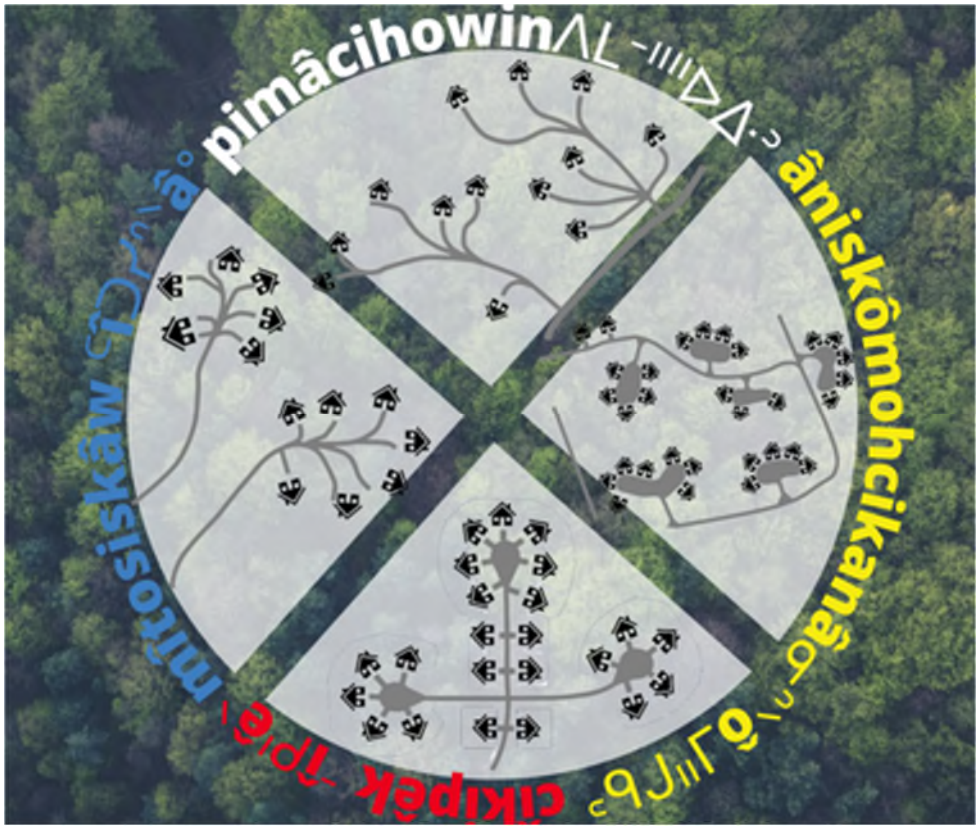

Co-Investigating Preferences for Subdivision Layout and Design for Muskoday First Nation

Muskoday First Nation
Band No. 371 Lᑫdᑌ° maskotêw

with the University of Saskatchewan

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Lori Bradford, Terry Fonstad, Wanda Martin, and Kerry McPhedran

University of Saskatchewan

Executive Summary

The Community Co-design Project at Muskoday First Nation focused on gathering perspectives on different 'subdivision' layouts from Muskoday First Nation community members and examining potential social, cultural, environmental, economic and health benefits from including community preferences in subdivision design. Note that the term 'subdivision' is used herein despite solutions including non-subdivision layouts. A community researcher was hired to support the research, help with data gathering, and act as a liaison between researchers and community members. The Covid-19 pandemic presented barriers to the connection between the University of Saskatchewan team and Muskoday First Nation community members; however, the importance of a community researcher facilitating engagement opportunities and connecting with the community meant this project could proceed safely.

The project used mixed research methods to provide community members with opportunities to share their perspectives in the planning of their communities. Perspectives were gathered from a literature review, interviews, and a sorting exercise of various subdivision layouts. The literature review on Indigenous community co-designing identified important areas of infrastructure design considerations on reserves, and processes to follow to ensure meaningful engagement during future community planning. Interviews with community members provided qualitative data illustrating personal preferences in community development. The sorting survey provided a unique data set drawing on qualitative and quantitative information. We found that consideration of additional up-front costs associated with larger lot sizes (for more space, privacy, and cultural and natural connection) may result in lower overall long-term costs associated with physical and mental health. For example, costs could be reduced with fewer visits to hospital, increased production of local goods, and promoting neighbourly care for one another. Additional research on these hidden costs is recommended.

Data gathered during the project provided a cross-section of community perspectives giving a greater understanding of what Muskoday members envisioned for future community development and what they considered important for enhancing well-being. Community members indicated they value space from larger, and more spread-out lots while maintaining community, cultural, and family connections. Engagement activities found that the community would like tree coverage that would provide privacy and enhance natural beauty. Safety (fencing, distance from road, and physical security), efficiency (for maintenance and infrastructure) and quality (good, durable materials) were also important design considerations.

The lessons learned during this process resulted in two primary outcomes:

- Improved understanding of how engineers and other consultants can adapt processes for engineering design, including details in initial scoping and feasibility documents, tools for gathering community input and feedback, and essential questions to ask.

- Appreciation for the importance of community stakeholders who continue to engage and advocate for aspects of community life that lead to creating a community centered on local needs and perspectives.

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Project Overview

A community-informed subdivision plan needs to be led by local perspectives on social, cultural, environmental, and human well-being. This project aimed to discover preferences for subdivision design and layouts guided by the community. A secondary goal was to learn from and share knowledge on how to improve the process of co-designing infrastructure and community. The perspectives shared by community members can be used to create unique and community-specific subdivision layouts that balance social, cultural, environmental, well-being, and financial metrics. Developing community-centred design processes can result in holistic, long-term benefits for present community members and future Muskoday First Nation generations.

The Community-Centered Design (CCD) project was organized by the Department of Civil, Geological, and Environmental Engineering at the University of Saskatchewan by Principal Investigators Dr. Terry Fonstad and Dr. Kerry McPhedran. The CCD research team from the University of Saskatchewan is a multi-disciplinary team of supervisors and graduate students:

Dr. Lori Bradford (School of Environment and Sustainability) supervising Derek Eisner
Dr. Wanda Martin (College of Nursing) supervising Shannon Hyslop
Dr. Terry Fonstad (Associate Vice President of Research), and
Dr. Kerry McPhedran (Department of Civil, Geological and Environmental Engineering) supervising Tanya LaBelle and Tim Vogel

The disciplinary backgrounds of the group are Civil Engineering, Community Health, and Environment and Sustainability. Each student conducted research related to their fields of study with the support of their supervisors. Others involved in the project were Muskoday First Nation community members, Chief and Council members, Community Researcher Gwen Bear and Sandi LeBoeuf, the Muskoday Project Management team with Grant McKercher, representatives from Indigenous Services Canada (ISC), Saskatoon Tribal Council (STC), and engineers from BCL Consulting. Parallel co-designed research at Muskoday First Nation allowed for input and direction from community members and leaders from Muskoday First Nation as well.

The CCD project team aimed to provide Muskoday First Nation with information for developing a community-guided housing plan that included social, cultural, environmental, and human health impacts. This is known as a Triple Bottom Line (TBL) approach that goes beyond economics as the decision-making criteria toward a values-based approach (Elkington, 1997)[1]. The project's adoption of co-design allowed for the collective interaction of stakeholders and researchers, whereby the community is centered throughout the planning process. Ultimately, the CCD project provides the framework for long-term policy change on how housing is developed in Saskatchewan First Nations Communities.

[1] Elkington, J. (1997). The triple bottom line. *Environmental management: Readings and cases*.

To meet community needs and identify preferences for subdivision design and ISC's need to examine and reflect on their policies, the team decided on mixed methodologies for the social and process-evaluation research.

The academic aspects of the project included gathering and analyzing background information from engineering, health, and social sciences to provide context and explore the boundaries of western knowledge on community-specific designs. Unfortunately, in-person events and activities were affected by the health restrictions in place because of the Covid-19 pandemic leading to a need to use virtual platforms for the success of this project. Virtual forums, such as Zoom, Webex, Microsoft Teams, conference calls, emails and texts subsequently became the pathways for building relationships during this project. In-person engagement became possible with the easing of restrictions, and the research team was privileged to have the opportunity to visit and meet local residents in person in the autumn of 2021 and spring of 2022. The research team was privileged to have the opportunity to meet some incredible Muskoday Elders at a Focus Group, discussing *Elder Perspectives on Community Design and Development in the Past, Present, and Future*, on April 12, 2022. The research group heard many stories of the past, present, and hopes for the future, and gained insight into the vibrant and wonderful community and people of Muskoday First Nation. Photos taken at this event are shown in photo collage format in Images 1 to 3.

