

FINAL REPORT



OKANAGAN RAIL TRAIL PLANNING PROJECT

Matthew Callow, Shareen Chin, Shannon Lambie, Pascal Volker

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The ORT Studio Team would like to graciously thank and acknowledge the following individuals for their assistance and contributions to this project.

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EXECUTIVE SUMMARY

The City of Kelowna (the City) has requested the UBC Studio Team (the UBC Team) develop recommendations that will enhance the 18 kilometre section of the Okanagan Rail Trail (ORT) that is contained in the City's jurisdiction.

These recommendations will aim to integrate the ORT with adjacent communities for the benefit of residents, commuters and the City. With this goal in mind, recommendations are intended to inform the City about:

1. Highest and best land use for adjacent properties;
2. Future thinking transportation options for the ORT;
3. Interim design guidelines for adjacent properties; and
4. Gateway locations for the public to access the ORT.

The UBC Team approached this task by establishing the 'Compact City' as a conceptual framework to guide recommendations. Additionally, the City of Kelowna's Community for All Action Plan¹ will guide recommendations to promote accessibility for all ages and abilities.

For a better understanding of site conditions, as well as to focus recommendations for specific contexts along the ORT, the UBC Team has segmented the Kelowna portion of the ORT into five zones.

These zones have been divided based on their common land-use composition, geographic conditions, and current road intersections. Based on general observations and land use analysis of the current site conditions, the UBC Team has provided the following recommendations for each zone:

- Access Points – the location of existing and recommendations for future access points;
- Land use changes;
- Design guidelines for the ORT and adjacent lands; and
- Gateway location and design guidelines.

Transportation research is also provided on the following four options:

- Autonomous Rapid Transit
- Light Rail Trail
- Micromobility – bike sharing
- Micromobility – scooter sharing

There may be multiple strategies to achieve the purpose of supporting the ORT as a thriving transportation corridor. Ultimately, these recommendations are designed to lead a conversation among City staff with an understanding that not all these can be implemented immediately.



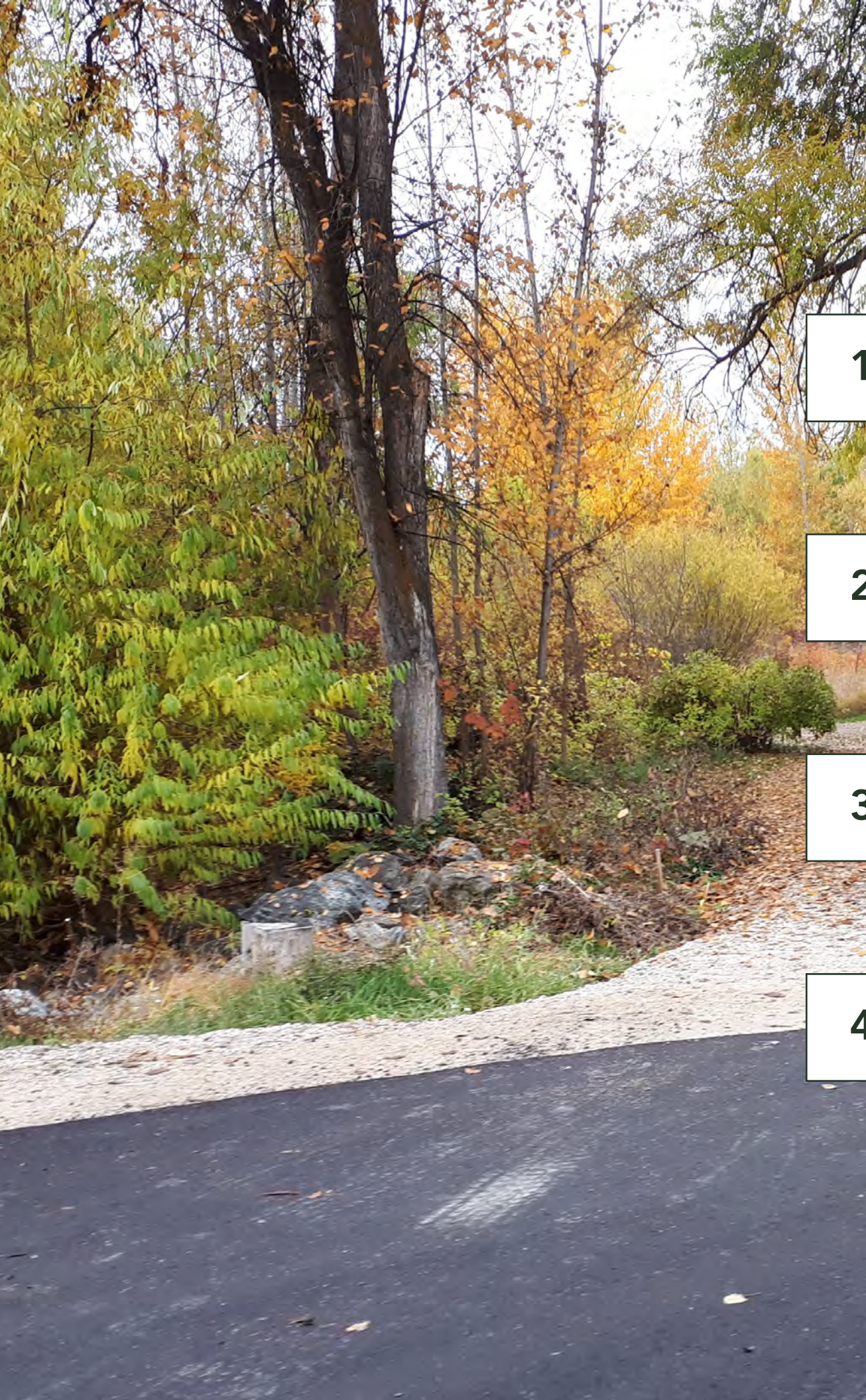
BACKGROUND AND VISION

The ORT is a 47 kilometre former Canadian National Railway (CN) corridor that runs through the City of Kelowna, Okanagan Indian Band, the District of Lake County and the Regional District of North Okanagan. These governments have partnered to create a continuous trail that runs from the Regional District of North Okanagan to Kelowna.

The City of Kelowna has partnered with the UBC School of Community and Regional Planning Studio course. The UBC Team consisting of Matthew Callow, Shareen Chin, Shannon Lambie and Pascal Volker (UBC Team) have partnered with the City to review best practices and make recommendations for the 18 kilometre section of the ORT that runs through the City of Kelowna. These recommendations aim to make the best use of the ORT (as a transportation corridor) for the benefit of the City and will include land use, transportation, access point and design guideline recommendations.

With an expected population growth of approximately 50,000 from 2018 to 2040², the City has recognized the need to densify their core and ensure transportation infrastructure meets the needs of their growing population.

The ORT provides the City with a unique opportunity to densify adjacent lands while delivering recreation and active transportation options for residents. The ORT also provides potential for future rapid transit in the corridor. In this sense, the future development of the ORT requires a clear and consistent conceptual framework, as presented by a number of case studies included in Appendix 1. Through this planning process, the ORT can contribute significantly to creating a compact and connected city. Ultimately, this reinforces Kelowna's mission of becoming a safe, vibrant and sustainable place for its residents.



OBJECTIVES

1

Anticipate the highest and best land uses immediately adjacent to the ORT within Kelowna's boundaries. Examine existing land use signaled in the 2030 OCP and provide recommendations on how to accommodate various future land uses for current and future time horizons.

2

Examine future transportation options that the corridor may serve within the existing Right of Way.

3

Establish interim design guidelines for properties adjacent to the ORT.

4

Establish gateway locations where the public will be able to access the ORT.



GUIDING PRINCIPLES

Initial Research

Before determining what the guiding principles for the ORT would be, various research activities were conducted by the UBC Team to get a better understanding of active transportation corridors, Kelowna and the relationship between the ORT and City of Kelowna. This report represents the beginning of the planning process for the ORT, as such there are limited policies and publications for the Kelowna portion of the ORT. Despite the lack of ORT documents, efforts were made to align these recommendations with the regional vision, Kelowna OCP, and City of Kelowna policies. Other research activities included: analysis of six case studies, conversations with City staff, background materials prepared by the City, various consulting reports, personal experience on active transportation corridors in other cities and a guided bike tour of the City of Kelowna portion of the ORT.

Based on the background research and the case studies presented in Appendix 1, it is clear that any long term planning requires a consistent conceptual framework to guide development and decision making. The case studies highlight the importance of conceptualizing the goals that are to be achieved. Furthermore, the case studies that were examined are further supplemented with best practice examples from other research studies.

Based on best practice research and conversations with City staff to understand their vision for Kelowna and the ORT, the conceptual framework was created. The conceptual framework that will guide recommendations in this report originates from the concept of the "Compact City."³ Important principles of the Compact City align closely with the sustainability goals established by the City and links the City's

goals to the long-term development of the ORT's adjacent areas².

Compact City Principles

Dense and proximate development patterns

Densifying and proximating development patterns is done by intensifying the use of land along the borders of the ORT in order to avoid low-density and fragmented development. Intensifying use will increase population density and move the City closer to the population density needed to make different modes of active and rapid transportation viable along the ORT. Similarly, this approach also suggests increasing job density in non-residential areas as a way to reach this goal.

Transit Oriented Development

All recommendations in this report keep in mind the long term goal of promoting and activating the ORT as a Transportation Corridor. To achieve this, existing zoning, future land use designations and city planning directions may need to change in order to maximize the potential that the ORT represents. Best Practices, particularly for bike share (the most feasible transportation mode for the ORT, at this point) suggest certain variables that can guide long term planning in this direction, such as population density, job density and service & commercial activity⁴.

Diversity and accessibility to local services

To promote an economically and socially vibrant corridor, an accessible and mixed land-use approach will increase resident's use and access to local services and jobs. This will then stimulate a range of activities at different times of the day, which will enhance the ORT and its adjacent communities.

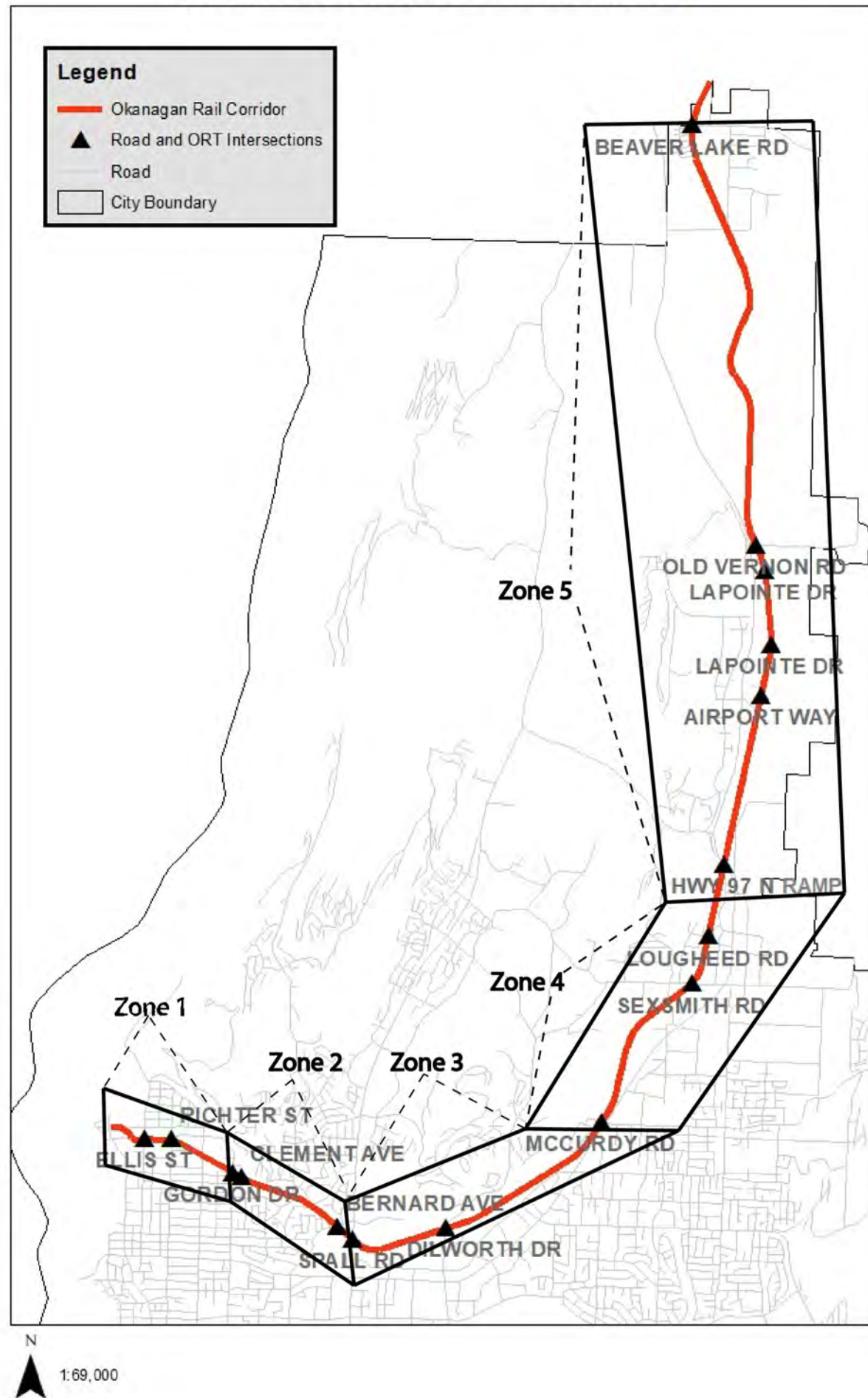
Additionally, a transportation corridor that is well connected to surrounding communities will encourage active use of the ORT and promote social and economic activity in adjacent areas. Studies based in British Columbia⁵ have concluded that there is a beneficial relationship between transit-use and walkability. In order to meet this goal, it is important to increase the number of access points to the ORT.

Relationship Between the Compact City and ORT

Following these principles, Compact Cities have been shown to promote healthy environments, social equity, economic viability, mobility and reduces the cost of urban infrastructure. Moreover, Compact Cities provide excellent opportunities for rural-urban linkages, such as farmers markets and agricultural tourism because they preserve agricultural land and reduce urban sprawl.

Recommendations are also guided by the principles outlined in the City of Kelowna's Community for All Action Plan. The Community for All approach complements the Compact City and requires planners to design and implement solutions that are well-suited and safe for people of All Ages and Abilities (AAA). Infrastructure of this type includes off-street pathways, physically protected bike lanes, and low volume local street bikeways. The Community for All approach facilitates walkability, cycling, sociability and animating the use of public space in and around the ORT, which aligns with the City's future vision.

Overview of Zone Boundaries



GENERAL ORT OBSERVATIONS

In this report, the ORT and legal parcels within 50 metres of the ORT are divided into five zones. 50 metres was chosen as a uniform measurement to capture all immediately adjacent properties. This allows for greater analysis of current conditions as well as a better understanding of the challenges the City faces. Zones have been divided based on common land use composition, geographic conditions, and current road intersections. The Intersection Map with Active Transportation is in Appendix 9.

An integrated ORT for Kelowna

In 2016, Kelowna, with a total land area of 212 square kilometres, had a population of 126,380⁶. This results in a population density of 596 persons per square kilometre. Though, without greater disaggregated information about neighbourhood densities, deeper analysis of densities is not yet possible. This low density population contributes to the walkability score for Kelowna being only 42/100⁷ and results in most errands requiring car ownership. Having an integrated ORT will help Kelowna achieve the sustainability goals it has outlined in the 2030 Official Community Plan².

In most residential areas, Kelowna is a car-dependent city where most errands require a car. The city has some public transportation options; however, 79% of residents commute by driving, while only 19% commute by sustainable transportation modes such as walking, cycling, carpooling or taking transit⁸. Neighbourhoods further from the core are described as “car-dependent,” and lack a sufficient population density to support effective transit services.

Safety issues from a planning perspective

The ORT runs through many areas where there are not many users. Additionally, users are often unable to see into or outside the ORT because of trees, buildings, hills or other natural features. Safety concerns are exacerbated by the lack of amenities such as inconsistent lighting, long distances between access points and lack of AAA connections to the ORT.

ORT Right of Way

Areas where the ORT Right of Way is less than 20 metres are shown in the following table.

Right of Way Less than 20 metres. Please see Right of Way Map in Appendix 4

Number on Map	Address	Width in Meters
1	1096 Manhattan Dr.	16.6
2	East of Spall Rd.	15.3
3	East of Spall Rd.	15.4
4	West of Hwy 97N	15.8
5	West of Hwy 97N	17.8
6	East of Neave Rd.	15.6

Separating Cyclists and Pedestrians

Given that bike share is the most feasible transportation mode for the ORT in the near future, special attention has been given to the alignment of this mode with planning objectives.

Various studies have shown the need to separate pedestrians and cyclists on urban multi-use pathways. In addition, countries seen as experts on cycling infrastructure such as the Netherlands and Denmark who have high cycling rates, typically separate cyclists and pedestrians in urban areas. This is important as there is the potential for conflicts between users who travel in different ways and especially at different speeds. Users traveling at different speeds can cause safety issues especially if one use of the trail will be high speed commuting⁹.

The Mississauga Cycling Master Plan shows that utilizing multi-use pathways for pedestrians and cyclists can make the pathway a space that is less desirable for pedestrians and cyclists⁹. The Toronto Center for Active Transportation also found that “differences in user speed are one of the largest sources of conflict”¹⁰ on multi-use pathways as cyclists are often traveling at much faster speeds compared to pedestrians. An SFU study found that the separated bike lanes resulted in a significant reduction in “serious collisions between pedestrians, cyclists and



motor vehicles”¹¹. The speed difference and resulting conflicts may result in users no longer using the trail. By separating users on the ORT, the different paths can be constructed with specific users in mind and reduce the conflicts between users therefore increasing enjoyment and use of the ORT.

Access Points

It is important to explain the difference between ‘Access Points’ and ‘Gateways’.

- **Access Points** are considered any location where people can physically access the ORT.
- **Gateways** are locations where there is space for nearby residents and ORT users to stop and use amenities as well as gather and actively use the space.

Gateways are also locations where there is potential for the City to focus amenities such as:

- Water fountains,
- Interpretive facilities,
- Bike share stations,
- Bike parking,
- Flex space,
- Washrooms,
- Garbage/recycling bins,
- Lighting,
- Wayfinding signs,
- Seating,
- Space animation (Eg. Public Art, playground etc.) and
- Outdoor bike tools.

All Gateways will serve as Access Points to the ORT. Not all Access Points will serve as complete Gateways, but may have some of the amenities or features typically seen at all gateway locations. There are currently 25 ORT access points and it is strongly recommended that 17 access points are added (see Appendix 8).

A study that underscores the need for AAA connections to the ORT found that “mixing (cyclists) with traffic puts people off cycling, especially children”¹². This study also found that cyclists prefer cycling away from pedestrians and away from cars¹².

A Vancouver-based study found that the built environment influenced the routes that were chosen by cyclists and that cyclists were willing to travel farther to access physically separated cycling facilities such as off-road paths. However, it was found that these cyclists were only willing to travel up to 400m out of their way. This underlies the importance of having as many physically separated bike connections as possible. This will encourage cyclists to utilize the ORT by having safe access points¹³. Comparable trails such as the Arbutus Corridor, have access points every 400 to 800 metres. The ORT currently has 25 access points (one every 720m on average), and if the 17 recommended access points are added there would be an access point every 440m, on average.

