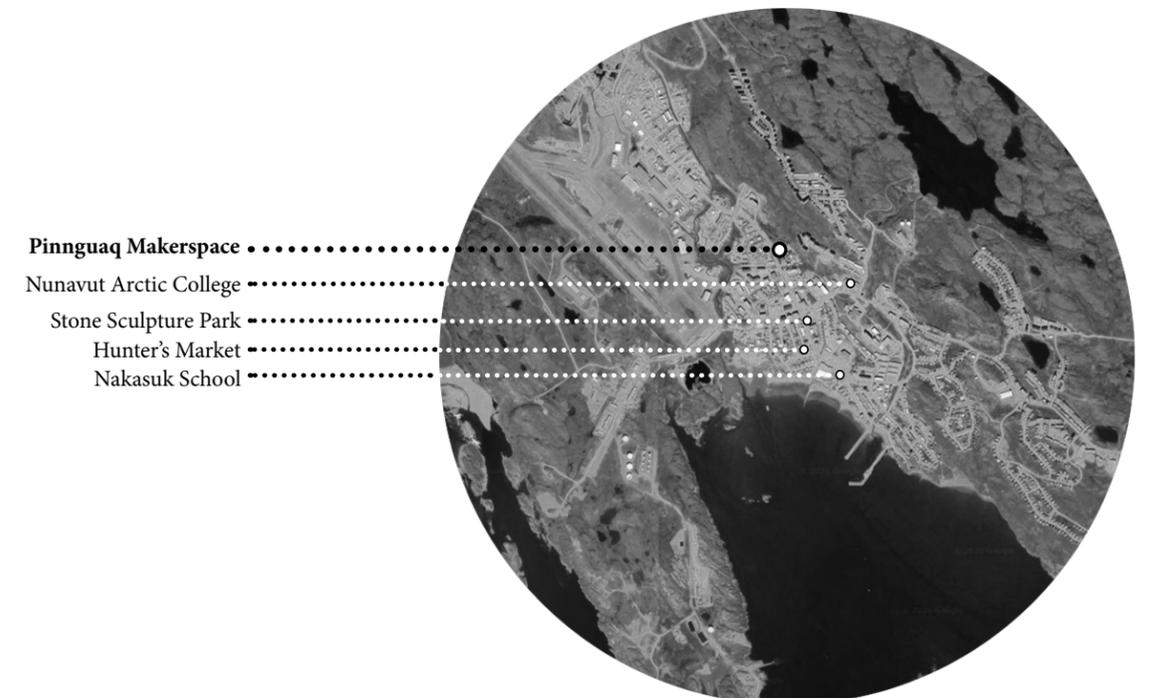


fig. 2.16 Pinnguaq Makerspace Map

## 2.2 Local Materials: Catalogue of Possibilities

fig. 2.17 (opposite) Tying a napook (cross-piece) to a runner - making a qamutiik

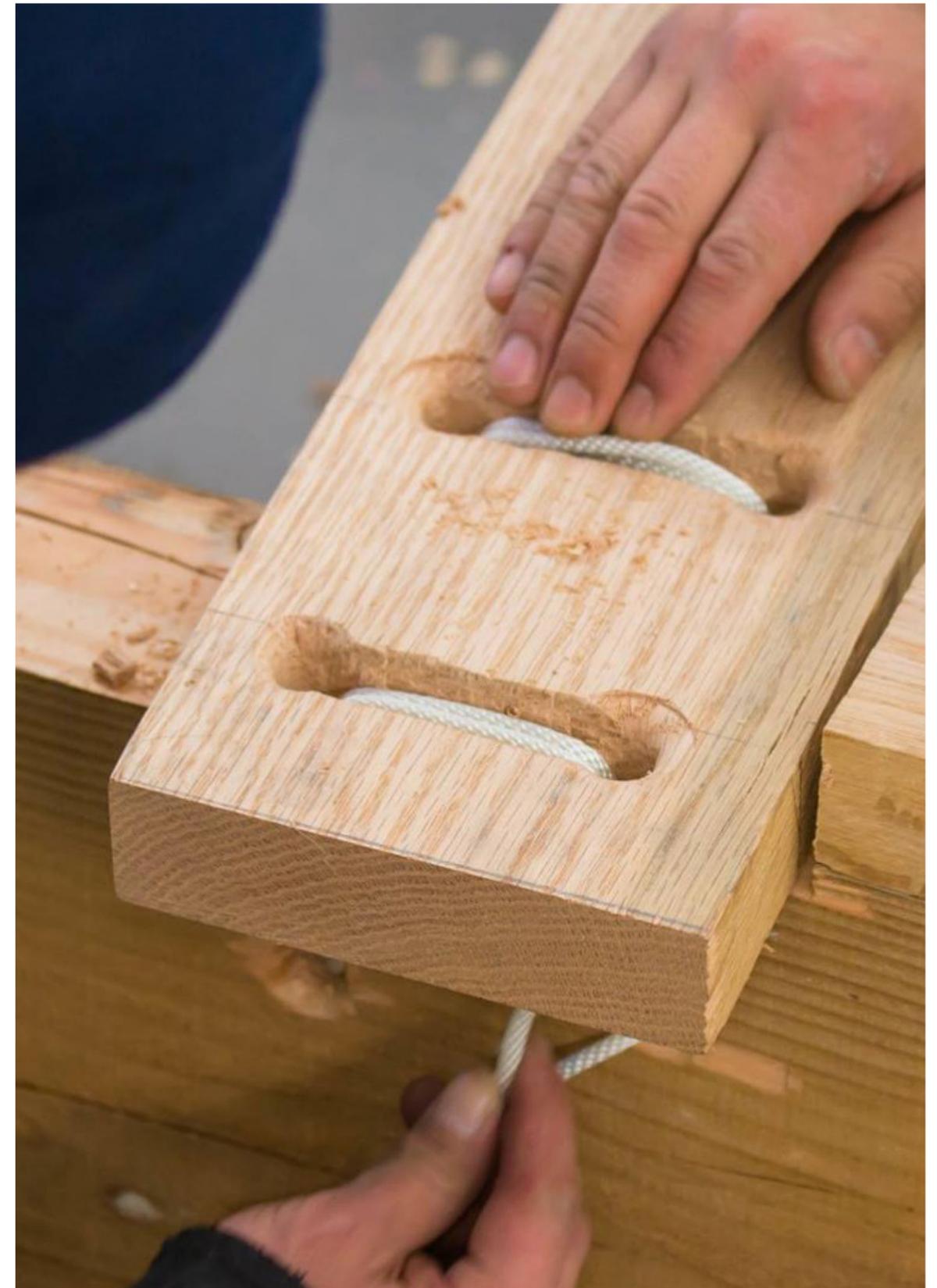
While inherently the idea of a built environment in Nunavik constructed entirely through the innovative use of local materials seems sustainable from an environmental and socio-cultural point of view, the reality of this proposal is layered with complexity. Due to climate change and resource extraction, the natural environment in Nunavik is transforming very quickly.<sup>14</sup> In this delicate state, material extraction can cause significant damage and the environment can be slow to recover. Wood that is suitable for building construction is not found in great quantities this far north. Sand and stone are already harvested in great quantities for road and gravel pad construction to the extent that many communities are running out of this resource.<sup>15</sup> Nonetheless, there are undeniable values to the use of local materials. They connect the building to the land and give a respect to that which is built in ways that southern models do not. Furthermore, they provide agency to innovate outside the confines of southern industry, government budgets and outside planning practices that often do not engage sensitively with the context. The following section lays out local material sources, current applications and potential applications while investigating the historic use and present-day viability of these resources.

### Wood

Wood conveys distinctive worldviews and values; specifically in its relation to living things and nature more broadly. The understanding of the material by elders in Nunavik is evident in the extensive vocabulary related to wood (figures 2.17 and 2.18). Some elders in a study documenting traditional Inuit knowledge listed as many as 92 different words related to wood and its uses in building.<sup>16</sup> Nunavik is spanned by 2 different vegetation zones including 4 different bioclimatic domains (figure 2.19). The northern tip of Nunavik crosses the 'Tree Line' where tree growth becomes significantly

14 Sheila Watt-Cloutier and Bill McKibben, *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change*. Minneapolis; London: University of Minnesota Press, 2015.  
15 Sarah Rogers, "Nunavik Sees Shortage of Gravel and Other Building Materials," *Nunatsiaq News*, June 15, 2017, <https://nunatsiaq.com/stories/article/65674nunavik-sees-shortage-of-gravel-and-other-natural-building-material/>.

16 Stéphanie Steelandt, Bhiry, Najat, Marguerie, Dominique, Desbiens, Caroline, Napartuk, Minnie et Desrosiers, Pierre M. "Inuit knowledge and use of wood resources on the west coast of Nunavik, Canada," *Études/Inuit/Studies* 37, no. 1 (2013) : 147-173. <https://doi.org/10.7202/1025259arBottom of Form>.



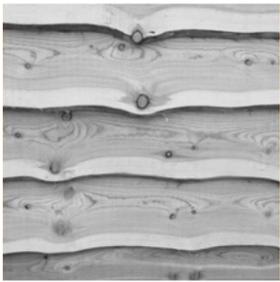
**WOOD** (fig 2.18)

**USES**

<p>1 Self-built houses 2 Hunting cabins 3 Hunting food cache 4 Storage sheds</p>	<p>5 Mobile cabin 6 Qamutiik (sleds) 7 Carving (ex. paddle) 8 Boat building</p>	<p>10 Bleachers 11 Driftwood playgrounds 12 Cold frames</p>
		
		
		
		

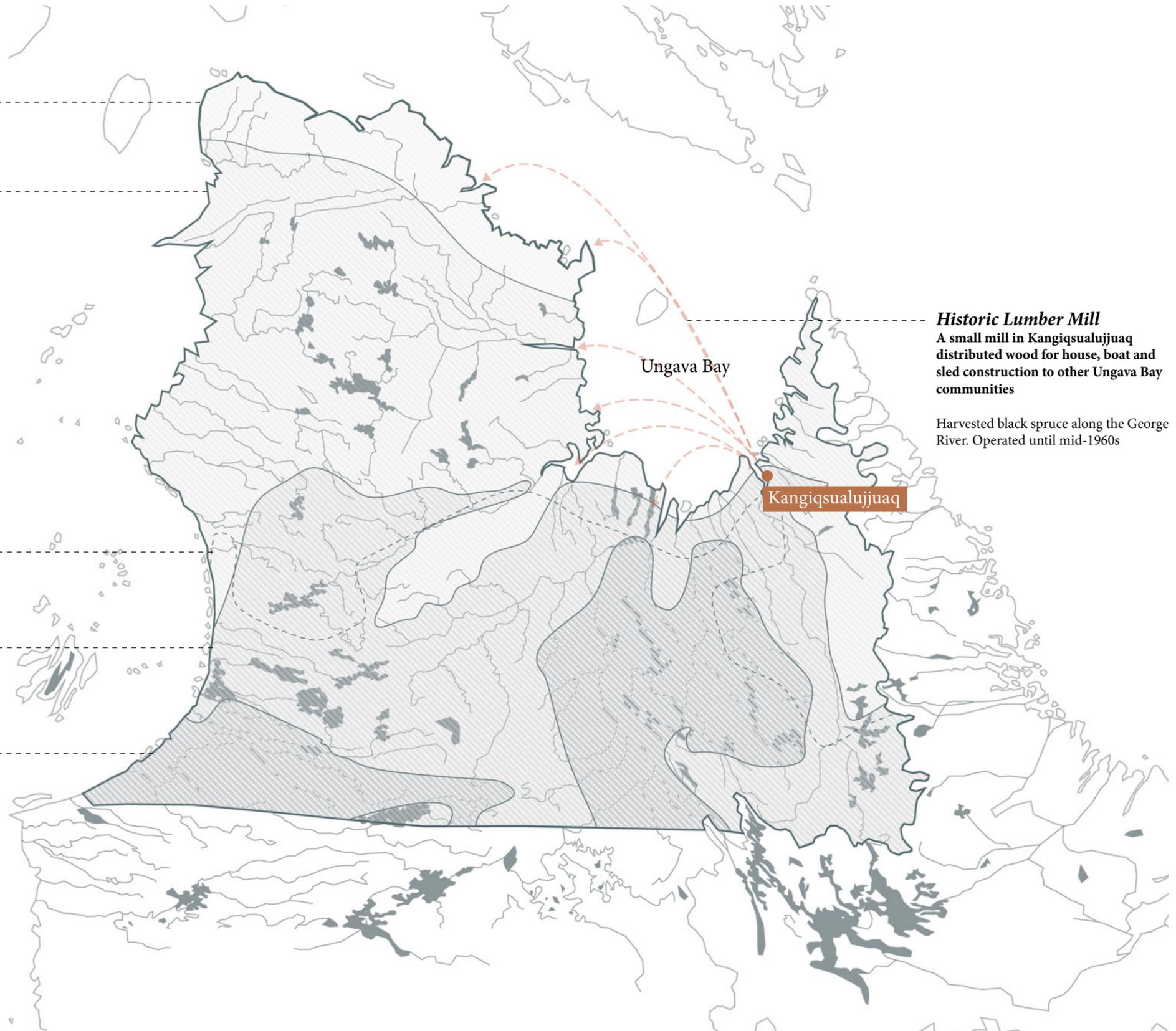
**SOURCES**

**LOCAL KNOWLEDGE**

<p>01 Black spruce 02 Dwarf birch 03 Reclaimed wood 04 Shipping byproducts</p>	<p>“I’ve built 4 log houses in the community using my knowledge of construction techniques in Abitibi, Quebec. The houses are a mix of recycled materials from social housing renovations and trees collected nearby. I have a mobile saw mill and I offer to share my knowledge with anyone who wishes to build their own house.”</p> <p>- Jean-Guy St-Aubin, from Kangiqsualujjuaq</p>
	<p>“I think it is important that our grandchildren know how wood was used in Nunavik.”</p> <p>- Aibillie Echalook, elder from Inukjuak</p>
	<p>“For trees, they went to cut them in winter, same as today. For shrubs, it was in autumn.”</p> <p>- Joshua Sala, elder for Umiujaq</p>
	<p>“Adamie Nivaxie noted that he had travelled through Kuujjuarapik (about 150 km south of Umiujaq) by dogsled during the winter in order to cut wood from large trees. Some of the elders in each village also told us that their parents and ancestors would sometimes cut wood from some trees in the forest tundra when traveling...”</p>
	<p>Above quotes taken from: <i>Inuit Knowledge and use of wood resources on the west coast on Nunavik, Canada.</i></p>

VEGETATION ZONES & HISTORIC LUMBER MILL ACTIVITY  
IN NUNAVIK (fig. 2.19)

- Herbaceous Arctic Tundra**  
Sedges, grasses and lichens  
Vegetation canopy rarely exceeds 1m
- Shrub Arctic Tundra**  
Willow, dwarf birch  
Vegetation canopy rarely exceeds 2m
- Tree Line**
- Forest Tundra**  
Black spruce (stunted), dwarf birch  
Vegetation canopy rarely exceeds 3m
- Spruce-Lichen Domain**  
Black spruce, limited quantities of jack pine and balsam fir  
Vegetation canopy rarely exceeds 4m



**Historic Lumber Mill**  
A small mill in Kangiqsualujjuaq distributed wood for house, boat and sled construction to other Ungava Bay communities

Harvested black spruce along the George River. Operated until mid-1960s

Citations for mapping information:

1. Ministère des Ressources naturelles, "Vegetation Zones and Bioclimatic Domains in Québec," 2003, <https://mern.gouv.qc.ca/english/publications/forest/publications/zone-a.pdf>.
2. Kativik Regional Government, "Ulittaniujalik." Nunavik Parks, accessed October 18, 2020, <http://www.nunavikparks.ca/en/parks/ulittaniujalik>.
3. Makivik Corporation, "Kangiqsualujjuaq," Makivik Corporation, January 16, 2018, <https://www.makivik.org/kangiqsualujjuaq/>.

stunted.<sup>17</sup> Black spruce is the only tree available locally that is used in a structural role in self-built houses. While the growth of black spruce is progressively stunted further north into Nunavik, this tree can still be found in sufficient width and height for building as far north as Kangiqsualujjuaq. This is evident from the historic lumber mill that operated in this community until the 1960s which milled black spruce along the George River and shipped it out to other Ungava Bay communities for house, boat and sled construction.<sup>18, 19</sup> In the present day, harvesting wood in the quantities necessary for building construction would almost certainly be unsustainable. Dwarf birch and driftwood are other traditional building materials while on the southern edge of Nunavik, jack pine and balsam fir grow in limited quantities.<sup>20</sup>

Reclaimed dimensional lumber and plywood from older projects can also provide legitimate building materials. An example of the hybrid use of these building materials would be the log houses Jean-Guy St-Aubin has built in Kangiqsualujjuaq. Using his knowledge of construction techniques from Abitibi, Quebec, the houses he builds are a mix of recycled materials from social housing renovations and trees collected nearby. He has a mobile saw mill and offers to share his knowledge to anyone who wishes to build their own house.<sup>21</sup> Hybrid practices innovating on traditional construction methods and re-appropriating government models offer interesting examples of local ingenuity. An example of this would be the old government-provided matchbox houses which were built on a simple cribbing system. While these houses were lacking in many regards, this simple and practical system has been adopted as a preferred foundation system in Inuit cabin design.<sup>22</sup> Ease of construction, repair and transformation tend to

17 Ministère des Ressources naturelles. "Vegetation Zones and Bioclimatic Domains in Québec," 2003, <https://mern.gouv.qc.ca/english/publications/forest/publications/zone-a.pdf>.

18 Makivik Corporation. "Kangiqsualujjuaq" Makivik Corporation, January 16, 2018, <https://www.makivik.org/kangiqsualujjuaq/>.

19 Kativik Regional Government, "Ulittaniujalik," Nunavik Parks, accessed October 18, 2020, <http://www.nunavikparks.ca/en/parks/ulittaniujalik>.

20 Kativik Regional Government, "Kuurrurjuaq Park Project - Status Report," 2005, [http://docs.nunavikparks.ca/SiteCollectionDocuments/EN/Kuurrurjuaq\\_StatusReport.pdf](http://docs.nunavikparks.ca/SiteCollectionDocuments/EN/Kuurrurjuaq_StatusReport.pdf).

21 Samuel Boudreault (Research Professional in LINQ and Sentinel North Partnerships), in discussion with the author, November 17th, 2020.

22 Susane Havelka, "Building with IQ (Inuit Qaujimatatuqangit): The Rise of a Hybrid Design Tradition in Canada's Eastern Arctic," Thesis, McGill University Libraries, 2018, 237.

be integral to details of this nature that endure. These principles have been taken into consideration in Lateral Office's hypothetical design of cabin facilities for an arctic food network. Inspired by qamutiik construction, the structural details are conceived as a kit of parts that can be transported by traditional qamutiik and built out on the land by a few people with minimal tools in a few days.<sup>23</sup> Relative to the current stock of mass-produced buildings that are provided from the south, hybrid design innovations of this nature better reflect local building knowledge and offer a more nuanced path forward that draws from Inuit adaptive practices.

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### *Earth, Stone & Snow*

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Earth and stone are materials that have been used for building in Nunavik for thousands of years (figures 2.20 and 2.21). The most notable example of this would be the seasonal qarmat dwellings which make use of turf blocks and stone around the base. Outside of Nunavik, earth has seen resurgence as a building material through contemporary innovations in rammed earth and compressed earth brick construction in recent years. Although this has primarily taken place in warmer climates, there are notable examples of cold climate earth construction and research. A study conducted in Quebec found that compressed earth brick construction could sufficiently withstand the freeze/thaw cycle of Canada's winters if stabilized with lime.<sup>24</sup> The study made use of sedimentary glacial deposit soil (within a 150 kilometer radius of Montreal) similar to that which is found in Nunavik. The soil in Nunavik primarily consists of glacial and fluvioglacial deposits from retreating glacial activity. The landscape around Kangiqsualujjuaq is characterized by river valleys that wind out to the ocean.<sup>25</sup> Glacial deposits typically leave behind thick layers of sedimentary soil (glacial till) over bedrock with a roughly equal composition of sand, clay and silt.<sup>26</sup> This is the case along the

23 Lateral Office, "Arctic Food Network," accessed November 30, 2020, <http://lateraloffice.com/filter/Regionalism/ARCTIC-FOOD-NETWORK-2011-12>.

24 Ginette Dupuy and Société canadienne d'hypothèques et de logement, *Construction En Blocs de Terre Comprimée*, trans. by Isaac Edmonds, Rapport de Recherche (Société canadienne d'hypothèques et de logement, 1999), 26.

25 Kativik Regional Government, "Kuurrurjuaq Park Project - Status Report," 2005, 48-50.

26 Dupuy, *Construction En Blocs de Terre Comprimée*, trans. by Isaac Edmonds, 4.

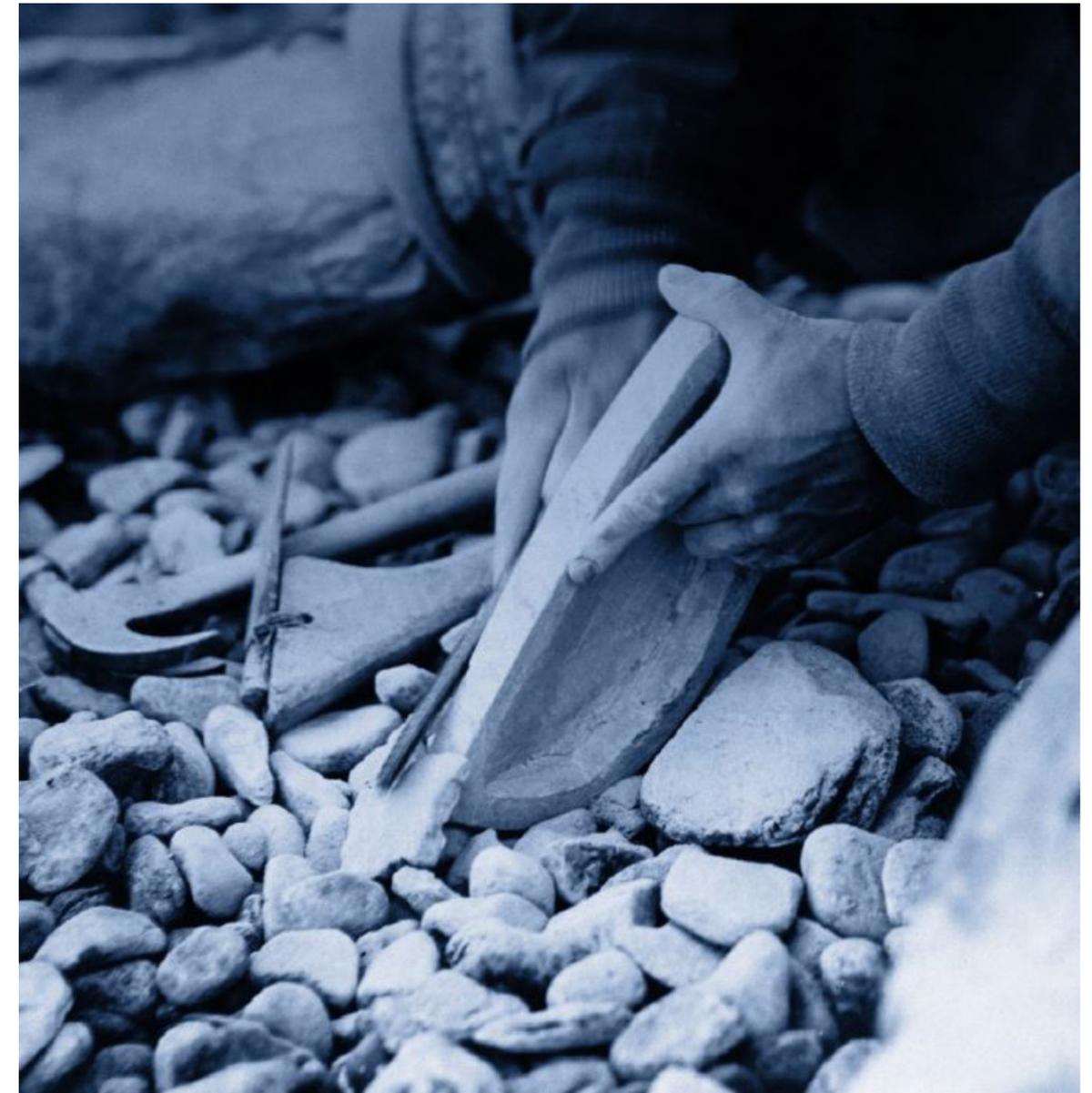
fig. 2.20 (opposite) Making a soapstone oil lamp (qulliq) with bone tools

Ungava Bay coast with deposits of sand, clay, till (a variety of rock sizes mixed with clay and sand) and organic deposits from retreated glacial rivers. Following the retreat of the ice sheet from the Ungava Bay coast, the Atlantic Ocean flooded the depressed glacial valleys. This temporary flooding eventually retreated leaving inland lakes and additional deposits of silt and sand (figure 2.22).<sup>27</sup> Contemporary innovations in earth construction such as compressed earth brick and rammed earth have yet to be attempted in Nunavik. The use of earth for interior walls that are not exposed directly to the environment has particular promise since it has excellent thermal mass and humidity moderation properties. Sand and gravel are in short supply due to road and pad construction, but this a resource waiting to be reclaimed if urban sprawl can be reduced and reliance on pad foundations can be decreased. Stone is also used in carving which provides sustainable local economic opportunities through maker studios such as the Kenojuk Cultural Centre and Print Shop. The Iqaluit sculpture garden is an interesting example of a northern public space that embodies local stone carving knowledge.

Snow is another material that has been used in building for thousands of years in Nunavik. Due to its molecular structure, snow is a porous material containing plentiful air pockets making it a strong insulator. Counter-intuitively, snow also has excellent thermal mass properties, allowing for significant temperature differentials between the interior and exterior of a shelter. Validation of snow's thermal properties beyond conventional igloo construction can be seen in the Cold War US military base Camp Century in Greenland. Buried entirely under a layer of snow, this base has been cited as an example of innovation in the north that 'went right, but went nowhere,' never taking up traction with northern housing authorities.<sup>28</sup> Earth, stone and snow are not typically associated with contemporary construction. The primary benefits of earth and stone as building materials are their relative abundance in every Nunavik community. Combined with novel building techniques, these materials may present opportunities for innovation in local construction practices.

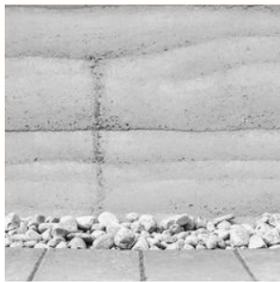
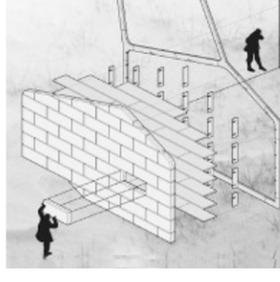
<sup>27</sup> Kativik Regional Government, "Kuurrurjuaq Park Project - Status Report," 55 and 75.