Image 1: *Muskoday Elder Focus Group, April 12, 2022*

Image 2: *Muskoday Elder Focus Group, April 12, 2022*

Image 3: *Muskoday Elder Focus Group, April 12, 2022*

Community Researchers

Key Points

- A local community researcher is vital to the success of any research project.
- Knowledge of the community and residents allowed for building relationships that helped guide the research.

There were many community members that contributed to achieving the outcomes of this project. Community leaders were instrumental in initiating the project and creating liaison opportunities for the research to move forward while in the midst of the pandemic. Community researchers were integral in gathering data and facilitating engagement with community members. Quinn Amyotte-Bear was involved in initial steps of the research, and the research group was grateful for her involvement in the preliminary design stages. Gwen Bear was central to the project. She shared community knowledge that was important to relationship building between the community and the USask research team. Gwen conducted interviews, participated in research team meetings, and was involved in organizing focus groups and additional in-person engagement opportunities. Glenda Brass was also involved in gathering community perspectives and preferences while facilitating the online sorting survey with Muskoday residents. Community Navigator, Sandy LeBoeuf was instrumental in coordinating aspects of the project, such as the Elders Focus Group. This photo in Image 4 was taken just before the Elders lunch (prepared by Lorna Crain) on April 12, 2022. Gratitude to all of the community members who participated throughout the project. All of your insight, knowledge and perspectives were vital to this research project.

Image 4: *Shown Left to Right Glenda Brass, Gwen Bear, Lorna Crain, and Sandy LeBoeuf*

Community Background

Key Points

- Past Muskoday First Nation community development was influenced by culture resulting in housing layouts that were designed to accommodate family clusters.
- Recognition by community members of the hard work of past community members that led to engagement in this co-design work to make the community design more culturally, socially, and wellbeing-oriented.
- Infrastructure costing concerns remain for future community development
- Interviewing and conversation was an effective way to learn about community background from Muskoday First Nation members' knowledge system, perspective and experiences. This learning was relevant to understanding why some design features would be preferred.

Past Infrastructure & Community Development

The United Nations defines community as a "subset of society at the local level, community can be defined by commonalities such as, but not limited to, norms, religion, shared interests, customs, values and needs of civilians." Conflictingly, the conventional practice for designing Indigenous communities typically uses financial considerations as the main driver for decision-making, often using the lowest cost alternative without consideration of the social (including health and culture) and environmental impacts. For Muskoday First Nation, several important themes were identified that community members felt were important for a healthy living environment. The word cloud in Figure 5 shows the main ideas shared by interview participants on the essential aspects of health and well-being with consideration to subdivision designs. The larger the word, the more common this was within the conversations.

Figure 1: *Aspects of a healthy community*

Canada's Indigenous communities are often negatively impacted by actions of federal agencies that fail to account for community preferences, resulting in community layouts that are not culturally appropriate or adequate. The lack of Indigenous-led community subdivision development reflects the impact of-European colonization on Indigenous communities disrupting culturally embedded practices for community living. Before European settlement, Indigenous community and culture were intertwined. Communities were designed to support extended families living close together. Traditional ways of living allowed community members to live beside who they chose, usually with family members. During the interviews and conversations with community members, the project team learned many details about the struggles that living on reserve had caused for those who lived there, and how they felt trapped with the current allocation and design of the community's housing. A Muskoday Elder focus group held in April 2022 and interviews conducted by Gwen Bear in 2021 will provide the perspectives in this section, highlighting the past ways of community housing layouts and better ways of providing housing for Muskoday residents.

"We're all together. That is the way it was."

"But that's how it used to be a long time ago, like we all kind of lived in the same area, the family, but now with the way that we get funded, we got to build, you have to build more closely together."

Muskoday community members reflected on the past way of developing housing layouts and issues concerning infrastructure costs for lot services. Traditionally, housing location was a personal choice for residents during housing allocation processes of the past.

"Traditionally most people lived over on the west side of the river until there were more services and infrastructure offered on the east side where the band office, health center and current subdivision is, and it wasn't until the late 80s when the subdivision was begun and planned out."

"And they used to build lots on the west side of the river. Just family lots or people would just pick a place to build. And that's how they used to build the houses. And of course, it was fairly expensive with the water systems and things like that. So that's why they went to the more type of village stuff and mostly for the east side based on costs of dollars and cost of the utilities and that."

However, the growth in the size of the community has led to financial barriers in choosing where to live due to the rising economic costs of providing housing for a significantly larger community. Community members reflected on the economic barriers to meeting past community needs, reiterating the social ills that are produced by proximity, and non-traditional community layouts. As the community grew, funding was not there to maintain traditional housing layouts.

As a result, economics played a role constraining on-reserve community development leading to overcrowding and inadequate access to utilities like water and electricity.

"I grew up with nine of us in one room and no electricity, nothing."

To provide a better home-life, families and community members routinely worked together to supply water and heat for their homes. Homes were sometimes built by members of, and within the community, and produced higher quality homes.

"Again, housing was done by a group of local carpenters who were very skilled carpenters back in the day. A group of brothers and relatives seemed to have a tradition of carpentry."

To sum up, historical inequity was recalled, and widely expressed, but there was also the desire to have more sovereignty over the design and building of new community infrastructure, and a sense of pride in past achievements.

Review of Previous Research on Co-Design

To understand trends across Indigenous communities in Canada, we reviewed online databases for other research published in peer-reviewed articles on co-designing community infrastructure with Indigenous communities. Initially, we hoped to assess how co-designing community infrastructure could positively impact health and well-being, but there was not enough research on this area to gauge any themes. We found eight peer-reviewed articles published in journals about studies that used some form of Indigenous community input when planning and designing infrastructure. Poster 1 provides an overview of the main results of this review.

As shown in the poster, we identified four main groups of benefits of co-designing community infrastructure with Indigenous communities across the eight articles. We titled the main benefits as follows: (1) incorporate exclusive local knowledge, (2) align with community needs and culture, (3) meet a broader set of needs, and (4) support community capacity. We have submitted this review for publication in a peer-reviewed journal and will share a version of the article when it is published.

Papers from the Literature Review

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3. Deane, L., and E. Smoke. 2010. "Designing Affordable Housing with Cree, Anishinabe, and Métis People." Canadian Journal of Urban Research 19 (1):51-70.
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7. Shelby, R., Y. Perez, and A. Agogino. 2012. "Partnering with the Pinoleville Pomo Nation: Co-design Methodology Case Study for Creating Sustainable, Culturally Inspired Renewable Energy Systems and Infrastructure." Sustainability 4 (5):794-818.
8. Wood, Clinton L., and Caroline M. Clevenger. 2012. "A Sampling of Community-Based Housing Efforts at Pine Ridge Indian Reservation." American Indian Culture & Research Journal 36 (4):3-27.

Poster 1. *Poster with results from review of literature on co-designing community infrastructure with Indigenous communities*

Community Layout Preferences

Key Points

- Preferences in housing layouts in Muskoday First Nation were prioritized based on five unique factors including: (A) Family Clusters; (B) Efficient Infrastructure Design and Maintenance; (C) Culturally Reflective Designs; (D) Landscaping, Privacy, and Natural Connection; and (E) Community Connections.
- Survey participants from Muskoday First Nation prefer unique designs with larger lot sizes, more space, and natural and landscaped privacy.

As a part of the research, forty-two Muskoday First Nation members voluntarily participated in a sorting activity where they were asked to examine and sort various community layouts and subdivision designs from most to least preferred. This activity was based on the research method known as Q-methodology.

Various features were represented in the survey layouts that were sorted to learn more about the opinions, perceptions, and likes and dislikes that the community can consider for future community design projects. Within this sorting activity, typical urban-style linear grid patterns, various lot sizes, different densities, curved or straight roads, water views, circular layouts, cul-de-sac family clusters, culturally symbolic designs, and rural acreages were each represented in 24 different aerial photos from unique First Nation communities across Canada (see Appendix document for all the layouts and outline of steps taken to complete the survey). Half of the designs had open views, and half had landscaped privacy, such as trees or forested areas.