Furthermore the City’s Community for All Action Plan promotes designing cities for people of all ages and abilities which means having as many access points as possible. Having a large number of access points will help ensure the safety of riders as well as increase connectivity by making it as easy as possible for Kelowna residents to get to the ORT and use the ORT safely and efficiently. More access

points means that residents can spend more time traveling on the ORT and less time getting to the ORT on roads without physically separated bike infrastructure. Having as many access points as possible will incentivize Kelowna residents to bike and therefore reduce the number of vehicles on the road. Studies also show that women will uptake cycling more if there are safer connections to ORT, increasing gender parity¹⁴. While there are a number of existing access points, many of them are not safe for cyclists of all ages and abilities therefore all existing and recommended access points should come with AAA connections from the local street or active transportation network to connect safely to the ORT.

Currently, in Zone 1, ORT users access Manhattan Drive where there is no bike infrastructure and no safe connection to the downtown core. The Cawston Avenue bike path runs parallel to the ORT but it is not a North-South connection between the downtown core and the ORT. Ellis Street, Richter Street and Ethel Street could be reconfigured to provide access to the ORT from the North and South side of the ORT. All of these streets have the potential to serve as a major route for commuters and visitors to travel to and from downtown Kelowna while using the ORT. Ideally, all of these streets would have separated AAA infrastructure, but in the short term, the City could provide a seamless link to the downtown core with separated AAA infrastructure on one of these roads. The Arbutus Corridor shares a similar vision of connecting the corridor to other active transportation routes and not focusing on a number of self-contained projects within a city. In the Greater Toronto and Hamilton Area a model of cycling behaviour revealed that “population density, land use mix, dedicated cycling facilities (i.e., cycle tracks and bicycle lanes) and safer streets (i.e., roads with lower speed limits) were positively associated with cycling uptake”¹⁵.

Amenities

The ORT will run through several unique environments and attract a variety of different users. The street design recommendations should incorporate new openings and cut-throughs to further increase accessibility to the ORT. Amenities encourage ORT use by providing an experience that is safe, comfortable, and convenient. Amenities should be accessible to all users and placed in safe, visible, and convenient locations. These should have a consistent design and be vandal resistant. Sign design, lighting, and benches should all have similar colors, materials, and overall design theme. Best practices from Pierce County, WA, Vancouver, BC, Cambridge, UK and from National Association of City Transportation Officials (NACTO) suggest the following amenities as requirements when building a cyclist-friendly trail:

- Bike parking in the form of racks or shelters
- Benches, tables and trash receptacles
- Water fountains
- Information and directional signage
- Restrooms
- Bollards, fencing, ramps and handrails
- Lighting¹²



READING GUIDE

In this report the ORT has been divided into five zones which include a site analysis, list of access points (existing and recommended), land use recommendations, and zone specific design guidelines using cross sections.

With the goal of supporting the ORT as a thriving transportation corridor, recommendations for land use change aim to increase population density and job density as increased density is associated with increased use of transportation corridors.

The following terms are featured in the analysis of each zone:

'Prototypical' cross sections were taken in areas that are representative of the majority of the zone.

'Gateway' cross sections were taken where there is space for nearby residents and ORT users to stop and use amenities as well as gather and actively use the space.

'Flex spaces' are intended for non-permanent uses that do not inhibit future rapid transit options on the ORT. Below are some possible uses within designated 'flex spaces':

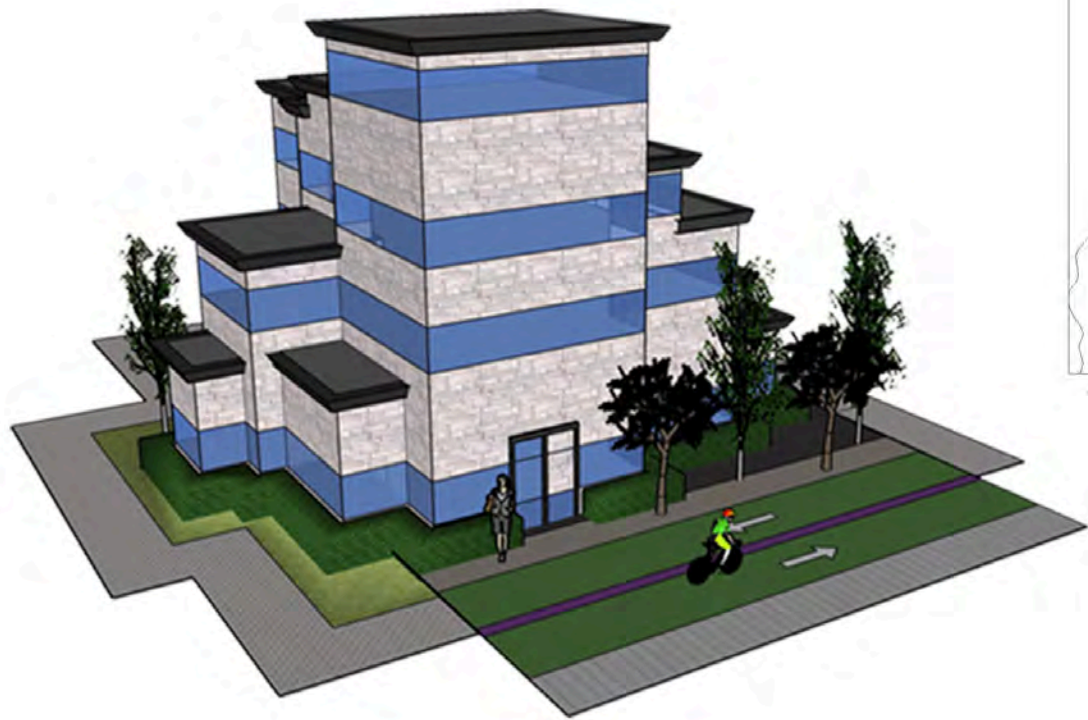
- Open grass area
- Community gardens
- Dog park and necessary fencing
- Exercise equipment
- Food trucks

'Gateway Amenities Package' is a list of amenities that should be considered for implementation at all Gateway locations. These items include:

- Water fountain
- Bike share station
- Bike parking
- Flex space
- Washroom
- Garbage/recycling bins
- Lighting
- Wayfinding sign
- Seating
- Space animation (Eg. Mural, sculpture etc.)
- Outdoor bike tools

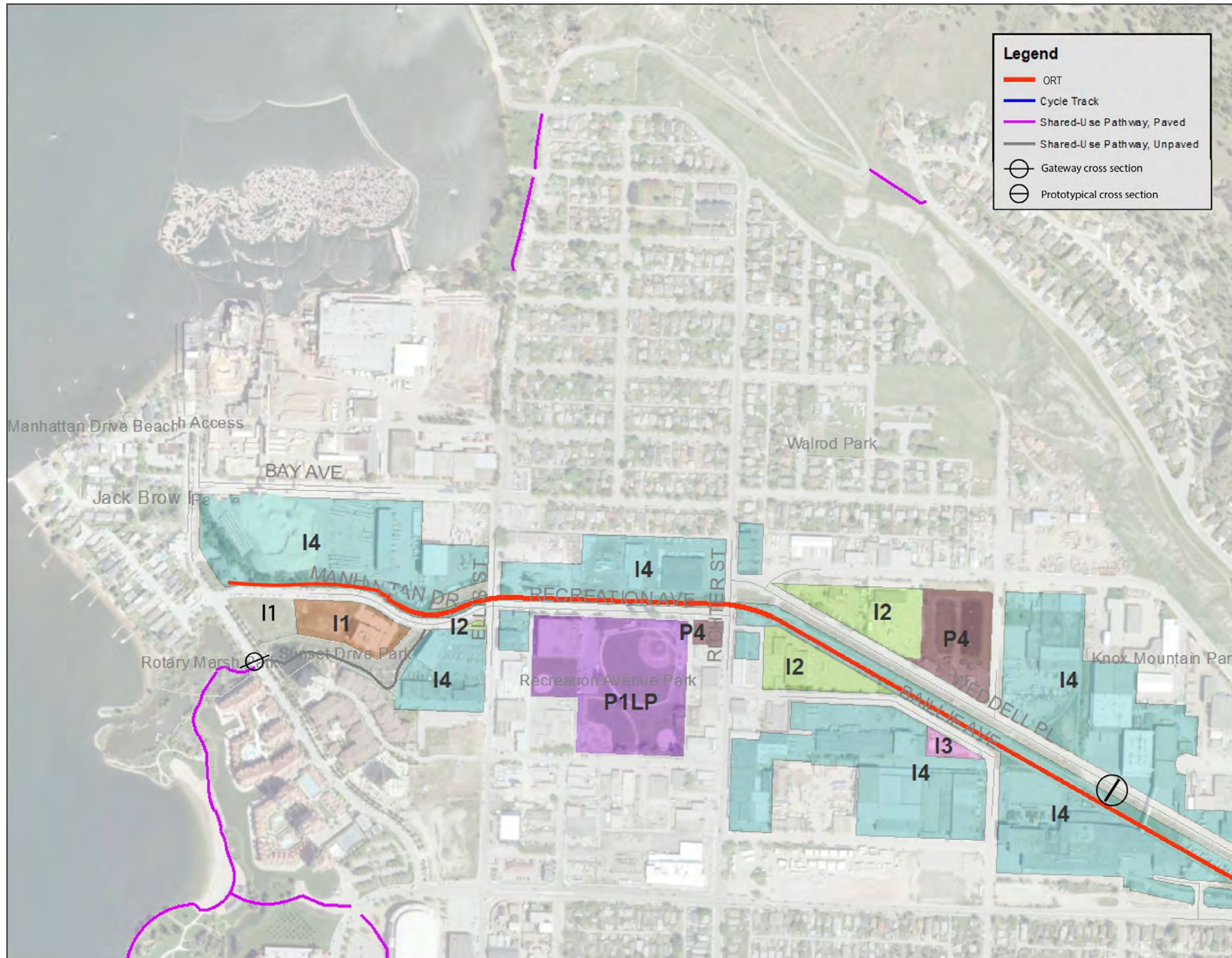
Zone 1 Innovation District

MANHATTAN DRIVE TO GORDON DRIVE





The goal in the Innovation District zone is to gradually transition industrial activities from low density employment to high density employment.

Zone 1: Manhattan Dr. to Gordon Dr.



Legend

- ORT
- Cycle Track
- Shared-Use Pathway, Paved
- Shared-Use Pathway, Unpaved
-  Gateway cross section
-  Prototypical cross section

Zone 1 Key Characteristics:

Predominantly industrial along ORT.
There are no zoned sensitive habitats in the Zone 1.
Parts of ORT follows along industrial roads but cyclists are not on the actual ORT.

Key Assets:
Recreation Avenue Park
Jack Brow Park
1155 Ethel Street
Suntype factory area
Ellis St. at Manhattan Dr. (Interjurisdictional events at the beginning/end of the trail)
No city owned properties communicated by City.

Limitations
ORT runs along Mill Creek.
ORT and Transportation Corridor does not reach Manhattan Drive.
Current bike path uses motorvehicle road ways.
Road debris affects riding quality.
Little signage to navigate industrial area.

Pinch points:
Manhattan Drive - 16.6M
Mill Creek runs along most of the ORT

Current population (Census 2016):
Includes parts of census tracts 0012.00 and 0013.00.
Approximate population density per sqkm:
Between 1788.1 and 1011.5

Active Transportation:
No active transportation routes connecting north-south

Current access points (approximate):
Ellis St. at Manhattan Dr.
Richter St. at Recreational Ave.
Ethel St. at Weddell Pl.
Gordon Dr. at Clement Ave.

Clement Avenue to Richter Street
Richter Street to Ellis Street
Ellis Street to Guy Street

Zoning of parcels within 50m:
I2 - General Industrial
I3 - Heavy Industrial
I4 - Central Industrial
P1LP - Parks and Open Space (Liquor Primary)
P3 - Parks and Open Space
P4 - Utilities

ZONE 1. MANHATTAN DRIVE TO GORDON DRIVE

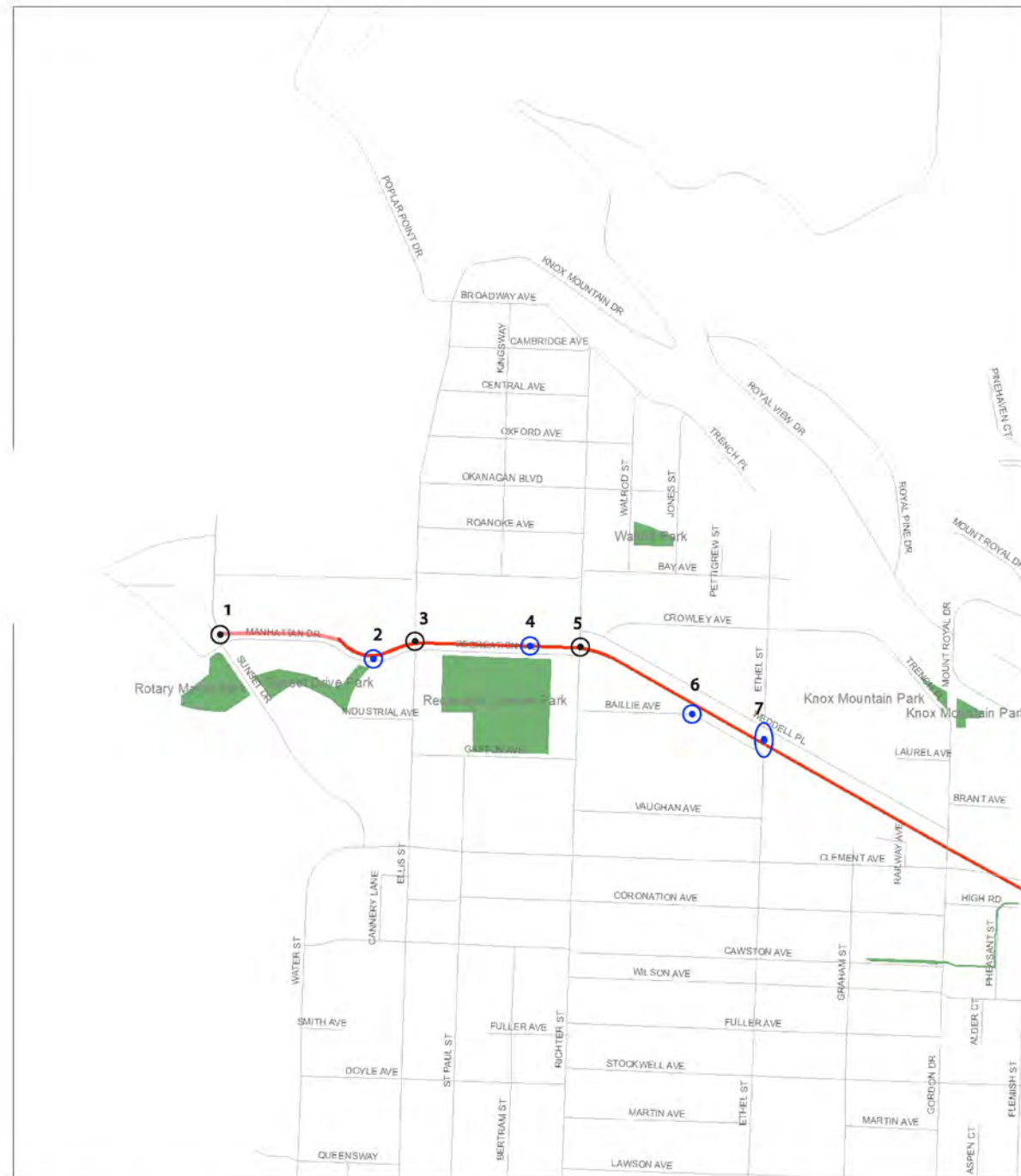
Zone 1 of the ORT is 1.8 kilometres long. This zone is highly industrial (I1, I2, I3 and I4) with some public & institutional uses (P1LP, P3 and P4). A water body (Brandt's Creek) runs adjacent to the ORT throughout most of the zone, attracting some wildlife. In addition, there are parks, such as Recreation Avenue Park and Jack Brow Park. Recreation Avenue Park functions as a baseball stadium while neighbouring the Kelowna Curling Club, as well as the Urban Links Golf Training Centres. The City has also identified Waterfront Park as an alternative location for inter-jurisdictional events. This zone is very well located near Okanagan Lake and the downtown urban centre.

Additionally, the SunType Factory area shows prototypical land use and building type within zone 1 due to its large scale industrial usage. As a result, this area presents challenges to future land use recommendations because of its size and its importance for current and future employment. The ORT corridor West of Richter Street is adjacent to the 'City Centre Urban Centre' which is expected to grow 17% by 2040¹⁶.



This urban centre is expected to add more than 5000 residential multi-family units demonstrating the need for development of a multi-modal corridor on the ORT to help counteract the increased number of vehicles on Kelowna's road network. This section currently has four intersections that serve as access points. Active transportation access in this section includes Ellis Street and Richter Street (sidewalk intersections).

Access Points

Location	Type of access	Existing / Recommended / Possible*
1. Guy St. and Manhattan Dr.	Road	Existing
2. On Manhattan Dr. between Guy St. and Ellis St.	Walking path	Recommended - Mid-block crossing as suggested in the Zone 1 Gateway design guidelines could be a continuation of the walking path
3. Ellis St. and Manhattan Dr.	Road	Existing
On Recreation Ave between Ellis St. and Recreation Avenue Park	Lane	Possible
4. Recreation Avenue Park (including the parking lot, grass, and lane)	Multiple	Recommended - Mid-block crossing for access to Recreation Avenue Park
5. Richter St. and Recreation Ave.	Road	Existing
Lane off Richter St., ~20m South of Recreation Ave.	Lane	Possible
6. Baillie Ave	Road	Recommended - Open fence to allow bike and pedestrian access
7. Ethel St.	Road	Recommended - Allow bike and pedestrian only access on North and South side of ORT



Legend

-  Existing Access Points
-  Recommended Access Points

Land Use Recommendations

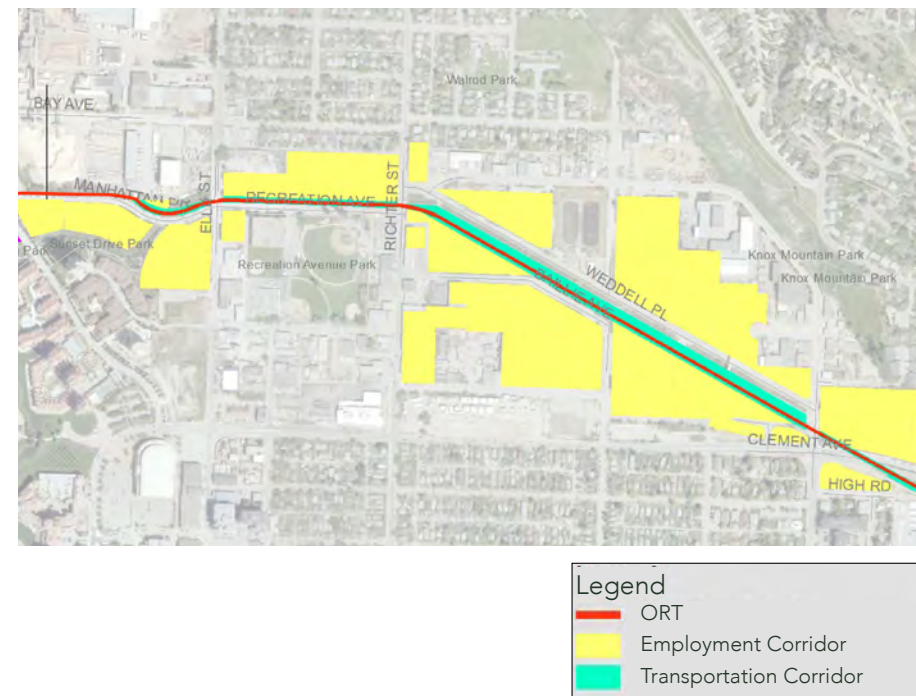
The activities observed in this zone speak to the historical industrial activities that Kelowna has performed in the past. Unfortunately these activities, though economically and symbolically relevant for the City, have low job density according to the 2015 Employment Density Matrix¹⁷. This situation poses an obstacle to the ORT's future development as a Transportation Corridor. To rectify this trajectory, a new future land use designation has been developed (building from experiences like San Francisco's 'Production, Distribution and Repair' zoning code) that will respect the area's past and will help direct land use development towards high job density activities that will make the ORT feasible as a Transportation Corridor in the future. This future land use designation is called "Employment Corridor" (see Appendix 2 for more detail). This Transit-Oriented Development approach, should also be stimulated with other incentives that encourage development of high job density activities.