<sup>28</sup> Susane Havelka, "Building with IQ (Inuit Qaujijajatuqangit): The Rise of a Hybrid Design Tradition in Canada's Eastern Arctic," 158-160.



**EARTH, STONE & SNOW** (fig 2.21)

SOURCES	USES	
<p>1 Shoreline (Sand, silt, clay, peat) 2 Quarry 3 Bedrock/Tundra</p>	<p><i>Traditional</i></p> <p>1 + 2 Qarmat base 3 Turf house (Greenland Inuit, maintained for tourism) 4 Snow house (varied)</p>	<p><i>Current</i></p> <p>5 Carving (export, ex. Kennojuak Studio) 6 Sculpture garden (ex. Iqaluit)</p>
		
		
		
		

POSSIBILITIES		LOCAL KNOWLEDGE
<p><i>Earth</i></p> <p>1 Rammed earth 2 Compressed earth bricks 3 Peat/turf</p>	<p><i>Stone + Snow</i></p> <p>4 Gabian walls 5 Bedrock as anchorpoint 6 Snow walls</p>	<p>The soil in Nunavik is primarily characterized by glacial and fluvioglacial deposits from retreating glacial activity. The landscape around Kangiqsualujjuaq is characterized by glacial river valleys that wind out to the ocean.</p> <p>- Kativik Regional Government and the Northern Village of Kangiqsualujjuaq, "Kuururjuaq Park Project - Status Report"</p>
		
		
		

// GLACIAL RETREAT  
12,000 BP - 7,000BP

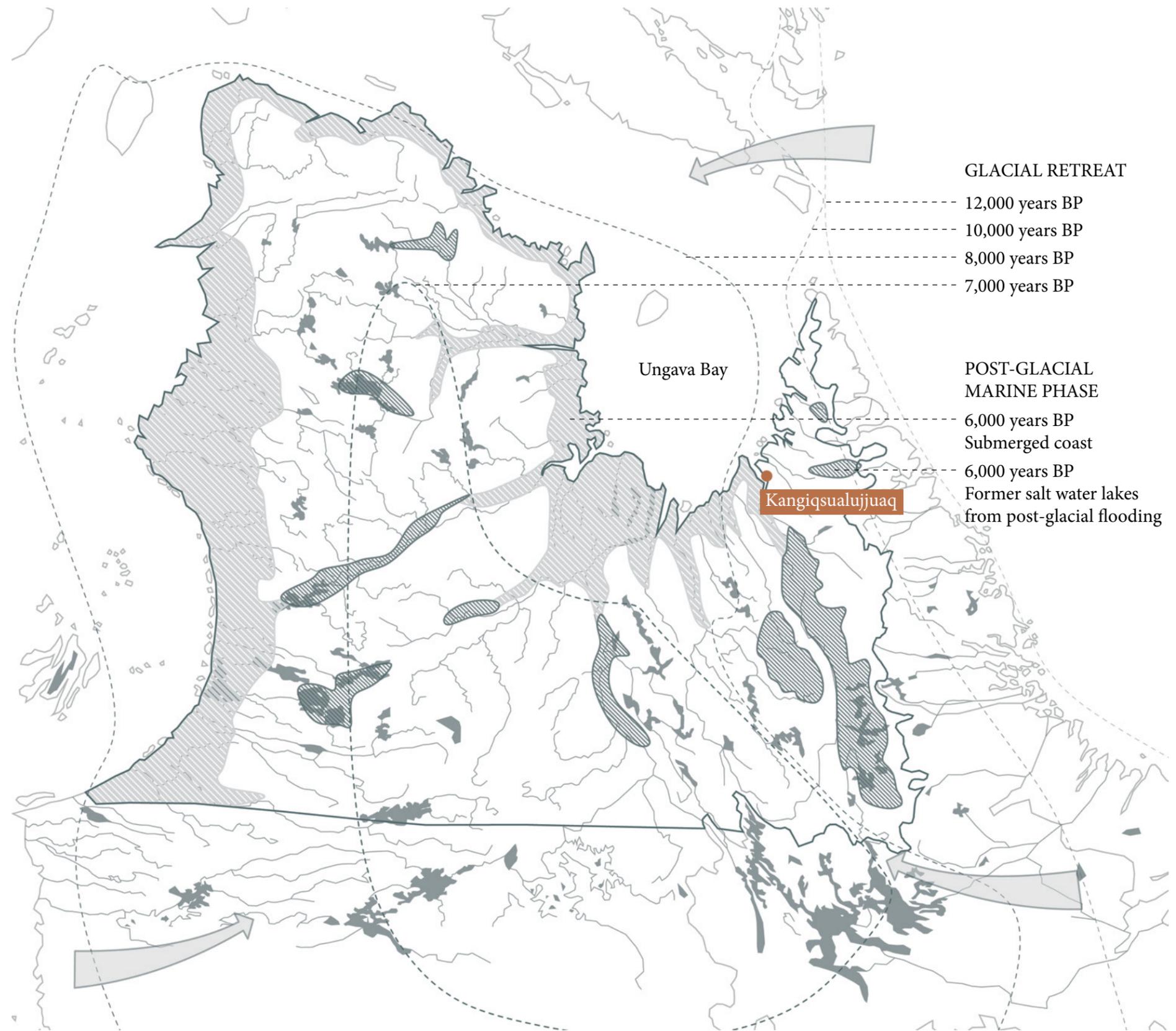
Retreating glaciers leave behind a thin layer of sedimentary soil (glacial till) over bedrock with a roughly equal composition of sand, clay and silt

// POST-GLACIAL MARINE STAGE  
7,000 BP - 6,000 BP

Following the retreat of the ice sheet from the Ungava Bay coast, the Atlantic Ocean flooded the depressed glacial valleys. This temporary flooding eventually retreated leaving inland lakes and additional deposits of silt and sand

// KANGIQSUALUJJUAQ  
(Present Day)

The landscape around Kangiqsualujjuaq is characterized by glacial river valleys that wind out to the ocean. Along the Ungava Bay coast, soil deposits consist of sand, clay, till (a variety of rock sizes mixed with clay and sand) and organic deposits from retreated glacial rivers.



Citation for mapping information:

1. Kativik Regional Government and the Northern Village of Kangiqsualujjuaq, "Kuurrjuaq Park Project - Status Report," 2005, [http://docs.nunavikparks.ca/SiteCollectionDocuments/EN/Kuurrjuaq\\_StatusReport.pdf](http://docs.nunavikparks.ca/SiteCollectionDocuments/EN/Kuurrjuaq_StatusReport.pdf), 48-50, 75.

*Plant & Animal Products*

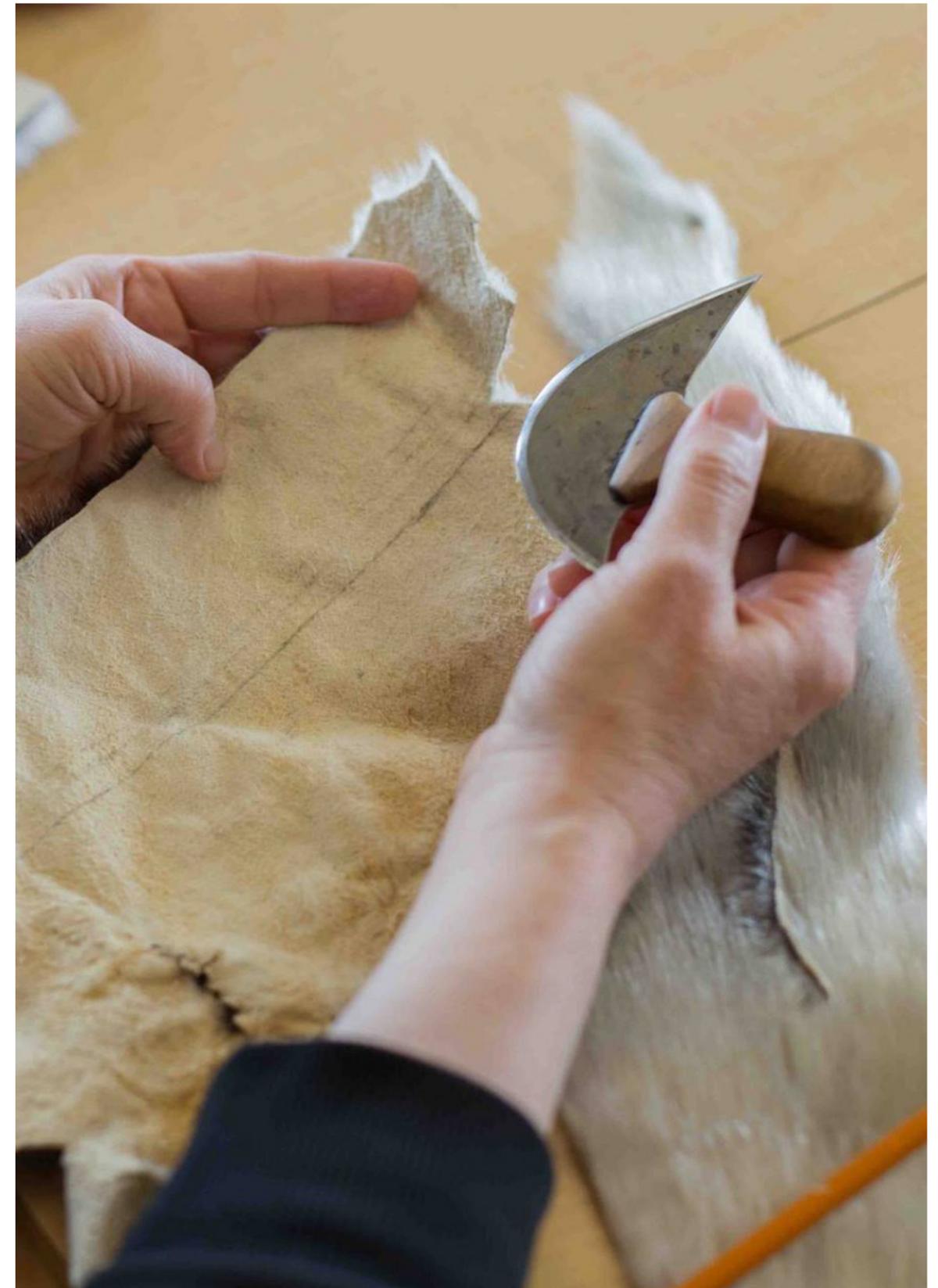
fig. 2.23 (opposite) Cutting a cleaned skin with an Ulu

Plant and animal products are used for a diverse variety of purposes in Nunavik (figures 2.23 and 2.24). Seal skin as well as thinned and stretched caribou intestine both have water proof properties and are commonly used in clothing for this reason. Seal skin can also be stretched into rope and used as a fastening mechanism for joinery (typically for constructing qamutiik, kayak or umiak). Although not without their difficulties associated with moisture sensitivity, natural insulation materials have been in use in the north for many years. Contemporary qarmat built by Inuit sometimes implement a thick exterior layer of dried seaweed between canvas or plastic tarp layers. There is limited documentation as well on the use of peat, moss and sod as insulating materials in contemporary cabin-style dwellings by Inuit.<sup>29</sup> Moss, goose down and feathers as well as compact dry seaweed are also readily available natural insulators. Since these are natural byproducts of cyclical hunting and gathering processes, a wealth of knowledge exists on the use of plant and animal products. While these materials are often viewed as outside the scope of architecture, the making practices surrounding them offer a wealth of local knowledge. The ulu knife used for cleaning and cutting animal skins offers an interesting example of this material culture. In Canada, the ulu handle is typically made from caribou antler or wood and the blade is made by purchasing a common handsaw and working the steel into the correct shape.<sup>30</sup> Historically, the blades were made from slate, shale or quartzite and shaved thin enough that one could hold the blade up to the sun and see light through the stone.<sup>31</sup> While the knife itself may not offer direct potential for architectural translation, the material mastery and adaptation of practice when presented with new materials both embody integral aspects of local making knowledge that are often underappreciated.

<sup>29</sup> Ibid, 120.

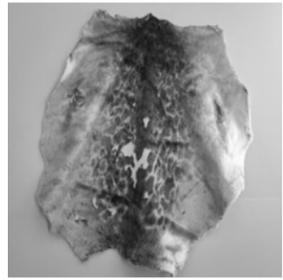
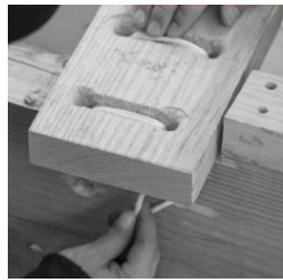
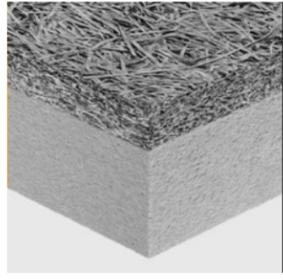
<sup>30</sup> Amanda Robinson, "Ulu," In The Canadian Encyclopedia Historica Canada, Article published May 23, 2018; Last Edited May 23, 2018, <https://www.thecanadianencyclopedia.ca/en/article/ulu>.

<sup>31</sup> Courtney Edgar, "Turning Rocks into Knives at Iqaluit Ulu-Making Workshop," Nunatsiq News, July 5, 2018, [http://nunatsiq.com/stories/article/65674turning\\_rocks\\_into\\_knives\\_at\\_iqaluit\\_ulu-making\\_workshop/](http://nunatsiq.com/stories/article/65674turning_rocks_into_knives_at_iqaluit_ulu-making_workshop/).



**PLANT & ANIMAL PRODUCTS** (fig 2.24)

SOURCES		
01 Seals 02 Caribou (limited hunting due to declining populations)	03 Geese 04 Seaweed	05 Natural fibres (moss, etc.) 06 Sod & peat
		
		
USES		
01 Clothing 02 Boats (traditional)	3 Tools 4 Carving (export)	5 Insulation 6 Joinery
		
		

POSSIBILITIES	
Weather-stripping 1 Seal skin 2 Caribou intestine (thinned and stretched) and skin Joinery 03 Seal skin rope	Natural insulation 4 Dried seaweed 5 Goose feathers and down 6 Moss, natural fibres 7 Insulated panels (wood fibre)
	
	
	
	

### Recycled Materials

fig. 2.25 (opposite) A wood cable spool in use as a carving table

“While the landscape remains the same, the introduction of southern Canadian housing stock, equipment, goods, and materials modified practices. Wood replaced bone as the material of choice in qamutiiks and cabins. Plexi-glass is today’s material of choice for cabin windows (bears find them harder to break). The kayak gave way to the whaleboat. The dog team surrendered to the snowmobile. Teflon replaced ivory or frozen mud on sled skids. Rebar replaced bone harpoon shafts, and the rifle replaced stone-tipped spears and harpoons.”<sup>32</sup>

Upcycled materials are commonplace in self-built construction in Nunavik (figures 2.25 and 2.26). While government housing has influenced the materials available and construction techniques, these self-built structures embody cultural resiliency and are a tool for maintaining traditional culture. Materials for these projects are sourced from all manner of locations including old social housing projects, leftover sea lift materials and the junkyard in each community. Reclaimed dimensional lumber, plywood, steel posts, Plexiglas and canvas are just a handful of materials harvested in this way. Entire leftover shipping containers are converted into workshop or storage space and wood cable spools become makeshift carving tables. While anthropologists have often asserted that this adaptation is a matter of necessity, the reuse of available materials is in fact a design tradition. In the words of Havelka:

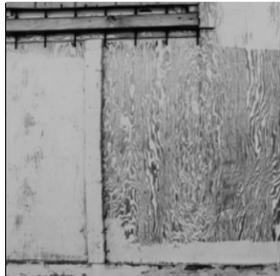
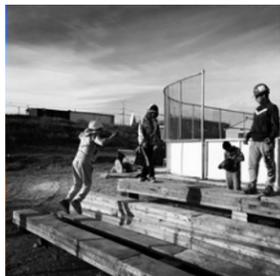
These privately-owned cabins, these small yet well-designed houses and their workspaces, are the domain of influence in which the individual dimension of self-realization and self-expression becomes clear. It emphasizes the notion that Inuit can control their built environment.<sup>33</sup>

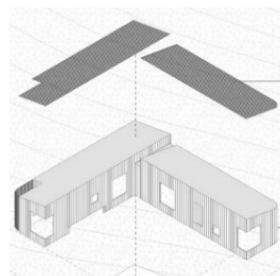
<sup>32</sup> Susane Havelka, “Building with IQ (Inuit Qaujimagatuqangit): The Rise of a Hybrid Design Tradition in Canada’s Eastern Arctic,” Thesis, McGill University Libraries, 2018, 227.

<sup>33</sup> Susane Havelka, “Building with IQ (Inuit Qaujimagatuqangit): The Rise of a Hybrid Design Tradition in Canada’s Eastern Arctic,” 228.



**RECYCLED MATERIALS** (fig 2.26)

SOURCES	USES	
<p>1 Community junkyard 2 Shipping byproducts 3 Old housing projects</p>	<p>1 Self-built houses 2 Self-built cabins 3 Cable spool work table</p>	<p>4 Canvas qarmat 5 Plexiglass windows 6 Playgrounds</p>
		
		
		

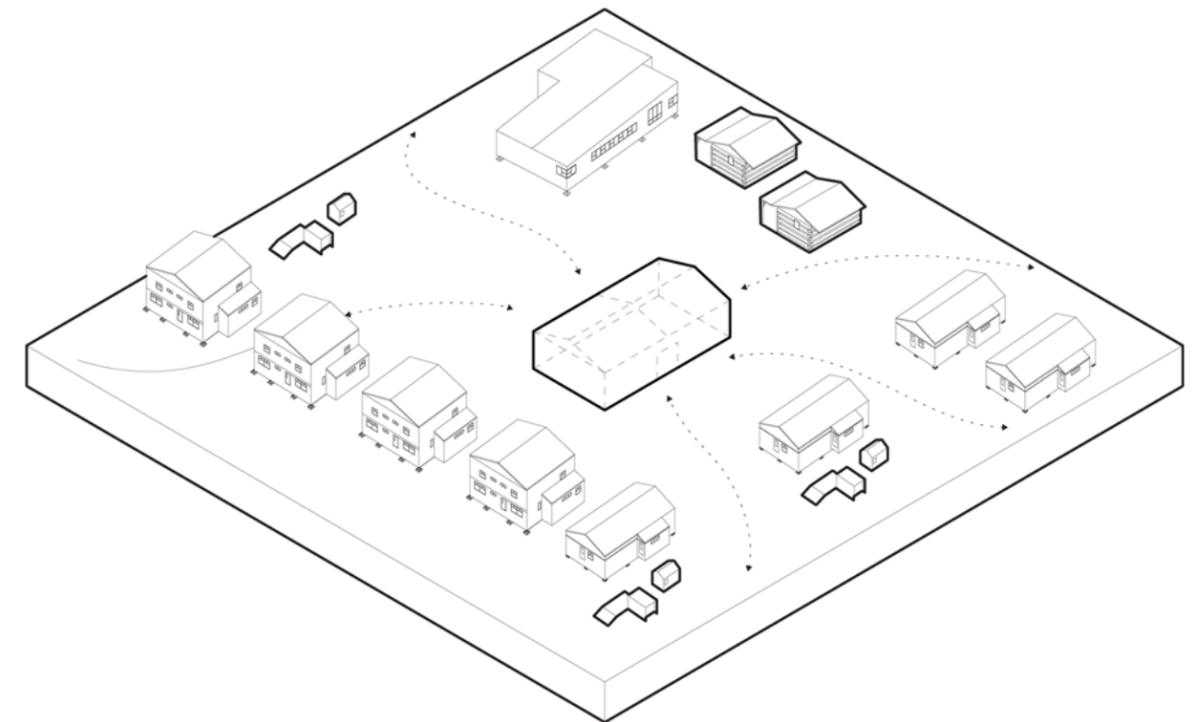
POSSIBILITIES		LOCAL KNOWLEDGE
<p><b>Foundations</b> 01 Recycled Steel Posts</p> <p><b>Envelope</b> 02 Metal roofing (from shipping containers)</p>	<p><b>Windows</b> Polycarbonate</p>	<p>“My son is so creative...he took some spare parts and made a cart to pull his friend behind him on his bike”</p> <p>Nancy Etok, vice-principal in Kangiqsualujjuaq</p>
		<p>“I’m building a proper Inuit house, 15 minutes away from the village.”</p> <p>- David Annanack, teacher from Kangiqsualujjuaq</p>
		<p>Inside out: floor, walls, and roof. Same thing on the roof. Insulation. I’ve got to find a little more plastic to put on top of the plywood. [As I interviewed him, three people who work in the community came over to buy some fresh fish.] It’s a plastic sheet, insulation, and last piece of metal on top. And I’ve got to put another piece of metal on top.</p> <p>Susane Havelka in a semi-structured interview with David, an Inuk from Iqaluit</p>

### 2.3 Design Objectives

At the moment, there are few dedicated workshop spaces and training facilities for building in Nunavik. Small personally-constructed workshops and outbuildings for material storage are common place throughout communities since these spaces are not provided in the current housing models. Instead of proposing an alternative to these informal making practices, shared community makerspaces should complement these making practices and look to provide community agency on a wider scale (figures 2.27-2.31).

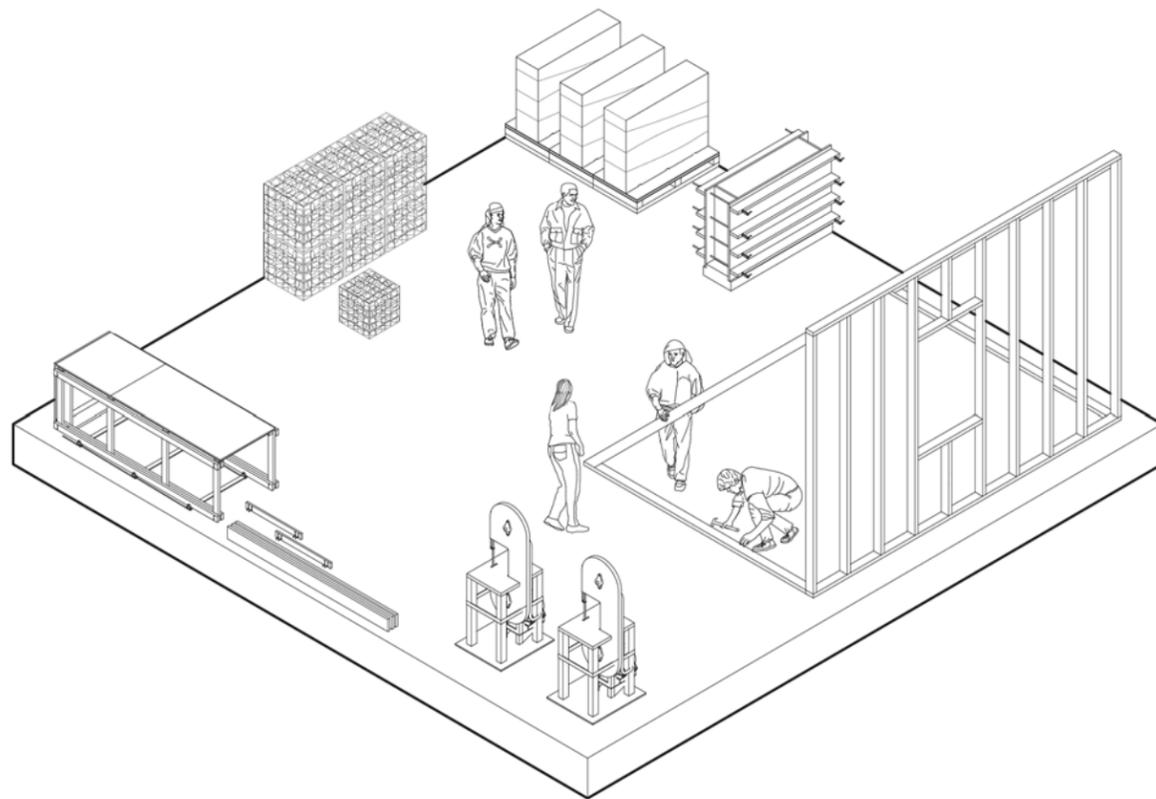
The design of this makerspace should embody several key tenets of Inuit making culture. Such a space should be a centre for knowledge sharing, celebrate the strong existing making culture and embody local knowledge of living on the land. From an architectural perspective, areas for vocational training, spaces that encourage communal gathering (flexible interior spaces with minimal dividing walls, areas to prepare food, cold porches, etc.) and accommodate traditional craft activities (kayak building, carving, etc.) support knowledge sharing. The celebration of a strong existing making culture in Kangiqsualujjuaq should go beyond simply providing a space that supports these activities. The architecture of the building itself can embody local making knowledge through detailing that draws inspiration from traditional assemblies such as the kayak and qamutiik. Providing key communal spaces with a view to the water, orienting facades and windows in response to the low southern sun path in order to fill spaces with natural light, shaping the building appropriately to deflect the strong south southwest winter wind and minimize snowdrifts, positioning entrances so that snowdrifts will not block them, responding to informal paths across the site, respecting soil and permafrost conditions and choosing methods of construction that minimize impact on the land are several ways that architectural solutions can respond to local knowledge of living on the land. Through the provision of a space that can accommodate traditional and contemporary making practices, intergenerational knowledge can be carried forward and merge with novel ideas to form the beginnings of a sustainable, locally-driven construction ecosystem in Kangiqsualujjuaq. The next chapter explores the potential of this proposal by presenting the comprehensive design of a makerspace that responds to these design objectives.