At the end of the sorting activity, two optional short answer questions were an opportunity for community members to give reasons for choosing some designs over others. The themes derived from these answers are presented in a word cloud in Figure 2. Family, privacy, more space, trees, landscaping, culture, connection, water, safety, infrastructure efficiency, and design were among the most common reasons for specific layout preferences.

Figure 2: *Reasons for preferred layouts*

Design Features

Figure 3 below shows the five groups within Muskoday First Nation participants that shared similar preferences with designs sorted from "Most Preferred" to "Least Preferred".

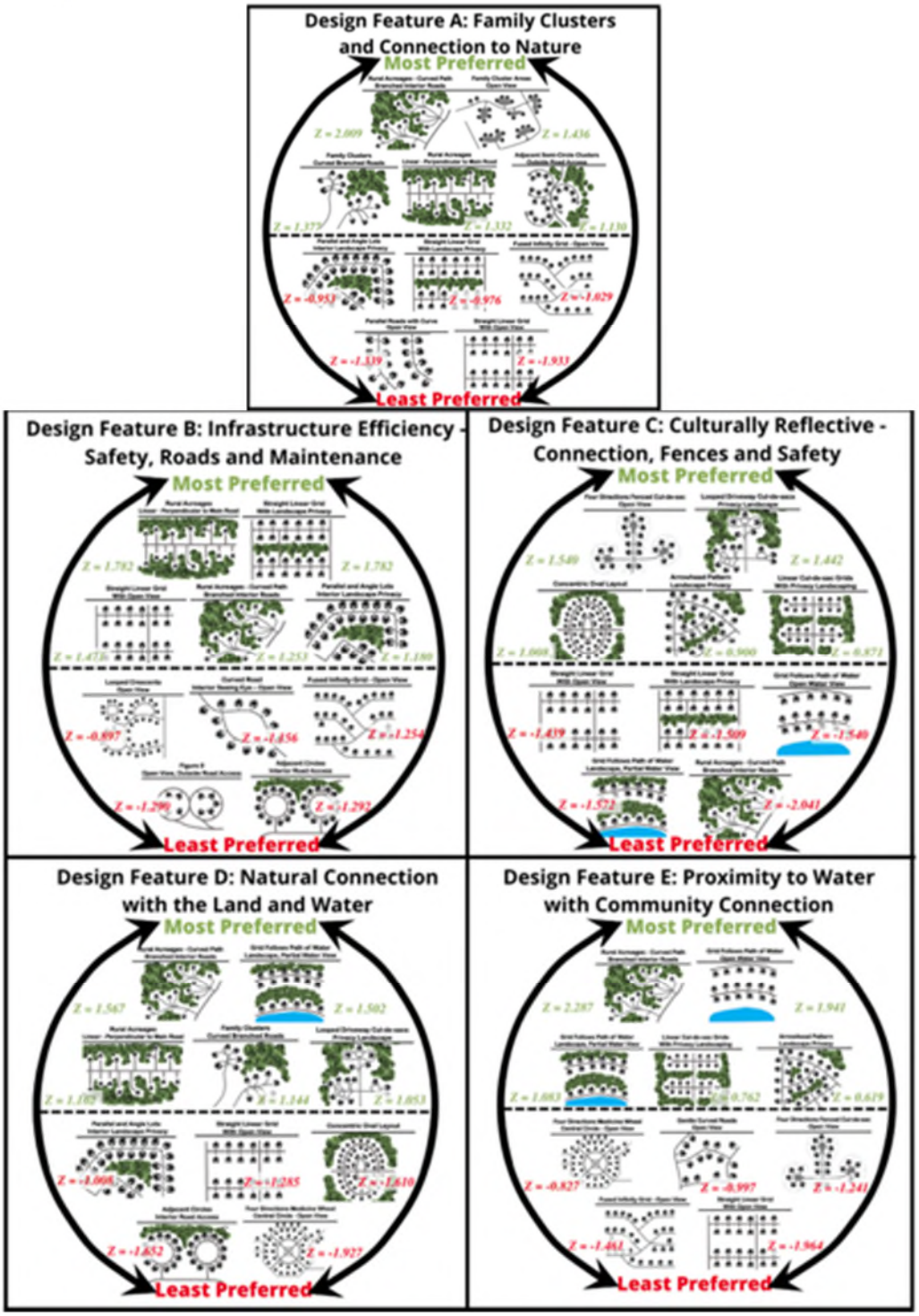


Figure 3: *Muskoday First Nation most and least preferred Design Feature groups*

Muskoday community members participated in this sorting activity online through a survey link shared on Facebook or manually facilitated on a tablet by the community coordinator, Glenda Brass. The survey results gave a cumulative score for each potential layout's contribution to the overall design features in the form of Z-scores, as shown above in Figure 3 and Table 1 for the top two most preferred and two least preferred housing layouts. Higher Z-scores reflect a greater preference for the elements of the layout (shown in green), while lower and negative scores suggest a dislike of some aspect of the layout (shown in red), ranging from +3 (most preferred) to -3 (least preferred).

Table 1 *Data from the Sorting Activity showing Design Feature Z-Scores for two most preferred layouts and the two least preferred layouts*

Design Feature A – Family Clusters and Connection to Nature	**Z-score**
Rural Acreages, branched paths - least dense housing layout with natural landscape privacy	2.009
Family Clusters on interior and exterior of arterial road	1.436
Parallel road with slight curve and no privacy	-1.339
Linear grid layout with no privacy or landscaping	-1.933
Design Feature B – Infrastructure Efficiency – Safety, Roads and Maintenance	**Z-score**
Rural Acreages, linear paths perpendicular to main road with natural landscape privacy	1.782
Straight linear grid with landscape privacy	1.782
Figure 8 circular design with outside road access and no landscaping	-1.290
Adjacent circles with interior road access and open interior view	-1.292
Design Feature C – Culturally Reflective – Connection, Fences and Safety	**Z-score**
Four directions fenced cul-de-sac with open view	1.540
Looped driveway cul-de-sac with landscape privacy	1.442
Grid following path of water with partial water view	-1.572
Rural acreages curved path with branched interior roads	-2.041
Design Feature D – Natural Connection with the Land and Water	**Z-score**
Rural acreages curved path with branched interior roads and landscape privacy	1.567
Grid following the path of water with treed landscaped and partial water views	1.502
Adjacent circles with interior road access and open interior view	-1.652
Four Direction Medicine Wheel with central circle and open view, most dense layout	-1.927
Design Feature E – Proximity to Water with Community Connection	**Z-score**
Rural acreages curved path with branched interior roads and landscape privacy	2.287
Grid follows the path of water with open view of water	1.941
Fused Infinity Grid – open view with no privacy	-1.461
Straight linear grid with no privacy or landscaping	-1.964

By looking closely at the images and their descriptive titles and assessing how they were sorted within the distribution for each Design Feature, similarities and differences were noted. Of

the 42 surveys completed in Muskoday, the responses are illustrated as shown in the pie chart in Figure 4. Design Feature A: 36% of participants preferred layouts with family clusters and connection to nature. Design Feature B: 19% of participants preferred more linear designs for infrastructure efficiency, safety, roads and maintenance. Design Feature C: 12% of participants prioritized culturally reflective designs, with fences for safety, and also layouts in which connection would be maintained. Design Feature D: 19% of participants preferred layouts with a natural flow and connection with land and water. Design Feature E: 14% of survey respondents selected designs that would maintain community connection and tended to prefer the designs near water.