Rotary Marsh Park/Sunset Drive Gateway

Zone 1 could also serve as the 'beginning' of the ORT. To signal this, a new Gateway land use designation could be applied to the south side of Sunset Drive. This street is the start of Rotary Marsh Park.

Amenities at the Rotary Marsh Park Gateway include: information and interpretive signage, water fountains, covered picnic tables, washrooms, bikeshare, and food trucks. The location of the bikeshare station is at the intersection of Guy Street and Manhattan Drive, and this is where the ORT officially starts.

Future Land Use Designation Map



Future Land Use Designation: Employment Corridor

As a future transportation corridor that is integrated physically and functionally to the city, the employment corridor aims to increase employment density by promoting high job density uses in lands adjacent to the ORT that are currently industrial.

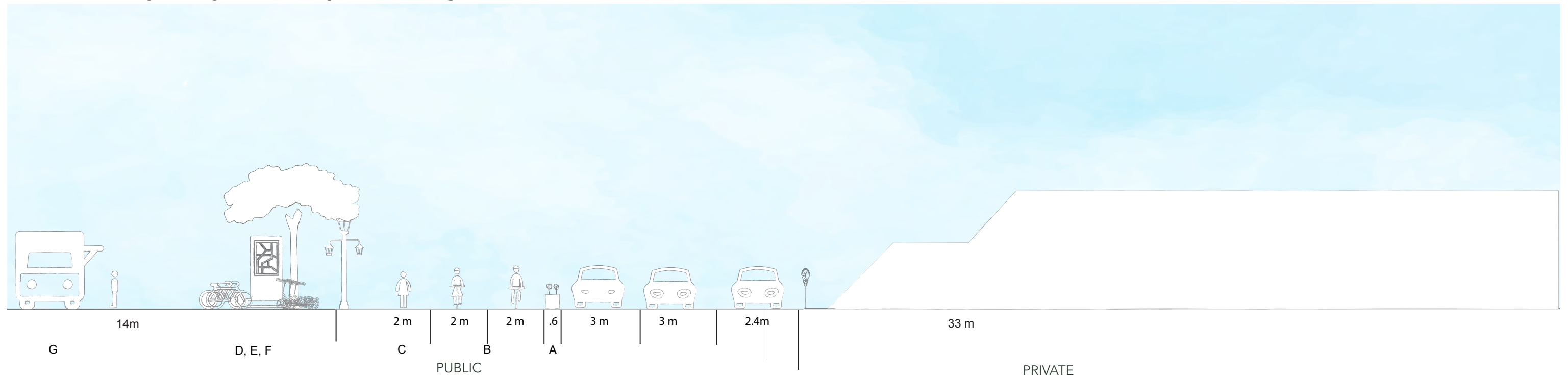
In order to acknowledge the city's past and present, land uses in the Employment Corridor should remain primarily industrial, but could also allow commercial or service uses, as long as they fulfill the high job density goal. Design guidelines suggested for Zone 1 are intended to ensure that individual developments are compatible with this future land use designation and the purpose of integrating the 'Innovation District' with an Okanagan Rail trail that is used and enjoyed.



Zone 1 Gateway at Guy Street: Existing - Facing East (61 m)



Zone 1 Gateway at Guy Street: Proposed - Facing East (61 m)



Design Guidelines for Zone 1 Gateway (Facing East)

(Not shown) - An official crossing on Guy Street to connect the ORT to separated bike lanes. This will allow bike lanes to be adjacent to the Gateway and not require ORT users to cross the street where the Gateway is located. This will further buffer the Gateway from the road.
 *Note that there is no ORT corridor at this location.

- A. Concrete planter box with breaks to allow pedestrians and cyclists to cross the street and access the ORT. Planter box will also protect ORT users from vehicles.
- B. Parking lane on South side of Manhattan Dr. is now a physically separated Micromobility ONLY path that includes scooter share, bikes and ebikes.
- C. Retain existing sidewalk
- D. Start of gateway event space
- E. Add all Gateway Amenities
- F. Add scooter share
- G. Add tourism kiosk

Zone 2 NeighbourHub

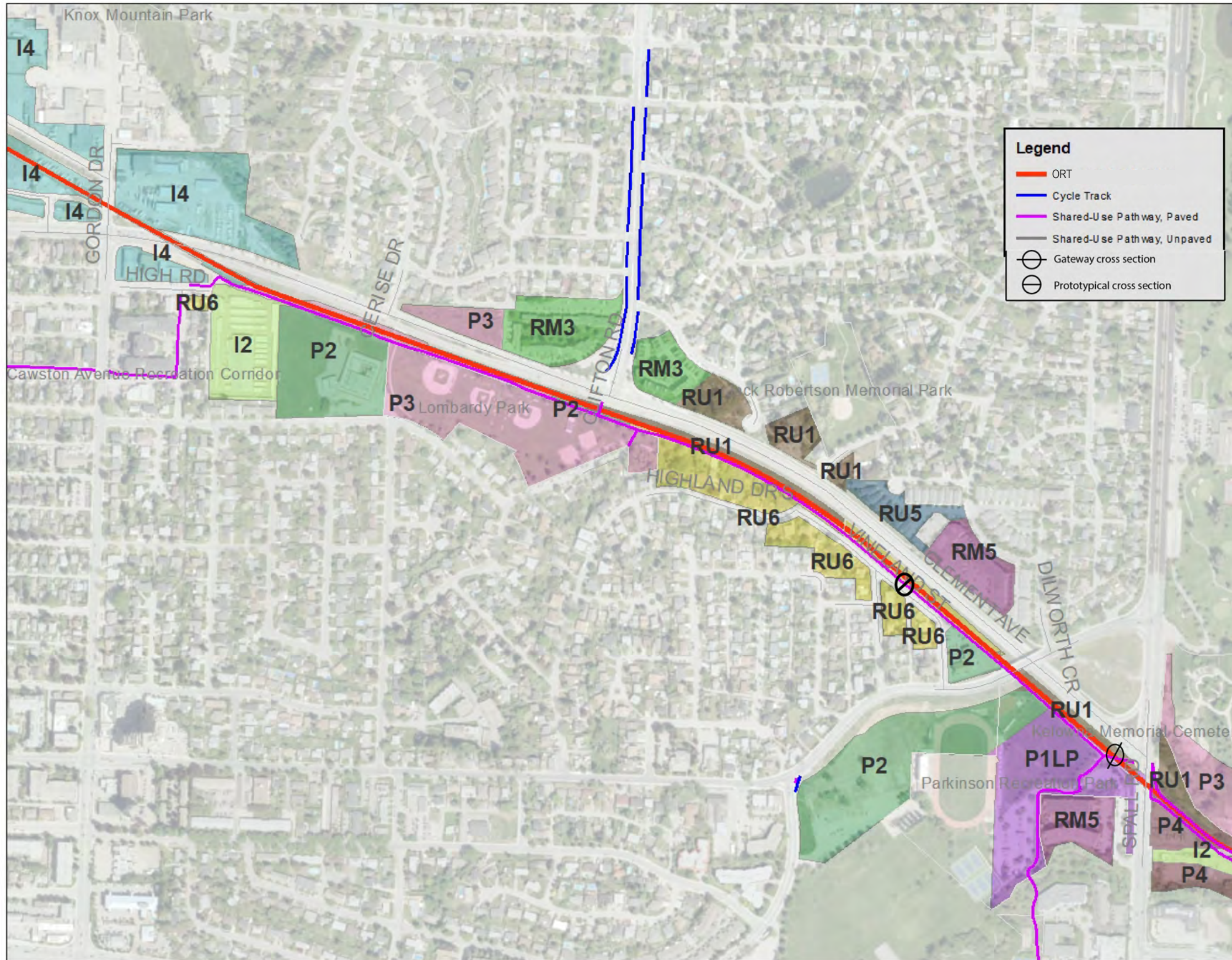
GORDON DRIVE TO SPALL DRIVE



The focus of the NeighbourHub zone is to promote a sense of community that is focused around multi-residential uses that increase current population density.



Zone 2: Gordon Dr. to Spall Rd.



Zone 2 Key Characteristics:

Predominantly residential along ORT.
The path used by the public is the existing RWT connection.
ORT and RWT path is separated with a chainlink fence.

Key Assets:

- Apple Bowl Stadium
- Parkinson Recreation Park
- Lombardy Park
- Cawston Avenue Rec. Corridor
- Rails With Trails (RwT) path
- Bankhead Elementary

Limitations

- Sensitive ecosystem at Spall
- ORT crosses Mill Creek
- Bernard Ave. is an overpass
- Clement Ave. separates smaller arterial roads from accessing ORT or RWT.

Pinch points:

- Some ORT RoW may not be 20m
- Adjacent to Rails with Trails increase capacity

Current population (Census 2016):

- Includes parts of census tracts 0015.00
- Approximate population density per sqkm: 1951

Active Transportation:

- High standard bike lanes included.
- Sidewalks and painted bike lanes excluded.

Current access points:

- Spall Rd. at Clement Ave.
- Access along Lombardy Park
- Clement at Erise (small path pedestrian path)
- Clement at Clifton (small path pedestrian path)

Zoning of parcels within 50m:

- I2 - General Industrial
- I4 - Central Industrial
- P1LP - Parks and Open Space (Liquor Primary)
- P2 - Education and Minor Institutional
- P3 - Parks and Open Space
- P4 - Utilities
- RM3 - Low Density Multiple Housing
- RM5 - Medium Density Multiple Housing
- RU1 - Large Lot Housing
- RU5 - Bareland Strata Housing
- RU6 - Two Dwelling Housing

N
1:6,000

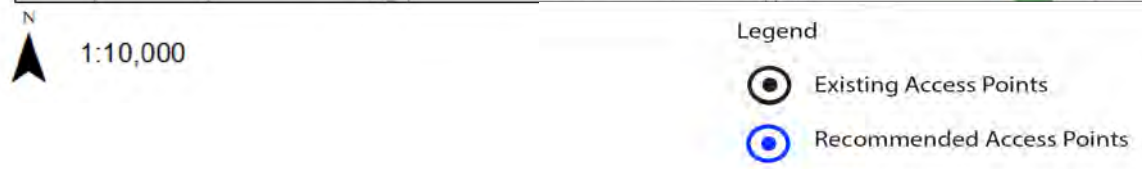
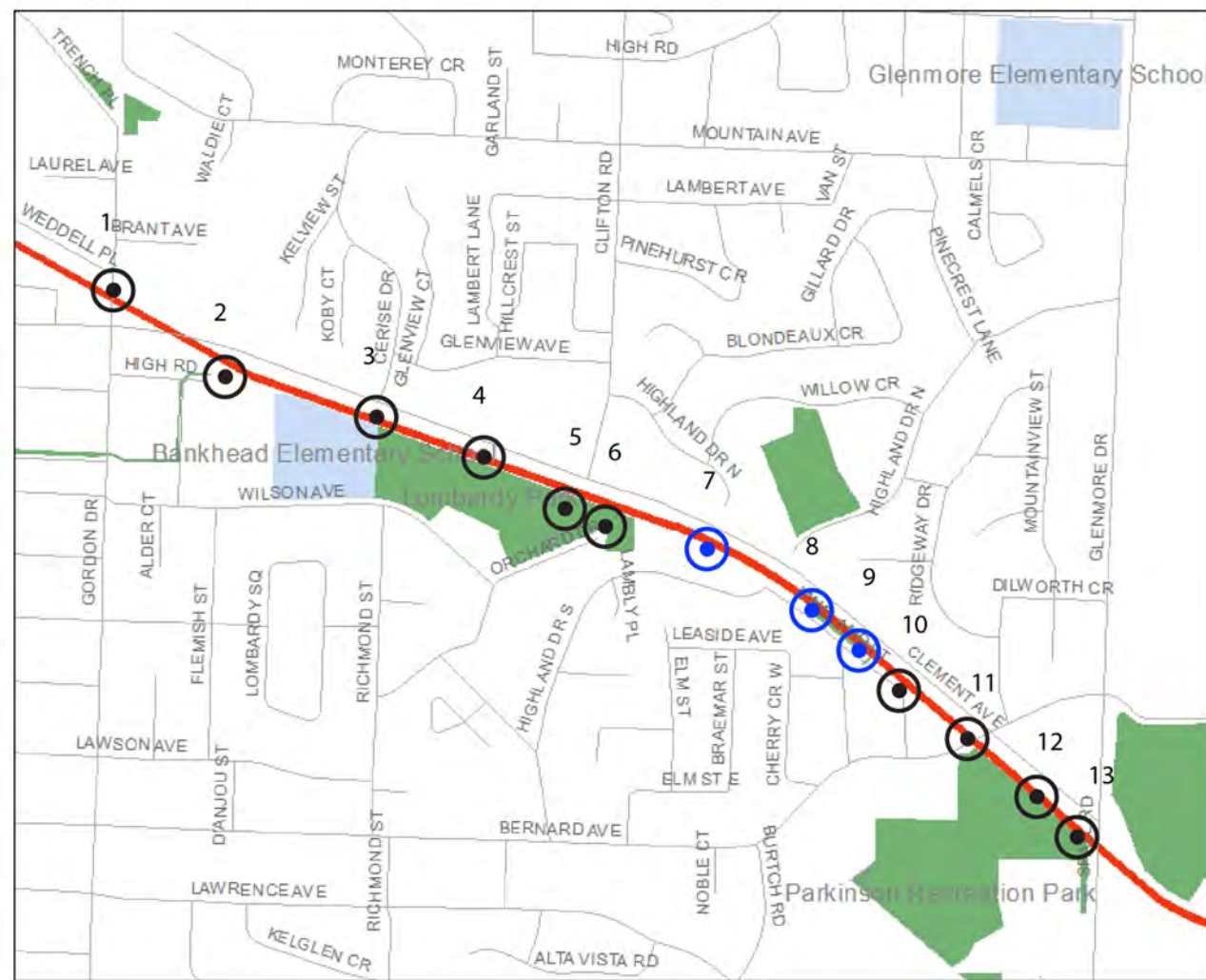
Source: City of Kelowna Data Set, Accessed 23.01.2019 by S.Chin
Canadian Census Data, 2016. Accessed 03.02.2019 by S.Chin

ZONE 2. SPALL ROAD TO GORDON DRIVE

This section is 1.8 kilometres long. It has many residential (RU1, RU5, RU6, RM3, RM5) and public & institutional uses (P1LP, P2, P3). There is also some industrial activity (I2, I4) near Gordon Drive. The location of public parks (Parkinson Recreation Park, Lombardy Park and Cawston Avenue Recreation Corridor) on the south side of the ORT present a great opportunity for integration with the Capri-Landmark Urban Centre (that is expected to grow by 13% between 2018 and 2040)¹⁷. Of all the Kelowna portion of the ORT, this zone is the most residential with approximately 375 units and over 900 residents.

Key locations in this section are the intersection of Spall Road and Clement Avenue (due to its ability to connect residential areas north and south of the ORT) and the Rails with Trails Path that runs alongside the south side of the ORT through the whole length of this section. There are five access points connecting to the ORT in this section, though there is an opportunity to significantly increase this number.

Given the strong residential character of this section and the location of public parks, residents would highly benefit from increasing the number of access points and, thus, walkability.



