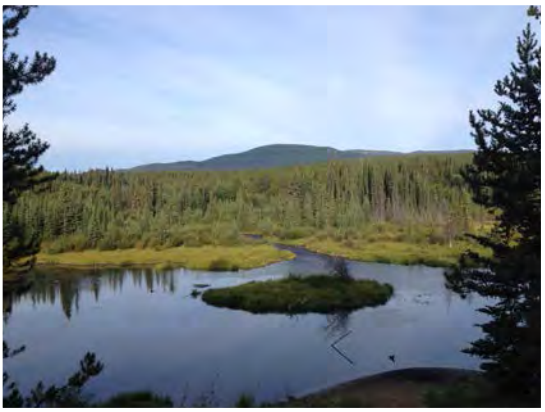
BACKGROUND REPORT

YUKON COLLEGE CAMPUS MASTER PLAN



November, 2014

BACKGROUND REPORT

YUKON COLLEGE
CAMPUS MASTER PLAN

PERKINS + WILL

kobayashi+zedda

PWL partnership

MODUS
from insight to impact

Associated Engineering

CONTENTS

Figure 1 - Project Site

1 INTRODUCTION

Yukon College is undertaking a planning process to develop a Campus Master Plan that will assist future planning and construction on the College's Ayamdigut campus.

The plan will incorporate the newly established Yukon College Reserve lands outlined in Figure 1.

Yukon College is at an important stage in its growth and is looking for a master plan that reflects its key aspirations. These include creating a unique post-secondary education model, collaborating with First Nations, engaging the Yukon community, ensuring quality to attract and retain students and expanding northern research and innovation.

The Campus Master Plan is an important plan as the College transitions to university status.

KEY CONTEXT

The Yukon College **Strategic Plan** sets out a clear direction for the College based on an extensive engagement process. It highlights the need to embrace diverse cultures and reinforce a sense of community both on and off campus. It describes a deep respect for the unique northern environment and a desire to lead research in northern sustainability. And finally, the Strategic Plan builds on the College's strengths by supporting existing initiatives in Social Justice, Mining and Technology and Green Technology. The Strategic Plan and the associated Academic Plan are key guiding documents in the campus master planning process.

Yukon College is within the **traditional territories** of the Kwanlin Dun First Nation and Ta'an Kwach'an Council and there are areas of archeological significance to the south side of McIntyre Creek. First Nations are partners at the college, will have membership on the Site Master Plan Advisory Committee (SMPAC) and will constitute a key stakeholder group to be engaged throughout the process.

McIntyre Creek is a sensitive environmental zone that borders the study area/endowment lands to the northwest. The area is identified as having high recreational and wildlife values as well as cultural values. The Kwanlin Dun First Nation and the Ta'an Kwach'an Council have identified the area as culturally significant, particularly the area where the Creek flows into Yukon River. Any new development on the campus will need to carefully consider and mitigate potential impacts on McIntyre Creek.

The area has high **recreational value** and is well used by the nearby residents of Takhini, Porter Creek, and Range Road neighbourhoods. There are great trails (both formal and informal) and cranberry picking areas within the study area. The recreational use is year-round, and both motorized and non-motorized. The creek and mature boreal forest figure prominently as natural recreational features of the area.

The College is home to the Yukon Arts Centre and the Yukon Art Gallery, Yukon Archives, and Yukon Permanent Art Collection. Though not necessarily connected to the academic goals of the College, the cultural components attract significant community participation. Both the Yukon Arts Centre and the Yukon Archives are slated for major capital expansions in the next few years. There has been a recent study completed that recommends the location of a new Heritage Resources Centre at the college campus. This combined with the new Centre for Northern Innovation in Mining building highlights the need for planning to accommodate known and future building development on the campus.

2 PROCESS

The campus master planning process kicked off with a start-up meeting in August 2014 and will finish with a detailed master plan for the future campus in June 2015.

PHASE 1: CONTEXT + ANALYSIS

Technical activities (including research and analysis of the current context) in Phase 1 are already underway and engagement activities are kicking off with awareness-raising activities and an Ideas Competition. The purpose of Phase 1 is for the project team to gain a better understanding of the opportunities and constraints of the site and the unique context that will form the basis of the plan moving forward.

This report represents a key deliverable in Phase 1 and will serve to summarize and synthesize the background information and analysis gathered to date.

PHASE 2: VISIONING THE CAMPUS

Phase 2 builds on the work done in Phase 1 and begins to explore a vision, guiding principles and big ideas for the site in close consultation with the College, key stakeholders, and the community. Phase 2 includes a baseline workshop with the Site Master Plan Advisory Committee (SMPAC) and a "Big Ideas" public event scheduled for November 12th, 2014.

PHASE 3 CAMPUS DESIGN CONCEPTS

Following the major engagement activities in Phase 2, the project team will co-create up to three Campus Design Concepts exploring growth scenarios that meet the principles and goals for the site and respond to the findings of Phase 1 and 2. Alternative approaches to density and built form, green space, type and location of retail opportunities, sustainability strategies, and stormwater management will be explored. This phase will conclude with a SMPAC workshop and a Public Open House to identify the components of a Preferred Campus Design Concept.

PHASE 4: MASTER PLAN

Based on the feedback received at the end of Phase 3, the project team will refine the Campus Design Concepts into one Preferred Campus Design Concept and develop urban design, building and landscape plans and guidelines. The final plan will be submitted to the College no later than June, 2015.

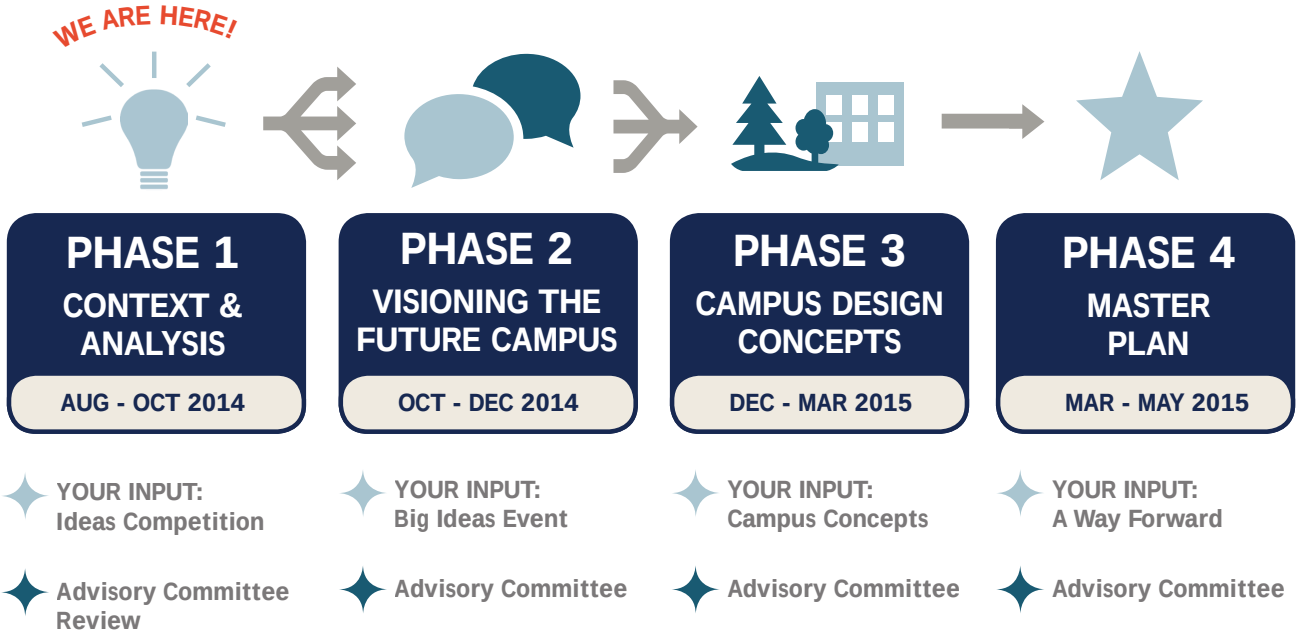


Figure 2 - Process diagram

2.1 Engagement Approach

Given the important role that Yukon College plays in the Yukon, and how many lives it touches, the success of the Yukon College Campus Master Plan project will be greatly influenced by how well its communication and engagement aspects are planned for, executed and reported upon.

The Perkins & Will-led consulting team brings local knowledge and best practices in engagement and campus planning ranging from Programming and Northern Planning to Public Realm, Winter City Urban Design, Cold-Climate Sustainability and Architectural Guidelines. All of this will be married with the skills, knowledge, history and commitment of staff, faculty, management, students, neighbours, First Nations, and other stakeholders. Equally important, the consultant team will work with an Advisory Committee (SMPAC), tying their ideas and concerns in with evolving trends in demographics, learning, student numbers, teaching practices, and other opportunities.

The consulting team and Yukon College are committed to early, ongoing and substantive involvement of a wide range of diverse groups in a transparent and creative design process. Essentially, the engagement process will be an ongoing conversation about the best future for the College, and will show how land use, site design, buildings, landscapes and infrastructure can be a key lever for and strategy to achieve many different objectives.

This project will use 4-phase approach to guide its activities. Each phase has a descriptive and action-oriented title, with the engagement focus provided in brackets:

- Phase 1 - Understand the Context, Complete Initial Analysis (tools to engage effectively)
- Phase 2 - Vision the Future Campus We Want (raise awareness, drive initial participation)
- Phase 3 – Create Campus Design Concepts (deepen the conversation, grow the participants)
- Phase 4 – Complete the Master Plan (ensure responsiveness, implementability and generate excitement)

The engagement process began with an early planning exercise conducted by Advisory committee members and the consulting team to generate a detailed list of audiences to raise their awareness and identify opportunities for their involvement.

The consulting team will work with the College in Phases 1 and 2 to build awareness of the project and the engagement process and frame it clearly so that people understand the opportunity and the challenge. This will involve developing a brand/identity and key messaging, a project webpage, a process map and calendar for completion, and various forms of communication including press releases, email, posters, mail-outs, information stands, and social media. Stakeholders (and potential community partners) will be informed via letters, phone calls, and face-to-face briefings.

Community engagement activities will include a digital survey, an “Ideas Competition” event, a “Big Ideas” event, and information/engagement booths at local community events in various locations to reach a diverse range of participants. Concepts and ideas gathered throughout the initial phases will help shape the design concepts in Phase 3.

The final phases of the project will use these same systems and contacts to obtain community input on the design and master plan as the project progresses. Various events will be held to continue gathering input and “close the loop” with participants so there is a clear understanding of what was heard and how it will be used to develop the final plan.

3 PLANNING CONTEXT

3.1 Regional Planning Context

Growth and development of the City, particularly the areas surrounding Yukon College, will affect campus planning in terms of housing availability, transportation, retail, community needs and amenities, as well as student and staff populations. As a large employer and node of activity, the scale and patterns of development on the Campus will affect the local ecology, transportation system and surrounding neighbourhoods.

Yukon College sits between several existing residential neighbourhoods including Takhini North, Takhini East, Takhini Trailer Park, Northlands Trailer Park. The college is a short drive but somewhat isolated geographically from other surrounding neighbourhoods such as Porter Creek which is separated from the College site by McIntyre Creek.

The City of Whitehorse has experienced fairly rapid growth in recent years; between 2006 and 2011, the City's population grew by 13.8% . However, historically, growth rates have been much lower at an average of 0.5% per year from 1971 to 2006. Because of these fluctuating trends, the City developed three potential growth scenarios in its OCP for the coming decades;

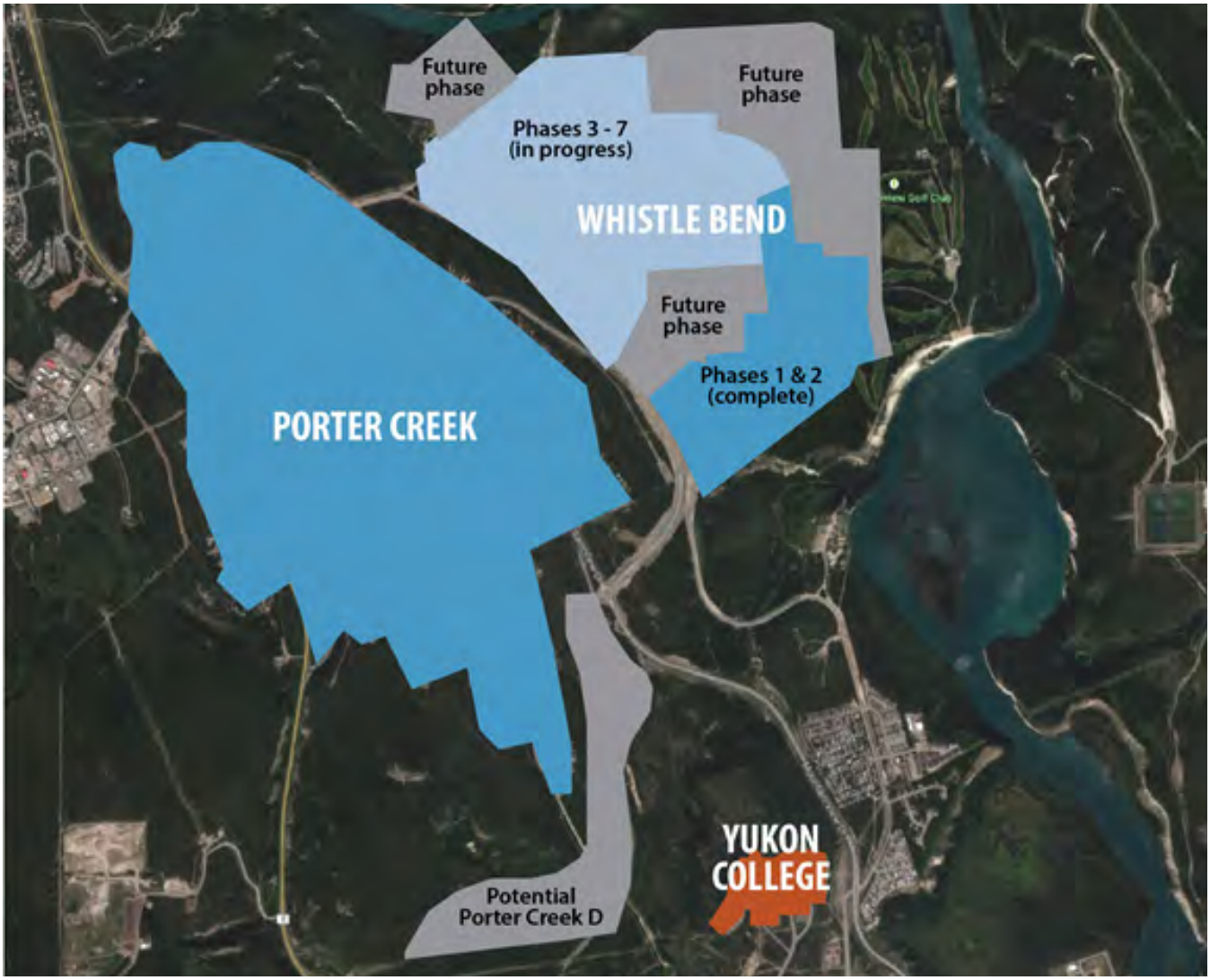


Figure 3 - Adjacent residential growth areas

low (0.5% per year), medium (2% per year), and high (3.5% per year).

To accommodate new growth, the City has identified a number of new residential development areas in its OCP; two of which are within 10 minutes of the College campus (see Figure 3).

Whistle Bend, a master-planned neighbourhood just north of the College, is expected to house 8,000 new residents and include transit service, schools, retail, public parkland and trails. Construction has begun on initial phases and detailed engineering design for the final phases is underway. A land use concept plan is provided in Figure 4 below.

The second proposed development area nearby, Porter Creek D, represents an extension of the existing Porter Creek neighbourhood northwest of the College campus. Porter Creek D was anticipated to accommodate approximately 200 to 300 residential units; however, planning for this neighbourhood has been delayed due to community concerns regarding the planning process, the EDI Wildlife Corridor Assessment and conservation/parks/recreation. Further investigation into the feasibility of the Porter Creek D extension has been put on hold until the final phase of Whistle Bend is constructed .

Figure 4 - Whistle Bend Land Use Plan

3.2 Local Planning Context

The City of Whitehorse **Official Community Plan (OCP)** contains goals, objectives, policies and land use to guide future land use changes within the City. According to the OCP, the Yukon College lands are designated as "Public Service," which allows public and institutional facilities that service the entire community of Whitehorse. Commercial uses, such as retail and restaurants, are also permitted as ancillary uses. However, the creation of a 'retail hub' within the College may require an OCP amendment and approval by the City of Whitehorse, depending on the scale of development envisioned.

The Public Service Designation may also provide for active transportation linkages through the provision of greenbelts. The OCP requires that consideration be given to retaining public access through these greenbelts as part of future development of the College.

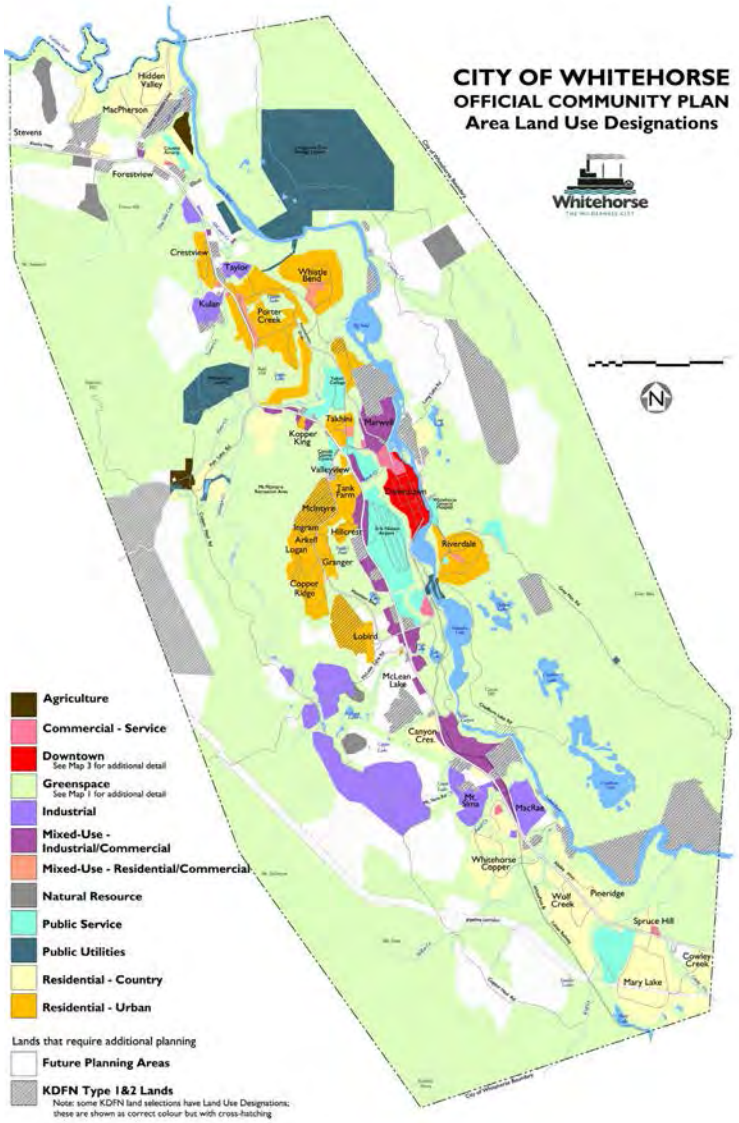
Other considerations in the City's OCP include concentration of cultural facilities in high activity areas such as Yukon College or the City's downtown core, and potential partnerships for sustainability education with Yukon College and other local organizations. The City's Strategic Sustainability Plan (currently being updated) also aims to form partnerships with local institutions to share northern knowledge and advance sustainability education in the region.

The City's **Zoning Bylaw** addresses the specific regulations that guide development on Yukon College lands including the overall density (floor area ratio), site coverage and maximum building heights as well as specifications for accessory building/facility development, ancillary uses, parking, and signage. The zoning bylaw identifies the entire College site as "PS – Public Service," which allows for a broad range of uses including public and privately owned facilities of an institutional or community service nature.

The current zoning limits the building density to 0.5 FAR and site coverage to 45%. The maximum building height is 20 m. In addition to the specific regulations of the PS zone, other general zoning regulations will apply including those covering accessory uses, site design, specific use regulations of section 6 (child care services, etc.), the parking regulations of section 7, and the sign regulations of section 8.

Depending on the form of buildings that are proposed, new development may or may not require an amendment to the City's zoning bylaw.

The new Campus Master Plan and proposed projects may also require review under the **Yukon Environmental and Socioeconomic Assessment Act**, depending on the specific activities and timelines proposed. Generally, projects that involve Territorial land or funding require an assessment under the Yukon Environment and Social Assessment Act. Final determination of whether or not the Campus Master Plan and proposed projects are "reviewable" will be determined by the YESAB Regulator .



3.3 Campus Planning

YUKON COLLEGE EDUCATION PLAN (2008 TO 2013)

The College's former Strategic Plan (2008 to 2013) included six key directions for the College: promoting a community of learners, leading with our strengths in research, programs, and service, working together with Yukon communities, working together with First Nations, building a vibrant and sustainable organization, and improving the identity of the College.

YUKON COLLEGE STRATEGIC PLAN (2013 – 2016)

The College's current Strategic Plan was developed with a broad consultation process that engaged over 420 people through public meetings, presentations, and focus groups. There were initial concerns that community input would not be incorporated in the plan, as a number of participants were cynical from the results of the previous plan's consultation process . To help alleviate these concerns, the College undertook a second phase of consultation in the form of a community forum. The forum involved over 120 people who explored key ideas and goals in greater depth.

The two-phase consultation process received important input from participants and resulted in a number of key values and directions for the short and long-term future of the College. The major themes that emerged from consultation were the importance of First Nations influence, the presence and leadership of the College in all communities and sectors, the importance of supporting community campuses, the challenge of the education gap for Yukon youth and adults entering post-secondary, the existing strengths of the College, the role of the College in the community, and the expectations of specific user groups such as students, employers and industry groups, governments, and the broader community.