### 1. COMPLEMENT EXISTING MAKING PRACTICES (FORMAL & INFORMAL) (fig. 2.27)



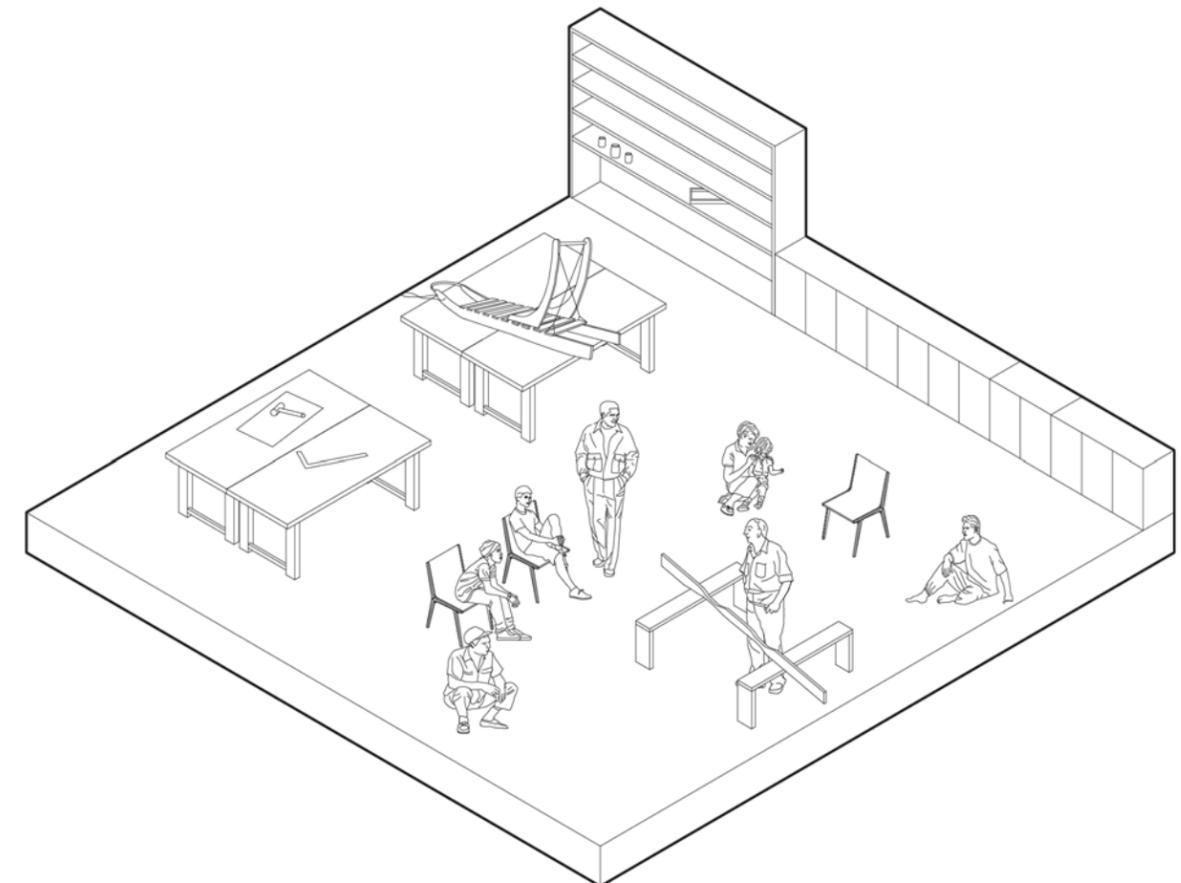
**2. SUPPORT ENTREPRENEURSHIP, SELF-BUILD INITIATIVES & OFFER OPPORTUNITIES FOR LOCAL INNOVATION IN CONSTRUCTION PRACTICES (fig. 2.28)**

*By providing spaces to innovate in building construction with local materials and knowledge, opportunities are created to reclaim control over the technologies and systems of development that continue to dictate settler colonial designs for buildings in these communities.*



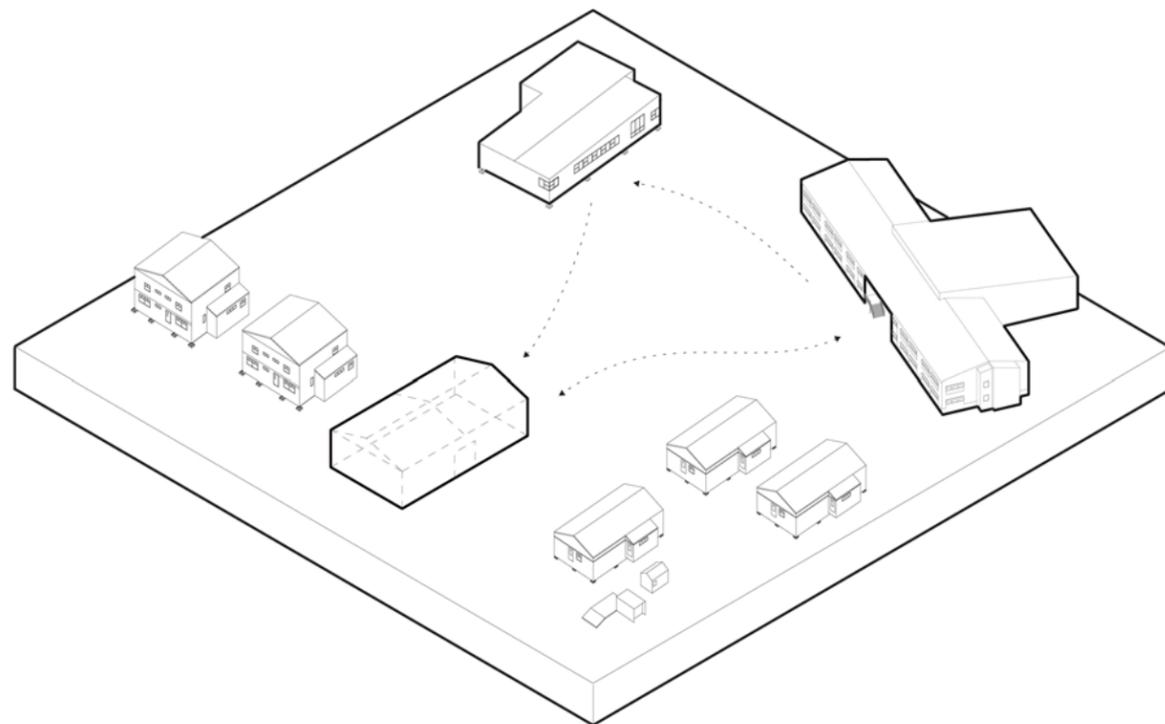
**3. ENCOURAGE KNOWLEDGE SHARING (BOTH INTERGENERATIONAL & NOVEL IDEAS) (fig. 2.29)**

*Through the provision of a space that can accommodate traditional and contemporary making practices, intergenerational knowledge can be carried forward and merge with novel ideas.*



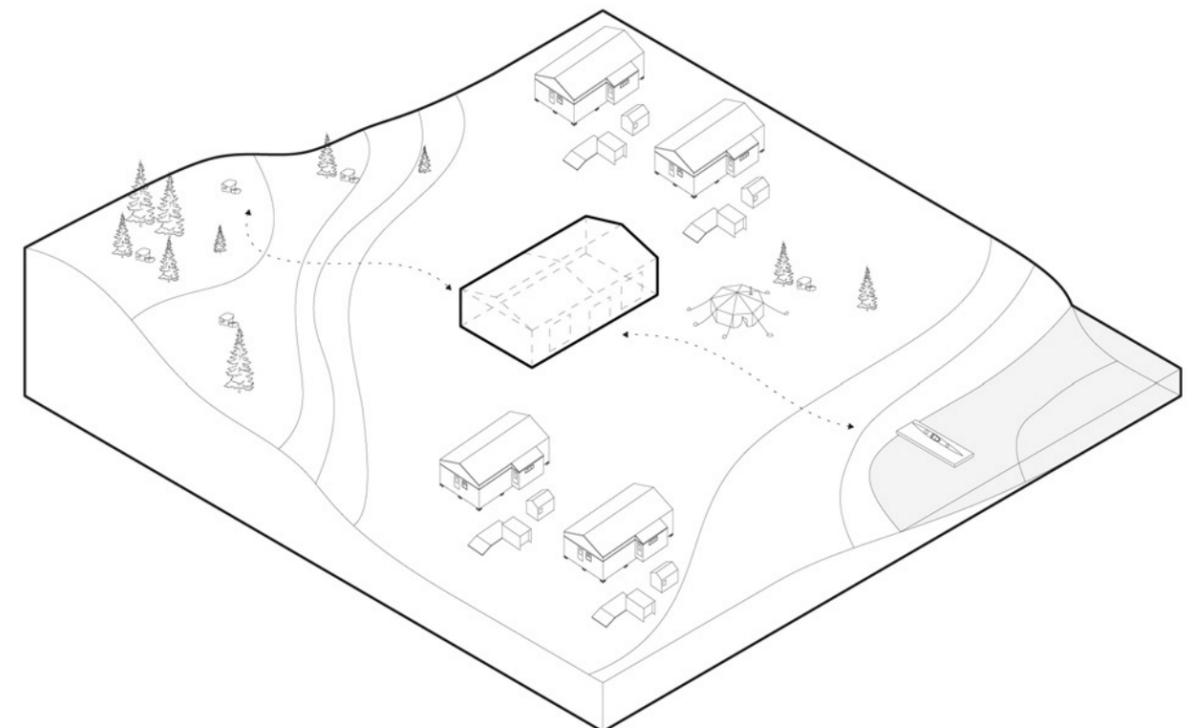
4. ENGAGE COMMUNITY BY CHOOSING A SITE THAT IS IN A CENTRAL, EASY TO ACCESS LOCATION (fig. 2.30)

By co-locating the new learning space next to existing learning spaces and selecting an easily accessible location, a strong connection can be established with the surrounding community.



5. ESTABLISH A DEEPER CONNECTION TO THE LAND (fig. 2.31)

Views to the water, considerate orientation in regard to sun, wind, informal paths, soil conditions, the sensitive use of local materials, etc. respond to local land-based practices.





### *3.1 The Community of Kangiqsualujjuaq*

### *3.2 Site Analysis + Selection*

### *3.3 Enriching the Heart of the Community*

### *3.4 Detailed Design*

### *3.5 Core & Shell Strategy*

### *3.6 Material Ecosystem*

### *3.7 Rammed Earth Hearth*

This chapter illustrates the design of a makerspace that draws inspiration from Inuit making culture in order to explore opportunities for sustainable, community-led building initiatives in Kangiqsualujjuaq. The first two sections cover the context of the community, site analysis and site selection. Section 3.3 outlines a framework by which the makerspace can enrich the heart of the community by creating a community hub centred on the existing school and child care centre. Additionally, urban design and community-scale connections are suggested to consider the long-term implications of the project and potential future possibilities. Section 3.4 presents detailed design of the makerspace including the strategies employed to respond to site conditions, a proposed program list, a detailed floor plan and rendered views of key spaces. Section 3.5 explains the passive strategies that are a key component of the makerspace design while 3.6 considers opportunities for sustainable material use as well as architectural details that respond to local material culture. The final section presents the design of a hearth for communal gathering. The design of this hearth through the lens of materials culture and local gathering practices offers an opportunity to consider the design principles embodied in this thesis project at a more intimate, tectonic scale.

### 3.1 The Community of Kangiqsualujjuaq

fig. 3.01 (opposite)  
The Journey North to  
Kangiqsualujjuaq

Kangiqsualujjuaq (“the very large bay” in Inuktitut) is one of the 14 communities of Nunavik in Northern Quebec (figure 3.01). Located on the shores of the George River, the name reflects the close proximity of the community to the Ungava Bay which lies 30km from the river’s mouth. No significant roads exist this far north so supplies are brought in via sealift during the summer and via airplane through all 4 seasons. Hunting, trapping and berry picking are common practices outside the village and reflect the significance of the Inuit’s relationship to the territory (figure 3.02).<sup>1</sup> The landscape around Kangiqsualujjuaq is characterized by glacial river valleys that wind out to the ocean. Rolling hills of exposed bedrock rise to the east and west of the community presenting a striking landscape (figure 3.03). The community itself is nestled around the water’s edge by the Akilasakallak Bay (figures 3.04-3.07). The first permanent settlement grew around a Hudson Bay Company trading post which closed prior to 1967 with the community expanding on a formal street grid which is still present today. As of 2016, 942 people inhabited Kangiqsualujjuaq. The average population age is very young with over half of the residents aged under 24. The economy of Northern Villages involve both a subsistence economy (hunting, fishing and similar activities) and a more standard market economy which functions in the same way as it does in the south with paying jobs (in education, healthcare, etc.).<sup>2</sup> Climate change presents a significant challenge in all Nunavik communities since this region is characterized by discontinuous permafrost. This is an important consideration in planning for the community’s future since much of the village is built on marine clay soils which hold a higher ice content and thus are more susceptible to instability as temperatures rise.<sup>3</sup> There are several active community nodes throughout the community with the areas around the Ulluriaq school, arena, co-op store and Qarmaapik House being hubs of higher activity (figure 3.08).

Among communities in Nunavik, Kangiqsualujjuaq is recognized as unique due to its strong leadership and entrepreneurial spirit.

<sup>1</sup> Sentinel North. “Pinasuqatigiitsuta - A guideline for community planning in Nunavik (2020)”.

<sup>2</sup> Ibid.

<sup>3</sup> Allard, Calmels, Fortier, Laurent, L’Hérault & Vinet, (2014), *Cartographie des conditions de pergélisol dans les communautés du Nunavik en vue de l’adaptation au réchauffement climatique*, trans. by Isaac Edmonds. 10.13140/2.1.4611.7440.

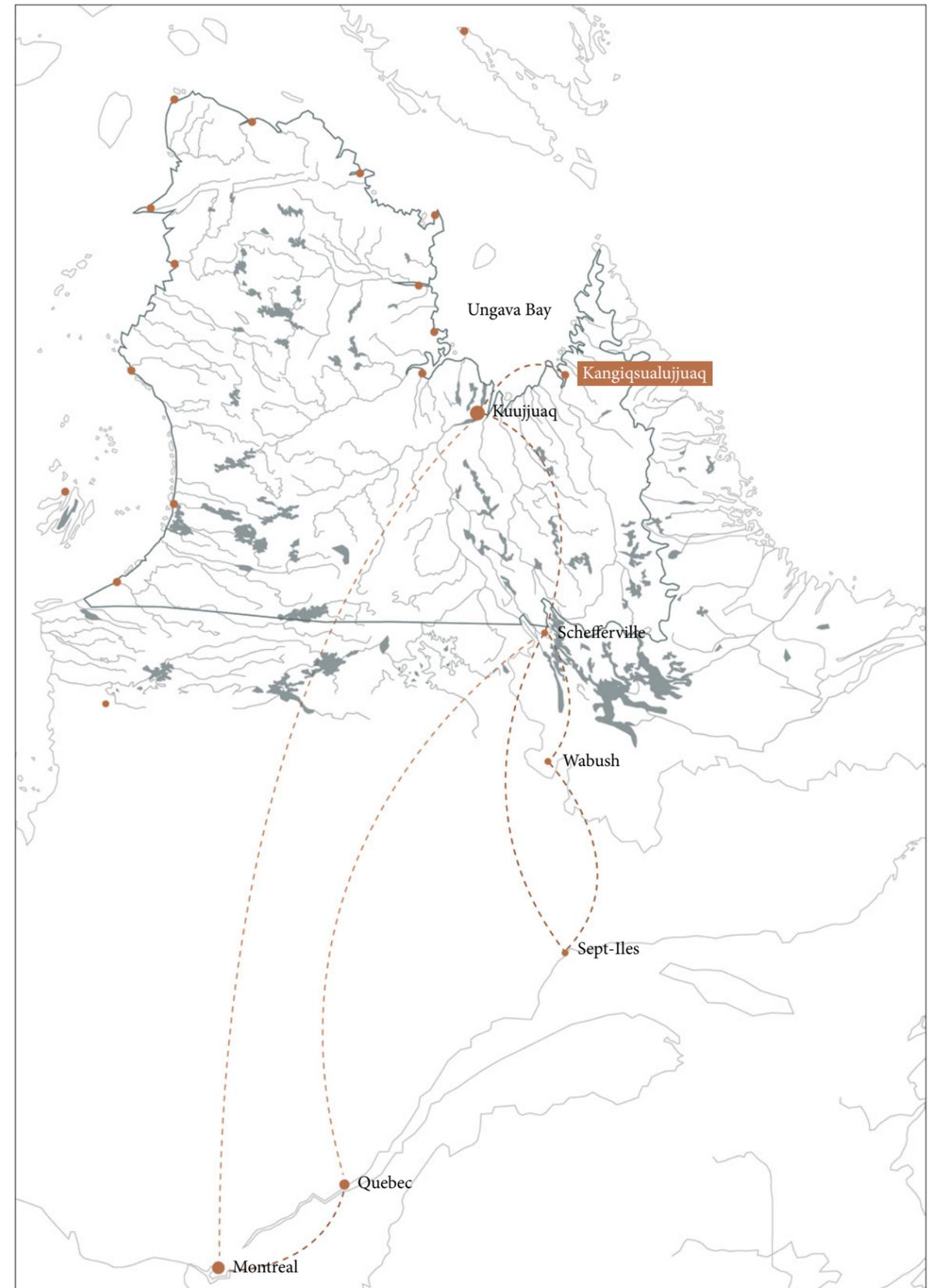


fig. 3.02 (opposite) Hunters watching for seals to surface on the George River

Qarmaapik House, a facility to help local families in crisis, was developed as a community-led initiative to allow Nunavimmiut to reclaim control over the faulty youth protection system which often implements a heavy handed approach in taking children away from their families. This space has been a clear asset to the community and, while funding presents an obstacle, other communities have expressed an interest in replicating Qarmaapik House's approach.<sup>4,5</sup> For a collaborative design studio in the first year of my Master's, I had the opportunity to visit Kangiqsualujjuaq and co-develop design ideas for a new Qarmaapik House building that would better serve the program's needs and responds to Inuit values. Nancy Etok, the co-founder of Qarmaapik House, was our gracious host during this visit. Due to the Covid-19 pandemic, I was unable to directly visit the community during my thesis, but Nancy generously acted as my point of contact; answering questions regarding the kind of makerspace that would best respond to the community's needs and helping identify an ideal site for the makerspace among other considerations.

Through conversation with Nancy, specific interest was expressed in "a community workshop, it would be perfect for people who would want to build anything with wood."<sup>6</sup> While practices of self-building are common throughout the community, there are no dedicated training facilities for building. A shared makerspace would complement existing making practices and provide community agency on a wider scale. From Qarmaapik House to the Interpretive Centre and community greenhouse, several pioneering facilities have already been established in Kangiqsualujjuaq through community-driven initiatives. This spirit of resourcefulness and track record of innovation provide good reason to believe that Kangiqsualujjuaq is a community where a pathfinder makerspace project could be used to its maximum potential as a valuable resource spurring the possible creation of further community-led projects.

4 Sarah Rogers, "Qarmaapik House Emerges as a Model for Family Wellness in Nunavik," Nunatsiaq News, December 12, 2018, <https://nunatsiaq.com/stories/article/qarmaapik-house-emerges-as-a-model-for-family-wellness-in-nunavik/>.

5 Maggie Emudluk, "Qarmaapik House: A Multi-Use and Safe Place for Families in Kangiqsualujjuaq," Northern Public Affairs RSS, accessed May 2, 2021, <http://www.northernpublicaffairs.ca/index/volume-5-issue-2-innovations-in-community-health-and-wellness/qarmaapik-house-a-multi-use-and-safe-place-for-families-in-kangiqsualujjuaq/>.

6 Nancy Etok (Vice-principal of Ulluriaq School), in discussion with the author, January 27th, 2021.

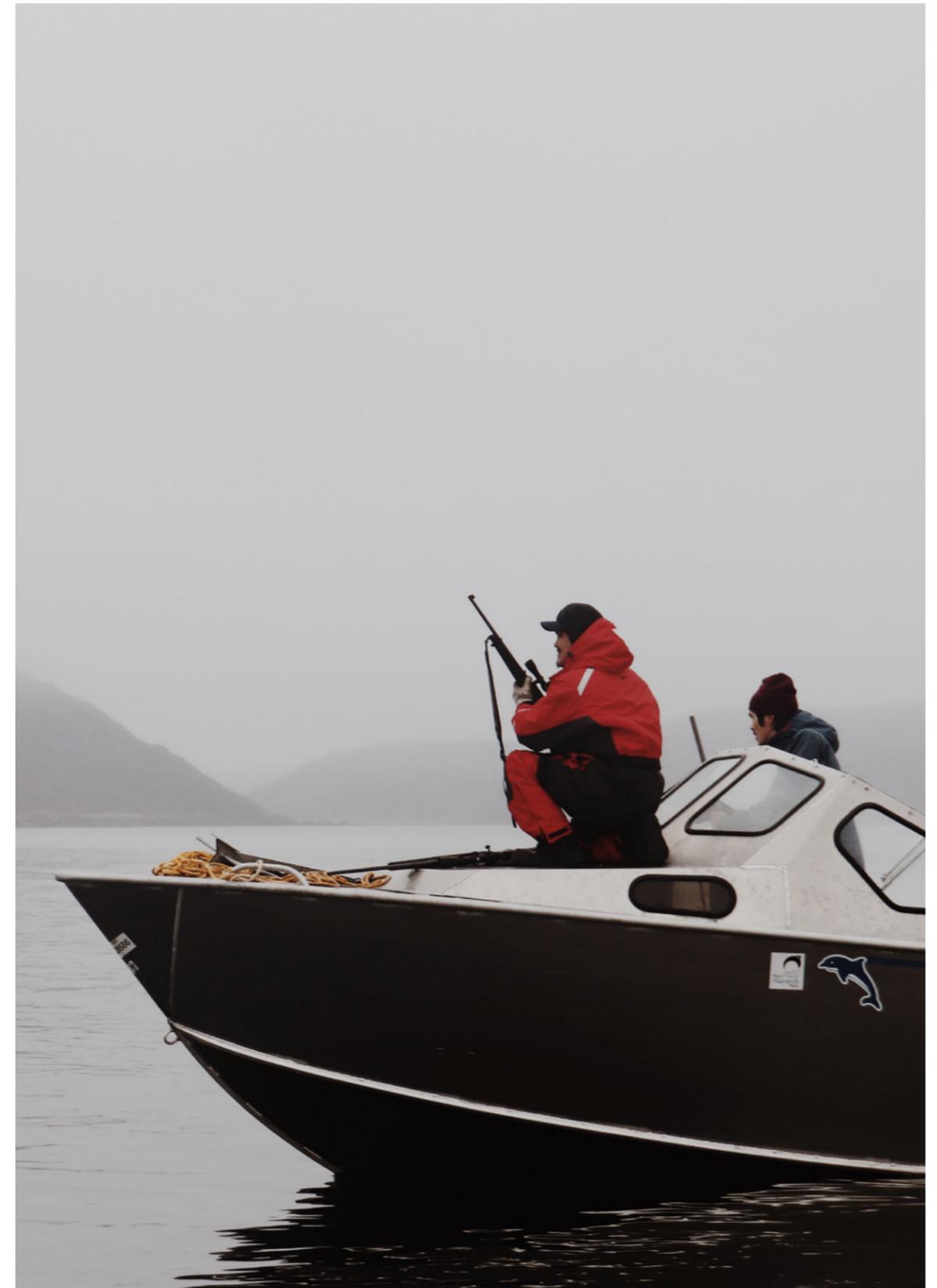


fig. 3.03 Kangiqsulaujjuaq



**KANGIQSUALUJJUAQ** (fig 3.04)

**RESIDENTIAL**



**COMMUNITY**

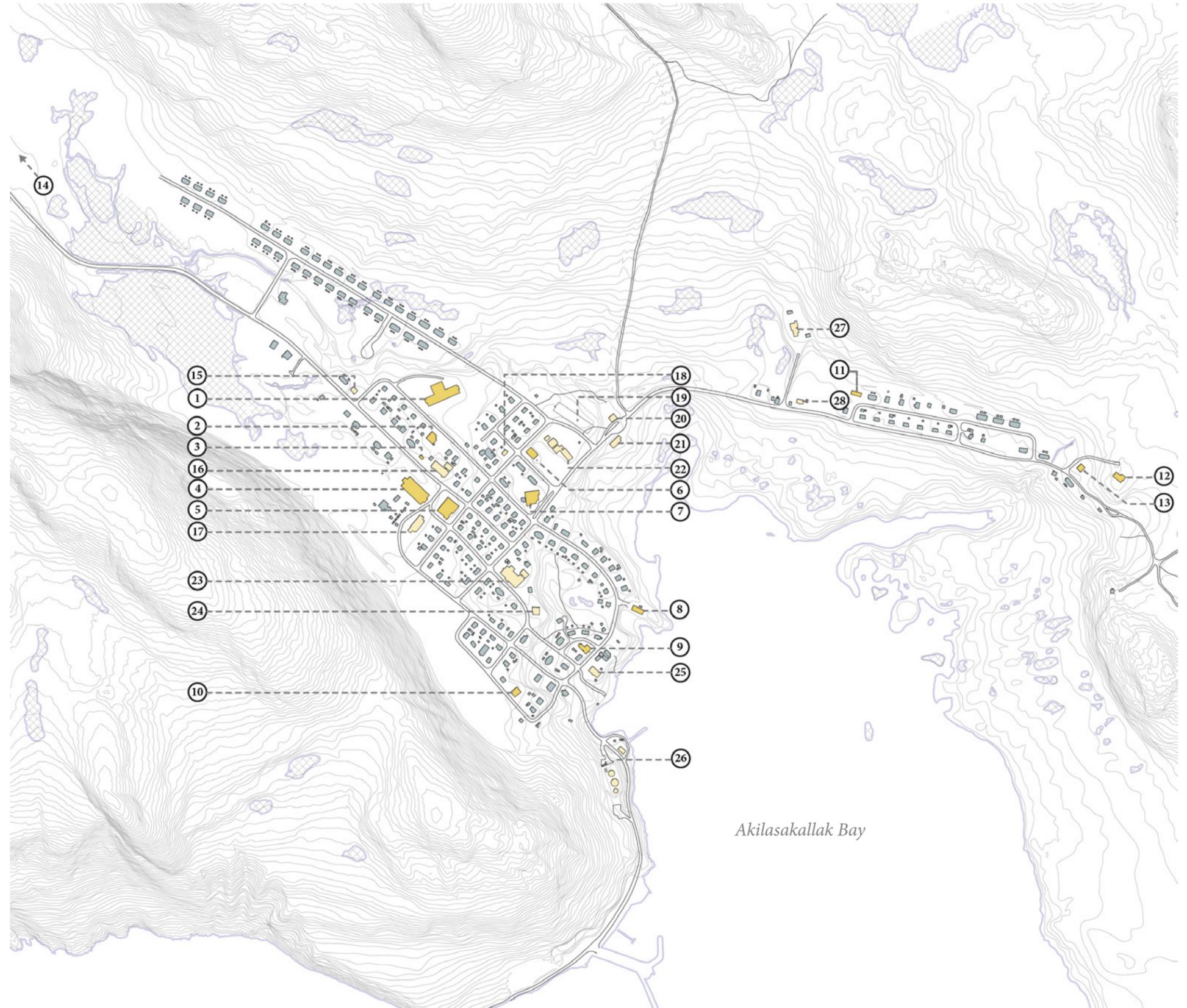


1. Ulluriaq School
2. Aqaivik Child Care Centre
3. Youth Committee Office
4. Arena
5. Community Centre
6. Community Freezer
7. Community Health Centre
8. Swimming Pool
9. Qarmaapik Family House
10. Mayor's Office
11. Community Greenhouse
12. Nunavik Parks Office
13. Nunavik Parks Garage

**OTHER**



14. Airport
15. Police Station
16. Northern Store
17. Elder's Residence
18. Radio Station
19. Graveyard
20. Water Supply
21. Niriviapik Restaurant
22. Firehall
23. COOP Store
24. COOP Hotel
25. Church
26. Tank Farm
27. Hydro-Quebec Power House
28. Centre for Northern Studies

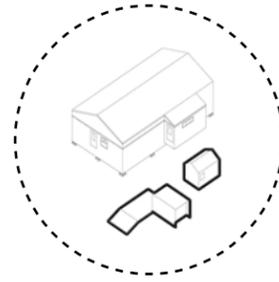


Akilasakallak Bay

## SPACES FOR MAKING (fig 3.05)

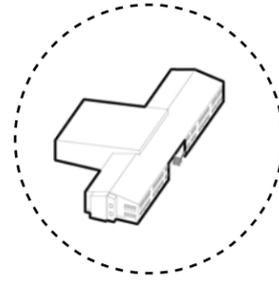
### // *Garages + Backyards*

Informal building and repair activities take place frequently in Kangiqsualujjuaq with sheds, backyards and left over shipping containers acting as personal workshop spaces.



