City of Whitehorse
Transit Master Plan

Stantec

Final Report

City of Whitehorse
Transit Master Plan

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Whitehorse Transit

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Acknowledgments

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Executive Summary

With a growing population pushing the development of new residential communities and increasing density in the downtown core, Whitehorse is in a prime position to reinvent its transit system; bringing it into the 21st century and providing a viable and sustainable alternative to driving. The Transportation Demand Management Plan for Whitehorse identifies the need for a long-term transit plan, developing key goals and a feasible trajectory for the agency that matches current demand, maintains the strength of the system, and rectifies its shortfalls in operations and customer experience. In response, Whitehorse Transit commissioned Stantec Consulting Ltd. (Stantec) to produce a long-term Transit Master Plan, fitting within the long-term visions for Whitehorse outlined in existing planning documents. Key considerations for future planning in Whitehorse include an environmentally sustainable design, infrastructure that encourages active transportation and multi-modal travel, and livable neighborhoods anchored by a strong downtown core. In the interest of coalescing these goals and providing concrete steps toward achieving them, this Transit Master Plan envisions a Whitehorse Transit that serves all mobility needs, leverages investments in active transportation and multi-modal travel, and is well positioned for the future.

Stantec first assessed the current operating landscape in Whitehorse, including existing transit service, demographics, planning and development endeavors, and customer satisfaction. This initial background work provided a comprehensive understanding of opportunities, changes and challenges currently being faced in the City, some of which include:

- A transit network historically centered around the downtown which artificially forces transfers downtown, decreases route directness and increases travel times.
- Customers not satisfied with route directness and the amount of information provided to passengers.
- Potential for high use of bicycles in combination with busing, especially in summer months.
- Lack of Sunday service, and low frequency on many routes (60 minutes or longer).
- Population growth throughout Whitehorse, with 5000-8000 residents expected in ongoing Whistle Bend development.
- High demand for transit in Downtown, Porter Creek, Riverdale, and Copper Ridge communities.

A complete summary of community engagement efforts and customer satisfaction can be found in section 2.0. Changes to the population, density, and planning efforts in Whitehorse will have a direct impact on how transit should operate in the City. It is important to establish consistent, stronger connections to the Whistle Bend development, and work with local planning departments to establish a transit-first, or transit-supportive neighborhood. In support of frequent travel outside of the downtown, specifically to Yukon College and local high schools, customers would prefer the option to travel by bus without connecting through the downtown, pushing for additional transfer points in the network, and well-timed transfers.

To understand how existing service matches with demand and requests from current riders, Stantec evaluated several aspects of the current network, identifying the strengths and shortfalls of each.

Technology:

The use of technology is evolving rapidly in public transportation. Technology has made public transportation more effective and efficient and is enabling riders to personalize their transit experience. What is required for the next generation of Whitehorse Transit are cost-effective technology solutions that continually enhance the rider experience to grow ridership while providing data and data analytics to help make Whitehorse Transit services sustainable, both financially and environmentally.

Whitehorse Transit has implemented many industry best practices, including on-board cameras to improve passenger safety, and the use of Trapeze as an electronic dispatch and scheduling system, and should be commended for bringing these technologies on-board.

Looking to the future, Whitehorse Transit uses dated technology that the industry has largely moved away from, including gravity driven fareboxes, and on-board 2-way radios. Fare payment technology has evolved in favour of user-friendly smartcard and electronic payment solutions, which appeal to a technology-reliant ridership base. In addition, Whitehorse Transit does not offer real-time next-stop announcements or real-time scheduling to its riders. Next stop announcements, while not legislated in the Yukon, orient riders and improve the usability of transit for visually-impaired passengers. Stantec recommends these technologies be considered in the future, empowered by a CAD/AVL and GPS system installed on each vehicle.

Fleet:

Whitehorse Transit currently operates a uniform conventional transit fleet comprised of 40-foot NOVA buses, and two Arboc specialized transit vehicles, streamlining the parts and maintenance process. As the transit industry investigates new technologies in vehicle propulsion, including CNG, electric and hybrid buses; Whitehorse Transit must determine the trajectory for its fleet and future vehicle procurement processes.

Given Whitehorse's remote location, and the cost associated with maintaining an aging fleet, Stantec recommends the following trajectory for Whitehorse Transit:

- Maintain the existing Diesel propulsion system in future procurements.
- Update procurement specifications to require a stronger product of future vehicles, reducing long-term maintenance costs.
- Retire conventional vehicles after 15 years, and specialized vehicles after 7-years, maximizing the productivity of the vehicle, at minimal cost.
- Perform a light refurbishment of the two 2008 Nova buses, and the two highest performing 2006 vehicles.

A full analysis of the existing fleet and future recommendations can be found in section 3.1.

Accessible Transit:

Whitehorse Transit currently operates a specialized transit service known as Handy Bus, offering door-to-door travel for eligible passengers with disabilities, or reduced mobility. While an extremely convenient service, the Handy Bus program is comparatively expensive, with a cost-per-trip 94% higher than its peer agencies. Stantec is concerned for

the financial sustainability of the Handy Bus program in its current state, and recommends that alternate service delivery models such as a Taxi Scrip program or user side subsidies be investigated as well as investments made into accessible conventional transit be leveraged.

Although Whitehorse Transit is not legislated to provide accessible transit for persons with disabilities, Stantec advocates for barrier-free access to transit for all citizens, and believes that Whitehorse Transit must take steps to provide a sustainable solution. Further improving upon existing performance, it is also recommended that Whitehorse Transit investigate the cause of higher than normal no-show rates, and reduce the wait time policy from 10 minutes, to 5 minutes – improving on-time performance for all passengers.

Further to this, Stantec recommends that Whitehorse Transit incorporate Handy Bus into the agency's master brand. Accessible transit is an extension of the conventional service, and a distinct brand that highlights disabilities may be marginalizing to its riders.

Active Transportation:

Active transportation—walking and cycling—can help improve a city's quality of life for many reasons, such as decreasing pollution, traffic, and noise related to single occupancy vehicles, not to mention the public health benefits associated with self-powered transportation. In tandem with public transit, active transportation can reduce congestion and help diversify transport options, particularly for short-distance trips (typically under 5 km). Taken together, the interplay between walking, cycling, and public transit can help achieve many of sustainability goals set by cities worldwide, and this is no different for Whitehorse.

Whitehorse Transit encourages the interplay between public transit and cycling by offering bike racks on the front of all vehicles, accommodating 2 bicycles, and allowing passengers to bring their bicycles on-board if space allows for it. Results from Stantec's community engagement survey indicate that those who cycle are also willing to use the bus on the same trip, especially in the winter. To further encourage this, it is recommended that Whitehorse Transit consider the following:

- Investigate the feasibility of bike racks to accommodate "fat-tires", popular in off-road trips and in the winter.
- Install secure bicycle parking at major bus stops
- Increase wayfinding and signage between bicycle trails and bus routes
- Participate in "share the road" campaigns to advise the public on safe cycling, especially on bus routes.

Capital Infrastructure:

Capital infrastructure refers to the physical infrastructure relevant to a transit system, including bus stops, and signage. In Whitehorse, capital infrastructure includes bus stop signage, shelters, and bench seating at bus stops. While bus stops are well dispersed throughout the City and its peripheral communities, there is a lack of consistency among bus stops, including:

- Few bus shelters placed intermittently throughout the network.
- Vandalism of bus shelters is a concern, prompting new metal design featuring First Nations artwork. While aesthetically beautiful, these shelters do not fully serve their purpose, as they lack adequate windscreens, allowing the wind through in the winter.
- Bench seating at bus stops is infrequent, but in high demand. Impromptu seating made of school chairs or old benches has been found at several stops, indicating that locals are taking matters into their own hands to increase comfort while waiting at bus stops.

Additional and consistent infrastructure at stops is necessary, ensuring that customers feel comfortable, safe, and protected from the elements (see section 3.2).

Marketing:

Marketing of transit is a key component to attracting and maintaining ridership. While significant investment has been dedicated to running Whitehorse Transit, this has not been extended to marketing of the service. As evidenced in Stantec's community survey, this has resulted in low appreciation for transit and a neutral image of the service. Stantec identifies the following shortfalls of the existing marketing strategy, which must be proactively addressed:

- **Transit is not perceived as "cool", but rather a last resort.** Given the engrained preference for driving found in the community survey, it is important that transit be perceived not only as a viable travel option, but as a "cool" travel option. This depends on a strong marketing campaign focusing on changing attitudes around using public transit, such as those used in Los Angeles.
- **No formal marketing plan.** Whitehorse has made tactical marketing efforts in the community, however these efforts have not been guided by a formal marketing plan. As marketing requires some level of financial investment, it is recommended that Whitehorse transit bring on a marketing consultant with transit experience to develop this plan, and guide its implementation in the coming years.
- **Bus stop signage does not convey brand, or attract ridership.** The existing bus stop signage is both unassuming, and confusing – as it does not clearly indicate a bus stop, route, stop identifier, or the Whitehorse Transit brand. As these stop markers are a frontline source of information within the community, it is recommended they be improved to reflect future branding.

Whitehorse Transit does, and will continue to provide a high-quality service to its residents. The battle lies in encouraging community members to use transit, especially if they do not need to (ex: car owners). A strong marketing plan and unified brand placed throughout the community will take large steps towards this goal (section 3.3).

Implementation Plan

Based on a thorough review of the operating landscape in Whitehorse, and the current performance of Whitehorse Transit, Stantec recommends the following 5-year implementation plan, separating recommendations into the short-term (0-2 years) and long term (3-5 years). A detailed explanation and rationale for each recommendation can be found in sections 3 and 4.

Route Network:

Short Term (0-2 Years)	Long Term (3+ Years)
• Alter existing route network and schedules to reflect Phase I of the recommended route network.	• Increase service on route 5 and consider additional service improvements. • Develop Key Performance Indicators tailored to the updated route network. • Increase fares alongside service increases and routing updates

Technology:

Short Term (0-2 Years)	Long Term (3+ Years)
• Install CAD/AVL and MDT technology to enable real-time schedule updates. • Consider the installation of a mobile fare payment solution. Stantec recommends the installation of a mobile fare payment solution such as eiGPS/PIN Payment Solutions.	• Whitehorse Transit website update and mobile app development. • Consider Wifi on-board vehicles • Remove handheld 2-way radios from buses • Monitor bus collision warning systems.

Fleet Procurement:

Short Term (0-2 Years)	Long Term (3+ Years)
• Update procurement specifications to require stronger provisions for future purchases. For example, despite the fact that Whitehorse Transit has been procuring steel-framed Nova buses, it is recommended that stainless steel frames be written as a bid requirement to ensure future procurements remain competitive. • Perform a light refurbishment of the 2008 Nova Buses extending their service life beyond the 2010 units. This may be accompanied by necessary refurbishment of the two best 2006 units.	• Continue to procure new 40-foot diesel-propulsion vehicles as needed, retiring buses after 15 years, and plan for the purchase of two additional vehicles in alternate years. • Continue to procure new specialized transit vehicles as needed, retiring buses after 7 years.

Specialized Transit:

Short Term (0-2 Years)	Long Term (3+ Years)
• Implement Taxi Scrip program in lieu of operating the Handy Bus • Continue enforcing policies and promoting travel training and use of conventional transit travel • Investigate and address the root cause(s) of the increase in no shows. • Reduce the wait time policy from 10 minutes to 5. • Rebrand Handy Bus to be an extension of the master agency brand, Whitehorse Transit.	• Continue evaluating ridership and demand for the home-to-hub program, adjusting service hours and fleet if required.

Active Transportation:

Short Term (0-2 Years)	Long Term (3+ Years)
• Improve bicycle safety and awareness by participating in “share the road” educational campaigns. • Improve signage and wayfinding between bus stops/routes and multiuse trails. • Participate in the ongoing Bicycle Network Plan processes to understand how transit can work better for cyclists. As Whitehorse is currently preparing a Bicycle Network Plan, this plan should include strategies to include transit, as well as ensure that new bike paths are designed and built in a way to minimize conflicts with bus routes and operations. • Investigate the feasibility and market of bike racks on buses with space for “fat tires”.	• Identify bus stops with high passenger volumes, as well as bus stops or locations that could serve as “bike park and rides” or mobility-hubs and work with the City to install secure bike parking.

Capital Infrastructure:

Short Term (0-2 Years)	Long Term (3+ Years)
• Identify the highest-demand stops in the network, and install seating and a bus shelter. • Consider new shelter designs, or new windscreen designs that are compatible with existing shelter designs, to provide adequate weather protection. A shelter design made of durable material (metal, wood, plexiglass) is recommended, ensuring that windscreens are present on both sides, protecting from the winter elements.	• Add shelters and seating to remaining stops as necessary while capital funding becomes available. Once infrastructure is installed at major bus stops and transfer points, additional funding should be used to progressively install shelters and bench seating at remaining stops, by virtue of a triage system. • Investigate paid advertising, managed and maintained by a local third party contractor. • Investigate the feasibility of a downtown transit hub at 2nd Avenue and Steele St.

Marketing and Rebranding:

Short Term (0-2 Years)	Long Term (3+ Years)
• Retain marketing agency/consultancy with transit expertise. This firm would assist Whitehorse Transit to develop a marketing plan, undertake a branding review and devise a future action plan. • Develop a marketing plan. In consultation with a marketing agency, prepare a marketing plan outlining an actionable vision, marketing strategy, budget, and implementation plan.	• Develop new branding • Initiate tactile marketing strategies, with a focus on grass-root tactics in the community. • Create a new design for bus stop signage, clearly marking all bus stops and creating a unified brand. • Develop a new website and app for transit.

1.0 PROJECT BACKGROUND

1.1 SERVICE AREA PROFILE

1.1.1 Demographics

The City of Whitehorse was home to 25,085 residents in 2016, showing significant population growth of nearly 8-percent from 2011. Understanding the demographic composition of Whitehorse is essential in developing a transit system tailored to the population's needs. Table 1 compares the demographics of the City to those of the Yukon Territory, and that of Canada.

Table 1: Demographic Profile of Whitehorse

Statistics	Whitehorse	Yukon	Canada
Total Population	25,085	35,874	35,151,728
Population Change (2011-2016)	+7.8%	+5.8%	+5.0%
Households	10,710	17,984	14,072,080
Average Household Size	2.4	2.3	2.4
Median Household Income	$81,768	$73,935	$61,348.00
Unemployment Rate	7.0	9.2	7.8
Labor Force	15,415	21,795	17,990,080
% Recent Immigrants	3.6%	3.1%	3.5%
% Caucasian	89.2%	91.5%	80.9%
% Aboriginal	17.5%	23.3%	5.6%
% Minority Groups	10.8%	8.5%	19.1%
% Male	49.5%	50.3%	49.1%
% Female	50.5%	49.7%	50.9%
% 14 or under	18.3%	17.5%	16.6%
% 15-35	27.9%	26.0%	18.9%
% 36-64	42.9%	44.6%	41.2%
% 65+	10.9%	11.9%	23.3%
No degree	14.5%	16.3%	20.1%
High school	24.6%	23.6%	25.6%
Postsecondary	60.8%	62.4%	46.8%
Owned	65.9%	63.7%	69.0%
Rented	34.1%	36.3%	31.0%

Single Detached Home	50.1%	61.2%	53.6%
Semi-Detached Home	9.6%	7.6%	4.9%
Apartment (<5 storeys)	15.1%	11.3%	9.9%
Apartment (>5 storeys)	0.04%	0.03%	18.0%
Other	25.16%	19.17%	13.6%
% Spending >30% of income on housing	19.8%	18.41%	25.2%
Car	84.0%	82.2%	79.7%
Transit	5.0%	1.7%	12.0%
Walk	6.4%	9.4%	5.7%
Bicycle	3.1%	2.6%	1.3%
Other	1.5%	4.1%	1.2%

Some notable features include a relatively high median after-tax income, workforce size, and average level of education in comparison to the national average. Several of these trends can have a notable impact on transit use and future transit planning.

First is population density which is impacted by land use, urban form, and housing types. As the Wilderness City, rural or unoccupied land surrounds much of Whitehorse, encouraging low-density sprawl. Whitehorse has a higher proportion of low-density housing (single detached, row housing, mobile homes, and apartments of fewer than 5 storeys) than elsewhere in Canada. This reliance on low-density housing can mean a more sprawling, difficult to serve market, given that transit relies on serving many people. This is apparent in Whitehorse as rapidly developing suburban communities emerge further from the downtown core, including the rapidly growing Whistle Bend development, which is projected to house nearly 8000 residents in the coming years. Connecting these far-reaching neighborhoods to employment opportunities will be essential to the success of the network. Further, Whitehorse is a City that relies heavily on the use of personal vehicles, shown by the 84-percent use of the car for daily commutes. As such, it will be difficult to convert most car users into regular transit users, given the convenience of the car in a small city like Whitehorse. Only by approaching the level of convenience and freedom—namely through high-frequency routes that are reliable—can some drivers be enticed to try, and hopefully adopt, transit and more sustainable travel modes.

As important for transit viability is employment density, which centres in the downtown core. Providing direct and reliable transit within the reach of many jobs will increase the utility of transit not only for commuting to work, but to use transit to reach services that are provided at those employment locations, like schools, clinics and hospitals, shopping malls, grocery stores, etc.

Finally, Whitehorse is home to nearly 70-percent of the population of the Yukon Territory. With several First Nations groups living in the Yukon, 17.5-percent of residents are First Nation; significantly higher than the rest of Canada (5.6-percent). Members of the Kawnlin Dun First Nation and Ta'an Kwach'an Council live throughout Whitehorse, with specific concentration in the McIntyre neighborhood. As a substantial portion of Whitehorse Transit's ridership comes from First Nations communities, it is important that this Transit Master Plan consult with and consider the needs of these groups.

1.1.2 Land Use Profile

Whitehorse is geographically distinct; separated into a series of small, primarily residential neighborhoods surrounding the downtown core, which are connected by a series of highways and arterial roads. The land use profile of Whitehorse is summarized below based on the prevalence of residential and employment opportunities in the City. Context can be derived from Figure 1, which explores the location of all suburban neighborhoods, and their relation to the existing Whitehorse Transit network.

Residential Land Use

Households are spread throughout Whitehorse and its surrounding neighborhoods. Currently, low-density residential housing, primarily in the form of single detached homes, is concentrated in Riverdale, Porter Creek, and Granger/Copper Ridge. It is noteworthy that development of the Whistle Bend neighborhood is currently underway, where single-detached and row homes are projected to house 5000 – 8000 residents in the next 10 years. Given that the current population of Whitehorse remains below 30,000 residents, this neighborhood will house a large demographic of Whitehorse, and therefore transit must adequately connect Whistle Bend, and other large neighborhoods such as Riverdale, Porter Creek, and Granger to local destinations.

Planning endeavors are also underway to increase housing density in the downtown core. The updated Whitehorse Downtown Plan suggests that condominium style housing and buildings of 5+ storeys may be introduced, prompting the need for frequent service in the future, as current trip patterns suggest that the Downtown is a hub for transit trips in the City.

Employment and Education

Employment opportunities are concentrated in the Downtown core, and Marwell. This includes a variety of commercial land uses, municipal, territorial, and federal government buildings in the Downtown, and heavy industry near Marwell. While the existing route network and transfer zone concentrates service in the downtown, future iterations of the transit network must maintain some connection between residential neighborhoods, and the downtown core to accommodate trips to work or school.

Educational institutions are prevalent throughout Whitehorse, the most notable of which is Yukon College, located between Downtown and Porter Creek. As Yukon College has recently been granted University status, plans to develop the campus into a dense regional destination are underway, likely increasing the footprint of the campus, and demand for travel. Future iterations of Whitehorse Transit's network should offer service and transfer opportunities at the College, as it is both a trip destination, and home to many students, and seniors. Additionally, large secondary schools in Porter Creek and Riverdale are frequented by many students from across the city. Current policy offers high school students the option to receive a public transit pass to use on Whitehorse Transit or contracted school bus service for their commuting needs. Maintaining service to Porter Creek High School, and schools in Riverdale South is therefore key to capturing student ridership in the future.

1.1.3 Whitehorse Transit Service

Service Overview

In 2016, Whitehorse Transit carried 616,000 riders across its six transit routes. This is impressive given the size of the city and transit agency. Of the six routes offered by Whitehorse Transit, two operate only from Monday to Friday, one operates only during weekday peak hours, and no service is offered on Sundays. All routes currently operate on an hourly frequency, with additional trips added to routes 2 and 5 during the morning and afternoon peak, increasing service to a 30-minute frequency during these periods. Table 2 lists the current Whitehorse Transit routes, and their respective service hours, while Figure 1 shows the current route network and schedules as advertised to riders.

Table 2: Existing Whitehorse Transit Service

Route	Weekday Service Hours	Saturday Service Hours	Sunday Service Hours	Notes
1 Riverdale North – Porter Creek Express	6:40 am – 7:40 pm	No service	No Service	Hourly Frequency
2 Riverdale South – Copper Ridge - Granger	7:00 am – 10:20 pm	7:30 am – 7:30 pm	No service	Hourly Frequency, half hour during peak times
3 Riverdale North – RR - McIntyre – Hillcrest	6:55 am – 10:20 pm	7:55 am – 7:00 pm	No service	Hourly Frequency
4 Porter Creek – Crestview	7:00 am – 10:20 pm	7:00 am – 7:00 pm	No service	Hourly Frequency
5 Takhini – Lobird – Copper Ridge Express	7:00 am – 10:20 pm	8:10 am – 7:10 am	No service	Hourly Frequency, half hour during peak times
6 Ingram – Granger – Porter Creek – Whistle Bend	8:00 am – 11:00 am 3:00 pm – 7:00 pm	No service	No Service	Peak Times Only

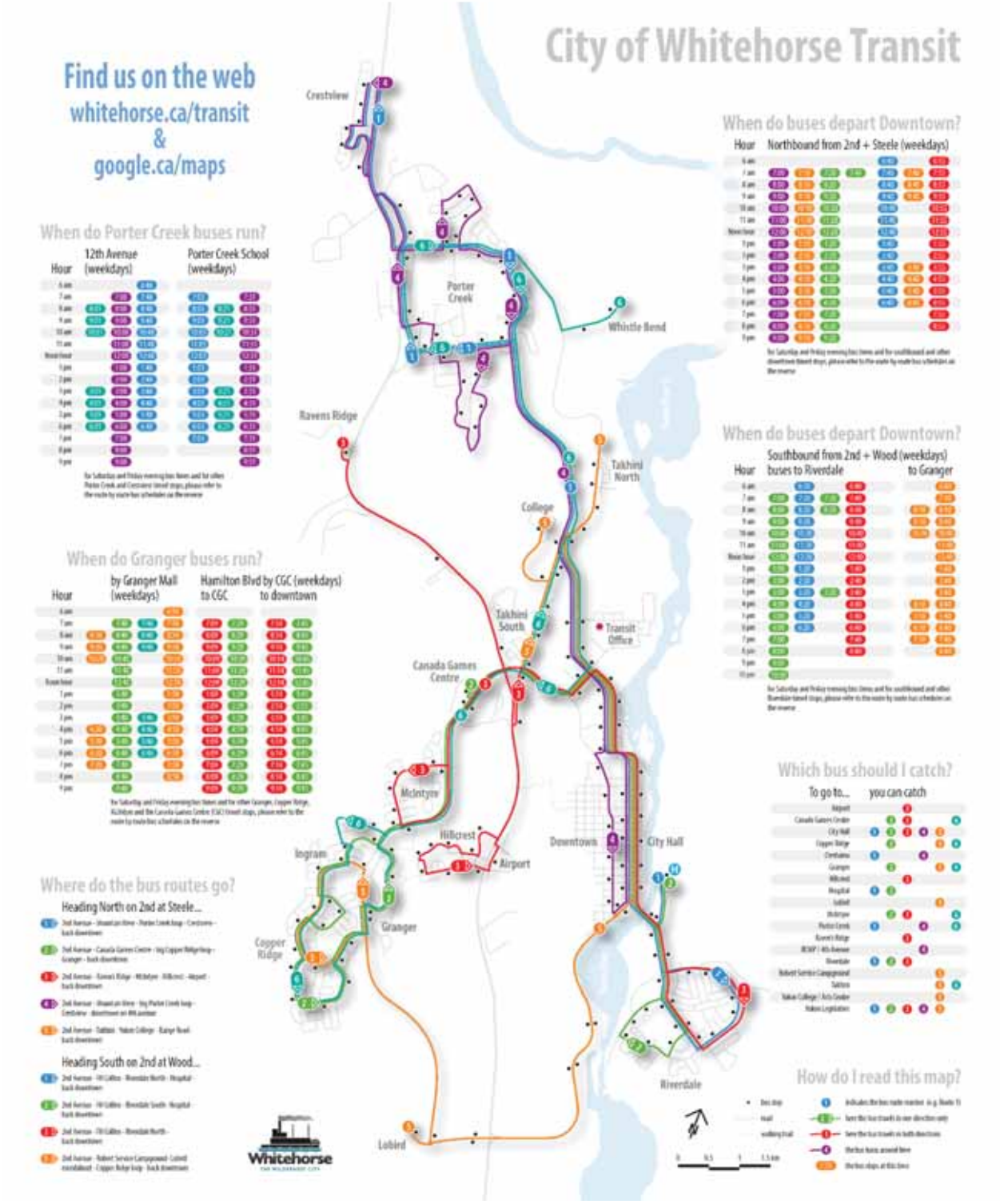


Figure 1: Map of current Whitehorse Transit service (Fall, 2017)

Current Routing Profile Review

Route 1 Riverdale North – Porter Creek Express

Route 1 currently connects Riverdale to Porter Creek and Crestview, offering an express route through the downtown core. Geared towards residents commuting into the downtown, and students travelling to school in Porter Creek and Riverdale, this route successfully connects several high-demand neighborhoods.

One-way travel time from Crestview to Riverdale on route 1 is 30-35 minutes, operating on an hourly frequency. One-way loops through Riverdale, Crestview, and Porter Creek increase travel time for riders boarding the bus prior to these locations. Travel time from Riverdale to Crestview by car is approximately 14 minutes, indicating over double the travel time on transit. To increase frequency, a shorter alignment or separate routes connecting Porter Creek and Riverdale to the downtown may be preferable, as the origin-destination survey shows there is little demand for a direct connection between Porter Creek and Riverdale.

Route 2 Riverdale South – Copper Ridge – Granger

Route 2 connects Riverdale to Copper Ridge and Granger by way of the downtown, and Canada Games Centre. Many students travel to high schools in Riverdale, prompting high demand for the service at the beginning and end of the school day. This has led to additional service (on 30-minute frequency) during peak hours. This route successfully connects Riverdale and the downtown core, allowing passengers the option to transfer to four other routes on 2nd avenue, however long travel times to Granger/Copper Ridge limit the frequency of the route to only 60 minutes during the off-peak.

Route 3 Riverdale North – Ravens Ridge - McIntyre – Hillcrest

Route 3 currently serves Ravens Ridge, Hillcrest, and McIntyre en-route to the downtown core, and Riverdale. This alignment creates a convoluted route with high travel time that is not warranted by the ridership in Ravens Ridge or Hillcrest. Existing travel time from McIntyre to the downtown core is nearly 25 minutes by transit, caused by a long deadhead into Ravens Ridge, while the same trip by car would take only 7 minutes.