Feedback included a significant focus on a supportive learning environment and accessibility (e.g., child care, housing, transportation), innovation and northern knowledge research (e.g., construction and permafrost, climate change, northern food production, First Nations governance, renewable energy, environmental protection, reclamation), skilled trades and training for local jobs (e.g., mining, mine reclamation, mental health), community partnerships (e.g., with government, other schools, First Nations initiatives, Northern Research Centre, Northern Institute of Social Justice, etc.), and community presence (e.g., facilities for community uses, arts and culture hub). Participants also raised concerns about the dynamics of changing from a College to a University in terms of funding, housing, students/teachers, community relations, and quality of learning.

Input from the two-phase consultation was compiled and refined by the Board of Governors into a focused three-year plan with the following key goals:

- Design a unique post-secondary education model that is influenced by the Yukon's unique culture, economy, and northern environment
- Collaborate with First Nations to strengthen relationships and enhance capacity.
- Engage Yukon Communities to enhance their educational opportunities.
- Ensure quality to attract and retain students.
- Expand northern research and innovation opportunities.

4 COMMUNITY OVERVIEW

4.1 Demographics

POPULATION

As of the 2014 Census, the City of Whitehorse's population was 26,711, representing 76% of the total population of the Yukon.

As the City's population makes up such a large portion of the Yukon's population, the distribution of sex and age ranges is quite similar. Compared to the broader Canadian population in the 2011 Census, the City has a higher proportion of youth and young adults (15 to 29 years) and a smaller proportion of seniors (65 and over). However, Whitehorse is similar to the rest of the nation in that its largest population is in 45 to 54 year range.

The age distribution of Whitehorse's population has implications for the future of the City's labour force, housing and transportation, industry sectors, and educational needs. While the baby boomer generation is aging, the City has a relatively high proportion of youth and young professionals entering the labour force compared to other regions. However, these younger generations require certain resources and amenities to stay in the community.

LABOUR FORCE

In the 2011 National Household Survey, the labour force participation rate for people aged 15 and over in Whitehorse was 80%. This is slightly higher than the participation rate for the Yukon (77.3%) and significantly higher than the national average of 66%.

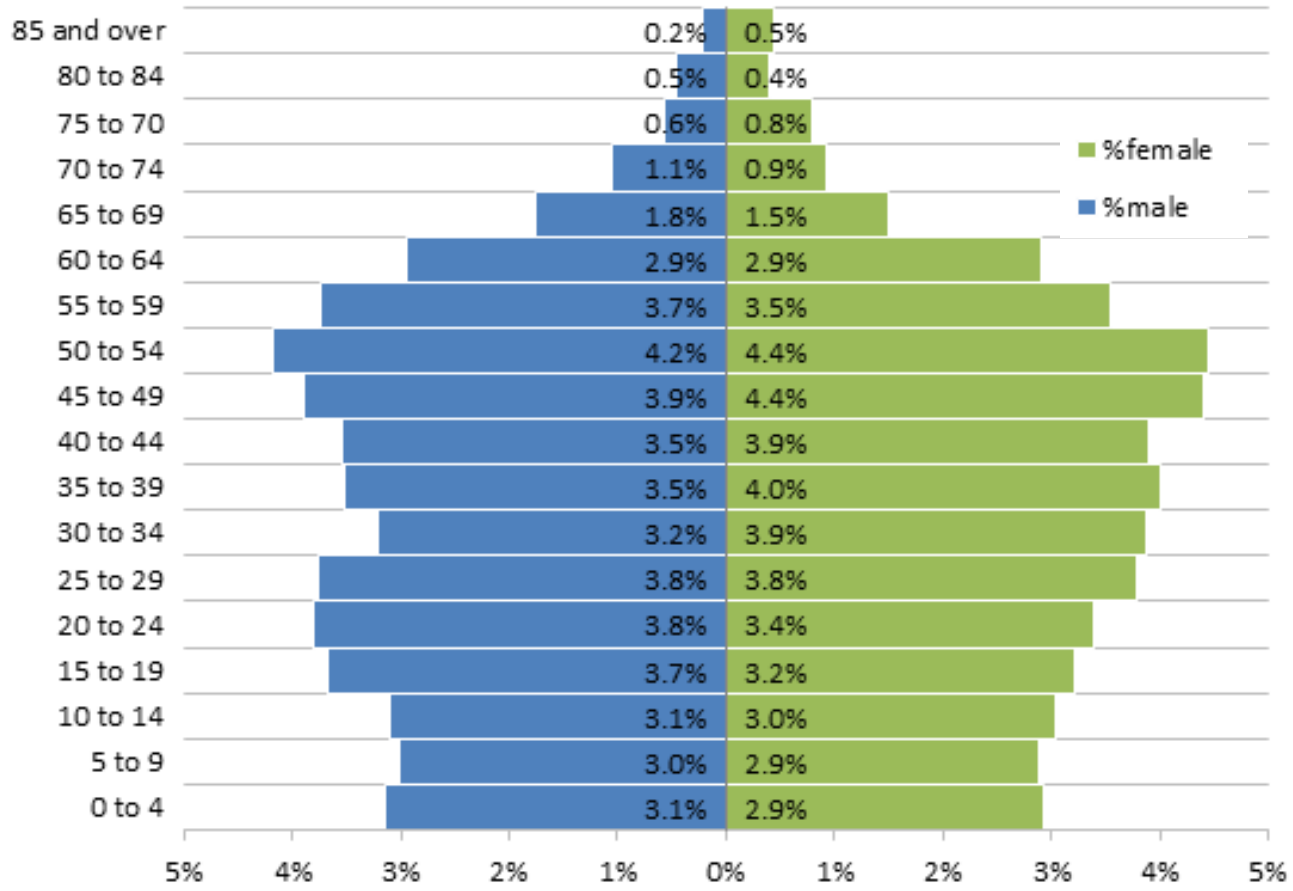


Figure 5 - Whitehorse Population Distribution (2011)

Unemployment rates in Whitehorse average 7.6% with a higher rate of unemployment for males (8.1%) compared to females (7%). These rates are lower than those of the Yukon (average 9.8%) and similar to the national average (7.8%).

The majority of jobs in Whitehorse in 2011 were in public administration, retail trade, construction, accommodation and food services, health care and social assistance, professional/technical services, and educational services.

INCOME & HOUSEHOLD CHARACTERISTICS

As of 2010, individual income in Whitehorse and the Yukon was higher than the nation as a whole. Average income for males was $5,590 higher than females in Whitehorse and $11,226 higher for males than females at the national level (refer to Table 1).

In 2011, average monthly shelter costs in Whitehorse were $1,287 for owners and $1,045 for renters, slightly higher than the Yukon and Canadian averages. Close to 22% of Whitehorse households spent 30% or more of their total household income on shelter costs, compared to 20% in the Yukon and 25% in the nation as a whole. However, the percentage of renters in subsidized housing was significantly higher in Whitehorse (19.1%) and the Yukon (21.6%) than the Canadian average (13.7%).

EDUCATIONAL ATTAINMENT

The majority (90%) of Whitehorse adults aged 25 to 64 have a high school diploma or higher. Overall, Whitehorse has slightly higher educational attainment than the Canadian average (refer to Table 2).

Over 16.5% of Whitehorse's population self-identifies as Aboriginal compared to 4.2% of Canada's population.

Table 1 – Comparison of Whitehorse Individual Income to Yukon and Canada

After-Tax Individual Income for Population Aged 15 and Over (2010)	Whitehorse	Yukon	Canada
Median Individual Income (the middle point between high and low income)	$38,680	$36,516	$27,334
Average Individual Income (the arithmetic mean of all household's income)	$42,349	$40,654	$33,998

Table 2 – Comparison of Whitehorse Education to National Average

Level of Education for Population Aged 25 to 64	Whitehorse	Canada
No certificate, degree, or diploma	10%	13%
High school diploma or equivalent	21%	23%
Post-secondary certificate, diploma, or degree (including trades apprenticeships)	69%	64%

4.2 People, history + culture

Yukon's heritage brings together First Nation's cultures, the history of the Klondike Gold Rush and the dramatic natural beauty of the northern landscape.

FIRST NATIONS

There are fourteen First Nations and eight language groups in the Yukon. Historically, First Nations people lived on the land and the Whitehorse or Yukon River Valley was used for fishing, hunting, gathering food and as a meeting place. Archaeologists estimate that the first people inhabited the Yukon more than 10,000 years ago after crossing the Bering land bridge, from Asia. The First Nations of the Whitehorse area did not establish large villages with permanent structures, however, archaeological digs have shown the continual use of seasonal hunting and fishing camps in the Yukon Valley for more than 5,000 years (OCP, 2010).

Today, First Nations people play a significant role in all aspects of Yukon society including governance, resource management, economy, art and culture.

Yukon College is adjacent to settlement lands of the Kwanlin Dun First Nation and the Ta'an Kwach'an Council. The Kwanlin Dun First Nation has cultural affiliations with the Northern and Southern Tutchone, the Tagish from Marsh Lake and an amalgamation of several other Yukon First Nation culture groups (OCP, 2010). The Ta'an Kwach'an Council separated from the Kwanlin Dun First Nation in 1998. Traditionally, the Ta'an Kwach'an people were concentrated in the Lake Laberge area.

Both First Nations share an ancient connection to the land, a history of subsistence and a respect for the land, the forces of nature and the animals and plants they share them with. The culture of Yukon's First Nations people evolved over thousands of years and can be seen today in a rich tradition of arts, crafts, cuisines and practices.

As a growing northern capital city, Whitehorse attracts a wide variety of new immigrants and transplants from other parts of Canada. With this comes the general transience associated with life in northern communities. The campus attracts students from across the north and around the world representing a rich cultural diversity that can be captured in future on-campus housing and the necessary supporting infrastructure associated with a critical mass of housing.

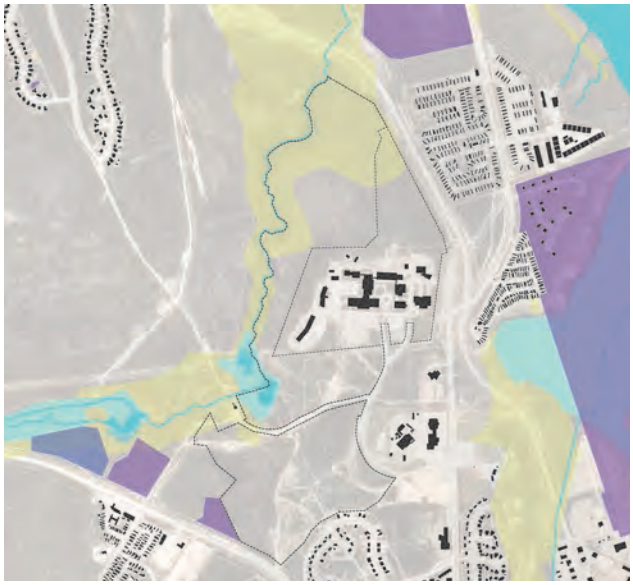


Figure 6 - Settlement Lands adjacent to Yukon College

KLONDIKE GOLD RUSH

In 1896 three men found gold near Dawson City and launched the legendary Klondike Gold Rush. When news of the discovery reached the rest of the world, thousands of stampeders headed north. In 1990, the

Figure 7 - Prospectors ascending the Chilkoot Pass, 1898

White Pass and Yukon Route railway was completed and Whitehorse came into being at the railhead. From early on, development in the north was often considered impossible. The history and culture of Whitehorse is strongly influenced not only by First Nations, but also by the pioneering spirit of those who came thereafter.

WWII + THE BUILDING OF THE ALASKA HIGHWAY

Completed in 1942, the construction of the Alaska Highway construction brought tremendous change to the Yukon. Constructed originally for military purposes, the first overland route through the Yukon brought with it significant infrastructure to Whitehorse including an airport, oil pipeline and refinery. Thousands of United States military personnel were stationed in Whitehorse, swelling the local population to more than 10,000, and changing forever the little community's way of life. Since those early days, the highway has remained an important factor in the physical development of the City as the Yukon's key service centre.

ARTS + CULTURE

As the largest city in the Yukon, Whitehorse attracts businesses, tourists, artists, and others looking to experience northern culture. Yukon is internationally acclaimed for outdoor sport and wilderness adventure tourism including mountain biking, canoeing, hiking, skiing, sledding, hunting, fishing and berry picking.

Yukoners are also known for their love of arts, music and theatre. Festivals, performances, events and activities are planned year-round, whether in the depth of winter or during the long days of summer. Francophones have contributed significantly to the culture of the Yukon since the 1800s when they came as pioneers, missionaries, prospectors and merchants. The francophone community has a French-language newspaper, festivals, a cultural centre and school.

The Yukon Archives, Yukon Arts Centre (YAC) and Yukon Gallery are all situated on the Ayamdigut campus and form a cultural district within the campus. Associated with the Yukon Art Gallery is an outdoor sculpture garden that highlights the works of various Yukon artists and the Yukon Government's permanent art collection, located within the YAC. Though the YAC is the marquee performing arts facility in the community, there is significant opportunity at the college to further express the cultural diversity found in the Yukon. Of key importance, is the incorporation of art, culture and arctic expression throughout the campus with a particular emphasis on the First Nation contribution to the artistic community.

Figure 8 - Yukon theatre performances (source: Tourism Yukon)

5 URBAN DESIGN ANALYSIS

The Ayamdigut campus is located approximately 4 kilometres north of downtown Whitehorse and approximately 3 km south of Whistle Bend, a large new mixed-used community that will provide housing for Whitehorse's growing population.

The physical conditions on the site and the way it relates to it's context create a number of preliminary opportunities and constraints that are summarized below. It is important to note that many features of the campus can be seen as both opportunities and constraints. Our initial thinking on some of the defining features of the site are highlighted below. More detailed analysis can be found in Section 5.1 - 5.2 of this report.

OPPORTUNITIES

- **Views**: Yukon College is location on an elevated plateau with views to the east, west and south. This represents an opportunity to enhance views to and from the site and take full advantage of the dramatic natural setting of the Yukon River Valley and surrounding mountains.
- **Dramatic Natural Setting:** The campus is surrounded by forested areas and an extensive trail network linking the campus to McIntyre Creek and other environmental areas that are important for wildlife habitat, stream health and recreation. This setting should be more deeply incorporated into the campus master plan to enhance a unique sense of place and connection to the land.
- **Yukon Research Centre (YRC):** The YRC hosts a number of programs and services to develop northern research, innovation and outreach including renewable energy generation that can help to support and reinforce the College's leadership in sustainability and applied research.
- **Existing Housing**: Residences for students and seniors are located within the core campus area and can help to support a more vibrant campus community and potentially neighbourhood serving retail
- **Trail Network**: An extensive trail network, including the TransCanada Trail, provides numerous opportunities for recreation within and around the campus lands.
- **Cultural Uses**: The Ayamdigut campus is home to the Yukon Archives and the Yukon Arts Centre. Both of these uses invite non-College users onto the campus, supporting activity and diversity outside of the usual College-related activities.

CONSTRAINTS

- **Disconnected 'Hilltop':** Due in part to the steep topography and thickly vegetated surroundings, the campus has only one vehicle access point and the steep topography represents a potential barrier to cyclists and pedestrians.
- **Environmental Sensitivity:** The Ayamdigut campus is immediately adjacent to several environmentally sensitive areas including McIntyre Creek. Any new development in this area will need to respect and protect these areas.
- **Limited Transit Service**: The lack of development intensity within and adjacent to the campus means that the density doesn't currently exist to support frequent transit service. Night service is fairly limited which makes it difficult for faculty, students and staff to rely on transit to get to and from the College after hours.
- **Limited Developable Area:** The campus is surrounded by steep slopes, vegetated areas and environmentally sensitive areas making the actual developable area within the College Reserve Lands quite constrained.
- **Cold Climate:** Whitehorse's cold climate makes the layout, design and location of outdoor spaces very important for creating microclimates that support the use of outdoor space. Cold temperatures and limited daylight in the winter also influence building performance and make the building envelop particularly important for energy use and occupant comfort.
- **Inefficient Building Envelopes**: Some of the older buildings on campus suffer from inefficient building envelopes that result in high energy use. This constraint also represents an opportunity to use new development to improve building envelopes of existing buildings.

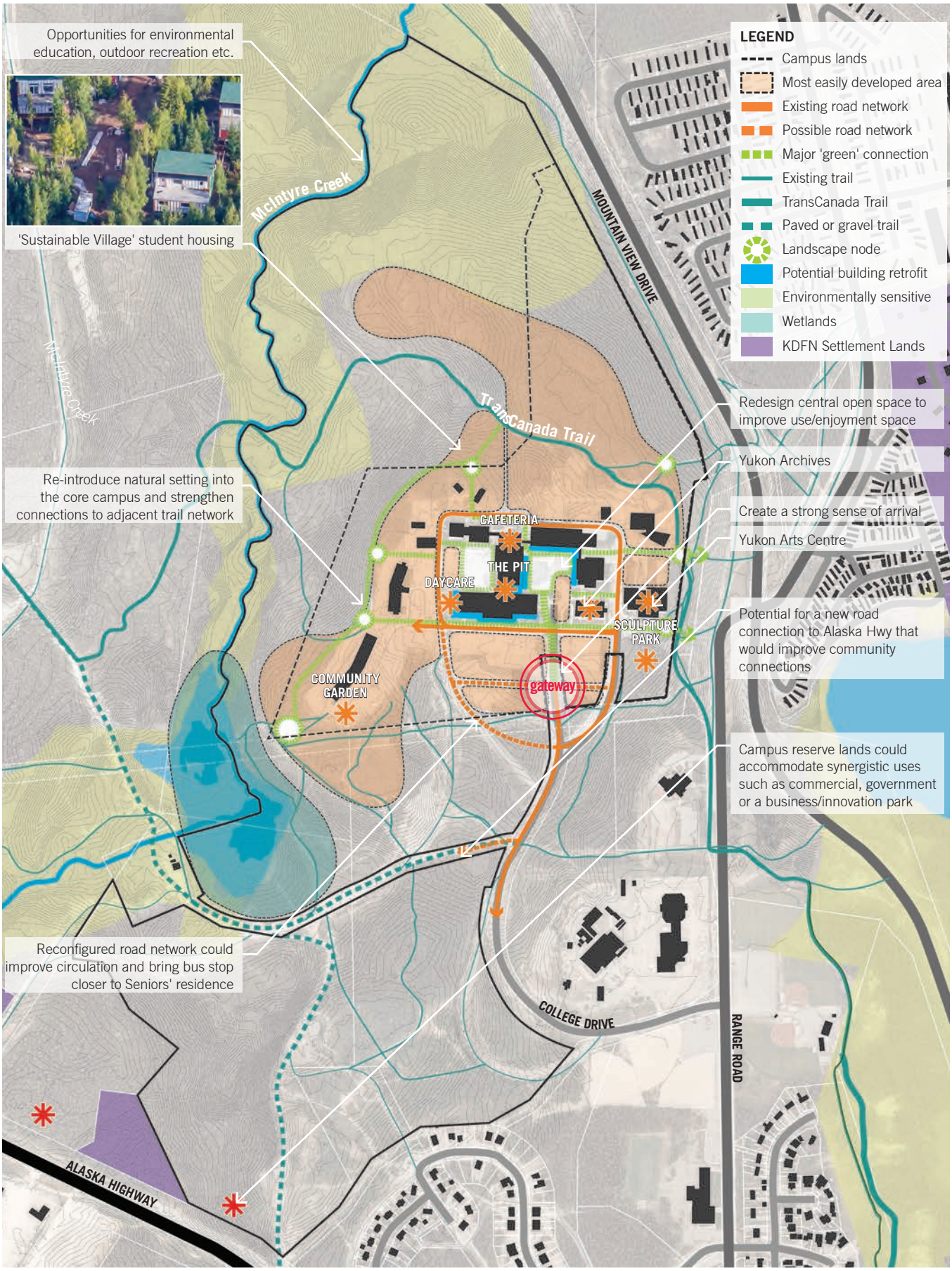


Figure 9 - Opportunities + constraints

5.1 Physical Conditions

TOPOGRAPHY

Yukon College is situated on a small plateau that slopes steeply downward 20-25 metres to the south, west and east with a more gradual slope of similar elevation to the north. To the west the site slopes steeply towards McIntyre Creek and to the east it slopes towards Range Road and a large wetland beyond. Access to the College is granted along College Drive which climbs steadily from Range Road to the campus.

Note: Available topographical information does not reflect all new buildings/development undertaken recently on the campus.

SOIL

The site is situated on a well-drained sand and gravel bluff. Based on a historical data review conducted in 2012 by EBA Engineering Consultants Ltd., general subsurface conditions on the Yukon College property consist of 5.3 - 6.0m of sand with trace silt underlain by 3.5 - 4.1 m of gravel overlying sand with some gravel of unknown thickness. There is no groundwater, permafrost or bedrock recorded. Boreholes to a depth of 15.2m.

ASPECT + VIEWS

The dramatic topography of the site affords the College a number of significant views of the Whitehorse Valley towards the Yukon River and the City of Whitehorse's downtown core. There are also views to the west overlooking McIntyre Creek (Figure 11).