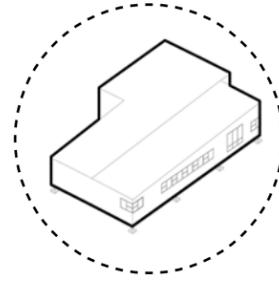
### // *Ulluriaq School*

The school is a primary location for knowledge transmission from elders to youth with demonstrations of traditional activities such as skinning and cleaning animals taking place here.



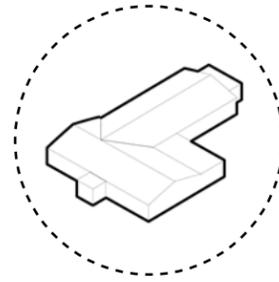
### // *Interpretive Centre*

This building acts as both an office and visitors centre for the Kuurujuak Provincial Park. The centre displays historic artifacts as well as crafts and artwork by community members. Craft activities such as cleaning seal skins for the sewing of clothes can take place here.



### // *Qarmaapik House*

An Inuit-run safe house and community space, Qarmaapik routinely runs classes with elders teaching traditional skills, employment support and other programs aimed at healing and empowering families through the lens of Inuit values.



### // *Self-built Houses*

Several self-built log houses and cabins can be found in the community.

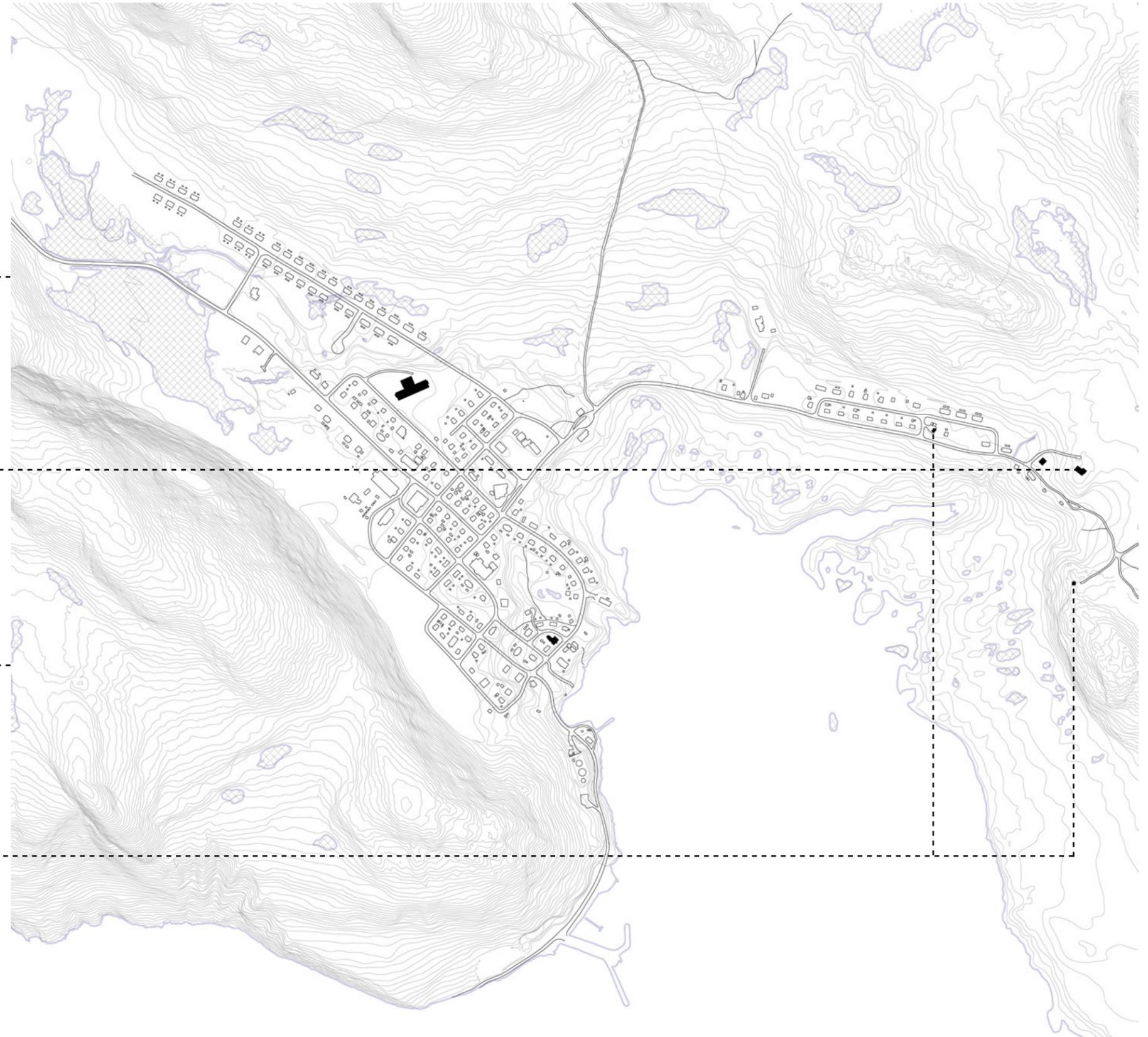
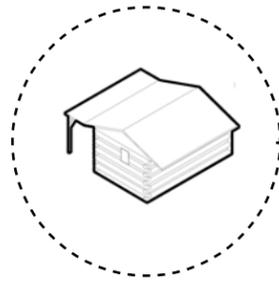




fig. 3.06 Community Satellite View

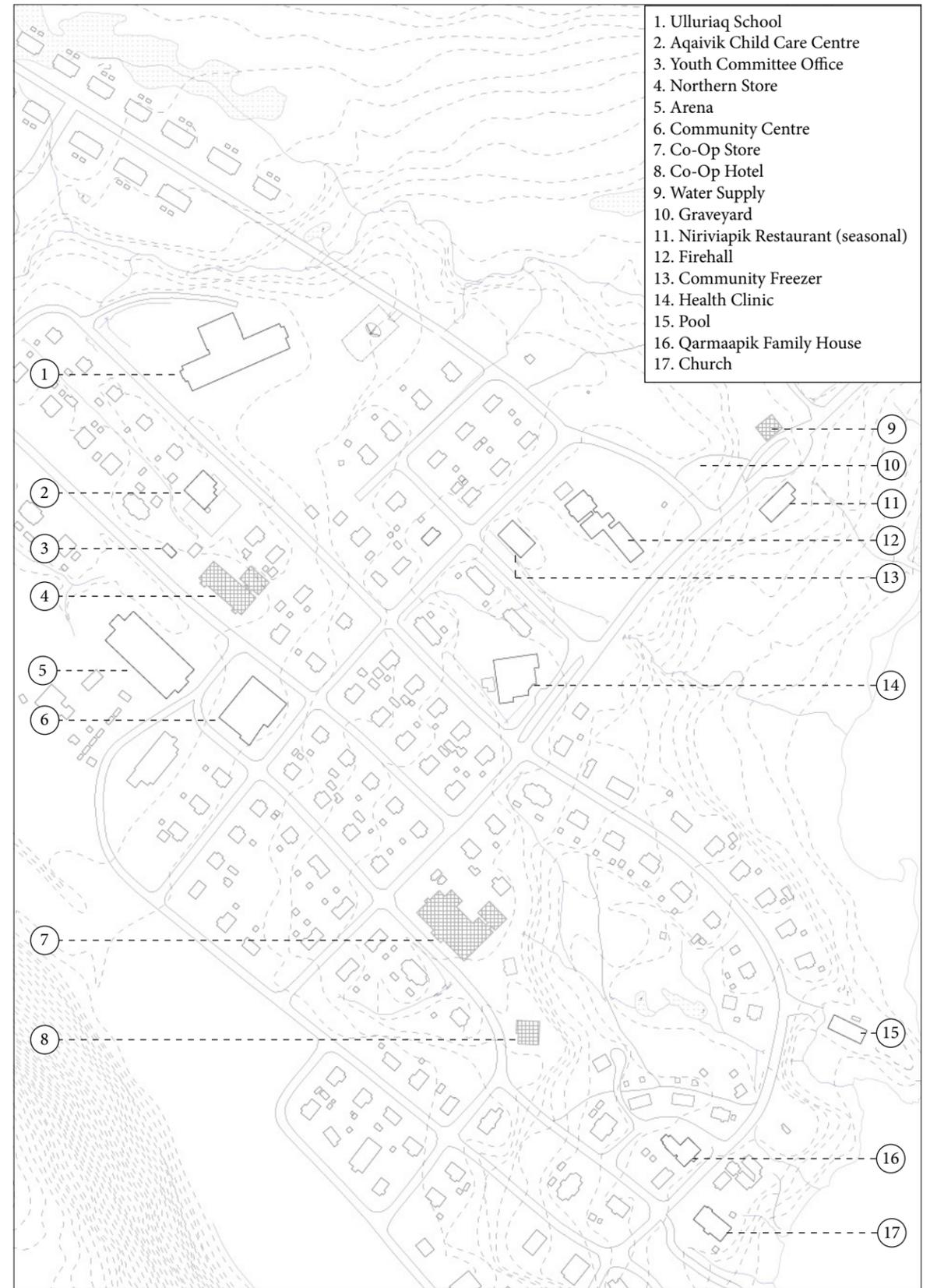
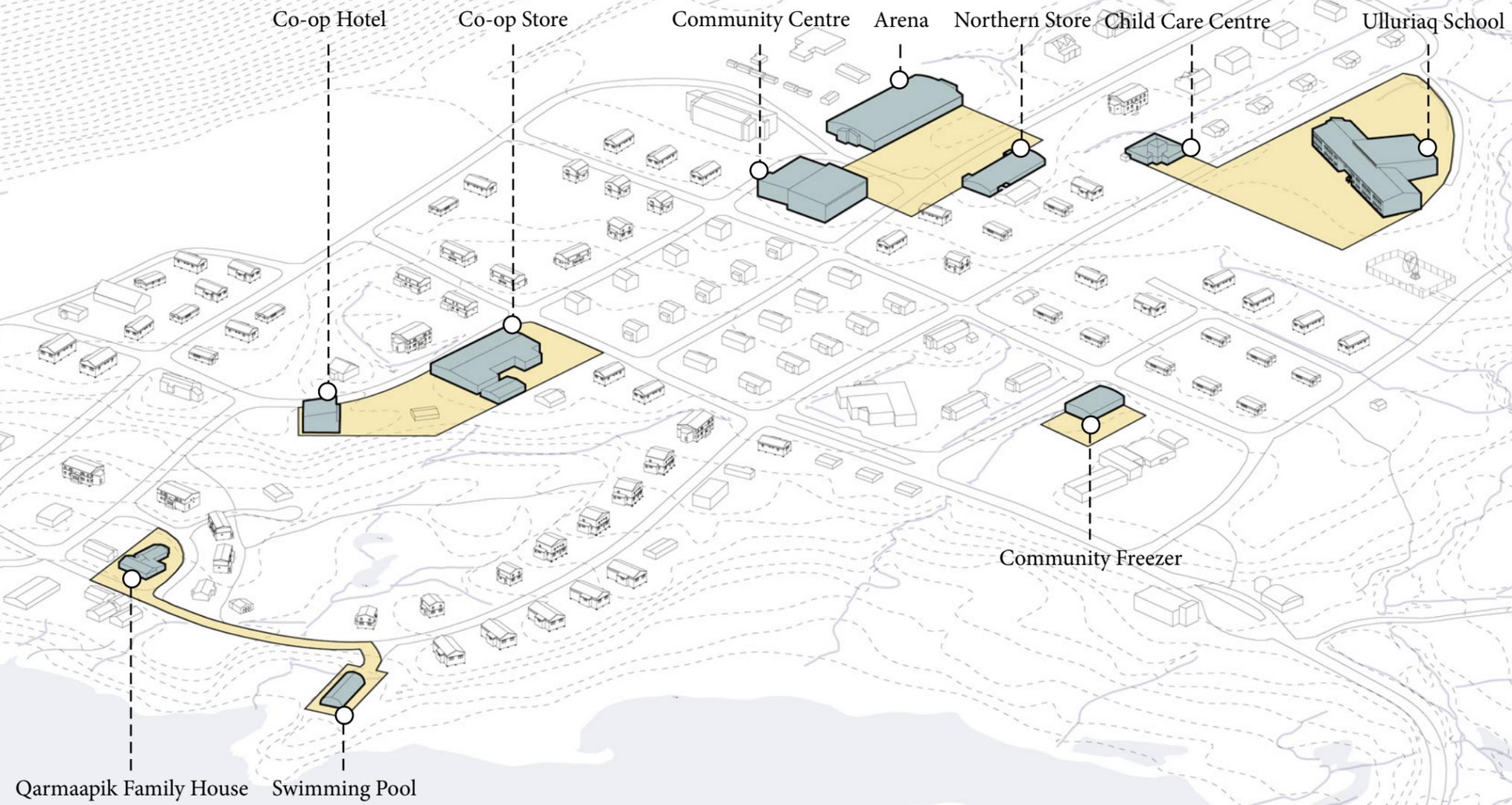


fig. 3.07 1:5000 Community Plan

**ACTIVE COMMUNITY NODES** (fig 3.08)



### 3.2 Site Analysis & Selection

fig. 3.09 (opposite) Children at Ulluriaq - Kativik taken by vice-principal Nancy Etok

The Ulluriaq school and Aqaivik child care centre form an important node of activity in the community as the primary place of teaching and knowledge transfer. This was a natural choice in the selection of a site for the makerspace since it is in a central, easily accessible location with ample unused open space surrounding the building (figures 3.09 and 3.10). In conversation with Nancy Etok, both proximity to the school and a location surrounded by plenty of open space were ideal. The intention in the selection of this site would be to create a central community learning hub that could then be linked with other important community activity nodes previously identified.

As is the case with all of the community, the school is constructed on a barren gravel pad (figures 3.11 and 3.12). This strategy, in conjunction with elevating buildings above the ground (typically on adjustable screw jacks) is aimed at preventing building heat from thawing the permafrost below while elevation also allows the strong winter winds to clear accumulating snow. Gravel pad construction is resource intensive and almost all natural vegetation is destroyed in the process.<sup>7</sup>

The school is the largest building in the community and serves as the single school for all age groups with more than 200 students and 29 teachers.<sup>8</sup> The school is often used for other community functions since there are not an abundance of spaces available in the community for public use. Of note, the school is oriented to provide a view south towards the water and there is a significant satellite dish that services the school to the east (figures 3.13 and 3.14). Immediately to the north of the school, a creek demarcated a boundary between the older community core and a new residential development. The natural landscape rises gradually into a significant bedrock hill on the eastern side of the site (figure 3.15). Access to the school often takes varied form depending on the distance students have to travel and the season. Walking is common, but cars, ATVs and snowmobiles are also frequently used for mobility. The paths that are typically traversed to access the school (or any other location in the community) rarely conform the street grid since this not a particularly efficient route. Often ignored in planning practices, this network of informal paths reveals more organic, functional paths of movement (figure 3.16).

<sup>7</sup> Sarah Rogers, "Nunavik Sees Shortage of Gravel and Other Building Materials."

<sup>8</sup> Kativik Ilisarniliriniq, "Ulluriaq," October 24, 2018, <https://www.kativik.qc.ca/school/ulluriaq/>.



fig. 3.10 Ulluriaq School





fig. 3.11 Satellite View of School Site

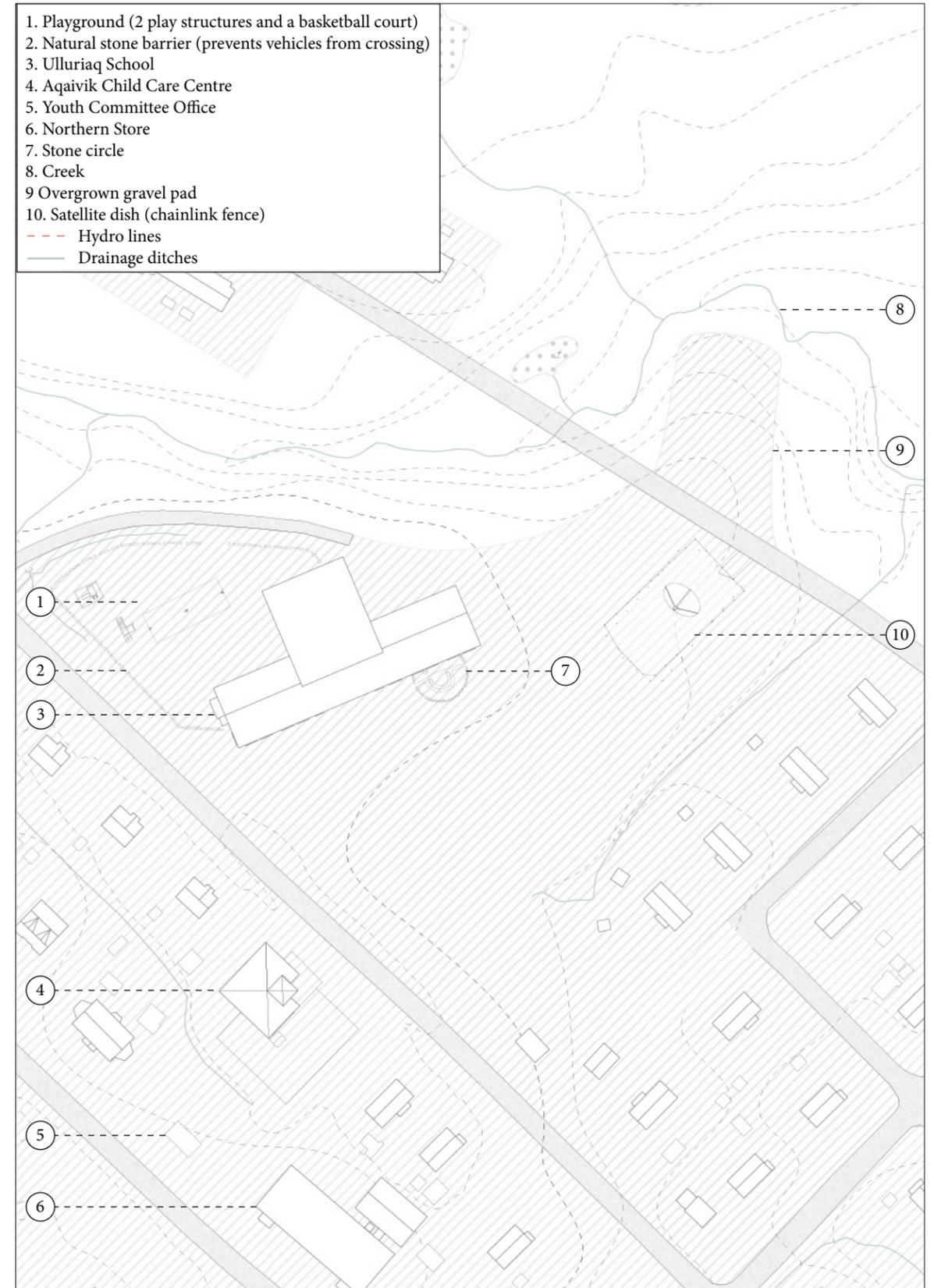
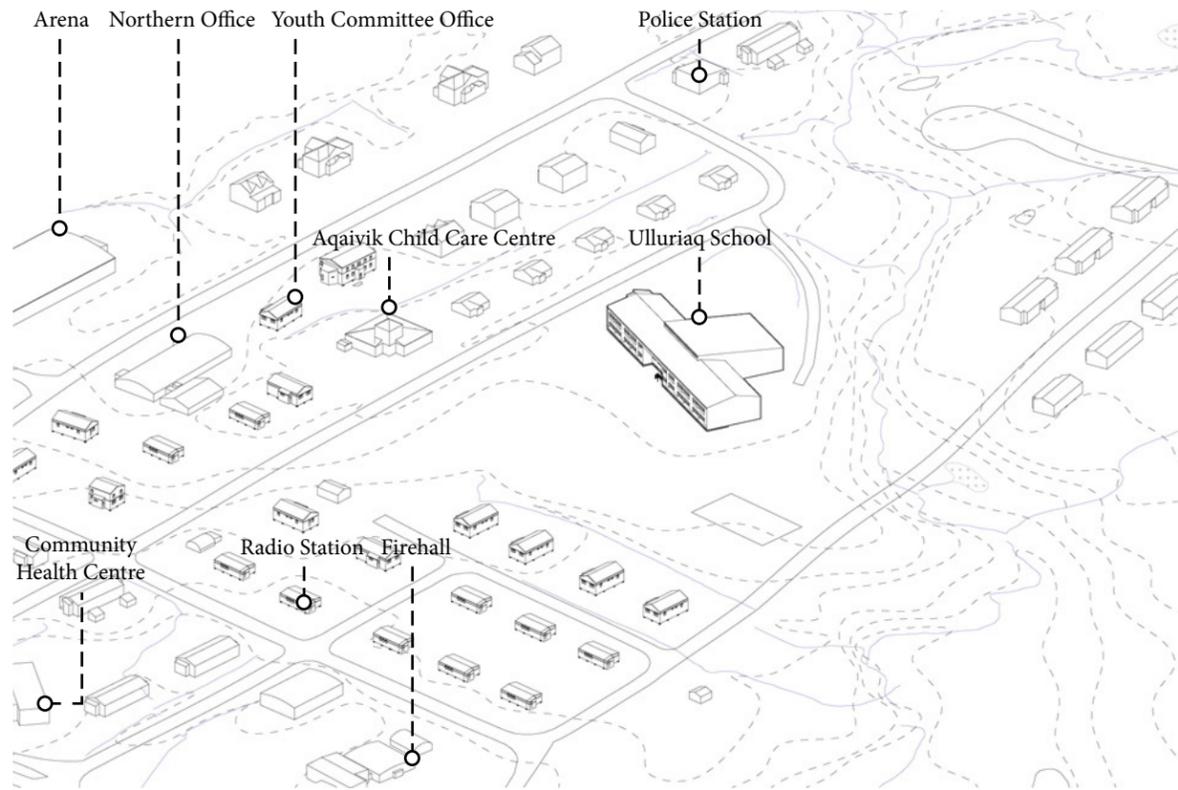


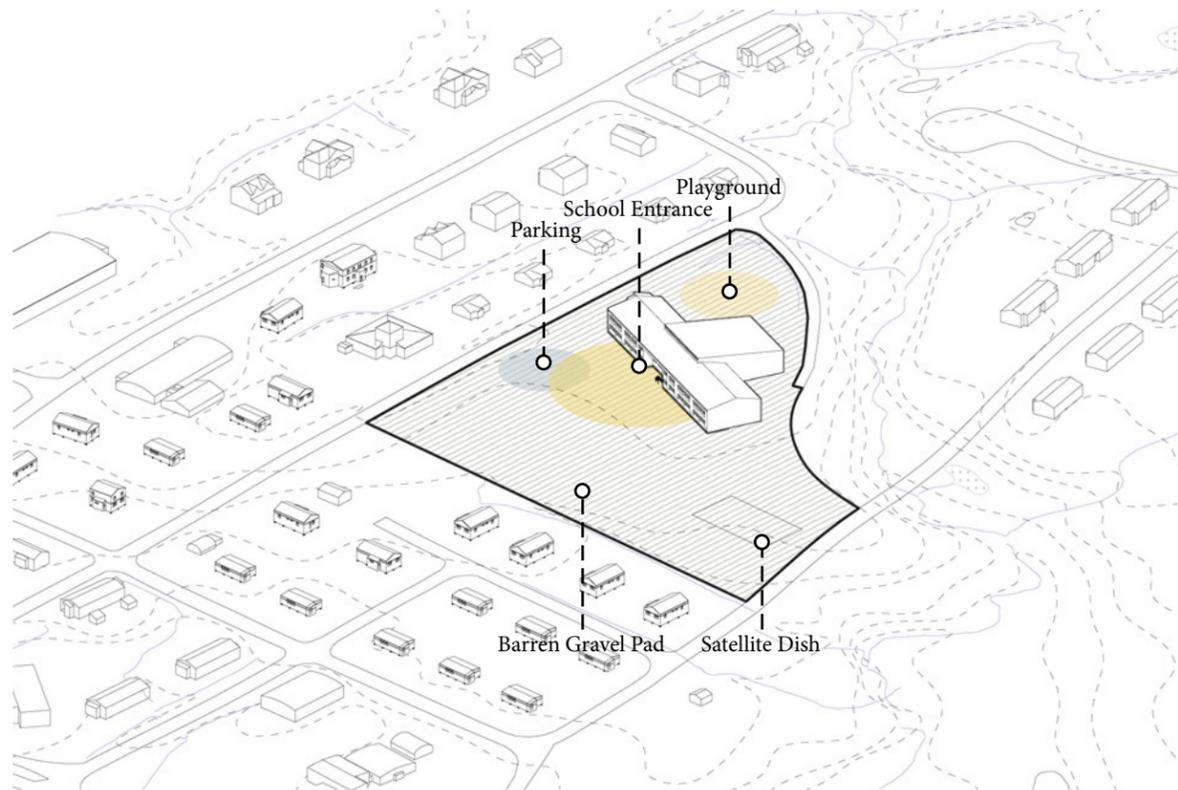
fig. 3.12 1:1500 Plan of School Site



CONTEXT (fig. 3.13)



SUN PATH & VEGETATION (fig. 3.15)



SITE (fig. 3.14)



INFORMAL PATHS (fig. 3.16)

### 3.3 Enriching the Heart of the Community

The proposed intervention aims to engage the community, especially youth, by creating an active, learning-oriented node based around the Ulluriaq school, Aqaivik child care centre and the new makerspace (figure 3.17). The central junction between these 3 spaces is activated with a sculpture park and gathering field for seasonal cultural activities (figure 3.18). By co-locating the new learning space next to existing learning spaces and responding to informal paths, a strong connection can be established with the surrounding community. In the long-term, a renaturalization effort focused on this gathering field could gradually restore some natural vegetation to the heart of the community. The school playground is relocated so that is easily accessible from both the school and the childcare centre. While vehicle access to the front of all buildings is maintained, parking has been shifted slightly to keep vehicles away from active pedestrian areas.