Ravens Ridge is spatially isolated from nearby communities, and sees little ridership. Removing conventional service in this area would decrease travel time by transit, and provide a direct connection to the downtown for residents of McIntyre and Hillcrest, who are served by only one route. With the elimination of conventional fixed-route, it is envisioned that a “home to hub” service be offered instead to provide coverage. This is further discussed later in the report.

Route 4 Porter Creek – Crestview

Route 4 supplements the connection between Porter Creek/Crestview and the downtown made by route 1. Alignment on route 4 is generally more circuitous, serving side streets such as Ponderosa Dr. and Sycamore St., while route 1 runs on larger arterial roads. Route 4 also makes a large, one-way loop through the downtown along 4th avenue, South Access Rd, and 2nd avenue. This alignment increases one-way travel time to nearly 35 minutes, limiting the on-time performance of this route on 60-minute frequency.

Service on route 4 terminates at 9:00 pm on weekdays, and 7:00 pm on Saturdays, limiting the use of transit for leisure and entertainment, especially given the direct connection from Porter Creek to the downtown.

Route 5 Takhini – Lobird – Copper Ridge Express

Route 5 connects Granger to Yukon College by way of Lobird, downtown, and Takhini. Travel times on route 5 are high given the deadhead time from downtown into Lobird, with a final turnaround point in Granger. This leads to an indirect route between Granger and Yukon College, with one-way travel times of up to 30 minutes. Based on origin-destination survey results, demand in Lobird is not sufficient to support a conventional transit route. This area may be better served by alternate delivery models.

Additionally, the routing southbound from the downtown along Robert Service Way serves few households, and only one tourist destination at the SS Klondike. Removing this alignment may benefit travel time.

Route 6 Ingram – Granger – Porter Creek – Whistle Bend

Route 6 connects Whistle Bend to Granger by way of Porter Creek, operating on hourly frequency during peak times only. This connection was developed with the intention of serving students travelling between Granger and Porter Creek/Whistle Bend, concentrating service at the beginning and end of the school day.

The alignment on this route creates travel times of nearly 40 minutes from Whistle Bend to Granger, caused by a one-way loop through Porter Creek, and circuitous routing through Copper Ridge and Granger. Routing through the Porter Creek loop appears redundant, as routes 1 and 4 already provide service in this area. Except for Porter Creek Secondary School, there is little demand to travel between Porter Creek and Granger/Copper Ridge, and therefore more direct alignment should be pursued.

Route 6 does not operate on Saturdays or Sundays, leaving Whistle Bend with no transit service. As a growing community, this must be addressed if transit is to be considered a viable travel option in the area.

Challenges with Current Routing Structure

At a high level, the current routing structure offers excellent coverage of Whitehorse, and its peripheral suburban neighborhoods, with one or more routes servicing each. The downtown core is well served, with a convenient transfer zone between five of the six routes along 2nd avenue, allowing riders to travel to almost any neighborhood in Whitehorse with one transfer or less.

At a user-level, several aspects of the network make it difficult or inconvenient to use in its current form, including:

Route Directness

Current routing, while connecting many neighborhoods and providing good coverage, pushes most trips into the downtown core for transfer between routes, rather than making direct connections. A single route is also likely to navigate through several isolated neighborhoods, requiring significant in-service “deadheading” along highways where no customers are being picked up, and high travel times.

Route Structure

The current routing structure does not appear to match the existing flow of travel in Whitehorse, based on origin-destination survey results. Service is concentrated in the downtown, Porter Creek, Granger and Riverdale; each served by three or more routes. The existing routing structure does not provide all-day service to Whistle Bend, where development is expected to bring over 5000 residents. Additionally, only one route on low frequency currently serves Yukon College, forcing all students and staff into the downtown for transfer onto route 5.

Future iterations of the route network must consider the demand for Transit in the City by making routes more direct, increasing service in Whistle Bend, and prompting transfers at other key destinations, such as at Yukon College, or Canada Games Centre.

Scheduling, Frequency, and Hours of Operation

The current route structure provides hourly frequency along each route, with supplementary 30-minute service during peak hours along routes 2, and 5. This generally low frequency indicates that the current fleet is being overextended across a broad network. This limits a user's ability to spontaneously travel by transit, and lowers the perceived convenience of the network. When transferring between routes, a missed transfer can lead to wait times of up to one hour, and in a city as small as Whitehorse, owning a car is likely to be perceived as more direct and convenient.

Whitehorse Transit offers limited service in the evenings, and on weekends. With service ending at 7:00-8:00 pm on Saturdays, transit cannot be used for leisure activities, further encouraging use of the car. This lack of evening service, in combination with no Sunday service, does not serve residents with non-traditional work hours, or who wish to travel within the City outside of a traditional work day.

1.2 BACKGROUND INFORMATION REVIEW

1.2.1 Whitehorse City-Wide Transportation Study (2002)

This document summarizes the findings of a multimodal transportation review undertaken in 2002. While details of the report may no longer be viable in the City's present state, goals for multimodal transportation in the City are well established. This report provides recommendations pertinent to the following transportation goals:

- **Community and Environmental Quality**: Enhancing the quality of life for residents, and preserving the natural environment.
- **Mobility:** Providing safe, convenient, and accessible transportation options throughout all modes of travel, and for all people.
- **Transportation Planning:** Provide infrastructure and services in support of long-term plans and planning goals.
- **Sustainability and Affordability:** Ensure that transportation infrastructure is cost-effective, efficient, and makes the best use of available resources.

This plan focuses mainly on road infrastructure though a review of the public transit network identifies the need for alternate service delivery models, multimodality, and transportation demand management techniques. This document supports the integration of public transit, cycling, and walking by recommending the development of policies and infrastructure that support multimodal trips (bicycle parking, sidewalks alongside bus stops, etc.). Whitehorse transit has already made many strides in this regard, however; it is important to ensure that goals for the City are maintained in future planning endeavors.

1.2.2 Handy Bus Service Review (2001-2005)

The City of Whitehorse Handy Bus Services 2001 to 2005 Review was prepared for City Council for information purposes only. The report reviewed Handy Bus performance over the five-year timeframe, including ridership, service hours, kilometres, and characteristics of registrants and of individual trips. The report also examined the operation's financial performance and included a peer review with some benchmarking. Given that this report is nearly 13 years old, and its contents were operationally aligned rather than outlining a formal plan, its current relevance is limited.

1.2.3 City of Whitehorse Official Community Plan (2010)

The Whitehorse Community Plan develop in 2010 is the current master plan for the City of Whitehorse. It provides an overall vision and direction for growth and development in the city, and is organized along six principles:

- Thriving environment
- Community development
- Diverse local economy
- Cultural identity
- Equity
- Leadership and education

The vision of the community plan states:

"Whitehorse will be a well-planned, self-sustaining community that is a leader in energy conservation and innovation that maintains and conserves wilderness spaces for future generations. Whitehorse will continue to strive for a better quality of life that is reflected in its vibrant economy and social life."

As a central component to mobility and quality of life, transit is included in the plan under Community Development. The main goal of Community Development is to guide decisions related to development, land use, and transportation, among others, to minimize the ecological footprint. Part of Objective 12, Improve Transportation, the Community Plan outlines some strategies for sustainable mobility in general, as well as some specific to transit.

The Community Plan acknowledges that improving the transit system by making it more practical and convenient will help sustainable city growth. Some standout strategies from the Community Plan include fostering compact development that is transit-supportive. Essentially, the Plan calls for new developments to be "transit oriented", meaning dense, compact, mixed-use, and thus walkable and transit-supportive.

Specific to Whitehorse Transit, the Plan recommends that:

"Transit improves its quality of service, while being realistic given financial constraints. Routes need to be revised as population increases or changes, and areas of the city develop. Furthermore, public transit should be integrated with an improved active transportation network. The City will collaborate with Transit to improve infrastructure, including buses, shelters, and pedestrian infrastructure, with a goal of increasing the universal accessibility of transit."

Some other interesting notes include the idea of winter city planning, and related to transit, suggests designing bus shelters with clear materials to maximize sunlight during the winter. Finally, the Plan recognizes the impact transit has on providing equitable mobility for residents.

The planning process ongoing here works in harmony with these recommendations, including improving bus service, incorporating active transport objectives, and recognizing the role the transit has in helping new residential developments occur in a more sustainable fashion.

1.2.4 City of Whitehorse Strategic Plan Update (2017)

The City of Whitehorse Strategic Plan Update in 2017 is a document describing the mission statement and values of the City, and a road map for improvements centered around four priority areas: affordable housing, environmental health, planning for growth, and operational efficiencies. Transit is listed in several places throughout the document under the categories of operational efficiencies and planning for growth. In particular, the document makes reference to the need for:

- Transit service revision, improvement, and expansion
- Increased service frequency to Whistle Bend
- Improved public information
- New technologies to improve service quality and customer service

1.2.5 Whitehorse Transportation Demand Management Plan (2014)

With the projected growth of 15,000 new residents in the next 25 years, additional demand on the road network stemming from single-occupancy vehicles can have a detrimental impact on the city and region, including congestion and road wear and tear, increased pollution and noise, and negative impacts on quality of life for Whitehorse residents.

Transportation Demand Management (TDM) designs a set of tools or strategies aimed at reducing dependence on vehicles, and focuses on expanding transportation mode choice. TDM uses both carrots and sticks to encourage use of alternative transport modes, like walking, cycling, and public transit.

The Whitehorse TDM plan describes a vision of a highly mobile community using a well-connected and maintained street network, favouring walking, cycling, transit, and carpooling for safe, comfortable, and convenient travel.

The TDM Plan sets the following targets for commuting mode share:

Table 3: 25 Year Mode Share Targets, Whitehorse

	2011	2016	2021	2026	2031	2036
Walk	7%	8%	10%	12%	14%	15%
Bicycle	3%	4%	4%	5%	5%	6%
Public Transit	5%	7%	9%	11%	13%	15%
Vehicle (Passenger)	8%	9%	10%	10%	11%	12%
Vehicle (Driver)	75%	70%	65%	60%	55%	50%

With respect to improving transit and the rider experience, the TDM Plan makes the following recommendations:

1. *Create a long-term transit plan*

   This strategy recommends that a transit plan be developed to help inform City decisions related to transit and develop a long-term vision, as well as develop route alterations, new service types, and stop improvements. This Transit Master Plan appears to be in direct response to this recommendation.

2. *Continue to expand transit pass programs*

   This recommendation includes implementing employee pass programs, as well as a transit pass program for new residential developments to help spur transit use in new developments.

3. *Create a formal bus stop improvement program*

   By implementing a bus stop program to improve and expand passenger amenities at bus stops, Whitehorse Transit can improve the rider experience, and demonstrate its respect for bus riders. Practically, the extreme weather conditions in Whitehorse make shelters and these types of enclosed amenities essential for waiting at a stop.

4. *Improve the downtown transit exchange*

   This recommendation proposes locating the main downtown transfer location at 2nd Avenue at Steele St. and providing amenities like bicycle parking, shelters, lighting, and transit schedule information. It also recommends commissioning a detailed design study.

5. *Improve transit service*

   This “catchall” lists ideas such as:
   - Travel training for Handy Bus users (current practice)
   - More weekend service
   - Winter flagging program
   - Bus only lanes

6. *Coordinate transit branding*

   The idea behind this recommendation is to improve visibility and awareness of transit in the City by hiring a marketing firm to design a branding and marketing strategy.

7. *Integrate the TDM position into transit*

   The final recommendation suggests hiring a City position as TDM Coordinator who would devote some time to Transit to manage the branding program, and organize and administer transit promotional events.

Overall, the TDM provides many recommendations that are examined in this Transit Master Plan, as well as outlining ways of improving active transportation and decreasing the reliance on vehicles in Whitehorse.

1.2.6 Whitehorse Sustainability Plan (2015)

The City of Whitehorse developed its first Strategic Sustainability Plan in 2007, beginning the development of a vision for the future of Whitehorse. The 2015 Sustainability Plan, building upon this work, presents a revised vision and plan for maintaining principles of sustainability, and respecting the natural landscape, and improving both quality of life and the environment. The vision for the City is:

“Whitehorse will be a well-planned, self-sustaining, innovative community that leads in management and conservation of wilderness, energy, and resources for the future. Whitehorse will strive for a good quality of life for all, a stable economy, and a socially diverse community.”

This document outlines fifteen goals and strategies pertaining to all aspects of the community. The following apply to transit in Whitehorse either directly, or indirectly.

Strong downtown and livable neighborhoods

This can be achieved by improving public transit connections to key neighborhoods, especially those where future growth and development is expected, and improving connections to non-motorized transportation infrastructure such as sidewalks, bike paths, and bicycle parking.

Efficient, low-impact transportation

Improving the efficiency of public transit requires a comprehensive understanding of transit service, resources, and the needs of the community. This can be better achieved by creating a Transit Master Plan for the City, understanding and improving customer experience and satisfaction, and improving the connectivity of active transportation infrastructure. Future transit plans must account for necessary funding, scheduling, dares, promotion/advertising, and infrastructure requirements.

Dynamic and diverse culture, heritage and arts

Partnership with community groups, especially those highlighting local First Nations art and culture will work towards protecting and promoting local culture and heritage. This can be incorporated into bus wraps, shelter and bench design, or other promotional material featuring local artists; bringing transit into the community.

Connected, engaged, participatory community

> To receive buy-in on upcoming changes from community members, it is important to involve the public, and consult with generally hard-to-reach groups (first nations, seniors, persons with disabilities, etc.).

Overall, the sustainability plan establishes a framework for sustainability and preservation, informing recommendations made in this Transit Master Plan.

1.2.7 Whitehorse Downtown Parking Study (2017 – Ongoing)

In 2011, the City of Whitehorse undertook a study to examine and devise a strategy for automobile parking in the downtown core. The strategy was divided into short, medium and long-term mitigation strategies. With most short and medium strategies now implemented, the City undertook a re-visit of this strategy to evaluate the progress and impact of these short and medium-term strategies; determine if any industry / social changes related to parking require other measures; and collectively, if these considerations changed the approach to any long-term parking strategies. In addition, several other studies undertaken by the City since the 2011 parking study (such as the Cycling Master Plan, Transit Master Plan, and others) may impact how the remaining recommendations from the 2011parking study are ultimately implemented. In late 2017, the City selected another team from Stantec to undertake this study. As part of this study, engagement with a broad range of stakeholders is expected. In addition, a detailed inventory of on-street and off-street parking occupancy and durations will be undertaken as part of this study to compare to the 2011 parking study results.

There is correlated linkage between parking availability and price with transit usage. The cheaper and more widely available parking is, the higher the unlikelihood people will use transit. To encourage more transit usage for destinations in the downtown core, Stantec advocates that parking supply be reduced and hourly rates be increased; currently, Whitehorse's downtown parking rates are some of the lowest in Canada.

Of note, many cities across North America are currently examining the role dynamic parking prices could play in managing travel behaviours and modes. At times of high demand, parking rates are high, while during low-demand, off peak times, parking rates are low. Technology enables this pricing scheme to be possible. If rates are high during peak periods, residents and tourists are more incentivized to take their trip using transit or another active mode of transport relative to the automobile.

2.0 STAKEHOLDER ENGAGEMENT

2.1 BACKGROUND

Stakeholder outreach requires more than just informing stakeholders; meaningful engagement requires that all stakeholders are included in the decision-making process. Throughout the process, Whitehorse Transit and Stantec engaged stakeholders with a broad spectrum of interests including transit riders, non-riders, community organizations, city staff, agency staff, the Kwanlin Dun First Nation, Ta'an Kwach'an Council, and others with an interest in Whitehorse Transit.

2.2 RATIONALE

A significant component of the Transit Master Plan included extensive outreach activities. These activities were necessary to understand the needs and desires of those who have an interest in Whitehorse Transit.

Whitehorse Transit ensured that those who live, work, and visit Whitehorse, particularly those who currently rely on transit, were given multiple opportunities to provide input to the review process. Outreach activities and one-on-one sessions were extended to employees, with special focus on those who carry out the day-to-day operations of Whitehorse Transit — the frontline staff.

The stakeholder outreach process had a number of facets, each aimed at reaching a different audience or market segment, ranging from community decision-makers, interested stakeholders, and members of the public.

2.3 APPROACH

The Transit Master Plan stakeholder engagement process included a series of stakeholder outreach methods, including:

Frontline staff drop-in sessions attended by bus operators and other frontline staff who provided in-depth input from those who execute Whitehorse Transit's operations and are the public face of the agency. Sessions were held with 1-2 operators at a time, providing many opportunities for frontline staff to provide their perspectives on the strengths and weaknesses of the current system given their unique experiences with conventional, and paratransit service in the City.

Management staff interviews attended by Whitehorse Transit management to discuss issues and challenges experienced in the areas of administration, planning, operations, and maintenance of the system.

Public outreach aimed at engaging current Whitehorse Transit riders and non-riders at various locations and through various approaches across the City.

Public Outreach Week (October 17-19, 2017)

Initial public outreach efforts were held in October 2017 over the course of one week. Engagement activities took place on-street across the city as well as on-board Whitehorse Transit buses. The Stantec Team facilitated two open house sessions at Yukon College on October 17th and 19th, encouraging riders and non-riders to provide feedback, and brainstorm service improvements. Stantec also engaged riders on-board transit vehicles. At a minimum, all individuals intercepted were provided with a flyer that contained information on how to complete an online survey to gauge popular interest, needs, and concerns. A separate survey was also conducted that was targeted to non-riders.

Stantec participated in a series of meetings with community organizations, including Yukon College, and the Golden Age Society of Whitehorse, to gauge the respective needs of students and seniors, who often rely on transit for travel.

Meetings with relevant municipal services including:

- Fleet maintenance and snow clearing
- Yukon Department of Education
- Municipal planning department

2.4 STAKEHOLDER INPUT

2.4.1 Frontline Employee Sessions

The input from Whitehorse Transit's frontline staff offered helpful operational information during the review of Whitehorse Transit's services. These personnel are closest to the service and often have tremendous insights concerning service issues and ideas as to how the service might be improved to work better for agency personnel and for the public. One-on-one or small group sessions were advertised to operators by Whitehorse Transit management, and took place upon completion of shifts, often in the late evening. Participation was voluntary.

In addition to open-ended questions and brainstorming sessions regarding current routing, scheduling, and performance, operators were also provided with the project email address and online survey, where additional confidential feedback could be provided.

Some of the issues brought forward by the operators at these sessions included:

- Inability to meet timing points, often resulting in late performance, or running early to compensate
- Low ridership out of the Lobird trailer park, and Ravens Ridge
- Congestion on board buses in Riverdale (60+ passengers) in the morning peak. Schedule not reflective of demand at this time.
- Timing transfers requires communication with other drivers, as one or many buses usually running off schedule. Often must hold buses to make transfer.
- Handy Bus schedule and demand allows for very long breaks between pick-ups, not productive or efficient.
- Service frequency issues and alternate routing considerations, including increased service to Whistle Bend.
- Consideration of smaller vehicles along low-demand routes (route 3, route 4, etc.)

- Infrastructure for waiting, especially given cold winters (shelters, etc.)
- Sunday service requested from many passengers.

2.4.2 First Nations Community Engagement

Stantec engaged with the Ta'an Kwach'an Council, a prominent First Nations Community in Whitehorse, by reaching out through email, providing a series of questions relevant to transit use and needs. The TKC preferred to respond to these questions electronically, and were provided the opportunity to give open-ended feedback in addition to preset questions.

- Some of the issues brought forward by the Ta'an Kwach'an Council included:
- Concern with lack of Sunday service, and insufficient service to the Whistle Bend area
- Many TKC members will live in Whistle Bend upon its full development. It is important that connections between Whistle Bend and other neighborhoods, specifically downtown and McIntyre, be fully established.
- Collaboration between First Nations and Whitehorse Transit. Originally promise of a First Nations bus wrap, yet concern that this has not been produced.
- Lack of schedules and signage at bus stops and in shelters.

2.4.3 Yukon College Open Houses

Stantec conducted two open house luncheons at Yukon College on October 17th and 19th respectively, offering students and staff the opportunity to identify their travel patterns, strengths, weaknesses, and suggestions for the network. 50 students and staff participated in these drop-in sessions, tapping into the varied perspectives of students, staff, transit users, and non-riders. Some of the issues brought forward by the students included:

- Only one route travels into the College (route 5), forcing a transfer unless students live in the Granger area or downtown.
- Transfers downtown can often be missed into the College, especially in the morning.
- Schedules do not reflect peak times at the College (late morning, and mid-afternoon).
- Sunday service.
- Later service on Fridays and Saturdays to accommodate late night trips into downtown for entertainment (past 10:20pm on Fridays and past 7:51pm on Saturdays).
- Ensure buses run past the last class on all weekdays.
- Buses often dirty inside.

In addition to the concerns noted above, several staff members found the lack of a staff transit pass to be a deterrent from using transit. One staff member suggested that an option be provided where Yukon College can provide *either* a transit pass, or a parking space with a plug in, as many transit riders do not own a car in the city. In addition to this constructive feedback, many students and staff noted several strengths of the current system:

- Drivers are courteous and helpful
- Policy of bicycle racks, or bikes on board supports cycling in the City.

- Many happy to have service in such a small city, and believe the agency is doing its best to provide high quality service.

2.4.4 Municipal Services Input

Stantec engaged in three meetings with government staff to gain a sense of key considerations and potential barriers to planning transit in Whitehorse. The findings of these meetings are summarized below.

Yukon Department of Education

- Agency working well with local high schools to advertise transit.
- Student pass is well used, and provides independence to high school students.
- Increasing runs to local high schools may decrease school bus requirements.
- Many students travelling across the city (Granger to Porter Creek, for example) to get to school. Need to provide reliable, high frequency connections between neighborhoods in the morning and afternoons for students to use it.

Fleet Maintenance

- Practicality in a universal fleet. Recommended fleet should consider the benefits of universal parts and training of mechanics.
- Cold weather makes electric buses impractical, open to the possibility of hybrid vehicles.
- New maintenance facility will increase capacity and centralize operations in the future.
- Interior cleaning of vehicles can be improved.

City Planning

- Future networks should consider population growth in Whistle Bend (5000-8000 residents in the coming years)
- Potential for Whistle Bend to be transit-first, or transit friendly with all-day service.
- Downtown currently under redevelopment, and will undergo densification and increased residential land use.
- Incentive program for City employees is poorly used.

2.4.5 Public Outreach Survey

Transit Rider Survey

The following analysis is based on 260 completed survey responses from Whitehorse Transit users.

Attitudes Towards Transit and Customer Satisfaction

71-percent of transit users have a positive image of the current system. Further, 77-percent of riders consider themselves either satisfied or very satisfied with the overall quality of service provided (Figure 2). At a high level, this

suggests that Whitehorse Transit is providing a service that is generally appealing to its users, and provides for their basic travel needs.

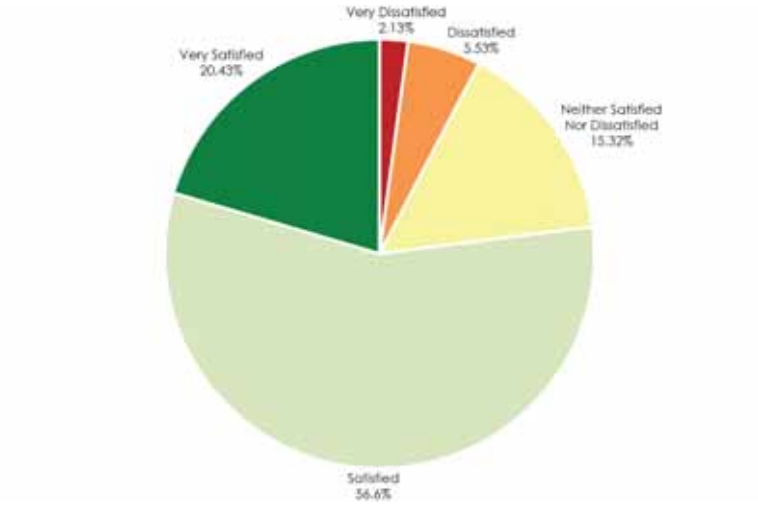


Figure 2: Satisfaction with Overall Service Quality

Figure 3 explores customer satisfaction across a series of service quality measures. Riders are most satisfied with driver behavior, the fare they paid, and their comfort on board the bus; therefore Whitehorse Transit should work to maintain current standards for operator conduct, and ensure schedules continue to minimize crowding and discomfort on board, as the current system is performing admirably in this regard.

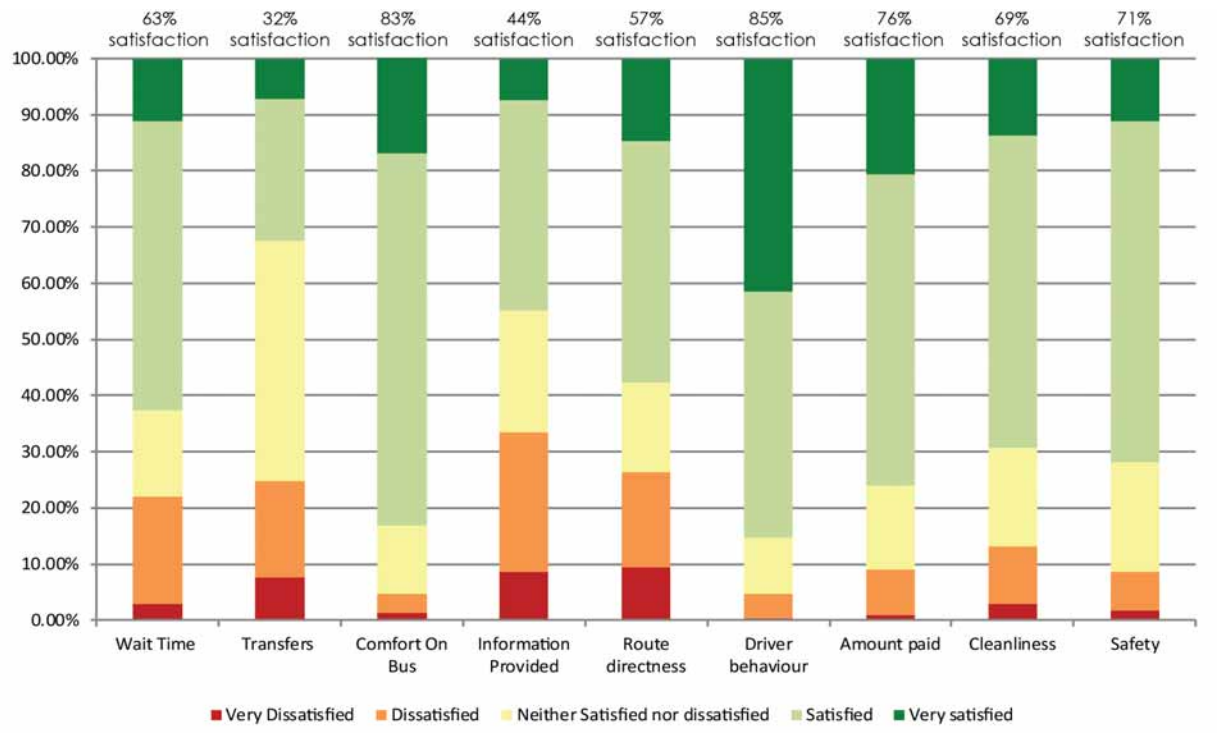


Figure 3: Customer satisfaction among service quality measures

While overall satisfaction with current service is high, customers appear most dissatisfied with the transfer process (68-percent are unsatisfied), and the information provided on the bus and at bus stops (56-percent are unsatisfied). Additional concern, but to a lesser extent, with wait time and route directness is also evident. These findings are supported anecdotally by many riders, one states: *"I wish the bus would come more on time. When I had lived near the Kopper King, I often had to arrive at the stop almost 10 minutes early to ensure I did not miss that bus".*

On-time performance has a strong impact on the perceived reliability of transit for many riders. If travel patterns cannot accurately be planned, or riders fear missing the bus, loyalty to the service and ridership may decline. This is exacerbated when frequency is perceived to be low, or service hours and transfer timing do not accommodate travel demand. It is important that on-time performance be addressed or schedules be realigned to reflect accurate time points.