Figure 10 - Steep slopes

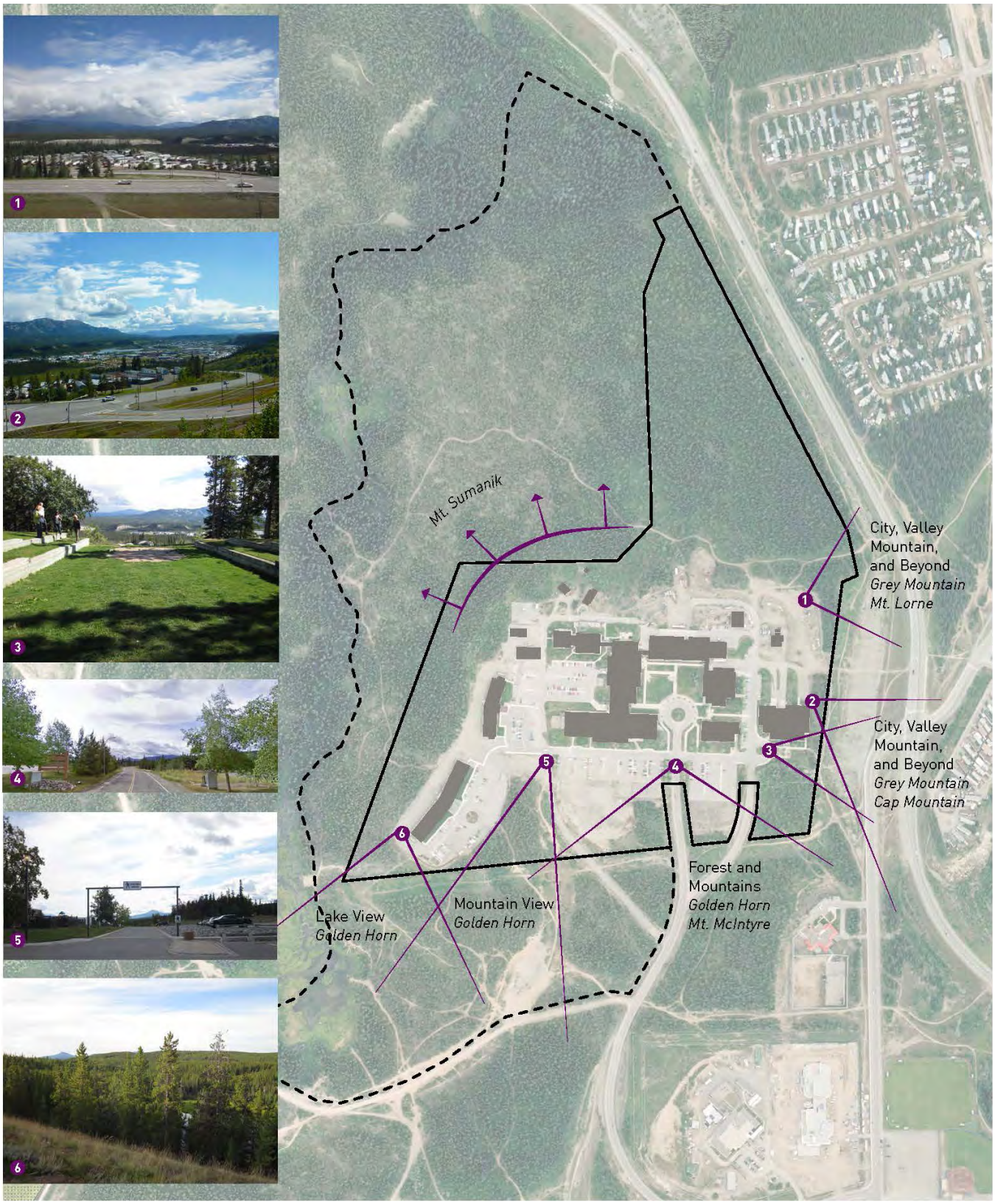


Figure 11 - View from the Yukon College site

5.2 Environmental Considerations

CLIMATE

At a latitude of 60.7 degrees north, Whitehorse is one of Canada's most northern cities. Its climate is milder than cities of similar latitude, however, due to its location in proximity to the Pacific Ocean. The longest day of the year lasts 19:08 hours, and the shortest night 18:22 hours.

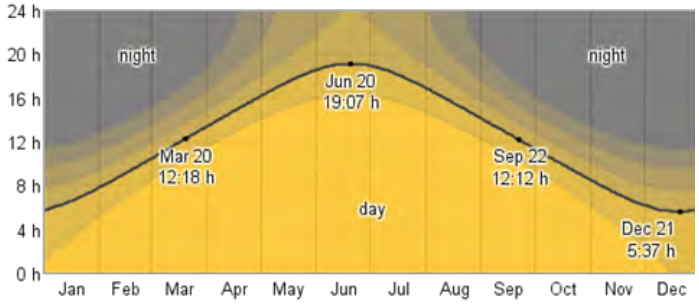


Figure 12 - The number of hours during which the Sun is visible (black line). Source: https://weatherspark.com/averages/28430/Whitehorse-Yukon-Territory-Canada

The warm season lasts from mid May to early September and enjoys daily highs above 13°C on average, while the cold season which lasts from mid November to mid February has an average daily temperature below -7°C.

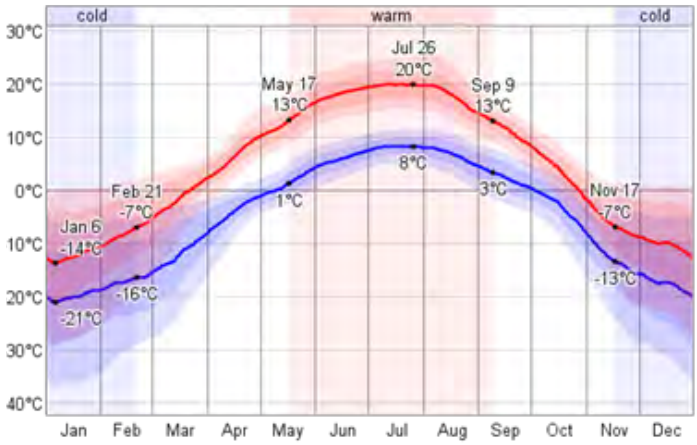


Figure 13 - Source: https://weatherspark.com/averages/28430/Whitehorse-Yukon-Territory-Canada

Falling within the Cordilleran climate region, Whitehorse has a dry subarctic climate. Far from being snow covered, Whitehorse is the driest city in Canada with an annual snowfall of 145cm and only 163mm of rain. In the cold season, there is a 61% chance that some precipitation will fall during the day.

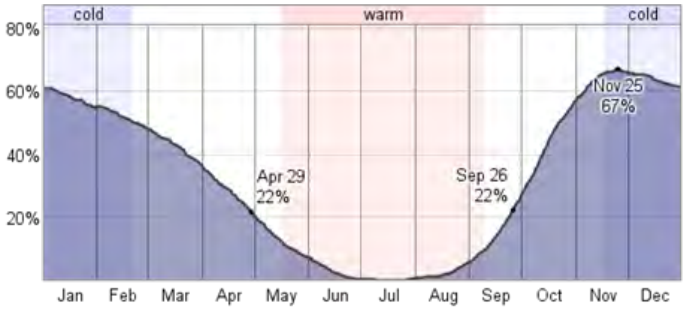


Figure 14 - Source: https://weatherspark.com/averages/28430/Whitehorse-Yukon-Territory-Canada

Winds typically range from 0 m/s to 8 m/s, or calm to moderate breezes, over the course of a year, and are predominantly from the south or south east.

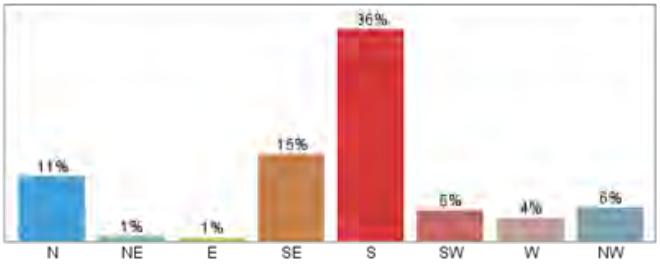


Figure 15 - Wind directions over the year. Source: https://weatherspark.com/averages/28430/Whitehorse-Yukon-Territory-Canada

ECOLOGY AND VEGETATION

The Yukon College site falls within Mid-Cordilleran Boreal region. Plant associations are as follows:

> "Its reference sites have closed and semi- closed canopied stands of Pinus contorta ssp. latifolia (lodgepole pine). Mature P. contorta seldom exceed 20 m in height and are typically shorter. Associated understory species commonly include Vaccinium vitisidaea (bog cranberry), Cornus canadensis (bunchberry), Hylocomium splendens, and Pleurozium schreberi (Schreber's moss) (Strong, 2002). Calamagrostis purpurascens (purple reedgrass) also occurs in association with S. canadensis.
>
> Stands on submesic coarse-textured soils develop a ground cover of Arctostaphylos uvaursi (bearberry), whereas drier sites have reduced P. contorta cover and an abundance of Cladina spp. (reindeer lichens). In contrast, warm south-facing slopes develop Populus tremuloides/Rosa acicularis and P. tremuloides/A. uva-ursi stands, with the latter occupying the driest sites. C. purpurascens – A. uva-ursi vegetation occurs on subxeric steep southfacing slopes. Wetlands of Salix spp. and Carex aquatilis (water sedge) develop where early summer flooding and water pooling occur, whereas P. mariana-dominated vegetation develops where near-surface soils are wet, but not continuously flooded with water, and often have a poor nutrient status."

Source:http://pubs.aina.ucalgary.ca/arctic/Arctic66-1-52.pdf

WATERBODIES

The city of Whitehorse is Approximately 270 Km from Gulf of Alaska Ocean (Pacific Ocean).

There are views from the Yukon College campus to the Yukon River 2.5 km to the east. Of particular significance in First Nations culture, Lake Leberge lies to the northeast, and Fish Lake to southwest. Most relevant to this study, however, is McIntyre Creek and its small lakes adjacent to the City of Whitehorse pump house southwest of the campus.

ENVIRONMENTALLY SENSITIVE AREAS

The majority of the wildlife area identified in the AEM Significant Wildlife Area Report of 2010 is located within the Yukon College Reserve Lands.

> "This area was identified for its mature riparian forest and wetland habitat characteristics. The most important forested area along this riparian corridor occurs behind Yukon College and is comprised of mature, highly structured spruce-feathermoss (SF) and spruce-willow (SW) ecosystems. Portions of this drainage contain residual forest patches that escaped the early 1920s fire event that affected most of Whitehorse West. Along with Wolf, Cowley and Croucher Creeks, these lowland forests provide some the best examples of mature riparian spruce ecosystems in Whitehorse. These riparian forests exhibit a large degree of vertical structure and contain a wide range of tree sizes; this diverse stand structure creates a number of different habitats for forest birds.
>
> The main wetland in this area occurs behind Yukon College. It is comprised of a marsh and shallow open water (OW). Beaver activity has maintained high water levels in this wetland. A grass-sage (GS) overlooks the Yukon College wetland."

Due to its significance as a wildlife corridor, it has been recommended that the section of McIntyre Creek near the Yukon College be protected and buffers established.

> "Given the amount of development and human activity in Middle McIntyre, we suggest that managing the area as a movement corridor for large animals (e.g. bear and moose) should not be considered because of potential human-wildlife conflicts.
>
> To maintain an area acceptable for wildlife movement through Middle McIntyre, we recommend including two wildlife movement corridors: one primary and one secondary corridor. We suggest developing a 350m primary buffer, where possible, to maximize the effectiveness of the movement corridor. However, this width may not be possible because of design constraints or existing land uses; therefore we recommend a minimum 250 m buffer in these areas."

Source: McIntyre Creek Wildlife Corridor Assessment

- Lawn with trees
- Lawn
- Planting
- Forest
- Disturbed area
- Building
- Hardscape
- 25m ecological buffer
- High wildlife values
- High environmental sensitivity
- Zone of awareness of wildlife areas

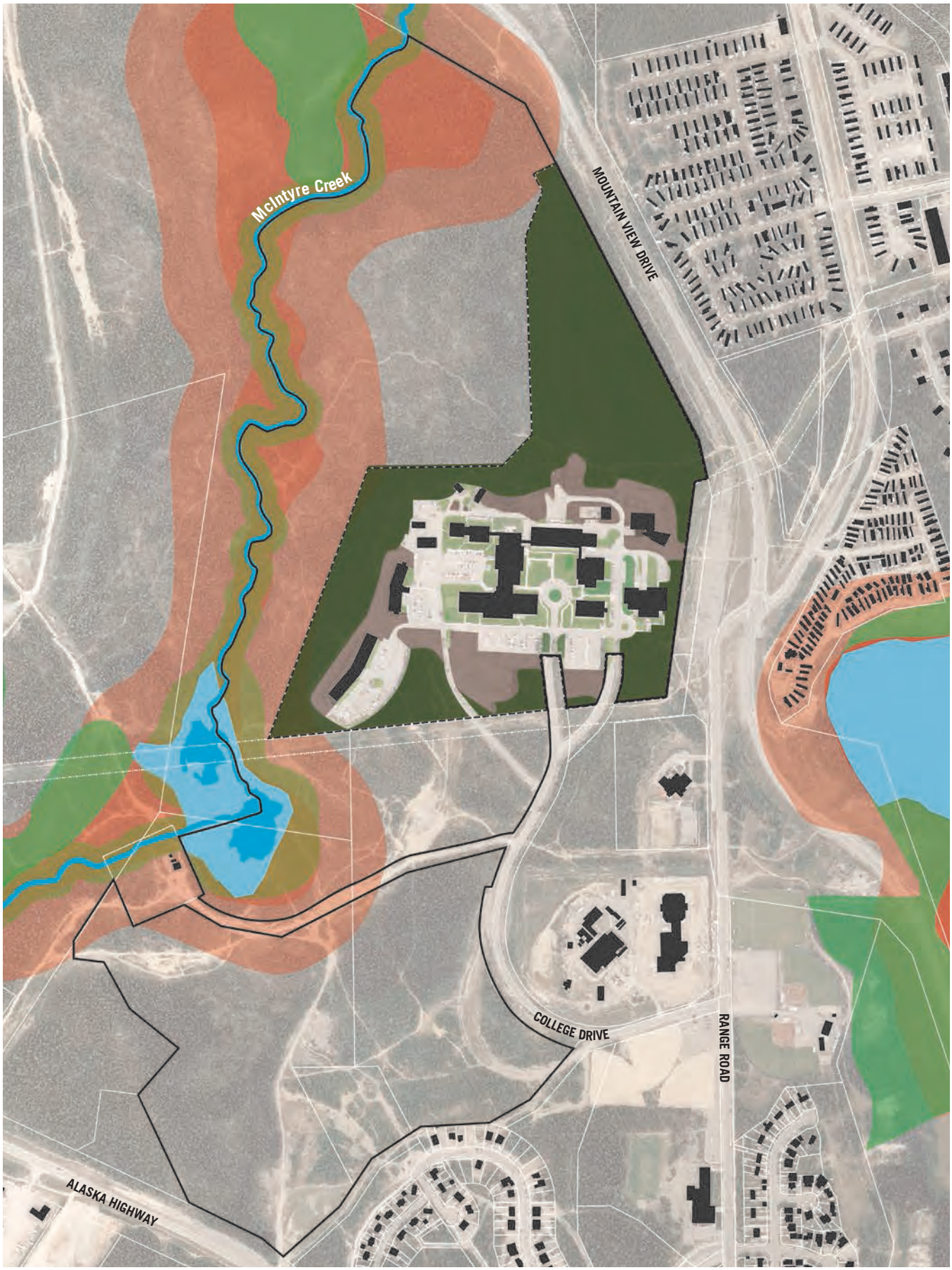


Figure 16 - Environmentally sensitive areas

5.3 Existing Site Development

BUILT FORM

Academic buildings on campus are 1-2 stories with peaked roofs and skylights that provide daylight to the interior spaces. The academic buildings are linked by corridors and to adjacent residences and the gymnasium. This allows for students to move throughout the campus during winter months without having to go outdoors.

The Students Residence and the Seniors Residence are 4 storey, wood frame, condo-style buildings that front onto large surface parking lots. Additional, smaller-scale Residences are found to the north of the core campus area.

BUILDING USES

The College's core academic uses are clustered around a central courtyard in three connected wings (the Academic wing, the Commons wing, and the Trades wing). A gymnasium is linked to these wings and forms the eastern boundary of the central courtyard.

Residences are generally located around the western periphery of the existing campus development and include a Seniors Residence, a Student Residence, a YRC Residence, an Attached Family Residence and an Attached Singles Residence. The A-wing also includes a daycare for faculty, staff and students.

The Yukon Archives and the Yukon Arts Centre are located within the southeast quadrant of the core campus. A new Centre for Northern Innovation in Mining (CNIM) building is currently in the final stages of design and will be constructed immediately north of the Yukon Arts Centre.

Figure 17 - View of central courtyard from the outdoor lounge area above 'the pit'

Figure 18 - Skylights provide daylight within the internal circulation networks of the a-, c-, and t-wings

Figure 19 - View of central courtyard from the Yukon Archives building

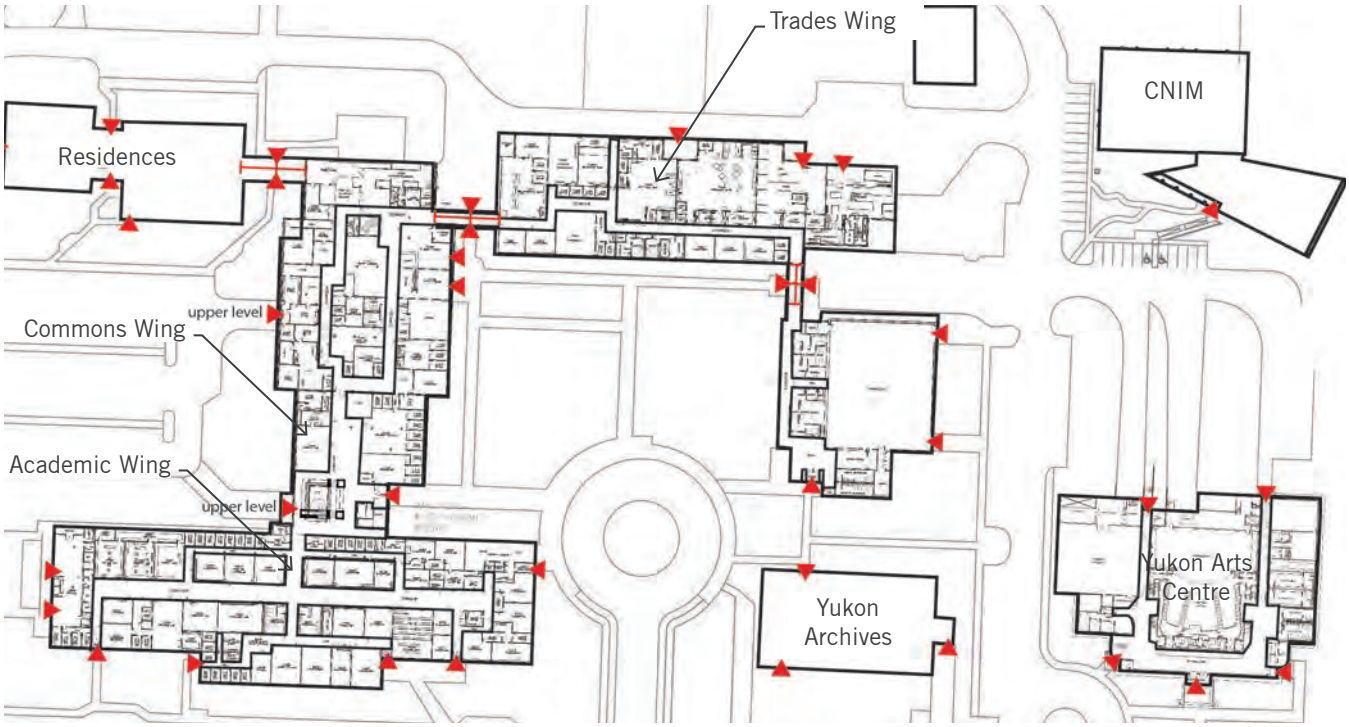


Figure 20 - Academic floor plans

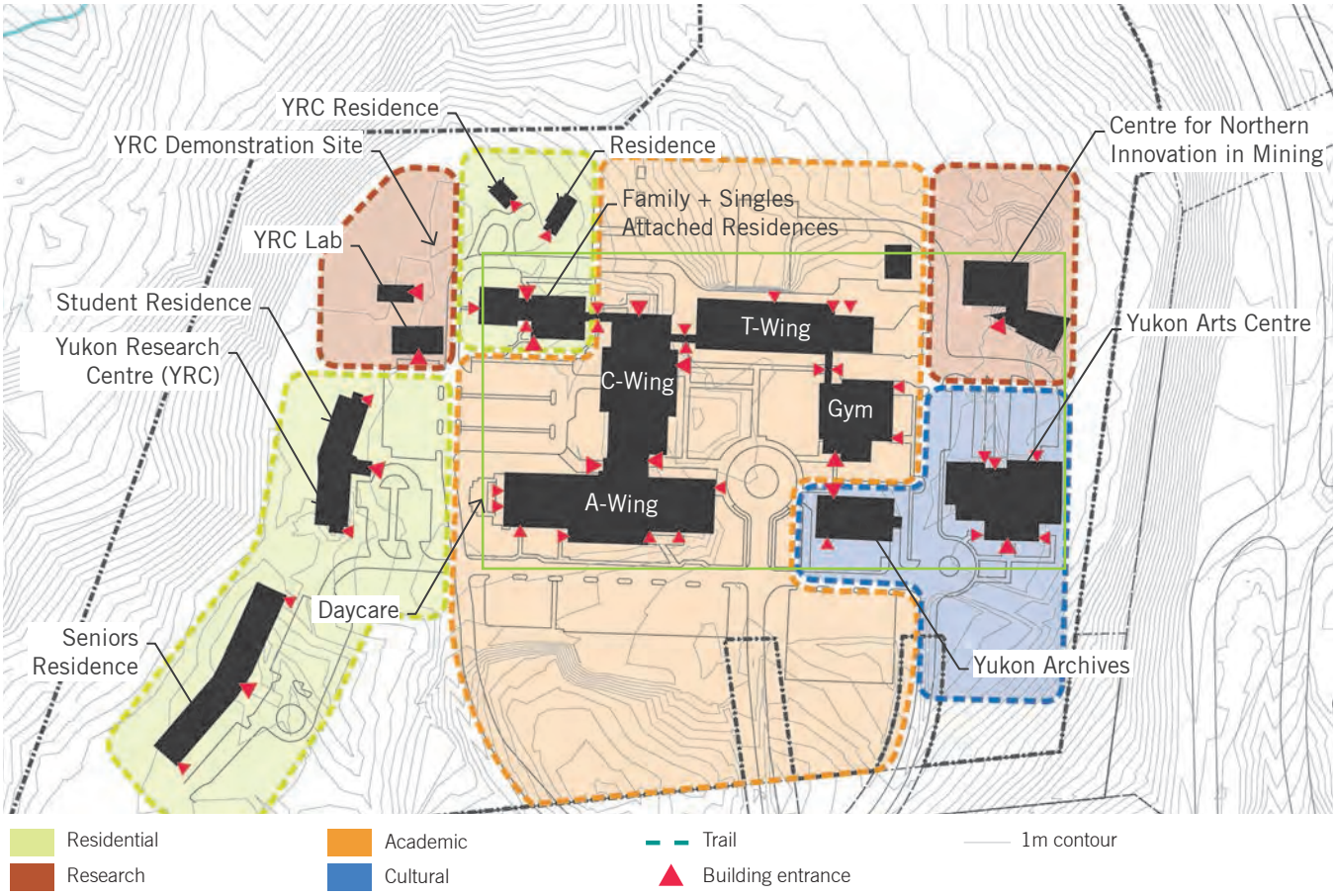


Figure 21 - Built form

5.4 Open Space Opportunities

Figure 18 shows locations and programs of existing open spaces and is intended to illustrate two things. First, the diagram shows the distribution of programmed open space on campus, revealing that all buildings do not have equal access to adjacent outdoor amenity. Second, the legend lists programs currently accommodated on campus, making it easier to see which desired uses are not currently supported and where there are opportunities to expand on existing programs. This information helps to set priorities for future open space planning.