The makerspace would be constructed in two phases with the primary workshop facilities built first and more community-oriented programs added in a second phase (figure 3.19). The intention of this project would be to support locally-driven building initiatives. Imagined future projects that could be generated from this makerspace include a bus stop, land-based learning classroom, youth and elder co-housing, tiny houses and artist residences. These artist facilities could support visiting or local artists in a similar model to the Fogo Island artist residences off the coast of Newfoundland. Building housing on empty lots helps reduce sprawl and allows for new residences to be in close proximity to central community facilities. Drawing inspiration from a community-built tiny house project in Salluit, new tiny houses with shared porches and courtyards are integrated with existing housing at the heart of the community. A strengthened connection to the area where the arena, community centre and northern store are located has also been envisioned by extending this new pathway beyond the child care centre. On the scale of the community, synergies could be created with other active community nodes (figure 3.20). For example, a local craft market next to the co-op store could support entrepreneurship and complement the functionality of the makerspace. Connections to Qarmaapik Family House and the water could be strengthened with additional learning programs such as a boat building workshop along the shoreline.

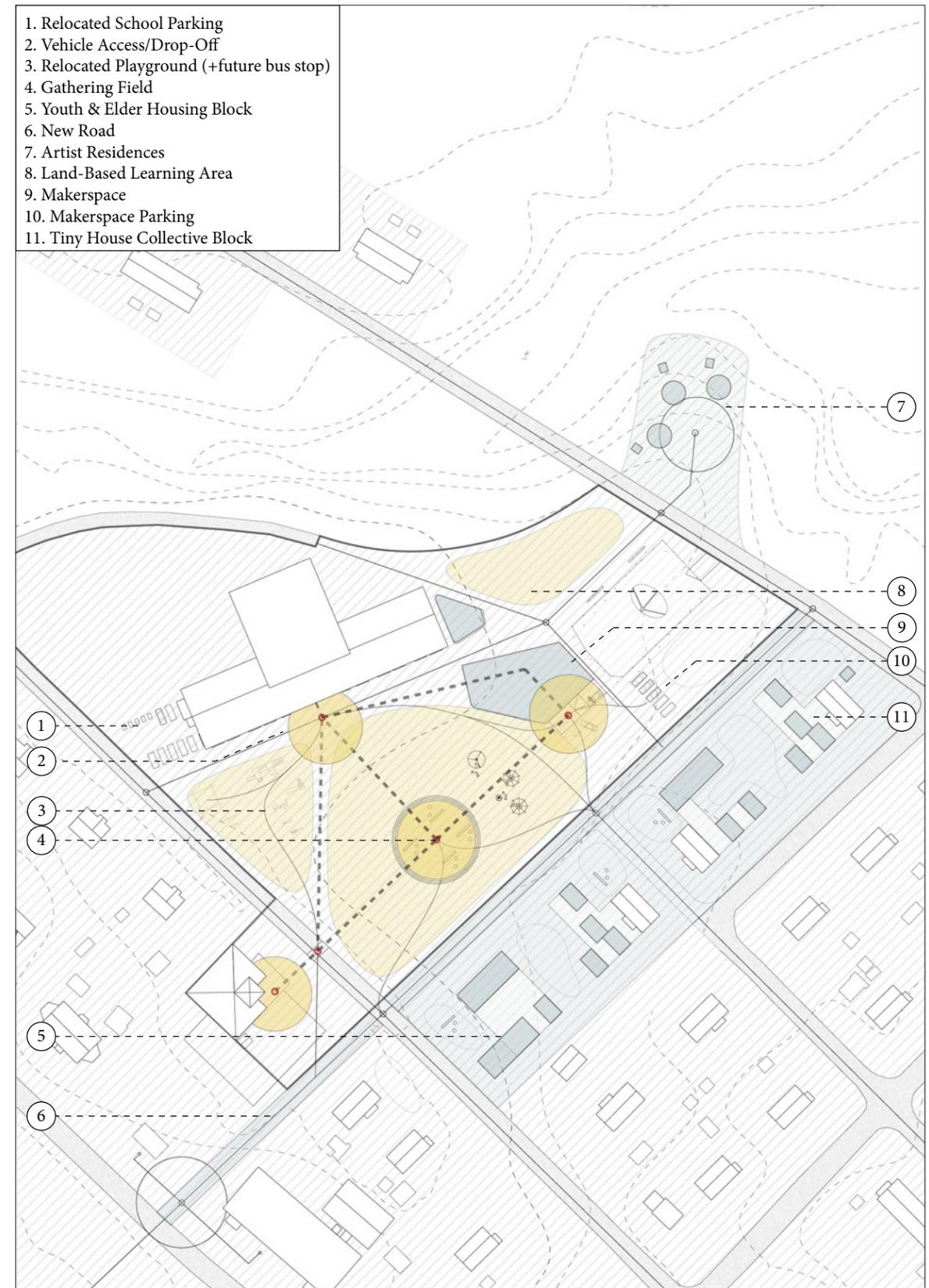
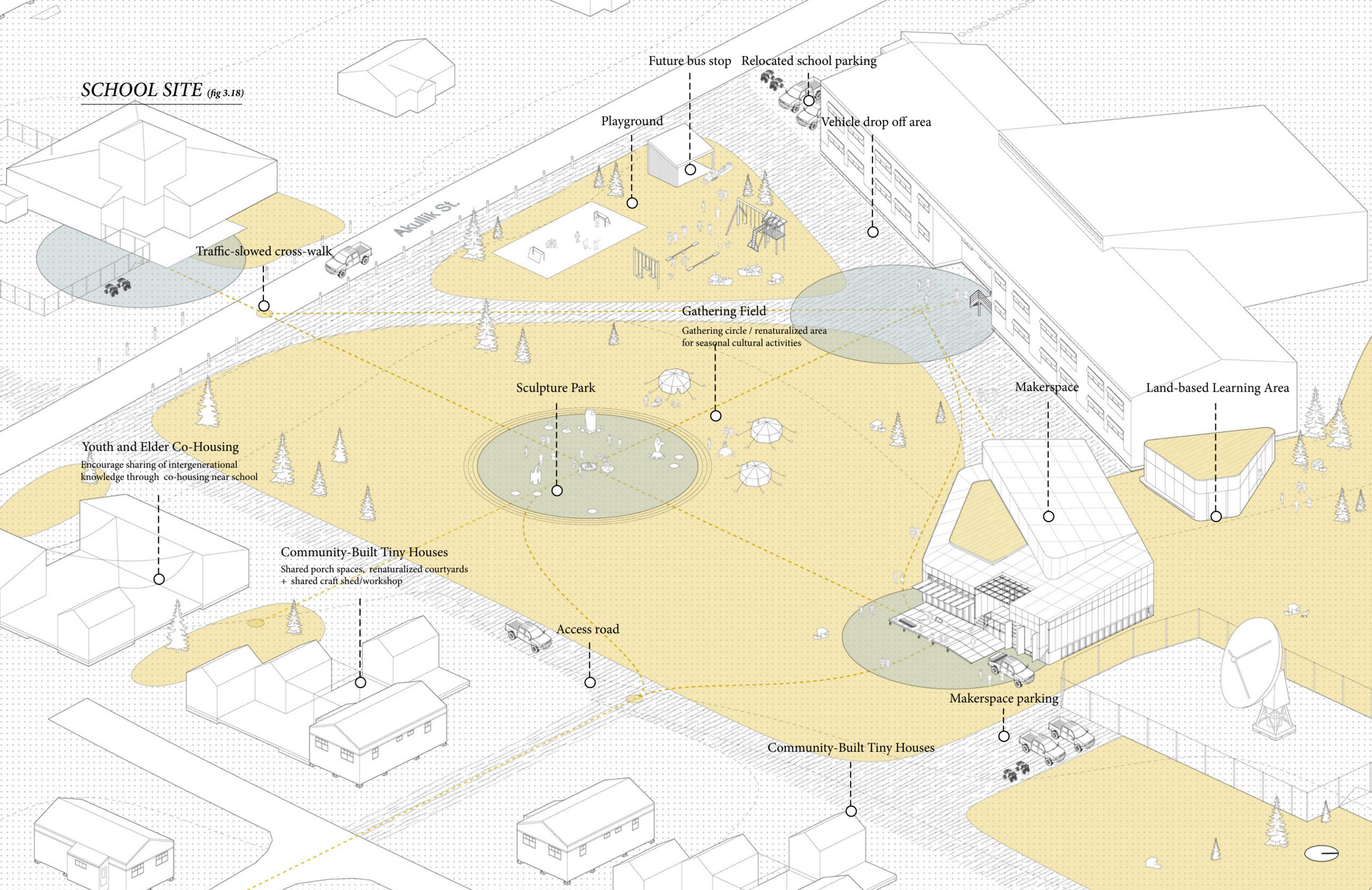


fig. 3.17 1:1500 Proposed Masterplan

**SCHOOL SITE** (fig 3.18)



Future bus stop Relocated school parking

Playground

Vehicle drop off area

Akulik St.

Traffic-slowed cross-walk

Gathering Field

Gathering circle / renaturalized area for seasonal cultural activities

Sculpture Park

Makerspace

Land-based Learning Area

Youth and Elder Co-Housing

Encourage sharing of intergenerational knowledge through co-housing near school

Community-Built Tiny Houses

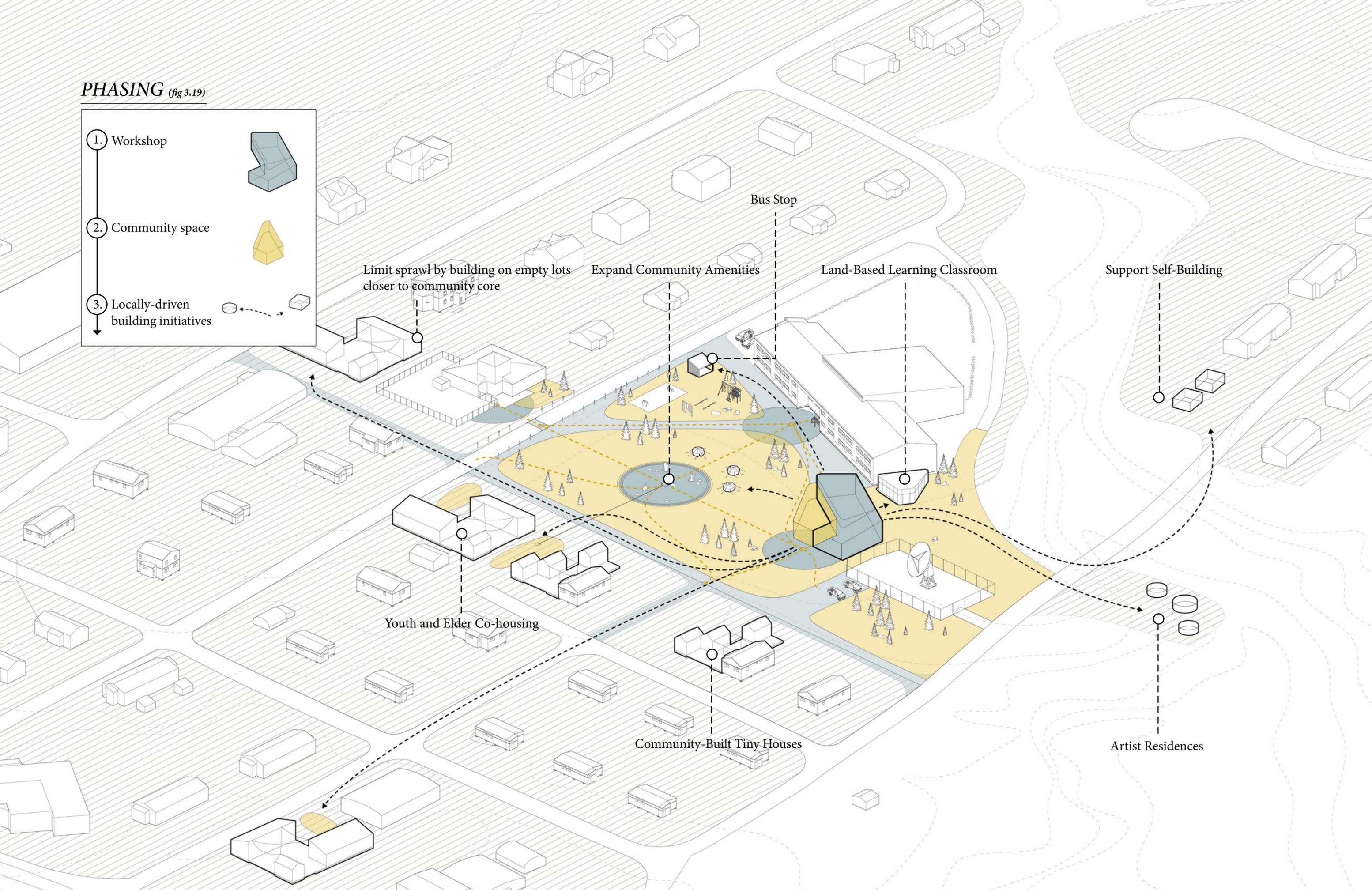
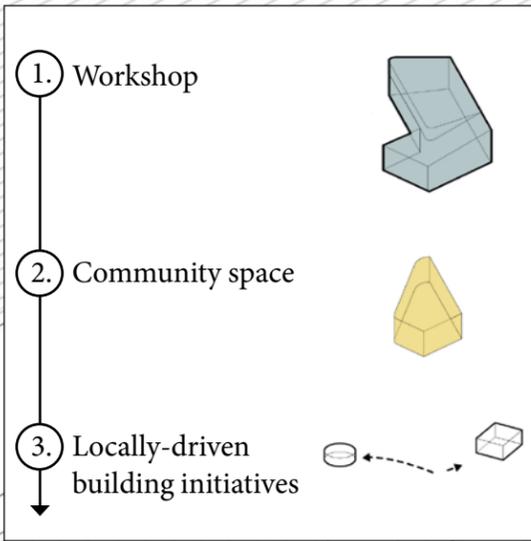
Shared porch spaces, renaturalized courtyards + shared craft shed/workshop

Access road

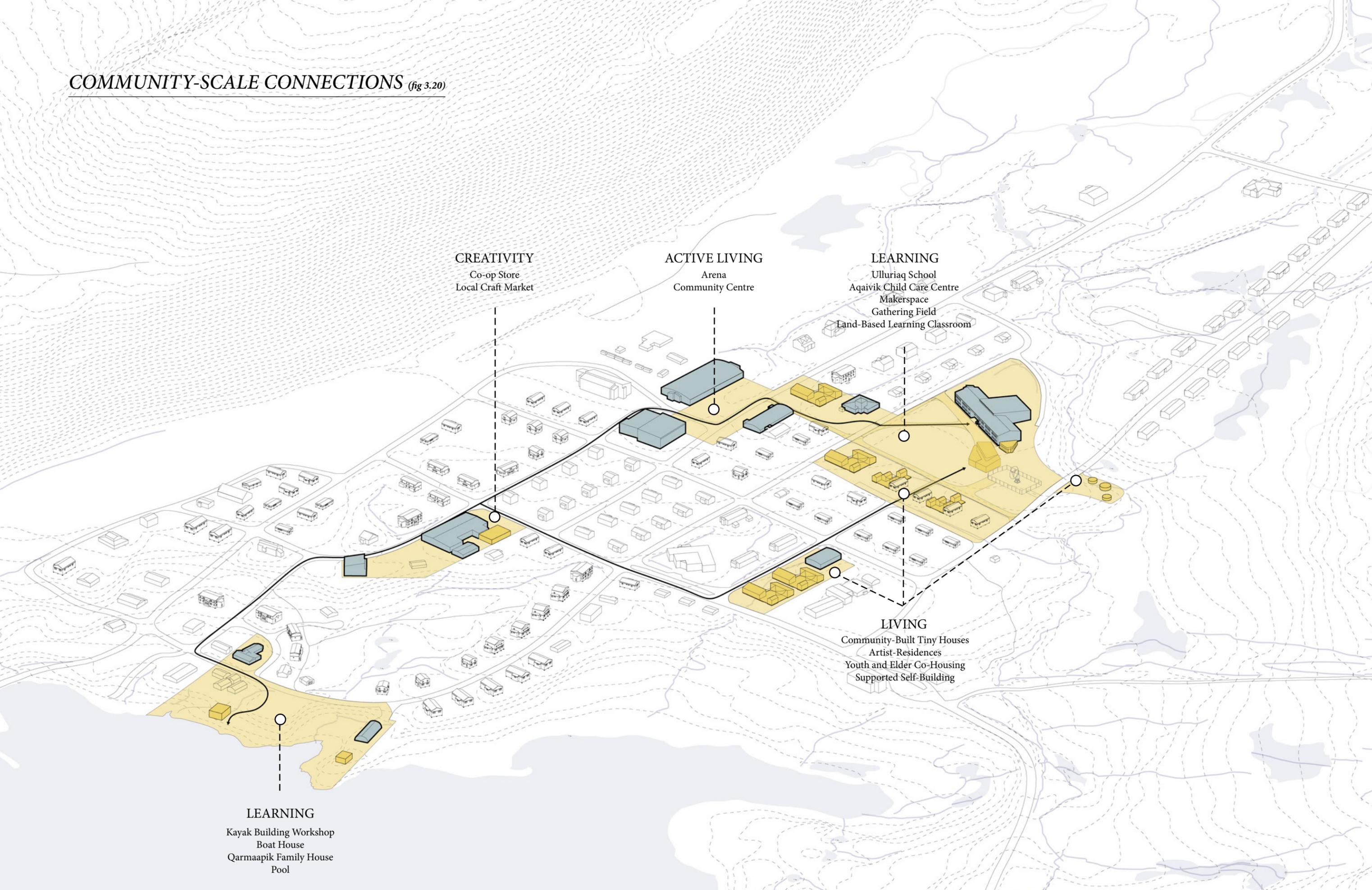
Makerspace parking

Community-Built Tiny Houses

**PHASING** (fig 3.19)



**COMMUNITY-SCALE CONNECTIONS** (fig 3.20)



**CREATIVITY**

- Co-op Store
- Local Craft Market

**ACTIVE LIVING**

- Arena
- Community Centre

**LEARNING**

- Ulluriaq School
- Aqivik Child Care Centre
- Makerspace
- Gathering Field
- Land-Based Learning Classroom

**LIVING**

- Community-Built Tiny Houses
- Artist-Residences
- Youth and Elder Co-Housing
- Supported Self-Building

**LEARNING**

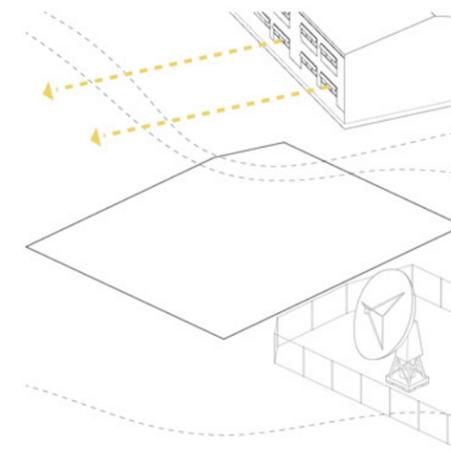
- Kayak Building Workshop
- Boat House
- Qarmaapik Family House
- Pool

### 3.4 Detailed Design

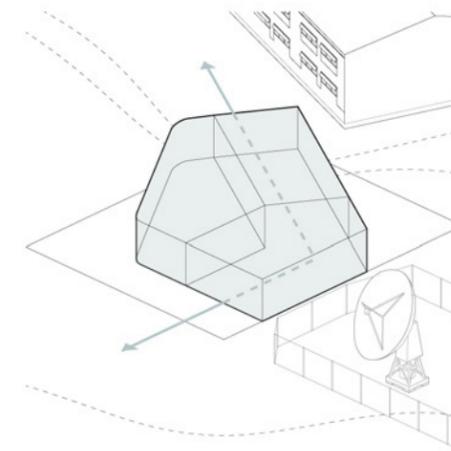
fig. 3.21 (opposite) Site Strategy

The specific site of the makerspace relative to the Ulluriaq school has been carefully selected to maintain views from the school to the water while still being in close proximity. The two primary axes of the building are oriented towards the water and the school's entrance. Natural lighting is integrated through a south-facing clerestory which fills the primary workshop space with natural light while framed views are presented to the water and the sculpture park. The form of the building responds to local land-based practices through the provision of views to the water, considerate orientation in regard to sun, wind, informal paths, soil conditions and snowfall (figure 3.21). The makerspace program is divided roughly into workshop space, community space and back-of-house functions (table 3.01, figures 3.22 and 3.33).

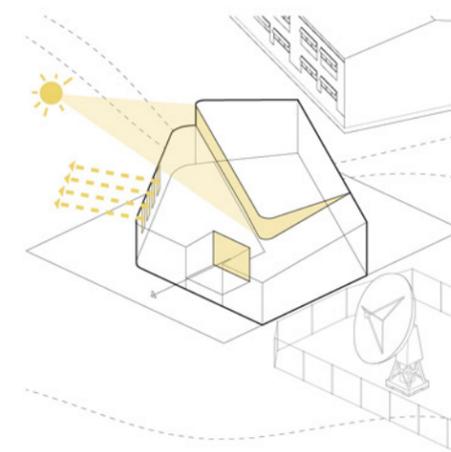
Knowledge sharing will be encouraged by providing spaces for making that support varied types of learning. A contemporary workshop facility will allow for professional vocational training (figure 3.24) while a flexible craft area will support activities such as sewing and carving (figure 3.25). This space can also be used as a community resource where collaborative projects can be developed that would not be possible in the smaller personally-constructed workshops of homeowners. A hearth and adjacent kitchenette provide a central space for communal gathering with a view over the community to the bay (figure 3.26). A sheltered porch extends beyond the hearth while a summer classroom and adjacent deck allow for open air activities such as kayak building demonstrations, harvesting animals after a hunt or providing a stage for community events (figure 3.27). On-grade entry is made possible due to the grade change from the Ulluriaq school's gravel pad (figure 3.28). The entry vestibule is open to allow for large building materials and built projects to be transported in and out. More intimately scaled spaces with seating and storage for coats and boots are located just above and below this open entry. An open assembly floor and machine area are complemented by a sizable storage space to the north in the colder exterior shell envelope. Seating nooks are integrated into the southern and northern facades. Washrooms, additional storage and a large mechanical room are co-located in a 'back-of-house' area parallel to the satellite dish fence.



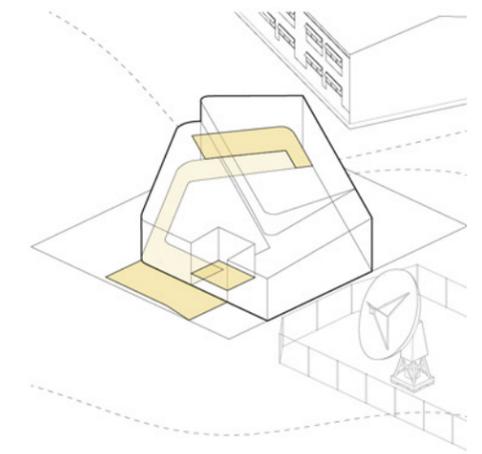
1 **SELECT:** Ideal makerspace location (proximate to school, but not blocking views to the water)



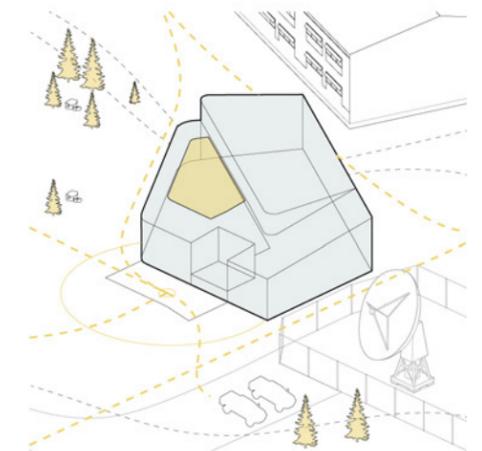
2 **CONNECT:** To school and community



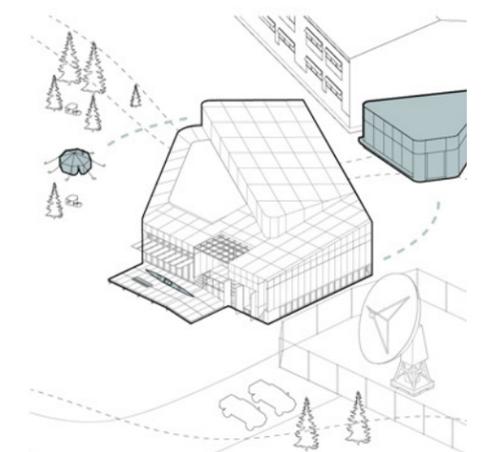
3 **WELCOME:** Sunlight and views



4 **CREATE:** Diverse exterior and threshold spaces



5 **ACTIVATE:** through walking paths and renaturalization over time



6 **GENERATE:** A local building ecosystem

## PROGRAM

SPACE	SIZE	NOTES
<b>WORKSHOP</b> <i>assembly space (noisy)</i>		
Open Assembly Floor	60 m <sup>2</sup>	Double-height, primary space for vocational training.
Machine Area	60 m <sup>2</sup>	Space for several machines - bandsaws, chop saws, a planar, etc. + necessary mechanical/ventilation.
Outdoor Deck	80 m <sup>2</sup>	Platform for outdoor making activities. Faces community and can double as a stage for events.
Vestibule	45 m <sup>2</sup>	Significant clearance to allow assembled structures to be transported in and out from main assembly floor.
<b>COMMUNITY SPACE</b> <i>flexible space (more quiet)</i>		
Hearth + Kitchenette	40 m <sup>2</sup>	Provides a central gathering space and radiantly heats the thermally massive rammed earth walls. Integrated seating, cooking element and firewood storage.
Flex Space (Worktables)	100 m <sup>2</sup>	Flexible space that can be reconfigured responding to community need. Tables provide additional workspace for craftwork and assembly.
Summer Classroom	40 m <sup>2</sup>	On grade class space with seating. Operable panels allow space to open up during the summer.
<b>BACK OF HOUSE</b>		
Washrooms	20 m <sup>2</sup>	Two universally accessible washrooms.
Material Storage	55 m <sup>2</sup>	Large open storage areas for storage of building materials, old prototypes, etc.. Does not require significant heating.
Additional Storage Areas	20 m <sup>2</sup>	Distributed around workshop. Provides storage for smaller building materials, power tools, safety equipment, etc..
Mechanical Room	25 m <sup>2</sup>	Mechanical room containing boiler, grey water tank, ventilation system, etc..
<b>CIRCULATION</b>		
	150 m <sup>2</sup>	
Core:	415 m <sup>2</sup>	
Shell:	285 m <sup>2</sup>	
<b>TOTAL AREA:</b>	<b>700 m<sup>2</sup></b>	