Travel Patterns

For transit riders, the purpose of their last trip was most often commuting to/from work (59-percent), shopping (24-percent), or personal business (23-percent) (Figure 4). The existing transit network supports these trips to a certain extent by providing a high level of service in the downtown core, where employment is highest. Commuting to school by transit represents only 10-percent of surveyed trips. Existing routes serve major educational institutions including Yukon College, Porter Creek High School, and a series of schools in Riverdale. However, ridership from students (12-percent of riders) may be low on account of low frequency or inefficient transfers between routes, especially into Yukon College, where all trips must transfer onto route 5. This is supported anecdotally, as one rider states *"In order to use transit more often I need a more frequent schedule and more busses going to the College - on the weekends as well."*

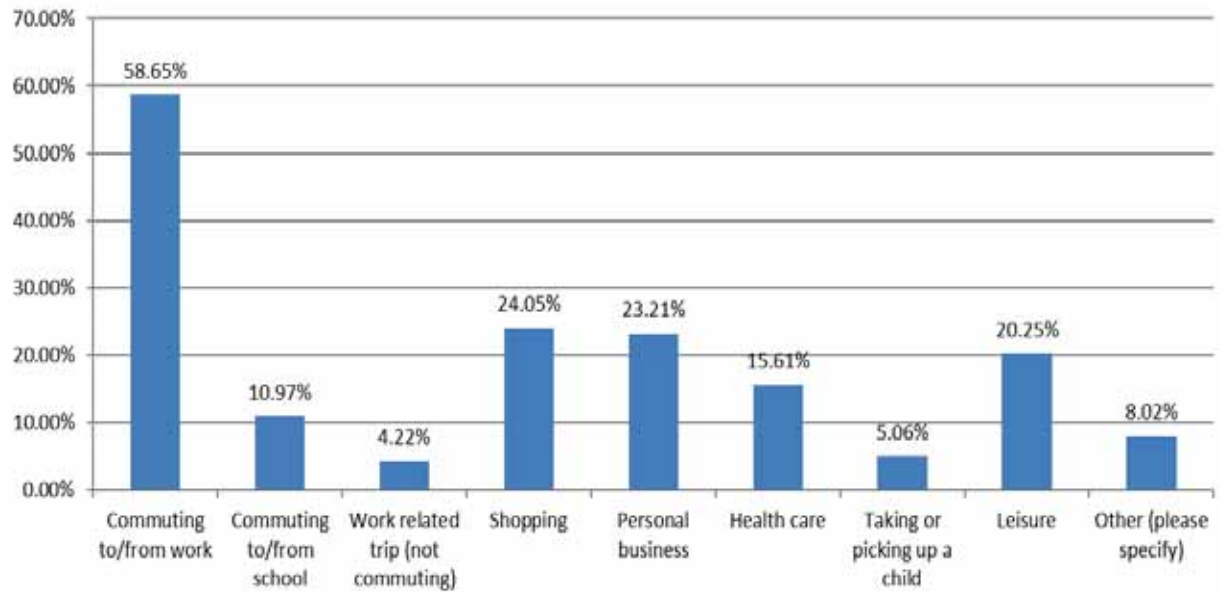


Figure 4: Trip purpose among Whitehorse Transit riders

Routes 2 and 5 see the highest ridership in the city (Table 4). As route 2 serves a series of high schools in Riverdale, and Route 5 is the only route serving Yukon College, it is important that these connections be maintained with high frequency, reliable service in the future.

Route 6 is used least often (14-percent of trips). This is likely a function of shorter service hours, as route 6 currently serves the Whistle Bend – Granger corridor only during peak hours. With projected growth of 5000-8000 people in Whistle Bend in the coming years, Whitehorse Transit should consider consistent, all day service to major transfer points and destinations, encouraging new residents of Whistle Bend to make transit their primary travel mode.

Table 4: Usage of Whitehorse Transit routes

Route	Frequency of Use
Route 1: Riverdale North - Porter Creek Express	**38.08%**
Route 2: Riverdale South - Copper Ridge - Granger	**42.69%**
Route 3: Riverdale North - RR - McIntyre - Hillcrest	**31.15%**
Route 4: Porter Creek - Crestview	**28.85%**
Route 5: Takhini - Lobird - Copper Ridge Express	**40.77%**
Route 6: Ingram - Granger - Porter Creek - Whistle Bend	**13.85%**

Figure 5 demonstrates common origin-destination travel patterns in Whitehorse. As it stands, Riverdale (23-percent of trips), Porter Creek (19-percent), Downtown (18-percent), and Granger (16-percent) are the most popular trip origins using transit. This directly correlates to level of service, as these neighborhoods are serviced by at least three routes, while downtown is a major transfer point for five routes.

The downtown core is the most popular final destination for transit trips, followed by Yukon College. It is therefore important that future iterations of the Whitehorse Transit network prioritize high frequency and convenient service along the following corridors:

- Riverdale to Downtown
- Porter Creek to Downtown
- Granger to Downtown
- Downtown to Yukon College
- Granger to Yukon College

Few trips originate in Hillcrest (2-percent of trips), Lobird (2-percent), and McIntyre (4-percent). All three of these neighborhoods are served by one route in the network, many of which operate on a 60-minute frequency. Alternate service delivery models may warrant consideration in these areas, especially in Lobird, which is spatially isolated from other neighborhoods, and requires significant deadhead time to provide service.

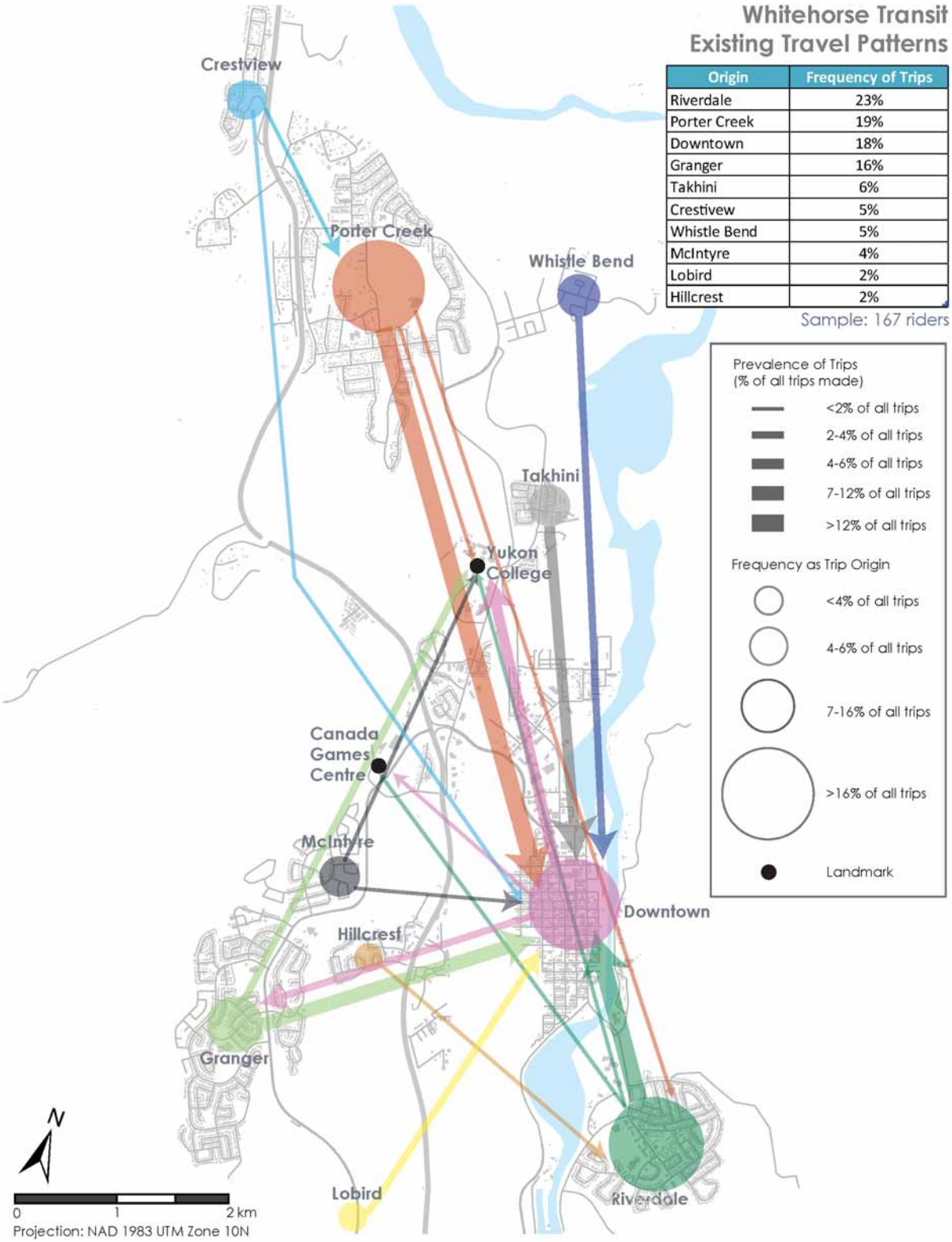


Figure 5: Travel patterns of trips made using Whitehorse Transit

Communication of Information

As shown previously in Figure 3, many riders (56-percent) are not satisfied with the information provided to them at the bus stop, or on the bus. This may include stop posts, posted schedules, route identifiers, next stop information on board, or real-time schedules using technology such as a mobile app (TransitApp, Google Maps, etc.).

One rider states "A mobile app telling me "where" and "when" and "which Route" can take me where I want based on my location. Better - more detailed online maps to get better idea where the bus stop is, especially when I am new in town.", another states *"Would like to see all bus stops having the information boards/schedules posted, not just the 'timed' bus stops".* These comments, supported by many other riders, identify a lack of communication of full schedules across all stops, and little technology or real-time information. Stantec observed the majority of riders using Whitehorse Transit have a smart phone, or wireless device, and may benefit from electronic schedules and next-bus technology. It is recommended that Whitehorse Transit investigate the potential for partnering with an app or mobile service to modernize the scheduling and information provided to customers.

Demographics of Riders

A small, but significant transit-dependent population exists in Whitehorse. 30-percent of riders have a combined annual household income of less than $40,000, often making car ownership unfeasible, or a financial burden. 65-percent of riders have access to a car at home, but choose to use transit, while 35-percent do not have access to a personal vehicle.

13-percent of respondents are young adults (16-25), who also may lack the necessary resources as students or young professionals to travel by car, and may be bound to transit if travelling across the City. 9-percent of respondents are senior citizens (65+); however, this low response rate may be a function of low proficiency or access to the technology required to complete an online survey.

78-percent of respondents consider themselves Caucasian, and 13-percent identify as First Nations. Ensuring that minority, low income, young, and elderly groups are well served by transit is important, as these groups are often most reliant on transit. Maintaining or furthering service to facilities or communities with a high presence of transit-dependent groups is recommended.

Non-Rider Survey

The following analysis is based on survey responses from 191 completed online surveys from members of the public who have not used Whitehorse Transit in the past 3 months; considered here as "non-riders".

Using a car is the primary mode of transportation in Whitehorse. 65-percent of non-riders opt to drive their own vehicle instead of using public transit, and an additional 13-percent opt to carpool with others (Figure 6). These figures point to a degree of reliance on private vehicles, and an engrained mentality that favors driving among many residents.

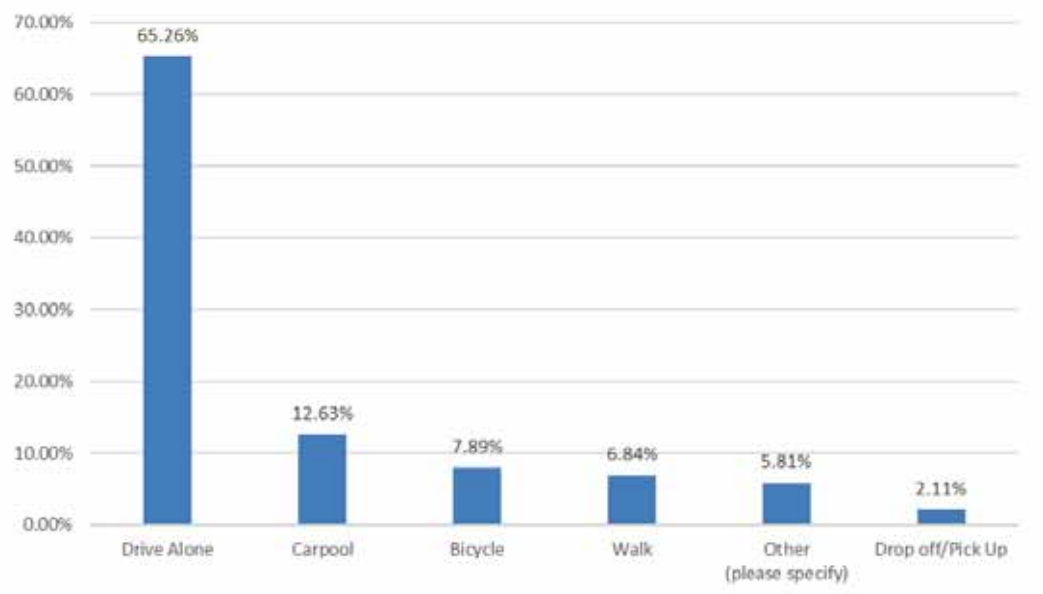


Figure 6: Preferred travel mode of non-riders

For those who choose not to take public transit, the main reason they choose to do so is “routes and schedules don’t cover my needs”, “service is not frequent enough” and “my regular trip would take too long by bus” (Figure 7). All three of these responses speak to a perceived lack of convenience, or low service quality caused by infrequent schedules, and longer than desirable travel times. This must be addressed in order to increase ridership. It is recommended that frequency be increased along high-demand corridors such as Riverdale and Porter Creek to Downtown, and that multiple transfer points be implemented with timed transfers, and accurate timing points. These factors are likely to increase on-time performance, and reduce wait time.

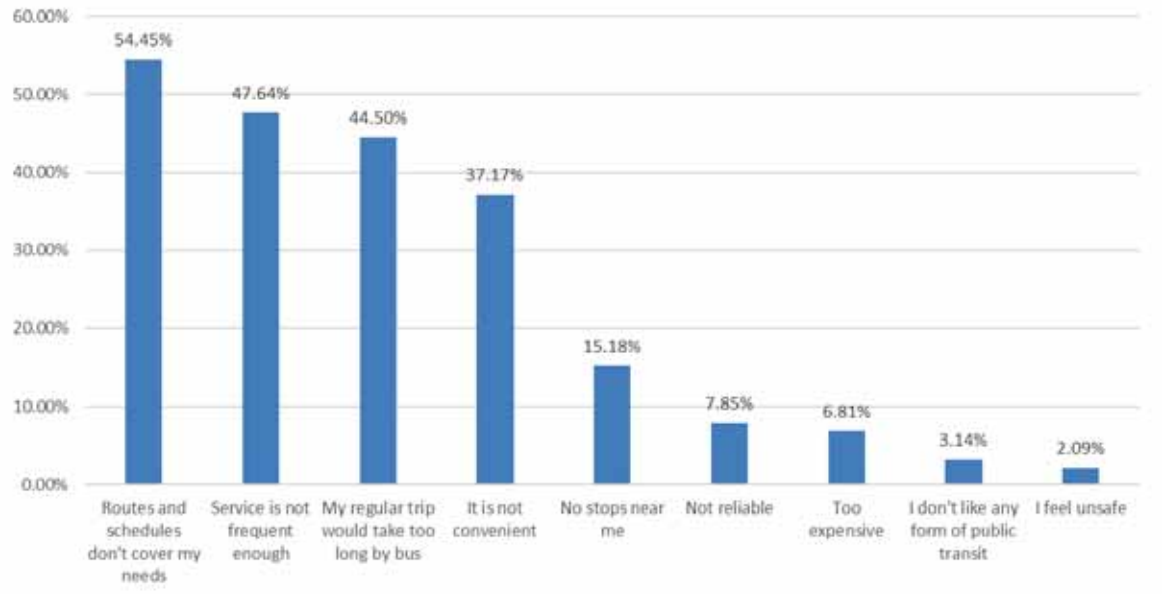


Figure 7: Rationale for not using Whitehorse Transit, non-riders

55-percent of non-riders would likely switch to public transit if it was a more convenient, efficient option, and 22-percent are unsure, as it depends on the circumstances. This is a promising result, as the appetite for using transit is present in the City, and many residents are willing to use it should service quality improve to better accommodate their needs. Further, 80-percent of non-riders feel that public transit service is necessary (Figure 8), however only 56-percent know which transit route is closest to their home. This speaks to a lack of knowledge and communication of the service to non-riders, which can be addressed through a print, online, and social media presence, and prominent advertising.

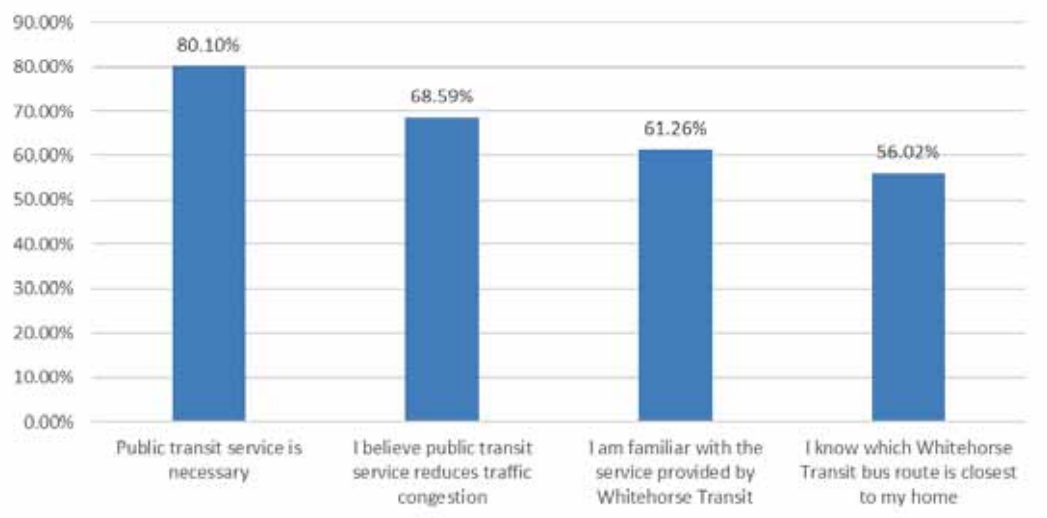


Figure 8: Level of agreement with above statements

Further to these concerns, many non-riders note they are deterred by a lack of Sunday service, and reduced Saturday hours. One non-rider states *"Transit in Whitehorse needs to be available to persons on Sundays and holidays, even reduced hours",* another notes *"Sunday coverage needs to be added. People in low-income jobs, who likely have no other form of transportation, often have to work on Sundays".* Although adding Sunday service poses significant financial burdens on the City and its taxpayers, it is recommended that some form of affordable service, whether conventional or an alternative, be considered on Sundays to accommodate this demand.

3.0 EXISTING CONDITIONS

3.1 FLEET REVIEW

3.1.1 Background

Current Whitehorse Transit fleet composition

Whitehorse Transit has a current fleet of thirteen 40-foot NOVA LFS buses and two cutaway units currently used for specialized transit service – 2017 and 2010 Arboc units. A 2006 international cutaway was retired from service in November 2017. As at the beginning of 2017, Whitehorse Transit's conventional fleet had an average age of 8.45 years, slightly lower than the national average age of 9.02. In March 2018, Whitehorse Transit will be receiving two new Nova LFS buses as replacements. This will further reduce the average age of the fleet. Nine conventional units are required at the peak service threshold suggesting four vehicles are allocated as spares. This translates into a spare ratio of 30.8-percent which is in-line with best practices for an agency of this size.

North American Bus Market Overview

Between 5,000 to 6,000 heavy duty urban transit buses are typically sold annually in North America. Canada accounts for approximately 10-percent of the total market. Some fluctuations do occur such as when a one-time or short term funding initiative beyond the typical programs is announced such as is currently occurring with the Public Transit Infrastructure Fund (PTIF). The bulk of production are 40-foot units, however articulated 60-foot versions as well as a limited number of 30-foot and 35-foot lengths are also produced in decent volumes. Over 90-percent of the market is dominated by three manufacturers. Two of the three (New Flyer Industries, NovaBus) sell both in Canada and the United States and have plants in both countries while the third firm, Gillig, only sells buses in the United States. The largest manufacturer, New Flyer Industries (which also has the largest number of product variants has in recent years seen production splits roughly as follows between propulsion types: Diesel – 60%, CNG – 25%, Hybrid – 10% and Electric – 5%. The balance of bus production is split between smaller North American and foreign based firms who in many cases focus on niche markets as well as transit agencies. In November 2017, New Flyer acquired Arboc Industries, a manufacturer of low floor body on chassis bus product in both cutaway and rear engine designs. Smaller volume firms such as Eldorado National, BYD and Proterra cover the balance of the market.

An interesting market observation is that all current diesel engines used by New Flyer, NovaBus and Gillig all come from one supplier - Cummins. Bus engines account for less than five-percent of the heavy duty automotive engine market so are simply a version of large truck engines configured for buses. The progressively stringent emission control requirements that have been legislated for approximately three decades have been very challenging and costly and in fact some engine manufacturers have dropped out of the market.

Alternate propulsion types prevalent in North America

While Whitehorse Transit's current conventional fleet is all diesel, the national fleet profile on bus propulsion types at the beginning of 2017 was (Table 5):

Table 5: National Fleet Profile on Bus Propulsion (2017)

Propulsion Type	Percentage of transit vehicles in Canada
Diesel	87.0%
Compressed Natural Gas (CNG)	2.1%
Diesel-Electric Hybrid	9.3%
Electric (Battery Electric Buses and Trolley)	1.6%

A brief overview of the most common propulsion types is discussed below.

Diesel and Compressed Natural Gas (CNG)

Propulsion for heavy duty urban transit buses in North America consists of six basic variants. Two use traditional reciprocating motion internal combustion engines. Of the two, diesel fuel powered is the more common and has been the most common type of propulsion for this purpose for over sixty years. CNG-powered engines are also becoming increasingly present. CNG use in transit buses has grown in popularity over the last thirty years because of the traditionally lower cost of CNG relative to diesel. In both cases the engines are coupled to an automatic transmission.

Diesel-electric hybrid

The third variant is the diesel-electric hybrid system. This propulsion type couples a diesel engine (generally one of smaller displacement than a conventional diesel powered unit) to an electric generator which drives an electric motor. The system includes large rechargeable batteries that supply electricity for the motor in addition to the generator and are recharged during vehicle braking, called regenerative braking. The inclusion of the batteries as a source of power reduces the dependency on the engine, lowering fuel consumption. There are two designs of diesel electric configurations; one is the simple series system as described above. The other, known as the parallel design includes a transmission component coupled to the engine. Output from the transmission and traction motor sources are optimally combined to yield the best performance for the road and speed conditions at that time and to optimize fuel economy. While in theory the same concept could be used in with compressed natural gas engines in place of diesels, this has not been pursued to any great extent.

Battery Electric Buses

Battery electric buses (BEBs) are a fourth variant. Large storage batteries are carried on board and are charged when the bus is parked and connected to a designated power source, either a proprietary system or to a standardized charging point depending on the manufacturer. Electricity for the traction motor is drawn from the batteries. Depending on battery capacity, bus operating range can vary. While a product claim of approximately 250 kilometres between charging is in the current market offering, other models have shorter ranges requiring lapses for recharging during a daily duty cycle.

Electric buses, like diesel-electric hybrids, also recharge batteries during regenerative braking. Stationary on route recharging for brief time intervals can also be done at layover or terminal locations. Induction charging while driving is also currently being investigated. Because of the service cycle profiles, it may be necessary to operate with a marginally larger fleet to offset the shorter range (duration of time or daily total run distance) that a battery electric product may have as compared to one of the other types. This enters the area of the service profile of each route and transit agency, vehicle dispatching and utilization methods and possible even Collective Agreements with the work

force. The changing and variety of battery technologies will impact this item. BEBs are often hailed as an “emission-free” vehicles although source of electric power generation needs to be strongly factored in. Off shore and small American original equipment manufacturers with purpose built vehicles have been joined in the marketplace by the domestic firms offering BEB versions of their existing bus platforms. There are currently less than 200 BEBS currently in use across North America. Pilots are underway where we will continue to learn about the viability of this propulsion source.

Electric trolley buses

The fifth variant, the electric trolley bus operates much like the electric bus. However, electricity is drawn from overhead wires through sliding roof poles. It is possible to equip trolley buses with storage batteries to be used for short periods when the bus must go off route/off wire such as for a street diversion. However; there are very few electric trolley bus systems operating in North America and all are successors to streetcar systems based on using an update of the existing infrastructure. The decades of the 1960’s and 1970’s saw this vehicle type virtually disappear in North America with a few systems (Edmonton, Hamilton and Toronto) carrying on for a few more decades.

Fuel cells

A sixth variant exists in the form of fuel cells. Typically, stored hydrogen gas is converted to electric power and a traction motor is driven like the other propulsion types discussed previously. Like compressed natural gas, special dispensing provisions are required at the bus facility.

Popularization of alternate propulsion types

The strong concern and corresponding legislation to reduce emissions has been an influence in propulsion selection. Before the current versions of “clean diesel engines” hybrids and BEBs came into the market place, compressed natural gas (CNG) was viewed as the cleaner alternative. This was reflected in many United States transit agencies switching to this product in the 1990’s. The changeover was not as pronounced in Canada. In fact, several Canadian systems that purchased fleets of CNG powered buses in the early days of this technology discontinued this propulsion source (e.g. Burlington, Toronto, Mississauga, Grand River Transit).

The other key factor in the historical favoring of CNG was price and supply of diesel. World economic and political situations can and did render diesel fuel a sensitive commodity. Conversely, CNG was basically all domestically sourced and relatively inexpensive and stable in supply. The aggressive legislative mandates by the California Air Resources Board made CNG an “appropriate” alternative in that State as well as other places.