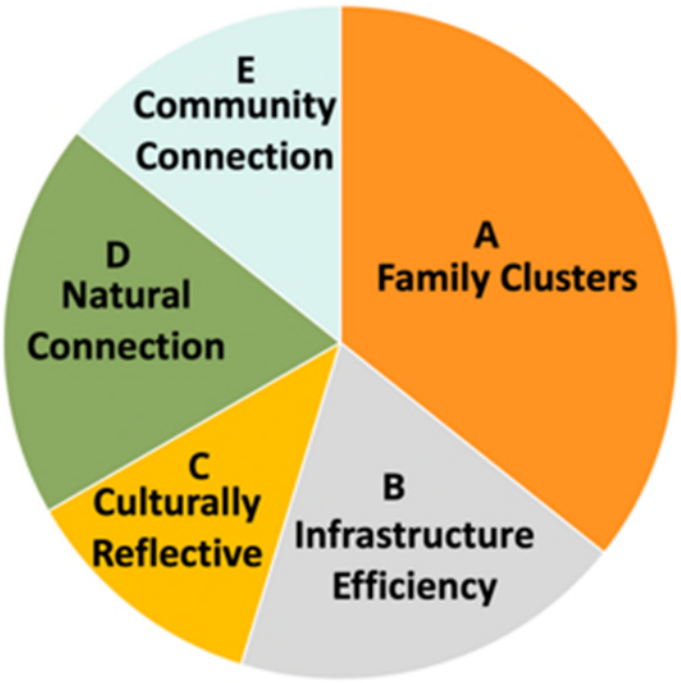


Figure 4: *Design Features Preferred in Muskoday First Nation*

Patterns were noted from looking at the design features that were not preferred within the groupings as well. For example, in Design Feature A, family clusters and trees and landscaping are a priority but straight and linear grids without privacy are not desirable. The group that shared similar preferences in Design Feature B, selected layouts with more linear qualities, in grid patterns, for infrastructure efficiency, and did not like the circular layouts. Participants in Design Feature C group preferred designs that could be considered culturally reflective with four directions, clustered cul-de-sacs, arrowhead and concentric circular layouts. This segment of the community tended towards designs that had elements of safety, fences, were away from the water, and had potentially protective support systems. Design Feature D group within the community prioritized connection with land and water and with designs that had elements that flowed along natural landscape features. They did not prefer linear equidistant grid patterned layouts. Proximity to water, with community connection was a priority for those who responded similarly within the Design Feature E grouping, and there was a strong trend to dislike designs that did not have any trees or landscape privacy.

Within the survey, there was an opportunity for participants to share their reasons for sorting and ranking preferences of their likes and dislikes of the various subdivision styles in their own words. The underlying viewpoints and perspectives of those that responded were identified within each group. Upon further review of all available data, distinguishing statements for each Design Feature are revealed and quotes from these short answers are referenced in the summary posters 2-6 below.

Design Feature A – Family Clusters and Connection to Nature

Maintaining Connection with Family Clusters, Larger Lot Sizes, More Space, Landscaping and Trees for Privacy 36% of Muskoday First Nation participants in the survey responded in a similar way – preferring family cluster designs, living in a clan system, with some preference towards circular or semi-circular designs and overall less crowded layouts with more space and privacy. A strong preference for trees, landscaping, gathering locations and connection to nature, were identified among this group within the community as shown in Poster 2.

Design Feature B – Infrastructure Efficiency – Safety Roads and Maintenance

Linear, organized and efficient designs for infrastructure installation and maintenance with ample space to allow for safe driving and community cohesiveness. 19% of survey participants in Muskoday First Nation preferred designs with more linear qualities, for potential safety considerations as well as for infrastructure, efficiency and maintenance, roads, and installation of water, wastewater, energy, telecommunications, and emergency services as shown in Poster 3.

Design Feature C – Culturally Reflective – Connection, Fences and Safety

Unique, culturally reflective, modern and fenced cul-de-sac designs with central gathering spaces. 12% of the survey respondents prioritized subdivision designs that were culturally reflective with circular cul-de-sac elements, with green space and natural landscaping as shown in Poster 4.

Design Feature D – Natural Connection with the Land and Water

Connection with neighbours in natural environments favouring proximity to the water and the land. 19% of participants preferred designs that were reflective of the important connection between neighbours, intertwined with a natural connection to the land and water as shown in Poster 5.

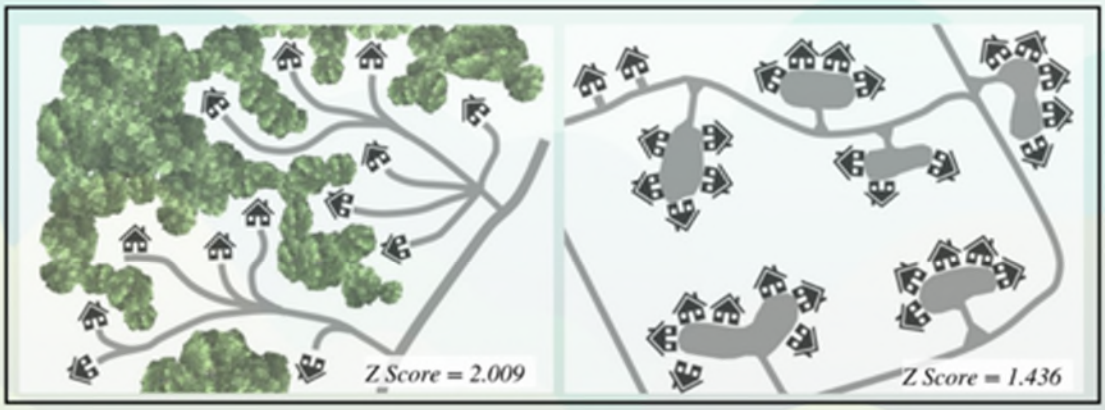
Design Feature E – Proximity to Water with Community Connection

Proximity to water, being surrounded by nature and with a connected community. 14% of survey participants preferred designs with access to water and equal and fair views, with trees, space and privacy as illustrated in Poster 6.

Muskoday First Nation
Preferences in Community Layouts

Design Feature A: Family Clusters and Connection to Nature

36% of Muskoday First Nation participants in the survey responded in a similar way - preferring family cluster designs and less crowded layouts with more space and privacy. A strong preference for trees, landscaping, gathering locations, and connection to nature, were identified among this group within the community.



Design Feature A: Housing layout designs most preferred by those who prioritized family clusters, space, privacy, gathering spaces, and connection to nature

"I like rural areas, and cluster layouts, like in the old days, when families lived close to each other, but with room" ....with more space for gardens, growing your own food, barns, and other outbuildings.

Reasons for Layouts Preferred the Most in Design Feature A Responses:

"Family cluster" style layouts are preferred by this part of the community. It was stated that grouping families together would allow for *"family members to support each other"* and could naturally provide a *"place for family gatherings"*. Overall this part of the community prefers *"less congested"* housing layouts that are *"further apart"* with more space, that subsequently provides more privacy. Rural, acreage-style layouts with a suggested *"minimum of one acre of space per household"* are preferred. Extra space provided by larger lots would allow for additional buildings, and *"room to grow"* and *"room for gardens"* *"to have our own food"*. Connection to nature, water, and trees were additional important factors among this group. Traffic interaction, and safety, was also a consideration among this group of participants, preferring the designs that would have less vehicle/people interaction.

Reasons for Layouts Preferred the Least in Design Feature A Responses:

This part of the community does not like the layouts that are *"too close together"*, *"too clumped together"* and the dense designs with *"too many houses"*. They did not like the *"bleak"* and *"bare"* designs without trees, water, nature, or any landscaping.

Poster 2: *Poster of Design Feature A: Family Clusters and Connection to Nature, with quotes from Muskoday community members sharing reasons for layout preferences*

Muskoday First Nation
Preferences in Community Layouts

Design Feature B: Infrastructure Efficiency - Safety, Roads and Maintenance

19% of participants preferred layouts that had more linear qualities that would be easier for driving, road maintenance, garbage pickup and other community and infrastructure servicing. Privacy and additional space between houses was an important factor among this group of survey participants.

Design Feature B: Examples of layouts chosen for part of community that preferred straight lines in the designs. Efficient linear designs provide for ease for maintenance. Natural areas, trees, landscaping, and additional space for privacy were also highlighted as important factors within this group.

Infrastructure installation, servicing, operation and maintenance....
"these look good because they are in a straight line."

Reasons for Layouts Preferred the Most in Design Feature B Responses:

The part of the community that preferred the more linear layouts with *"clean lines"* liked *"neatly placed, orderly"* designs in which infrastructure installation, servicing, operation, and maintenance would be more efficient. It was also recognized that *"driving would be easier"* in the layouts with straight roads Additional space and the importance of privacy was highlighted as a necessary consideration among this part of the community. More space between the houses, using landscaping for privacy and having a *"good distance between houses"* were stated as preferred factors in the layouts that were selected as being more desirable amongst this group.