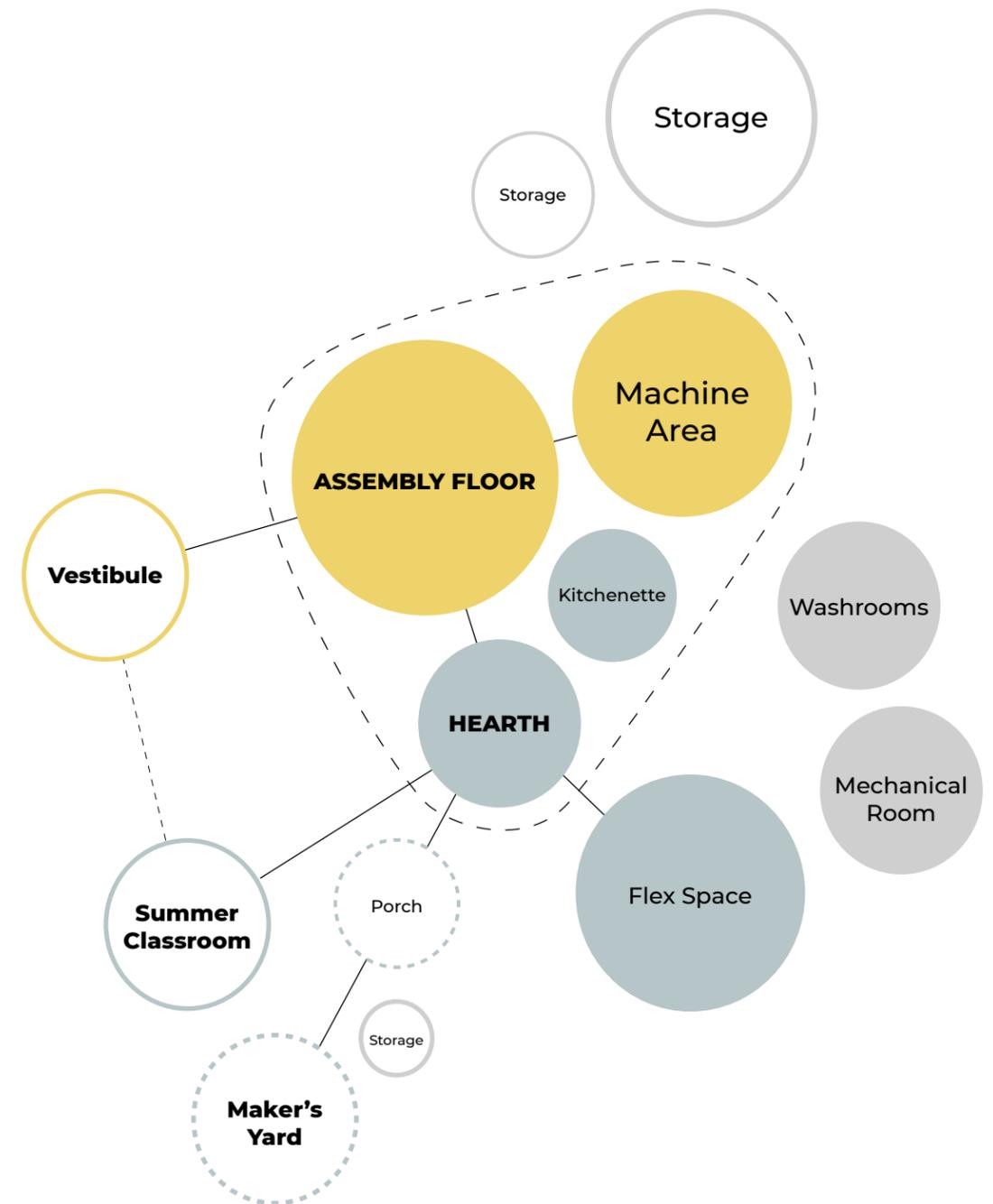


fig. 3.22 (above) Makerspace Program Adjacencies  
tab. 3.01 (left) Makerspace Program Table

1:150 PLAN (fig 3.23)

Ulluriaq School

Satellite Dish  
Perimeter Fence

To School Entrance

To Water

- 1. On-Grade Entry (due to grade change from school's gravel pad)
- 2. Vestibule (coat and boot storage above and below)
- 3. Assembly Floor
- 4. Machine Area
- 5. Storage
- 6. Storage Closet
- 7. Washrooms
- 8. Mechanical Room
- 9. Hearth
- 10. Kitchenette
- 11. Flex Space (Worktables)
- 12. Flex Space (Craft Area)
- 13. Seating Nooks
- 14. Summer Classroom
- 15. Exterior deck
- 16. Maker's Yard Storage
- 17. Gas

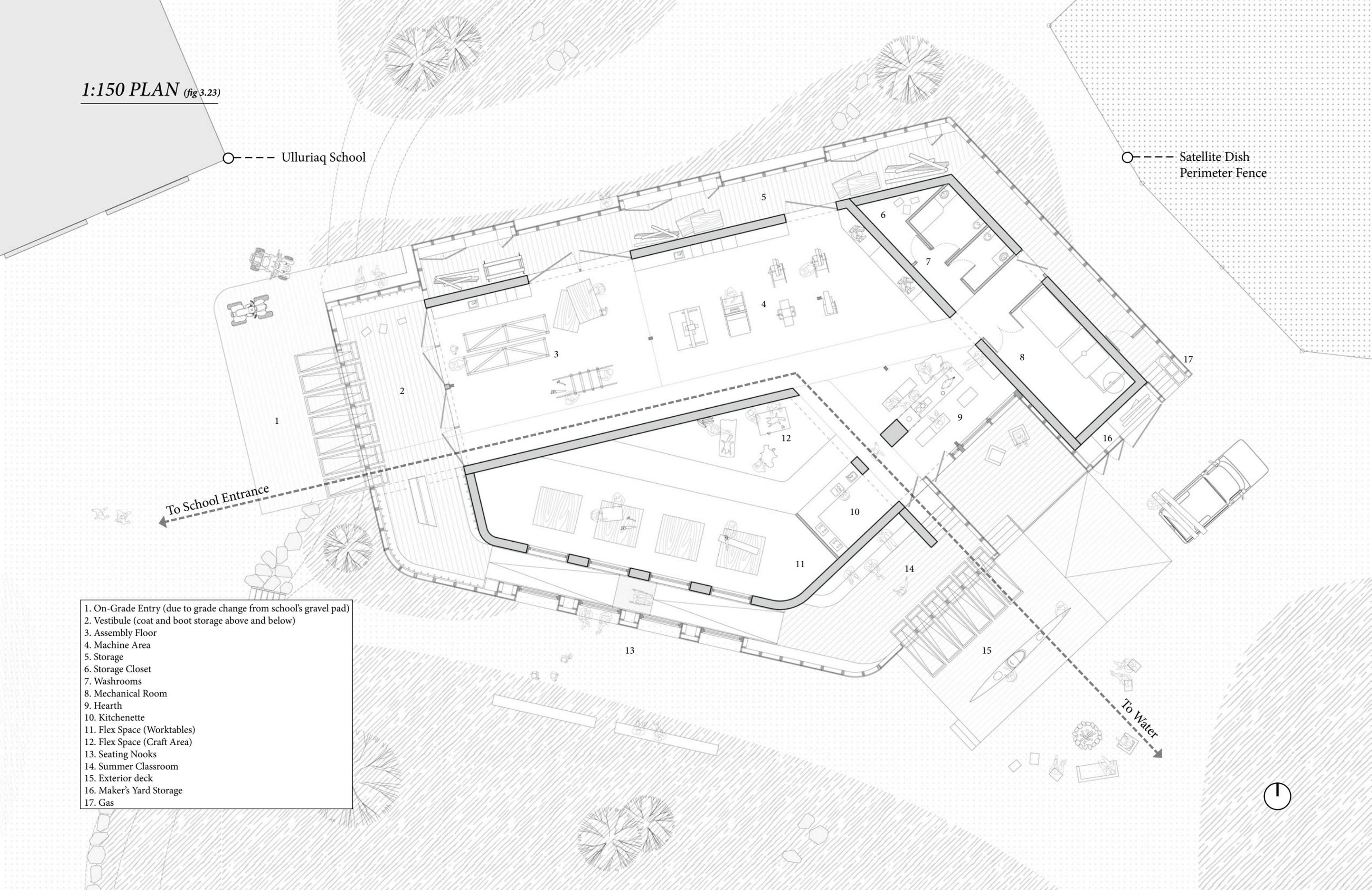


fig. 3.24 Workshop Assembly Floor





fig. 3.25 Flexible Workshop Space

fig. 3.26 Hearth



fig. 3.27 View of facade facing the water

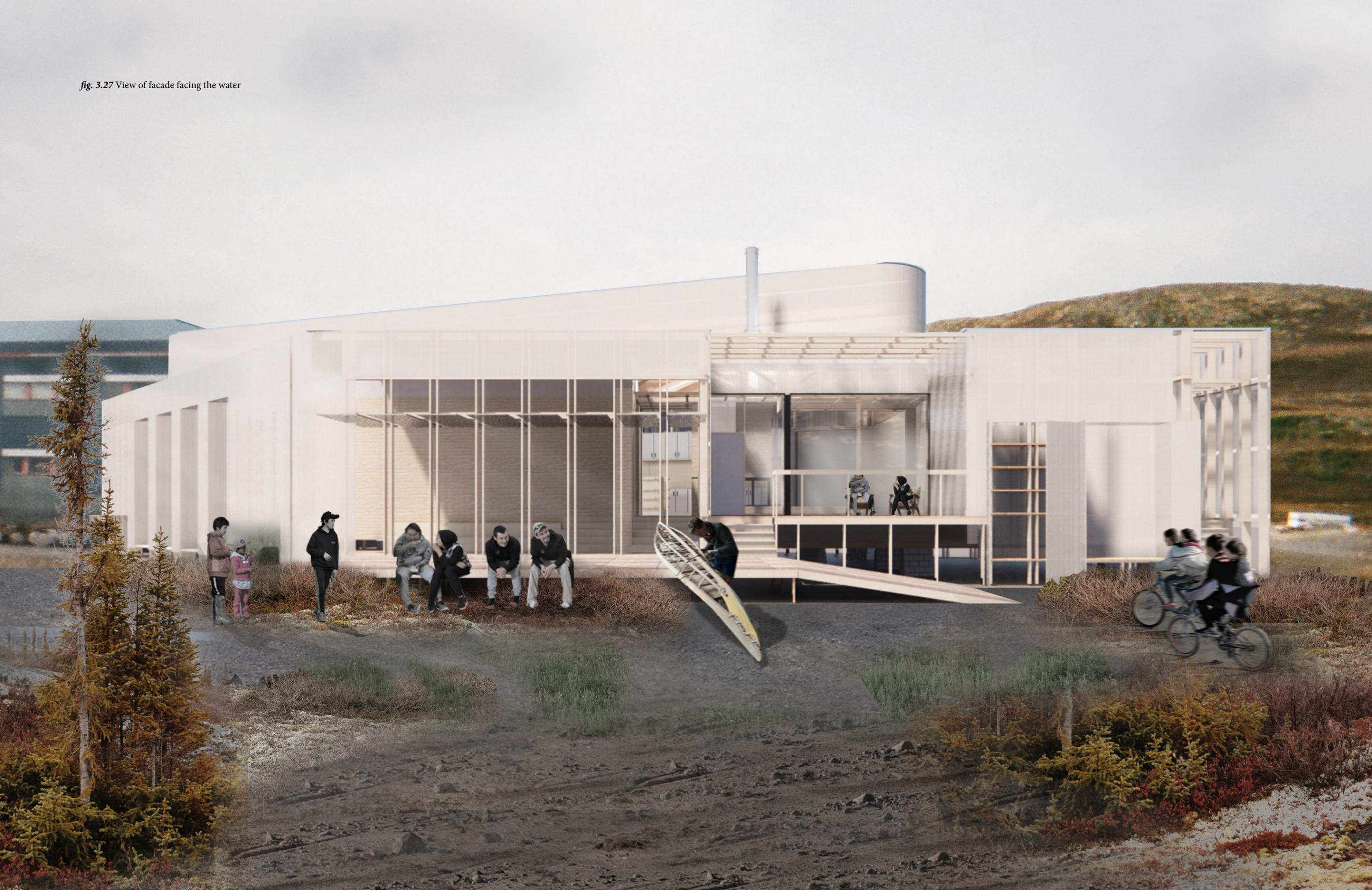


fig. 3.28 View of entrance facing the school

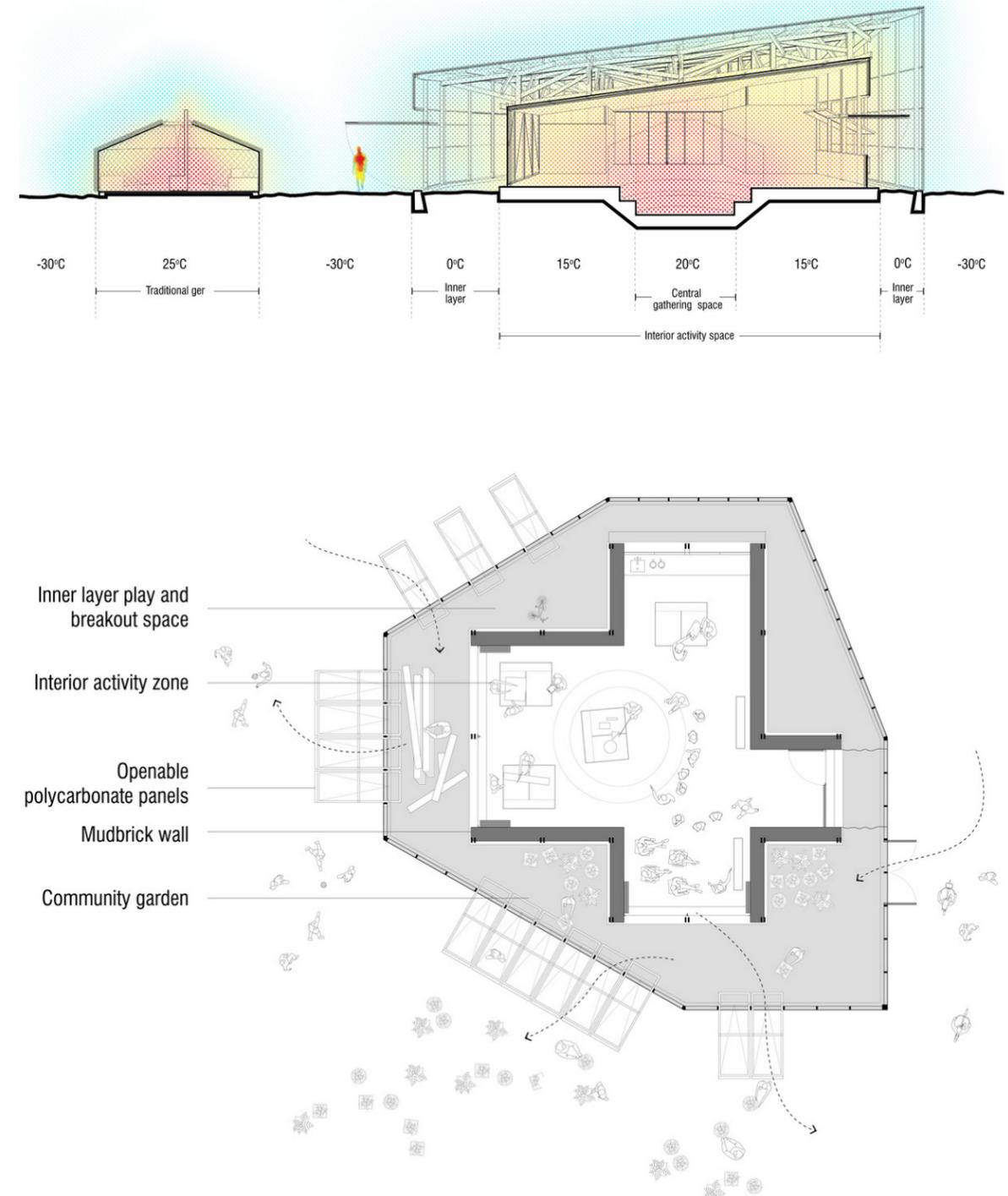


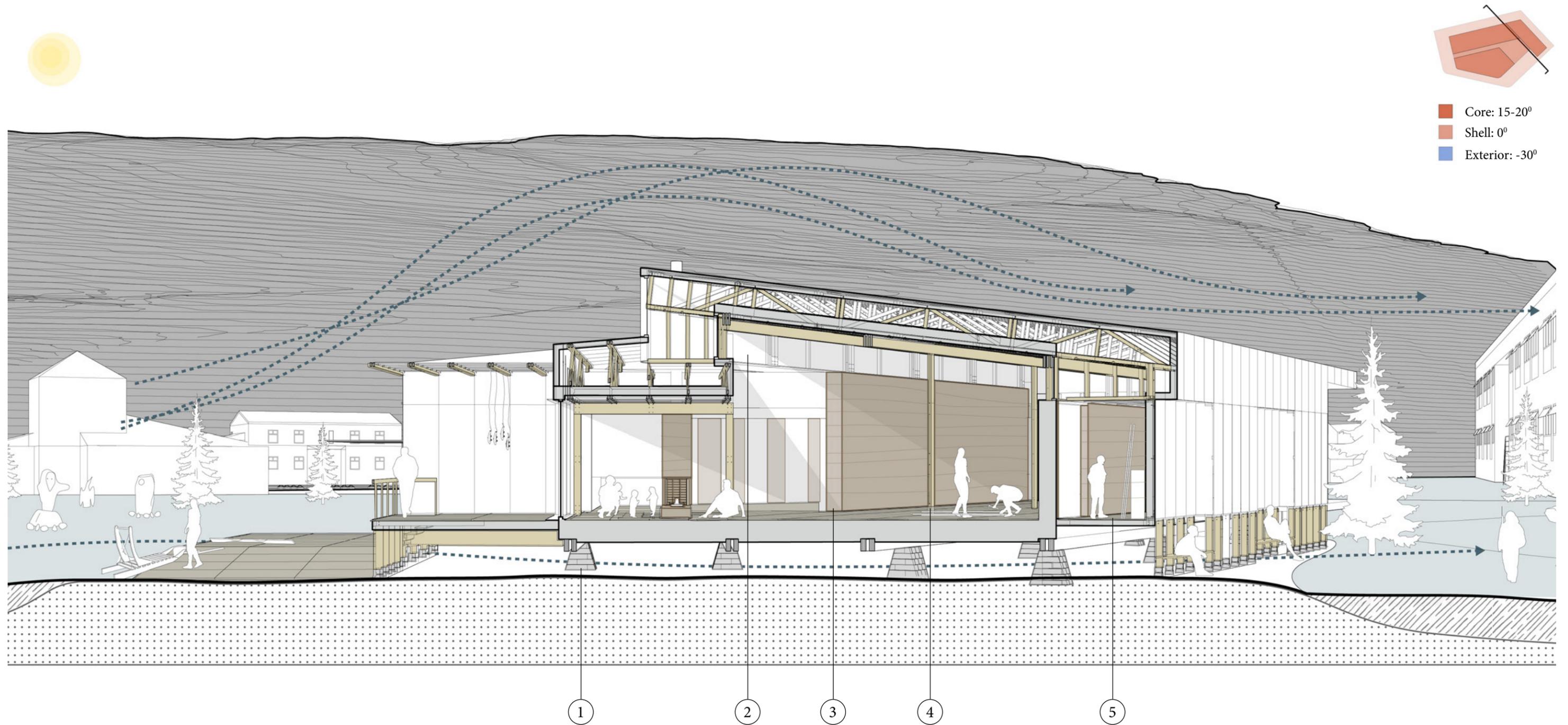
### 3.5 Core & Shell Strategy

fig. 3.29 (opposite, top) Ger Innovation Hub thermal map  
 fig. 3.30 (opposite, bottom) Ger Innovation Hub floor plan

The makerspace envelope design draws significant inspiration from the Ger Innovation Hub built by Rural Urban Framework in Ulaanbaatar, Mongolia (2018). This project employs a ‘core and shell’ strategy with an interior heated ‘core’ that is usable year-round and exterior ‘shell’ wrapped with polycarbonate panels (see pages 32,33 and 35 for a case study on this building). In a similar manner to a greenhouse, the sun heats the air in the large gap between the polycarbonate shell and the interior core. Earth walls provide an excellent thermal mass that is heated radiantly from the interior. This project was able to achieve significant temperature differentials (figures 3.29) with minimal active heating requirements through this strategy. In addition to minimizing heating costs, this allows the building to be constructed with materials that can be sourced locally for the most part (dimensional lumber, earth) while the polycarbonate paneling is cheap and easy to replace (figure 3.30). This strategy also allows construction to occur with local labor and minimal machinery. An interesting benefit of this system is that it does not need to be extremely airtight - a significant innovation relative to current airtight models of building in the north that often suffer damage that can’t be seen or repaired easily.

This strategy is adopted with several modifications for this thesis project design (figures 3.31 and 3.32). Due to permafrost conditions and the necessity to prevent snow drifts from accumulating against windward walls, the building is elevated 1 meter above the ground on stone piers that are spanned by wood beams. A sloped roof has been selected to minimize snow accumulation and provide natural lighting through south-facing windows. Glazed openings are typically minimal when building in Nunavik to reduce heat loss. To this end, window openings are limited to a few framed views towards the water and the proposed sculpture park. Additionally, while the Ger project made use of mudbrick walls, rammed earth has been proposed here as a stronger and more durable method of earth construction. The exterior ‘shell’ envelope includes a diverse variety of threshold spaces which can become flexible indoor-outdoor spaces during the summer months through a series of operable panels. Innovative, relatively simple structural systems such as this ‘core and shell’ method offer interesting possibilities for sustainable building solutions in Nunavik.





① **ELEVATED BUILDING ENVELOPE**  
The building is elevated 1 meter above the ground to prevent heat from the building thawing the permafrost below and to allow the strong winter winds to clear accumulating snow.

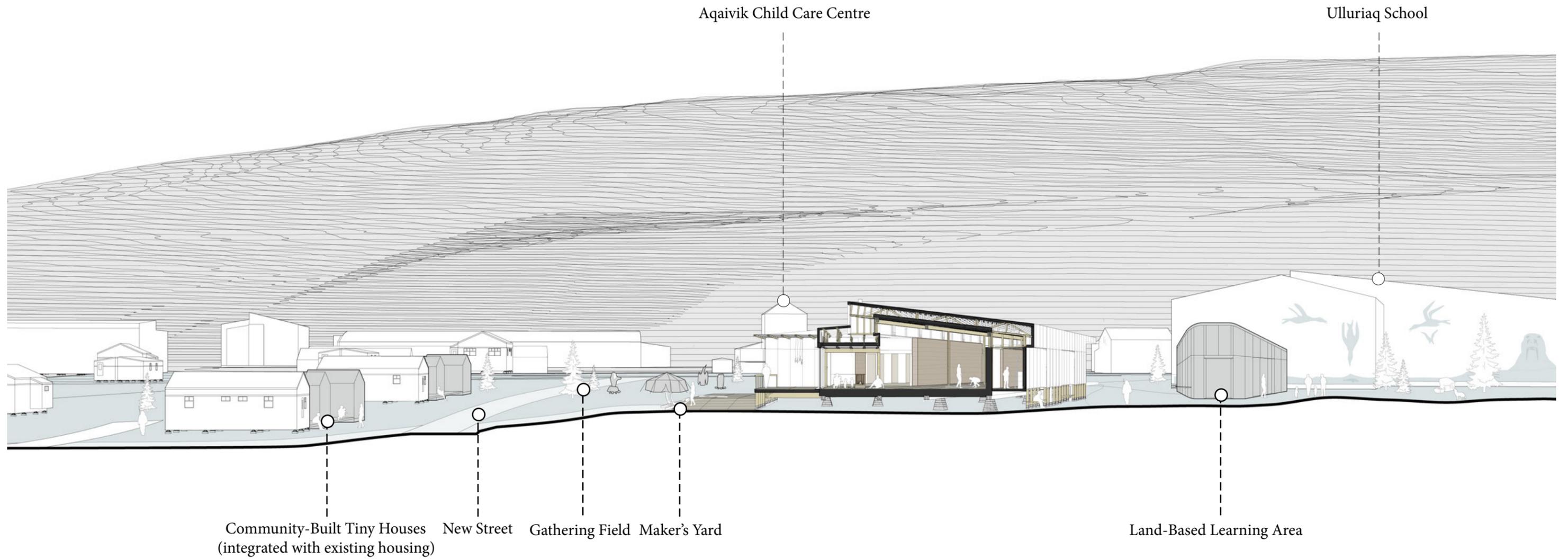
② **NATURAL LIGHTING**  
A southern clerestory window fills the primary workshop space with natural light.

③ **THERMAL MASS**  
Rammed earth walls provide an excellent thermal mass that is heated radiantly from the interior.

④ **LIGHT WOOD STRUCTURE**  
The wood structure is constructed with dimensional lumber to minimize requirements for heavy construction equipment and simplify repair in this remote location.

⑤ **CORE + SHELL STRATEGY**  
Sunlight heats an exterior polycarbonate shell that is separated from the interior core by a significant air gap.

CONTEXT SECTION (fig 3.32)



### 3.6 Material Ecosystem

The natural environment in Nunavik is transforming very quickly due to climate change.<sup>9</sup> In this delicate state, the environment can be very slow to recover from material extraction. Wood that is suitable for building construction is not found in great quantities this far north. Nonetheless, local materials possess several distinctive values. Firstly, they connect buildings to the land and give a respect to that which is built in ways that imported models do not. Furthermore, agency to innovate outside the confines of southern industry that often does not engage sensitively with the context can be provided through the considerate use of locally harvest materials. This thesis project proposes an open framework where opportunities for small-scale, sustainable use of local and recycled materials can be integrated with the use of imported materials (figure 3.33). Specifically, the primary structural system proposes the use of rammed earth walls.

While rammed earth is a technique that does not have a historic precedent in Nunavik, its principles of sustainability and working with materials from the land are important aspects of Inuit making culture. Additionally, earth is perhaps the only material that is available in relative abundance in every Nunavik community. The use of earth is proposed only for interior walls that are not exposed directly to the environment. Rammed earth is an excellent thermal mass with inherent humidity moderation properties.<sup>10</sup> Research on the viability of earth construction in Kangiqsualujjuaq can be found in chapter 2.2 (pages 45-46). This included studies on cold climate rammed earth construction in Canada (the Prairies and Ontario),<sup>11,12</sup> a research paper on earth brick performance under thaw cycles in Quebec and soil studies which can be used to determine the viability of the earth in Kangiqsualujjuaq for rammed earth construction.<sup>13,14,15</sup>

9 Sheila Watt-Cloutier and Bill McKibben, *The Right to Be Cold: One Woman's Fight to Protect the Arctic and Save the Planet from Climate Change*. Minneapolis; London: University of Minnesota Press, 2015.