Over the past several years certain changes have occurred in the diesel and CNG products. The continued legislated emission reductions have made diesel emissions much “cleaner.” Diesel-electric hybrids use the same engines (i.e. same emission levels) as straight diesels but because propulsion is supplemented/complimented by the electrical side, less diesel fuel is used. However, diesel engines have become more complicated and maintenance intensive because of needing to attain reduced emissions. For example, a particulate trap filter (DPF) is now part of the exhaust system and a urea based liquid i(DEF)s sprayed into the exhaust gases to further reduce emissions. There are maintenance routines associated with the particulate trap filter that involve both cost and downtime. Thus; both capital and operating costs are now relatively higher for diesels than in the past. Diesel fuel has also been made

more environmentally friendly through the reduction of sulfur content. Also, bio-diesel, sourced from vegetation is/has been used as a blended component into conventional diesel fuel.

From a capital perspective, CNG powered buses have always been more expensive to buy than diesel powered buses (but less expensive than diesel- electric hybrids). But with the accessories and other changes to diesel engines due to stricter emission standards, the price gap between current diesel and CNG buses has shrunk.

The ongoing quest to reduce emissions continues with concern for sustainability, renewable resources. The "green environment" perspective is particularly front and centre with current social consciousness and political posturing. Renewable resources including some tied into the CNG fuel cycle are viewed as attractive features. Because of the high profile that environmental/carbon reduction initiatives command, opportunities for funding may expand. This would no doubt include any propulsion type other than conventional diesel (even though current diesels are referred to as clean diesels based on emission controls and fuel characteristics).

Changing propulsion types comes with considerable costs

Buses

It is important to recognize that changing to another propulsion type will include significant capital costs regardless of how funds are obtained. While BEBs are currently in vogue, the cost of a BEBs is nearly twice that of a diesel bus. Added to the initial purchase cost is the reality that much is still unknown about the long-term "behavior" of these vehicles; this translates into risk for transit agencies that must be managed and provisioned for. Approximate capital cost premiums relative to diesel are shown in Table 6:

Table 6: Capital cost premiums (diesel)

Propulsion Type	**Approx. Cost Premium Relative to Diesel**
CNG	+10%
Series Diesel-Electric (Hybrid)	+25%
Parallel Diesel-Electric (Hybrid)	+45%
BEB, Electric Trolley and Fuel Cells	+100%

Due to component sourcing and labour outside of Canada, currency fluctuations and associated currency risk impacts the final pricing in Canada. Also impacting prices is the "hunger" of the marketplace at time of bidding and as well as bus delivery date projections.

Infrastructure

Infrastructure costs such as building code generated modifications, refueling hardware, charging infrastructure, transmission network upgrades need to be factored into the business case. Operating costs will be effected if changes to daily processes are triggered. This includes changing vehicle and staff deployment, dispatch procedures, employee training and accreditation, service line routines, etc. In addition, there may be other unforeseen added costs. For example, the agency may need to operate the existing and new propulsion products in parallel either until the fleet is turned over or in perpetuity if two or more types are retained. Infrastructure costs for each respective type are additional and need to be factored in. There may be compliance issues required to outfit a facility to store and

dispense CNG fuel. For working on bus roofs where batteries may be carried in diesel hybrid or battery electric modes, fall arrest and hoisting provisions may need to be fitted in. Electric capacity feed at specific voltage and distribution circuits are required for battery electric buses being recharged while stored in the garage.

Training and maintenance

Training for maintenance personnel (and to a lesser extent for operating personnel) would be needed for a change in propulsion. And if the propulsion type is changed through the normal vehicle life cycle/turnover process (one for one) it would take a full life cycle from introduction of the new propulsion to completely change over the fleet (e.g. 15 years for a 15-year service life). This mean that during the turnover period, two propulsion modes would be in use and in need of maintenance.

Premature for "total cost of ownership" comparisons between all propulsion types

It is still relatively early to make accurate life cycle costing between the various propulsion types, particularly BEBs. Batteries are constantly improving and will likely realize longer lives and less failures in the future. At the same time, with mass uptake of BEBs comes the necessity to manage and dispose of batteries that have reached their lifespan for transit but may still have a useful afterlife as potentially battery banks for energy storage. Improvements to components through in service trial and error (e.g. better weather proofing) has reduced in service failures and increased mean distance between failures. An overarching theme is that diesel engines are more maintenance intensive due to the emission control features and apparatus that has been added to meet legislated standards as previously discussed. Conversely; with the increased use and product improvements of CNG engines, these engines are becoming less maintenance intensive as compared to the first generation over a decade ago. Comparisons of the various types need to be done in identical operating conditions in order that the results are "apple to apple" (e.g. same transit authority, same vehicle type and age and same route profile).

Diesel-electric hybrid buses offer some fuel savings through the combination of regenerative power when braking and the typical use of a smaller displacement engine. However, the savings vanish when the vehicles are used on route profiles with longer distances between stops and higher speed schedules (non-Manhattan duty cycle as defined by Altoona) as is the case in Whitehorse. The start and stop/close stop placement profile of a downtown urban route is where the true economies of this technology are evident (Manhattan duty cycle). Similarly, BEBs are best suited for the constant start and stop environment to recover energy through braking. Diesel-electric hybrid and electric (both battery and trolley) do realize extended brake lining/pad life through the regenerative braking function. BEB and trolley electric buses also eliminate the automotive power train components of engines and transmissions, which avoids the use of lubricating fluids and filters, engine coolant product and lines, emission apparatus and testing, etc.

Long pay-back period for alternate propulsion types

A peer transit agency recently undertook a cost comparison analysis a few between current diesel and diesel-hybrid types propulsion types. The conclusion was that the fuel savings and other cost reductions in operations and maintenance at that transit property would offset the higher capital cost of the diesel hybrid after ten years in service. A net savings or return would generate for the residual life of the bus after the first ten years. This payback period appears to be very close to the design life of the buses - discussed further below.

Paratransit/specialized transit vehicles have limited propulsion choices

A different scenario exists with the smaller cutaway body on chassis products used in paratransit/specialized transit and feeder-route applications. Diesel, gasoline and CNG have all been used with a very limited emergence of electric propulsion. Weight capacity and space to some extent restrict additional components. However; in the last five years both Ford and GMC have discontinued their diesel-powered versions of their common van chassis products. The recently introduced Ford Transit has a diesel offering but is a lighter, smaller product than the common E450 van product. Diesels are available on pickup truck chassis products which are heavier with longer wheelbases. Naturally, manufacturers are examining battery-electric versions of these vehicles although no production-ready ones exist at the time of this report.

3.1.2 Analysis

An informed evaluation of the marketplace, governmental policy, future service development plans, legislation, and the attributes of the various types of propulsion products should be considered to devise a long-term strategy.

Conventional transit buses have a 12-year design life set by US market

All buses, even those delivered in Canada, are designed to meet criteria and design lives set by the US Federal Transit Administration. The market for transit buses in the US is considerably larger than that of Canada; therefore, manufacturers align themselves with the parameters of that market. Heavy duty conventional buses, such as the Nova buses owned by Whitehorse Transit, have a 12-year design life, medium duty vehicles have a 10-year design life and lighter body on chassis products such as Whitehorse Transit's ARBOC buses have a 7-year design life. These design lives are largely tied to the capital funding programs of the Federal Transit Administration in the U.S. If a 12 -year design life bus is purchased, it is eligible for replacement and corresponding funding after 12 years of service in the US.

Canadian transit agencies have typically have had 18-year lifecycles

Canadian transit agencies do not have this federal funding arrangement (other than specific initiatives from time to time such as currently the case with PTIF) and typically rely on provincial/territory or local sources. Because of this, lifecycles in Canada have typically been longer with 18-years as a common benchmark. Generally, achieving this target requires midlife structural refurbishment as well as engine and transmission overhauls. Increasing use of corrosion inducing anti-icing road (and bus stop shelter stops) products take their toll on body and structure condition. The products used at bus stops and shelters are tracked into buses by customers are could affect flooring structure, certain seat frames, floor heater boxes, etc. To make best use of capital funds and mitigate out of service downtime, other work may be tied into this exercise (power train rebuild or replacement, new driver's seat, etc.).

Mid-life refurbishments including the associated downtime and costs are eliminated and components are addressed on an as needed or independent time line scheme; e.g. driver's seats are replaced every four years and power plants at a certain kilometrage range. Vehicle specifications can be enhanced or written with longer structural warranties and corrosion resistant componentry.

Canadian transit agencies are moving to shorter lifecycles in alignment with design life

Canadian transit systems are increasingly adopting shorter vehicle lifecycles to match or move towards the considerably shorter design-life of the vehicles.

Whitehorse has a 12-year lifecycle but exploring extending to 15-years

Whitehorse Transit has historically replaced its buses at 12-year intervals. Recently, the agency has been exploring increasing lifecycles to 15-years, subject to a midlife overhaul in years 8-12 at an approximate cost of $150,000. This cost does not include a cosmetic body or interior vehicle refresh, but does include structural refurbishment. This level of investment is considerable and questionable to extend the useful life of the vehicles by three additional years. By proxy, York Region Transit (YRT) invests $180,000 in years 8-9 of the vehicle's life to attain an 18-year lifecycle. YRT's midlife refresh program is more robust essentially resulting in a "new vehicle" because of the extensiveness of their refresh program.

As emission standards continue to become increasingly stringent and the demands for "zero-emission" fleets grow as is currently occurring in Whitehorse, prolonging lifecycles is possibly counter-intuitive. It is fact that older and less-clean engine technologies such as Whitehorse's 2006 Novas are more reliable and easier to maintain because they do not have the advanced emission controls newer buses do. However; refurbishing these vehicles and prolonging their retirement to circumvent current emission standards is merely delaying the inevitable.

Whitehorse specialized transit vehicles current lifecycle is 10-years

Whitehorse is currently retiring its cutaway specialized transit vehicles after 10-years of service. This is considerably longer than the 7-year design lifecycle for these vehicles and not consistent with industry practice. Cutaway vehicles are typically a fiberglass body mounted on a metal chassis with a number of conversion modifications. As these vehicles age, they become "rickety" from the constant flexing of the two different materials. This is particularly noticeable after seven-years of operation. Added to this are the harsher environmental conditions encountered in most of Canada that are not prevalent in much of the United States.

Recently, some Canadian transit agencies have moved from traditional cutaway vehicles in favour of less complex unibody vehicles that are not subject to the degree of modifications as cutaway buses are and sell at a substantially lower cost. These vehicles have maintenance and operational profiles in line with automobiles. For example, a recent entrant in the market is the Dodge Promaster, pictured below (Figure 9), as outfitted by Creative Carriage for the Toronto Transit Commission. While the Promaster chassis is also available for cutaway applications, the use of one of the van variants mitigates the modifications and alternations associated with a cutaway. The Promaster van is slightly smaller but can be laid out to accommodate three mobility aid devices. It will be necessary to monitor a full life cycle to determine performance and cost of operation.

Figure 9: Dodge Promaster Van

3.1.3 Recommendations

1. Continue with diesel as primary propulsion source for conventional buses

Stantec believes that Whitehorse Transit is best-served continuing with diesel as its primary propulsion source for conventional buses. Considerably higher capital costs aside, alternate propulsion types such as BEBs or diesel-electric hybrids are best suited to dense urban environments with plenty of "stop and go" activity and traffic congestion. Whitehorse is a geographically disperse community. As a result, buses are often "deadheading in service" where they are essentially running at high speeds and not picking up passengers as they run alongside wilderness. The benefits of alternate propulsion types, particularly that of regenerative braking, would not be realized with this type of duty cycle.

One unique advantage diesel has compared to any of the alternate propulsion types is that it can sustain extended idling in emergency situations where the bus is being used as a shelter for a rescue or evacuation. This can be particularly helpful given Whitehorse's arctic climate. The fuel fired auxiliary heater provides a comfortable environment for patrons in stationary mode.

It is Stantec's belief that diesel-propelled products will continue to be dominant into the near future given the tremendous volume of units going through annual turnover. A recent article by Reuters in the US confirms this logic. The article stated that of 65,000 transit buses currently in operation in the US, only 300 are electric. Agencies are approaching the decision to switch propulsion types cautiously as they do not want to have to deal with the risks and costs of being early-adopters. However; if pressing environmental considerations or unforeseen funding opportunities present specific for "greener" technology, this recommendation can and should be revisited.

2. Adopt a seven-year lifecycle for specialized transit vehicles

Whitehorse Transit should adopt a seven-year service life/replacement threshold for its specialized transit vehicles. As mentioned previously, cutaway/body-on-chassis units have a shorter design lives than the current 10-year standard used by Whitehorse. In addition, Whitehorse Transit should evaluate moving to unibody vehicles in future

procurements that have a considerably lower capital (up to approximately 50-percent), operational and maintenance costs relative to traditional cutaways/body-on-chassis vehicle. In tandem, gasoline power versus diesel power can be reviewed. Diesel options are current less common in small vehicles but the fuel is common with the conventional fleet. However, in small front engine type vehicles, gasoline engine characteristics offer greater heat generation for passenger comfort in cold weather.

3. Adopt 15-year maximum lifecycle for conventional with updates to purchase specification

Stantec believes that 15-year lifecycle is advantageous and realistic given Whitehorse's operating parameters. However; Stantec recommends that Whitehorse Transit update its procurement specifications to require stronger provisions for future purchases. First, we suggest that Whitehorse Transit require a stainless steel framed bus. Costly midlife structural refurbishment programs are avoided on stainless steel vehicles. The current Novabus LFS product is solely built with a stainless-steel frame while New Flyer offers this feature for its frame as an option. While we recognize that Whitehorse Transit has recently procured Nova models with stainless-steel frames exclusively, by including this provision it allows for competitive procurement and avoids the possible perception of sole-source or restrictive bidding. However; this recommendation must be complemented by other established programs to keep the fleet in a state of good repair.

Based on Whitehorse Transit's fleet size of 13 units, purchasing 2 units in alternate years would keep the service life just under an average of 15 years. This may be more advantageous than going through an annual procurement (and associated incidental costs) and reduce small variances than may occur annually in product models.

Stantec recommends that a stronger warranty provision be included in the procurement document (e.g. 2 years/160,000 kms.). This would ensure that a portion of the fleet is under warranty for the most part with any cost for this option born in the capital account while generating savings on the operating account size.

Reviewing specifications of larger transit agencies or "piggy-backing" on the orders of other transit agencies or joint procurement initiatives may yield greater value-for-money for the agency and a product built with better componentry. As an example, the Metrolinx Joint Procurement Initiative in Ontario standardizes certain items on the purchase while allowing individual agencies to select certain unique features. All buses purchased through this process have 12-inch high stainless steel paneling on the aisle side of the driver's platform and front wheel housings to prevent damage from mobility aid devices. This was essentially a "free upgrade" because of the size of the joint procurement.

4. Maintain current spare ratio despite being higher than industry norm

Whitehorse Transit's 30.8-percent spare ratio is higher than the operating norm of 20-percent in the industry. However, Whitehorse is a small transit system and a single additional bus can vary the ratio much more than a larger operation. Having extra buses affords Whitehorse Transit the opportunity to put buses out of service for long durations to facilitate midlife overhauls.

5. Continue with acquisition of 40-foot buses

With respect to bus size, the common 40-foot model is the optimum product given all of Whitehorse's circumstances. It is acknowledged that there may be a route or routes where a smaller 30- or 35-foot unit would be warranted. But with a small overall fleet, versatility and interchangeability are important considerations. Currently, there are no 30-foot products partially or fully built in Canada. While New Flyer offers a 35 -foot version of its 40-foot model, Nova

does not. There are 30-foot products available from offshore vendors and from the US. In the latter case, the current exchange rate does not give much of a capital cost savings relative to a 40-foot made in Canada bus. The offshore products are relatively new in the market and sold through dealerships. At present, aftermarket service/parts may be a potential issue for Whitehorse with offshore vendors. It is recommended that the bus type/size issue be reviewed in the future in tandem with any route or service profile/passenger demand and changed in market offerings of bus types. For instance, with the introduction of microtransit or “home-to-hub” solutions, a smaller vehicle such as the Dodge Promaster may be more a more nimble and prudent choice.

6. Whitehorse’s 2008 Nova buses should undergo light refurbishment

Whitehorse Transit requested guidance from Stantec as to whether its 2006 or 2010 buses should undergo a midlife overhaul process. Dissecting the situation, some of the 2006 units are essentially at the end of their design life, and despite their more favourable maintenance experience compared to the 2010 units, they are four-years older and have been subjected to four more years of wear and tear. It is recommended instead that Whitehorse Transit perform a light refurbishment on the two 2008 units to extend their in-service life beyond the 2010 units. In tandem, only the most necessary work should be performed on the two best of the four 2006 units to extend their lives in tandem with more limited peak time use. It is important to retain a long-term goal of a shorter vehicle life than the historic Canadian 18-year duration and keep inserting new vehicles at a constant rate to maintain a contemporary average age with contemporary features, achieve a better cost recovery on warranty and keep capital and operating fund needs smooth over a long period.

3.2 CAPITAL INFRASTRUCTURE REVIEW

Customer experience and the appeal of public transit extend far beyond operational considerations such as scheduling and routing, but also include infrastructure, user information, and amenities outside the vehicle that make taking transit easy, safe, and convenient. Capital infrastructure is a direct reflection of the agency and can influence the customer perception of the quality of its services regardless if it is fact or not. At the stop level, Whitehorse transit offers infrastructure and user information at bus stops, but with little consistency or predictability in their placement.

3.2.1 Shelters

Shelters at bus stops provide protection from inclement weather and winds, and frequently offer a bench seat, which is especially useful for passengers with disabilities, or those who may be unable to stand for long periods of time. In its present state, Whitehorse Transit offers shelters at some key destinations or major intersections, such as Yukon College, Canada Games Centre, and at key points along McIntyre Avenue and Range Road.

Original shelters to the network offer Plexiglass windscreens and a roof to protect from the weather. As in other cities, vandalism of shelters is a problem in Whitehorse, as glass or plexiglass siding can be easily broken or burned. In recent months, the City of Whitehorse partnered with the Kwanlin Dun First Nation to design artistic shelters as a symbol of the continued partnership between the organizations. In an effort to prevent vandalism, and while artistically pleasing, the sides of these shelters are made from carved metal. The resulting gaps from the artistic design do not provide complete protection from the weather, allowing wind to pass through easily from the large cut-outs (Figure 10). It is recommended that the City continue its partnership with the Kwanlin Dun First Nation, but for future shelter designs to consider a homogenous material, or a durable transparent cover over the metal designs to block wind, and allow riders to see approaching buses.

Figure 10: Current Whitehorse Transit Bus Shelter, Yukon College

Many transit users express the need for more shelters throughout the City, with specific concern for the cold winter weather. One customer notes; *"have a few more bus shelters so people may be more encouraged to wait for the bus despite the cold winter days or rainy weather",* a sentiment echoed by the following passenger *"it is COLD in Yukon, please build a waiting shelter to protect from the elements at each and every bus stop".*

Recommendations:

While the notion of adding a shelter at every bus stop may be cost-prohibitive in present day, it may be prudent for Whitehorse Transit to triage stops, isolating the most frequented stops in the network, adding shelters to remaining stops as necessary funding becomes available. Using the recommended route network (section 4.1), stops at a high-priority for a bus shelter may include:

- Canada Games Centre
- Yukon College
- Downtown (2nd and Main)
- Whistle Bend Loop
- Porter Creek High School
- Whitehorse Airport
- Riverdale (Lewes and Nisutlin)
- McIntyre
- Granger
- Copper Ridge
- Crestview (Squanga Ave)

While not exhaustive, these high-priority stops would provide a shelter at the most common trip origins, allowing future funding to support more high-demand stops in the future. As a method of increasing this available funding, Whitehorse Transit should permit paid advertising on its shelters, managed and maintained by a local third party contractor.

In a comparably cold-weather city, Whistler, British Columbia has opted to introduce a shelter made primarily of metal, and wood (Figure 11). While this shelter design would solve some concern for breakable glass shelters, this design should be easily altered to fit the climate in Whitehorse, providing windscreens on the sides. This shelter is not only practical, but also visually appealing, creating an identity for Whitehorse Transit in the city that matches its Wilderness City branding and could continue to incorporate artisitc plesantries from the Kwanlin Dun First Nation community.

Figure 11: Wood and metal shelter design; Banff, Alberta

3.2.2 Seating

Similar to shelters, providing bench seating at bus stops minimizes the perceived inconvenience of waiting for the bus, especially for seniors or riders with mobility-challenges/disabilities who may not be able to stand for long periods of time. Seating is not found at many bus stops in Whitehorse, however the desire for seating among community members is apparent. Throughout the City, impromptu seating has been developed at several bus stops, clearly outside the authority of Whitehorse Transit. This seating ranges in sophistication from quality handmade benches, to repurposed school chairs (Figure 12), identifying the desire for permanent seating at stops.

Figure 12: Impromptu seating at Whitehorse Transit stop

It is recommended that Whitehorse Transit first provide accessible bench seating, generally accommodating 2 persons, at any high-priority stops with a bus shelter, or at transfer points between routes where riders are more likely to wait. Seating can then be installed at remaining stops as funding becomes available. As bench seating is more affordable than bus shelters, generally running at $2,000 or less per bench, this is a method of improving customer experience at a feasible cost. Figure 13 shows a sample accessible bench fitted inside a bus shelter in Toronto, Ontario.

Figure 13: Bench seating in bus stop, Toronto Ontario

3.2.3 Transit Garage

In addition to stop-level infrastructure, Whitehorse Transit operations and management are based out of a facility north of downtown, in Marwell. In recent years, Whitehorse Transit's fleet has expanded beyond the capacity of this garage, forcing maintenance teams to operate out of two distinct locations, and leaving some buses parked outdoors at night, potentially decreasing their useful lifespan in the winter months.

In response to these concerns, Whitehorse Transit has secured a new operations facility, centrally located north of the Airport in proximity to the Alaska Highway and Two Mile Hill Rd. This facility, which will open in 2019, will house all maintenance, operations, and administration of Whitehorse Transit, increasing operational efficiency. While this location is central to the network, changes to deadhead time caused by a relocated operations centre must be considered when updating bus schedules, and creating operator shifts.

3.2.4 Downtown Transit Terminal

Whitehorse Transit and the City of Whitehorse are currently considering design options for a proposed Downtown Transit Terminal, at the southeast corner of 2nd avenue and Steele St. While the design and scale of services provided at the terminal have not yet been finalized, the proposed concept outlined in the Whitehorse Downtown Plan is a useful starting point. Stantec recommends that some infrastructure in the downtown core be developed in support of public transit, as there is little infrastructure currently.

The notion of a large transit terminal in the downtown core was conceived during a time when 5 transit routes ran along the 2nd avenue transfer zone, pushing most public transit users through the downtown core. Using the recommended route network provided in section 4.1, a terminal of this scale may no longer be necessary, as only 2 routes will travel through the downtown by virtue of stronger connections elsewhere, and the capital investment of developing a standalone transit terminal may not be justified. Instead, Stantec recommends that funding be allocated more broadly to address infrastructure deficiencies across the network, leading to increased ridership, customer comfort, safety, and satisfaction.

To increase amenities and encourage transit use in the downtown, Stantec recommends that a smaller facility be built at 2nd and Steele, considering the following design elements:

- Large, fully enclosed bus shelter (accommodating 20+ persons)
- Heating and lighting in shelter to improve comfort and safety in the winter months
- Consider real-time next arrival screens
- Posted schedules and other key user information
- Bench seating
- Bicycle storage
- Accessible washrooms adjacent to the shelter to further promote the accessibility of the service

Stantec recommends that Whitehorse Transit partner with the City Planning team to investigate the feasibility of building up transit infrastructure at 2nd Avenue and Steele St. Many riders have, and will continue to transfer between routes – making this a pleasurable and safe experience is a key to increasing customer satisfaction and ridership.

3.3 MARKETING REVIEW

3.3.1 Overview

The visibility of public transit plays an underappreciated role in attracting new ridership, and retaining existing ridership. Cities and municipalities make significant investments into their transit systems but have historically tended to starve the marketing and communication of them.

The transit industry is becoming increasingly cognizant of the need for a long-term marketing and communication strategy which evolves the agency's brand, engages riders, and promotes travel mode conversion as primary activities. The necessity of marketing transit cannot be overstated particularly in light of increasing transit industry disruptors such as Transportation Network Companies (TNCs) that are swaying market share. The need to stay relevant in the minds of transit's customers has never been more prevalent.

3.3.2 Current Marketing Approach

The City of Whitehorse has made a significant investment in transit, however very little is done in the way of formal marketing to promote the agency. Stantec's survey demonstrated a general lack of awareness for the services provided by Whitehorse Transit, except for transit dependent customers (i.e. those with no other means of transport other than transit). This creates barriers to use and weakens the public image of transit. Transit is not perceived as being "cool" in Whitehorse but rather a choice of last resort. This is something Stantec recommends be proactively addressed.

Current branding is not memorable or striking

Limited to vehicles, bus stops and shelters, transit branding in Whitehorse is not overly striking or memorable. Whitehorse Transit adopted the city's corporate logo that identifies transit as an extension of the city's overall services. Historically, Whitehorse Transit had a distinct colourful logo and presence from other city services as shown below.

Current

Previous

While Whitehorse Transit formally adopted the city's logo, there are still legacy uses of the old logo across the system which are confusing from a customer's perspective. Using the city's corporate logo as the identifier for transit is regressive of the industry's recent direction and antiquated. Distinct, catchy brands with modern visual and verbal language that speak to its intended audience is increasingly becoming norm. In fact, other agencies that have

recently rebranded have seen a 5-percent to 8-percent increase in ridership from that effort alone. Stantec encourages Whitehorse to invest into a refreshed and dedicated branding strategy specific to transit.

Bus stop signage does not act as marketing tool

Bus stops signage in Whitehorse is not prominent and often blends into the natural environments because of its lackluster colour palate. In current form, bus stop signage does very little to act as a marketing tool for transit. An advantage of fixed infrastructure such as bus stop signage is that it can be leveraged for dual purposes and is something not currently being done by Whitehorse Transit. Additionally, signage does not convey a welcoming nor inviting environment for would-be transit customers and likely sending the wrong message about transit services in Whitehorse; they are off-putting. Stantec was confused by the unusual marriage of a "no parking sign" for automobiles with a bus stop sign. This is not considered best practice. Last, signage is not consistent across the system (different type faces and graphics) which does not foster a holistic customer experience. Stantec suggests Investment in new signage is warranted and desperately needed.

Figure 14: Current Whitehorse Transit stop signage

The below images represent high quality stop identifiers and branding, showing colour, user information, and branding tools to create a unique and recognizable identity for the agency.

Figure 15: Successful branding techniques from peer agencies

No formal marketing plan but tactical campaigns have been used

Whitehorse Transit has used incidental tactical campaigns in the past to entice people to use transit. Historical campaigns were aimed at how transit can save users money relative to personal automobile ownership. Stantec applauds Whitehorse Transit for this positive initial step of increasing awareness for transit and travel mode conversion.