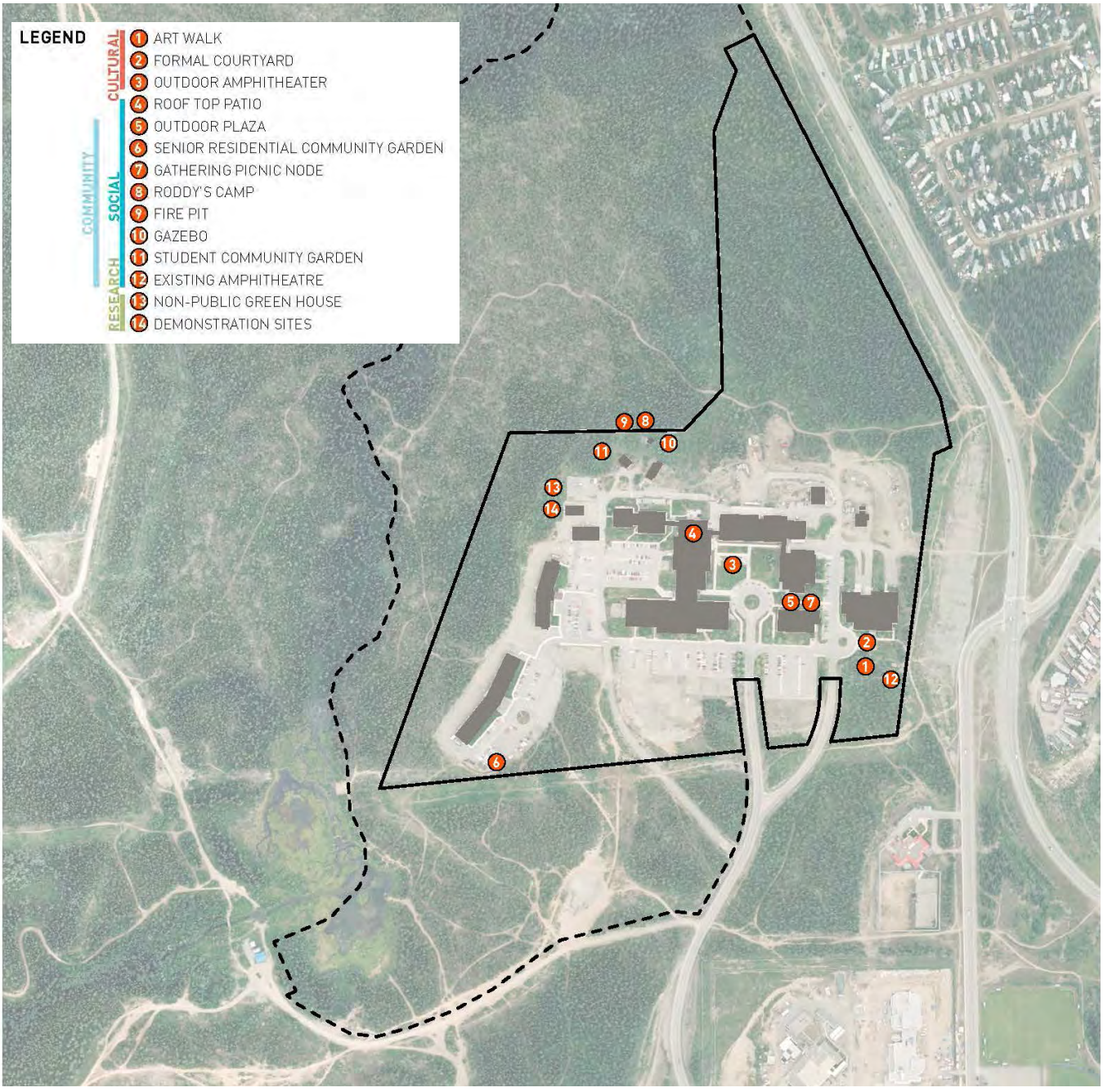


Figure 22 - Existing open spaces

Figure 19 shows proposed open space locations and programs. These respond to existing site conditions and microclimates, adjacencies to site features such as views or trailheads, and current programming. This diagram shows how the open space plan could serve to provide more diverse, and evenly distributed programs to site users.

1. Shared recreation space: with play equipment: seniors, students, toddlers
2. Expanded trail head: a stronger connection to trail system, interpretive trail
3. Potential key bus stop: uses buildings to provide shelter, recreational space for residents
4. Potential courtyard: with potential for light commercial use in a potential future building
5. Renovation of existing courtyard: potential for laminating space to existing SUB, landscape to respond to future development
6. Trail head: interpretive trail, pedestrian access to campus, warming hut, winter recreation hub
7. Celebration + learning plaza: with access to TransCanada Trail
8. Connection node: with TransCanada Trail
9. Expansion of cultural programs: preserve views to the east, access to TransCanada Trail
10. Expand community garden: create more informal residential outdoor spaces

Figure 23 - Open space opportunities

5.5 Movement

This section provides a high level overview of mobility on the campus. More detailed discussion of transportation can be found in Section 6 of this report.

PEDESTRIANS

The pedestrian network at Yukon College is fairly well-developed, with many paved pathways linking the campus buildings. However, the network is less developed leading to the campus -- College Drive does not have dedicated sidewalks and Range Road only has a sidewalk on its western edge. Steep slopes and relatively long walking distances make accessing the campus by foot somewhat difficult.

CYCLING

Both College Drive and Range Road have dedicated bike lanes in place which connect Yukon College to a larger, city-wide network of bike lanes and paths. Gravel trails also connect the campus to nearby neighbourhoods.

TRANSIT

The campus is connected to downtown Whitehorse via the Route 5 bus [Takhini - Lobird - Copper Ridge Express], which stops at the roundabout at the campus centre as well as the intersection of College Drive and Range Road.

VEHICLES + PARKING

The current network favours cars and trucks as the preferred method of transportation. On-site parking at the campus is all surface parking, primarily located to the south and west of the main campus block.

RECREATION

The area surrounding the campus contains many trails, ranging from paved multi-use pathway to gravel and dirt trails which are used for biking, hiking and ATVing. There are also extensive cross-country ski and snowshoe trails located less than 3 kilometers away at the Mt. Mac Recreation Centre. The Trans Canada trail loops around three sides (north, east and west) of the core campus area and there is the potential for a sub-loop encircling the campus.

Figure 24 - There are numerous ways to access the campus including cycling, transit and even cross country skiing during winter months

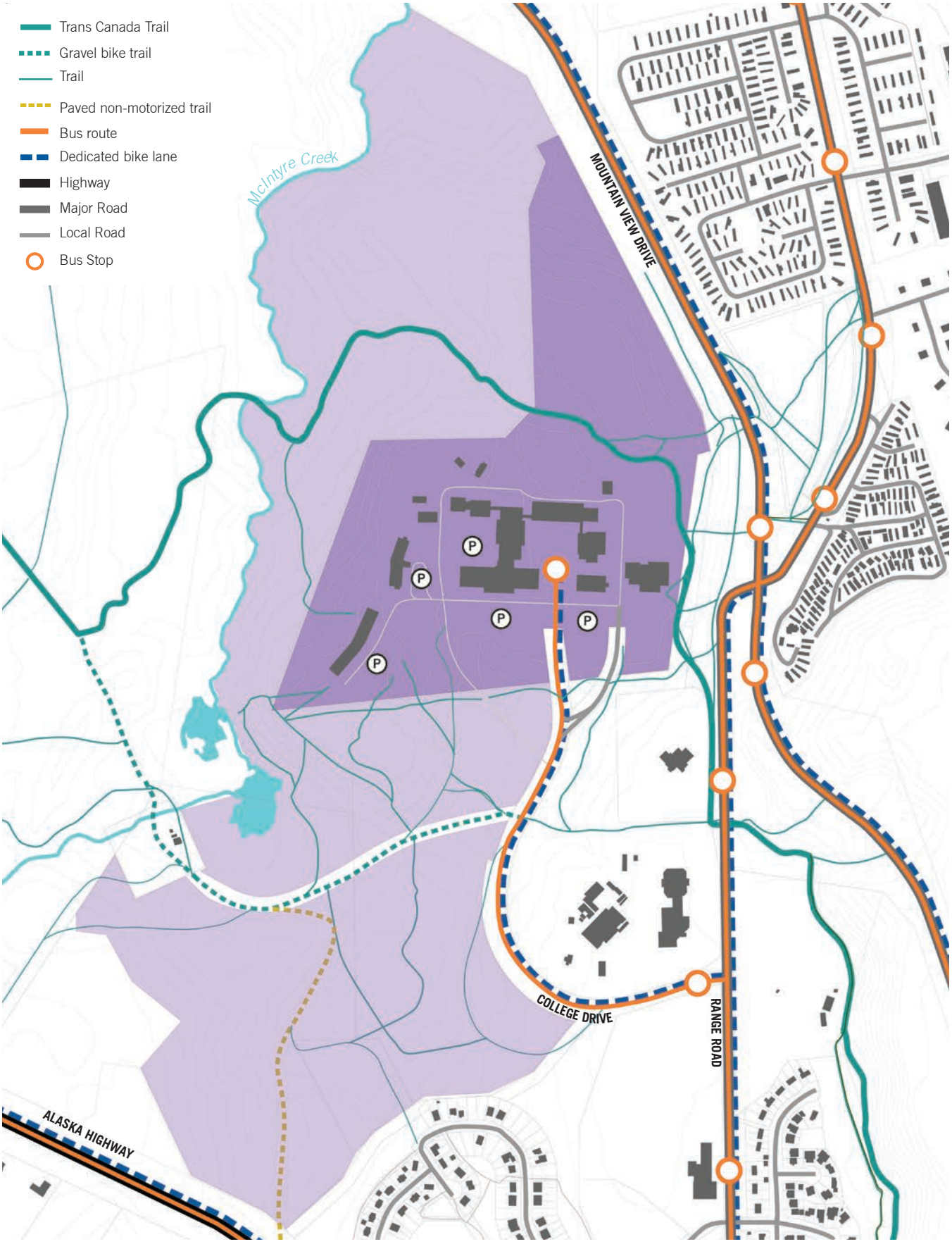


Figure 25 - Movement networks

5.6 Sustainability Findings

Opportunities for implementing sustainability on the Ayamdigut campus generally fall into three broad categories:

- Site-wide sustainability;
- Renewable energy; and
- Cold climate design.

SITE-WIDE SUSTAINABILITY

Site-wide sustainability strategies include approaches to habitat, stormwater management, water treatment, district heating, food production, waste management and transportation. The potential for site-wide sustainability strategies on the Ayamdigut campus are discussed below.

HABITAT: The Ayamdigut campus is located within a rich natural setting in close proximity to adjacent environmentally sensitive areas. An important sustainability strategy will be to reintegrate the natural environment into the campus landscape and thereby restore and enhance the ecological function of the core campus. In addition, future development will minimize disruption to the natural environment by implementing a tree retention strategy and using best practices in low impact northern development.

STORMWATER MANAGEMENT: Permeable soil conditions and limited precipitation on the Ayamdigut campus mean that stormwater management is not of major concern. Landscape design should continue to focus on on-site rainwater infiltration and avoid reliance on collection and conveyance stormwater systems.

WATER TREATMENT: Sanitary infrastructure on the campus is under-sized and new development will likely require upgrades to the existing infrastructure. Opportunities to treat greywater and/or blackwater as part of a strategy to reduce pressure on the sanitary system and provide opportunities for education and innovation in water treatment in a northern context should be explored as part of the master planning process.

DISTRICT HEATING: The Yukon College currently uses an oil-burning district heating system that is relatively inefficient and relies on a non-renewable fuel source. As part of a site-wide sustainability strategy, the College should look for opportunities to transition away from oil to a more sustainable fuel source. Over the short term this could mean a transition to natural gas with a longer term outlook to include a greater combination of renewable energy sources such as biomass. The adjacent Correctional Facility is currently using pellets that could be incorporated into a campus-wide system. Important considerations moving forward include:

- Potential government incentives to help fund system upgrades;
- Changing the jurisdiction of the district heating system to allow the College to make decisions relating to operation and maintenance; and
- Synergies with the Yukon Research Centre and existing renewable energy generation on campus.

FOOD PRODUCTION: A small greenhouse and community garden for the Seniors Residence is already located at the southwest corner of the site. The greenhouse is only operated during the warmer months to avoid the additional costs associated with heat and light during the colder months. The YRC is already experimenting with northern greenhouse technology and an expanded local food production system on the campus could help to demonstrate northern self-sufficiency, reduce transportation costs associated with importing food, provide a source of fresh, healthy food, and create opportunities for students and residents of Whitehorse to enjoy the experience of a year-round greenhouse during long winter months.

Figure 26 - Northern Bioponics Ltd. in Prince George, BC uses aquaponics (a combination of aquaculture and hydroponics) to create a system that maximizes nutrient cycling and minimizes waste. Water from fish tanks is circulated through planting areas where bacteria convert ammonia waste to nitrates and plants extract water and nutrients before the cleaned water is then returned back to the fish tanks. This creates a fish and plant food production system that can operate all year round.

WASTE MANAGEMENT: The waste management system on campus could be expanded to include on-site composting that could feed into on-campus food production, thereby 'closing the loop' and demonstrating a key aspect of northern self-sufficiency.

TRAFFIC DEMAND MANAGEMENT: Transportation is an important element of site-wide sustainability. The way people move around can contribute significantly to greenhouse gas emissions, habitat destruction and an eroded public realm. Transportation approaches should aim at reducing automobile use by improving pedestrian, cyclist, and transit infrastructure and minimizing the negative impact of vehicles on campus. Programs that encourage car-sharing and alternative transportation should be implemented on campus.

RENEWABLE ENERGY

The Cold Climate Innovation (CCI) program at the Yukon Research Centre is focused on the development, commercialization and export of sustainable cold climate technologies and related solutions for subarctic regions around the world. CCI project areas include alternative energy, building construction, climate-related research, environmental remediation, food security and mechanical innovation.

There are significant opportunities to incorporate this cutting edge research into the campus master plan. Projects including a closed loop biomass energy control system, a remote solar/diesel hybrid power generation station, wind turbines, and plastics-to-fuel optimization could all help to contribute to energy generation, optimization and education on the Ayamdigut campus.

Figure 27 - Yukon Alternative Energy Demonstration Site on the Ayamdigut campus

COLD CLIMATE DESIGN

A number of important considerations surround the development, retrofit, and maintenance of buildings as they pertain to the Yukon College Campus and its planned expansion. A preliminary sustainability strategy needs to consider both existing and future buildings. The approach should allow all buildings to meet energy targets. The master-planning process forms an important milestone for the College to implement key strategies and show leadership in accelerating sustainable building construction and community development in the North. A list of key sustainability initiatives/targets have been identified, as follows:

- Retrofit of existing YCC buildings to meet current needs, optimize energy savings and increase occupant comfort.
- New Building Construction on YCC campus to meet aggressive energy and sustainability targets
- District Heating / District Energy – Fuel Source & Transitioning to lower GHG emissions
- Sanitary Infrastructure Upgrades Required – On-site Treatment?
- Performance Certification (LEED, Green Globes, etc.)
- Renewable Energy & Tie-in w/ Cold Climate Research / Innovation
- Reduced/Mitigate development footprint and impact on existing natural areas – Connected to PWL's work/strategy
- Food Production/ Greenhouse / Living Wall – Occupant Health & Tie-in w/ Research
- Jurisdictional sensitivities with ownership and operation and its impact on future sustainability goals/targets

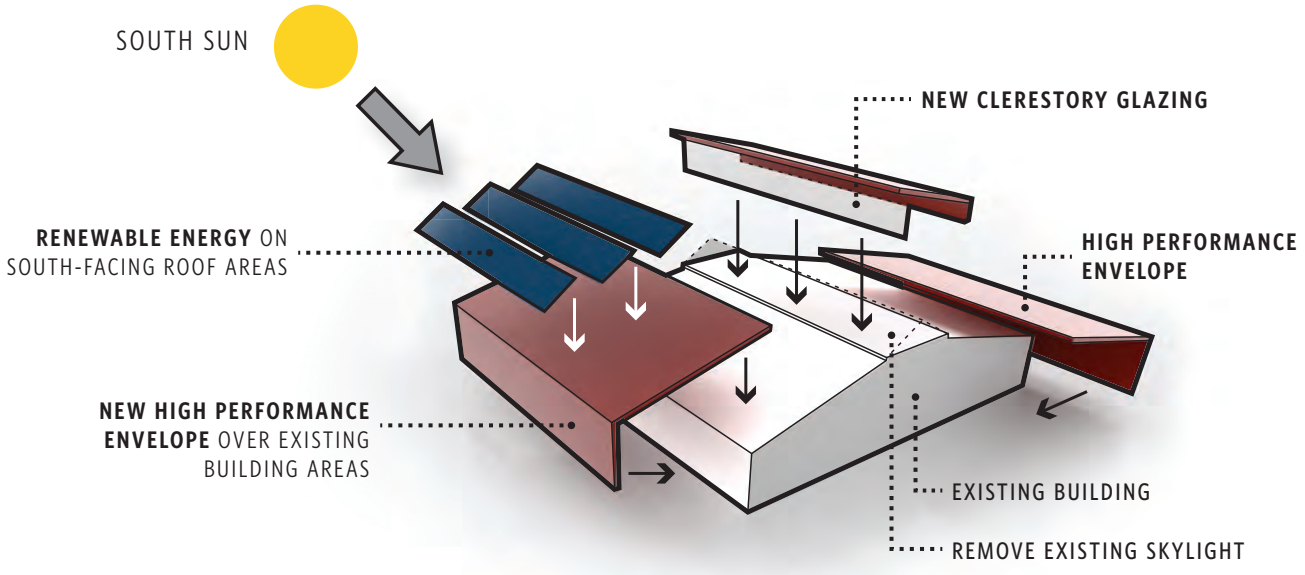


Figure 28 - Envelope upgrades, new clerestory glazing + renewable energy

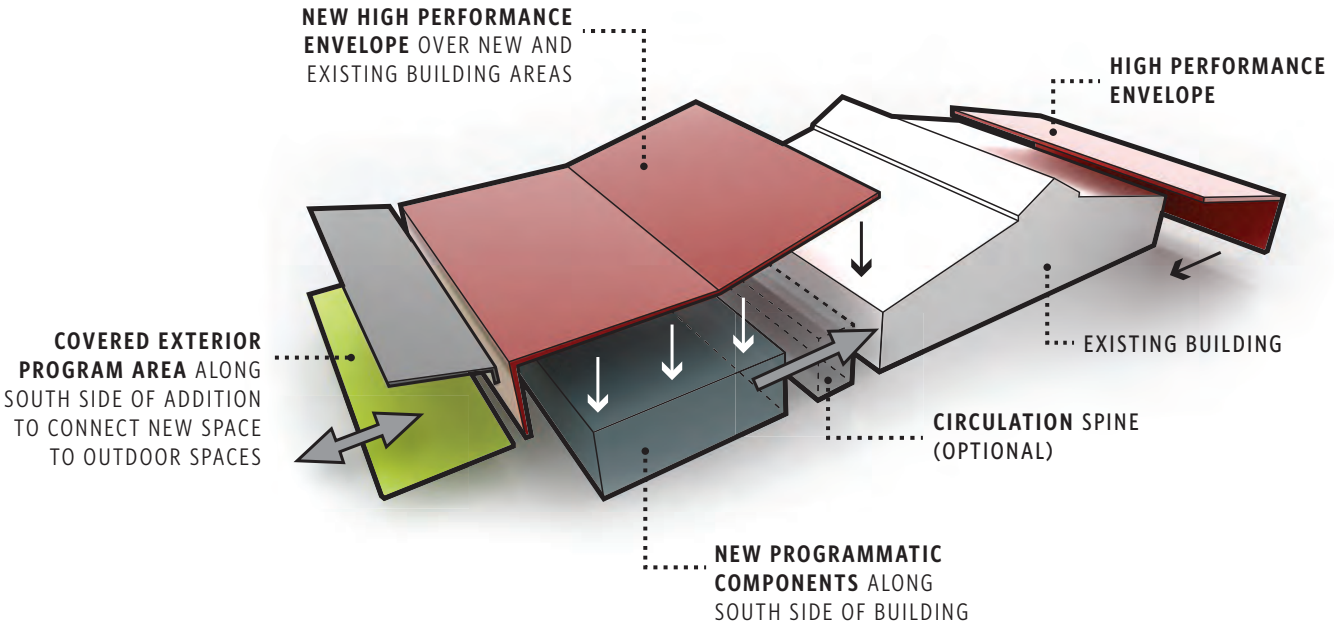


Figure 29 - New programmatic upgrades + envelope upgrades

BUILDING ENERGY TARGETS

Yukon College finds itself with an interesting opportunity as it establishes itself as a northern university and leader in cold climate and renewable energy research. If one marries the desire to utilize the college as an innovation and research campus with the goal of reducing energy use through a variety of initiatives, one can see that establishing aggressive energy reduction targets is possible. With the goal of incorporating renewable energy in both existing building retrofits and new construction, the potential net energy use can be reduced significantly. In the northern Canadian context, energy and energy security play a significant role in the performance and "sustainability" of buildings.

It is noted that many of the original YCC buildings have a poor energy performance and significant opportunities exist for reductions in both existing and new facilities. The City of Whitehorse Energy Conservation Bylaw outperforms the National Energy Code for Buildings (NECB 11) in regards to certain envelope performance requirements, and makes a commitment to energy and GHG reductions. The challenge for YCC, if it is to become a sustainability leader in the North, requires that it take the energy performance of existing and new buildings significantly beyond the NECB 11 baseline.