Access Points

Location	Type of access	Existing / Recommended / Possible*
1. Gordon Dr. and Clement Ave.	Road	Existing
2. High Rd.	Bike and Pedestrian Only	Existing
3. Bankhead Elementary School	Bike and Pedestrian Only	Existing
4. Lombardy Park	Bike and Pedestrian Only	Existing
5. Clifton Rd.	Bike and Pedestrian Only	Existing
6. Orchard Dr.	Bike and Pedestrian Only	Existing
7. Highland Dr. S and Vineland St.	Bike and Pedestrian Only	Recommended - Pave and make an official Access Point
8. Cherry Cr.	Bike and Pedestrian Only	Recommended - Provide a gap in the concrete planter boxes for bike and pedestrian access. (concrete planter boxes are recommended to replace Jersey Barrier in the design guidelines)
9. Lane between Cherry Cr. and Vineland St	Bike and Pedestrian Only	Recommended - Provide a gap in the concrete planter boxes for bike and pedestrian access.
10. Vineland St.	Bike and Pedestrian Only	Existing
11. Bernard Ave.	Pedestrian only	Existing
12. Okanagan Park Run	Bike and Pedestrian Only	Existing
13. Spall Rd.	Road	Existing

Land Use Recommendations

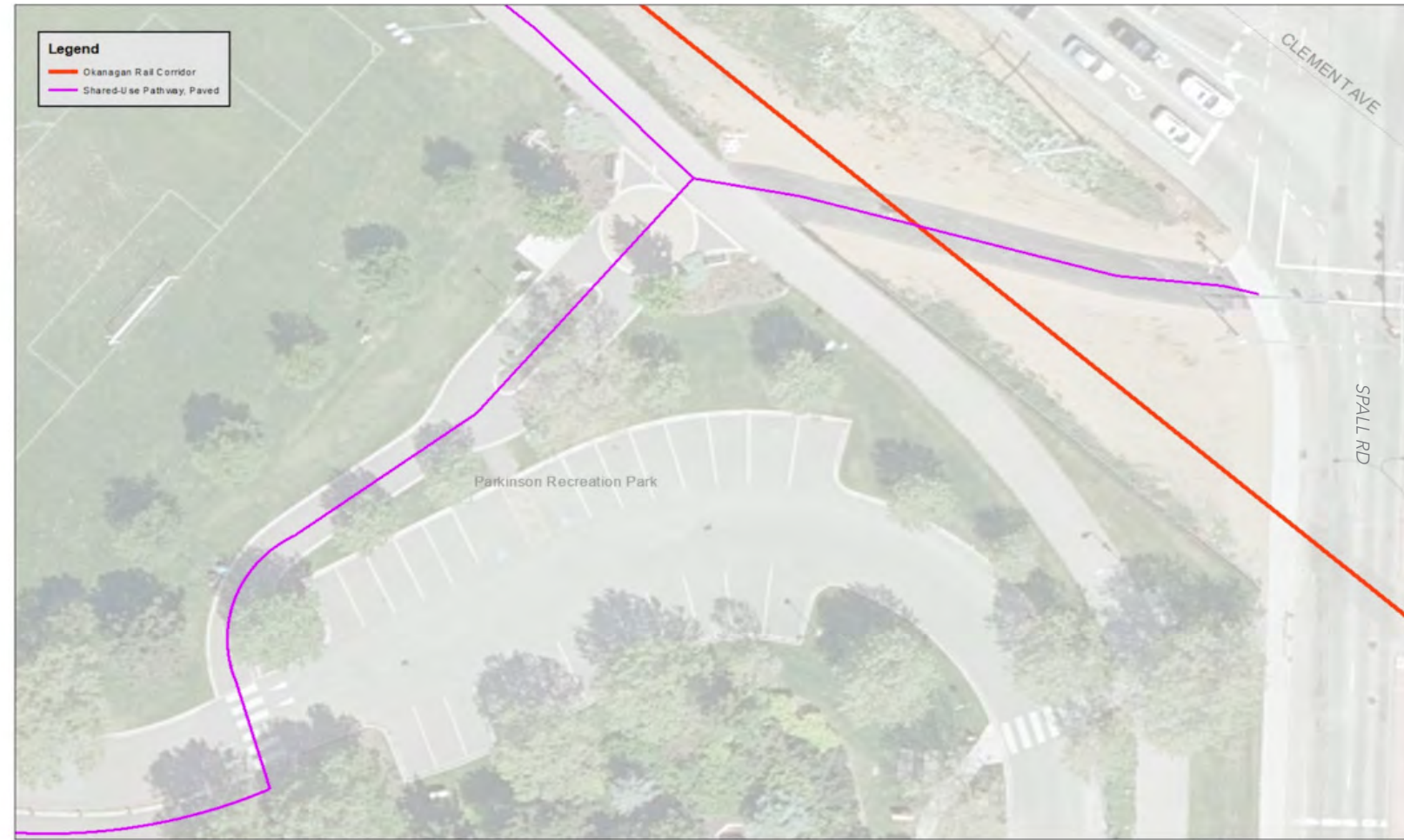
When looking at the ORT primarily as a Transportation Corridor and taking into account the highly residential character of this area, our recommendation is to further densify this area in order to achieve the population density associated with bike share ridership. Bike share is the most achievable transportation mode at this point of time. It is recommended that residential properties are designated (according to Kelowna's 2030 OCP Future Land Use definition²) as Multi Residential Medium Density (MRM), which is associated with current RM4 and RM5 zoning codes. Another recommendation for this zone is for the property west of Bankhead Elementary School. It is recommended that this property be designated as Mixed Use Residential/ Commercial (MXR, Kelowna's 2030 OCP Future Land Use definition²). This action will allow increased population density, as well as providing commercial opportunities for nearby residents and workers.

According to estimates on the number of existing residential units adjacent to this zone of the ORT and on Canada's 2016 corresponding census tract, the suggested land use change would allow this zone to almost triple (x2.8) the current number of residential units and population (see Appendix 3 for further detail). This change would associate population density to one that is similar to Denver and Washington's Bike Share stations. In this scenario, development of this zone would contribute significantly to the ORT as a Transportation Corridor.

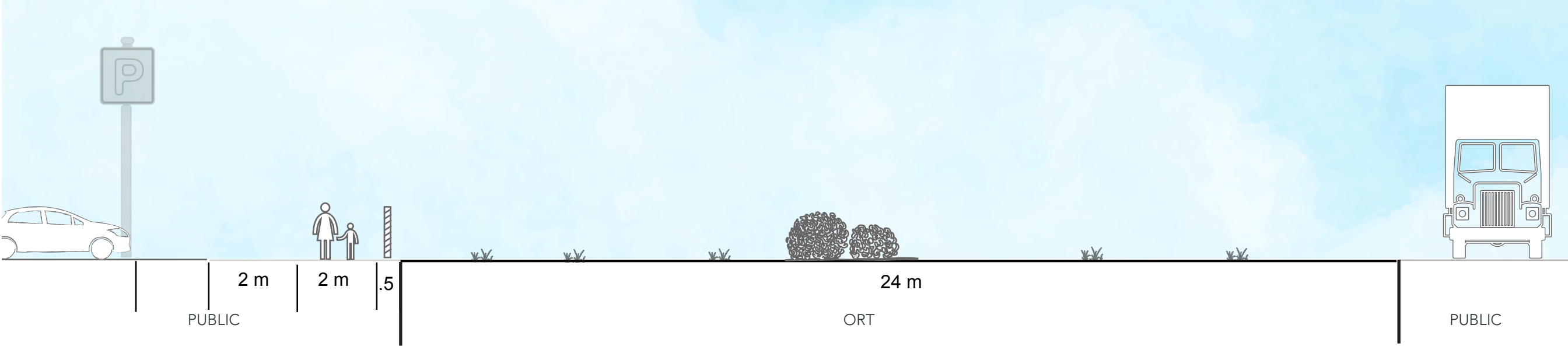
Spall Gateway

A portion of the existing P1LP zoning near Spall Road is recommended to be the location for a Spall Gateway. This location was selected due to its connection with the Rails to Trails/ Okanagan Park Run Pathways and also from City staff and resident feedback. Locating a Gateway at this location may require repurposing some parking stalls from the Mill Creek Estates to make room for a bike share station and other Gateway amenities.

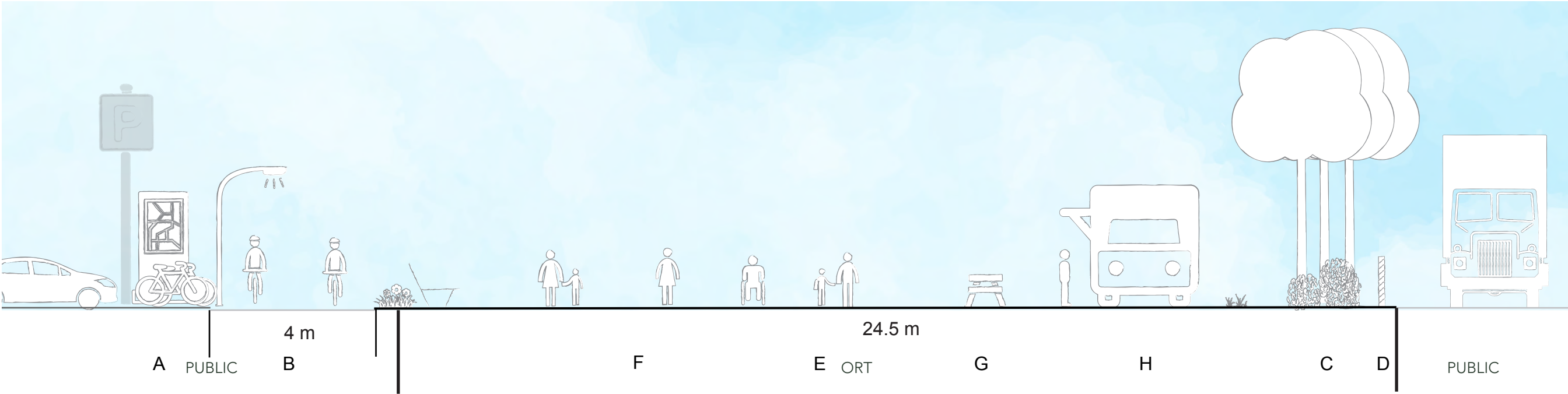
Conceptual image of Spall Gateway with amenities shown (bottom image).



Zone 2 Gateway at Clement Ave: Existing - Facing West (28.5 m)



Zone 2 Gateway at Clement Ave: Proposed - Facing West (28.5 m)



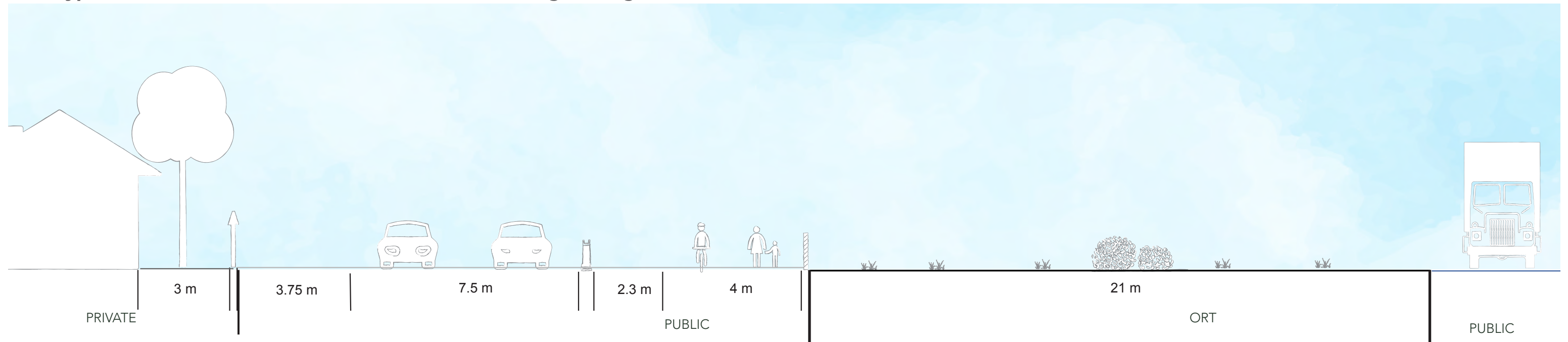
Design Guidelines Zone 2 Gateway (Facing West)

- A. Add bike share and wayfinding sign
- B. Make existing RWT path bike only
- C. Buffer from busy road that includes bushes and shade providing trees
- D. Move fence to edge of Clement Ave.

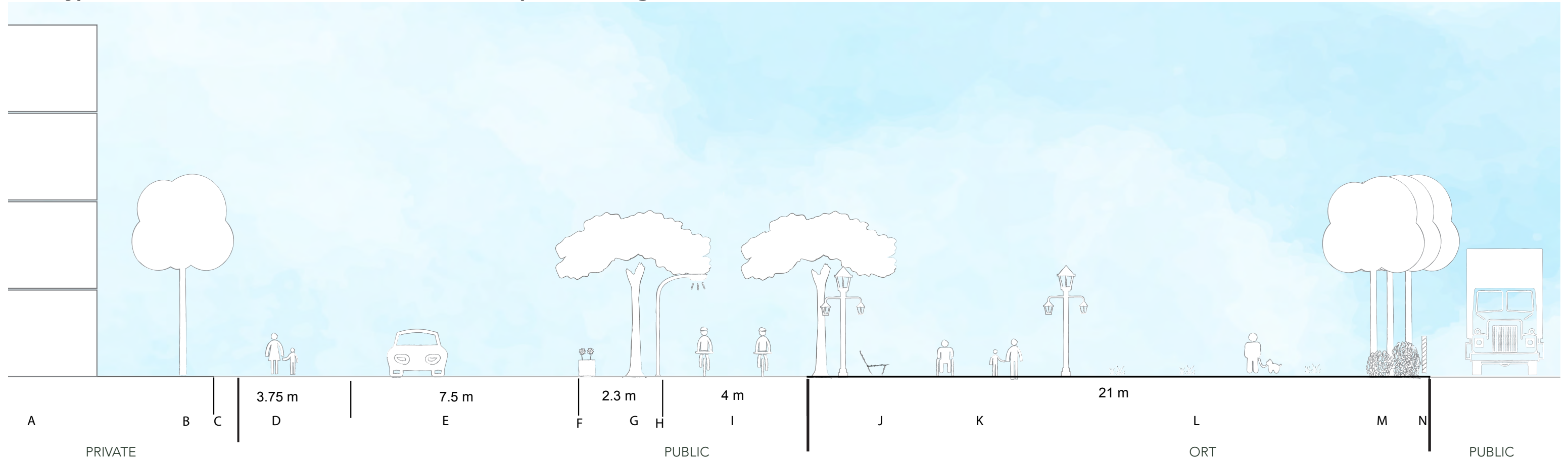
Recommendations for the ORT corridor that compliment the design guidelines for adjacent properties

- E. Add all gateway amenities
- F. Pedestrian ONLY paved sidewalk
- G. Add picnic tables
- H. Use 'Flex space' for food trucks

Prototypical Zone 2 at Vineland Street Cross Section: Existing - Facing West (43 m)



Prototypical Zone 2 at Vineland Street Cross Section: Proposed - Facing West (43 m)



Zone 2 prototypical (Facing West)

- A. Change all adjacent residential zoning to MRM zoning with frontage facing the ORT
- B. High canopy tree(s) from approved Kelowna tree list to retain sightlines to and from the ORT
- C. For adjacent low density residential adjacent uses, fences and other barriers should not exceed 4ft in height. Exceptions will be considered for barriers that provide ecosystem services such as food production, pollinators species habitat or rain gardens that replenish aquifers.
- C.. For adjacent medium density apartment type units, no fencing will be allowed, instead landscaping and a wider permeable sidewalk should be included
- D. Semi permeable sidewalks
- E. Add crosswalks at intersections of local roads

- F. Concrete planter box with breaks to allow pedestrians and cyclists to cross the street and access the ORT and RWT. Planter box will also protect ORT and RWT users from vehicles.
- G. Shade providing tree(s) from approved Kelowna tree list to reduce the impact of high summer temperatures
- H. Lighting
- I. Make existing RWT path bike only
- J. Seating options
- K. Pedestrian ONLY paved sidewalk
- L. The intention of the flex space in this zone is to perpetuate a neighbourhood family feel and could change throughout the zone to include all of the flex space options
- M. Buffer from busy road that includes bushes and shade providing trees
- N. Move Fence to the road edge

Zone 3 Mill Creek

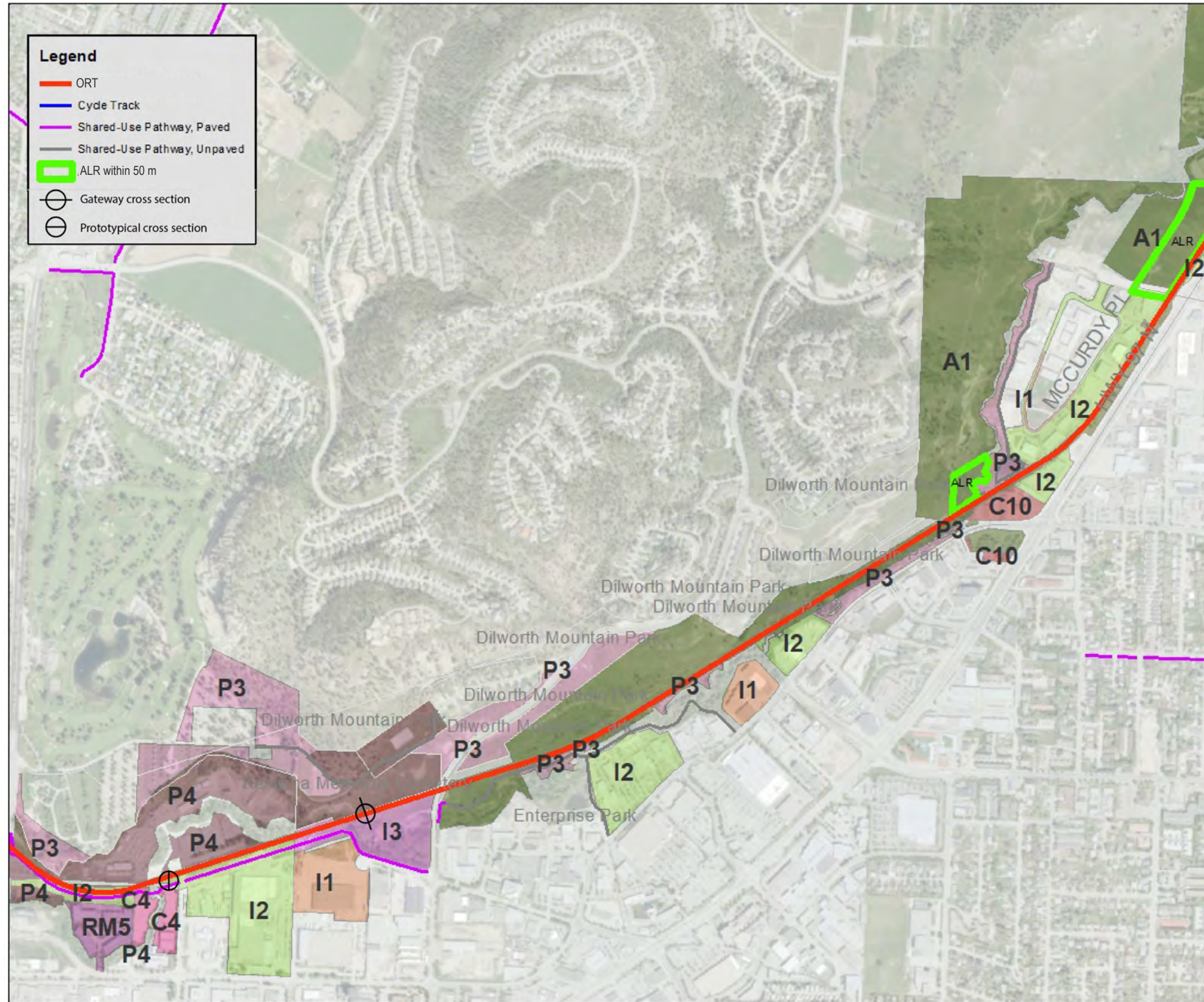
SPALL ROAD TO MCCURDY ROAD



The intention of the Mill Creek zone is to showcase Kelowna's history and promote outdoor recreation in urban and natural areas.



Zone 3: Spall Rd. to McCurdy Rd.



Zone 3 Key Characteristics:

Highly complex area with no dominant land use zoning. Significant sensitive ecosystems within the ORT area. Most areas that are sensitive are zoned as ALR, A1 or P3.

Key Assets:

- Enterprise Park
- Mill Creek Linear Park
- Dilworth Mountain Park
- Kelowna Memorial Cemetery
- Grist Mill
- Intersection at McCurdy Rd. and Highway 97 (connection to Rutland)
- 1494-1495 Hardy St.

Limitations:

ALR, Mill Creek, Adjacent to sensitive ecosystems that are near the water course.
At McCurdy and 97N, there are nearby vulnerable groundwater aquifers.

Pinch points:

- West of Highway 97 - 15.8 m
- East of Spall - 15.3 m

Current population (Census 2016):

Includes parts of census tracts 0015.00 and 0019.01
Approximate population density per sqkm:
217 and 1951

Active Transportation:

Not many routes connecting north-south across ORT.