Figure 16: Tactile marketing campaign, Whitehorse Transit

However; a formal marketing plan does not exist for the agency which provides strategic direction of when to market, the audience, the message being conveyed and the medium. In this regard, Whitehorse Transit is not dissimilar of other peers its size where tactical approaches are taken, but an overall strategy of the goal and intent of marketing is missing. Different people have different reasons for using transit; we need to understand those reasons to market to them. Further, we must understand how to reach them with our message and which message to use. Strategic considerations such as these are typically codified into a formal marketing plan which is considered best practice.

3.3.3 Future Marketing Considerations for Whitehorse Transit

Stantec is a strong proponent of simple, economical, and proven methods to market transit. In the age of constant "digital noise" word of mouth marketing is making a strong comeback. Of course, this does not diminish the role or need for strong web and app platforms to support those initiatives. As Whitehorse Transit evaluates the role and future opportunities for marketing, Stantec highlights some of the most successful marketing approaches, some of which our team has direct involvement with.

Establish "Transit is Cool" Culture in Whitehorse

As demonstrated in Stantec's survey, customers have diverse reasons for using public transit. Indeed, the opportunity to leverage these reasons as real considerations exist to position transit as a "cool" choice. There is a new generation of customer that wants to use transit but the value proposition has not been sufficiently established. Whitehorse

Transit could embark on a public education campaign that prompts answers to the overarching question...*Why is Whitehorse Transit the Cool Choice?*

- Economic impact of reducing regional congestion – *traffic costs money*
- Environmental benefit – *keeping the Wilderness City beautiful and in its natural form*
- Lifestyle benefit – *we drive, you enjoy life*
- Transit as the first choice

Below are examples of *LA Metro's "Make Transit Cool" program* including environmental impact and traffic congestion adverts and modernized red vehicle colour schemes to evoke pride in existing riders and likewise attract a new generation of riders.

Figure 17: Sample marketing from LA Metro "Make Transit Cool" campaign

“Grass roots” marketing is a powerful and cost-effective tool

Transit marketing does not need to be elaborate nor a cost-driver for the agency to be effective. Members of our team worked with Fort Saskatchewan Transit (FST) in Alberta where the client made replica bus stop signs that contained user information and placed them throughout the city to raise awareness for its services. Below, the replica sign is shown at the entrance of Canadian Tire in the city. The cost of producing this series of replica signage was reportedly under $500 and made by city employees.

Figure 18: Sample "grassroots" marketing campaign, Fort Saskatchewan Transit

Guerilla and street marketing reach wide audiences quickly and effectively

From its experiences, Stantec believes nothing is more effective at achieving travel mode conversion than being in the community promoting the message. This is a simple solution to educate would-be riders about transit and raise awareness. Oftentimes, people are interested in trying transit but intimidated at the prospect of the “first ride”.

Shown below, again in Fort Saskatchewan, is a community festival where one of FST's buses is parked and used as a "free attraction" for families - bus bowling (Figure 19). This fun and innovative approach to community engagement was well received and its believed to have achieved new ridership. In the Whitehorse context, community engagement activities could coincide with important community events such as Global Fiesta, university frosh weeks, summer festivals, farmers markets, and more. Guerilla and street marketing will be particularly important given the significant routing changes this report contemplates. Stantec recommends that Whitehorse Transit partner with local high schools and Yukon College to recruit volunteers and form "street teams" to assist with engagement efforts.

Figure 19: Community event featuring Fort Saskatchewan Transit

Cooperative marketing is a great way to involve local businesses for joint purpose

Local business and organizations can help promote Whitehorse Transit through use of their own media opportunities such as shelf talkers in grocery stores, digital screens in retailers such as Tim Horton's, kiosks at shopping centres and inserts in company/organization communications.

- Suggested messaging opportunities for local business partners could include:
- Sponsorship and/or advocacy of Whitehorse Transit and public transit
- Promotional discounts for those that use Whitehorse Transit

While the messaging is focused on service, the underlying intent for Whitehorse Transit is that the agency has wide support in the community it serves. Figure 20 is an example of a very successful cooperative marketing relationship between Famima, a bakery, and LADOT in Los Angeles. In this sample, customers are given a discount for showing their monthly transit pass at the bakery, can purchase transit fare media at the store and are shown on a map how to get to the business using the transit routes that serve the location. A similar approach could be used in Whitehorse to engage local business, particularly those downtown, that would be mutually beneficial both to transit and the business.

Figure 20: Sample partnership advertisement for LADOT

Rider-centric technology that facilitates integrated mobility are a customer expectation

Whitehorse Transit needs to be prepared to communicate with the customer of the future; one who is tech-expectant. Whitehorse Transit would benefit from a new web platform that reflects a modernized Whitehorse Transit. This will be touched on in the technology section of this report. The new web and app platforms requires a rider-centric approach that implements a comprehensive user experience strategy, modern creative direction and design reflecting Whitehorse Transit's master values, an operational content strategy, future-proofed technology strategy, social media integration and intuitive customer service mechanisms. The new web and app platforms must also have an eye towards consolidation of integrated mobility options and the future direction of the agency. It should provide wayfinding, trip planning and fare payment capabilities. Société de transport de Montréal (STM) has digital properties that are very robust and is a strong Canadian example of these functions being done well.

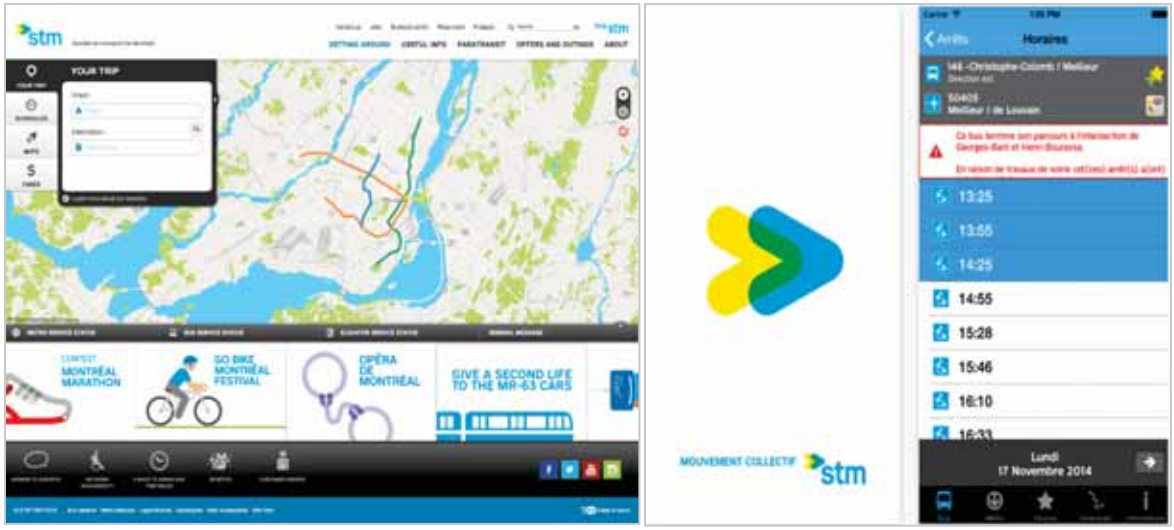


Figure 21: Digital interfaces from STM (Montreal)

While developing new web and app platforms owned by the agency is suggested, Whitehorse Transit should also provide open source data (GTFS data), so users can use any app of their choice. This would include publicly providing, as most transit agencies currently do, General Transit Feed Specification (GTFS) data online. GTFS is a standardized data format for storing public transit routes, stops, and schedules. This data can be used for trip planning and powerful systems analysis. To enable this, Whitehorse Transit would need to invest in a CAD/AVL system as outlined in the technology section of this report.

Marketing to internal transit staff cannot be overlooked

In speaking with front-line staff, we found that they are proud supporters of the organization, however require more support on how to communicate positive impact by Whitehorse Transit to the public. They are also seeking a feedback mechanism so that their experiences can help improve the quality of service and communications to riders.

It is important to consistently inform and train staff on how to communicate with transit's customers. For ease of education and information distribution, this can be produced as a series of actionable online self-help and or guidance systems that both staff and riders can refer to that enable front line staff to act as ambassadors of the new Whitehorse Transit brand and its services. This online portal could be called – "*It's Our Whitehorse Transit" Employee Engagement Program*

Figure 22 is an example of *BC Transit's Employee Engagement Action Plan*.

Figure 22: Sample internal marketing campaign

3.3.4 Recommendations

Whitehorse Transit would benefit from overhauling its identity and the method it communicates to current and prospective customers. Stantec believes a modern visual and written presence would elevate customer interest and experience. Establishing a “transit is cool” culture should be the primary focus of future marketing efforts.

New branding and marketing must be supported with a robust and properly funded effort, with the services of a marketing agency/consultancy procured to guide the efforts and produce content. Experience has shown that the most successful transit programs in North America that have continued to grow ridership invest between 2- and 5-percent of their operating budgets on marketing.

We appreciate that financial resources are finite. From its experiences at numerous transit agencies across North America, Stantec has seen and proven that investments in marketing translate into sustained, as well as and new ridership. A marketing investment for transit in Whitehorse should be scalable, economical, and results-oriented to build interest in transit. We identify our recommendations according to a proposed timeframe.

Short-Term Recommendations (0-2 years)

1. **Retain marketing agency/consultancy with transit expertise**: This would firm would assist Whitehorse Transit to develop a marketing plan, undertake a branding review and devise a future action plan.

2. **Develop a marketing plan**: The resulting plan should be pragmatic, provide clear direction and outline an actionable implementation plan for market. At a minimum, the marketing plan should contain the following components:

    i. Vision and Objectives
        i. Identify business objectives
        ii. Audience analysis
    ii. Marketing Strategy
        i. Branding recommendations
        ii. Marketing medium evaluation
        iii. Tactical recommendations including:
            1. Building awareness
            2. Guerilla & Event Marketing
            3. Community Outreach
            4. Digital marketing / social media
            5. Cooperative Marketing
            6. Employee engagement
    iii. Measuring Return on Investment
        i. Establish KPIs/Performance metrics
    iv. Budget
    v. Implementation plan

Long-Term Recommendations (3-6 years)

3. **Implement marketing plan and associated recommendations**

    i. **Develop new branding:** Continue working with a marketing agency/consultancy to develop new visual and written identity for the agency. Identify deployment schedule for brand activation to include printed materials, digital and fixed infrastructure (bus and bus stops).

    ii. **Tactical marketing strategies:** In tandem with brand activation, initiate tactical program that initially raises awareness for the "new" Whitehorse Transit but incrementally changes the focus to travel mode conversion. Grass-root tactics are encouraged as they are typically low cost but have a high yield.

    iii. **New bus stop signage:** To use fixed infrastructure as a marketing tool, it is recommended that bus stop signage be replaced with colourful, vibrant signage consistent with the new branding.

    iv. **Develop new website and app for transit:** Whitehorse Transit's customers of the future will increasingly demand a better digital experience with rich user information. To support many of the recommendations contained within other sections of this report, particularly integrated mobility recommendations, a revamped digital experience will be required.

3.4 TECHNOLOGY REVIEW

3.4.1 Overview

The use of technology is evolving rapidly in public transportation. Technology has made public transportation more effective and efficient and is enabling riders to personalize their riding experience.

Wireless technology has been especially influential in this change. Riders now can locate the nearest transit service to their location, to know when the next vehicle will arrive and to pay their fare. Technology has also introduced choice into the travel decision.

Whitehorse Transit understands the influence of technology on its core services as well as the influence that technology has on the ways in which its riders use its transit services. Stantec advises its clients that technology is no longer a “nice to have”, but rather “a must” particularly as transit services compete with other transportation modes, including ride hailing and car sharing services, that are predicated on technology and ease of use.

What is required for the next generation of Whitehorse Transit are cost-effective technology solutions that continually enhance the rider experience to grow ridership while providing data and data analytics to help make Whitehorse Transit services sustainable, both financially and environmentally.

3.4.2 Current Technology Approach

Historically, Whitehorse Transit has used minimal technology in the provision of service. This legacy approach has served the agency relatively well, but as Whitehorse’s riders are becoming increasingly conversant with technology options in the transit context and see its deployment at other peer transit agencies, particularly at TransLink in British Columbia, there are demands on Whitehorse Transit to embrace it as well. This section reviews Whitehorse Transit’s current technology investment into its operations.

Conventional Transit

Fare collection: Whitehorse Transit uses gravity-fed Diamond fare boxes. This manufacturer’s fare boxes have been a popular choice in the Canadian transit industry for their reliability and extremely low capital cost and minimal operating cost. However; cash handling and paper-based fare media are administrative cost drivers for Whitehorse Transit as someone must count, process and reconcile the fare collected in these fare boxes.

The fareboxes currently installed on Whitehorse Transit’s buses are dated and cannot support modern fare payment methods such as dedicated fare card, open payment nor near-field mobile payment systems. Whitehorse Transit’s fareboxes would either need to be upgraded or a bridging-product acquired, such as a standalone validator with communication capabilities, that would be used to facilitate these increasingly popular and demanded payment forms.

Handheld two-way radios: The agency relies on handheld two-way radios for vital operating communications. With this approach, a “dispatcher” is supposed to be in constant communication with bus operators about operating parameters “on-the-street” (vehicle location, schedule adherence, on-road issues, delays, mechanical issues, etc.). This is an outmoded approach to managing bus operations and no longer considered best practice. Most of Whitehorse Transit’s peers across North America have migrated away from using two-ways radios for ongoing

operating communications in favour of computer-based dispatching systems with Global Positioning System (GPS) capabilities that operate in real-time and are considerably more accurate.

Currently, handheld two-way radios are permissible according to Yukon's distracted driving laws. Interestingly, most other jurisdictions in North America have prohibited the use of handheld two-way radios in their distracted driving laws. Irrespective of the legality of handheld two-way radios, peers across North America are overwhelmingly migrating away from vocal communications inside the bus. Instead, most communications are increasingly done via Mobile Dispatch Terminals (MDT) with dispatch and emergency panic buttons underneath operator seats. If continued vocal communications are desired by Whitehorse Transit, adoption of hands-free technologies is considered best-practice. This could be implemented in one of two ways:

- Base station microphones with tie-into pre-existing bus speaker system; or
- In-ear Bluetooth wireless earbuds for drivers.

Cameras: Whitehorse Transit buses are equipped with cameras. This is a worthwhile investment that helps to ensure the safety of both bus operators and customers. Further, cameras have become a vital tool to protect frontline staff by disproving malicious allegations brought against them. Last, recordings from buses are now also actively sought and used by law enforcement to assist in its investigations. This is a best-practice that should continue.

Automated next stop annunciators: Yukon does not have prevailing accessibility legislation that requires next stop announcements. In the interest of encouraging barrier-free lifestyles for those persons with disabilities and mobility-challenges, other properties have adopted automated next stop annunciators. Next stop annunciators work by tracking a vehicle's GPS coordinates that trigger an automated announcement when the bus passes a predefined geographical "ring-fence." This approach is considered best practice, but is costly because of the GPS tracking.

Specialized Transit

On-vehicle technology: Similar to its conventional buses, specialized transit buses are equipped with handheld two-way radios which present the same challenges as discussed previously.

Scheduling software: Whitehorse Transit uses Trapeze software to schedule and dispatch specialized transit trips. Trapeze is a robust software package that is widely used at transit properties across North America and considered in line with best-practice. Having automated scheduling and dispatch software for specialized transit enables Whitehorse Transit to adopt progressive alternate service delivery concepts such as microtransit and "home-to-hub" type solutions which the Stantec believes should be a part of Whitehorse Transit's future.

3.4.3 Future Technologies to Improve Whitehorse Transit

Technology benefits riders, non-riders, and the agency itself in terms of operations, safety, and rider satisfaction. These benefits can provide operational improvements, as well as play an important role in communicating between the system and riders so that any impacts to service can be mitigated on the rider side of the equation. For the agency, it eliminates "running-blind" in the sense that it allows operations to get real-time feedback and information on how service is operating to adjust on-the-fly and provide a more proactive service as opposed to a reactive one. Beyond operations, the right technology can save transit service providers money by reducing costs, improving

decision making, and encouraging new ridership through improved user information. Naturally, financial resources are finite and the merits of each must be scrutinized.

While there is a plethora of emerging transportation technologies that are impacting the provision of transit service around the world, a select portfolio emerges that is of direct benefit to Whitehorse Transit for the term of this business plan and the future. Generally, technology can be grouped according to operational, safety and rider benefit, with significant cross-over amongst the three.

Operations

The right technology can improve the operational effectiveness and efficiency of a transit agency. Without fiscal restraint, solutions that would provide demonstrable benefits to Whitehorse Transit include:

- Computer Aided Dispatch / Automated Vehicle Location (CAD/AVL)

  CAD/AVL describes the use of computers and Global Positioning Systems (GPS) in dispatching and tracking transit vehicles. CAD/AVL is accompanied by added costs of operating and maintaining additional computer equipment, but transit agencies benefit from improvements to customer service and operations through real-time information. Because CAD/AVL is becoming so common, it is increasingly becoming expected as standard for fixed-route systems. The good news is that the price of these systems has come down considerably because of their popularity. Although two individual products, CAD and AVL are generally discussed as one in the transit context as it is not a prudent investment to have one without the other.

  Many agencies have found that CAD/AVL has helped to improve service by increasing schedule adherence and enabling agencies to easily monitor bus driver performance. CAD/AVL also helps to reduce response time to operational problems by improving communication between bus operators and dispatchers. Dispatchers can handle communication with and monitoring of a greater volume of vehicles. Customers also perceive their transit systems to be more modern and reliable because they can access real-time bus arrival information. CAD/AVL also aids in planning by collecting better historical data. CAD/AVL has also been proven to improve safety and security on transit vehicles because many systems include a silent alarm and video monitoring capabilities. For example, Denver's Regional Transportation District saw a 20-percent drop in assaults after adding a CAD/AVL system to its vehicles.

- Mobile Data Terminal (MDT)

  A MDT is usually a portable computer added to buses to assist with information and data management at service delivery. The computer may be a laptop, tablet computer, or customized hardware. There are many applications for MDTs such as managing paratransit trip manifests, collecting passenger and fare data, communicating with dispatch, and trip routing. MDTs are an effective tool for analyzing operations data in greater detail than with traditional pen-and-paper data collection. MDTs are typically grouped as an integrated bundle with CAD/AVL and allow the agency to make most out of its investment into such a system. Without MDTs, CAD/AVL is of limited use.

Common functions include:

- CAD/AVL: MDTs can incorporate CAD/AVL by processing location data to transmit to a central server or dispatch. Some are also capable of serving as a GPS-based navigation assistant for vehicle operators.

- Communication: MDTs can be used to facilitate efficient communication between vehicles and dispatch. This is often in the form of pre-programmed text messaging, which uses significantly less bandwidth than voice calls over a two-way radio system.

- Data entry and information management: A common use for MDTs is to collect a greater level of operating detail than might otherwise be possible. This may include the ability for the driver to categorize passenger counts by fare type (half-fare, adult, passes, etc.), by boarding or disembarking location, and so on. Some systems can incorporate some level of automation, such as pairing a location from the AVL component with the passenger fare type.

- Automatic Passenger Counters (APC)

  An electronic device available for installation on transit vehicles which records boarding and alighting data. This technology can improve the accuracy and reliability of tracking transit ridership over traditional methods of manual accounting by drivers or estimation through random surveying. They are typically installed at transit vehicle doorways and using infrared beams to sense when people enter or exit a vehicle. While a useful data source, it should be noted that APC's are notorious for overstating ridership by counting "phantom passengers." Therefore; APC data must be cleansed and validated against an alternate data source, such as electronic fare box information, MDT data, or manual counts to ensure accuracy.

- On-Demand/ Dynamic Scheduling Software

  Transit agencies are increasingly exploring on-demand or dynamic scheduling software solutions to unlock the opportunities of microtransit. Fixed-route services are costly and not advantageous in areas where land use is poor and residential densities are low - the ridership generated in those areas often do not warrant the fiscal investment. Gaining tremendous interest, on-demand solutions allow agencies to create "pop-up" routes in real-time based on demand for service. As discussed in the routing review section, there are a few areas within Whitehorse that have low residential densities, including Lobird, Ravens Ridge and Crestview, that would benefit from on-demand solutions. Residents in those areas would receive better mobility options than what is currently provided with fixed route. A software package, such as TransLoc, RouteMatch or SpareLabs, or the purchase of the on-demand module of the Trapeze software currently used in specialized transit service provision is required to fully enable this opportunity.

Safety

Emergency room visits due to pedestrians injured while walking with cell phones have soared in recent years. The proliferation of distracted walking will further raise the risk of negative interactions between pedestrians and vehicles.

At the same time, transit agencies continue to provide more service which will increase the interactions between transit vehicles and pedestrians/cyclists. Transit Cooperative Research Program's (TCRP's) report number 125 identified five factors that contribute to bus-pedestrian collisions and other road incidents:

- Operator distraction, multi-tasking and fatigue
- Tight or problematic schedules
- Timing/scheduling of buses
- Lack of training and follow-up enforcement by transit agency
- Lack of pedestrian friendly environments

Transit, just as much as any other road user has a part to play in keeping roadways safe for everyone including, passengers, other motorists, cyclists, and pedestrians. Whitehorse Transit has been fortunate that there have been no instances of bus-pedestrian collisions in the city. Proactively, some peer agencies such as York Region Transit are investigating and piloting new technology to minimize the potential for interface called bus collision warning systems (BCWS). There are three types of BCWS – active, passive and warning. Each has its purposes as well as resulting pros and cons but the overall purposes are the same: alerting the 'pedestrian' and bus operator that an interaction is about to occur and provide sufficient forewarning to prevent it. While this technology is still in its infancy, we believe Whitehorse Transit should monitor developments and potentially consider this as future technology when reliability improves and costs decrease. As an interim cost-effective measure, some agencies have started tying-in their signalling system to their external speaker system to provide some type of audible warning to pedestrians that a bus is turning. Additionally, agencies like Cleveland RTA have complimented this approach with brightening-up the side of the bus by installing strobe marker lights and blinking chevrons on all side mirrors that are activated by the signal system that help catch the attention of individuals "walking with their heads down."

Rider

Improving the customer experience builds loyalty of current riders and entices non-riders to consider transit. People with access to real-time transit information have been shown to spend 15-percent less time waiting at bus stops than people without this information. [1] Additionally, a study of Chicago's bus routes found that access to real-time transit information increased average daily ridership by 2-percent. [2] New York City's bus system found that this information also led to an increase in ridership, resulting in $5 million per year in additional fare revenue.[3]

With the strong adoption of smartphones and the realities of non-stop connectivity for many transit riders, there are opportunities to improve their experience including:

- Next Bus Arrival System

  An application that considers historical travel times, actual vehicle position, intended stops and the typical traffic patterns to present an extremely accurate estimation on when the next bus will arrive at the nearest stop. If the user is not at a stop, it also provides users with information about the nearest stop and directs them on how to get to it. This type of information is typically generated by CAD/AVL systems as a General

[1] http://www.wri.org/blog/2016/02/real-time-transit-data-good-people-and-cities-whats-holding-technology-back
[2] http://www.wri.org/blog/2016/02/real-time-transit-data-good-people-and-cities-whats-holding-technology-back
[3] http://www.wri.org/blog/2016/02/real-time-transit-data-good-people-and-cities-whats-holding-technology-back

Transit Feed Specification (GTFS). For reference, GTFS is a real-time feed specification that allows transit agencies to provide real-time updates about their fleet to application developers.

- Trip Planner

  An application such as the one provided by Google Maps or the Transit App that will assist the user in getting where they want to go. Users provide a starting location, optional midpoints, the destination, and whether they would like to depart now, later, or perhaps arrive by a certain time. The trip planner will then produce a personalized plan based on these parameters that outlines both the path and mode(s) of travel. The data required to power a trip planner such as Google's Transit Planner or the Transit App is the GTFS feed.

- Advanced Fare Payment Systems

  The number of transit payment options has increased with mobile payments, open payments and more. Agencies can now choose between operating branded fare cards; contactless open payment systems (which allow the use of non-affiliated credit and debit cards); mobile phones; wearables or other smart tokens (easily portable devices which can display and transit balances, connect to other devices via near-field communication or Bluetooth, etc.), such as the Barclaycard in London, UK; digital ticketing systems with video-based assistance, such as the NextAgent system in Essen, Germany; smart stations (which provide integrated ticketing platforms enabling connections to other transportation modes such as commuter rail or taxis); or region-wide fare cards which can be used across transportation modes and platforms, such as those used in Sweden and Scotland.

  The other payment system often overlooked is account management systems which are proving to be very effective for the delivery of certain types of services and for certain types of riders. Account management systems are perfect payment solutions for riders of accessible services who are seniors and the disabled that may have challenges using traditional fare products. Mobile and open payment systems can communicate with a back office or central management system to validate the rider's eligibility to ride the service and to deduct the value of the ride the rider is taking from a prepaid account. In addition to accessible service programs, account management payment systems work well with commuter rail and bus programs where riders received some form of subsidy from an employer.

  Closed-source payment, such as fare cards, are quickly becoming obsolete, so moving to open-source fare payment, such as Interac debit, Visa, MasterCard, etc., and mobile is a much more advisable option. In the case of Whitehorse Transit, we believe a simple and cost-effective solution such as the one developed by eiGPS/PIN Payment Solutions may be worthy of consideration. eIGPS created a product that can accommodate proprietary cards (closed loop), contactless credit cards and mobile devices (Supported Payment Credentials or SPCs). Their solution can be set up in a short period of time without disturbing legacy systems that may currently be in place such as Diamond fareboxes. The company recently launched a 150-bus pilot in Laval Quebec.

- Mobile Transit System Notifications and Service Disruption Alert Systems

  A service that will send a text or notification to the user's mobile device, notifying them of any delays, changes, or disruptions to service. It can be as simple as providing the user with information the user

selects, or as complex as using the user's location and riding history to update them on routes they frequently use. Some agencies have embraced Twitter to provide real-time service updates which requires minimal technological investment, but does require staffing resources to be responsive and done well. It should be noted that many systems are using all forms of social media and traditional communication channels, i.e. agency websites, to communicate with passengers. Often communications and/or customer service staff performs these duties in addition to their traditional duties.

- Wi-Fi

  Wi-Fi could be easily provided through the assets Whitehorse Transit procures in an integrated CAD/AVL/MDT package. The only additional cost to the agency for the service is for the increased bandwidth used by riders. However, in return the agency benefits from a new origin and destination (O-D) data source for route planning purposes by providing the service.

The way in which people consume services around the globe and throughout different industries has changed considerably over the last decade. Our world is becoming evermore virtual with the need for information instantaneously. Our riders expect transit to be as nimble and easy to understand as the many other services they use daily. The Canadian Urban Transit Association's (CUTA's) Vision 2040 has recognized the role in which mobile apps have become pervasive in the transit world and that agencies must consider this new reality. Twitter and Facebook are great venues to communicate with passengers particularly in a city like Whitehorse with a lot of students. This is a great first-step towards improving the lines of communication between Whitehorse Transit and its riders. However; these functions must be given appropriate staffing resources to be effective and proactive; otherwise good intentions can quickly become "damage control" exercises where staff respond reactively to oftentimes negative, rude, and vulgar customer comments and complaints – a counterproductive use of time to what is trying to be achieved.