Reasons for Layouts Preferred the Least in Design Feature B Responses:

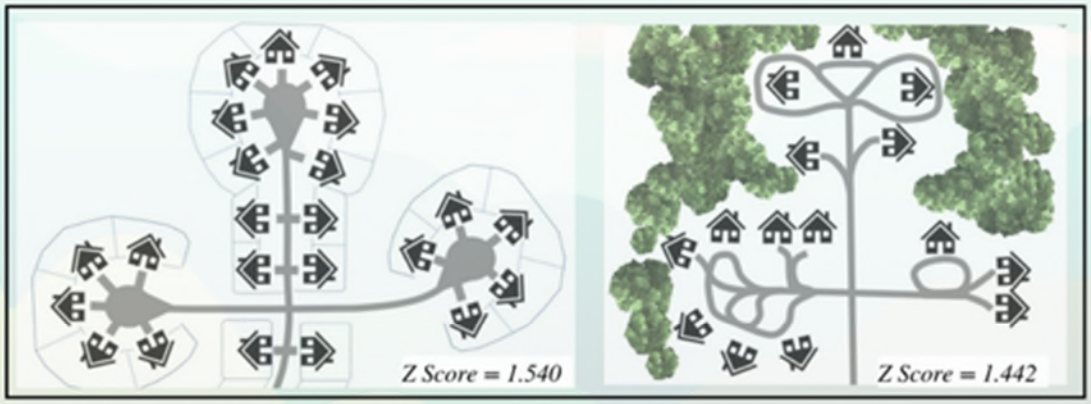
The designs that were not liked by this portion of the community were the houses that were *"too cramped"* and *"the neighbours would be right on top of one another"*. It was added that *"the closer the houses are, the more conflict between the neighbours for noise."* This group also did not like the designs that appeared *"cluttered, unorganized"* or in *"disarray"* and felt that the crowded designs *"did not look good"* and *"wouldn't work as well"*.

Poster 3: *Poster of Design Feature B: Infrastructure Efficiency – Safety, Roads and Maintenance, with quotes from Muskoday community members sharing reasons for layout preferences*

Muskoday First Nation
Preferences in Community Layouts

Design Feature C: Culturally Reflective - Connection, Fences and Safety

12% of participants in the survey prioritized fenced cul-de-sacs, and unique layouts that had culturally reflective circular elements in modern and open designs.



Design Feature C: Culturally reflective cul-de-sac style housing layouts with circular elements and preferred because of the trees, landscaping, and privacy, while still maintaining connection

"I like the idea of a bit of design, and circle design to me represents a circle of family, or a floor of a teepee, or pow wow grounds, very nice "

Reasons for Layouts Preferred the Most in Design Feature C Responses:

Unique, culturally reflective, modern and open designs were prioritized in this part of the community. The fenced cul-de-sac design, with central gathering spaces in the midst of each cluster, or each direction of the layout, was consistently a preferred layout within this segment of the community. Preferred layouts were selected to be *"easier for garbage, security, road access for snow removal"* and overall as an *"easy to find place"* for living.

Reasons for Layouts Preferred the Least in Design Feature C Responses:

The layouts that were not liked by this portion of the community were the designs that were *"too close together"* with *"no privacy"*. The designs that were not liked were those that *"look more expensive to maintain infrastructure like roads"* and that others had the *"same linear looking design as your average town or city, so why not put a bit more design into it?"*

Poster 4: *Poster of Design Feature C: Culturally Reflective – Connection, Fences and Safety, with quotes from Muskoday community members sharing reasons for layout preferences*

Muskoday First Nation
Preferences in Community Layouts

Design Feature D: Natural Connection with the Land and Water

19% of participants in the survey prioritized connection with neighbours in natural environments favouring proximity to the water and land, and the addition of landscaping for aesthetic reasons, and privacy.

Design Feature D: The importance of the connection between neighbours intertwined with a natural connection to the land and water were among the preferred characteristics selected in the layouts preferred by this part of the community.

The preferred designs "allow us to stay visually connected with our neighbours, and that allows us to be a close community and watch over each other. These layouts would also simplify a future plan for local green energy production. With each subgrouping being built as a semi-independent, and self-maintaining, mini-grid within the bigger community/subdivision."

Reasons for Layouts Preferred the Most in Design Feature D Responses:

The important connection with neighbours was prevalent in the designs preferred in this part of the community. Participants suggested *"family circles for more privacy"* and noted that in this case, you would *"know your neighbours"* and *"feel safer"* and *"proper landscaping can lead to a little more peace when it comes to neighbours"* . Designs preferred were a *"mix of common and unique that would likely be the most logically used"*. Additional space for privacy, and more thought put into landscaping and aesthetic designs were highlighted.

Reasons for Layouts Preferred the Least in Design Feature D Responses:

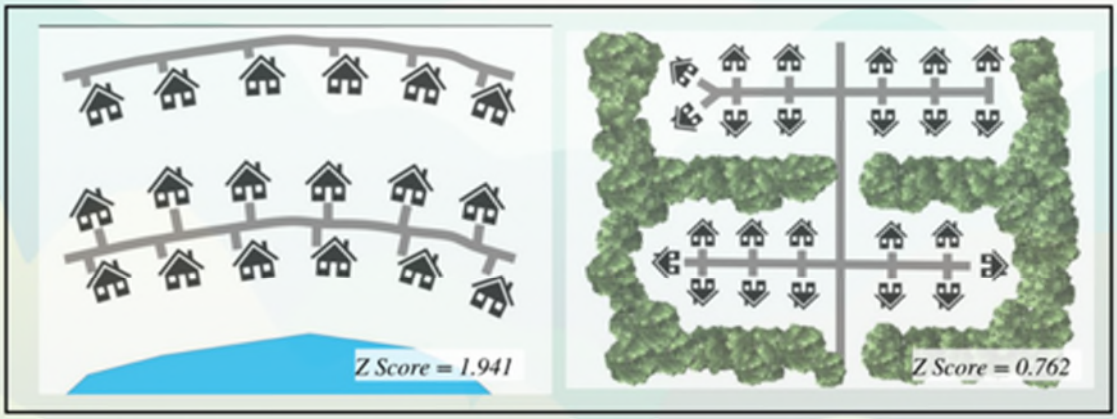
This part of the community did not like the designs in which houses were *"too close together, with too much traffic and noise, no privacy"*. Some of the designs were deemed *"too much, too complicated"*. One respondent did not like rural isolated acreages, or a separate farming area style of community, saying that they felt that this results in the loss of *"the biggest draw of living here, a feeling of a single connected community"*

Poster 5: *Poster of Design Feature D: Natural Connection with the Land and Water, with quotes from Muskoday community members sharing reasons for layout preferences*

Muskoday First Nation
Preferences in Community Layouts

Design Feature E: Proximity to Water with Community Connection

14% of participants in the survey prioritized proximity to water and the overall importance of water. Clan housing was also preferred among the layouts as well as designs with additional space, more trees and surrounded by nature.



Design Feature E: Proximity to water, being surrounded by nature, and with a connected community with clan-style housing, were among the most preferred factors for the participants that choose layouts as shown.

"A house on the water would be best."

Reasons for Layouts Preferred the Most in Design Feature E Responses:

Proximity to water, access to water, and privacy, were among the most important factors in layout preference in this group of survey participants. Participants preferred the designs that were *"further apart"*, had *"more trees"* and those designs with *"water"*. Clan housing, surrounded by nature, with *"pretty views"* and with lots of space, were important factors in sorting desirable layouts. Having a nice yard, with a fence, and a fair view for all community members was also highlighted as an important factor for this group.

Reasons for Layouts Preferred the Least in Design Feature E Responses:

The designs that were not liked for the participants that responded similarly in this part of the community, were those designs that did not have any trees and were too close together. This part of the community did not like the designs that did not have privacy.

Poster 6: *Poster of Design Feature E: Proximity to Water with Community Connection, with quotes from Muskoday community members sharing reasons for layout preferences*

Conversations with Community Members

Key Points

- Reproducing urban style neighbourhoods with high-density contributes to the potential for poorer wellbeing outcomes.
- Privacy is an important consideration, and while houses should be in view of each other, lot sizes need to allow for a level of privacy.
- Fences would address several challenges regarding privacy and safety.
- Walkability, recreation, and greenspace need to be considered in the design process.

"I think row housings, like what we have now is, it doesn't look good. It doesn't feel good. I think it... Some creativity has to take place too in the design. Maybe cul de sacs type of thing, those things. And separation, have barriers, either fence or bushes, just to separate the property."