Current access points:

- 1501 Hardy St.
- Dilworth Dr.
- McCurdy Rd. at Hwy 97

Zoning of parcels within 50m:

- ALR - Agricultural Land Reserve
- A1 - Agriculture 1
- C4 - Urban Centre Commercial
- C10 - Service Commercial
- I1 - Business Industrial
- I2 - General Industrial
- I3 - Heavy Industrial
- I4 - Central Industrial
- P1LP - Parks and Open Space (Liquor/Primary)
- P2 - Education and Minor Institutional
- P3 - Parks and Open Space
- P4 - Utilities
- RM5 - Medium Density Multiple Housing

N
1:12,000

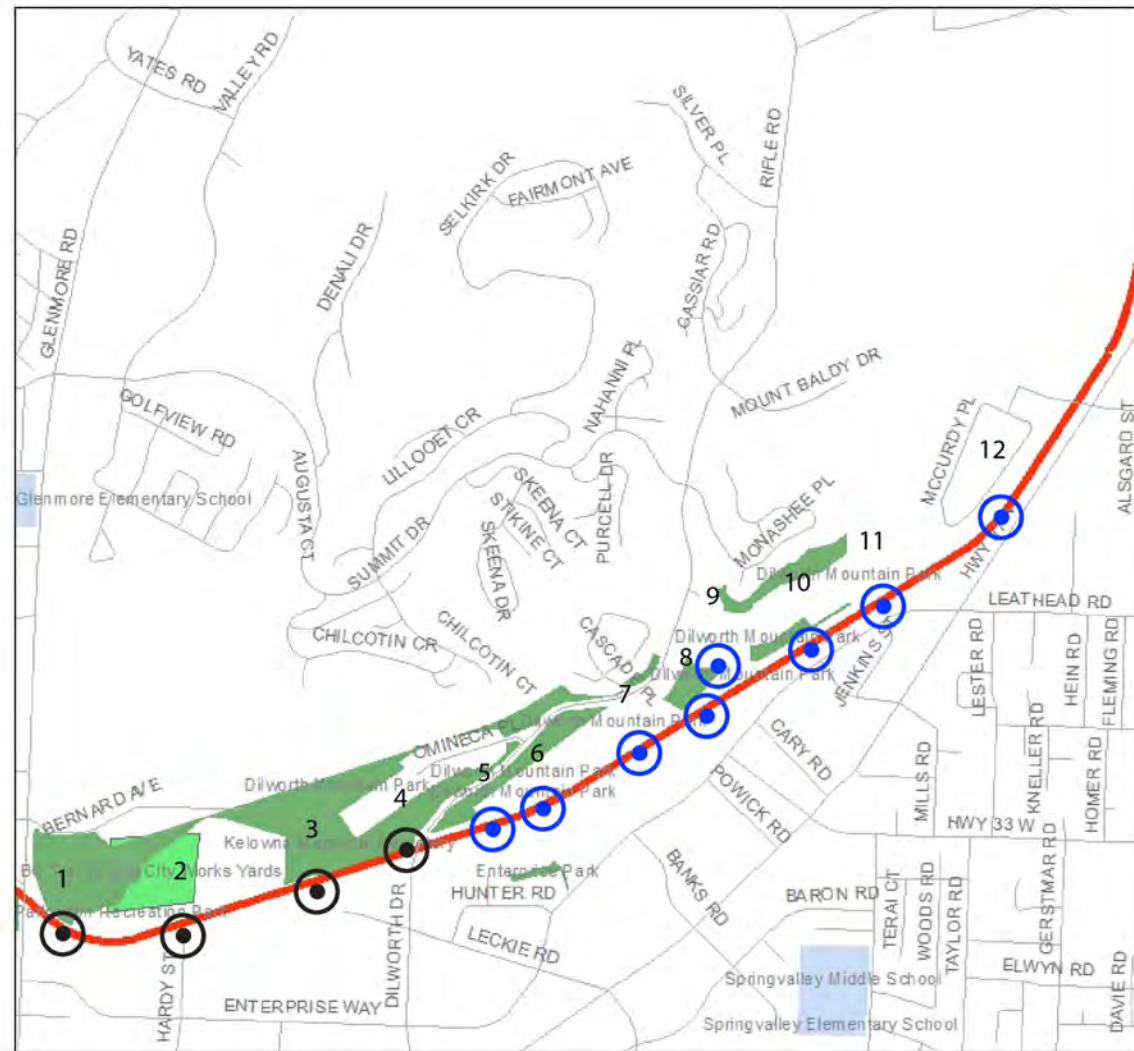
Source: City of Kelowna Data Set, Accessed 23.01.2019 by S.Chin
Canadian Census Data, 2016. Accessed 03.02.2019 by S.Chin

ZONE 3. MCCURDY ROAD TO SPALL ROAD

This 3.8 kilometre zone begins at McCurdy Road and ends at Spall Road. Due to the diverse land use composition, this section of the ORT presents challenges because of the mix of land uses and natural ecosystems. This section of the ORT contains industrial use (I1, I2 and I3), agricultural (often not included in the ALR), commercial (C4 and C10), residential (RM5 and RU1), and public & institutional (P3 and P4). This section also runs parallel to water bodies (Mill Creek) and sensitive ecosystems, as well as overlapping vulnerable groundwater aquifers. This zone features four adjacent parks: Enterprise Park, Mill Creek Linear Park, Dilworth Mountain Park and Kelowna Memorial Cemetery.

This mixed land-use and the presence of significant public parks (in number and extension) provides this section of the ORT with great potential for effective use as a place to recreate and as an active transportation asset. However, there are only four intersections to access the ORT within this 3.8 kilometre section. In order to provide the City with the full benefits of the ORT, its mixed land-use and the adjacent public parks, it is strongly recommended that more access points be added. Key locations in this section are the intersection of McCurdy Road and Highway 97 (for its connectivity with the Rutland Urban Centre) and Grist Mill (for its historical significance and role as a public park).

Finally, at 1494-1495 Hardy St. there is a city owned property that is currently used as a BC Transit and City Works Yard. Although the City does not anticipate this property as a place for the public to connect to the ORT or gather, its location adjacent to the ORT. Additionally, its extension would be an asset to service requirements for any rapid transportation mode that could be developed in the future on the ORT.



Access Points

Location	Type of access	Existing / Recommended / Possible*
1. Alphonse Rd.	Lane	Existing
2. Hardy St.	Road	Existing
3. Leckie Pl.	Road	Existing
4. Dilworth Dr.	Road	Existing
5. ~150m E of Dilworth Dr.	Bike and Pedestrian Only	Recommended - Provide bike and pedestrian access from Enterprise Park
6. ~280m E of Dilworth Dr.	Bike and Pedestrian Only	Recommended - Provide bike and pedestrian access from Enterprise Park
7. Enterprise Park trail via Enterprise Way	Bike and Pedestrian Only	Existing access through Enterprise Park. Recommended - Add protected bike lane on Enterprise Way to allow safe connection to Enterprise Park
8. Hwy 33 extension	Bike and Pedestrian Only	Recommended - Provide access to ORT over stream
9. Glacier Cr.	Bike and Pedestrian Only	Recommended - Maintain path to connect residents North of the ORT. This access is challenging because of the steep topography (35 grade change)
10. Commerce Ave.	Bike and Pedestrian Only	Recommended - Provide crossing over stream
11. Jenkins St.	Bike and Pedestrian Only	Existing (as of 2020)
12. Hwy 97 across from Kelowna Nissan	Bike and Pedestrian Only	Recommended - Provide access over Hwy, near Kelowna Nissan

Land Use Recommendations

Due to the variety of land uses in this zone, land use recommendations are limited to a pilot area study and if the pilot proves to be a success other areas can also be rezoned. It is recommended that the current commercial use adjacent to Hardy Street and Enterprise Way be changed to Mixed Use Residential/Commercial (MXR) for a pilot study. Though this area lies outside the Urban Core, it is recommended for MXR zoning given its proximity to zone 2 and the fact that current C4 zoning is considered 'Urban Centre Commercial'. MXR designation would provide a transition between current commercial uses and adjacent multi-residential use (RM5), while giving spatial consistency to a zone that is mixed use. Additionally, industrial properties that could also be designated as MXR if the pilot is successful, are highlighted. Zone 3 would benefit from a shift away from industrial uses due to its recreational potential and natural character.

While outside the 50m scope of this report, it is important to note that beyond the adjacent industrial uses, this zone is predominantly commercial and residential. To accommodate the recent March 4, 2019 news release *Official Community Plan update: Planning for urban and suburban growth*, these commercial areas should explore the potential of MXR development. There is a somewhat uniform band of C4 (Urban Centre Commercial) and allowable principle uses are mainly apartment hotels, motels, apartment housing, multi-dwelling housing, micro-suites, and temporary shelter services among others.

With these uses, future MXR zoning can allow for retention of commercial space while blending permanent residential uses in the same land area. Furthermore, the blend of commercial and residential uses will serve as a transition to the residential zoning in zone 2

Gateway

The parcel of land that is currently occupied by Brent's Grist Mill has been identified as historically significant. The preservation of the Grist Mill reflects the community's commitment to conserving their built heritage. Currently, the Grist Mill consists of a mill and two associated buildings; Brent's residence and a dairy barn. The three buildings are located on a large site at the northwest corner of Dilworth Drive and Leckie Place, adjacent to Mill Creek and the CN right-of-way. The buildings were relocated here in 2002 and are sited to retain their original orientation to one another, including their location along Mill Creek. The buildings are in the process of being restored by the Central Okanagan Heritage Society.

While located on I3 zoning and on an area that has a waterway, there are no observable industrial uses on this parcel of land. As such, this location would be an excellent location for a Gateway that also celebrates local history.

Existing land use conditions at potential Gateway parcel (top right).



Zone 3 Gateway at Grist Mill: Existing - Facing East (50 m)



Zone 3 Gateway at Grist Mill: Proposed- Facing East (50 m)



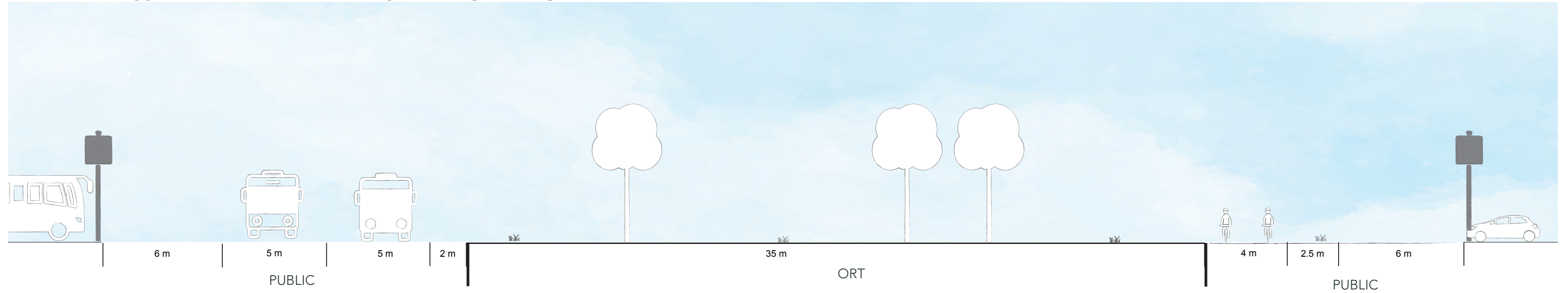
Design Guidelines for Zone 3 Gateway (Facing East)

- A. Plan to level slope and put in retaining wall to allow for future mass transit option. ART should be on the left hand side of the bike lane to avoid cyclists and pedestrians dangerously crossing to access the Gateway. Change I3 zoning to 'Gateway zoning'
- B. Pedestrian ONLY paved sidewalk
- C. Add all gateway amenities

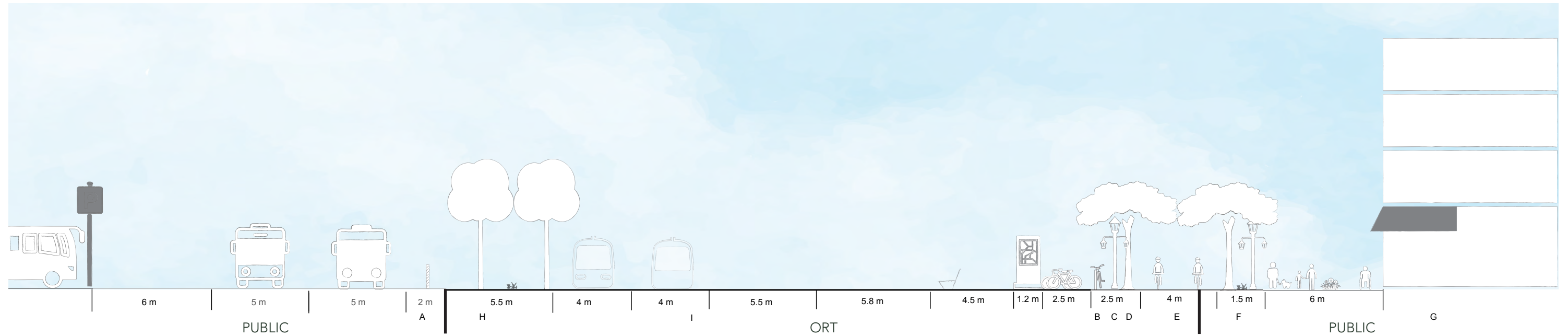
Recommendations for the ORT corridor that compliment the design guidelines for adjacent properties (from left to right)

- D. Make pathway bike ONLY
- E. Add lighting, bike share and wayfinding sign

Zone 3 Prototypical Cross Section at Hardy: Existing - Facing East (63.5 m)



Zone 3 Prototypical Cross Section at Hardy: Proposed - Facing East (63.5 m)



Zone 3 prototypical (Facing East)

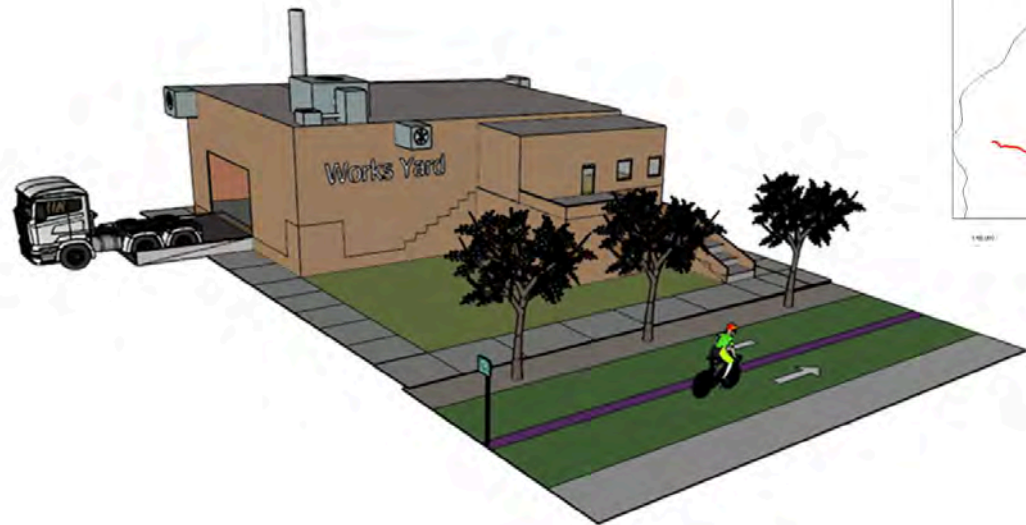
- A. Add fence to buffer the ORT from the road
- B. Add bike rack
- C. Add Lighting
- D. Shade providing tree(s) from approved Kelowna tree list to reduce the impact of high Summer temperatures
- E. Make existing RWT path bike only
- F. Pedestrian ONLY paved sidewalk
- G. Pilot the conversion of the Commercial zone to a mixed use development.

Recommendations for the ORT corridor that compliment the design guidelines for adjacent properties (from left to right)

- H. High canopy tree(s) from approved Kelowna tree list to retain sightlines to and from the ORT
- I. 'Flex space' uses to allow for future mass transit. ART option is pictured here.

Zone 4 The Works Yard

MCCURDY ROAD TO HIGHWAY 97 OVERPASS



The purpose of the Works Yard zone is to make current uses compatible with recreational and transportation uses of the ORT.



Zone 4: McCurdy Dr to Hwy97 Ramp



Zone 4 Key Characteristics:
 Low density, area dominated by A1 or ALR.
 Some A1 areas include recreational services or protect ecological services.
 Some commercial and industrial uses.
 No residential.

Key Assets:
 Bulman Rd. Multi-Use Pathway
 Mill Creek
 Carney Pond
 4690 Highway 97 N (Future City Works Yard)
 No parks within 50m

Limitations
 Mill Creek and Carney Pond.
 Significant sections crossover vulnerable ground level aquifers.
 One small adjacent section of sensitive ecosystem

Pinch points:
 Neave Road - 15.6 m
 West of Highway 97 - 17.8m

Current population (Census 2016):
 Includes parts of census tracts 0019.01
 Approximate population density per sqkm:
 217

Active Transportation:
 Not many routes connecting east-west across ORT.

Current access points:
 Fenwick Rd. at ORT
 Sexsmith Rd. at ORT (near Reid's Corner)
 Lougheed Rd. at ORT
 Bulman Rd. Multi-Use Pathway

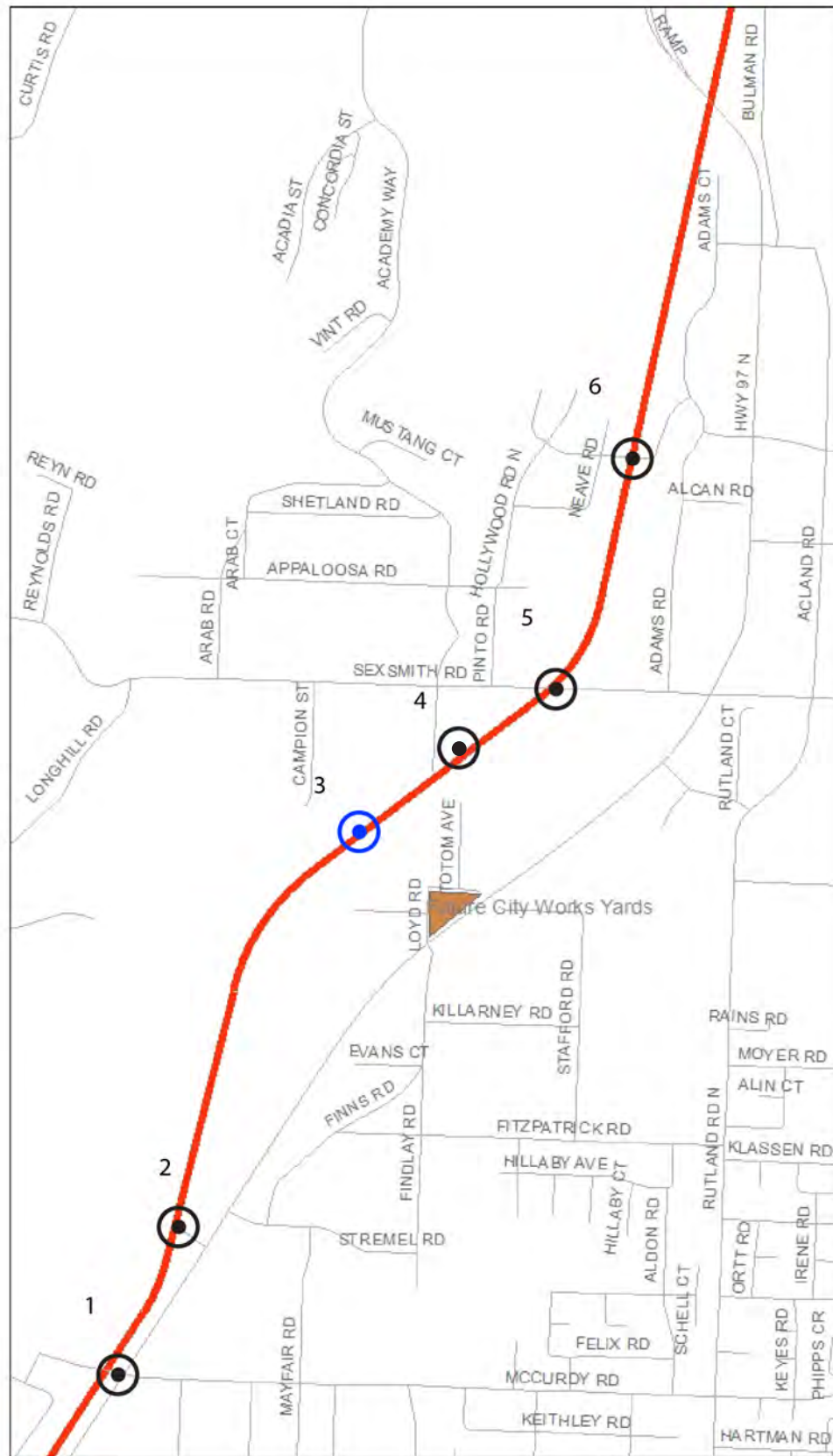
Zoning of parcels within 50m:
 ALR - Agricultural Land Reserve
 A1 - Agriculture 1
 C3LP - Community Commercial (Liquor Primary)
 C9 - Tourist Commercial
 C10 - Service Commercial
 I1 - Business Industrial
 I2 - General Industrial
 I3 - Heavy Industrial
 I6 - Low Impact Transitional Industrial

Note: ALR land extends beyond the green box.
 Box provided immediate adjacent land use conflict.