3.4.4 Recommendations

The next generation of Whitehorse Transit requires cost-effective technology solutions that continually enhance the rider experience to grow ridership while providing data and data analytics to help make Whitehorse Transit services sustainable, both financially and environmentally. We applaud the investments that Whitehorse Transit has previously made, but suggest more resources will be required going forward for transit to stay relevant in the minds of its customers through modernized technology.

We appreciate that financial resources are finite. From its experiences at numerous transit agencies across North America, Stantec has seen and proven that oftentimes an upfront capital investment is warranted as it will translate into increased ridership and/or reduced operating expenses for the agency that more than offset the level of investment. Therefore, we are proposing pragmatic recommendations that will require a new, yet reasonable, investment to enable Whitehorse Transit to proceed with the modernization of its technology efforts.

The Federal Government's Public Transit Infrastructure Fund (PTIF) presents opportunity as a funding source for the recommendations presented below. Accordingly, Stantec suggests that PTIF be explored to its fullest potential.

We identify our recommendations according to proposed timeframe.

Short-Term Recommendations (1-3 years)

1. **On-demand/dynamic scheduling software**: To enable microtransit solutions in lower density areas of the city increasing productivity and lowering the cost of providing service in those areas, Stantec recommends that Whitehorse Transit invest in on-demand/dynamic scheduling software. On-demand solutions such as the one envisioned for Whitehorse allow agencies to create "pop-up" routes in real-time based on demand for service. Many of these newer software packages require only a tablet onboard the vehicle and a cellular connection. Depending on the software provider selected, there are opportunities to integrate conventional transit into the same platform offering an integrated CAD/AVL/MDT solution. More is discussed below.

2. **Integrated CAD/AVL/MDT solution:** Stantec recommends, as a near-term priority, that Whitehorse Transit invest in a CAD/AVL/MDT technology solution. An integrated CAD/AVL/MDT solution would allow Whitehorse Transit to manage its operations dynamically, allow it to be informed for decision making and provide to better user information to its customers. Given that Whitehorse is an Arctic-weather climate, having real time next-bus arrival information would be a tremendous upgrade for its customers. Riders would have the ability to stay inside a heated climate as long as possible before proceeding to their bus stop. Additionally, MDTs can be used to collect rider counts negating the need for a true APC system which needs to be calibrated and maintained, and the data cleansed, over an ongoing basis. Irrespective, it is best practice to validate even manual counts on MDTs against another source such as GFI farebox data.

   Many software companies are integrating CAD/AVL/MDT solutions for fixed route transit and on-demand/dynamic scheduling capabilities onto a common platform. Stantec advocates for this type of solution as it is the most cost-effective approach and will give riders a single source of information using a common app.

3. **Install a simple open and mobile fare collection solution:** Stantec believes that modernizing the fare collection system is a prudent step to reduce the agency's administrative and fare collection costs that affords riders more choice in how they want to pay for service. We suggest a simple validator product such as the one developed by eiGPS is an appropriate solution and at a very reasonable price point. We understand that the approximate cost of the validator unit is approximately $300-$500 per bus installed. Cash handling and paper-based fare media are administrative cost drivers for Whitehorse Transit and should be minimized in the future. Closed-source payment, such as fare cards, are becoming obsolete, so moving to open-source fare payment, such as Interac, Visa, MasterCard, etc., and mobile is a much more viable option.

Long-Term Recommendations (4-6 years)

4. **Whitehorse Transit website and mobile app**: Subject to the implementation of an integrated CAD/AVL, Stantec suggests that Whitehorse Transit have its own website and app. A Whitehorse Transit app would improve communication and enhance the rider experience, which are both keys to enticing travel mode conversion to transit.

5. **Wi-Fi**: Wi-Fi is becoming increasingly common across all consumer industries and transit is not immune to the demands for it either. In some regions across North America it is expected on transit and it has been shown to "speak volumes" to younger consumers. Free Wi-fi could be part of a mobile app solution since

both are enhancements to the customer experience. Wi-Fi could be provided through the assets Whitehorse Transit procures in an integrated CAD/AVL/MDT package. The only additional cost to the agency for the service is for the increased bandwidth used by riders. However, in return the agency benefits from a new origin and destination (O-D) data source for route planning purposes by providing the service.

6. **Remove handheld two-way radios from buses:** Irrespective of any change in the Distracted Driving legislation, Stantec recommends that handheld two-way radios be removed as they are not consistent with the industry best practice. Many of the communications that currently occur through two-way radios could be replaced by an integrated CAD/AVL/MDT solution negating the need for two-way radios. Peers in North America are overwhelmingly migrating away from vocal communications inside the bus. Instead, all communications are done via MDTs with dispatch and emergency panic buttons underneath operator seats. If continued vocal communications are desired by Whitehorse Transit, adoption of hands-free technologies are recommended as best-practice. This could be implemented in one of two ways:

    - Base station microphones with tie-into pre-existing bus speaker system; or
    - In-ear Bluetooth wireless earbuds for drivers.

7. **Monitor Bus Collision Warning Systems**: Bus Collision Warning Systems are still in their infancy and being piloted by bigger agencies who can provide the research and development support to perfect these products. As the accuracy of these products improves and the costs decrease, their may be a business case for them in Whitehorse's future. In the interest of improved safety, Whitehorse may wish to consider a simple solution such as brightening up the side of its buses with LED strobe marker and mirror lights as well as an audible warning tied into the external speaker system. A simple solution such as described could be implemented for $200-300 per bus and may reduce operating risk to the agency.

For a summary of how these technologies compare and recommended implementation timelines see Table 7.

Table 7: Summary of Recommended Technology Solutions

Solution	Category	Capital Cost*, ** ($ - initial)	O&M Cost*, ** ($ - ongoing annual)	Time Horizon	Example Providers	Notes
On-demand dynamic scheduling software	Rider and operations	$300 to $25,000 per bus	$300 to $800 per bus per month	Years 1-3	TransLoc SpareLabs Routematch	Most require solutions require simple off-the-shelf tablets (IPads) and cellular data connection to enable
Integrated CAD/AVL/MDT Solution	Operations and rider	$300 to $15,000 per bus	~ 10-15% of initial capital cost	Years 1-3	TransLoc SpareLabs Constat, RouteMatch, Passio, Clever Devices	Capital cost dependent on sophistication of system installed Opportunity to procure common system with on-demand /dynamic scheduling software solution
Advanced fare payment system	Rider and operations	$300 to $13,500 per bus	Minimal up to $35,000 per year	Years 1-3	eiGPS Route Match Strategic Mapping	Capital cost dependent on sophistication of system installed. Stantec advocates for a simple solution.
Mobile app and website	Rider	Free to $85,000	Free to $12,500 per year	Years 4-6	Constat, Route Match, Passio	CAD/AVL and app should be deployed at same time; website to be updated with launch of app
Wi-Fi	Rider	None if routed through integrated CAD/AVL/MDT solution	To be negotiated with bandwidth data provider	Years 4-6	Constat, Route Match, Passio, Clever Devices	A free add-on to most CAD/AVL/MDT systems nowadays; agency pays for increased bandwidth usage but gains O-D date source in return
Handheld two-way radios	Operational / safety	~ $100 per bus – base station microphone ~ $450 per bus operator – Bluetooth	~ 2-5% initial capital cost	Years 4-6	REI, Motorola	Costs are dependent on solution-type selected
Bus Collison Warning Systems	Safety	~ $300 to $20,000 per bus installed	~ 2-5% initial capital cost	Year 6+	Protran Clever Devices	Costs are dependent on solution-type and sophistication selected

* Order of Magnitude Estimates
** USD pricing converted at 1.375 exchange rate

3.5 SPECIALIZED TRANSIT AND ACCESSIBILITY REVIEW

3.5.1 Overview

Riding conventional transit is a daily routine for many—transit service provided by Whitehorse Transit allows Whitehorsers and visitors the freedom to commute, shop, socialize, and explore the city. Nevertheless, for residents with disabilities, whether physical or cognitive, temporary or permanent, riding conventional transit can be a difficult task. Navigating transit, overcoming barriers such as inaccessible infrastructure, and transferring between routes, can be intimidating, or impossible for some. The aim of Whitehorse Transit's Handy Bus service is to provide a safe, reliable, equitable, and cost-efficient transportation service for eligible persons who are unable to use the conventional public transit system, and to increase accessibility to (and knowledge of) Whitehorse's conventional transit system. As there is no legislation in Yukon Territory mandating specialized transit, providing this service is at the discretion of Whitehorse Transit.

Eligible Handy Bus registrants consist of persons with physical, cognitive, and sensory disabilities. Registrants are classified according to four categories of eligibility: full eligibility, conditional eligibility, temporary eligibility, and visitor eligibility. These categories act as a demand management tool to ensure that individuals are matched with the right level of service consistent with their degree of mobility. In other words, if an individual can use accessible conventional transit under certain conditions, they are not eligible to use Handy Bus for those trips. Handy Bus also has a re-certification process whereby eligible riders are required to re-apply to the program after their period of eligibility has expired. This helps ensure that the service is used by those who need it and not abused by those who do not, or who no longer need it. A travel training program is available to help persons with disabilities feel comfortable using the accessible conventional bus services.

3.5.2 Service Review

Financial Performance

While Whitehorse Transit provides specialized transit service that is revered by many of its riders, the existing service delivery model is a costly one and limits the flexibility and spontaneity of travel. Handy Bus offers subscription trips that may be pre-booked at regularly scheduled times, but with a small service population and low population density, the benefits of trip grouping through subscription trips are not as evident as they are in large and medium-sized cities. Cost management is a primary challenge of Handy Bus, with cost-per-trip and cost-per-hour being the largest among its peer group, and R/C ratio being the second-smallest. Handy Bus' cost-per-hour is 94-percent higher than the peer average and is of considerable concern for the financial sustainability of the program. Whitehorse Transit may wish to explore the creation of a taxi scrip program to deliver specialized transit trips with the current Handy Bus vehicles redeployed as Home to Hub or microtransit vehicles to serve lower density areas of the city (more discussed below). Table 8 below shows some key performance indicators of Whitehorse's Handy Bus in comparison to similar services delivered in other Canadian jurisdictions of under 50,000 residents.

Table 8: CUTA 2016 Statistics for Specialized Transit Operators (ordered by population)

City/Town	Population	Ridership	R/C Ratio	Cost/Trip	Cost/Hour	Trips/Registrant	Trips/Hr	Km/Trip
Belleville	49,454	16,559	1%	$25.36	$41.45	11.17	1.62	3.92
Cornwall	46,000	41,752	12%	$33.05	$78.34	20.64	2.84	5.85
Prince Albert	45,182	39,679	13%	$19.47	$47.58	69.98	3.53	2.40
Timmins	36,622	13,551	5%	$36.93	$82.40	26.99	2.53	7.18
Stratford	32,000	19,817	10%	$22.52	$59.87	40.44	2.66	4.75
Leduc	30,498	30,207	12%	$27.01	$69.94	27.36	3.05	4.25
Renfrew	26,950	38,184	65%	$23.50	$35.86	50.91	2.80	8.63
Whitehorse	**23,027**	**6,385**	**2%**	**$54.29**	**$126.61**	**12.26**	**7.98**	**5.01**
Yellowknife	19,569	7,110	4%	$39.04	$70.85 [1]	30.26	1.99	not provided
Cobourg	18,519	8,759	10%	$19.51	$39.91	14.90	2.05	3.46
PEER AVG.	***32,782***	***22,200***	***8%*** [2]	***$30.07***	***$65.28***	***30.49***	***3.10***	***5.05***

[1] 2015 data
[2] excludes Renfrew's R/C ratio of 65% as it is an extreme outlier

Ridership Trends

At the same time, as is shown in Table 1, Whitehorse's Handy Bus has the smallest ridership out of its peer group as well as the largest number of trips-per-hour. Both measures are beneficial to Whitehorse Transit from a cost management perspective. The large trips-per-hour could be an indicator of efficient scheduling and dispatch practices. Small ridership is likely due to rider and registrant policies, policy enforcement, and the implementation of initiatives such as travel training. Looking at historical ridership, a year-over-year reduction in trips over the last five years is observed, with an average of an 8% trip reduction per annum since 2013. This is contrary to the increasing demand at many other peer agencies in Canada.

In 2017, 5,956 trips were forecasted (based on January-October ridership totals), which represents an average of under 500 trips per month. Ridership trending appears favourable and is illustrated in Figure 23 below.

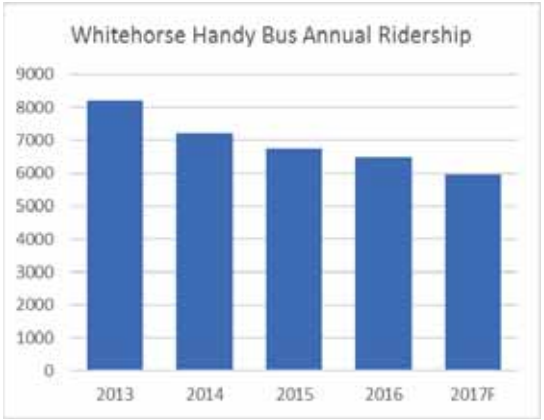


Figure 23: Ridership Trending

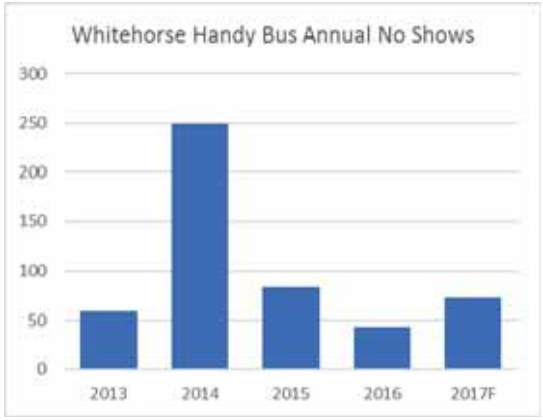


Figure 24: No-Show Trending

At the same time, other measures have been declining such as refusals, cancellations, and short notice trips. Trip denials, however, were projected to increase a little in 2017, but otherwise have been relatively stable over the last five years – not declining alongside ridership. There also appears to be a high variability in the number of no shows

per year, and no shows are projected to be 68-percent higher in 2017 compared to 2016 (also based on January-October totals). Handy Bus should investigate into the root cause(s) of this increase in no shows, to ensure no shows do not return to 2014 levels, as is illustrated in Figure 24 above. Excessive no shows are costly to the operation and could be an indicator of shortcomings in policy enforcement or that the agency is too lenient with respect to issuing warnings and suspensions.

A new "Home-to-Hub" Service for Lobird and Raven's Ridge to Replace Conventional Fixed Route Services

Currently, conventional transit and specialized transit are operated independent of each other in Whitehorse; With low ridership in certain parts of the city on conventional transit and underutilized capacity on Handy Bus vehicles, the business case for comingling riders exists through a comingled "home to hub" offering.

Comingling, while a relatively new concept to Canada, has had considerable uptake and success with many US properties to help derive greater productivity from their specialized transit fleets. Where fixed-route service is suggested to be removed, the introduction of a subscription-based comingled service is proposed. This new innovative service model would take advantage of underutilized specialized transit service vehicles to provide a more flexible and low-cost means of transit service as an affordable alternative to providing fixed route conventional services in low demand, low ridership areas. Members of Stantec's team worked with Oakville Transit and York Region Transit to help both agencies successfully implement the first "home-to-hub" pilot projects in Canada that have been hugely successful. Section 4.2 provides additional information and recommends a home-to-hub system tailored to Whitehorse.

Under this service model, Whitehorse Transit would use its Handy Bus cutaway fleet and infrastructure to deploy and manage the service. The proposed home-to-hub service is suggested to be subscription-based and available only at peak travel times of the day and scheduled in advance. The service should only be subscription-based to avoid the impression that the service is a replacement to the taxi industry.

There is existing seating capacity within the Handy Bus service where the home-to-hub service could help Whitehorse derive greater productivity from its cutaway fleet by moving more passengers and recovering more costs. The service would have to be carefully deployed and managed to ensure that it does not become a cost-driver. While the fare would initially be set the same as the rest of Whitehorse Transit, there is nothing that precludes the agency from raising the fare for home-to-hub service only if it becomes extremely popular since it can then be viewed as a premium service. It is recommended that the Handy Bus operation begin co-mingling specialized transit trips with conventional transit trips. Specifically, a Home to Hub concept, such as that which is offered in Oakville, ON, would benefit Whitehorse (section 4.2).

Taxi-Scrip Program or User-Side Subsidies

Whitehorse Transit has been exploring the option of establishing a taxi scrip program to provide accessible transportation to persons with mobility challenges and ceasing the Handy Bus program in its current form. As there is no legislation in Yukon Territory mandating specialized transit, providing this service is at the discretion of Whitehorse Transit. Stantec is an advocate for inclusive, barrier-free living of all persons and believes providing a specialized transit option in some form is non-negotiable.

Given that Whitehorse Transit's cost per trip is 94-percent higher than its peer group ($54.29) and parallels the cost per trip to that of the Toronto Transit Commission, the opportunity for an alternate service delivery model should be

given the fullest consideration. We are concerned about the financial viability of Handy Bus program in its current form and we believe Whitehorse Transit's assets could be redeployed for greater Value for Money as Home to Hub or microtransit vehicles to serve low-density areas of the city. Moreover, in light of emergent funding challenges, the timing is critical to implement an alternate service delivery model before April 2019.

Taxi scrip programs can be useful in reducing specialized transit program costs assuming the program is carefully managed and strictly enforced. Stantec suggests that a per-user quota per month should be established and strictly enforced to ensure that the scrip program itself does not become a cost driver to the agency. At other peer agencies, Stantec has seen, firsthand, taxi scrip programs being misused by program patrons for the purposes intended (example – providing taxi scrips to cab drivers to do grocery runs or perform errands).

More recently, peer agencies across North America have been exploring the concept of user-side subsidies for specialized transit instead of taxi scrips. Under a user-side subsidy model, program users are allotted a dollar-value per month (example 75 dollars) and are provided discretion on how those funds are used – specialized transit provided by the transit agency, accessible conventional transit provided by the transit agency, Uber/Lyft, etc. This is a more progressive model that acknowledges the changing dynamics of the transportation industry, the personalization of travel through technology and the role Transportation Network Companies (TNCs) will play in the future of mobility. The transit agency in Boston (MBTA) is currently piloting this initiative and the industry is eagerly awaiting results to gauge success.

Conventional Transit Accessibility

Accessibility of Whitehorse Transit's conventional fixed-route service depends on two factors – the accessibility of the buses and the accessibility of the road and stop infrastructure. Whitehorse Transit has been diligent in upgrading its fleet to fully-accessible low-floor buses, although the accessibility of conventional bus stops r is severely lacking. As such, it is recommended that Whitehorse Transit pivot its focus from the accessibility of the fleet to the accessibility of the infrastructure. At a high-level, the most accessible bus stops exhibit the following characteristics:

- Shelters
- Mild or no slopes
- Seating with armrests
- Clearly demarcated stop posts and stop area

Appendix 1 describes two Canadian transit agencies, TransLink and Thunder Bay Transit, that have developed guidelines with high standards in providing accessible bus stops to their riders. Also included in Appendix 1 are the international best practices of bus transit as presented by the United Nations Development Programme (UNDP).

While Whitehorse Transit is significantly smaller than both TransLink and Thunder Bay Transit, the best practices may still be considered and applied where possible particularly where bus stops are being rebuilt. At the same time, it is important to consider that priorities in one city may be different from the priorities in another. Whereas items such as next-bus arrival screens, lighting, and tactile surface indicators may be important to TransLink and Thunder Bay Transit, they are lower priorities in Whitehorse Transit where a smaller capital budget is available. Instead, with winter temperatures that dip below those of most other Canadian cities, shelters may be the highest priority investment with regards to passenger amenities.

Shelters should be prioritized at stops with frequent boardings and alightings, and especially at transfer locations and consistent with established service standards. The stops along 2nd Avenue and 4th Avenue, and at Yukon College, are the top candidates for new shelters (and other accompanying passenger amenities such as clearly labelled stop posts). While it is true that riders have the option of waiting indoors at Yukon College, given its proposed importance as a transfer point, it is recommended that a larger shelter be installed there regardless. Doing so will clarify the stop location for those who may be unfamiliar with where to wait, provide a platform for communicating rider information (particularly critical given its new importance as a transfer point), and help improve the visibility of transit.

Wait Time Policy

The wait time policy of Handy Bus is currently generous at 10 minutes past the scheduled pick-up time. Most other Canadian operations, on the other hand, have a wait time policy in between 0 and 5 minutes. Handy Bus' wait time policy is good from a customer convenience perspective, however it also brings the possibility of inconveniencing passengers already on-board and can limit on-time performance, throwing off the scheduling of upcoming pick-ups. It is recommended that Whitehorse Transit revise the wait time policy down from 10 minutes to 5 minutes consistent with industry best practice.

Branding

Across North America, properties have been rebranding their specialized transit programs to deemphasize the exclusivity of the service. The premise being that since travel training empowers more individuals to use conventional transit, having a dedicated brand for specialized transit becomes less relevant.

Whitehorse Transit's specialized transit program is currently branded as Handy Bus. This creates the perception of exclusivity, which can be off-putting to registrants who want to feel as though they are using Whitehorse Transit services like the general public. The name Handy Bus itself can also be offensive to the rider base as it implies the service involves a level of care or help. While the name choice is well-intentioned, it is contrary to the independent lifestyle that many specialized transit users are aiming to lead. It is recommended that Handy Bus be rebranded simply as Whitehorse Transit. In essence, the specialized transit service will become an extension of the agency's master brand. In addition to solving the challenges noted above, a further benefit of brand consolidation is that Whitehorse will be able to more effectively manage a single brand, and for fewer costs, compared to current conditions where two brands require management and stewardship. Moreover, with the proposed co-mingling of conventional transit and specialized transit trips as described above, a unified Whitehorse Transit brand lends itself to less confusion from the users' perspectives.

Figure 25: Hamilton Street Railway's New Specialized Transit Vehicle Branding

An example is the Hamilton Street Railway (HSR), which has removed all reference to the DARTS program on its cutaway vehicles and has replaced that branding with the HSR logo (Figure 25).

As Whitehorse Transit transitions to a family-of-services approach to specialized transit delivery, Stantec recommends that the Handy Bus brand be deemphasized and replaced by the master Whitehorse Transit brand, which would be consistent with recent best practice in the industry. This rebranding would also assist with the introduction of “comingling” and the roll-out of the home-to-hub service.

3.5.3 Summary

In summary, Stantec recommends the following:

1. Continue strong efforts in enforcing policies and promoting travel training and use of conventional transit.
2. Consider freezing operator wages given that cost-per-hour is currently 94% higher than the peer average.
3. Investigate and address the root cause(s) of the increase in no shows.
4. Concurrently launch pilots of taxi scrip in lieu of current Handy Bus service, and on-demand service in Raven’s Ridge and Lobird using the specialized transit fleet. Invest in driver training/re-training.
5. Identify stops with frequent boardings, alightings, and transfers, and install shelters and other passenger amenities consistent with peer best practices.
6. Reduce the wait time policy from 10 minutes to 5 minutes.
7. Rebrand Handy Bus to be an extension of the master agency brand, Whitehorse Transit.

3.6 ACTIVE TRANSPORTATION REVIEW

3.6.1 Background

Active transportation—walking and cycling—can help improve a city's quality of life for many reasons, such as decreasing pollution, traffic, and noise related to single occupancy vehicles, not to mention the public health benefits associated with self-powered transportation. In tandem with public transit, active transportation can reduce congestion and help diversify transport options, particularly for short-distance trips (typically under 5 km). Taken together, the interplay between walking, cycling, and public transit can help achieve many of sustainability goals set by cities worldwide, and this is no different for the Wilderness City.

For the City of Whitehorse, a major draw is the opportunities for an active and outdoor lifestyle. Nevertheless, to help reduce car trips, walking and cycling need to be used beyond recreational purposes, and serve useful purposes, such as commuting to work or to run errands. Indeed, the Transportation Demand Management Plan (2014) set a 2036 commuting mode share targets of:

- 6-percent for cycling
- 15-percent for walking
- 15-percent for public transit

From the recently released 2016 Canadian Census, the current commuting mode shares are:

- 3-percent for cycling
- 6-percent for walking
- 5-percent for public transit

To encourage more sustainable mode choices, this section of the Transit Master Plan provides an overview of cycling and transit in Whitehorse, and provides some recommendations aimed at improving the use of transit and/or cycling, with the overall goal of reducing car trips in Whitehorse.

Existing Conditions

Whitehorse Transit currently provides bike racks on the front of all buses, with two bike positions. Moreover, at the operator's discretion, riders may bring their bikes aboard the bus. There is no cost to board a bike.

The City of Whitehorse is currently developing a Bicycle Network Plan, hoping to encourage more cycling for utilitarian purposes. There are over 700 km of multiuse trails for recreational purposes in and around the city, but on-street bike infrastructure for utilitarian purposes is minimal (Figure 26). The City provides bike racks and lockers, and these are colourful and vibrant additions to the streetscape.

Figure 26: City of Whitehorse Commuter Cycling Map
Source: City of Whitehorse

While cycling and transit can be complementary, it's also important to recognize that sometimes, particularly on streets with bus routes and bike paths, cyclists and buses may come into, at times, dangerous conflict. Nevertheless, when looking at survey respondents who used Whitehorse Transit within the last 3 months, 96-percent arrive at their bus stop by walking (91-percent) or cycling (5-percent). Furthermore, of the 16 respondents who would bike if transit were not available, 63-percent (10 of 16) indicated that they use both bike and transit more than twice a week. Of these 10 respondents, 70-percent take their bike on the bus (bike rack or in the bus). Finally, both riders and non-riders indicated overwhelmingly (83-percent, 25 out of 30) that more bicycle infrastructure (bike lanes and signage) would help them bike more often, while 10-percent (3 of 30) suggested that more secure bicycle parking near bus stops could encourage cycling and transit trips, and 7-percent (2 of 30) felt that more secure bicycle parking near their destinations could encourage cycling. Taken together, there is unlikely a single strategy to emerge that could encourage cycling and transit, and it's important to recognize that cyclists will often bike an entire trip, given the option.

Nonetheless, a few factors unique to Whitehorse play in the favour of Whitehorse Transit to encourage transit use by cyclists. Namely, the hilly terrain and winter weather may encourage cyclists to bike to a bus stop, mount their bike, and take the bus home in the uphill direction, such as from the Downtown core into Whistle Bend, or Takhini. In addition, inclement weather could see some riders use their bikes to reach a bus stop and use the bus, or perhaps bike in the morning to work or school, only to return home on a bus. Or some summer cyclists may choose to become bus riders in the winter.

Some respondents' comments speak to the discussion above:

"I bike to work most of the year but I take the bus more often in the winter or for going long distances after work. I appreciate having bike racks on the bus for when I bring my bike on the bus."

"..More share the roads education, signage and infrastructure. CoW is easily bikeable but there are areas where lack of signage and uneducated drivers make it unsafe.."

"Buses that make stops in bike lanes (i.e. on Lewes) are problematic."

3.6.2 Recommendations

Based on the high-level overview of cycling and transit in Whitehorse, the following recommendations are proposed that may encourage cyclists to use transit for part of a trip.