Using NECB 2011, the following preliminary energy targets are proposed.

- New Building Construction: 80% better than NECB 2011 (Assumes renewable energy component)
- Existing Building Retrofit: 50% better than NECB Equivalent (Ashrae 90.1-2010 50% - LEED 2014)

Renewable Energy Target:

- 10% of total building energy (new building)
- 5% of total building energy (existing/retrofit building)

Perkins + Will and KZA are currently working on the design of a new Centre for Northern Innovation in Mining (CNIM) to be located on the YCC. In the preparation of an energy performance strategy (Table 3), the energy conservation measures have been considered and could be considered appropriate for future building development on the campus.

Table 3 – CNIM Energy Performance Strategy

ENERGY CONSERVATION MEASURE	DEFINITION	STRATEGIES	ANTICIPATED IMPACT
ECM 1	Envelope	Improved performance on envelope over NECB 11: insulation walls, roof, w/ full insulation under slab, very high performance glazing (3 pane), doors, near thermal bridge free, near super airtight.	Heating & Cooling load savings and improved comfort, TBD
ECM 2	Lighting & Plug loads reduction	Target 15% reduction over NECB 11 lighting power densities, occupant sensors beyond NECB 11, plug load switch-off controls recommended for 50% in offices and classrooms as per ASHRAE 90.1-2010. Consider strategic location of glazing to allow even distribution and penetration of natural light, while mitigating solar gain during non-heating season with stepped control or dimming depending on space type	Power and cooling load savings, TBD

ENERGY CONSERVATION MEASURE	DEFINITION	STRATEGIES	ANTICIPATED IMPACT
ECM 3	High efficiency HVAC distribution system:	Academic/Administration Areas: Displacement ventilation 100% OA system with demand controlled ventilation + low temperature in-slab heating system, VSD on pumps and fans Trades/Research/Garage Areas: 100% OA system with demand controlled ventilation + low temperature in-slab heating system, VSD on pumps and fans. Service areas: Fan-coil units Residential: 100% OA ventilation system + low temperature in-slab heating system. Low-flow plumbing fixtures throughout	Fan power and heating/cooling load savings. TBD
ECM 4	HVAC: Heat recovery high efficient – min. 75%	High efficiency heat recovery min. 75% efficient.	Heating load savings, small fan penalty, TBD
ECM 5	HVAC: Ventilation preheat	Consider potential performance with a Solar Wall for ventilation air pre-heat.	Heating load savings, minor fan penalty, TBD
ECM 6	District Heating Plant Upgrades	Buildings connected to campus plant Energy Centre. Transition from diesel to lower GHG fuel (LNG), on site renewable energy and biomass.	Heating load savings, TBD
ECM 7	Renewables: Solar PV & Wind	Investigate size and cost to achieve a 80% reduction target over NECB 11 by inclusion of PV and/or micro wind turbine.	Electricity generation, TBD
ECM 8	Building Orientation, Footprint and Sun-shading	Consider building orientation to maximize solar gain during heating season. Consider configuration of building footprint to create sheltered outdoor micro-climate areas	Heating and cooling load savings, Occupant Comfort, TBD

ENVIRONMENTAL RATING SYSTEMS AND TOOLS

Non-energy sustainability targets are well captured in a sustainability certification process. The merits of a certification process include targets that apply to all buildings but allow a variety of options in how points are achieved dependent on occupancy, use, location and size. In support of establishing sustainable performance criteria, a number of environmental certification systems and tools can be considered for YCC based on feasibility, accountability, and certification cost considerations.

The following systems should be considered in the evaluation of the most appropriate certification system:

- Green Globes
- LEED Canada
- Passive House Planning Package (PHPP)
- Living Building Challenge
- 2030 Challenge

While each rating system has its pro's and con's, Canada Green Building Council's (CaGBC) Leadership in Energy and Environmental Design (LEED) is considered the most appropriate tool to measure and verify project performance. LEED is the most commonly used system in Canada for building projects and is often used as a minimum standard in many projects. The LEED rating system provides a framework for verification including site, water, energy, materials, indoor environmental quality and innovation and design, supporting the project over the design period of multiple iterations, and guide decisions made by the design team and stakeholders. Moreover, the third party verification by CaGBC is essential in demonstrating credible performance results and is an efficient mechanism for accountability.

The LEED 2014 rating system allows for regional priority credits with energy performance, enhanced commissioning, sensitive land protection, site development/ restoration of habitat, and lifecycle requirements resulting in additional points (maximum of 6).

With the challenge of achieving LEED in the North and with few (so far) certified buildings, there is a great opportunity for Yukon College to create landmark buildings that achieve high level certification and show leadership and a commitment to sustainability.

5.7 Heritage + Site History

The Whitehorse Vocational and Technical Training Centre was established in 1963 in the southeast sector of downtown. It changed names to the Yukon Vocation and Training Centre and when it was granted College status in 1983, it became Yukon College. The Ayamdigut campus was opened in 1988 at Yukon Place, next to the Yukon Art Centre and the Yukon Archives. Family residences were part of the new campus, and in the 1990's singles residences were added. The 2007 Canada Winter Games saw the addition of the Athlete's Village Facility, which is now used for additional family and seniors housing.

Over the course of its history, the College syllabus expanded its focus on vocational programs to include academic programs. The College now offers a range of post-secondary courses and continues to add to its offerings. The Northern Research Centre was added in the 1990's, and is used to facilitate exciting research on subjects particular to life the north, such as mine reclamation, cold climate construction, climate change impacts, community health and economic diversification.

ARCHAEOLOGICAL SITES – PAST USE

There are a number of archaeological sites located within the Yukon College Reserve Lands.

SITE A

Located along a ridge overlooking McIntyre Creek within the Yukon College Endowment Lands. On a series of benches about 20 m in width.

- Features: Hearth, Pit, Scatter (Lithic)
- Occupation Period: 6000BP to 4000 BP
- Site size: 5000 sq. m.

SITE B

Located southeast of a wetland encompassing McIntyre Creek. Current information suggests the site is a small-sized sub-surface lithic site with a low density of debitage situated along a terrace feature.

- Features: Cultural Materials, surface, subsurface, lithics.
- Occupation Period: Prehistoric
- Site size: 16m X 20 m

SITE C

Located north of the pump house on McIntyre Creek. Includes lithic debitage and artifacts above (Plate 3) and below a layer of White River Volcanic Tephra (WRA; 1250 years old). Artifacts found below the WRA include micro-lithic technologies. At present it is suggested that the site includes both an Aishihik phase (1250 to 150 years BP) occupation and a Little Arm Phase Occupation (7000 to 4000 years BP) in intact stratigraphic sequence.

SITE D

This site contains a log structure and burned log structure

Source: Heritage Sites of the Proposed Pine Street Extension of Porter Creek Subdivision

6 TRANSPORTATION OVERVIEW

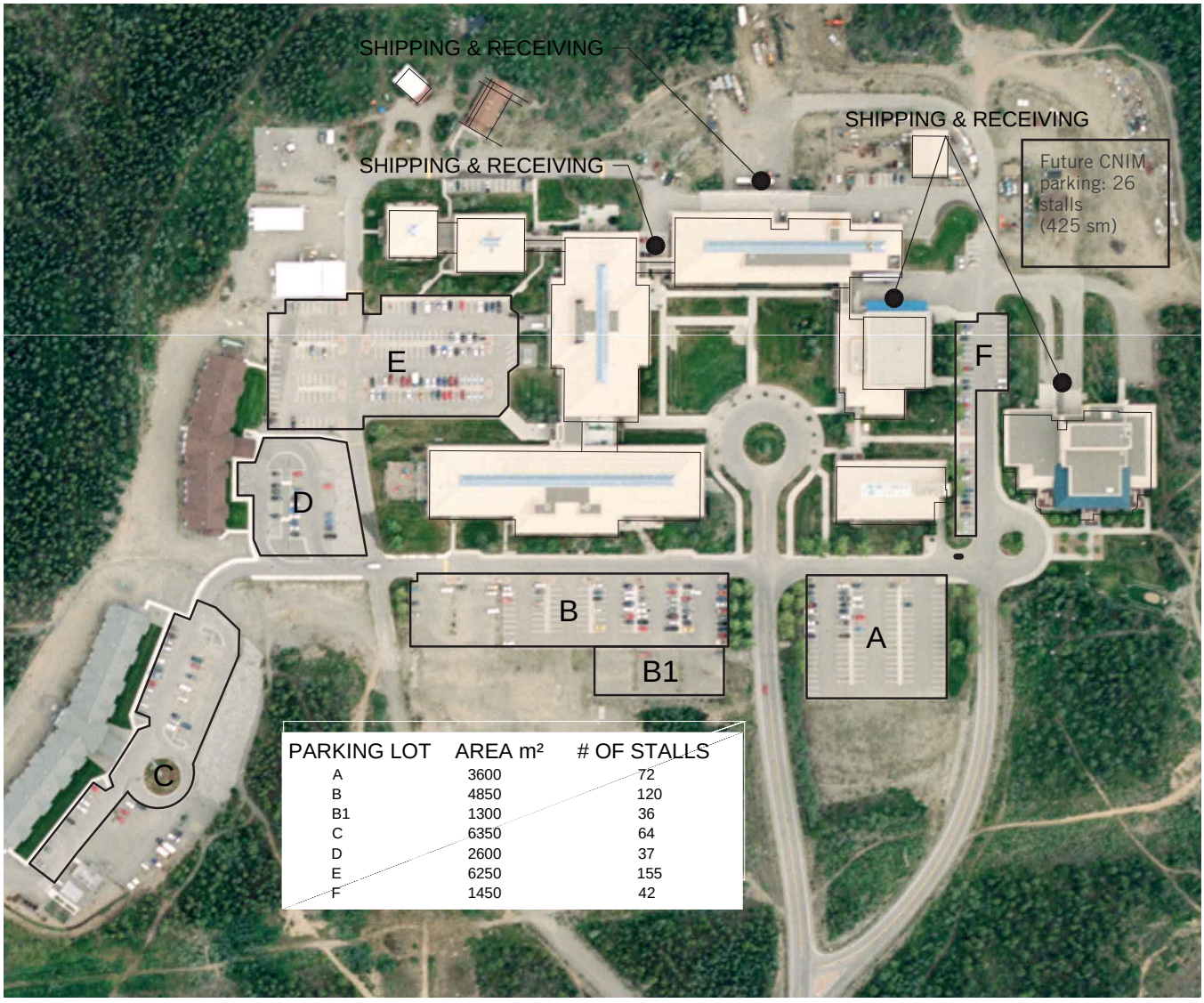
Currently the Yukon College campus is primarily a commuter campus where vehicles are the primary driver for the layout of the internal ring road. In order to work towards a more sustainable campus, transportation options for a growth campus must be considered from a green aspect.

EXISTING TRANSPORTATION & PARKING

The single access to the campus is located off Range Road. This primary access point is non-descript and provides vehicle access but poor pedestrian access to the campus. A service road extends around the perimeter of campus to access parking areas, residences and shipping/receiving areas.

Two main parking lots for students currently exist, lot B and a portion of lot E as seen in Figure 22. Residence parking is located in lot D and a portion of lot E. Parking lot C is dedicated to the seniors residence adjacent to it. Public parking is located in lot A. Staff parking is located in lot F and at various points on the north side of the perimeter road. Parking lot B is used extensively by students but those who park there generally do not enter the College from the main entrance. Accessible parking stalls for students are located on the east side of parking lot E closest to the main entrance.

The campus is surrounded by a network of formal and informal trails with access to adjacent subdivisions. These trails are used both to access the campus and for general recreation.



PARKING LOT	AREA m²	# OF STALLS
A	3600	72
B	4850	120
B1	1300	36
C	6350	64
D	2600	37
E	6250	155
F	1450	42

Figure 30 - Existing parking

FUTURE TRANSPORTATION & PARKING

Future transportation infrastructure for the campus should explore providing multiple transportation options both to arrive at the campus and within the campus itself. Such new options should be considered directly as a key point in any future infrastructure on the site. The primary access off Range Road can be improved through landscaping and construction of an improved trail network providing pedestrian access along this route.

As the campus grows, a road for onsite travel and emergency access will be required. To create an efficient and attractive onsite road network a hierarchy of roads, access points, landscape elements and pedestrian pathways should be created. Accessibility options explored should include level crossings, lighting techniques and adequate sightlines for safety concerns.

The campus may benefit from an onsite bicycle sharing program where used bikes could be utilized to aid in short distance trips on campus.

As the campus grows parking will always be required onsite. We suggest providing a sliding scale of parking stalls per full time equivalent (FTE) students for the campus. As growth occurs, lowering the ratio of parking to FTE while at the same time working with the City to increase transit options. The main parking lots will continue to remain on the perimeter of the campus and should be sized appropriately for the mixed use of the area. The design of future lots should take into account:

- Utilizing landscaping to visually breakup the parking area with buffer strips providing both snow storage and interrupting vistas of endless parking
- Utilizing the sloped terrain on the south edge of the campus, future parking can be terraced
- Lots shall be well lit and not screened for security purposes.

Accessibility parking should remain scattered throughout the campus as smaller designated sites adjacent to level access points to the buildings.

The local trail network could be upgraded with additional signage for directions and distances. Trail maps should be produced outlining both regional and campus trails for use. Such maps should indicate a hierarchy of trails and indicate intended uses. Primary trails should be hard surfaced and be built according to principles of accessible design. All trail development should include the City of Whitehorse 2007 Trail Plan to coordinate regional developments and design standards. The campus may also wish to develop specific trails into Nordic or winter bike trails to promote active transportation in the winter months.

EXISTING TRANSIT

There is one bus stop on campus located in the turnaround east of the main entrance. The bus runs every hour on weekdays between 7:20 am and 9:20 pm with additional service during peak periods every half hour between 7:20 am and 9:50 am and 3:50 pm and 6:50 pm. On Saturday the bus runs every hour from 8:20 am to 7:20 pm. Bussing times to the College vary greatly depending on pickup points, times range from 10 min from downtown to up to an hour in Copper Ridge. Currently there is no bus access from Whistle Bend Subdivision but the City of Whitehorse has future plans to incorporate the subdivision into its transit routes. Only one of five bus routes stop on campus but others stop within walking distance along Range Road or Mountain View Drive.

FUTURE TRANSIT

The College should continue promoting transit use through the current program of an integrated transit pass with the City of Whitehorse for students. On campus, transit stop points should look at being located closer to a building foyer, or providing heated shelters for winter operations. A joint investigation with the City of Whitehorse on more frequent bus service, or dedicate shuttle services from specific gathering points around the City should be undertaken as the student population grows. In the near term, opportunities should be investigated to provide improvement to the current transit service including:

- Upgrade of existing pathways near the College for bus route running adjacent to the campus to promote walking access to the College from Range Road and Mountain View Drive.
- Investigate a more responsive transit schedule based on current programming.

7 FUNCTIONAL ANALYSIS

CAMPUS FUNCTIONAL ANALYSIS / SPACE NEEDS ASSESSMENT

The following section is a high level functional analysis and space needs assessment of the Yukon College's academic and administrative facilities. The outcome is a high level master space program that describes long range space requirement estimates by function and space type. The long range planning horizon is 25 years to 2039 with interim planning horizons at 5 and 10 years. The space needs analysis involved the collection and analysis of current enrollment and current space both support and teaching spaces for the Ayamdigut campus. Satellite campus facilities are excluded from the analysis.

The following tasks were undertaken in the development of the Campus Functional Analysis:

- Existing space database was developed from floor plans and room data obtained from Government of Yukon and was used to compare existing to future space requirements.
- Yukon population projections were used to determine growth in enrolment and faculty and staff.
- Future space needs calculations were prepared based on BC University Space Standards.
- Future space needs were developed based on future enrolment and faculty and staffing projections and presented as a summarized master program table.
- The fact that the College is transitioning from a college to a university was factored into the growth projections. It was assumed there would be an increase in program FTEs by 35 percent on average over the population growth. This factor accounts for the repatriation of students who transfer to universities outside of the Yukon.

GENERAL PLANNING ASSUMPTIONS

The following planning assumptions provide guiding principles, which are critical in developing the space needs analysis.

- The primary focus of this analysis was on the quantity of space by type and use. A physical assessment was not conducted during this study.
- Analysis was limited to academic and administrative space located on the Ayamdigut campus. Building plant operations, Yukon Research Centre, Centre for Northern Innovation in Mining, and satellite campuses were out of scope.
- The space needs calculations used the BC Universities Space Manual dated February, 2003. The space standards were used as a guideline along with the experience of Perkins+Will consultants.
- The long term planning horizon for this analysis was over 25 years to the year 2039 with interim planning horizons at 5 and 10 year.
- The growth rate of 2.2% used to project enrolment and faculty and staff numbers is based on the population growth rate from the Yukon Bureau of Statistics Population Report, March 2014.
- Student FTEs were derived from full- and part-time enrolment numbers assuming part time students were on average 0.3 of a fulltime student.
- For laboratory and shop space calculations it was assumed an average of 15 weekly student laboratory contact hours.
- An additional growth factor of 35 percent on average was applied to student FTEs calculations for increase in number of programs and the increase in students enrolled in each program as the College transitions to a university. It is expected that more programs will be offered, both under graduate and graduate degree level programs to accommodate the repatriation of students who currently who leave the Yukon to complete their education. It was assumed that enrolment in some academic programs would increase at a faster rate than others. These differences were used to calculate FTEs.
- Past enrolment growth trends were of limited value in projecting future enrolment based to the flat growth observed over the last six years due to the fact that the College is at capacity.
- Office space needs for both faculty and non-faculty positions were allocated based a simplified office space guideline – with the allocation of private offices or workstations depending on staffing level. Private offices are sized at 10 nsm and workstations are allocated 4.5 nsm. It is assumed all full-time faculty will be provided a private office.
- Research Laboratory space requirements were based on the estimated number of faculty who would be engaged in research. It was assumed 25 percent of faculty will engage in research activities that require specialized or dedicated research space.

YUKON COLLEGE: CURRENT AND FUTURE STATE

CURRENT STATE:

Yukon College Academic programs are organized into 8 Schools:

1. School of Science
2. School of Management, Tourism and Hospitality
3. School of Liberal Arts
4. School of Education, Health and Human Services
5. School of Academic and Skills Development
6. School of Trades
7. School of Mining and Technology
8. School of Continuing Education

In addition to the schools, there are research focused programs and centres of excellence on the Ayamdigut campus. The Centre for Northern Innovation in Mining provides a dedicated facility for trades training and applied research specific to the northern minerals and mining industry. The facility offers two mine training simulators capable of accommodating surface and underground training modules.

Northern Institute for Social Justice provides training and professional development to front line workers who deliver social justice-related programs and services. Training is delivered to government and non-government organizations in professional development workshop sessions.

The Yukon Research Centre provides facilities that support research and innovative programs focused on climate change, cold climate innovation, environmental science, society and culture, and technology innovations.

Other areas of focus for the college include:

- International Students
- First Nations' Initiatives

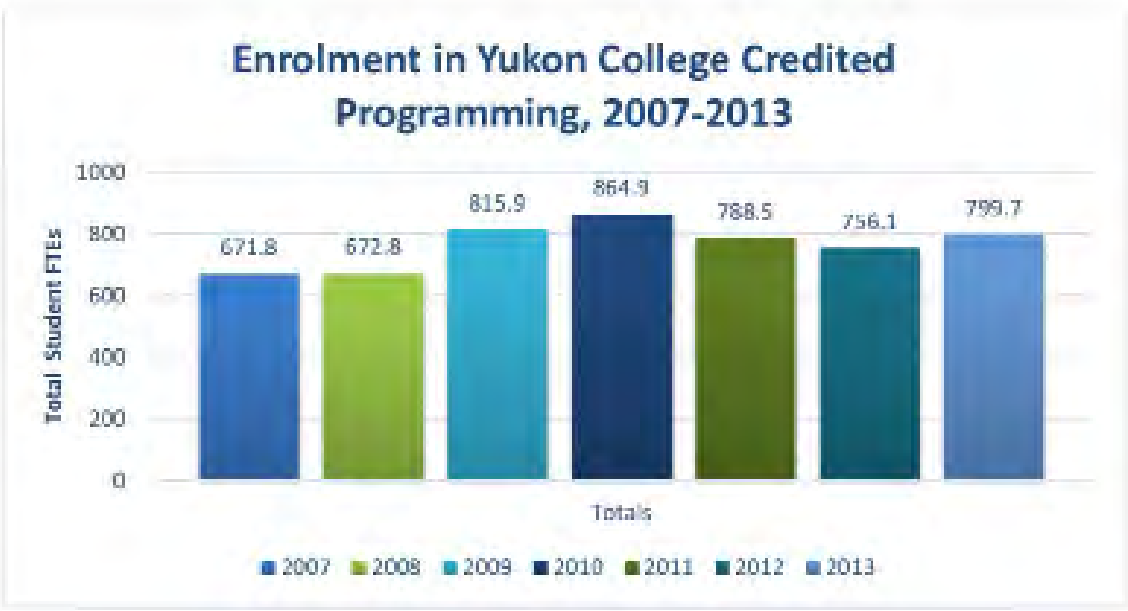
CURRENT FACULTY AND STAFF

Currently there are 525 total faculty and staff employed at Yukon College. The total includes excluded/management staff, faculty, and non-faculty employees.

EXISTING FACILITIES

Drawings for the buildings on the campus were provided by the Yukon Government. Rooms and their corresponding areas were identified from the drawings and assigned specific space categories based on the BC University Space Guidelines.

Only usable net assignable areas are included in the analysis, which is the usable area of buildings and does not include circulation space such as corridors and mechanical areas, building walls, etc.



The following table shows the existing component gross areas by functional category.