The community researcher had conversations (research interviews) with ten community members of different genders and ages living in different areas of the community. The conversations were used to explore what is working well or needs to be changed about the community design for new 'subdivisions'. Here are some characteristics of participants:

- Ages ranged from 18 to 69, with 4 people over 60 years old
- One person identified as non-binary, 6 as female, 3 as male
- Half (5) had lived in the community for 20 years or longer

Well-being

The main focus of the conversations with community members was how the community design affected well-being. The main topics of conversation included a sense of community, safety, family, space, privacy, recreation, and land. We also heard about how house design influences health. These topics are explained in greater detail below. Poster 7 is also included at the end summarizing the information shared here.

Community

Community members noted the importance of neighbourhood relations, especially how neighbours looked out for each other. Community members specifically mentioned the ability for children to play together and access community activity spaces (e.g., trails, play areas).

"What I liked about the housing was the visiting, the opportunity to just support one another in terms of gardening, in terms of history, visiting, sharing stories, music... The fact that we were a community, that we were related, that we had a lot of things in common..."

Safety

Most community members mentioned how community design impacts a person's sense of safety. Safety considerations included the distance from roads to houses, the distance between houses, whether people had someone close by they could rely on, how fast people travel in vehicles, and whether there was fencing for protection from dogs. Community members wanted increased safety infrastructure such as streetlights or flood lights, improved visibility at road intersections, speed and traffic cameras, and the presence of tribal police. Safety impacted the ability of family members to be comfortable with children playing outside unsupervised.

"Streetlights are a big thing, especially in an area where you're living in, not crowded, but you're living close to other people. You want that safety, with streetlights and housing with proper lighting, outside and make things bright, and it just gives a person more sense of security that way."

Family

Many community members mentioned the importance of family connections. There were multiple suggestions for house groupings by family units or people with other similarities, such as interests or age (e.g., Elders, gardeners, tradespeople). Community members thought living in family units would allow for more support and guidance for children or others who need it.

"First Nations people have always lived more in family units. And quite honestly, my yard, I love my yard. My brother-in-law's next door. Yes, you have your family issues every once in a while, but for the most part, your family, no matter what, you have to work it out. When you're not families, you're creating sometimes animosity, that is."

Perspectives about Elders

Elders are an essential part of the community. Accommodating Elders requires space for specific needs and promotes activities to enhance well-being. Muskoday First Nation supports the development of Elder living, providing greater accessibility for both social engagement and physical mobility. Another important aspect of Elder living is providing a space that is away from noise, close to health facilities and developed with opportunities for gardening and other activities. Muskoday community members noted the value of Elder teachings and perspectives as beneficial to the community.

"That's where it would be so great to have a place to host things for them [Elders]. We keep talking just as much as we talk about how our children are our future; our children are so important. We're losing our elders, especially with Covid-19."

Space

Community members had different views on the amount of space that would be ideal between houses. Some people felt wide-open spaces would support healthier lives. Others expressed that if the houses were too spaced out, it would be harder to get help from others, which was particularly important for Elders. With houses a bit closer together, there was a greater sense of community, more places to walk, and it was easier to access services from each other.

"It would be nice to see something planned out a little bit more spaced out, to give people a little bit more privacy, to be able to live comfortably and quietly so that they don't have to worry about all the other things that come along with living in a dense subdivision area."

Privacy

Privacy was a big concern. Fencing was suggested as a potential solution. Community members felt that better fencing between properties would provide more personal space in the house and yard. Fencing would protect people from dogs or other animals and children from wildlife or dangerous drivers.

"I think that a lot of it has to do with privacy. And I've got plans for my garden. I had to put up a fence to keep the dogs out, I put that fence up last year after I planted the garden and after the dogs dug up, and did their damage, so I've got a fence there. Now, I've got to paint it. There's a lot of cost and maintenance that goes into privacy. It would be a lot better if that was pre-planned."

Recreation

Community members wanted to be able to walk around the community safely. Clear, marked pathways to the Band Office and school were encouraged, along with naturalized trails for recreational walking. The importance of being able to walk places was explicitly mentioned for people who do not have cars.

"I think there should be pathways that are pedestrian-friendly, safe for people that are going to the Band's Office or people that are walking to school. Because some of the little paths that go to the school they're bushy and dark and not really easily accessible by the students to get there. So, if there was more of a path that was cleared to it, I think that would be better."

Community members also spoke about the importance of having green spaces and other recreational spaces for families to play.

"The planting of shrubbery and park space, or green space, should be built into the subdivision plan. There should be some park spaces with

playground equipment installed so that kids have a safe place to go. They're not just playing on the street."

Land

Many community members talked about the importance of building new houses on land that was not prone to flooding or too soft. They also talked about the importance of landscaping, trees, the direction of the sun, and shrubbery.

"And for them to start looking at upgrading those buildings like that and to make sure that the landscaping is done. Right now, I notice that some of those houses, they go in there really quick, and they just grade it down, and then they build the houses. And there's been places where the ground has caved in around a house."

Community members also said that without paved roads or landscaping, dust impacts air quality around the houses, which affects respiratory health.

"Pave the roads, pave the driveways. If we were able to do that, the driveways and the approaches, so that when the grader comes in, they're not pushing the gravel all into the grass kind of thing. And then that way it's easier to keep clean. It keeps the dust down that way. You imagine having a house where you got a nice lawn and a nice asphalt driveway. When you go into the house, it's not going to track in dirt or anything like that."

Housing Design

Although this was not the main focus, community members told us the consideration of the design of the houses was necessary for health and well-being, according to community members. Community members mentioned:

- **Accessibility** – The ability for a person to get in the house and access everything they need without going up or down stairs was important, particularly as people age.
- **Size** – Bigger houses are needed. The size of bedrooms and lack of storage areas were issues. Living in small houses could negatively impact family relationships by not having enough space to gather and share activities or meals. Houses that are too small could cause mould because of increased moisture due to the number of people in the house.
- **Quality of Building Materials** – Some houses were reported to be built with poor building materials that did not last. This was mentioned for trailers and Ready-To-Move houses.
- **Basements** – Community members (5/10) felt the houses needed basements for better temperature control and flexibility with space. The ability to create additional bedrooms in the basements was a benefit. However, potential negatives were small basement windows not big enough for people to escape in the case of a fire or the potential for mould developing after flooding.
- **Mould** – Community members with mould in their houses spoke about the negative impacts on their health and well-being.

Poster 7 *Poster with results from individual conversations with community members about how community layout could be improved to support wellbeing*

Costs and Impacts

Key Points

- Increased up-front infrastructure costs can result in decreased wellbeing costs in the long-term
- Up-front costs associated with increased lot size are minimal compared to wellbeing benefits

As a part of this project, we considered the up-front and long-term financial costs and well-being impacts of community designs. These costs and impacts are explored in two ways in this section. First, we provide an overview of how varying design features impact well-being and the associated costs of such impacts. Then, we discuss lot size specifically, evaluating well-being impacts and costs associated with larger lots.

Potential Costs and Wellbeing Impacts

In some instances, increasing up-front costs for infrastructure could lead to long-term savings associated with well-being impacts, as many design features can contribute to enhanced well-being. It is possible to estimate a dollar amount for different well-being impacts; however, this would be a separate study with conversations focussing on costing. For example, The Aboriginal Housing Management Association (2022)[2] completed a study showing the difference in short- and long-term costs of housing in British Columbia. It used the results to advocate for increased funding. We used information from this study and the individual conversations the community researcher had with community members to create Table 2.