1. *Identify bus stops with high passenger volumes, as well as bus stops or locations that could serve as "bike park and rides" or mobility-hubs and work with the City to install secure bike parking.*

   By working with Planning and Sustainability Services, Transit could identify prime locations of high passenger activity to prioritize bike rack installation. The City already has a bike parking program aimed at installing colourful and unique lockers and racks, such as the ones below at the Canada Games Centre. By providing racks, transit may become an option for cyclists who do not want to bike in the inclement weather or uphill.

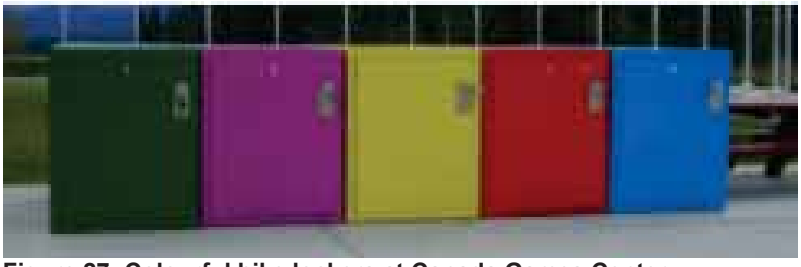


Figure 27: Colourful bike lockers at Canada Games Center
Source: City of Whitehorse

   Furthermore, canopy- or shelter-style bike racks could also be piloted, such as the example below from outside a GO Transit station in the Greater Toronto and Hamilton Area.

Figure 28: Sheltered bike rack (Hamilton, ON)

2. *Improve the flexibility to bike and ride transit by:*

   a) Adopting policies elsewhere in the Master Plan that facilitates transit use, such as electronic fare media.

   b) Fat tire bike racks. During stakeholder engagement activities, Stantec heard from many customers that they would like to see Whitehorse Transit buses outfitted with Fat Tire Bike Trays. One respondent in particular noted that "Bike racks don't fit fat tires". Fat tires are often used by cycling enthusiasts in the winter for improved traction. They are typically 4 to 5 inches in thickness versus standard tires half the size. Standard bus bike racks historically used in transit have only accommodated standard width tires; however, that is

changing to accommodate growing market needs. Sportworks, one of the leaders for bike racks for transit, will be releasing a Fat Tire Bike Tray for transit in the immediate future. These Fat Tire trays will be available as an option with new racks or as a retrofit to existing one. Reportedly, agencies will be able to "mix and match" standard size trays with fat tire trays to meet the needs of all customers. Given that Whitehorse has an active winter cycling population, Stantec recommends that Whitehorse Transit investigate the feasibility of having Fat Tire trays installed on its buses. Whitehorse Transit may wish to pilot these racks on a couple of its busiest routes and gather customer feedback to make an informed decision.

Figure 29: Sample Fat Tire Bike Tray for transit[4]

3. *Improve safety and bike awareness by participating in "share the road" educational campaigns.*

   These campaigns can be organized with advocacy groups, police, and City staff to inform drivers (and bus operators) of safe driving around cyclists and pedestrians. Whitehorse Transit can also bring a bus to an event to demonstrate the use of bike racks on buses, to encourage the use of transit by cyclists.

4. *Improve signage and wayfinding between bus stops/routes and multiuse trails.*

   Some respondents noted that signage could be improved for bike infrastructure, and clearly demarcating bike lanes and transit stops could help reduce conflict between buses and cyclists. Whitehorse Transit may also wish to advertise or promote routes that reach recreational destinations and that bicycles ride for free on buses. This strategy may help encourage transit use when using bicycles for recreational purposes.

5. *Participate in the ongoing Bicycle Network Plan processes to understand how transit can work better for cyclists.*

   As Whitehorse is currently preparing a Bicycle Network Plan, this plan should include strategies to include transit, as well as ensure that new bike paths are designed and built in a way to minimize conflicts with bus routes and operations. Indeed, one respondent commented on how buses typically stop in the bike lane on Lewes Blvd. By participating in the planning process, as well as by collaborating with bike advocacy groups (such as the Urban Cycling Coalition), Whitehorse Transit could benefit from a positive image from cyclists, and could learn from one another on how and where to reduce conflicts between buses and cyclists.

[4] . Image credit: Sportworks (https://www.sportworks.com/fat-tire-bike-trays-for-apex-2-apex-3)

4.0 FUTURE VISION

4.1 BACKGROUND AND GUIDING PRINCIPLES

Transit is a critical element of the City of Whitehorse's transportation resources; deployed to realize the vision of supporting economic growth while maintaining a high quality of life. Whitehorse wishes to use its transit services to help make its anticipated growth more rational and sustainable. As rapid growth is anticipated in the coming years, particularly in Whistle Bend where there is significant planned development, it is important to review the current network for appropriateness in serving the needs of Whitehorse residents and visitors today and into the future.

In developing a vision, goals, and objectives for Whitehorse Transit's future network, our team reviewed background information such as Whitehorse's land use and demographics, as well as the performance, strengths, and limitations of each Whitehorse Transit route individually and as a holistic network. The objectives of the Transit Master Plan were also considered, along with the objectives and outcomes of previous plans and reports commissioned by the City. To summarize the Transit Master Plan's objective in one sentence, it is to provide a roadmap for Whitehorse Transit to ensure that service delivery is of maximum effectiveness and efficiency. Transit service effectiveness is defined to be service that meets the transportation needs of the public, promotes community objectives, and serves destinations that promote economic activity and contribute to quality of life. Transit service efficiency refers to the balancing act of maximizing service quality while minimizing the cost to the rider and to the non-riding public that supports Whitehorse Transit with tax dollars.

A set of guiding principles were developed to act as a compass for evaluating the current network. These guiding principles are all related to the underlying objective of delivering effective and efficient transit service. They are summarized as follows:

1. **Strengthen what is working and eliminate what is not working**. This includes increasing frequency along heavily used corridors and to/from major destinations. It also includes removing routes or segments that are unproductive, or provide redundant, or overlapping coverage to the same locations as another route. Where fixed-route service coverage is removed entirely from certain areas, other service coverage options are to be explored such as comingled "home to hub" or microtransit.

2. **Improve route directness where possible**. In reviewing feedback from our stakeholder engagement activities, lack of route directness was identified as one of the main deficiencies of Whitehorse Transit's current routing structure. Currently, all routes go into downtown Whitehorse regardless if that is the final destination for its customers. As a legacy system that has "pulsed" from the downtown core, people are artificially forced to make all transfers there regardless of their final destination. In concurring travel route directness, it is also important to consider the role transfers play, opportunities to minimize them and the tradeoff between travel and route directness. Naturally, customers prefer "one-seat rides" but many bodies of research and transit agencies across North America have proven that customers will accept transfers if it leads to faster travel time and more direct routing. One strategy for improving route directness is to explore the opportunity for additional transfer points that are more centrally located, including Yukon College and the Canada Games Centre, rather than forcing riders into the Downtown if their trip requires a transfer.

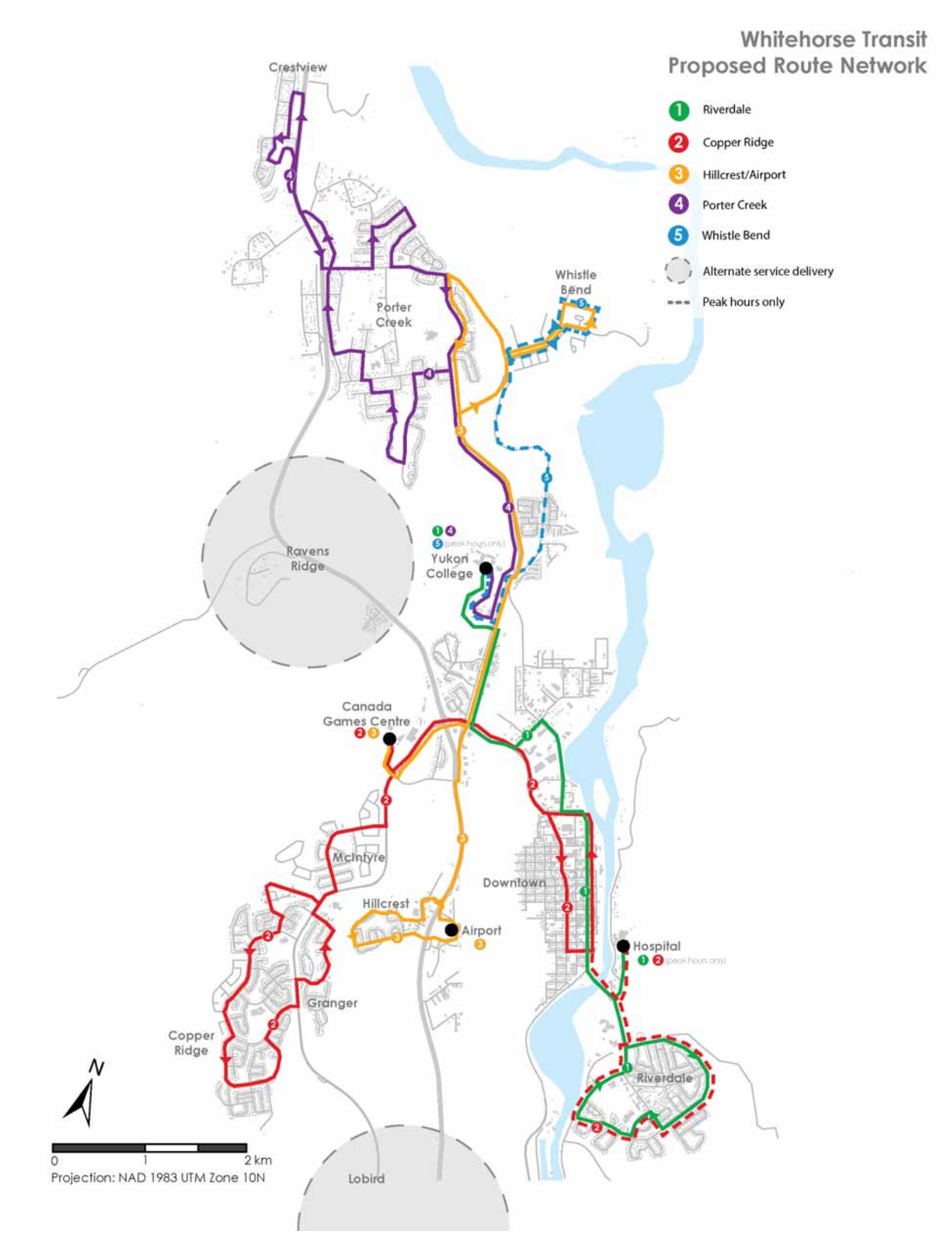
3. **Improve the reliability of transit service**. That is, improvements to the route network should formally account and budget for sufficient recovery time to improve on-time performance. At present, Whitehorse Transit does not have any recovery time formally built into its schedules. This is problematic since congestion continues to grow in the region. Additionally, as the agency accommodates more customers with mobility devices and bicycles, extra time must be built into the schedule to accommodate boarding, securement and alighting. This is particularly critical for smaller systems that operate at lower frequencies, and for systems where users rely on timed transfers. A more manageable schedule can also create a reduced-stress work environment for the operators, leading to improved operator morale. Accordingly, the proposed network reflects formally scheduled recovery time (10% recovery time was built into the schedules) as well as shorter distances and cycle times, while operating at similar-or-better frequencies compared to present. The result is a more reliable system which admittedly may require additional transferring, but which will ultimately transport passengers from their origins to their destinations more quickly.

Keeping these guiding principles in mind and based what we heard for stakeholder engagement activities, the need to improve Whitehorse Transit's frequency, routing and reliability are heavily factored into our recommendations. However; we are also cognizant that these desires must be balanced against resource and fiscal realities. The proposed future network for Whitehorse Transit appreciates the need to maintain costs and fleet size, and is actionable by management without a prerequisite increase in operating dollars. In other words, it is a 'zero sum solution'.

4.2 PROPOSED NETWORK CHANGES

Stantec developed an initial set of proposed changes to the alignments and frequencies of fixed routes. These proposed changes were reviewed with Whitehorse Transit and refinements were made leading to the recommended future transit network. In addition to changing the route alignments, route frequencies, and introducing a home-to-hub service, a simplification of the route naming convention is also proposed. Short route names are easy for people to relate to, assist persons with disabilities to more easily navigate the system and fosters word-of-mouth marketing for Whitehorse Transit.

This proposed network is shown in figure 30 and is described in detail below.


Whitehorse Transit
Proposed Route Network
1 Riverdale
2 Copper Ridge
3 Hillcrest/Airport
4 Porter Creek
5 Whistle Bend
Alternate service delivery
Peak hours only
Crestview
Porter Creek
Whistle Bend
Ravens Ridge
Yukon College
Canada Games Centre
McIntyre
Hillcrest
Airport
Downtown
Hospital
Granger
Copper Ridge
Riverdale
Lobird
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2 km
Projection: NAD 1983 UTM Zone 10N

Figure 30: Whitehorse Transit Proposed Route Network

Route 1: "Riverdale"

Riverdale – Downtown – Takhini South – Yukon College

This route provides coverage throughout Riverdale, to Whitehorse General Hospital, through Downtown, Marwell, Takhini South, and terminating at Yukon College. When Route 5 is operating, Route 1 will interline with Route 5, providing a one-seat ride between Whistle Bend and Riverdale. Timed transfers also allow for quick travel times between Riverdale and Porter Creek. The intention is for this route to operate on 30 minute frequencies at peak and 60 minute frequencies off-peak. This route also provides coverage throughout north and south Riverdale. Although the alignment along Lewes Blvd. in between Nisutlin Dr. and Duke Rd. has been removed, this area will remain within an acceptable walking distance of 400m from the nearest bus stop. It is also recommended that the Transit Lane initiative in Riverdale along Lewes Blvd. be implemented in full. If buses continue to be delayed for up to 17 minutes coming out of Riverdale, this undermines the performance of not only the transit service to and from Riverdale, but the performance of the Whitehorse Transit network as a whole, given its increased reliance on timed transfers.

Route 2: "Copper Ridge"

Copper Ridge – Granger – McIntyre – Canada Games Centre – Downtown – (Riverdale)

This route provides coverage throughout Copper Ridge, Granger, McIntyre, and into Downtown connecting at the Canada Games Centre enroute. The intention is that this route operates on 30 minute frequencies during peak and 60 minute frequencies off-peak. During peak hours, the alignment also extends to Whitehorse General Hospital and Riverdale, providing an effective frequency of 15 minutes (combined with Route 1) into Riverdale when school lets out. Off-peak, Route 2 short-turns Downtown, and this short-turn variation is henceforth described in this report as Route 2S. Canada Games Centre acts as a timed transfer point with Route 3, allowing for residents in Copper Ridge, Granger, and McIntyre to access Porter Creek and Whistle Bend. It is noted also that Copper Ridge and Granger residents would now need to pass through McIntyre to get elsewhere in the city. This gives the opportunity for the social issues in McIntyre to be addressed through campaigns related to inclusion, respect, and appropriate behaviour on board a public transit vehicle. Ideally these campaigns will be delivered in collaboration with local non-profit organizations that are doing work related to social equity.

Route 3: "Hillcrest/Airport"

Hillcrest – Canada Games Centre – Takhini South – Porter Creek – Whistle Bend

This route provides coverage from Hillcrest to the airport, Takhini South, Porter Creek, and finally Whistle Bend. It also stops at the Canada Games Centre, which is a timed transfer point with Route 2. The intention is for this route to operate at 60 minute frequencies during both peak and off-peak hours. Although this route runs infrequently, it provides fixed route coverage in Hillcrest, which is an area that would otherwise be unserved. It also provides a means for students in Whistle Bend, Granger, and Copper Ridge to access the Porter Creek Secondary School. Route 3 does not stop at Yukon College as this would make the alignment too long and hinder on-time performance, however it is noted that college students may alight by the intersection of Mountain View Dr. and Range Rd. and walk to campus from there. The distance between campus and the nearest bus stop is walkable, at less than 400m.

Route 4: "Porter Creek"

Crestview – Porter Creek – Yukon College

This route provides coverage throughout Porter Creek and Crestview. It terminates at Yukon College, where timed transfers allow Porter Creek and Crestview residents to quickly access Downtown, Riverdale, and Whitehorse General Hospital. Although Porter Creek and Crestview are now only served by one route, the intention is that this route will operate continuously on 30 minute frequencies at peak and 60 minute frequencies off-peak. This route also provides a high level of coverage and as such, despite the elimination of routes, residents living off the main street, for example along Grove St. or Sycamore St. will observe an increase in service. Furthermore, transit service in Porter Creek and Crestview will become less confusing and generally more desirable, with more predictable service that operates on clock-face headways and with improved on-time performance.

Route 5: "Whistle Bend"

Whistle Bend – Takhini North – Yukon College

This route provides service between Whistle Bend, Takhini North, and Yukon College on 30 minute frequencies only during peak hours. The purpose of this route is to bolster service in Whistle Bend in anticipation of developments and population growth in the area, and also to provide coverage in Takhini North. This route interlines with Route 1 at Yukon College, providing a one seat ride between Whistle Bend, Downtown, and Riverdale. It is recommended that as Whistle Bend continues to grow (and as Whitehorse Transit's budget permits) that future service expansions focus on providing all-day service on Route 5 to ensure that Whitehorse Transit continues to adequately fulfill the travel needs of Whistle Bend residents into the future. In the meanwhile, during off-peak hours, Whistle Bend residents would need to rely on Route 3, which despite limited service, is still an improvement over current service levels in Whistle Bend. Moreover, the sooner all-day service can be implemented, the less likely Takhini North riders will become disenfranchised as a result of comparatively low service.

Introduction of home-to-hub service for Lobird and Raven's Ridge

The proposed network eliminates fixed-route service in Lobird and Raven's Ridge. This decision is warranted due to extremely low ridership in these neighbourhoods, however, Stantec believes it is important to provide an alternate service coverage solution to these residents such as not to leave them stranded from transit service. In these areas, a new home-to-hub service is proposed, where passengers are picked up from their homes in Lobird and Raven's Ridge "on-demand" using the specialized transit fleet, and are dropped off at the nearest hub where they can make connections with multiple fixed routes. For Raven's Ridge the nearest hub is the Canada Games Centre, and for Lobird the nearest hub is downtown, at the intersection of 2nd Avenue and Hawkins St. (although if a hub is constructed by 2nd Avenue and Steele St. as proposed, it would be worth considering driving this extra distance).

Figure 31 demonstrates the recommended home-to-hub service areas, and proposed transit hubs for each.

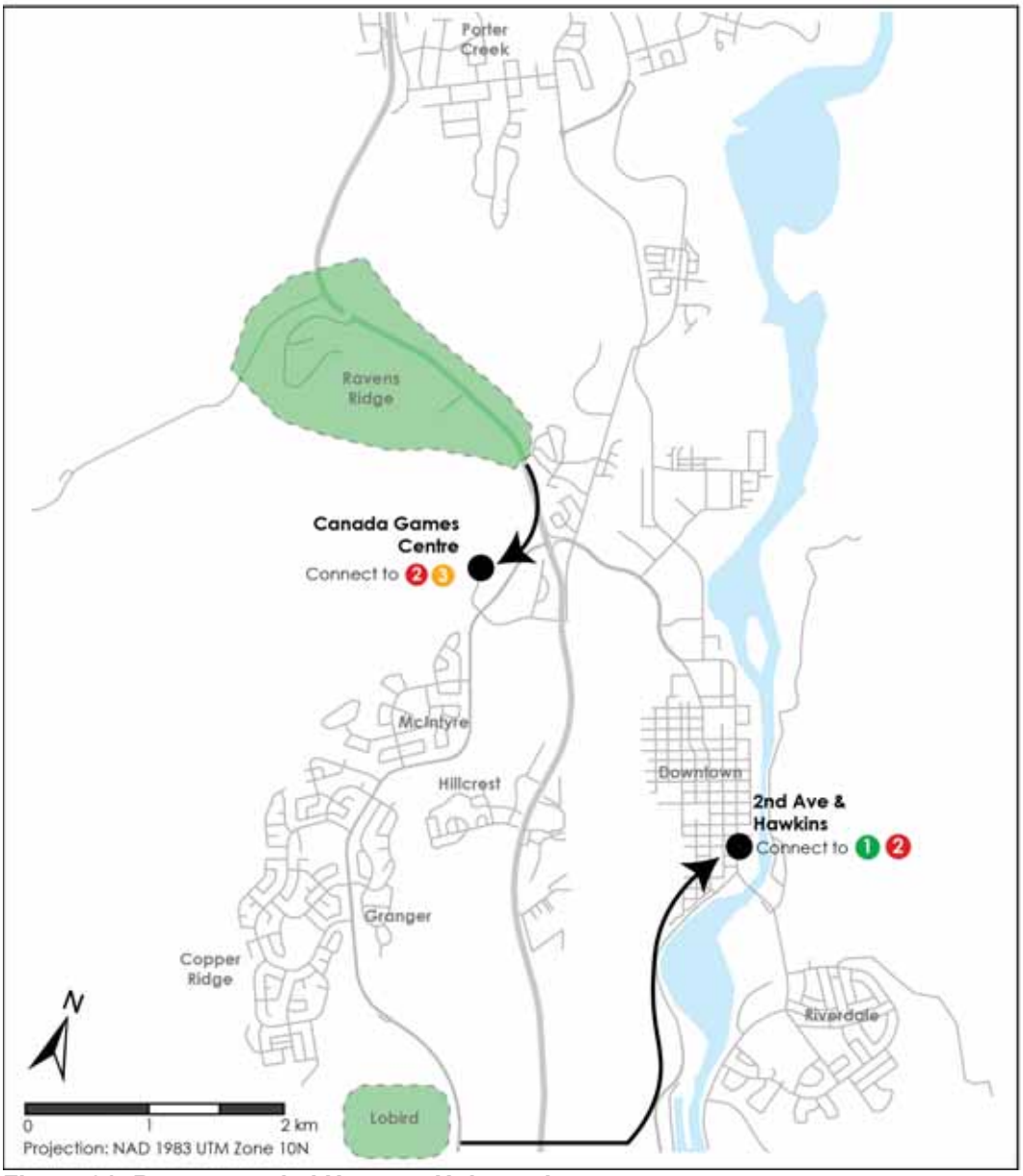

Figure 31: Recommended Home to Hub service map

To ensure that the home-to-hub service remains a more cost-effective alternative compared to fixed route service operation, it is recommended that Whitehorse Transit offer the home-to-hub service on a subscription basis and only at peak travel times of the day. Doing so affords Whitehorse Transit the opportunity to group trips as best as possible while also helping to dispel the notion that this service is a replacement to the taxi industry. As the popularity of the home-to-hub service grows, there may come a tipping point where it becomes necessary to increase fares to be commensurate with the premium service that is offered, however with the existing levels of demand, it is recommended to maintain fare parity with fixed route service. Eventually, if demand continues to grow, it may become necessary to revisit the possibility of fixed route service, however, if the population of Lobird and Raven's Ridge remains stagnant this is not anticipated to be necessary.

4.3 PROPOSED SCHEDULING

Stantec recommends that Whitehorse Transit continue to operate a service span consistent with that which is presently offered. There were not a significant number of comments in the Whitehorse Transit Survey indicating the desire for expanded service hours; at the same time, shrinking the service hours has the potential to disenfranchise existing riders and would not be perceived favourably by the general ridership. As such, the proposed schedule assumes a weekday service span from 6:30am to 9:00pm, with the last run of the day departing at 8:00pm. Service that is scheduled to start on the hour and on the half-hour, is easy for riders to understand, whereas service that is offset in its timing, even by a round number such as ten or twenty minutes, can undermine the value of operating at clock-face headways. On Saturdays, service span is slightly reduced, beginning at 8:00am and finishing at 8:00pm.

The service plan assumes AM peak hours run from 6:30am to 10:00am, and PM peak hours run from 3:00pm to 7:00pm. During weekdays, these hours are scheduled with more frequent service, allowing Whitehorse Transit to provide adequate service for the riders that are commuting to and from their jobs, and to and from school. During the off-peak hours of 10:00am to 3:00pm, and 7:00pm to 9:00pm, the demand for service is lower and bus frequencies are reduced accordingly. Frequencies by time of day broken down by route are summarized below in Table 9, and the vehicle requirements are summarized in Table 10.

On Saturdays, the schedule proposes consistent operating frequencies throughout the day, from 8:00am to 8:00pm. Although it was evident in the Whitehorse Transit Survey and during stakeholder engagement that Sunday service is desired, it is cost prohibitive for Whitehorse Transit to operate fixed-route Sunday service at present. Additionally, the introduction of fixed-route Sunday service would necessitate the reopening of the Collective Agreement with frontline operators as the current agreement does not include provision of Sunday service.

Instead of fixed route Sunday service, it is recommended that Whitehorse Transit pilot a ‘first-come, first-served’ on-demand Sunday service leveraging the specialized transit fleet. The intention is for Sunday service to be funded through the specialized transit budget. Given the reduction in expenses permitted by converting specialized transit service delivery to a pure taxi scrip program, budget is freed up to be reallocated into the Sunday service pilot. The operating parameters of the Sunday service pilot should be tailored to the budget that is available.

Table 9: Proposed Route Frequencies

		Frequencies (minutes)			
		Weekday		Weekend	
#	Route	Peak	Off-Peak	Saturday	Sunday
1	Riverdale	30	60	30	-
2	Copper Ridge (to Riverdale)	30	-	-	-
2S	Copper Ridge (to Downtown)	-	60	60	-
3	Hillcrest/Airport	60	60	60	-
4	Porter Creek	30	60	60	-
5	Whistle Bend	30	-	30	-

Table 10: Vehicle Requirements

		Vehicle Requirements			
		Weekday		Weekend	
#	Route	Peak	Off-Peak	Saturday	Sunday
1	Riverdale	2	1	2	-
2	Copper Ridge (to Riverdale)	3	-	-	-
2S	Copper Ridge (to Downtown)	-	1	1	-
3	Hillcrest/Airport	1	1	1	-
4	Porter Creek	2	1	1	-
5	Whistle Bend	1	-	1	-
	TOTAL:	9	4	6	-

Preparing a detailed schedule with timepoints, as well as blocking and run cutting, are outside of the scope of the Transit Master Plan. To better illustrate the proposed service plan, however, sample schedules with a single timepoint are illustrated below in Figure 32 and Figure 33. It is intended that Routes 1, 4, and 5 begin and end at Yukon College, while Routes 2 and 3 begin and end at Canada Games Centre. Both locations contain warm, sheltered areas where riders can wait for their transfers, and facilities for operators going on break.