Existing Space Summary m²	
Space Category	**Total**
C1 - Classroom Facilities	2091.81
C2 - Laboratory, Undergraduate	1468.66
C4 - Academic Departmental Offices + Related Space	1749.03
C5 - Library Facilities + Study Space	1012.1
C6 - Athletic / Recreation Space	1350.79
C7 - Food Service	988.07
C8 - Bookstore + Merchandising Facilities	101.01
C9 - Plant Maintenance	50.46
C10 - Administrative Office + Related Space	780.01
C12 - Central Services	404.13
C13 - Health Service Facilities	8.96
C14 - Common Use + Student Activity Space	627.1
C15 - Assembly + Exhibition Facilities	70.53
C16 - Non-Assignable (Circulation, Plant, Washroom, Ho	5940.03
C17 - Residential Space	1733.07
C19 - Other University Facilities	169.51
C20 - Health Science Clinical Facilities	145.33
C22 - Shop Areas and Supportive Spaces	3010.66
Grand Total	**21701.26**

FUTURE STATE:

The future state master program is informed by Yukon College's Strategic and Education Plans and with discussion with key stakeholders. One of the key drivers for change at the College is the support the Government of Yukon is providing to the College for a phased approach towards the evolution of a northern university. The College is currently creating degree programs with a focus on northern issues, such as Bachelor of Science in Environmental and Conservation Sciences the First Nations Governance and Public Administration Program, and the Heritage and Culture Certificate Program.

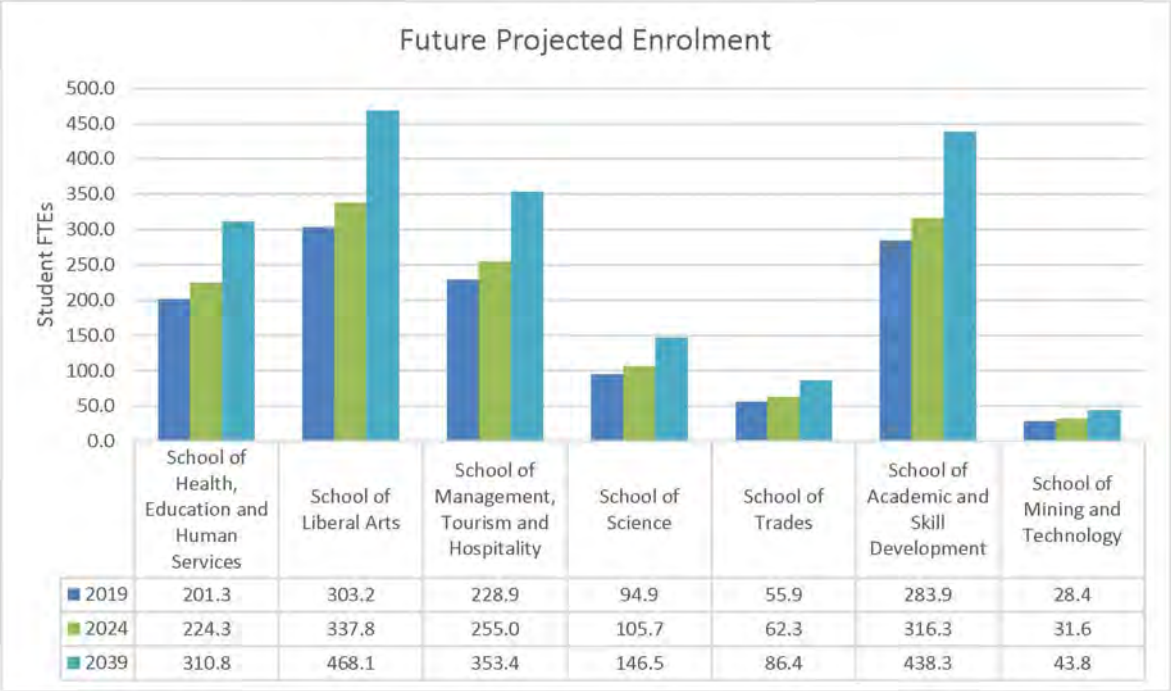
For the master program, it is anticipated development of new degree programs will continue and the College will have University status within the long term planning horizon.

The unique needs of the College's role in providing post-secondary education to students, not only at the Ayamdigut campus but at community based campuses across the Yukon, and the need to support the transition to a university, the continued emphasis on continuing education opportunities for the community, and the wish of the College to connect with the greater community of Whitehorse have provided the impetus of the master program outlined below:

- All teaching spaces must be adaptable to changes in pedagogy. Movable tables and chairs, smart boards, wireless technology are required for all classrooms, labs, and seminar rooms.
- Teaching will not only occur in typical classrooms but also will occur in spaces as outdoor teaching areas. These atypical teaching spaces require connectivity and technology to support learning.
- On-line/Distance learning – increasing need for this type of course delivery. Demand on space for course development, technology requirements to host the courses, etc. Classrooms should be audio/video conference capable with smart board technology, etc.
- Learning Commons – library/study space with internet access, group and private study areas.
- Need for crush space for students study/gathering areas – informal study spaces across the campus.
- A growing demand for Continuing Education programming with the ability to host larger seminars and fora. Currently there is only one lecture theatre on campus with limited seating for 75. There is a need for an additional lecture theatre to seat up to 200.
- Conference Centre for Professional Development – to attract students who are looking for professional/ executive development programs (Executive MBAs, Leadership programming) and to provide a space to hold fora or meetings for other organizations, such as Northern Institute for Social Justice, First Nations, and outside organizations and community groups. The Centre shall include a conference centre, lecture theatre, seminar rooms, food services (bistro), and should have a First Nations focus.
- Current Yukon Research Centre focuses on environment, climatic change research. As the College transitions to a University than there will be a greater need for expanded research requiring more research space, both dry and wet bench.
- Along with research space there is a need for dedicated space to support visiting faculty/ researchers. Hoteling workstations and meeting space, for temporary/sessional faculty, researchers, graduate students and fellows.
- With increased numbers of students on the campus there is need to provide more and better student services such as bookstore, cafeteria, Student Union, Health/Wellness Centre, Advising services, and Drop in Centre.
- For Campus Housing, it was assumed up to 12 percent of total students would be housed on site. The types of housing planned include: typical dormitory style facilities, cabins which can accommodate up to 4 people, and townhouses. Housing for temporary faculty/researchers, and Continuing Education students have been included

in the total space allocated.

- For International Students – additional residential space and dedicated meeting/gathering space is required.
- First Nations – presence on campus Gathering Space (food services important) should be central to the campus.
- Continuing Education programs will continue to increase in number in the future. Additional teaching space has been added to the program to accommodate the increasing demand.
- The campus master planning should take into account the need to foster collaboration between faculties, staff and students. For instance, Fine Arts may benefit from being adjacent to Trades as the welding shop could be used by both sets of students creating an opportunity for sharing ideas and exposing each group to new activities.



	School of Health, Education and Human Services	School of Liberal Arts	School of Management, Tourism and Hospitality	School of Science	School of Trades	School of Academic and Skill Development	School of Mining and Technology
2019	201.3	303.2	228.9	94.9	55.9	283.9	28.4
2024	224.3	337.8	255.0	105.7	62.3	316.3	31.6
2039	310.8	468.1	353.4	146.5	86.4	438.3	43.8

FACULTY AND STAFF PROJECTIONS

In the future the total number of faculty and staff will be projected to increase to 1247 by 2039. The total includes excluded/management staff, faculty, and non-faculty employees.

FUTURE ENROLLMENT PROJECTIONS

The table above summarizes the projected future enrolment by school for Yukon College for the planning horizon years of 2019, 2024, and 2039 based on the assumptions stated above. The number of student FTEs are estimated to be 1847 by 2039 with Continuing Education enrolment increasing to over 10,000 students in the same timeframe.

SPACE NEEDS ANALYSIS

The outcome of the space needs analysis is a master program for Yukon College, which is summarized in the following table.

The projected space requirement are based on the stated assumptions and specific objectives outlined above, and provide for the college's future needs as it transitions to a university. The table is organized by component and shows existing and projected space requirements by planning horizon year.

It should be noted that Yukon Research Centre, and the Centre for Northern Innovation in Mining have been excluded from the space needs analysis. By 2039, Yukon College will increase from nearly 22,000 sq.m. to nearly 66,000 sq.m.

FLEXIBLE LEARNING DELIVERY

21st century learning delivery requires more flexible academic and common spaces to facilitate collaboration and support a range of teaching formats and approaches. This focus on more flexible spaces will be explored as the campus master plan progresses.

	Program Components	Existing Space	Projected Space TOTAL 2019	Projected Space TOTAL 2024	Projected Space TOTAL 2039	Comments
		NSM	NSM	NSM	NSM	
Component Space Allocations						
Academic Spaces						
1	Classrooms	2,091.81	2,392.94	2,665.82	3,694.36	Classroom space, lecture halls, testing areas, and applicable storage space. Projected Space calculations are based on FTE of Students, with a space standard of 2.00 nsm
2	Teaching Labs Wet/Dry Labs Drop-In Centre	1,468.66	1,916.21	2,134.72	2,958.36	Teaching Labs include wet and dry lab areas, computer labs, applied arts, and food lab areas. This also includes the Drop-In Centre. Calculations are based on weekly student contact hours.
3	Continuing Education Teaching Space Allocation	0.00	460.00	513.00	710.00	Includes classroom and laboratory teaching space, support space and CE faculty office and support space
4	Faculty Offices Non-Faculty Offices Departmental Support Offices Office Support Space	1,749.03	5,182.39	5,773.37	8,000.89	Included in this area are all faculty and non-faculty offices, departmental support spaces such as reception, storage, and technical areas, and office support areas. This space will grow to accommodate space for future Graduate Students, as well as increased numbers of academic and non-academic faculty. Calculations are based on the FTE of Faculty, Graduate Students, and Non-Academic Faculty. Note: Faculty Lounge areas are calculated in Student Services + Common Use
	Subtotal	5,309.50	9,951.54	11,086.91	15,363.60	
Administration						
4	Offices, Administration Program and Course Development	442.73	861.84	960.12	1,330.56	Administration includes all office support and meeting space. Space requirements are based on the FTE of Administrative Faculty, with a space standard of 20.0 nsm
	Subtotal	442.73	861.84	960.12	1,330.56	
Student Support Services and Amenities						
5	Food Service Cafeteria Kitchenettes Food Storage	988.07	1,250.00	1,500.00	1,750.00	Food Service areas include the main cafeteria/dining space, food storage and refrigeration, as well as departmental kitchenettes. Calculations are based upon the FTE of Students, with a space standard based on best practices.
6	Student Services + Common Use Student Union College Relations Student Lounges Common + Staff Lounges	627.10	850.00	1,000.00	1,200.00	Student Services are calculated along with Student Support and Specialty Facilities, based on the FTE of Students, and a space standard based on best practices.
7	Health and Wellness Centre	8.96	150.00	150.00	150.00	The Health and Wellness Centre is calculated along with Student Support and Specialty Facilities, based on the FTE of Students, and a space standard based on best practices.
8	Drop-in Centre (See Teaching Labs)					
	Subtotal	1,624.13	2,250.00	2,650.00	3,100.00	
Facility Operations						
9	Central Services Shipping/Receiving Equipment Storage + Repair	404.13	414.96	441.92	543.56	Central Services include shipping and receiving, along with equipment storage and repair, and centralized printing/processing facilities. Calculations are based off of Inventory Net Assignable Area, with a growth factor of 1.4%
10	Facilities Maintenance Custodial Supply Rooms	50.46	100.00	100.00	100.00	Custodial supply rooms are calculated along with Student Support and Specialty Facilities, based on the FTE of Students, and a space standard based on best practices.
	Subtotal	454.59	514.96	541.92	643.56	
Campus Housing						
11	Campus Housing	1,733.07	5,525.66	5,945.89	7,529.87	Includes dormatory style, cabins and townhouses for students, CE students, and visiting faculty and researchers. Excludes Market housing options.
	Subtotal	1,733.07	5,525.66	5,945.89	7,529.87	
Trades						
12	Classrooms (see above)					
13	Shops and support spaces	3,010.66	8,391.83	9,348.79	12,955.80	Trades shops include space for carpentry, electrical, welding, machine tools, and mechanics. It also takes into account adequate storage facilities for equipment and machines, and specialty classroom space.
	Subtotal	3,010.66	8,391.83	9,348.79	12,955.80	
Research						
14	Research Labs	0.00	887.51	988.72	1,370.19	Space requirements are based on the following assumptions: 25% of Faculty will partake in research, based on an average growth factor of 16.26. 50% of Graduate Students will partake in research, based on an average growth factor of 8.14. 5% of Non-Faculty Staff will partake in research, based on an average growth factor of 8.14
	Subtotal	0.00	887.51	988.72	1,370.19	
Specialty Facilities						
15	Conference Centre	0.00	629.00	880.60	1,232.84	The Conference Centre is unit comprising a lecture theatre for 200, bistro space, 5-6 seminar rooms, with a lobby and offices/support space.
16	Gathering Place	0.00	67.50	67.50	67.50	The Gathering Place is comprised of a circular seating area for 25 people, with adjacent food prep area and offices/support spaces.
17	Bookstore	101.01	175.00	175.00	175.00	Bookstore space standards based on best practices.
18	Recreational Facilities	1,350.79	1,500.00	1,500.00	1,500.00	Recreational Facilities includes indoor fitness and weight room facilities, change and locker rooms, and coaches support areas. This excludes any exterior recreational spaces, such as sports fields.
19	Café/Restaurant	72.27	216.81	216.81	216.81	The Café/Restaurant space is a dining room that supports the Culinary Training room. Cafeteria and Kitchen spaces are accounted for in Food Services.
20	Daycare	169.51	240.00	240.00	240.00	Daycare space standards based on best practices.
21	Exhibit Space	0.00	50.00	50.00	50.00	Exhibit space standards based on best practices.
22	Theatre	70.53	140.00	140.00	140.00	Theatre space standards based on best practices.
	Subtotal	1,764.11	3,018.31	3,269.91	3,622.15	
	Total Master Program Areas	14,338.79	31,401.64	34,792.26	45,915.73	
	Component Gross Area	0.00	40,822.13	45,229.94	59,690.45	
	Building Gross Area	21,795.00	44,904.35	49,752.93	65,659.49	Excludes: Yukon Research Centre and the Centre for Northern Innovation in Mining.

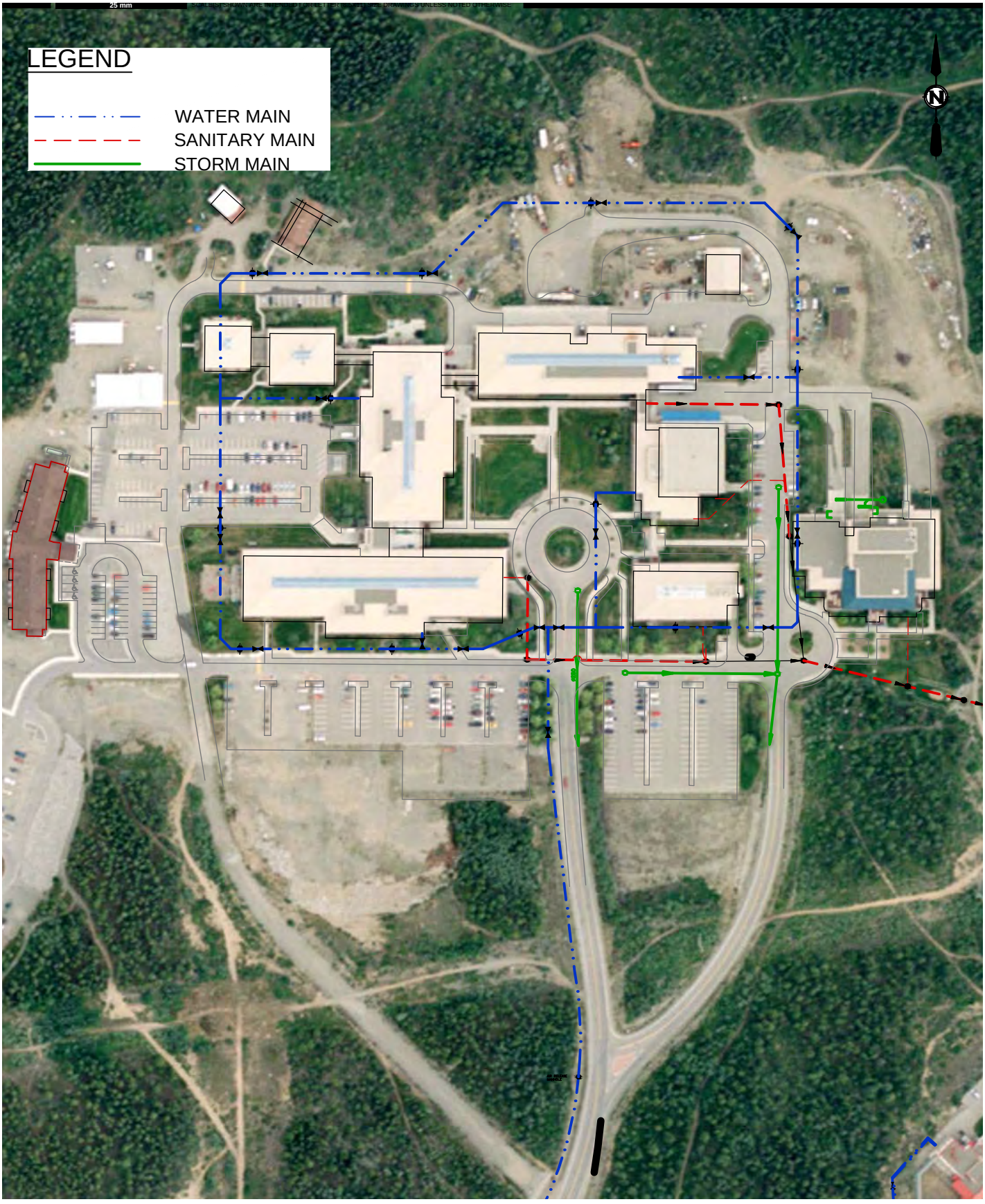


Figure 31 - Existing infrastructure

8 INFRASTRUCTURE ASSESSMENT

Currently the campus is serviced from the existing City of Whitehorse distribution and collection system. Refer to Figure 23 for a diagram of existing utility infrastructure.

EXISTING WATER

Yukon College water system is currently supplied by a 250 mm diameter water main installed underground along College Drive. Water in this system is sourced from the City of Whitehorse municipal supply via the Valleyview reservoir and Two Mile Hill booster station. This main supplies a 200 mm dia. ring loop that approximately follows underneath the perimeter road around the College. Multiple services of varying sizes are tapped into the ring loop to supply buildings on campus, including the recently constructed student residence and senior's complex.

According to the 2003 study of the City of Whitehorse's water and sewer infrastructure systems, fire flows at Yukon College met recommended guidelines and were considered adequate. The fire hydrant flows at the College were measured at 70 L/s and a pressure of 303 kPa. In the same study, water demand at the College was considered to be low at 0 – 25 L/s.

FUTURE WATER

The current demand on the existing water system at Yukon College is relatively low and therefore has some capacity to handle growth of the campus in the near term. Depending on the anticipated growth rate and student population of the campus, required upgrades to the existing system would be minimal at this time.

Looking forward to the future expansion, a water system upgrade may be required in the longer term based on full build out of the campus mostly to address fire protection concerns. Any future water system expansion should be designed as a recirculating system for frost protection. Within and adjacent to future buildings, implementation of design considerations that conserve water in landscape areas and internal fixtures should be explored.

For domestic water use, the College may wish to investigate sourcing water from either McIntyre Creek or an onsite well in order to support ongoing training programs such as the small water systems certification programs. Developing an onsite water source would provide the course with ongoing, real world, water treatment requirements.

EXISTING SANITARY

Yukon College sanitary sewage is collected in 150 mm or 200 mm diameter underground main lines which converge on the south side of the Arts Centre and discharge off campus to existing City of Whitehorse infrastructure on Range Road. The Range road main flows into the Takhini outfall, to the Marwell Lift Station and across the Yukon River to the Livingston Trail Sewage Lagoons.

According to the 2003 study of the City of Whitehorse's water and sewer infrastructure, the loading capacity of the Takhini outfall system was 0 – 0.8. During ultimate loading events some sections of the system increased to a loading of 1.2. The influence sewage volume from Yukon College has on the downstream collection system is unknown but it is considered to have an impact.

Depending on the configuration of new buildings on campus and the expected student population, some of the existing underground sanitary system will require upgrades and expansion. City of Whitehorse Standards specify minimum pipe diameter of 200 mm for sanitary mains.

FUTURE SANITARY

With the expansion of the campus some of the smaller sized sanitary lines may require upgrades to accommodate additional flows.

The College may wish to consider developing onsite treatment for sanitary sewage as a benefit to current training programs at the College such as the small water system operators and mine water treatment programs. Discharge of such systems could be into adjacent wetlands or water courses providing opportunities for ongoing environmental monitoring.

The College should also explore the possibility of water reuse and water reduction measures to lessen the sanitary flows in the future. Programs requiring large amounts of water or water for non-potable uses may be able to utilize rainwater collection, grey water reuse or snow melt as sources.

EXISTING STORM

Asphalt and concrete surfaces collect storm runoff water on campus and direct it to the storm sewer system. Landscaped and natural areas promote infiltration. Storm sewer is installed under the College Dr. roadway and discharges at an unknown point along College Dr. Sizing of system is unknown at this time.

FUTURE STORM

Upon completion of the campus mater plan, a storm water management plan should be developed for the overall proposed campus development. Within this plan, storm water from the site should be viewed as a resource for the campus rather than a waste. Within the development of such a plan the following possibilities for storm water management could be explored with the aim of seeing storm water created onsite as a resource to the campus.

- Onsite collection and land treatment
- Explore the possibility of utilizing existing wetlands for treatment
- Onsite collection of rain water and snow melt for high water intensity program's usage
- Rainwater collection to be utilized as source water for current heat distribution system
- Rainwater collection utilized as irrigation sources

With the location of the campus on granular materials opportunities for storm water infiltration points or exfiltrating storm water collection systems should be seriously explored in any future expansions. Future plans should re-enforce natural drainage patterns on campus with site specific landscaping. Additional hard surfacing for parking lots should consider permeable paving and/or directing water to landscaped areas to promote infiltration and passive treatment adjacent to the source prior to conveyance.

Snow removal should also be formalized in any future development plans. Currently snow removal is unorganized and typically piled off edges of current parking lots. We would recommend exploring formal snow removal storage sites where dirty snow collected can be stored. Concentrations of debris, possible contaminants and road sanding materials can be properly collected, sorted and treated or reused.

9 PRECEDENTS

9.1 Master Planning

UNIVERSITY OF ALASKA FAIRBANKS
Campus Master Plan

The University of Alaska Fairbanks (UAF) is one of the few Land, Sea and Space Grant Universities in the country. Similary to Yukon College, a major institutional goal is to strengthen integration with the community and enhance the cultural and natural assets of this unique northern environment. Perkins+Will completed the UAF update to the 2002 Campus Master Plan.