Table 2 includes design features that multiple community members mentioned favourably. The Table also includes potential enhancements to well-being that community members shared in relation to the design features and broad areas for long-term savings. Examples of items that could be costed for each of the broad areas for savings follow:

- **Physical health** – Visits or stays in hospital, surgery, medication, follow-up visits with health practitioners, rehabilitation
- **Mental health** – Visits or stays in hospital, medication, counselling, or other therapy
- **Social** – Childcare, care for Elders and others as they age, income assistance
- **Enforcement** – Surveillance cameras, visits from police

[2] https://www.ahma-bc.org/s/AHMA_BCURNIHousingStrategy_220124.pdf

Table 2: *Favourable Design Features, Potential Enhancements to Well-being, and Cost Savings*

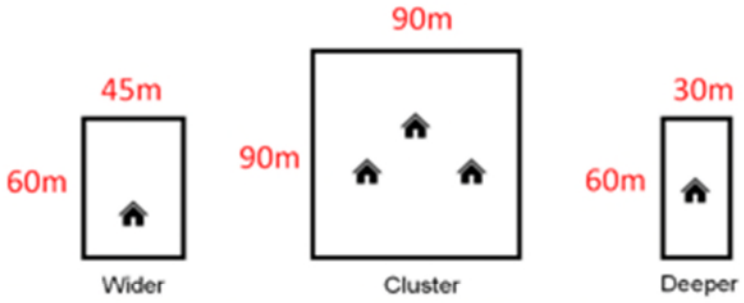
Up-Front Costs	***Long-Term Savings***	
Design Features	**Potential Enhancements to Well-being**	**Savings Area**
Family clusters or groupings	Increased sense of community leading to reduced loneliness and improved social cohesion; increased opportunities for sharing teachings, skills, and practices	Mental health
	Increased ability to rely on neighbours for mutual support leading to improved child development and senior or Eldercare	Social
	Increased ability for shared economy leading to equipment sharing and improved financial outcomes	Social
	Increased safety leading to decreased break-ins	Enforcement
More space between the houses	Increased personal space and privacy between houses, reducing stress and improved sense of security	Mental health Enforcement
	Decreased noise from neighbours, reducing stress, aesthetics, artistic inspiration	Mental health Enforcement
More space from road to house	Decreased traffic-related injuries, decreased dust contributing to respiratory illness	Physical health
Fencing	Increased safety for children leading to increased time outdoors, impacting physical and mental health	Physical health
	Decreased injuries from stray dogs and wildlife; damage from snowmobiles and other off-roads vehicles	Physical health
	Increased ability to have a garden and grow food due to protection from dogs	Physical health Social
Green spaces or recreation spaces (e.g., parks, natural trails)	Increased connection to nature	Mental health
	Increased time doing recreational activities leading to improved physical health and mental health	Mental health Physical health
Ramps, elevators, or ground-level buildings	Increased ability to complete activities of daily living with dignity and sovereignty	Physical health Social
Proximity of houses to services with wide roads	Increases physical activity because of increased walkability to Band Office, Medical Services, School, and other essentials reduces the need to drive	Physical, Mental health

Ideally, the up-front costs associated with implementing the design features in the first column would be weighed against the potential long-term savings associated with the enhanced well-being from the design (second and third column). Considering both the up-front and long-term costs during design stages would provide a better understanding of the true costs of design features over longer periods.

Design Features and Potential Savings

Generally, the important features to community members require a larger lot size, which has a greater cost to service with water and wastewater utilities. A few alternate lot sizes were compared to a conventional lot (30 m by 60 m with a 20 m home setback) as an example of costs and benefits. A green checkmark was given if the lot size was perceived to have improvements to themes from the previous table (safety, family, nature, privacy, access, or security). Likewise, a red X was used to show either a downgrade or no change to those themes. Increased capital costs were estimated as a percentage increase using values from an engineering consultant.

Table 3: *Costs of Features by Lot Size*



	Wider	Cluster	Deeper
Safety	✗	✓	✓
Family	✗	✓	✗
Nature	✓	✓	✗
Privacy	✓	✓	✓
Access	✗	✗	✓
Security	✓	✓	✗
Capital cost of service	**+30%**	**+15%**	**+10%**

The more significant capital cost can be offset when considering the benefits to well-being. For example, wider lots give more privacy and create opportunities for land to be used for natural areas or gardening. Access to community amenities and services is unlikely to be reduced with a moderate (50%) increase in lot width. Keeping the typical 30 m by 60 m lot size but setting the house further back can give the feeling of more privacy and reduce stress from traffic and road dust. An acreage lot shared by a family cluster of 3 homes can provide the privacy and natural connection that comes with a larger lot while creating a safe family environment and limiting service cost increase to 15% by having multiple homes on the same lot.

Conclusions

Muskoday First Nation is a unique and vibrant community with a desire to move towards more culturally aligned and sustainable housing layouts and design. Reflections by community members on the past conditions in Muskoday highlight the many challenges of inadequate on-reserve housing, requiring community members to work hard to maintain substandard infrastructure.

The sorting activity (*Q-methodology*) findings of housing layouts indicate several preferences for future community subdivision designs. The main design features that are priorities for Muskoday community members include: (A) Maintaining connection with family clusters, larger lot sizes, more space and landscaping and trees for privacy; (B) Linear, organized and efficient designs for infrastructure installation and maintenance with ample space to allow for safe driving and community cohesiveness; (C) Unique, culturally reflective, modern and fenced cul-de-sac designs with central gathering spaces; (D) Connection with neighbours in natural environments favouring proximity to the water and the land; (E) Proximity to water, being surrounded by nature and with a connected community.

These findings support what was shared in the conversations (*interviews)* with the community researcher, where safety, recreation, space, privacy, and family were among the most important priorities for well-being in future community designs.

The *literature review* highlighted the importance of co-designing with Indigenous communities showing the benefits of including local knowledge, thereby aligning with community needs and culture, within the context of developing community capacity.

Preliminary costing projections illustrate that greater initial investment in infrastructure, which would be required with larger lot sizes, may provide long-term savings associated with well-being. For example, developing a healthy, culturally aligned community would result in greater opportunities for knowledge sharing, and fewer hospital visits which require time and transportation costs.

Research limitations are inherent to any study. Qualitative research can be influenced by cultural bias on behalf of the researcher. Cross-cultural work can provide some barriers to communication, especially when in-person meeting and relationship building is prevented due to the necessity of medical safety protocols during the Covid-19 pandemic. A community member completed qualitative interviews. This was good in some ways, as the participants were at ease with someone they knew. However, it meant the research team could not probe into certain statements, limiting their understanding from an outsider's perspective. Qualitative interviews and the sorting activities represent perspectives shared during a snapshot in time, and external events like the global pandemic may have influenced answers. The pandemic created housing challenges with restricted movement that may have led to conversations that may be different in a pre- or post-pandemic world.

Additionally, inflation during this research impacts the costs associated with infrastructure involved in all community building projects. The information within this report has not yet been

peer-reviewed by other scholars. Once published, the research results can be used to inform, and guide continued steps forward for community-centered design processes.

Next Steps

What follows are future research studies that could complement or extend the research shared in this report:

1. *Costing Wellbeing Impacts:* A similar research study to the one done by the Aboriginal Housing Management Association (2022) (introduced in the Costs and Impacts section of the report), called a *Social Return on Investment*, could be done in the future to explore wellbeing costs of specific community layouts or design features. Such a study could demonstrate how wellbeing benefits and associated long-term savings can offset financial costs for community design.

1. *Recommendations for Indigenous Services Canada (ISC):* Compiling community perspectives on community design and the issues resulting from current subdivisions can be shared with ISC in developing future communities. Further, community engagement preferences collected through the research process provide insight into what the community prefers when discussing future community development with ISC. Ideally, data and future academic work stemming from this project will facilitate future co-design of policy frameworks.

1. *Key Stakeholder Interviews:* Gaps in ISC housing policy were identified through interviews with key stakeholders in developing Indigenous community infrastructure. Future outcomes from these interviews can inform engineering firms and federal agencies in factoring infrastructure costs, hidden costs, health problems and the structure of managing bylaws. Overall, the perspectives of the Muskoday community provided insight that, combined with the consultant's experience, can better manage the increasing costs of construction, economics, funding frameworks, and inflation.

1. *Influence on future Community Development:* The Community Co-Design research project at Muskoday Nation can assist in reproducing co-designed communities both in urban and rural contexts. Other interested First Nations communities can apply some of the ideas in this report while adding their knowledge to further developing frameworks for culturally centred community designs.

Acknowledgements

We are very thankful for every Muskoday First Nation community member who shared knowledge with us in every step of this project. We appreciate the insight and perspectives of Chief Ava Bear, and each of the past and present Muskoday First Nation Chiefs and Councillors, community leaders, and Elders that were involved in this project. Gwen Bear was the community researcher for this project. Her overall contribution and community connection was vital to the research project and the team's engagement with the Muskoday community throughout the many

restrictions of the Covid 19 pandemic. Special thanks to Linda McCloskey, Alfred Crain, Beryl Bear, Margaret Thomas, Merle Crain, Amy Bear, Clayton Crain, Ron Bear, Elwin Bear, Dean Bear, Herman Crain, (and fourteen additional participants who wished to remain anonymous) who were involved in the individual interviews with the community researcher. Thank you Glenda Brass for facilitating the sorting exercise and all those who participated in this activity and shared your preferences of community layouts for this research.