1:11,000

Source: City of Kelowna Data Set, Accessed 23.01.2019 by S.Chin
 Canadian Census Data, 2016, Accessed 03.02.2019 by S.Chin



ZONE 4. MCCURDY ROAD TO HIGHWAY 97

This section of the ORT is approximately 4 kilometres long and goes from the underpass of the ORT and Highway 97N to the intersection at McCurdy Rd. Adjacent lands in this section have a distinct land-use composition of industrial (mainly I2) and agricultural land (both ALR and non-ALR land). There is very limited commercial use in this section. Additionally, there is a significant presence of natural ecosystems such as Carney Pond (the first interpretive site) and Mill Creek, vulnerable groundwater aquifers (mostly under the current industrial zone) and a minor area adjacent to sensitive ecosystems. This zone serves an important ORT function by ensuring there is an active transportation connection to UBC-O and the airport.

The industrial zones overlap vulnerable groundwater aquifers. Similar to the previous section, there is a low number of intersections and access points that highly limit the potential for active transportation. Providing more intersections and access points to the ORT could enhance connectivity with residents of the growing Rutland Urban Centre (estimated 9% growth between 2018-2040) and can enhance active transportation, public transit use, recreational and commercial activity. Finally, there is a city owned lot at 4690 Highway 97 that is expected to be a future City Works Yard. Active transportation access in this section includes Sexsmith Road (bike lane intersection) and McCurdy Road (sidewalk intersection).

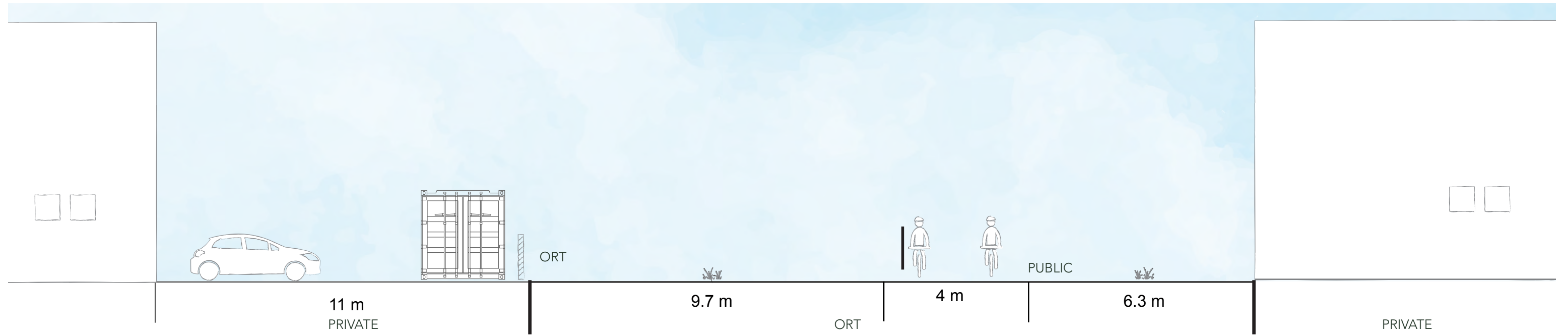
Access points:

Location	Type of access	Existing / Recommended / Possible*
McCurdy Rd.	Bike and Pedestrian Only	Existing
Fenwick Rd.	Road	Recommended - Provide paved pedestrian and bike only access
Cambro Rd.	Bike and Pedestrian Only	Existing
Sexsmith Rd.	Road	Existing
Lougheed Rd.	Road	Existing
Bulman Rd. multi use pathway	Bike and Pedestrian Only	Existing

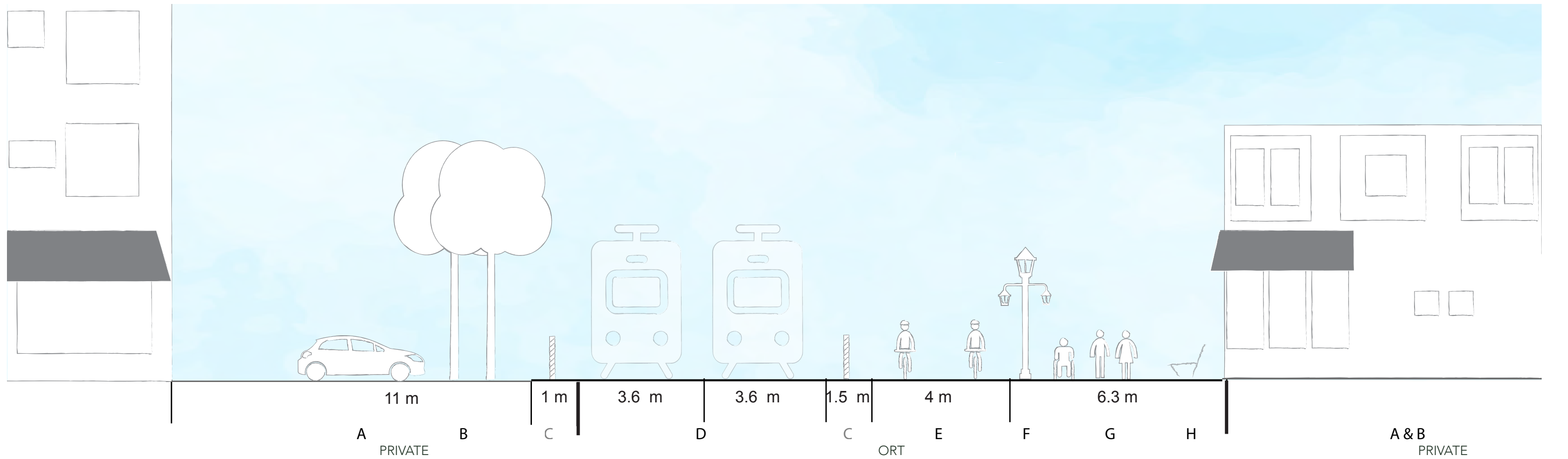
At this time, there is no recommendation for a Gateway location. However, some basic amenities, such as a restroom and a water fountain should be provided in this zone.

Another opportunity in this zone is at the Bulman multi-use path access point. This location could have some kind of public art installation that signals the start of the urban portion of the ORT. This could take the form of a mural on the underside of the HWY 97 overpass commissioned by a local artist of group of UBC-O students.

Zone 4 Prototypical Cross Section at Cambro Road: Existing - Facing North East (31 m)



Zone 4 Prototypical Cross Section at Cambro Road: Proposed - Facing North East (31 m)



Zone 4 prototypical (Facing Northeast)

- A. Building frontage facing the ORT with mandatory setbacks upon redevelopment
- B. Properties adjacent to the ORT should provide a tree buffer

Recommendations for the ORT corridor that compliment the design guidelines for adjacent properties (from left to right)

- C. Addition of protective fencing to buffer against mass transit option ONLY when mass transit option is built. No fence allowed until that time.
- D. 'Flex space'
- E. Make pathway bike ONLY
- F. Add lighting
- G. Pedestrian ONLY paved path
- H. Add seating

Zone 5 Farms and Flights

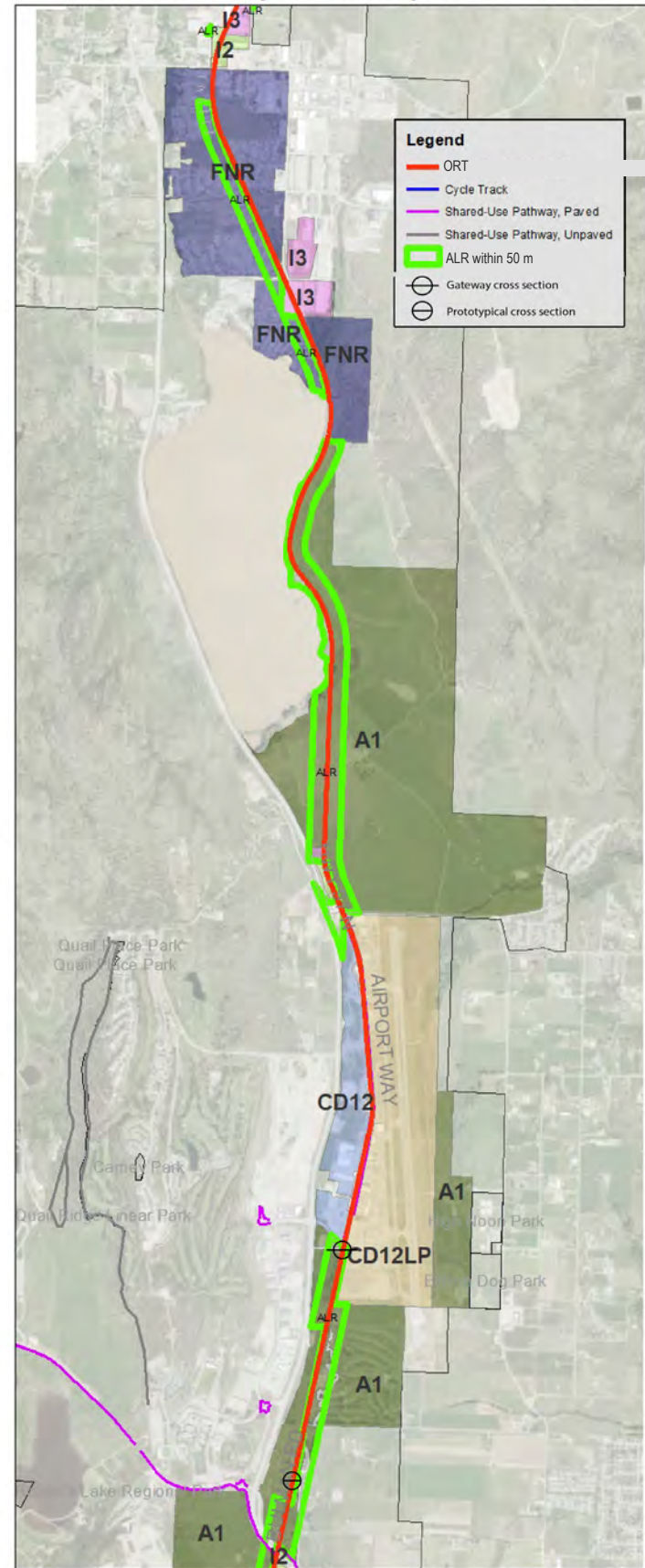
HIGHWAY 97 OVERPASS TO BEAVER LAKE ROAD



The focus of the Farms and Flights zone is to provide a seamless connection from UBC-O and the airport to downtown Kelowna.



Zone 5: Hwy97 Ramp to Beaver Lake Rd.



Zone 5 Key Characteristics:

First Nations Reserve land with area dominated by A1 or ALR. Transportation corridor is not continuous in this area.
Kelowna International Airport and UBC - Okanagan dominate as major land uses.
No residential.

Key Assets:
Bulman Rd. Multi-Use Pathway
Mile Creek
Carney Pond
4500 Highway 97 N (Future City Works Yard)
No parks within 50m

Limitations:
ALR denied permission for construction of a three-kilometre section of the path through farms and between airport and Lake Country.
Mile Creek and Carney Pond.
Significant sections crossover vulnerable ground level aquifers.
One small adjacent section of sensitive ecosystem

Pinch points:
Neave Road - 15.6 m
West of Highway 97 - 17.2m
ALR land between airport and Lake Country

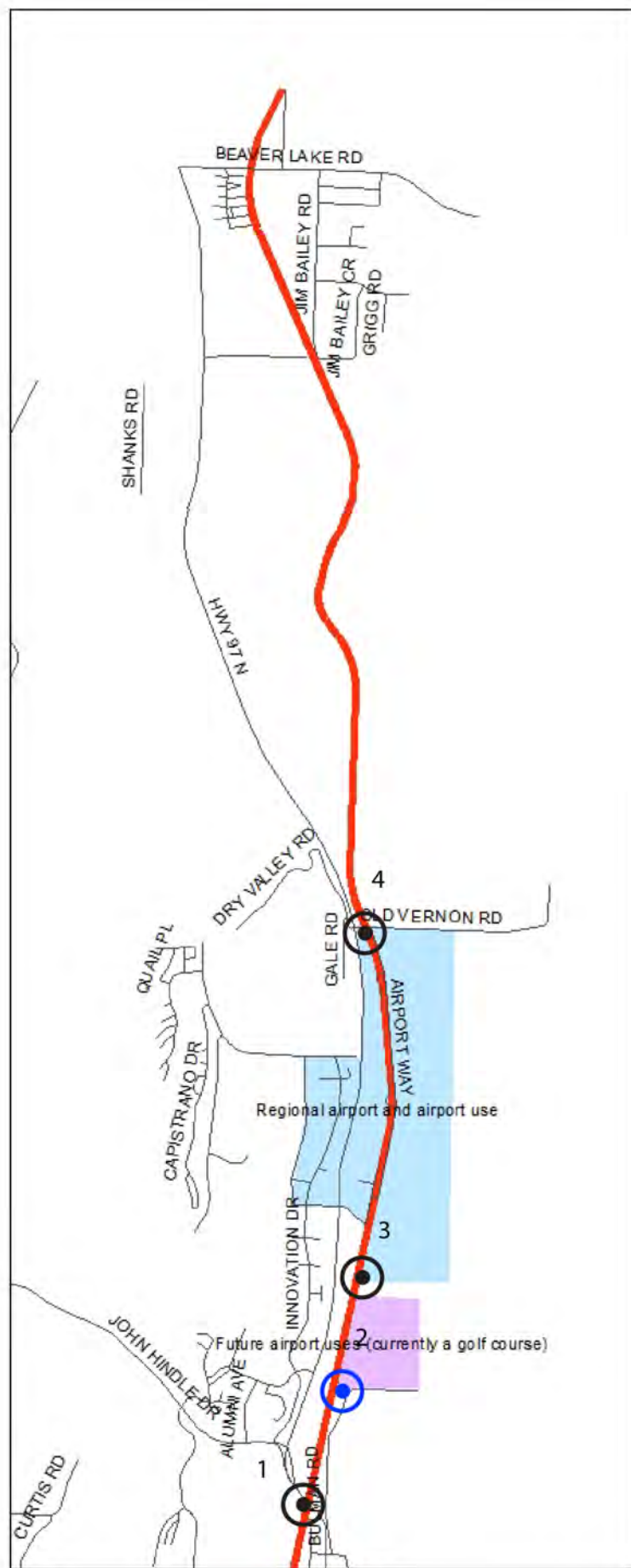
Current population (Census 2016):
Includes parts of census tracts 0019 01
Approximate population density per sqm:
217

Active Transportation:
Not many routes connecting east-west across ORT.

Current access points:
Fenwick Rd. at ORT
Sixsmith Rd. at ORT (near Reids Corner)
Lougheed Rd. at ORT
Bulman Rd. Multi-Use Pathway

Zoning of parcels within 50m:
ALR - Agricultural Land Reserve
A1 - Agriculture
FNR - First Nations Reserve
CD12 - Comprehensive Development
CD12LP - Comprehensive Development (Liquor Primary)
CS - Tourist Commercial
B - Heavy Industrial

Note: Only ALR within 50m was identified for immediate adjacent analysis. ALR extends further.



1:45,000

Legend

● Existing Access Points

● Recommended Access Points

ZONE 5. BEAVER LAKE ROAD TO HIGHWAY

This last section of Kelowna's ORT is approximately 10 kilometres long and stretches from the northern limit of the City's boundary to where the ORT passes under Highway 97N. Most of the adjacent lands are designated by the City as agricultural and included in the Agricultural Land Reserve (ALR). Agricultural and ALR lands are beyond the scope of land use change recommendations. Key locations in this section are the Kelowna International Airport (the airport) and UBC's Okanagan Campus (UBC-O). In addition to its agricultural composition, this section of the ORT is adjacent to First Nation Reserves, as well as sensitive ecosystems, vulnerable groundwater aquifers and water bodies, such as Ellison Lake.

While these features restrict most types of development, they highlight the scenic features of the valley. In this section, there are no parks within 50 metres of the ORT.

There are also a very low number of access points to the ORT in this 10 kilometre section. This limitation is mainly caused by the large extension of agricultural lands, the extended airport property and the lack of a dense road network. This zone serves an important ORT function by ensuring there is an active transportation connection to the District of Lake Country.

As a result, this report proposes more access points along all parts of the ORT, though increasing the number of access points in this zone is highly limited due to the constraints mentioned before. The government owns lands at 5533 Airport Way and 3770 Bulman Rd. These locations are reserved for current and future airport uses, but may also provide an opportunity to connect airport traffic with UBC-O and the rest of the City. Similar opportunities could be explored to integrate UBC-O with the City.

There are only two active transportation intersections at the Airport and Bulman Road. There is one bike lane near Beaver Lake Road at Jim Bailey Crescent that is close to the ORT, but it does not connect.

Access points:

Location	Type of access	Existing / Recommended / Possible*
Bulman Rd. North of Hwy 97	Bike and Pedestrian Only	Possible
Bulman Rd. South of Shadow Ridge Golf Club	Bike and Pedestrian Only	Recommended - Provide paved pedestrian and bike only access
Airport Way	Road	Existing
Old Vernon Rd.	Road	Existing

Land Use Recommendations

Due to the constraints of the ALR and the Airport parcels, there are no major recommendations for land use changes in this zone.

Existing land use conditions at potential Airport Gateway parcel (Google Satellite Imagery, right).