10 Lindsay Howe, (2019), *Upscaling Earth: Material, Process, Catalyst*. ETH Zurich.

11 Stuart Fix & Russel Richman, (2009), "Viability of Rammed Earth Building Construction in Cold Climates," Ryerson University.

12 T. Wong & S. Cook, (2011), "Insulated Rammed Earth for a Cold Climate," 14th Canadian Conference on Building Science and Technology.

13 Allard, Calmels, Fortier, Laurent, L'Héroult & Vinet, (2014), *Cartographie des conditions de pergélisol dans les communautés du Nunavik en vue de l'adaptation au réchauffement climatique*, trans. by Isaac Edmonds, 10.13140/2.1.4611.7440.

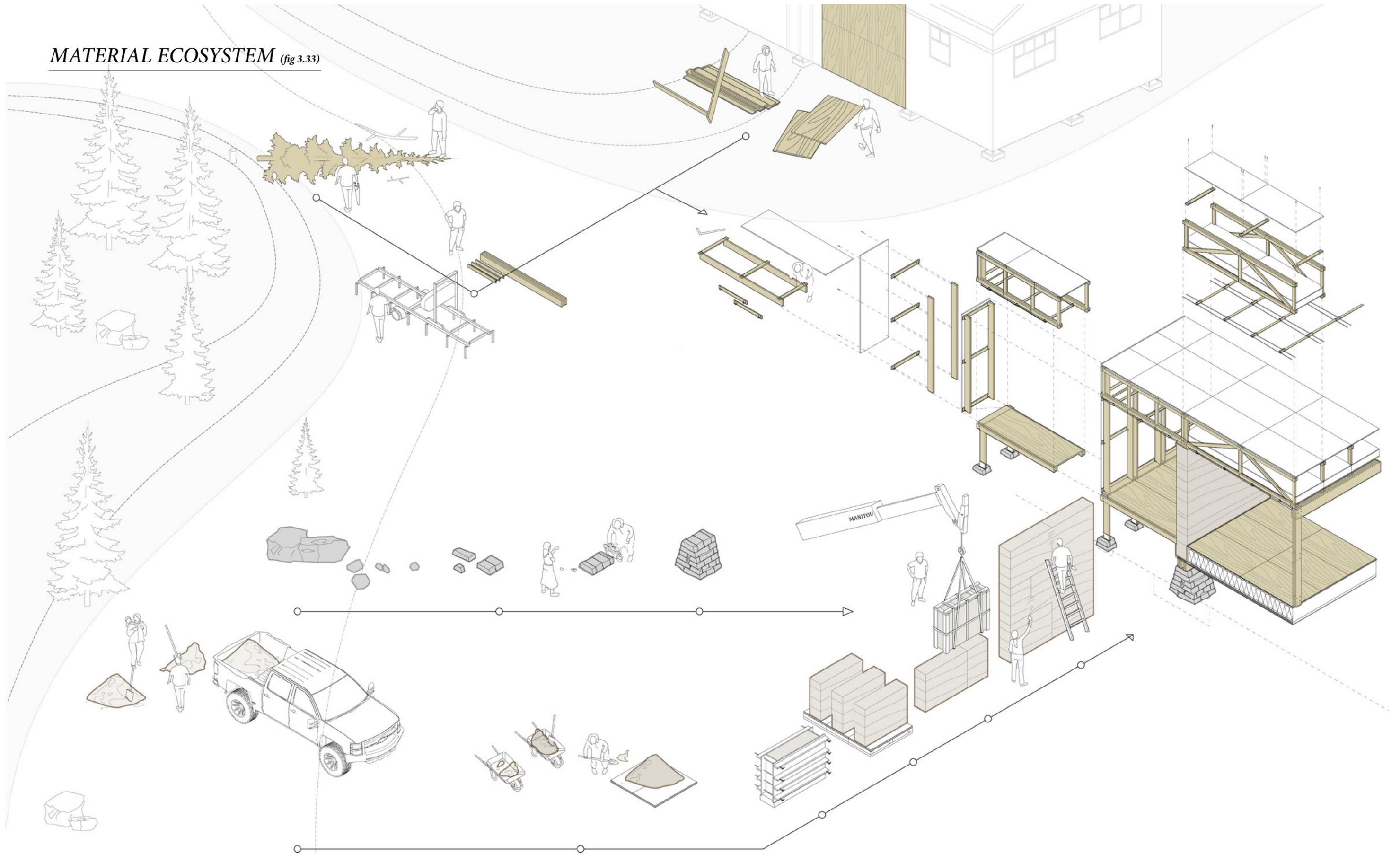
14 Dupuy, *Construction En Blocs de Terre Comprimée*, trans. by Isaac Edmonds.

15 Kativik Regional Government, "Kuururjuaq Park Project - Status Report," 75.

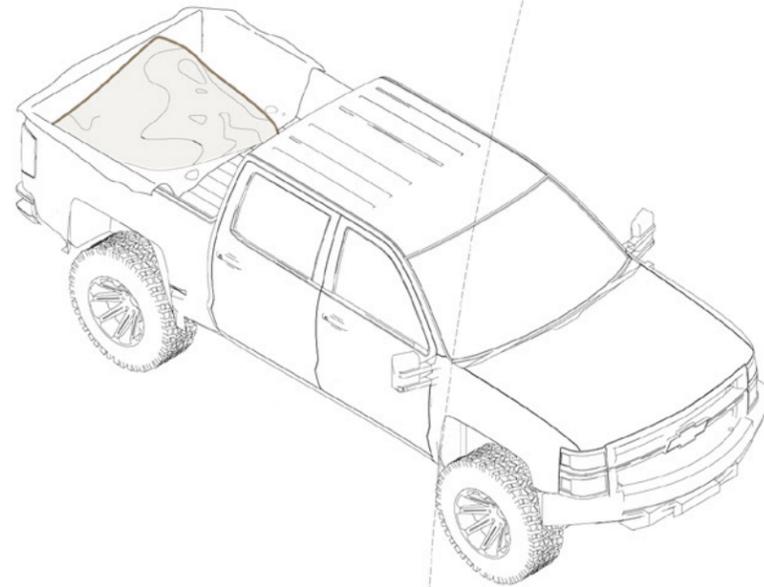
From this research, it seems quite likely that there would be suitable earth locally for earth construction. Studies by geomorphologists would be helpful to confirm this, but since the earth is only proposed for interior walls the performance criteria for construction would not be as rigorous. The earth would be harvested during the summer months while the upper layer of soil is thawed (figure 3.34). Making use of prefabrication techniques pioneering my Martin Rauch that are now commonplace in Europe, wythes (blocks) would be fabricated during the winter months in a temporary workshop facility (figure 3.35). All building components can be prefabricated in this manner to minimize assembly time and ensure a more consistent work schedule throughout all four seasons. The intention of the strategy would be to create a sustainable model for local labour that responds to Inuit values by allowing for a less frenetic working pace that is more seasonally stable. Furthermore, using materials in innovative ways can generate small-scale economic opportunities based around local material culture. Rauch's book *Upscaling Earth* has been an important reference in in the technical considerations of this process.

The wood structure references both traditional and contemporary elements of local making culture. Small quantities of locally harvested black spruce and recycled wood from old housing projects could be used in the construction process (figure 3.36). All elements are comprised of manageable components that can be assembled by hand and transported with minimal machinery (figure 3.37). Additionally, the use of plywood and dimensional lumber allow for ease of repair since these materials are relatively easy to acquire and are frequently recycled for the construction of cabins, storage sheds and other building projects in the community. Traditional details of making culture are referenced through the design of the roof and wall assembly (see pages 136-137). In collaborative design exercises for a previous Master's studio, community members expressed their appreciation for natural wood as a material. This wood structure helps to create a warm and welcoming workshop space. The intention of this tectonic exploration is to stimulate discussion around alternative building methods that could respond to local making culture and more closely align with Inuit values.

**MATERIAL ECOSYSTEM** (fig 3.33)

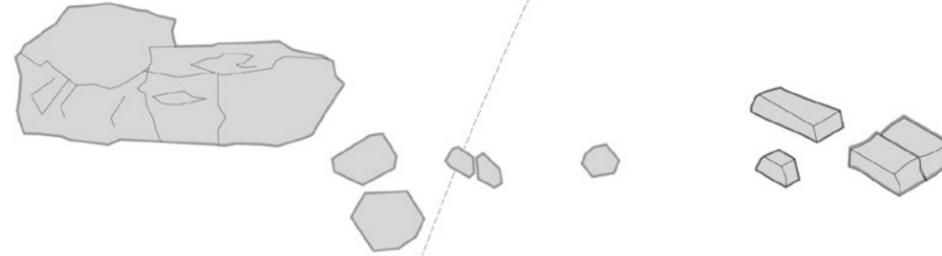


**EARTH & STONE** (fig 3.34)

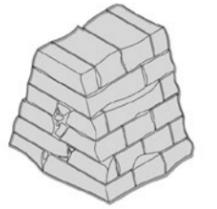
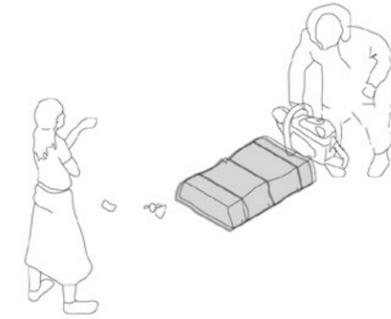


**GRANITE**  
Quartzite and granite stone are harvested from the land.

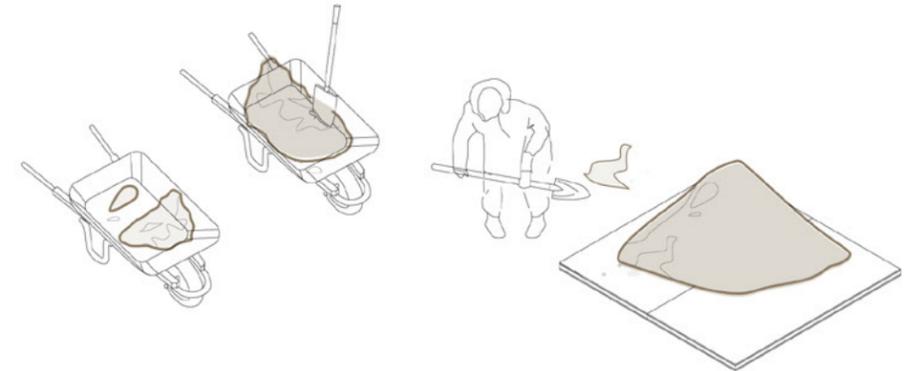
**HARVEST**  
Soil is gathered from the land in the summer months while the upper layer is thawed.



**CUT**  
Stones are cut to appropriate sizes.



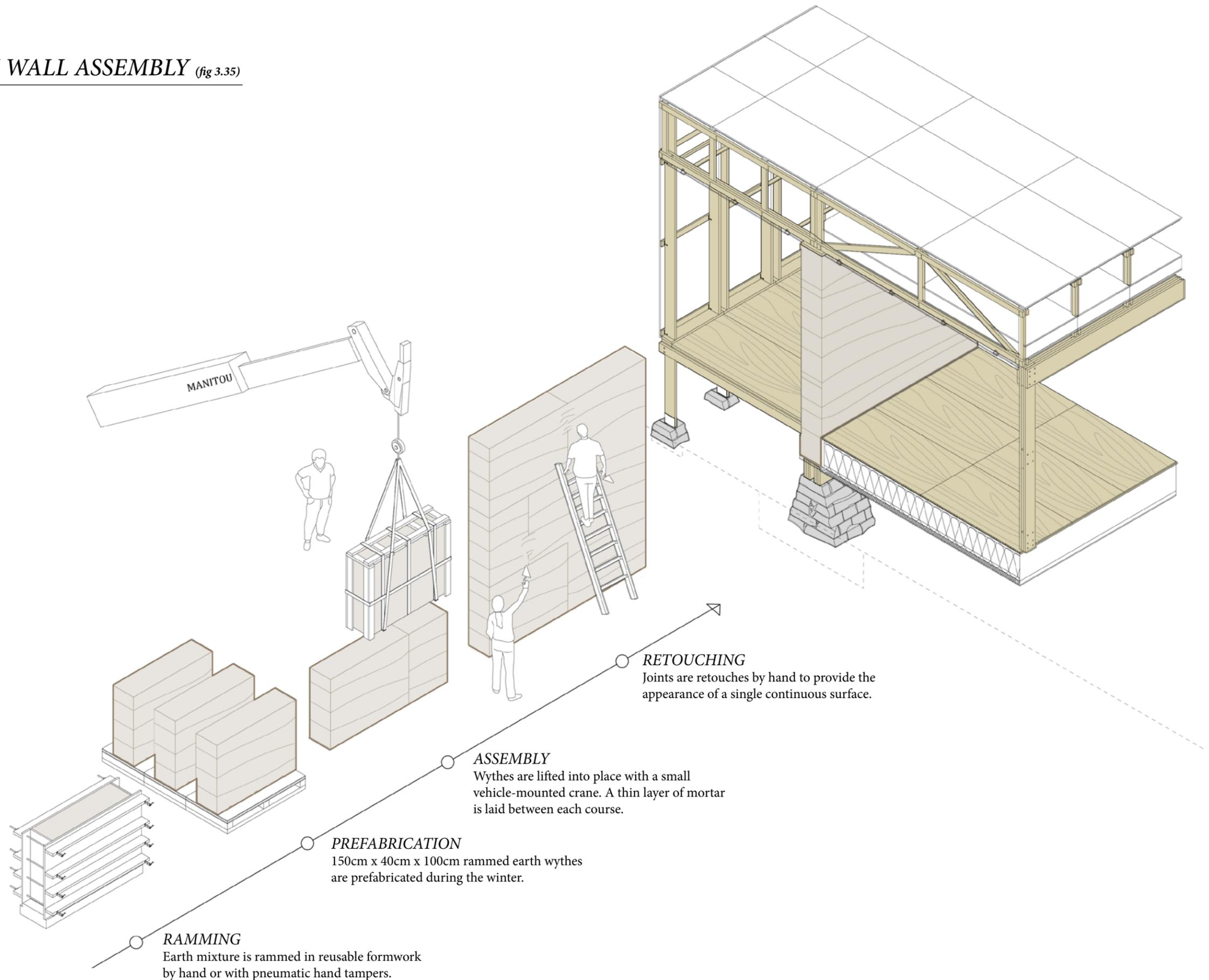
**LAY**  
Stones are dry laid to form foundation piers.



**MIX**  
Soil is sifted and mixed to achieve an even particle mixture.

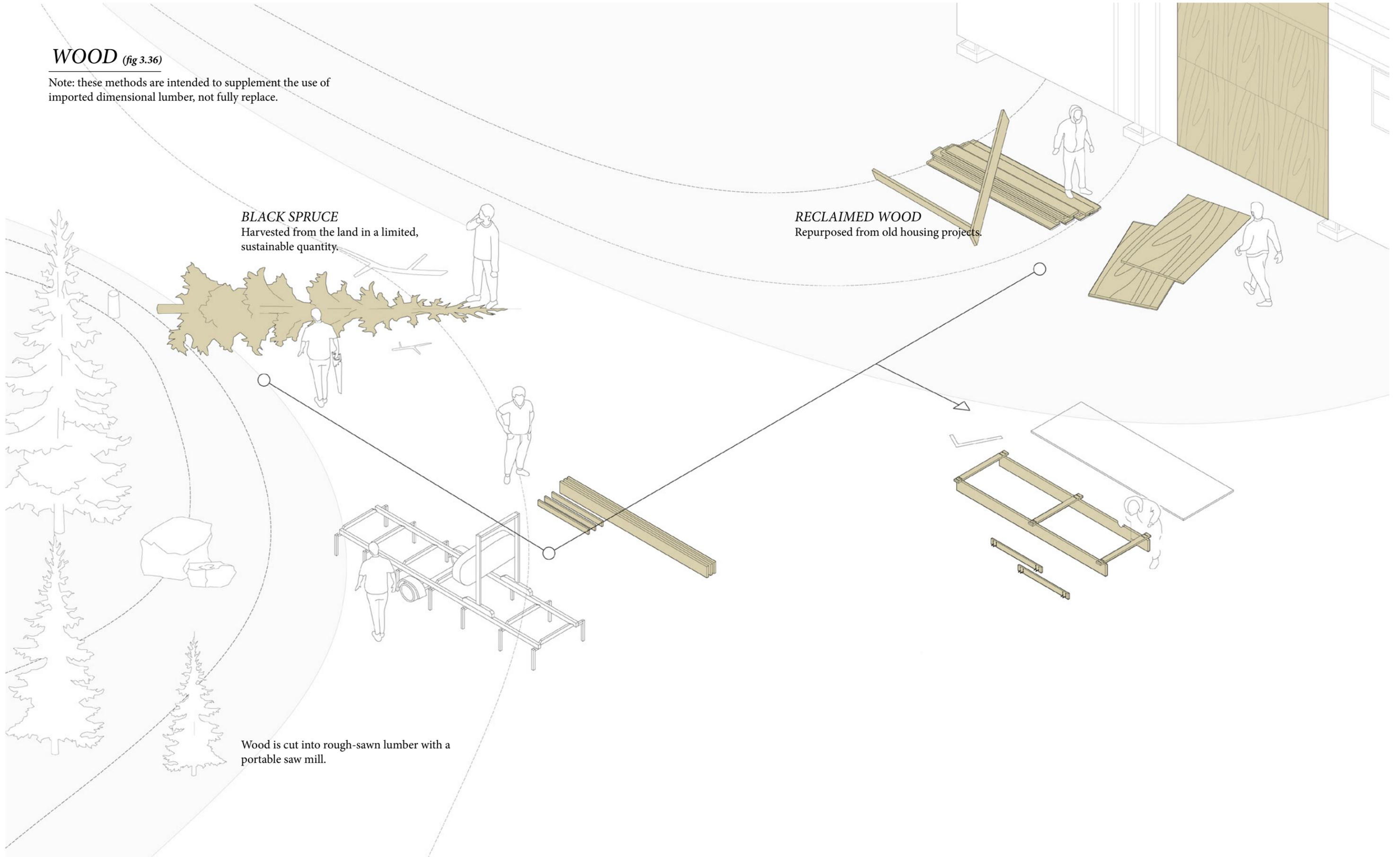
**Rough percentages:**  
30% fine sand  
35% course sand (or finely crushed gravel)  
15% silt  
10% clay  
10% lime (a natural stabilizer)

**RAMMED EARTH WALL ASSEMBLY** (fig 3.35)



# WOOD (fig 3.36)

Note: these methods are intended to supplement the use of imported dimensional lumber, not fully replace.



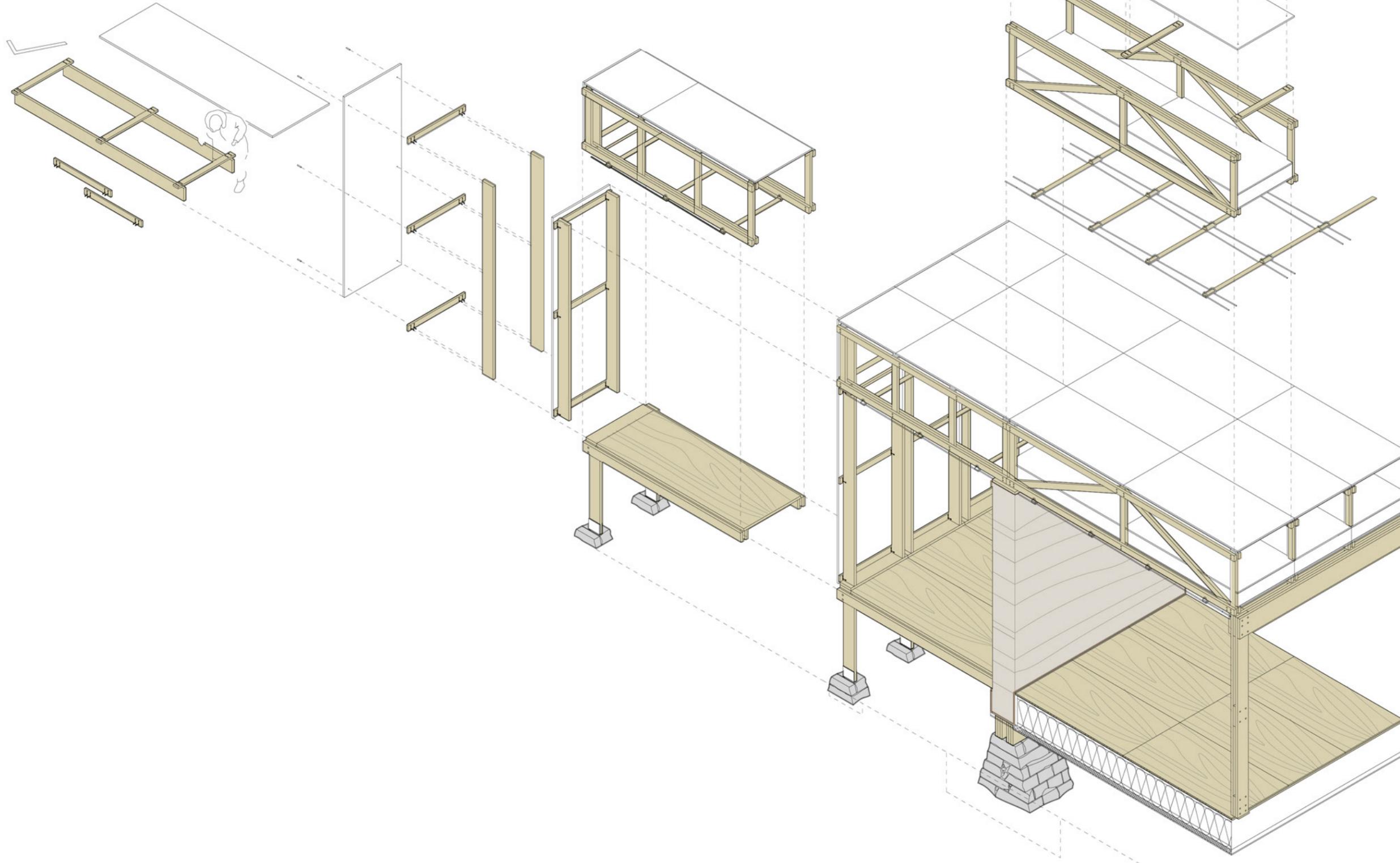
## WOOD STRUCTURE ASSEMBLY (fig 3.37)

### WALL ASSEMBLY

Utilizes similar tied joinery to the qamutiik.

### ROOF ASSEMBLY

Structure references Inuit kayak design.



*Polycarbonate Panels*

### *Trusses*

2x4s joined with full-thread screws made from black spruce heartwood.

### *Cross-bracing*

Overlapping ribs run perpendicular to the trusses while a continuous rope lashes them in place running in the opposite direction. Traditional Inuit kayak construction makes use of this technique.

### *Post and Beam*

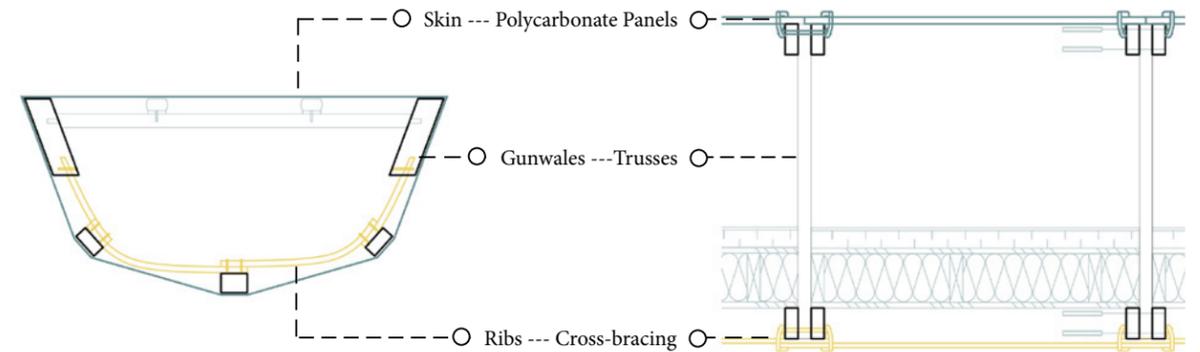
2x lumber with blocking is used to create lightweight columns and beams where achieving longer spans is necessary.

## ROOF STRUCTURE

fig. 3.38 (top) Workshop Roof  
 fig. 3.39 (bottom) Hearth  
 Roof  
 fig. 3.40 (opposite, top) Roof  
 Structure Parti



The roof uses tied and doweled joinery in a similar manner to the traditional Inuit kayak to create a visually striking ceiling that can also be used in a functional manner as a rack for hanging objects (figures 3.38-3.40).



In traditional Inuit kayak joinery all joints are tied or doweled. A single continuous piece of rope running the length of each gunwale lashes the ribs to the frame. Ribs consist of multiple small members that overlap at each gunwale and are locked in place with doweled mortise and tenon joints on each end (figures 3.41-3.43).



fig. 3.41 Building a traditional Inuit kayak

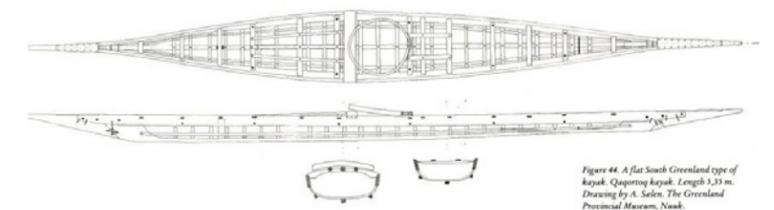


Figure 44. A flat South Greenland type of kayak. Qaqortoq kayak. Length 1.23 m. Drawing by A. Selén. The Greenland Provincial Museum, Nuuk.