Riverdale	Copper Ridge	Hillcrest/Airport	Porter Creek	Whistle Bend
Departing YC at:	Departing CGC at:	Departing CGC at:	Departing YC at:	Departing YC at:
6:30	6:30		6:30	6:30
7:00	7:00	7:00	7:00	7:00
7:30	7:30		7:30	7:30
8:00	8:00	8:00	8:00	8:00
8:30	8:30		8:30	8:30
9:00	9:00	9:00	9:00	9:00
9:30	9:30		9:30	9:30
10:00	10:00 S	10:00	10:00	
11:00	11:00 S	11:00	11:00	
12:00	12:00 S	12:00	12:00	
1:00	1:00 S	1:00	1:00	
2:00	2:00 S	2:00	2:00	
3:00	3:00	3:00	3:00	3:00
3:30	3:30		3:30	3:30
4:00	4:00	4:00	4:00	4:00
4:30	4:30		4:30	4:30
5:00	5:00	5:00	5:00	5:00
5:30	5:30		5:30	5:30
6:00	6:00	6:00	6:00	6:00
6:30	6:30		6:30	6:30
7:00	7:00 S	7:00	7:00	
8:00	8:00 S	8:00	8:00	

Figure 32: Sample weekday schedule of departures

Riverdale	Copper Ridge	Hillcrest/Airport	Porter Creek	Whistle Bend
Departing YC at:	Departing CGC at:	Departing CGC at:	Departing YC at:	Departing YC at:
8:00	8:00 S	8:00	8:00	8:00
8:30				8:30
9:00	9:00 S	9:00	9:00	9:00
9:30				9:30
10:00	10:00 S	10:00	10:00	10:00
10:30				10:30
11:00	11:00 S	11:00	11:00	11:00
11:30				11:30
12:00	12:00 S	12:00	12:00	12:00
12:30				12:30
1:00	1:00 S	1:00	1:00	1:00
1:30				1:30
2:00	2:00 S	2:00	2:00	2:00
2:30				2:30
3:00	3:00 S	3:00	3:00	3:00
3:30				3:30
4:00	4:00 S	4:00	4:00	4:00
4:30				4:30
5:00	5:00 S	5:00	5:00	5:00
5:30				5:30
6:00	6:00 S	6:00	6:00	6:00
6:30				6:30
7:00	7:00 S	7:00	7:00	7:00

Figure 33: Sample Saturday schedule of departures
Note: “S” indicates Route 2S operates in lieu of Route 2, with a scheduled short turn Downtown

4.4 THE COPPER RIDGE / HILLCREST TRADEOFF

Canada Games Centre is located mid-alignment on both Routes 2 and 3 rather than at a terminus. At the same time, Route 2 operates with only one vehicle assigned to it during off-peak hours and on Saturdays, and Route 3 operates with only one vehicle during all hours. This presents a tradeoff in that the transfer at Canada Games Centre only works in one direction. That is, a rider transferring from Route 2 to Route 3 will not have the choice of going northbound to Whistle Bend or southbound to Hillcrest; likewise, a rider transferring from Route 3 to Route 2 will not have the choice of going westbound to Copper Ridge or eastbound to Downtown. It is recommended that Route 2 depart westbound towards Copper Ridge as Route 3 departs southbound towards Hillcrest, as this will facilitate the ability for Copper Ridge residents to access Porter Creek and Whistle Bend as well as the ability for Hillcrest residents to access downtown. It is noted, however, that the westbound Route 2 alignment is longer than the southbound Route 3 alignment by approximately 5 minutes, so extra care will be needed to ensure that transfers are timed appropriately on the return trip.

4.5 ADDITIONAL TRANSFER LOCATIONS

Before finalizing the schedule, it must be appreciated that one might wish to transfer outside of Yukon College and Canada Games Centre. It is recommended that Whitehorse Transit take these additional locations into consideration when formalizing the schedule, as it may be warranted to offset the timed transfers at Canada Games Centre from the timed transfers at Yukon College to more easily facilitate transferring between the Yukon College routes (1, 4, and 5) and the Canada Games Centre routes (2 and 3). Such transfers include the following:

- **Between Route 3 (Hillcrest/Airport) and Route 4 (Porter Creek)**. Depending on how many users wish to travel between the southwest neighbourhoods (Copper Ridge, Granger, Hillcrest, etc.) and the northwest neighbourhoods (Porter Creek and Crestview), a timed transfer near the intersection of Mountain View Dr. and Whistle Bend Way may be appropriate.
- **Between Route 1 (Riverdale) and Route 3 (Hillcrest/Airport).** Depending on how many users wish to travel between Riverdale and Hillcrest, a timed transfer near the intersection of Range Rd. and Two Mile Hill Rd. may be appropriate.
- **Between Route 1 (Riverdale) and Route 2 (Copper Ridge).** If deemed necessary, a timed transfer downtown along 2nd Ave. would be most appropriate as it is what riders are currently used to. Ideally, the transfers would be timed at approximately the intersection of 2nd Ave. and Hawkins St. as this is the proposed "hub" location for home-to-hub services operating in Lobird.

Another consideration that impacts the schedule but is unrelated to transferring is the timing of service into Riverdale that is desired during peak hours. If true 15 minute headways are desired, this will impact the timing of Route 2's departure from Canada Games Centre relative to the timing of Route 1's departure from Yukon College. Otherwise service into Riverdale might involve, for example, two buses arriving at the same time every 30 minutes, or buses arriving with alternating 20 minute and 10 minute frequencies. Addressing the timing of these buses in the schedule, however, may impact the ability for Whitehorse Transit to operate service that is also supportive of the possible timed transfer locations listed above. Each possible permutation of the schedule is not without its tradeoffs.

4.6 COSTING

To validate that the proposed network, frequencies, and sample schedule is indeed a 'zero sum solution', the implied change in revenue-hours associated with the proposed network was estimated and the inclusion of formally schedule recovery time, which was used in turn to estimate the implied change in operations and maintenance (O&M) costs. To assist in this exercise, the consultant team relied on Whitehorse Transit's statistics as shown in the 2016 Canadian Transit Fact Books published by the Canadian Urban Transit Association (CUTA). The inherent assumption is that the following statistics did not vary greatly in 2017 compared to 2016, and therefore the statistics shown in Table 11 were a suitable proxy for current performance of the conventional transit service.

Table 11: Whitehorse Transit's current performance, as per the 2016 CUTA Fact Books

Conventional Transit		Specialized Transit	
Value	Unit	Value	Unit
31,884	revenue vehicle hours	800	revenue vehicle hours
38,534	total vehicle hours	2,500	total vehicle hours
50,912	operator paid hours	-	-
$3,329,528	total operating expenses	$346,637	total operating expenses
$1,033,539	passenger revenues	$8,542	passenger revenues
$1,101,898	total revenues	$8,542	total revenues
$86.40	cost per vehicle hour	$138.65	cost per vehicle hour

By adding up the number of cycles per route over the course of one year permitted by the proposed schedule, and multiplying by the scheduled cycle time per route, it is calculated that the proposed service plan requires a minimum of 27,891 revenue-hours. Adding 10% to this estimate to be conservative and to allow for supplemental service to be provided during special events or emergencies, inflates this estimate to 30,680 proposed revenue-hours. This is a reduction of 1,204 revenue-hours compared to present, which at $86.40 per vehicle-hour, results in estimated annual cost savings of $104,017. In this estimation, it is conservatively assumed that the number of deadhead hours is unchanged in the proposed service plan compared to the current service plan.

These cost savings, however, only pertain to Whitehorse Transit's fixed route service and neglect to consider the introduction of home-to-hub service in Lobird and Raven's Ridge. The costing of the home-to-hub service follows a similar method as described above. Approximately 750 revenue-hours is estimated to be the annual level of service for home-to-hub, which is an estimate that considers the population of Lobird and Raven's Ridge, the distances between "home" and "hub", the average operating speed, and industry average transit ridership for new service in low populated areas. It also includes a contingency of 10% to account for the uncertainty involved in this type of forecasting exercise.

This revenue-hours estimate can be validated by considering that 750 revenue-hours represents a little over 2% of the combined fixed route and home-to-hub transit service; and similarly, the population of Lobird and Raven's Ridge relative to the total service area population is also slightly in excess of 2%. Multiplying 750 revenue-hours by $138.65 per vehicle-hour (assuming that the cost per hour of specialized transit is a better proxy for home-to-hub service) results in annual incremental costs of $103,971, which almost perfectly offsets the cost savings of fixed route service. In essence, the recommended service plan discussed above is truly a 'zero sum solution'.

4.7 REVENUE ESTIMATION

As indicated earlier in this report, the underlying purpose of proposing a new route network and service plan is to provide a solution for delivering transit service to the community more effectively and efficiently. Correspondingly, a boost in ridership as a result of implementing the proposed service changes can be expected.

In looking at Whitehorse Transit's existing routes, the most productive route is Route 1, at 50.8 passengers per revenue-hour, and the least productive route is Route 6, at 10.6 passengers per revenue-hour. Conservatively, we can use existing route-by-route productivity as a proxy for the route productivity of the proposed transit network, on the premise that the proposed network includes more productive service and less unproductive service. For example, Route 1 of the proposed network is most similar to Route 1 of the current network, therefore it can be

reasoned that Route 1 of the proposed network will be similarly productive at approximately 50.8 passengers per revenue-hour. Applying this logic to the rest of the system, and taking the home-to-hub service into consideration, suggests that a systemwide ridership growth of approximately 5% and annual revenue growth of approximately $50,000 is a reasonable conservative expectation.

It is noted that this is a high-level estimate which is conservative in that it doesn't account for the ridership impacts from other recommendations in the Transit Master Plan such as infrastructure improvements and improved marketing and communications. As such, the $50,000 revenue estimation is provided for illustrative purposes, suggesting that it is not too early for Whitehorse Transit to consider opportunities to re-invest the revenue into making further improvements to the service. If Whitehorse Transit is able to generate an additional $50,000 in revenue per year, this is equivalent to almost 600 revenue-hours of service per year, which in turn is approximately equivalent to the operation of one route once per week at 60 minute headways.

4.8 PHASING

Whitehorse Transit should strive for continuous improvement of transit services throughout the City, and as such the 'zero sum solution' described above should be regarded as the first step to improving transit – not the only step. The 'zero sum solution' will be henceforth be referred to as 'Phase I'.

It is recommended that Phase II of the implementation focus on operating Route 5 (Whistle Bend) all day, and simultaneously improving the frequencies along Route 1 (Riverdale) from 60 minute frequencies off-peak to 30 minute frequencies, allowing for continuous interlining of Routes 1 and 5. This improvement corresponds to an additional 3,315 revenue-hours of service, or approximately $200,000 in incremental net operating costs assuming conservatively a 30% farebox recovery ratio. No incremental capital costs for fleet expansion are required, as this improvement pertains only to off-peak operations. Phase II may be funded in part through the additional revenues permitted by the implementation of Phase I. Taking this into consideration, the additional net funding requirement associated with Phase II implementation is likely on the order of $100,000 to $150,000 per year.

Improving service on Route 5 should be the first priority to ensure Whitehorse Transit is able to meet the needs of the growing Whistle Bend community, as well as those of Takhini North, and to instill confidence in the riders regarding the reliability of Route 5. In the transit industry, routes that operate only during peak hours of the day tend to have limited success, as is evident in Whitehorse Transit's current Route 6, which is the least productive of the six routes at 10.6 passengers per revenue-hour.

After Phase II has been implemented, it is recommended that Whitehorse Transit re-evaluate the performance of the network and identify the most pressing needs for further service expansion. Options to be considered further down the road might include those described in Table 12 below.

Table 12: Options for further service improvements related to the proposed network

Route	Time Period	Service Improvement	Additional Rev-Hr	Additional Net Operating Costs @ 30% R/C	Fleet Expansion Requirements (# of vehicles)
1 – Riverdale	Weekday peak	Improve frequencies from 30 min to 15 min	3,315	~ $200,000	2
3 - Hillcrest/Airport	Weekday peak	Improve frequencies from 60 min to 30 min	2,040	~ $125,000	1
All Routes	Sunday	Implement service using the same schedule as Saturday	3,666	~ $225,000 [1]	-

[1] *This increase in costs will be partially offset by the cost reduction associated with eliminating on-demand Sunday service*

As an alternative to the simple service increase to Route 3 illustrated above in Table 12, it would be worth considering the expansion of the Route 3 alignment to include Yukon College, thereby further developing Yukon College as an important transfer hub. With this addition, however, it will no longer be possible to operate the route with a 60-minute cycle time (including layover). Rather, an opportunity is presented to increase the cycle time to 90 minutes while exploring additional alignment expansions, for example a loop through Rhine Way and Normandy Rd., as possible strategies to attract new riders while limiting the layover time. Then, by adding a second and third vehicle to the route, this alternative Route 3 concept could also be operated on 30-minute frequencies.

In addition, it might be appropriate to explore fifteen-minute frequencies during peak hours in Porter Creek and Copper Ridge in the future. At this time, because Route 1 will also be on fifteen-minute frequencies, it may become appropriate to cease operation of the full alignment of Route 2, and operate the short turn variant, Route 2S, during peak hours instead.

5.0 IMPLEMENTATION PLAN

5.1 OVERVIEW

After reviewing Whitehorse Transit's existing service levels, finances, infrastructure and available resources in detail, Stantec presents its recommended implementation strategy for the Transit Master Plan (TMP). This implementation plan advances the recommendations made throughout the TMP with a suggested timeline to guide implementation in the coming years. Recommendations have been split into the short and long term, indicating the time at which it is believed Whitehorse Transit should, and is likely capable of moving forward with each.

Short term recommendations can conceivably be implemented within the next 2 years, and will make strides towards improving customer experience and the efficiency of Whitehorse Transit with minimal time commitment. Longer term recommendations may require greater financial investment and pre-planning prior to implementation.

5.2 SHORT TERM RECOMMENDATIONS (0-2 YEARS)

Recommendation: Improve existing route alignment and scheduling to better match demand

- **Alter existing route network and schedules to reflect Phase I of the recommended route network.** Phase I of the proposed route network focuses fixed-route service in areas where there is demonstrated demand for it, offering home-to-hub service in low-demand areas such as Ravens Ridge and Lobird. The proposed schedule and route network is actionable given the resources available to Whitehorse Transit, and offers a zero-sum solution which can be implemented quickly. Sufficient marketing to inform riders of the new network and schedule must be undertaken in advance of physical changes.

Recommendation: Install on-board technology to improve scheduling and fare payment.

- **Install CAD/AVL and MDT technology to enable real-time schedule updates.** Recent CAD/AVL technology updates have brought the cost of real-time scheduling updates down significantly. Stantec believes this is a feasible option for Whitehorse Transit, and will provide customers with reliable, real-time schedules – increasing trust in the agency, and decreasing wait-time at the stop.

- **Consider the installation of a mobile fare payment solution.** Stantec recommends the installation of a mobile fare payment solution such as eiGPS/PIN Payment Solutions or another solution equipped with near-field payment capabilities. These types of solutions can be set up in a short period of time without disturbing legacy systems that may currently be in place such as Diamond fareboxes which can still accommodate cash-paying customers with the eventual intent of phasing cash payments out. This system increases the convenience and flexibility of fare payment for all customers, and streamlines farebox revenue calculations at the agency level.

Recommendation: Procure and maintain vehicles tailored to the needs of the route network.

- **Update procurement specifications to require stronger provisions for future purchases.** To minimize costly mid-life refurbishment costs, it is recommended that tenders for future procurement include technical specifications including a steel-framed vehicle, maintaining a competitive bidding process and improving the quality of the future fleet.

- **Perform a light restoration of two 2008 vehicles, and as-needed restoration to two 2006 vehicles.** In response to difficulties in maintaining the existing 2010 Nova buses, focusing on extending the life of 2008 and some 2006 vehicles beyond the 2010 vehicles may be a more productive choice.

Recommendation: Improve the overall efficiency of the Handy Bus program

- **Consider taxi-scrip programs or user-side subsidies to improve efficiency.** To decrease costs per trip, transferring ridership to taxi-scrip programs, or offering fixed monthly subsidies for use on specialized or accessible conventional transit are recommended. This is particularly critical in light of emerging funding challenges and implementation of the preferred solution is recommended before April 2019. It is important that Whitehorse Transit consider enforcing per-user quotas to prevent these initiatives from becoming a cost driver to the agency.

- **Continue enforcing policies and promoting travel training and use of conventional transit.** As cost-per-trip is highest for the Handy Bus service, continuing the existing travel training program to encourage the use of accessible, conventional transit will increase operating efficiency. Travel training is also encouraged for the Home-to-Hub program, recommended in low-demand neighborhoods such as Lobird and Ravens Ridge.

- **Reduce the wait time policy from 10 minutes to 5 minutes.** The current 10-minute wait time policy does not align with industry best practice, and can inconvenience passengers already on-board and limit on-time performance, throwing off the scheduling of upcoming pick-ups. It is recommended that this policy be adjusted to reflect a 5-minute wait time on all Handy Bus, or Home-to-Hub pickups.

- **Rebrand Handy Bus to be an extension of the master agency brand, Whitehorse Transit.** Whitehorse will be able to more effectively manage a single brand, and for fewer costs, compared to current conditions where two brands require management and stewardship.

- **Investigate and address the root cause(s) of the increase in no shows.**

Recommendation: Improve the interplay between public transit and active transportation in Whitehorse, encouraging multi-modal trips.

- **Improve bicycle safety and awareness by participating in “share the road” educational campaigns.** These campaigns can be organized with advocacy groups, police, and City staff to inform drivers (and bus operators) of safe driving around cyclists and pedestrians. Whitehorse Transit can also bring a bus to an event to demonstrate the use of bike racks on buses, to encourage the use of transit by cyclists.

- **Improve signage and wayfinding between bus stops/routes and multiuse trails.** At the stop level, clearly mark bicycle trails on the ground and with signage, reducing the conflict between buses and cyclists when the bus is stopped. Whitehorse Transit should also improve signage and advertising that bicycles are welcome on-board vehicles, and note any routes joining with cycling trails.

- **Participate in the ongoing Bicycle Network Plan processes to understand how transit can work better for cyclists.** As Whitehorse is currently preparing a Bicycle Network Plan, this plan should include strategies to include transit, as well as ensure that new bike paths are designed and built in a way to minimize conflicts with bus routes and operations. Whitehorse Transit should actively participate in the development of this plan, with a common goal of creating a network that encourages multi-modal trips, and gets people out of their cars.

Recommendation: Improve customer experience and branding at transit stops.

- **Identify the highest-demand stops in the network, and install seating and a bus shelter.** Using the new network as a guide and applicable service standards, bench seating and a shelter should be installed at key stops in the network including transfer points, and high demand stops in each residential neighborhood. As additional funding becomes **available, infrastructure can be added to lower-priority stops throughout the network consistent with service standards.**

- **Consider new shelter designs to provide weather protection.** Procure a shelter design made of durable material (metal, wood, plexiglass), ensuring that windscreens are present on both sides, protecting from the winter elements. Retrofit existing shelters to have adequate windscreens.

Recommendation: Plan for rebranding and marketing efforts

- **Retain marketing agency/consultancy with transit expertise**. This firm would assist Whitehorse Transit to develop a marketing plan, undertake a branding review and devise a future action plan.

- **Develop a marketing plan**. In consultation with a marketing agency, prepare a marketing plan outlining an actionable vision, marketing strategy, budget, and implementation plan.

5.3 LONG TERM RECOMMENDATIONS (3+ YEARS)

Recommendation: Analyze network success and increase service as resources become available.

- **Increase service on route 5 and consider additional service improvements.** Whitehorse Transit should evaluate the success of the recommended Phase I route network, and consider the implementation of Phases II and III. This includes service increase on route 5, and the procurement of additional vehicles to increase frequency on all other routes.

Recommendation: Install infrastructure to support multi-modal cycling and transit trips.

- **Identify bus stops with high passenger volumes, as well as bus stops or locations that could serve as "bike park and rides" or mobility-hubs and work with the City to install secure bike parking.** Secure parking facilities have been installed throughout Whitehorse, but with little connection to the bus network. Building bicycle lockers or providing a secure parking facility at major bus stops and transfer points will encourage multi-modal trips, and

- **Investigate the use of bike racks on buses with space for "fat tires".** The prevalence of off-season cycling and informal trails and pathways in Whitehorse encourages the use of fat-tire bicycles, often with a 4-inch wide tire. If bike racks on the front of buses were retrofitted to accommodate fat tires, all cyclists can make multi-modal trips using public transit, with no limitations.

Recommendation: Procure and maintain vehicles tailored to the needs of the route network.

- **Continue to procure new 40-foot diesel-propulsion vehicles as needed, retiring buses after 15 years, and plan for the purchase of two additional vehicles in alternate years.** This procurement strategy may require adjusting maintenance practices to reflect a 15-year life cycle on new vehicles. The procurement of two additional 40-foot buses in the coming years will allow for service expansion and all-day, more frequent service on the recommended route network.

- **Continue to procure new specialized transit vehicles as needed, retiring buses after 7 years.**

Recommendation: Continue adding infrastructure to bus stops, as funding becomes available.

- **Add shelters and seating to remaining stops as necessary while capital funding becomes available.** Once infrastructure is installed at major bus stops and transfer points, additional funding should be used to progressively install shelters and bench seating at remaining stops, by virtue of a triage system. The least frequented stops in the network are to be improved last, impacting the most passengers with minimal resources.

- **Investigate paid advertising, managed and maintained by a local third party contractor.** Utilize newly installed bus shelters for paid advertising, contracted to a local advertising firm for maintenance and installation. This revenue stream may supplement the cost of installing and maintaining infrastructure at bus stops, working towards a zero-sum solution for improving capital infrastructure.

Recommendation: Develop policies and procedures to improve performance.

- **Develop Key Performance Indicators**. The success of the network is best measured by consistent quantitative measures considering financial performance, customer satisfaction, service standards, and staffing. It is recommended that Whitehorse Transit pursue the development of regularly tracked KPIs, which will inform service changes made in the future.

- **Increase fares alongside service increases and routing updates.** As all-day frequent service becomes a reality across all routes, reasonable and incremental increases to fares may be required to offset increased O&M costs. Higher fares may also be necessitated by increased home-to-hub service hours, or vehicles. Increases to cash fares should be convenient for customers, rounding them off to the nearest $0.25, for example.

Recommendation: Implement marketing plan and associated recommendations

- **Develop new branding:** Continue working with a marketing agency/consultancy to develop new visual and written identity for the agency. Identify deployment schedule for brand activation to include printed materials, digital and fixed infrastructure (bus and bus stops).

- **Tactical marketing strategies:** In tandem with brand activation, initiate tactical program that initially raises awareness for the “new” Whitehorse Transit but incrementally changes the focus to travel mode conversion. Grass-root tactics are encouraged as they are typically low cost but have a high yield.

- **Create a new design for bus stop signage, clearly marking all bus stops and creating a unified brand.** Vibrant colours, pictograms, and stop/route identifiers should be added to the updated stop marker design, which is to be installed at all stops across the network, creating a unified brand.

- **Develop new website and app for transit:** Whitehorse Transit’s customers of the future will increasingly demand a better digital experience with rich user information. To support many of the recommendations contained within other sections of this report, particularly integrated mobility recommendations, a revamped digital experience will be required.

APPENDICES

Appendix A

A.1 PEER BEST PRACTICES – ACCESSIBLE BUS STOPS

A.1.1 Translink, Vancouver

While TransLink's fleet is accessible, characterized by low-floor buses with kneelers and auditory cues, access to buses is limited by inaccessible bus stops. In 2007, TransLink commissioned the development of Universally Accessible Bus Stop Design Guidelines, with the intent of implementing universally accessible stops in a future pilot project.

These guidelines propose a list of "essential" and "desired" characteristics which Whitehorse Transit may find useful in its improvement of existing stops and construction of new ones, recognizing that what is essential versus desired in Vancouver is likely to be different than what is essential versus desired in Whitehorse.

Essential	Desired
- Wheelchair pad or landing area, providing a loading/unloading zone - A stop post with tactile features for the visually impaired - 1.2m wide tactile surface indicator extending from the curb to the back of the sidewalk - Seating for two persons, with a back rest - Clear and accessible approaches from the adjacent sidewalk network	- Shelter with clear area inside to accommodate a wheelchair or scooter - Seating of various heights with backrests - Enhanced lighting

Having now implemented universally accessible bus stops, Figure 34 demonstrates the desired outcome for TransLink bus stops, which accommodate a wide range of abilities.

Accessible bus stops according to TransLink incorporate the following elements to accommodate different riders' needs: (1) wayfinding signage, (2) tactile media, (3) tactile surface indications, and (4) benches (Figure 34).

Figure 34: Elements of accessible bus stop, TransLink

A.1.2 Thunder Bay Transit, Thunder Bay, Ontario

Thunder Bay transit operates 16 routes across the city, making every effort to provide fully accessible bus service to all passengers. As the capital costs of accessible bus stops can be prohibitive, the City of Thunder Bay has developed a categorization system for bus stops based on ridership, service level, and land use; also, presenting the infrastructure that is to accompany each stop type.

Four stop types can be derived from this work:

1. **Basic Stop** – Characterized by low activity levels, one transit line, not located near key destinations
2. **Enhanced Stop** – Moderate ridership, stops near key destinations, may be served by 1+ routes
3. **Major Stop** - Located in core urban areas or near a series of key destinations. Some stops may serve as transfer points (between bus, subway, etc.)
4. **Terminal Stop** – Route terminus, or inter-service transfer location, highest ridership levels.

In Thunder Bay, major and terminal stops are generally provided with the following amenities:

- Accessible seating
- Shelter
- Lighting of stop
- Lighting of shelter
- Stop post
- User information
- Next arrival screen
- Tactile strips on sidewalk

Thunder Bay Transit recommends bus stops have (1) curb cuts, (2) tactile strips, as well as (3) shelters with accessible benches/lighting to accommodate passengers with diverse needs (figure 35).

Figure 35: Elements of accessible bus stop (Thunder Bay Transit)

More best practice features of Thunder Bay bus stops are (1) marked curbs, (2) an extra space for waiting passengers, and (3) bus information placed at a height readable for people using a wheelchair (figure 36).

Figure 36: Additional best practices (Thunder Bay Transit)

A.1.3 International Best Practices, United Nations Development Programme

To condense best practices in accessible transit around the world, the UNDP has developed a series of guidelines for creating bus stops tailored to persons with disabilities. The following components of bus stops should be actively considered by Whitehorse Transit:

- Location of stops: bus stops should be provided within 400m intervals.
- Surface quality: The stop surface must be level, with no obstructions.
- Stop layout: Bus stops must be a minimum width of 1500 mm, however larger space, up to 2400 mm, is preferred to accommodate a deployed ramp, waiting passengers, and through traffic.
- Shelters and Benches: Shelters should be provided where possible. Restricted advertising on shelters, so as not to block user information or visibility from inside, can recover all or nearly all operating and capital costs of shelters. Seating should be painted in contrasting colours, and should be fixed at a height of approximately 480 mm. As stop infrastructure often lies outside the jurisdiction of transit agencies, this may require collaboration with municipal departments.
- Stop posts and user information: It is recommended that the following information be present on stop posts:
    - Pictogram of a bus to identify it as a bus stop;
    - Route number/name;
    - Accessibility symbol if services using the stop are fully accessible; and
    - Telephone number for more information.

  Where a stop post uses existing infrastructure such as telephone poles, clear markings should be used to distinguish them as bus stops. Schedules should be posted clearly inside the bus shelter, with Braille or tactile symbols where possible.
- Boarding Area: It is recommended that a raised, coloured marking be placed in the exact spot where boarding takes place, which will aid in guiding visually impaired persons towards the bus entrance.