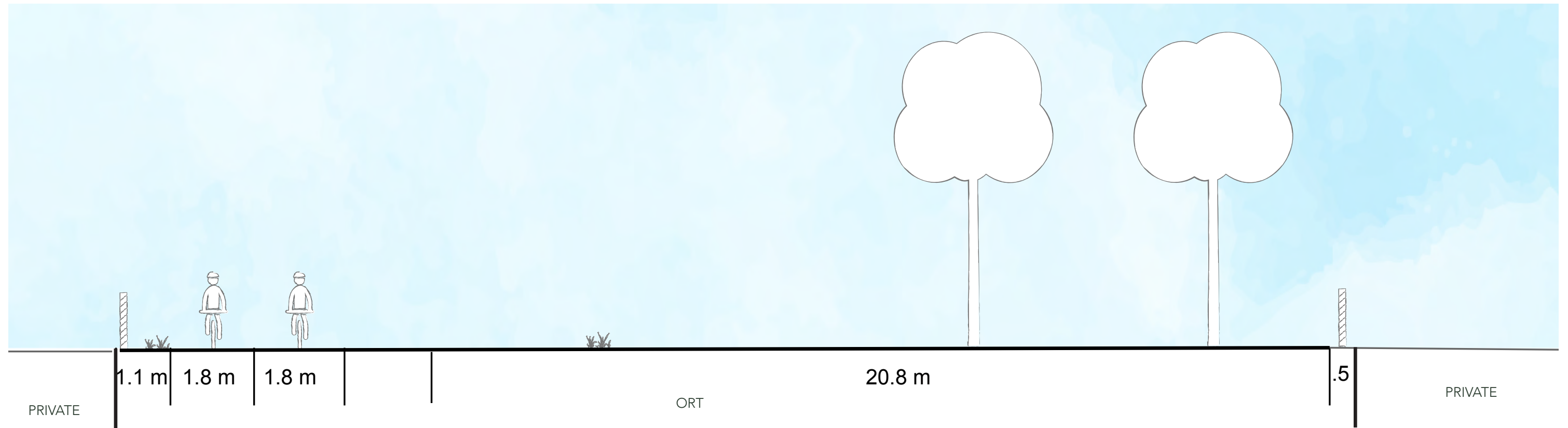
Airport Gateway

As recommended by the City of Kelowna the location of the gateway will be immediately outside the main entrance of the airport. This integrates the airport with the ORT and ensures a seamless connection with downtown and future rapid transportation options to help relieve traffic congestion on Hwy 97.

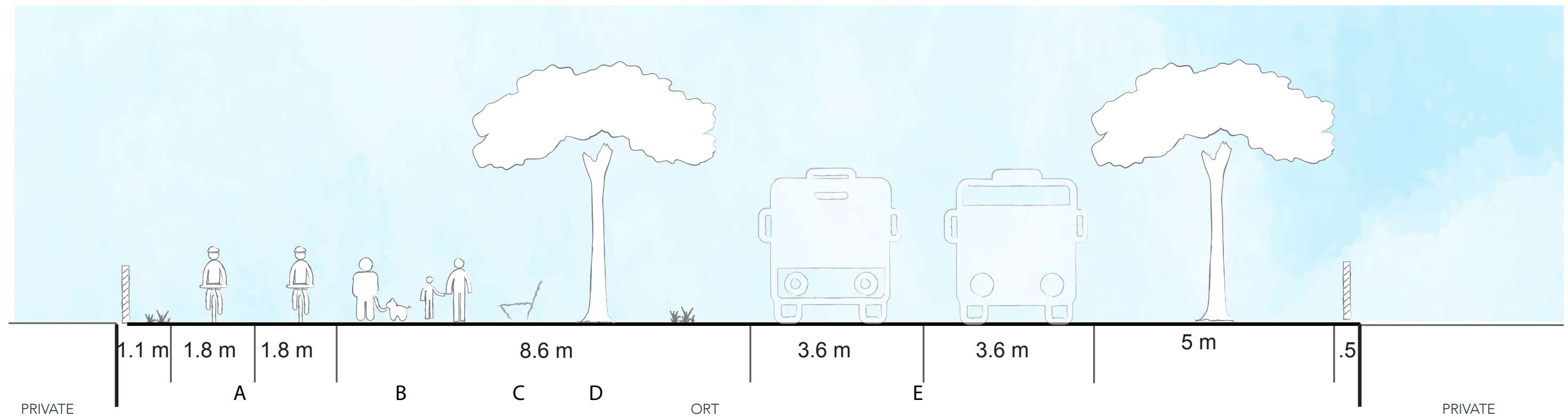
To capture airport travellers as users of the ORT, bike share, signage and ORT information should be placed near the main entrance of the airport. Additional gateway amenities, such as washrooms or water fountains, will not be required due to the proximity to the airport.



Zone 5 Prototypical Cross Section at Bulman Road: Existing (26 m)



Zone 5 Prototypical Cross Section at Bulman Road: Proposed (26 m)



Recommendations for the ORT corridor that compliment the design guidelines for adjacent properties (from left to right)

- A. Make pathway bike ONLY
- B. Pedestrian ONLY paved path
- C. Add seating
- D. Shade providing tree(s) from approved Kelowna tree list to reduce the impact of high summer temperatures
- E. 'Flex space' - BRT option pictured

TRANSPORTATION OPTIONS

As indicated by the City's RFP, a list of forward-thinking transportation options is required to help inform future development of the ORT as a rapid transportation corridor. For each option, the physical, electrical, demographic, construction and financial requirements for each option were researched and presented in Appendix 3. Most importantly, the list in Appendix 3 makes clear the actions which need to be taken to not preclude these feasible options in the future. An explicit explanation for why each option is proposed is also provided.

However, the table below will provide a high-level overview of each option.

<p>Autonomous Rapid Transit</p>	<p>Description: ART is a crossover between a train, a bus, and a tram. It is at grade and compatible with existing road infrastructure. It is a rail-less system for urban passenger transport, similar to other guided busways.</p> <p>Pros:</p> <ul style="list-style-type: none"> • Works with existing road infrastructure, can run alongside car traffic and bus traffic • No need to build new rail infrastructure resulting in cheaper and faster implementation • No need to maintain rail infrastructure resulting in cheaper ongoing track maintenance <p>Cons:</p> <ul style="list-style-type: none"> • First trial built in China in 2018 cost 2,857,575.00 Canadian Dollars for a 6.5 km test track. This breaks down to \$439,626 per km of track • Costs do not include station costs • Platforms for getting on and off the ART need to be constructed which could have varying costs <p>Key Considerations: A minimum width of seven metres needs to be left uninhibited through the entire right of way to accommodate a track in both directions</p>	<p>Micromobility – Bike Share</p>	<p>Description: A bike-sharing system, public bicycle system, or bike-share scheme is a service in which bicycles are made available for shared use to individuals on a short-term basis for a price or for free. Electric assist bikeshares are possible options for this model.</p> <p>Pros:</p> <ul style="list-style-type: none"> • The DropBike was piloted in Kelowna. • Stats Canada reports that Kelowna's to work cycling and walking mode shares were 3.0% and 5.6% respectively. These are above the average in British Columbia. • Globally, bikeshare programs are popular. A well designed and implemented bikeshare program have been proven to be effective in relieving congestion and air pollution. <p>Cons:</p> <ul style="list-style-type: none"> • Bikeshares are often subject to theft and vandalism. Best practices are to use commuter bikes with specially designed parts and sizes that would discourage theft and resale <p>Key Consideration: A best practice is for a city to enter into a contract with a vendor that maintains, repairs and incurs all liability or fees associated with the bikeshare program. As such, the life expectancy of the drop bikes will be hinged upon the commercial agreement between vendor and city. Another practices is to use commuter bikes with specially designed parts and sizes that would discourage theft and resale.</p>
<p>Light Rapid Transit</p>	<p>Description: Light rail transit (LRT) is a form of urban rail transport using train cars on tracks similar to a tramway, but operating at a higher capacity and on an exclusive right-of-way (the existence of an exclusive right of way is generally what separates LRT from a tram system).</p> <p>Pros:</p> <ul style="list-style-type: none"> • LRT systems can accommodate a high volume of commuters. • A typical four car LRT can accommodate 720 passengers at once <p>Cons:</p> <ul style="list-style-type: none"> • There is much variation in the cost of LRT • The biggest factor that affects the cost of rail transit projects is whether the alignment will be at grade, elevated, or underground—with underground projects costing much more than elevated, which costs more than at grade <p>Key Considerations: Narrower turning radii due to the gauge of the tracks (can be overcome using articulated cars) Tunnelling or building elevated guideways can rapidly increase the cost of LRT</p>	<p>Micromobility – Scooter Share</p>	<p>Description For the purposes of this research, 'scooter' refers to the kick-scooter model that is propelled by a standing rider pushing off the ground. Electric scooter-share for short term or short distance rentals was explored</p> <p>Pros:</p> <ul style="list-style-type: none"> • Electric scooters are another alternative active transportation option that can complement the infrastructure that supports cyclists and pedestrians. • Scooter is easier to use due to the smaller learning curve. <p>Cons:</p> <ul style="list-style-type: none"> • At this time, scooter companies have not released the average life span of their products. • Due to a scooter's small size and portability, theft and vandalism can be high. <p>Key Considerations: A best practice is for a city to enter into a contract with a vendor that maintains, repairs and incurs all liability or fees associated with the scooter share program. A stronger recommendation is to partner with a vendor that offers both bike and scooter share.</p>





CONCLUSION

The purpose of the ORT is to provide a critically important corridor for the City of Kelowna's future multimodal transportation needs. Similar to the Arbutus Corridor in Vancouver, the ORT is a rare opportunity to link pedestrians, cyclists, residents and commuters from one end of the city to the other and be a defining element of the City of Kelowna's identity.

The recommendations in this project aim to promote long-term use of the ORT as a transportation corridor, while encouraging active transportation options for residents and visitors alike.

There are four key concepts to encourage use of the ORT as a transportation corridor.

1. **Population Density** has been recognized to be highly influential in increasing usage of transportation corridors.
1. **Access Points and Gateways** are critical to increase walkability and use of active transportation infrastructure.
2. **Job Density** is highly correlated with commuting by public transit, as well as active transportation.
3. **Amenities** such as bike share, water fountains and washrooms can play a crucial role in encouraging people of all ages and abilities to use the ORT.

Recommendations were provided as:

- Design Guidelines;
- Access Points & Gateways;
- Land Use Changes; and
- Transportation Options.

Kelowna has the potential to be the first major city in the province to comprehensively implement safe active transportation networks. Integrating the values of the Compact City in planning and future development would make Kelowna a leader in North America and set new standards for transit-oriented development.

APPENDIX

Appendix 1. Case Studies

The Galloping Goose Regional Trail is a 55-kilometre rail trail between Victoria and Sooke. It is operated and maintained by the Capital Regional District. This trail is part of the Trans-Canada trail and intersects with the Lochside trail. The Galloping Goose provides both active transportation and recreation opportunities in and around Victoria and passes through urban and rural communities. The trail is multi-use and can accommodate cyclists, pedestrians, horses and dogs. The trail is closed to motor vehicles. Created in 1987, the trail was a former CN Railway. The surface is paved for approximately 13km. It's relevance for the ORT is that it is also in a mid-sized city in British Columbia.

The Arbutus Corridor is a former rail corridor in the City of Vancouver that has been redesigned to function as a paved active transportation corridor. The Arbutus Corridor is in a major city in British Columbia and has a seemingly similar commuter, recreational mix while being wide enough to accommodate light rail or other public transportation in the future. Current plans along the corridor can help inform design guidelines for the ORT by showing short term designs as well as long term designs for when some form of light rail will be implemented. The Arbutus Corridor connects users to adjacent residential and commercial locations and provides a link to the downtown core with infrastructure that physically separates users from motor vehicles. The Arbutus Corridor provides proof of concept in the British Columbia Context.

El Corredor Verde de Cali (Colombia) is a 17 kilometre former railway that crosses the city. This project has been highlighted for its strong conceptual framework that ties the transportation development of an electric tram with the sustainable revitalization of the city's center. In fact, the three pillars of this project are: mobility, environment and recreation. In this sense, the planning process of this project gives priority to the re-densification of the borders along the corridor, the central role of the electric tram for public transport and the mixed use of space through a network of recreational and cultural amenities and the promotion of business clusters.

San Francisco

In the last years, the City of San Francisco has faced the challenge of preserving and growing its Industrial base, while accommodating a growing population. With this in mind, San Francisco created the 'Production, Distribution & Repair' zoning code (PDR), that provides space for old and new PDR business, while prohibiting residential and limiting institutional uses. Additionally, this zoning also takes into account expectations for job growth within the PDR framework. What is interesting about this approach, is its goal oriented focus, while respectful for San Francisco past and present land use activities.

Reference:

San Francisco (2005). Production, Distribution & Repair. Available in: <https://oewd.org/Industrial>

San Francisco (2011). Central Corridor Planning Project. Available in: http://default.sfplanning.org/Citywide/Central_Corridor/Central_Corridor_Background_Report.pdf

Denver

Station level studies for Bike Share ridership have determined that the main 'built environment' variables for bike share ridership are: population density, job density and service and commercial uses (particularly, food related businesses). Understanding that the long term development of the ORT as a Transportation Corridor will require its activation with transportation modes that are sustained by users, it is most likely that Bike Sharing mode will be most useful at this moment. In this sense, it is suggested that activation of the ORT through planning, encourages the development of the variables that are most likely to influence ridership. Land use recommendations made in this report aimed to achieve the population densities that were associated with successful Bike share experiences. Denver's population density around stations can be associated with the population densities that have been recommended around Kelowna's ORT. In Denver's experience, a 400m buffer zone around Bike Share stations had –in average- less than 1700 people, allowing this variable to be associated with recommendations made for the future of the ORT.

Reference:

Rixey, A. (2013). Station-Level Forecasting of Bikesharing Ridership: Station Network Effects in Three U.S. Systems Transportation Research Record. Journal of the Transportation Research Board, No. 2387, Transportation Research Board of the National Academies, Washington, D.C., 2013, pp. 46–55.

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National Cycle Route 75

National Cycle Route 75 (NCR75 or The Hillend Loch Railway Path) - In 1982, this section of original national rail system was shut down. In 2011, a bike path was opened up that provided 24km of paved surface between Airdrie and Bathgate, UK. National Cycle Route 75 follows dismantled railways, riverside and canal tow paths, connecting urban areas to the countryside. The overall route is gentle with a total of 60m gained. In 2010, the rail was reopened as a fourth direct link between Glasgow and Edinburgh. Currently four trains run per hour in each direction with some sections running on electrified lines. The National Cycle Route 75 with the Hillend Loch Railway Path is an example of how pedestrian and cyclists pathways may be integrated with railways. With little available literature on NCR75, Google Satellite imagery was used for greater comparison. In 2011, a bike path was opened up that provided 24km of paved surface between Airdrie and Bathgate, UK. National Cycle Route 75 follows dismantled railways, riverside and canal tow paths, connecting urban areas to the countryside. Unfortunately, through this analysis, this case study may not be fully suited to fit the needs of the ORT, and hence was not heavily referred to throughout the Interim report. While the distance is similar, the land use surrounding NCR75 is heavily agricultural or rural and the population density is not comparable to the 2040 population projections of Kelowna.

Appendix 2.

Employment Density for current zoning (I4 is the most extended land use zoning in Zone 1, reason for which was selected for comparison with Employment Corridor zoning) was estimated according to the Employment Density Matrix described in the Employment Density Guide of 2015 developed by the UK Government (Homes & Communities Agency, 2015).

Zone 1 Employment Density Estimation	Current Zoning Potential (I4)	Employment Corridor Potential
Minimum Employment Density (square meters per full time job)	95	77
Maximum Employment Density (square meters per full time job)	36	8

References:

Homes & Communities Agency (2015). Employment Density Guide, 3rd Edition. London, UK: UK Government. Available in: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/484133/employment_density_guide_3rd_edition.pdf

Appendix 3.

Estimation of current number of units was made by i) counting single family properties and, ii) researching the real estate market, for multi-residential properties. In the case of Mill Creek Estates, where the number of total units was not found, the number of units was estimated by calculating unit/sq. meters in other RM5 of this zone. Population per unit (2.5) was obtained from Statistics Canada 2016 Census for the corresponding census track for Zone 2 (Statistics Canada, 2016).

Zone 2 Population Density Estimation	Current	Potential after Recommended Zoning
Number of Units	375	1050
Population	937	2625

This estimation allows zone 2 population density to be associated with Denver Bike Share system in which stations have, in average, 1700 people living around a 400 meter buffer (Rixey, 2013).

References:

Statistics Canada (2016). Census Profile, 2016 Census for Geographic Area 9150015.00 [Census Tract]. Available in: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CT&Code1=9150015.00&Geo2=CMACA&Code2=915&Data=Count&SearchText=9150015.00&SearchType=Begins&SearchPR=01&B1=All&TABID=3>

Rixey, A. (2013). Station-Level Forecasting of Bikesharing Ridership: Station Network Effects in Three U.S. Systems Transportation Research Record. Journal of the Transportation Research Board, No. 2387, Transportation Research Board of the National Academies, Washington, D.C., 2013, pp. 46–55.