The master plan update is grounded in Vision 2017, a plan to position UAF as the premier arctic research and teaching university by 2017, the university's 100th anniversary. Focal points for planning included enrollment growth for an additional 900 FTE, space utilization, research expansion, housing improvements, signature open space reflecting the unique Alaskan culture, and reduced energy and water use. Dramatic topography and harsh climate conditions provide unique challenges to strengthen campus connectivity. Solutions include multimodal circulation and protected pedestrian connections.

UNIVERSITY OF ALASKA SOUTHEAST
Campus Master Plan Update

Perkins+Will recently updated the university-wide facility master plan that encompassed six campuses across three communities. Located in a coastal rainforest, driven by distance learning, and responding to community arts, education and recreation needs; the completed plan clearly defines the university's physical image and sense of place while including a statement of principal values and significant challenges and providing a data-driven facilities development plan.

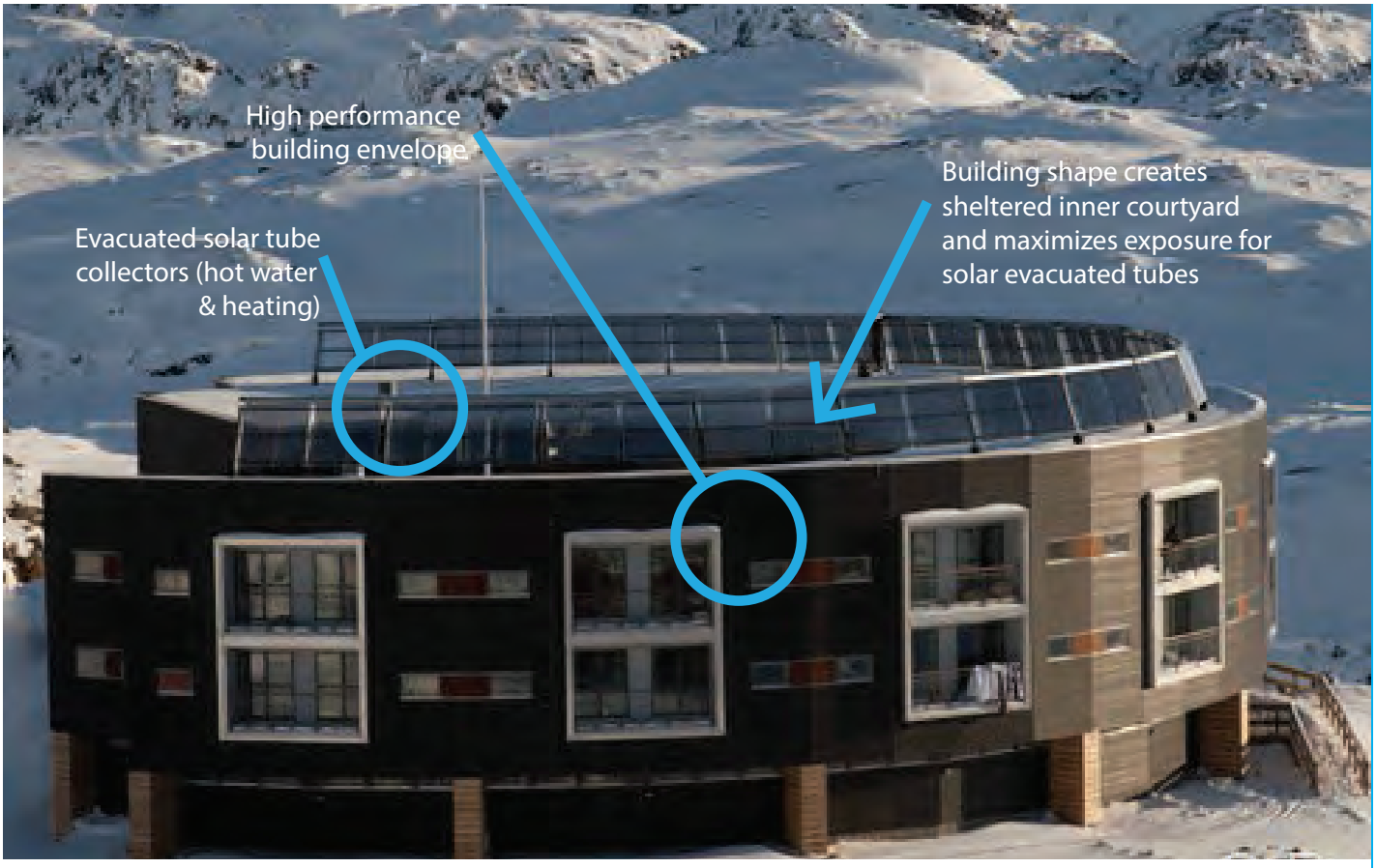
A departmental analysis was completed on the project to clarify the specific space needs as was required per location since each campus had unique departments/ programs. The overall project ensures implementation of the Strategic Plan, strengthens continuity of the campus character, and promotes a truly sustainable campus landscape and infrastructure.

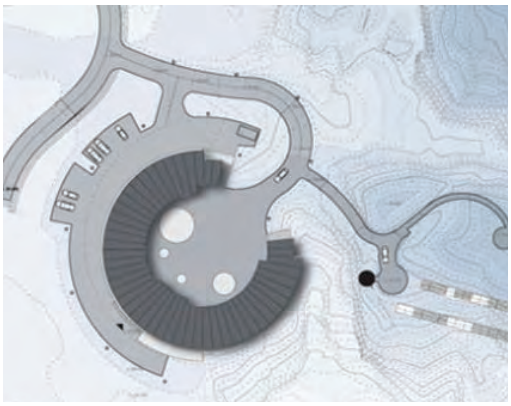
9.2 Cold Climate Architecture

Across the circumpolar north, the challenges associated with the built environment are reflected in building form, technologies, material use and overall relationship of the building to the natural and built environments. As with other small northern communities, the Yukon College campus carries with it the potential to embody cold climate design principles tested, proven and adopted elsewhere in the circumpolar region. The campus setting provides the critical mass necessary to implement sustainable cold climate principles at both the single building scale and the broader community level. This allows for a comprehensive approach to the design of both the indoor and outdoor campus components. Assembled is a representative cross-section of relevant cold climate and building addition/renovation precedent projects.

With many Yukon College buildings being more than 25 years old, there is a significant need for energy retrofits that meet and even exceed minimum current energy standards. Coupled with this is the preliminary master planning concept to infill existing under-utilized open areas for future buildings or building additions thereby reducing the need to further expand the campus footprint and supporting infrastructure. Precedent projects highlighting building retrofits and/or additions have also been included. Each precedent project identified includes a description of the project, annotated images and a brief summary of the relevancy to the YC master planning process.

Precedent Project	Location	Category
Apisseq Student Housing	Sisimiut, Greenland	Housing / Research
Katuaq Cultural Centre	Nuuk, Greenland	Culture
Cold Climate Housing Research Centre	Fairbanks, Alaska	Research / Housing
Children's First Centre	Inuvik, NT	Education
University of Alaska Sustainable Village	Fairbanks, Alaska	Housing / Research
Centre for Northern Innovation in Mining	Whitehorse, Yukon	Research / Education
UBC Sauder School of Business	Vancouver, BC	Building Repurpose / Addition / Education
Dronning Ingrids Hospital	Nuuk, Greenland	Building Repurpose / Addition
Sami Cultural Centre	Inari, Finland	Culture

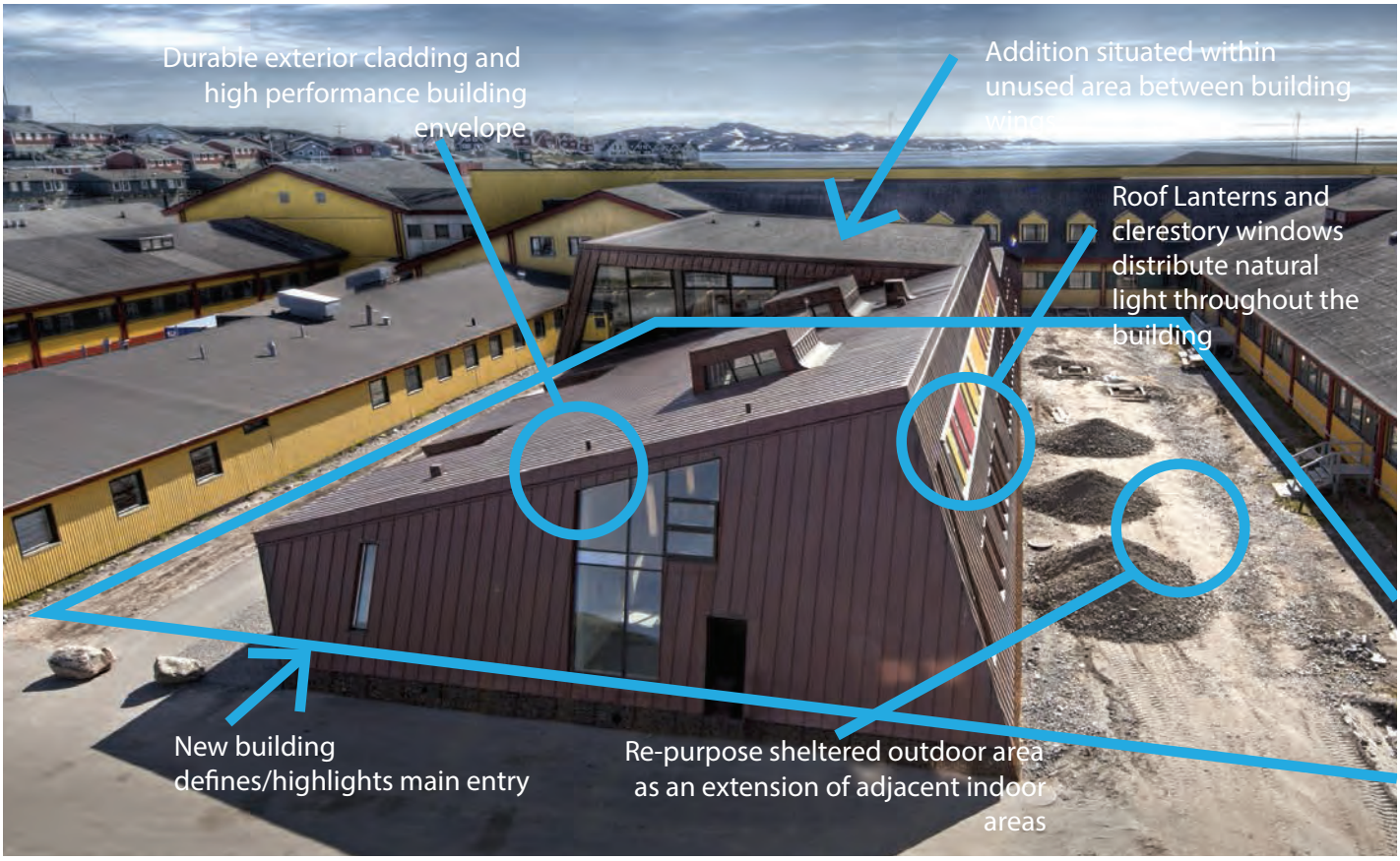


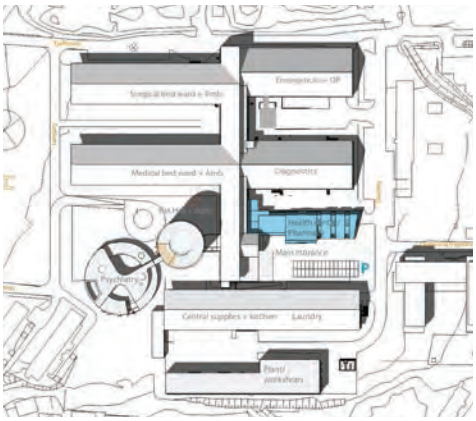


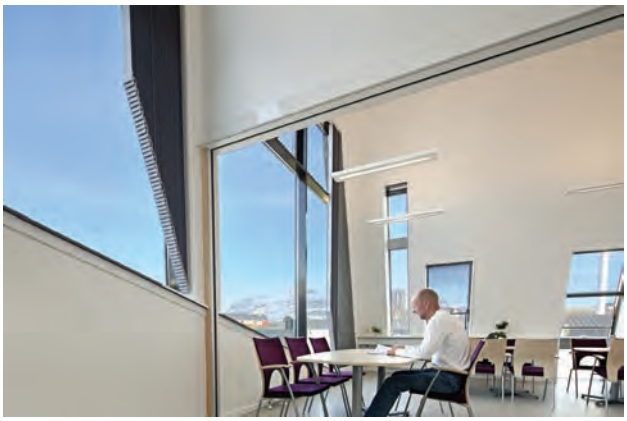
APISSEQ STUDENT HOUSING

Sisimiut, Greenland, 66˚ North
TNT Nuuk Architecture

Completed in 2010, the Apisseq Engineering Student Housing project was constructed as an energy efficient building in which modern energy-saving technologies were installed and monitored after occupancy. The main source of building heat is from a district heating network that is supplemented by a vertically-mounted evacuated solar tube system when sufficient solar gain is available. Post-occupancy monitoring by the Arctic Technology Centre (ARTEK) of the Danish Technical University (DTU) includes U-Value performance of windows and doors, blower door (airtightness) testing, thermo-graphic surveys, and ventilation performance.







DRONNING INGRIDS HOSPITAL

Nuuk, Greenland, 64˚ North
C.F. Møller Architects

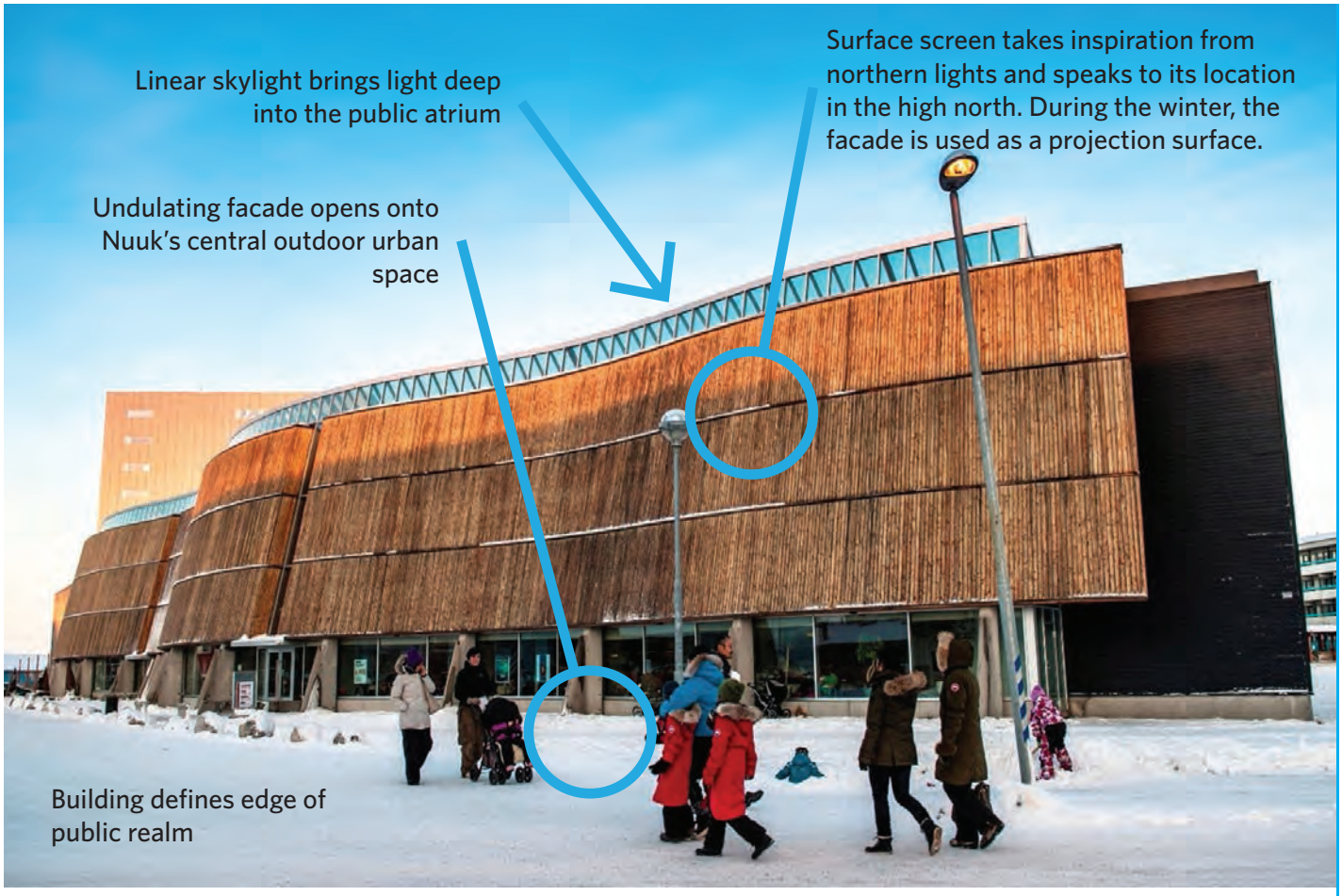
Completed in 2011, the 1,500 s.m. addition to the Dronning Ingrids Hospital help future-proof the original 1980 building through the combination of new buildings ar renovations. Filling an empty area between wings, the addition provides much neede new diagnostic and clinical space while abundantly capturing natural light and drawin inspiration from the natural surroundings.

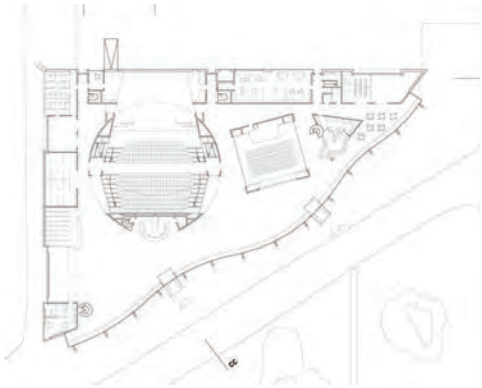
The texture of the copper and its robustness in response to the extreme climactic conditions of Greenland suits the sculptural nature of the building shape. Its sculptura form directs itself toward the town and its users, marking the hospital's new main entrance and renewal process.

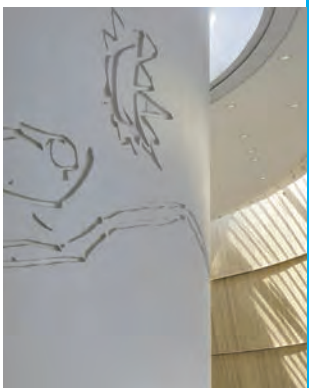
UNIVERSITY OF ALASKA FAIRBANKS SUSTAINABLE VILLAGE

Fairbanks, Alaska, 65˚ North
Cold Climate Housing Research Centre (CCHRC)

The University of Alaska Fairbanks Sustainable Village is a living laboratory for students and researchers to learn about energy efficient design and construction and other facets of sustainable living in the north. The project is a partnership between the Cold Climate Housing Research Center (CCHRC) and UAF to develop new building and energy technologies and include students in the creation of sustainable housing. Several types of insulation, ventilation, heating, and renewable energy systems were installed to allow for monitoring, comparative research and post-occupancy evaluation.



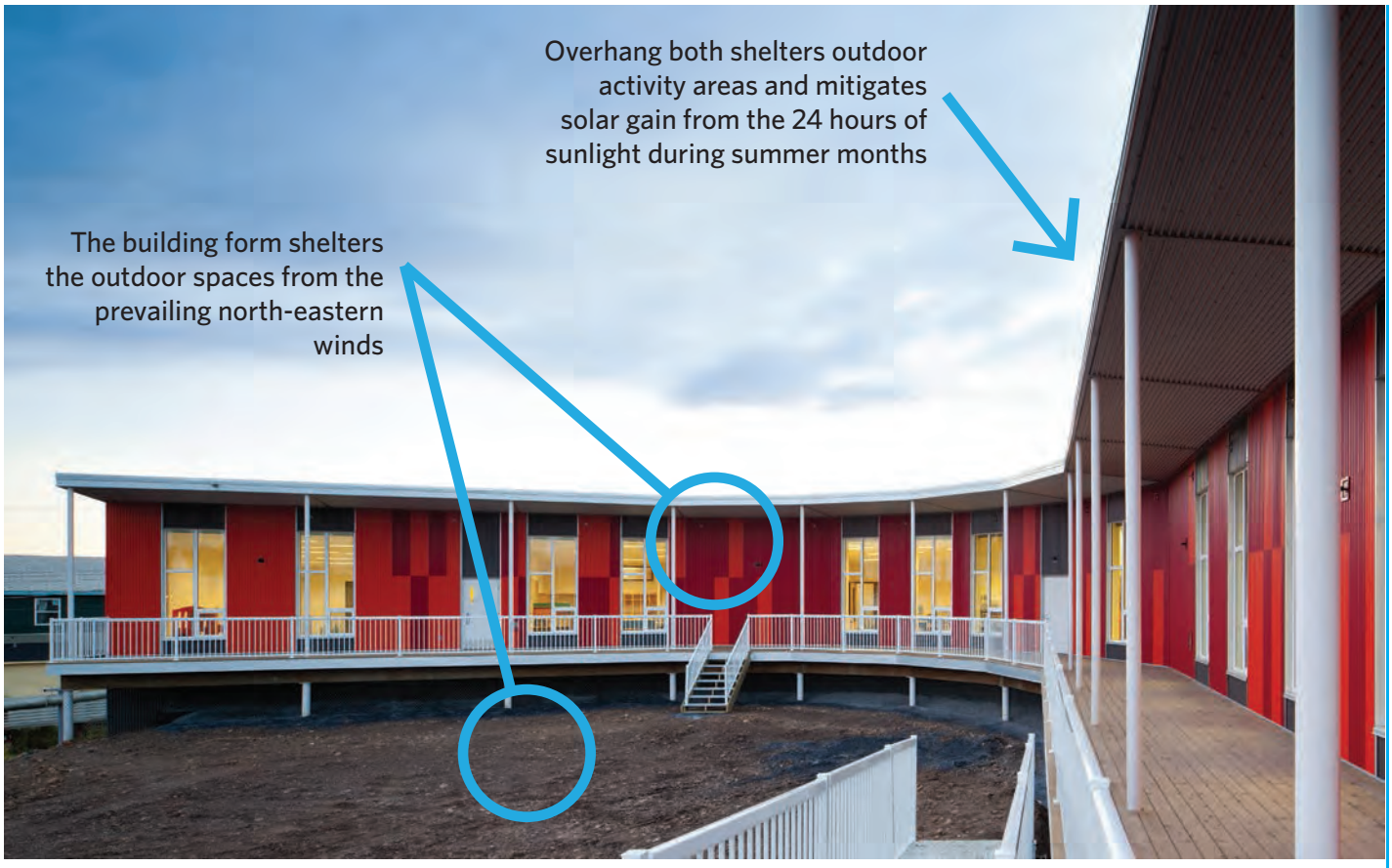


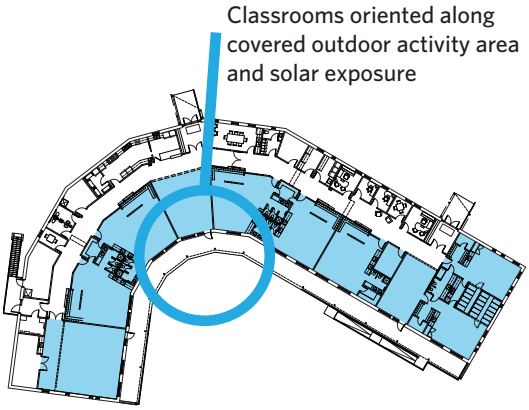


KATUAQ CULTURAL CENTRE

Nuuk, Greenland, 64° North
Schmidt Hammer Lassen Architects

Constructed in 1997, the 4,800 s.m. Katuaq Cultural Centre in Nuuk is used for concerts, exhibitions, conferences and as a cinema. The triangular-shaped building has an undulating, back-leaning facade that faces onto Nuuk's central urban space. Raised above the ground and clad in golden larch wood on both interior and exterior surfaces, the screen takes its inspiration from the northern lights and creates a contrast from the solid form of the building proper. Between the perimeter screen and the core building lies the large foyer that serves as an indoor public plaza for the city. The foyer is also a popular exhibit hall for artists from Greenland and Nordic countries.