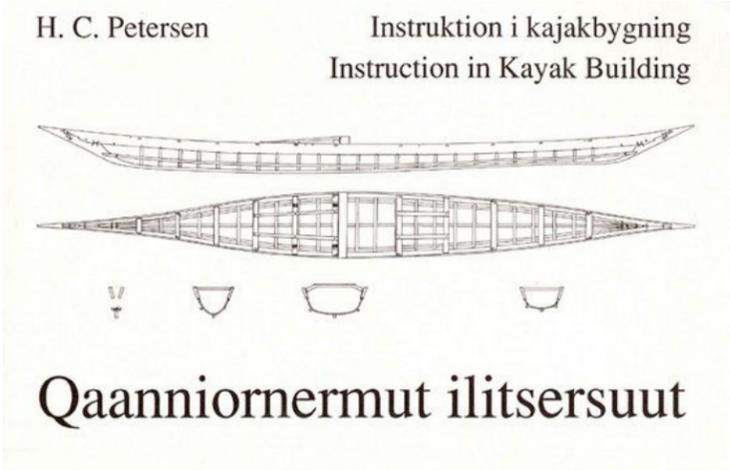


fig. 3.42 (top) Qaqortoq kayak  
 fig. 3.43 (bottom) Qaanniormut ilitsersuut

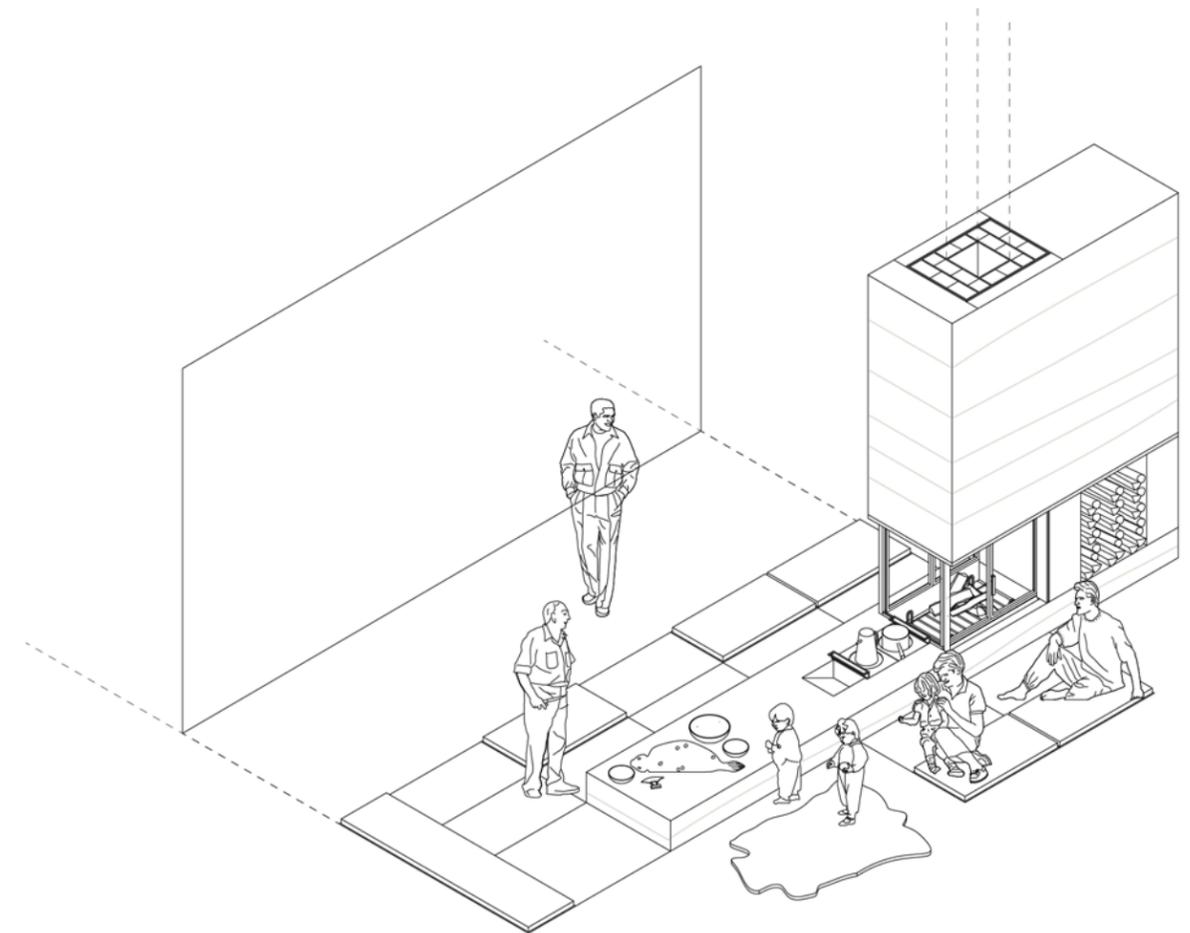
### 3.7 Rammed Earth Hearth

fig. 3.44 (opposite) Hearth  
Axonometric

A hearth and adjacent kitchenette provide a central space in the workshop for communal gathering with a view over the community to the bay.<sup>16</sup> In Inuit culture the act of gathering around a fire is significant and a fire is often the location where activities such as harvesting 'land' food (seals, caribou, etc.), gathering for tea, sewing or ceremonies takes place. More traditional activities of this nature are often done sitting on the ground in a circle. This hearth is imagined as a heavy monolithic construction in order to clearly denote a place of gathering while the low level of the fire encourages sitting around in a circle. The direct adjacency to a framed view provides a connection to the water while space for food preparation encourages the practice of gathering to eat around a fire (figure 3.44).

During my visit to Kangiqsualujuaq, I had the chance to watch an elder harvest a ring seal at the Ulluriaq school. All the kids gathered around the hunters who caught the seal, watching in fascination as an elder harvested the seal. As the elder methodically removed different parts of the seal, he explained what each part was used for, its nutritional value, and how to make the cuts while distributing pieces of raw meat around the room to eat. The harvesting was done in a relatively small multi-purpose room that also served as a space to store school supplies. The floor surface was hard tile, but most people chose to sit on the ground nonetheless while others pulled up chairs or stood. A thin sheet of plastic was rolled on the floor to prevent staining and several pieces of cardboard were laid out to provide a less slippery surface to harvest the seal on. When the elder had finished cutting and cleaning the seal an hour later, it was evident he had somehow managed to carefully avoid getting even a drop of blood on his socks despite the slippery surfaces. This experience illustrates the importance of this gathering practice both as a means of knowledge transfer and coming together as a community. Additionally, it provides a good point of reference for the space that is required for such activities and the ways in which people tend to sit around and gather.

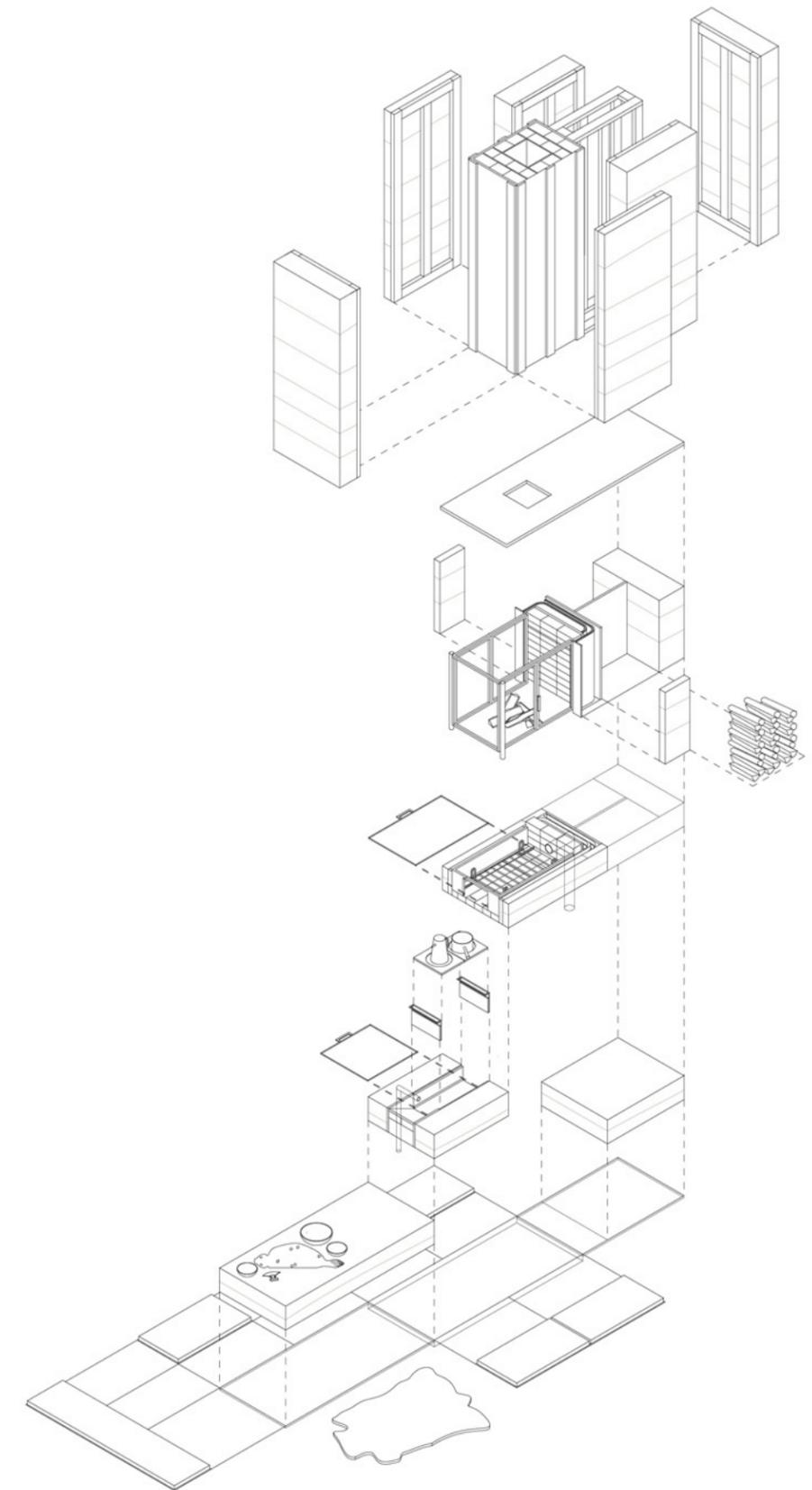
A series of technical drawings were developed to resolve the tectonic aspects of the hearth (figures 3.45-3.48). While rammed earth



<sup>16</sup> This rammed earth hearth is the object I chose to design for the Fabrication course that runs in parallel to thesis.

fig. 3.45 (opposite) Hearth  
Exploded Axonometric

provides an excellent thermal mass, it takes a long time to warm up which is not ideal for a fireplace since this tends to create smoke. For this reason, fired clay bricks which refract heat are used as the primary material lining the firebox and chimney (steel has been used sparingly where achieving thermal protection with a relatively thin liner was necessary). To provide the monolithic appearance of rammed earth construction around this clay brick chimney, pre-cast rammed earth paneling encases the brick. This is a system that utilizes 3" to 4" rammed earth panels that are rammed to a greater level of compaction than typical rammed earth.<sup>17</sup> While these panels will maintain their structural integrity without back bracing support, a mounting system is necessary to connect them to a wall. This is typically a light wood or steel frame that is connected to the back. This solution could allow individual components to be prefabricated locally with the lighter individual components increasing ease of transport. The joints between panels are re-touched after assembly to provide the appearance of a single continuous surface. This more detailed investigation of materiality and spatial use around the hearth provides an opportunity to respond to local values and enriches this space of gathering through the lens of material culture.



<sup>17</sup> Rammed Earth Works is an example of a company with a product line of this nature.

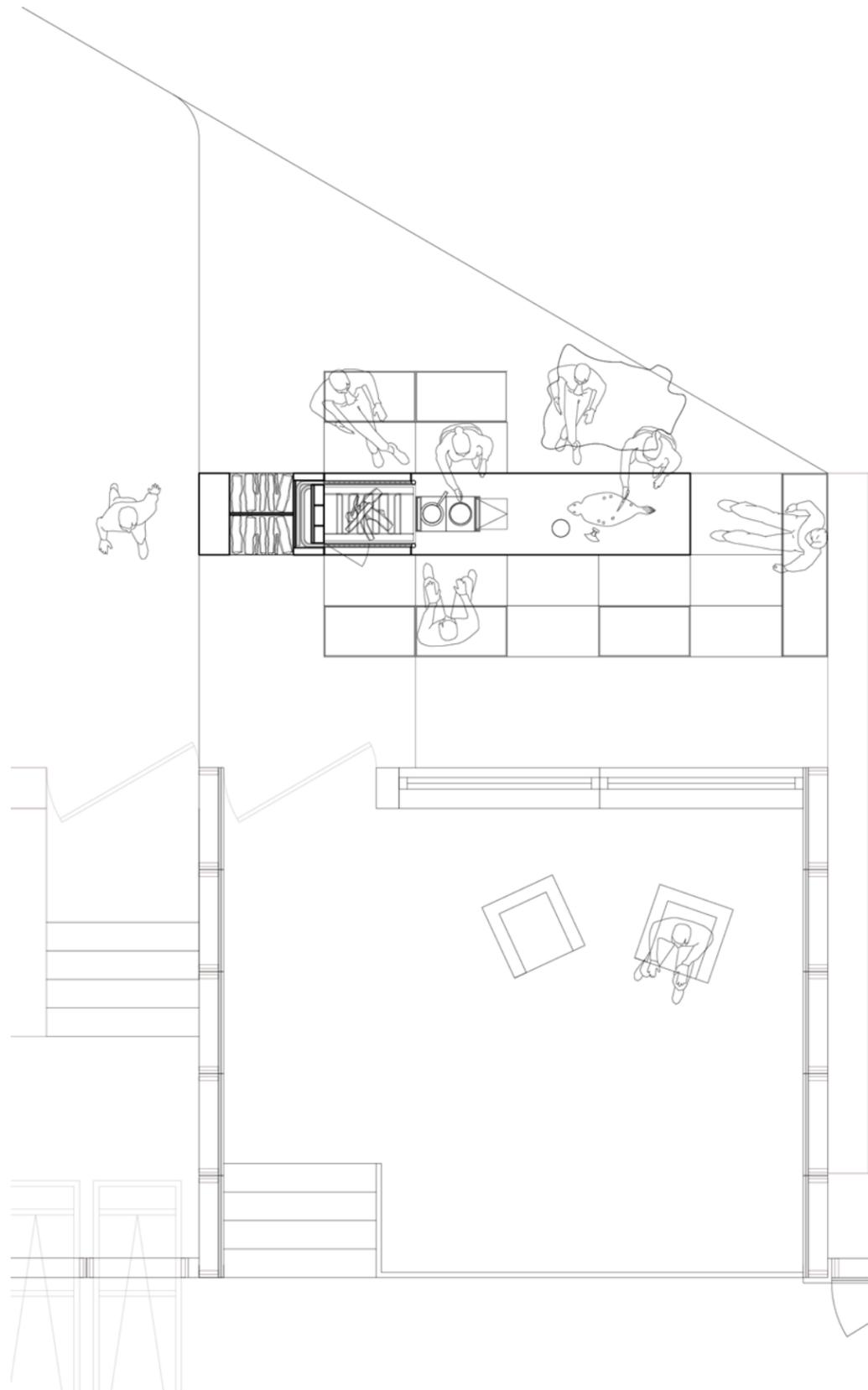


fig. 3.46 1:50 Spatial Use Plan

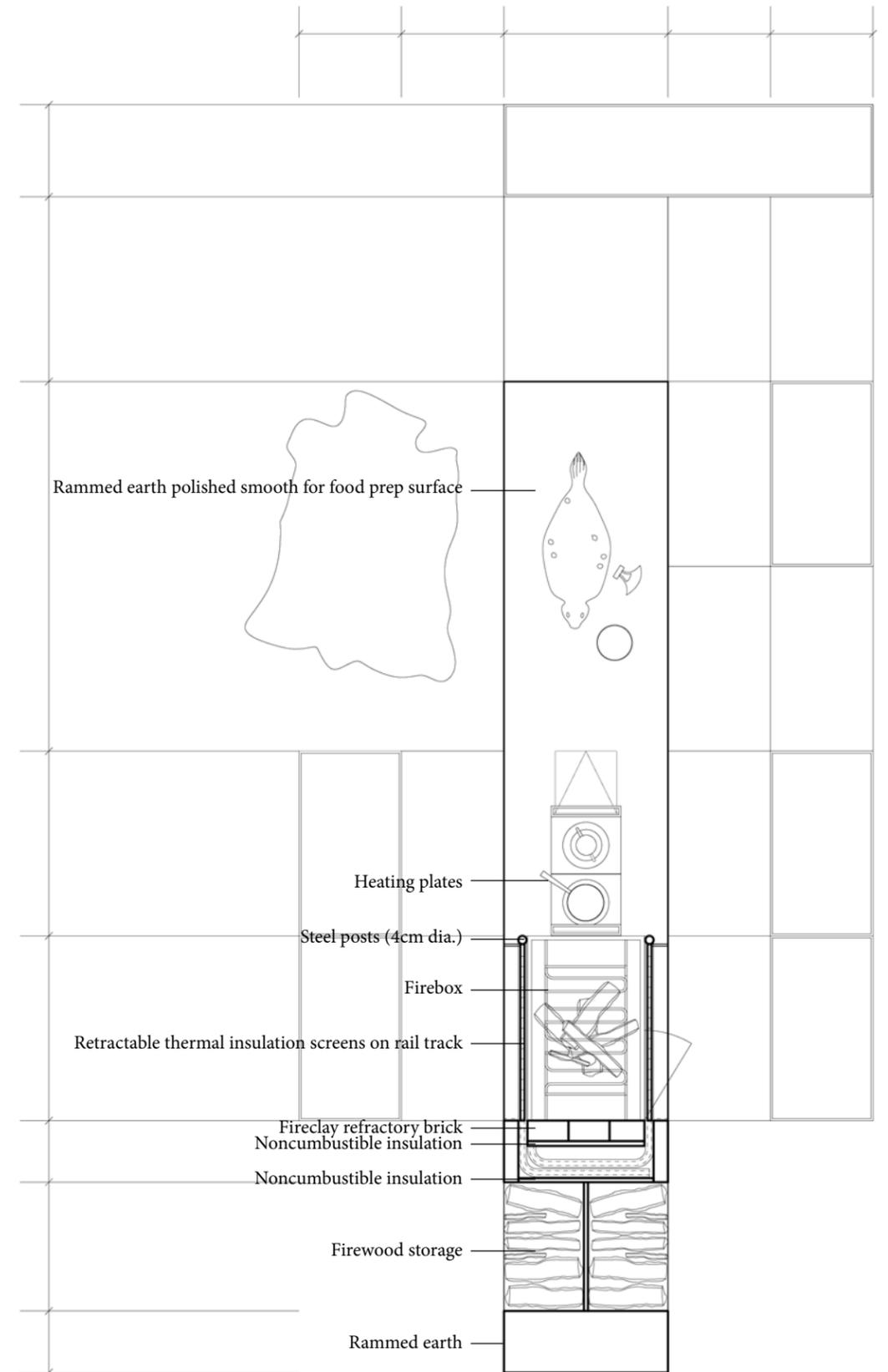


fig. 3.47 1:25 Detail Plan

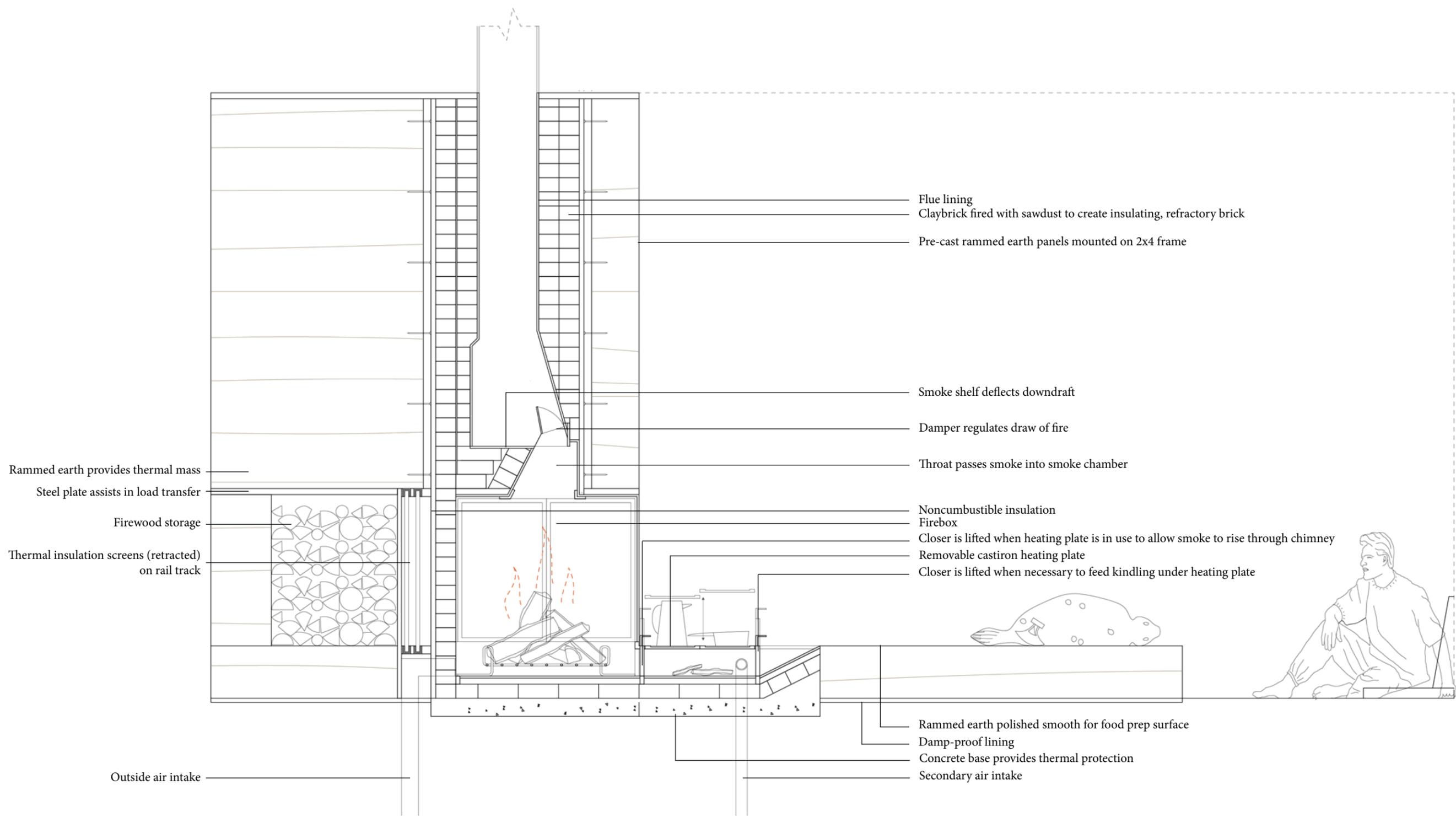


fig. 3.48 1:25 Detail Section

## CONCLUSION

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From the first Rigid Frame houses delivered in the 60s to current social housing models, a crisis-response approach directed by southern planning and budgets has pervaded decision making regarding the provision of buildings to communities in Nunavik. Critical infrastructure such as housing and schools are seemingly in a perpetual state of supply crisis with no end in sight. It is evident that sustainability will require radical change. An appreciation for Inuit values and their robust existing making culture should form the foundation of this change. Spaces for making present opportunities for the development of more culturally reflective construction practices because they support locally-driven building initiatives and empower communities to shape the future of their built environment. Makerspaces allow for the expansion of local training opportunities, support self-building initiatives, encourage entrepreneurship and stimulate innovation in construction practices by and for Inuit. Through the creation of opportunities to innovate outside the confines of southern planning practices, locally-driven solutions can organically emerge to form the roots of a sustainable construction industry.

I have chosen to use the word 'ecosystem' instead of 'industry' in this thesis to suggest a new way of thinking about the construction industry that does not conform to current standards. This 'ecosystem' would be supported by the sharing of building knowledge between communities and draw from the principle of *Piliriqatigiingniq* (collaborative relationships or working together for a common purpose). There is good reason to believe that Kangiqsualujjuaq is a community where a pathfinder project of this nature would be a valuable resource due to their strong leadership and entrepreneurial spirit. While practices of self-building are common throughout the community in personally-constructed workshops, there are no dedicated training facilities for building. A shared community makerspace would complement existing making practices and provide community agency on a wider scale. This facility would allow community members to explore their own design and construction projects in addition to expanding professional training opportunities. Thus, such a project could explore possibilities for the beginnings of a more autonomous construction ecosystem in Kangiqsualujjuaq with

construction activities being driven by Kangiqsualujuamiut. This thesis proposes that by revisiting the framework of building delivery in the context of Kangiqsualujjuaq, a better balance can be achieved between different forms of making practices, namely southern construction industry, self-building and community-led projects. Due to the constant crisis in housing delivery, short-term thinking is often applied based on the fluctuation of yearly budgets. This can lead to difficulty funding longer-term solutions or innovative local initiatives. Financial incentive and training programs for self-building as well as community-led projects such as Salluit's tiny house program can help alleviate the pressures that are constantly facing communities in the north for housing delivery. Capacity building can be a slow process and longer term thinking is necessary to realize positive change over time. Local making practices can be supported by architectural interventions to contribute to the preservation and transmission of Inuit culture in Nunavik. This thesis proposes the creation of a makerspace in the community of Kangiqsualujjuaq as a catalyst for the development of environmentally and culturally sustainable solutions that can shape the future of their built environment.

In a project of this nature, returning the ideas to the community is perhaps the most important step in the process. It is my intention to make the drawings and ideas accessible to anyone in the community who might have interest. The Living in Northern Quebec Research Partnership orchestrates collaborative projects with First Nation and Inuit communities in Quebec's North in order to support sustainable living environments respectful of their culture. Student projects are a notable component of this and it was through this partnership that I was able to visit Kangiqsualujjuaq in the first year of my Master's. Through a Living in Northern Quebec grant, several pieces of media have been created for display on their website and YouTube channel. In a community-oriented project, developing means to share research creation in a concise, easy to distribute manner is an important aspect in ensuring that ideas are returned to a wider community audience. Due to Kangiqsualujjuaq's northern location, there is no cellular access and limited internet bandwidth. For this reason, Facebook has become a remarkably common method of communication in many of these

communities. Links to YouTube videos are particularly easy to share and to this end, I have composed a brief video summarizing the key ideas of this thesis.<sup>18</sup> Especially considering the limitations imposed by the Covid-19 pandemic, digital media like the video and website project page created for this thesis are increasingly important tools for knowledge transfer in remote locations.

Through conversation with Nancy, a shared community workshop for woodworking was identified as a much needed space in the community. Since this workshop space has been identified as a much needed asset, it is feasible that the community will seriously look to invest in a facility of this nature in the future. It is my hope that this thesis could contribute to the discussion of the type of workshop space envisioned and its architectural qualities. It is interesting to consider how the lessons learned from this exploration of makerspace could be applied on a wider scale. Could a network of makerspaces across all 14 Nunavik communities be leveraged to support Inuit-led self-determination in the creation of their future built environment? Could an ecosystem of collaborative relationships, knowledge sharing and the exchange of materials or equipment contribute to this process in a way that embodies Inuit values? At a time of climate and housing crisis, it becomes necessary to rethink construction practices in Quebec's northern communities and reflect on holistic, sustainable solutions that empower the people who call Nunavik home.

<sup>18</sup> I have also mailed my full length thesis booklet to Nancy Etok so community members who may have interest can access the full project results.

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