It was an honour and privilege to meet and listen to reflections from several Muskoday Elders regarding *Muskoday Community Design in the Past, Present and Future.* Gratitude to Elder Liason Gwen Bear, and community navigator, Sandy LeBoeuf for the direction and guidance in preparation for the Elder Focus Group on April 12, 2022. Thank you to Norma Crain for preparing a delicious lunch for the Elders and participants. Hiy hiy to Bente Huntley, Hazel, Margaret Bear, Edwin, Louis Bear, Dianne Dreaver, Doreen Crain, Darlene Crain, Delores Bear, Georgina Bear, Joan Bear, Quinn Amyotte-Bear, Delbert Bear for sharing stories of the past and current Muskoday community and hopes and ideas for the future. The opportunity to witness your connected and vibrant community further illustrates the strength of your culture, family, and community connections that continue through the generations.

Thank you to the leaders of the Saskatoon Tribal Council for input on this project. Gratitude to members and research participants from Muskeg Lake Cree Nation, who were also involved in co-designing the overall research project in a parallel study with Muskoday. This research proceeded with input and updates at monthly Project Management Team (PMT) meetings with project manager Grant McKercher, and bi-weekly University Research team meetings. Thank you Ryan Arnold, Kyle Blixt, and Connor Traves from BCL Engineering for sharing reports and information with us. Gratitude to faculty and students from the University of Saskatchewan Department of Civil, Geological and Environmental Engineering, College of Nursing, and School of Environment and Sustainability. We are grateful for the guidance from the USask Indigenous Engagement leadership team and the USask Research Ethics Board, who ensured that this research was conducted with truth and respect, and within the framework of the First Nations Information Governance Centre's Principles of OCAP ®. Thank you to all Muskoday First Nation members, including on-reserve, urban, and off-reserve members, who shared perspectives, knowledge, and information and reflections of your beautiful nation.

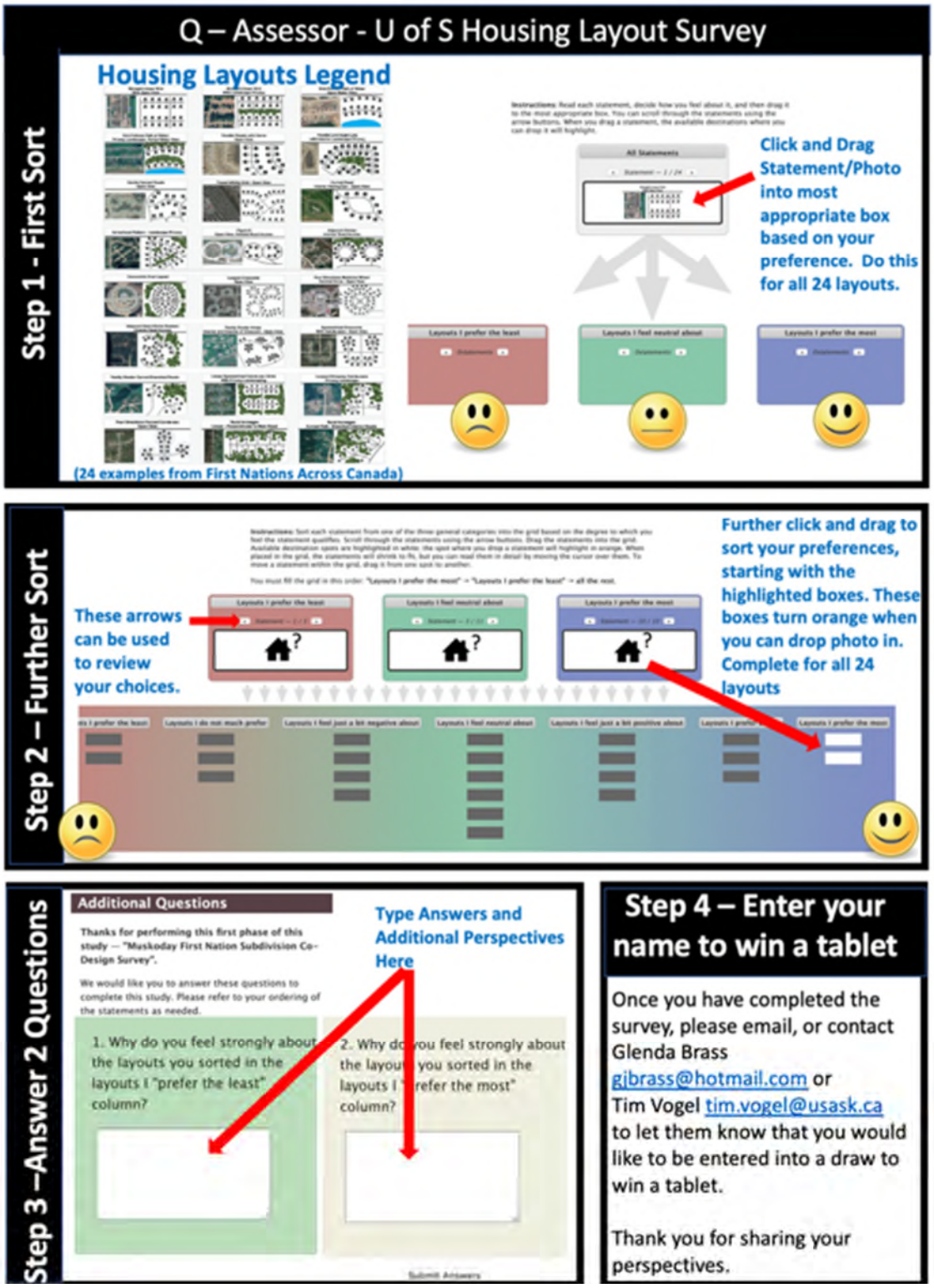
Image 5 *Photo taken during USask Research Team visit with Chief and Council members of Muskoday First Nation, on August 27, 2021*

Appendix A: Research Methods

Q-Sort

The housing layouts were used to create a survey where photos are ranked by preference to show what styles and features in a layout (linear roads versus curved, landscaping, shape, density, water) community members like and dislike. The results from the sorting exercise, given reasons for preferences, and interviews can directly influence the final designs. Q-sort is an exercise where participants are shown a series of photos or phrases, in this case, photos, and are asked to sort them based on like, dislike, and no preference. The participant then takes the sorted groups and further ranks the group from strongest preference to least preference. The researchers can find statistically significant patterns in these responses across all participants, and themes can be derived for groups with similar sorting patterns. These are the 24 layouts and associated aerial photographs from unique First Nations communities across Canada that the survey participants sorted.

Muskoday Community Researcher, Gwen Bear, participating in survey research methods at the onset of the Community Centred Co-Design project, October 1, 2021



Visual representation of steps to complete the on-line Sorting Survey (Q-sort) for Muskoday First Nation

Legend showing the 24 distinct layouts, with aerial photos taken from First Nations communities across Canada, that were sorted in the sorting survey

Individual Conversations/Qualitative Interviews

The Community Researchers had individual conversations with a wide variety of community members (e.g., range of genders, ages, living in different areas of the community, different family sizes, etc.) about likes, dislikes, what makes people feel good, what works well and what doesn't with the community design, as well as how the community design impacts community members' well-being. The conversations were semi-structured, meaning the Community Researchers had a set of questions they could ask while also following the lead of the community member. All conversations were audio-recorded, transcribed into written form, and analyzed by two research team members for the common themes shared in this report.

Interview Guide

1. Tell me about the community layout/housing layout/subdivisions in your community (past, or current where, how many, who lives there, how were they decided on).
2. What do you like or dislike about the housing layout/subdivisions (placement, density, design, shape, houses, and roads)?
3. What would you change about the current housing layout/subdivisions or future ones?
    a. Why would you change them?
    b. What do you think the changes would do to support people living there, in surrounding areas, and within all members of the nation?
4. What is important to your community about how the community/subdivisions are designed and built? (Probes: number of houses, design, size, health concerns, roads, flood control, placement on the reserve, landscaping, surrounding areas, density...)?
5. How do you feel the community layout/housing layout/subdivision design affects your well-being?
6. What makes you feel good when you think about the community layout/housing layout/subdivisions?
7. What works really well for you with how your community is designed?
8. Is there anything you would like to change about the way your community is designed?
    a. Can you describe what you would change first?
9. If you had unlimited money and time, how would the community/the housing layout in the community look?
10. Are there any more concerns or things that you would like to share about community/housing/subdivision design?