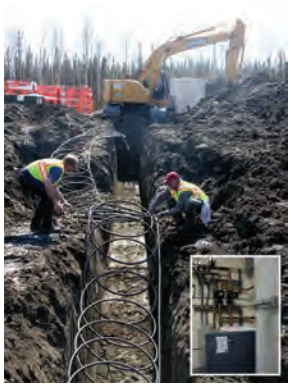


CHILDREN'S FIRST CENTRE

Inuvik, NT, 68° North
Kobayashi + Zedda Architects

Completed in 2013, the Inuvik Children's First Centre is the community's main early childhood education facility. Designed to respond to the prevailing north eastern winter winds, the building bends in plan to create a sheltered outdoor activity and play area as an extension of classrooms straddling the south-facing facade. During the shoulder and summer seasons, the building opens to embrace the adjacent outdoor area.

The large overhang also helps to shade the building from overheating associated with the 24 hours of sunlight during summer months. The plan follows a linear layout to maximize natural light penetration throughout the building.

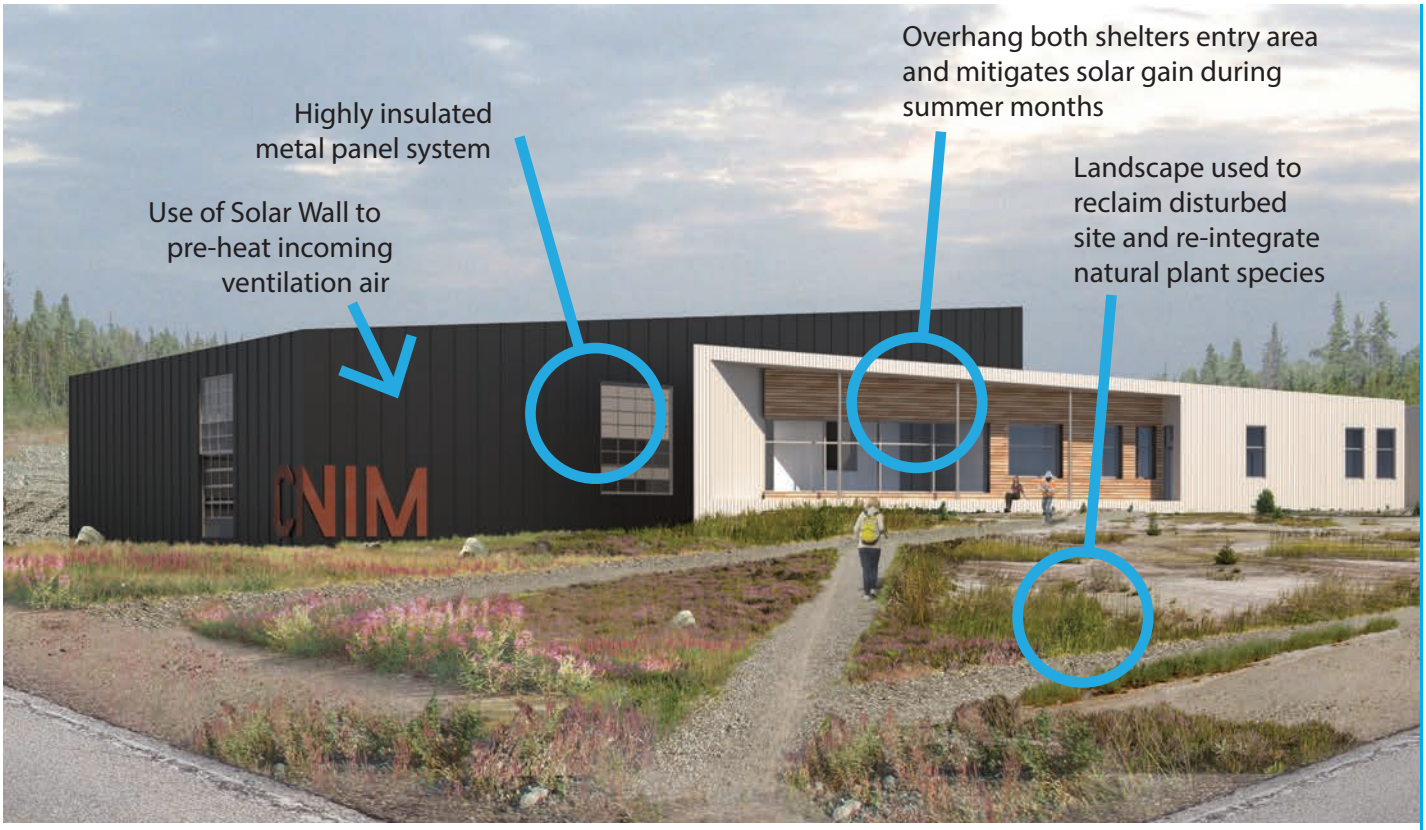


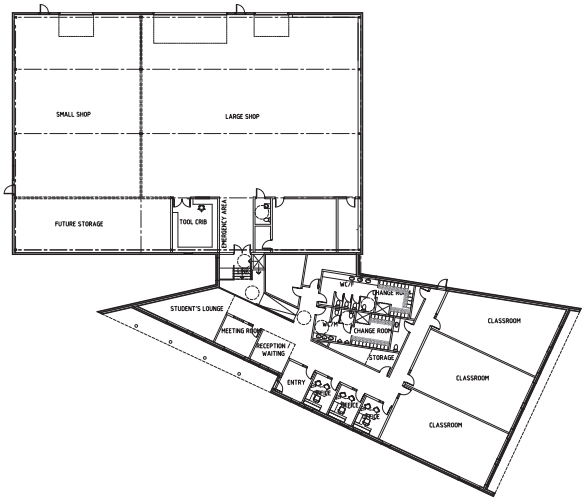
COLD CLIMATE HOUSING RESEARCH CENTRE

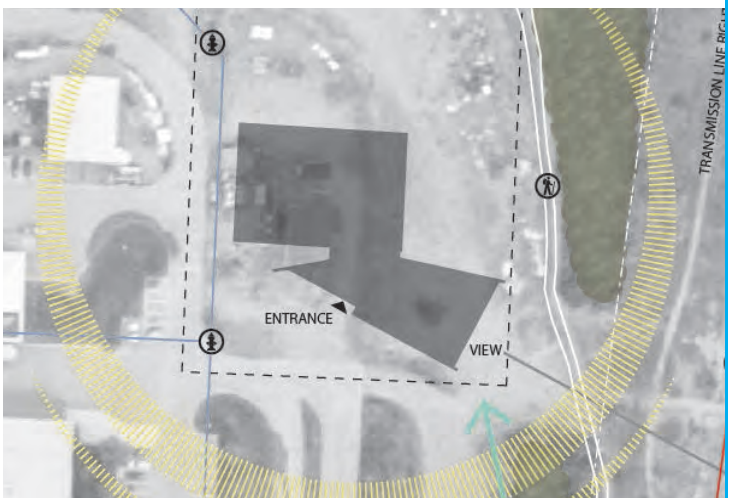
Fairbanks, Alaska, 65˚ North
CCHRC

The CCHRC is a research center based near the University of Alaska in Fairbanks, that tests, develops, and vets cold climate building and heating technologies for the north. CCHRC's Research and Testing Facility (RTF) is the most northern LEED Platinum building on earth. The 2,200 s.m. building incorporates cutting-edge building and energy technologies – such as an adjustable foundation, a ground source heat pump, a solar thermal storage system, and hundreds of sensors – as a demonstration of what's possible in cold climate construction.

Constructed in 2006, the RTF provides office and lab space for CCHRC and its partners to manage and carry out building and energy research and product testing. It also provides classroom, library, meeting, and demonstration space.





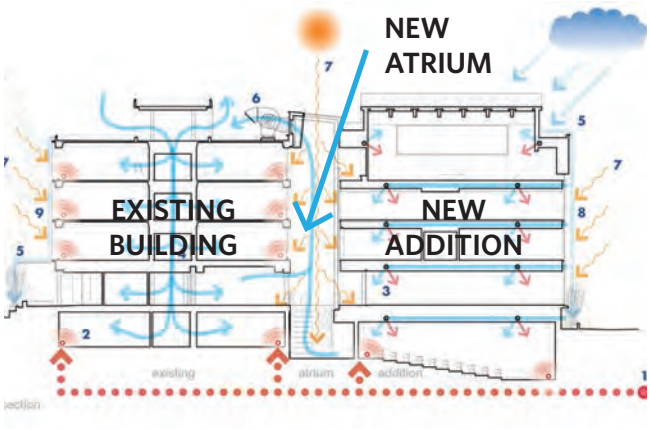


CENTRE FOR NORTHERN INNOVATION IN MINING (CNIM)

Whitehorse, YT, 60˚ North
Kobayashi + Zedda Architects

To be completed in 2015, the mandate of CNIM is to establish an education, training and research centre to respond to the changing needs of the mining industry in the Yukon. The new facility will provide shop, classroom and offce space for the new program at Yukon College.

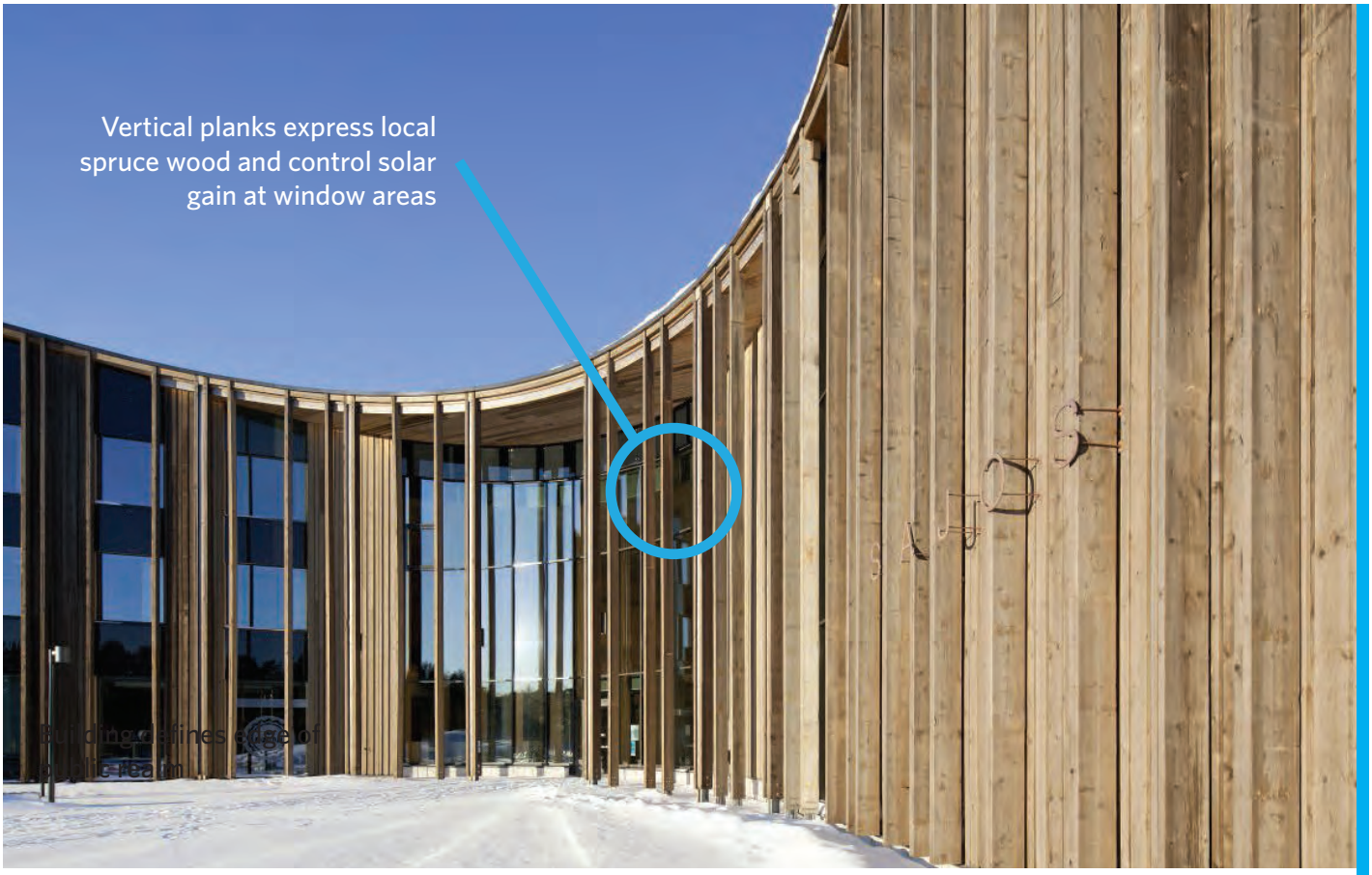
The building is oriented for maximum southern exposure in order to benefit from passive solar heat gain. By using a dark coloured material on the extensive south-facing shop wall, passive solar air heating will be achieved by using the building as a solar wall. The shop will feature highly insulated metal panels for both the roof and wall cladding, while the classroom wing will use an outboard insulation system over conventional wood framing, providing a continuous layer of insulation on the entire building that will continue into the foundation to ensure the building has minimal thermal bridging.

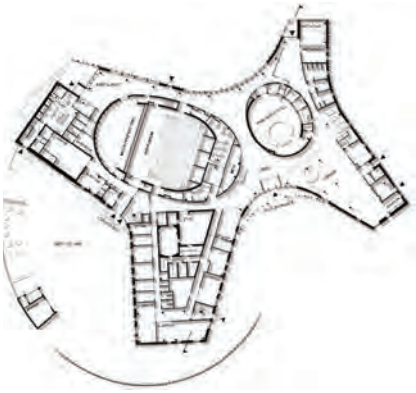


UBC SAUDER SCHOOL OF BUSINESS

Vancouver, BC, 49° North
Acton Ostry Architects

The new Sauder School of business complex is a combination of four interconnected buildings constructed in 1965, 1975, 1995 and 2010. It includes a 5 level, 5,400 s.m. addition with a connecting atrium. To achieve a new, bold, identity for the building, the old impassive concrete building was wrapped with a new high-performance glazed facade that references the rhythm, cadence and pattern language associated with digital commerce and business information. The final phase of the project reinforces the School's mandate of innovative learning through the inclusion of a wide variety of high tech and state-of-the-art teaching and learning spaces, including flat and tiered classrooms, breakout rooms, meeting rooms, a trading lab, learning commons, graduate student study areas and student lounges.





SAMI CULTURAL CENTRE SAJOS

Inari, Finland, 69˚ North
HALO Architects

The Sami Cultural Centre is located in the northern village of Inari, in the Finnish Lappland. Sajos is the centre of culture and administration for the Sami, the only indigenous people in Europe.

The building houses eight distinct functions with the space between program areas acting as a large flowing public space visually and physically connected to the adjacent river. Thermal insulation exceeds rigorous Finnish standards. Plentiful use of wood expresses Sami culture. The facade and interior are defined by vertical full-height planks of spruce wood treated with iron sulfate, while interior spaces are clad in horizontal treated pine boards to give an impression of a traditional handcrafted object.

9.3 Landscape Architecture

Leighton Artists' Residences, Banff Centre for the Arts
Banff, Alberta

The Leighton residences consist of eight unique small scale buildings, each designed by a different renowned Canadian architect. Intended for use by Canadian and international artists, these buildings have been the used for many artistic pursuits, including the cre - ation of novels, poetry, musical compositions and choreography.

The residences have been placed sensitively in a mature forest setting minimizing dis - turbance to the native ecosystem. It is not unusual to see elk wander through this site, enlivening the otherwise serene setting. No ornamental planting has been introduced to the native plant palette.

Some of the buildings have engaged the landscape by creating interstitial space between the indoor and the outdoor spaces. Generous overhangs and covered porches at entries create comfortable transition spaces, which are especially useful in cold climates.

Legislative Assembly of the Northwest Territories

Yellowknife, Northwest Territories

Opened in 1994, the Legislative Assembly of the Northwest Territories is situated in an environmentally sensitive wooded area next to a lake and a natural peat bog. Nestled into its surroundings, the building is an example of how a large development take a restorative approach and support ecological processes.

The building showcases local materials, including exterior cladding in zinc panels. Large windows in the Great Hall create a strong visual connection with the surrounding forest. The open space design focuses on restoring and preserving the native landscape.

Extra care was taken to preserve existing trees and minimize site disturbance during construction. Native plant material was used exclusively, and was propagated from seed collected on site. The peat bog, which was damaged during construction by the installation of a temporary access road, was carefully restored at the end of the project to bring it back to its pre-disturbance state.

Squamish Lil'wat Cultural Centre

Squamish, British Columbia

The Skwxwú7mesh and Lil'wat7ul Nations constructed this shared cultural centre overlooking Whistler and Blackcomb Mountains. The building has been placed in a natural setting to take best advantage of views while minimizing site disturbance. This facility showcases the two Nations' cultures during the 2010 Winter Olympics and is a permanent venue for cultural activities and displays.

The architecture, an amalgam of the Squamish longhouse and Lil'wat pit house, is integrated into the site with the landscape as a vital interpretive tool. The open space includes an interpretive native ethnobotanical garden featuring species traditionally used by both First Nations Groups. The pit house features a green roof that visually links views from the interior of the building to the mountains beyond.

10 EMERGING DIRECTIONS

Three Big Ideas

Yukon College is poised to create a new kind of campus that captures the unique spirit of the north through a deep understanding of people and place. This understanding is based on three over-arching ideas related to people, land and learning.

PEOPLE

Reinforce northern art and culture throughout the campus and create vibrant places for people to gather and enjoy

RECOGNIZE THE UNIQUE CULTURAL CONTEXT AND SITE HISTORY

- Reference the site's cultural context and history in the layout, design, and programming of buildings and open space
- Incorporate an interpretive network/wayfinding strategy that connects the campus with it's surroundings and history
- Reinforce new building/landscape directions (such as CNIM and reclamation landscapes) that embrace cultural context

SUPPORT CAMPUS LIFE AND COMMUNITY CONNECTIONS

- Maximize outdoor comfort in key gathering places
- Invite the community onto the campus through design and programming
- Co-locate synergistic uses/buildings such as a museum, government offices or business partners on campus
- Build attractive and responsive student housing
- Ensure support services (daycare, dog daycare etc.), amenities and recreation opportunities are provided on campus
- Provide high quality places for people to gather in a compelling indoor/outdoor network

LAND

Incorporate a holistic approach to sustainability that embraces the natural environment and introduces sustainable systems

MAKE COMPELLING CONNECTIONS TO THE NATURAL SETTING

- Take advantage of extraordinaary views to and from the campus
- Strengthen the relationship between buildings and exterior spaces and link inner spaces to the periphery/ adjacent trails in a clear and logical way
- Bring the natural environment into the core campus area
- Ensure new development minimizes disturbance to natural environment
- Use design and building configurations to improve microclimates

IMPLEMENT SITE-WIDE SUSTAINABILITY RELATED TO TRANSPORTATION, WATER, WASTE, AND ENERGY

- Design pathways and trails that allow pedestrians, cyclists and other recreational users to move comfortably, safely, and efficiently to and within the campus
- Maximize transit access and comfort on campus
- Improve building performance by using new development to trigger envelope upgrades
- Consider laminating new space onto existing buildings to improve energy performance and create new gathering places

LEARNING

Embrace cold climate innovation, university directions and leadership

CREATE A COLD CLIMATE SHOWCASE AND STRENGTHEN PROGRAMMATIC DIRECTIONS IN THE DESIGN OF THE CAMPUS

- Reinforce the College's leadership role in renewable energy research
- Promote research and innovation throughout the campus and strengthen research focus by testing new technologies and approaches on campus
- Enhance support for economic development and community-building through campus design and programming
- Implement climate responsive design campus-wide
- Target a precedent-setting campus that demonstrates how to do things better in the North

REFLECT THE NEW UNIVERSITY STATUS IN THE DESIGN OF THE CAMPUS

- Provide direction for campus architecture and public realm that expresses the dignity and enhanced campus experiece of a university
- Reinforce identity through a stronger sense of arrival
- Explore ways to lessen the visual impact of existing surface parking and work with grades to find opportunities for structured parking