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Appendix 3. Transportation Options

Type of transit	Autonomous Rapid Transit (ART)
Description	ART is a crossover between a train, a bus, and a tram. It is at grade and compatible with existing road infrastructure. It is a railless system for urban passenger transport, similar to other guided busways. Its external appearance, composed of individual, fixed sections joined together by articulated gangways, resembles a rubber-tired tram, although it has the flexibility to move around like a standard articulated bus. The ART is equipped with various sensors to assist the driver in following the route on a virtual track, or to make detours in the case of traffic jams. A Lane Departure Warning System helps to keep the vehicle in its lane and automatically warns if it drifts away from the lane. A Collision Warning System supports the driver on keeping a safe distance with other vehicles on the road and if the proximity reduces below a given level, it alerts the driver by a warning sign. The Route Change Authorization is a navigation device, which analyzes the traffic conditions on the chosen route and can recommend a detour to avoid traffic congestion. The Electronic Rear-view Mirrors work with remotely adjustable cameras and provide a clearer view than conventional mirrors including an auto dimming device to reduce the glare.
Width required	2.65 metres wide per direction (total 5.3 metres plus between buffer = 7 metres)
Life expectancy considerations	25 years
Power considerations	<ul style="list-style-type: none"> The train is powered by lithium–titanate batteries and can travel a distance of 40 km per charge The batteries can be recharged via current collectors at individual stations. The re-charging time for a 3 to 5 km trip is 30 seconds, and for a 25 km trip, 10 minutes
Why it fits with the physical site considerations	<ul style="list-style-type: none"> The ART is advantageous where construction of rail infrastructure is not possible The ART can make turns easily and navigate through challenging intersections Would not require a significant amount of effort to fit it into current transit patterns The average ORT right of way of 20 metres can easily accommodate the 5.3 metre width required to run ART Grade concerns are not an issue as the section of ORT in Kelowna is flat
Why it fits with the demographic considerations	<ul style="list-style-type: none"> The ART can carry 100 people per cabin. ARTs can currently be constructed with up to five cabins, resulting in a carrying capacity of 500 people per trip ART can travel 70 km per hour, meaning the trip from Kelowna to Vernon would take just over 41 minutes (not including stops). The 18 km length of the Kelowna portion of the ORT would take just over 15 minutes (not including stops) If the ART ran every five minutes, the system could move 6000 people per hour each direction (increasing frequency of schedule would increase this number)
Cost considerations	<ul style="list-style-type: none"> First trial built in China in 2018 cost 2,857,575.00 Canadian Dollars for a 6.5 km test track. This breaks down to \$439,626 per km of track Costs do not include station costs
Construction considerations	<ul style="list-style-type: none"> Platforms for getting on and off the ART need to be constructed which could have varying costs As ART is at grade, these stations do not need to be underground or elevated which saves costs Barriers separating the ART from the active transportation should be constructed
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> A minimum width of 7 metres needs to be left uninhibited through the entire right of way to accommodate a track in both directions The ART functions well within existing infrastructure
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> Works with existing road infrastructure, can run alongside car traffic and bus traffic No need to build new rail infrastructure resulting in cheaper and faster implementation No need to maintain rail infrastructure resulting in cheaper ongoing track maintenance Can make turns easily and is bi-directions so it does not need to turn around to change directions as it has a double locomotive design Having no permanent track enables flexible operations according to traffic conditions. It can suggest detours in the case of road traffic accidents or ongoing construction work Can navigate through traffic at intersections Using quick charge batteries reduces the need for overhead cables en route between the stations and produces no exhaust gases within urban areas ART will be able to accommodate high volume commuter capacity The ORT has a wide enough right of way to accommodate the ART
Limitations of this recommendation	<ul style="list-style-type: none"> Since the ART is a guided bus system, ruts and depressions will be worn into the road by the wheels which are controlled by a multi-axle steering system May not function well in winter climates as the system has not been implemented in climates with ice and snow

Type of transit	Light Rail Transit (LRT)
Description	Light rail transit (LRT) is a form of urban rail transport using train cars on tracks similar to a tramway, but operating at a higher capacity and on an exclusive right-of-way (the existence of an exclusive right of way is generally what separates LRT from a tram system). There is a considerable level of variation across different implementation approaches internationally and it is difficult to make generalizations. LRT has been growing in popularity in recent years due to its increased reliability as compared to traditional rail systems and traditional car commuting.
Width required	<ul style="list-style-type: none"> The standard width of LRT cars is 2.65 metres There are more narrow options (2.4 metres), but these are not as common With buffers in between, perhaps a total of 7 metres should be left uninhibited Lengths vary, but most cars are in the range of 26 to 28 metres
Life expectancy considerations	~30 years
Power considerations	<ul style="list-style-type: none"> Overhead lines supply electricity to the vast majority of light rail systems
Why it fits with the physical site considerations	<ul style="list-style-type: none"> LRT is an at grade system. It is suitable for a variety of geographical landscapes. Tunneling and building elevated sections are common solutions to overcome geographical or existing infrastructure barriers The existing ORT right of way of approximately 20 metres can easily accommodate the 5.3 metre width required to run LRT Grade concerns are not an issue as the section of ORT in Kelowna is flat
Why it fits with the demographic considerations	<ul style="list-style-type: none"> While capacity varies, typically capacity can reach up to 200 in an articulated single-deck bus. Travel speed can also vary, but generally range from 27 to 48 km/h meaning the 48 km trip from Kelowna to Vernon would take between 1 hour and 46 minutes to 1 hour (not including stops). The 18 km length of the Kelowna portion of the ORT would take between 40 - 22 minutes(not including stops)
Cost considerations	<ul style="list-style-type: none"> This cost varies widely and estimates suggest anywhere from \$10,000 per km to tens of millions. Costs do not include station costs
Construction considerations	<ul style="list-style-type: none"> Bus Rapid Transit can co-exist in the existing road infrastructure, so construction needs might be limited Platforms or stations would need to be constructed Barriers separating active transportation from the tram/streetcar on the ORT need to be constructed Considerations to not preclude this feasible options in the future
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> A minimum width of 8 metres right of way needs to be left uninhibited through the entire right of way to accommodate a track in both directions (as some sections can run on the highway or road right of way so there is some flexibility)
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> Explicit explanation why this recommendation has been made Less expensive Easy to construct and install
Limitations of this recommendation	<ul style="list-style-type: none"> Bus Rapid Transit utilizes (generally) fossil fuels. BRT may still have to navigate existing intersections Not as fast as LRT in an exclusive right of way

Type of transit	Bus Rapid Transit
Description	Bus rapid transit (BRT), also called a busway or transitway, is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system. Typically, a BRT system includes right of ways exclusively for buses, and give priority to buses at intersections or anywhere else that buses interact with other traffic. BRT also aims to reduce the amount of time it takes for passengers to board or get off the bus and purchase fares using off board fare collection. BRT systems aim to combine the capacity, efficiency, and speed of a metro but at a flexible, lower cost.
Width required	8 meters minimum both directions
Life expectancy considerations	12 years and 250,000 miles
Power considerations	Unlike electric-powered trains commonly used in rapid transit and light rail systems, bus rapid transit often uses diesel- or gasoline-fueled engines.
Why it fits with the physical site considerations	<ul style="list-style-type: none"> Bus Rapid Transit is capable of operating within the existing road infrastructure, thus the intersections that cross the ORT would not prove particularly challenging The approximately 20 metre ORT right of way can accommodate the 8 metres required to for a tram or streetcar line Grade concerns are not an issue as the section of ORT in Kelowna is flat
Why it fits with the demographic considerations	<ul style="list-style-type: none"> Although it varies, LRT systems can accommodate a high volume of commuters. A typical four car LRT can accommodate 720 passengers at once LRT speed varies widely, ranging from 30 km per hour to 80 km per hour, meaning the trip from Kelowna to Vernon would take between 1:36:00 - 36 minutes (not including stops). The 18 km length of the Kelowna portion of the ORT would take between 36 - 13 minutes (not including stops) If the LRT ran every five minutes, the system could move 8,640 people per hour each direction (increasing frequency of schedule would increase this number)
Cost considerations	<ul style="list-style-type: none"> There is much variation in the cost of LRT The biggest factor that affects the cost of rail transit projects is whether the alignment will be at grade, elevated, or underground—with underground projects costing much more than elevated, which costs more than at grade The number of stations also adds to the cost of rail transit projects, particularly for underground sections where a station can easily cost \$100–150 million. Most LRT systems range from \$9 million to over \$60 million per km Standardization can lead to cost savings as there are many suppliers
Construction considerations	<ul style="list-style-type: none"> A separated right of way is necessary for LRT, this means that the current intersections on the ORT will have to be elevated or tunneled Barriers separating the LRT from the active transportation should be constructed
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> Minimum width of 7 metres right of way needs to be left uninhibited through the entire right of way to accommodate a track in both directions (as some sections can be tunnelled or elevated, there is some flexibility)
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> The Hillend Loch Trail opted to implement LRT The ORT has a wide enough right of way to accommodate the LRT LRT will be able to accommodate high volume commuter capacity Standardization will lead to streamlining benefits, including: standard railway maintenance equipment can be used, light rail vehicles can be moved around using the same tracks as freight railways, standard sizes can be switched between networks either temporarily or permanently and both newly built and used standard-gauge rolling stock tends to be cheaper to buy, as more companies offer such vehicles
Limitations of this recommendation	<ul style="list-style-type: none"> Narrower turning radii due to the gauge of the tracks (can be overcome using articulated cars) Tunnelling or building elevated guideways can rapidly increase the cost of LRT

Type of transit	Bikeshare
Description	A bicycle-sharing system, public bicycle system, or bike-share scheme is a service in which bicycles are made available for shared use to individuals on a short-term basis for a price or for free. Electric assist bikeshares are possible options for this model. <p>Examples:</p> MobiShaw bikes (Vancouver) Barclay Bikes (London, UK) Bixi (Montreal, Toronto, Ottawa) U-Bicycle (Victoria and Richmond) Drobbike – smart bikeshare (UBC) Capital Bikes (Washington, DC) Population threshold High population density supports a healthy bikeshare program. However, bikeshare programs, when scaled and adapted appropriately to the realities of the small community may also succeed. For example, Madison, Wisconsin has a population of 250,000 with a density of 1,200 per square kilometre. During March until December, the Madison BCycle bikeshare operates a 35 stations with 350 bikes (https://madison.bcycle.com/what-is) . (https://momentummag.com/bike-share-finds-success-in-small-cities/)
Width required	Separate bike path assigned to cyclists and physically separated from motor vehicles by either side, or by open space. Minimum, width for separated bike path 3.0m for two-way, 1.5m for one way[i]. <p>Docking Stations: Station will vary depending on size of bikes stored. Capital Bikes are docked at stations that can hold 11, 15 or 19 bikes. In Kelowna, the docking stations should be in locations where the RoW is able to accommodate an intact ORT, or by repurposing land from adjacent parking spots.</p> MobiShaw Docking Station Grade Requirement: The surface must be leveled with a maximum cross slope of 3% and have a consistent grade (i.e. no grade transitions) along the length with a maximum slope of 5%. At minimum, spot elevations at the four corners of the station must be provided[ii]. <p>CycloShare stations include one kiosk and up to 64 bike docks. Narrow areas will require all bikes docked in the same direction, but a space that allows a bike-share station footprint may allow docking facing each other.[iii] Life expectancy considerations</p> ORT Path – With no or little regular motor vehicle use, this path will not experience the same deterioration as automotive roadways.
Life expectancy considerations	Dockless bikes – A best practice is for a city to enter into a contract with a vendor that maintains, repairs and incurs all liability or fees associated with the bike-share program[iv]. As such, the life expectancy of the drop bikes will be hinged upon the commercial agreement between vendor and city. Bikeshare stations – Similar to the dockless bike approach, the vendor or operator will maintain the network of stations where the bikes are locked to bike racks[v]. Example: CycloShare provides a 2-year warranty on bike and equipment (excludes normal wear and tear)[vi]
Power considerations	<ul style="list-style-type: none"> MobiShaw bikes utilize solar power (ideal station would require 5hrs of direct sunlight). Provision of electrical service and power would be required[vii] as a redundancy. No power requirements: "Dumb" docks do not require electrical power and are being used in some U.S cities[viii]. The pilot Bixi electric assist bikeshares require four hours for a fully shared battery. One hour of charging provides 15km of battery life[ix].
Why it fits with the physical site considerations	<ul style="list-style-type: none"> The existing ORT and RoW exist as a multimodal path that cyclists are already using. The addition of public bikeshare stations can be done at gateways. Best practices for MobiShaw Go bikes recommend spacing stations every 200-300m, or approximately every 2-3 blocks[x]. However, Vancouver has higher urban core density than Kelowna.
Why it fits with the demographic considerations	<ul style="list-style-type: none"> In June 2018, the Dropbike was piloted in Kelowna[xi]. Stats Canada reports that Kelowna's to work cycling and walking mode shares were 3.0% and 5.6% respectively. These are above the average in British Columbia. Globally, bikeshare programs are popular. A well designed and implemented bikeshare program have been proven to be effective in relieving congestion and air pollution.
Cost considerations	<ul style="list-style-type: none"> Bikeshares are often subject to theft and vandalism. Best practices are to use commuter bikes with specially designed parts and sizes that would discourage theft and resale[xii]. It is also suggested that the seat is not detachable from the bike frame. A wireless tracking system, such as radio frequency identification devices (RFIDs), could be used to locate bikes for pick up and return[xiii]. Other bikeshare programs utilize RFID credit cards, some student cards, or membership cards. Possible criticism for bikeshare includes using public funds for bikeshares when funds could be diverted to building or maintaining roads or other services that more residents use on a regular basis. However, this criticism assumes that taxpayer money is the significant source of bikeshare funding.
Construction considerations	<ul style="list-style-type: none"> ORT is or will be complete paved. A dockless bikeshare program would not require any docking stations to be built. Docking stations will require design guidelines, electrical power access and grade leveling. However, docking stations can be paired with wayfinding signs or other path amenities. Construction to build docking stations will be required.
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> None, or minimal: Bikeshare would not permanently alter the ORT RoW for future transportation options.
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> Exploring bikeshare as a micromobility option is in line with the future transportation options requested by the City of Kelowna.

Limitations of this recommendation

[i] BikeBC – Moving Cycling Forward, Ministry of Transportation and Infrastructure, Accessed 17.02.2019 at file:///C:/Users/share/Downloads/H1194.pdf

[ii] Design Standards for Public Bikeshare, City of Vancouver – Engineering Services Accessed 17.02.2019 at https://vancouver.ca/files/cov/design-standards-for-public-bike-share.pdf

[iii] Products, CycloShare, Accessed 25.02.2019 at http://www.cycloshare.com/products.php

[iv] Dockless Bikes: Regulation Breakdown, Brandon Bordenkircher & Riley L. O'Neil, Access 17.02.2019 at https://nabsa.net/wp-content/uploads/2017/09/Dockless-Bike-Regulation-Breakdown-12-Tone-Consulting-1.pdf

[v] Terms and Conditions of Use, Mobi Shaw Go, Accessed 17.02.2019 at https://www.mobibikes.ca/en/terms-and-conditions-use

[vi] Products, CycloShare, Accessed 25.02.2019 at http://www.cycloshare.com/products.php

[vii] Design Standards for Public Bikeshare, City of Vancouver – Engineering Services Accessed 17.02.2019 at https://vancouver.ca/files/cov/design-standards-for-public-bike-share.pdf

[viii] Bikeshare Station Siting Guide, NACTO, Accessed 17.02.2019 at https://nacto.org/wp-content/uploads/2016/04/NACTO-Bike-Share-Siting-Guide_FINAL.pdf

[ix] Electric BIXI pilot Project, biXi, Accessed 24.02.2019

[x] The Bike-Sharing Planning Guide, Institute for Transportation & Development Policy, Accessed 17.02.2019 at https://www.itdp.org/wp-content/uploads/2014/07/ITDP_Bike_Share_Planning_Guide.pdf

[xi] One thousand rides, no stolen cycles for Dropbikes in Kelowna, Ron Seymour, Accessed 17.02.2019 at http://www.kelownadailycourier.ca/news/article_a5b087f2-7971-11e8-9d09-e3ca6f1b7bd5.html

[xii] The Bike-Sharing Planning Guide, Institute for Transportation & Development Policy, Accessed 17.02.2019 at https://www.itdp.org/wp-content/uploads/2014/07/ITDP_Bike_Share_Planning_Guide.pdf

[xiii] Toronto Expands RFID-Enabled Bike-Sharing Program, Claire Swedberg – RFID Journal, Accessed 17.02.2019 at https://www.rfidjournal.com/articles/view?14559/

Type of transit	Scootershare
Description	<p>Micro mobility – Electric scooter share for short term rental. For the purposes of this research, ‘scooter’ refers to the kick-scooter model that is propelled by a standing rider pushing off the ground.</p> <p>Description</p> <p>The scooter share follows the same model of the bikeshare system. Some bikeshare programs are now offering scooter share programs to complement the existing bikeshare program.</p> <p>Scooters are generally “dockless”, meaning that they do not have a fixed home location, and are dropped off and picked up from arbitrary locations in the service area. This makes them a convenient mobility option for first-/last-mile mobility in urban areas.</p> <p>Examples of Electric Kick Scooter Share Companies:</p> <ul style="list-style-type: none"> Bird Bolt Jump Bike (Uber) Lime Lyft RazorUSA Scoot Networks Skip Spin (Ford Motors) URB-E <p>Population density required</p> <p>At this time, there are no studies that provide a per capita threshold for scooter share density. However, much of the case studies identify that scooter share should be limited to high density locations, such as college campuses or downtown cores.</p>
Width required	<ul style="list-style-type: none"> Standard recommended width for bike lanes would accommodate electric or non electric scooters.
Life expectancy considerations	<ul style="list-style-type: none"> ORT Path – With no or little regular motor vehicle use, this path will not experience the same deterioration as automotive roadways. At this time, scooter companies have not released the average life span of their products[i]. Dockless Electric Scooter– A best practice is for a city to enter into a contract with a vendor that maintains, repairs and incurs all liability or fees associated with the scooter share program[ii]. A stronger recommendation is to partner with a vendor that offers both bike and scooter share. As such, the life expectancy of the scooter will be hinged upon the commercial agreement between vendor and city. Scooter share stations – Similar to the dockless bike approach, the vendor or operator will maintain the network of stations where the scooters are locked to bike racks[iii]. Due to the portability of an electric scooter, the use of RFID tracking on the scooter and payment method is highly encourages.
Power considerations	<ul style="list-style-type: none"> Dockless electric scooters only function with charging contractors. These are contractors that use GPS to locate and charge the scooter. Some scooter share schemes allow people to charge a scooter using their smartphone and reward that individual each time a scooter is retrieved, charged and delivered for public use[iv]. There are reports of personal safety issues in this model of electric scooter maintenance. Scooters have occasionally been used to bait the charging contractor, and then the contractor is mugged[v]. Docking stations would resolve the issue of the above safety issue. URB-E has created foldable electric scooters that are being launched on college campuses and large residential developments.
Why it fits with the physical site considerations	<ul style="list-style-type: none"> The existing ORT and RoW exist as a multimodal path that cyclists are already using. The addition of public scooter share stations can be done at gateways in conjunction with bikeshare In addition, in locations where the larger bikeshare docking station cannot be built, the smaller scooter share station may be able to fit. Why it fits with the demographic considerations Electric scooters are another alternative active transportation option that can complement the infrastructure that supports cyclists and pedestrians. While bikes are better suited for longer, more stable, more comfortable journeys, a scooter is easier to use due to the smaller learning curve[vi]. Furthermore, a rider will stand when using a scooter. This enables people that wear dresses and skirts or wedge shoes and low heels to ride without having to change wardrobe.
Why it fits with the demographic considerations	<ul style="list-style-type: none"> In June 2018, the Dropbike was piloted in Kelowna[xi]. Stats Canada reports that Kelowna’s to work cycling and walking mode shares were 3.0% and 5.6% respectively. These are above the average in British Columbia. Globally, bikeshare programs are popular. A well designed and implemented bikeshare program have been proven to be effective in relieving congestion and air pollution.
Cost considerations	<ul style="list-style-type: none"> At this time, scooter companies have not released the average life span of their products[vii]. While theft and vandalism often occur, in some areas where scooter use outpaces cycle use, the cost of a scooter can be recouped in two or three weeks[viii].
Construction considerations	<ul style="list-style-type: none"> ORT is or will be complete paved. A dockless scooter program would not require any docking stations to be built. Construction to build docking stations will be required. Docking stations will require design guidelines, electrical power access and possible grading However, docking stations can be paired with wayfinding signs or other path amenities.
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> None, or minimal: Scooter share would not permanently alter the ORT RoW for future transportation options. Scooter share could possible compliment future public transit as scooters are smaller, foldable and able to be brought onboard busses 20 . Currently, Mobi Shaw Go bikes are not allowed on bus, skytrain or ferry 21
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> Exploring electric scooters as a micromobility option is in line with the future transportation options requested by the City of Kelowna.

¹² The life of an electric scooter: Nasty, brutish and often short Peter Holley, Accessed 17.02.2019 at https://www.washingtonpost.com/technology/2018/07/27/life-an-electric-scooter-nasty-brutish-sometimes-short/?utm_term=.04d32538d3c9

¹³ Dockless Bikes: Regulation Breakdown, Brandon Bordenkircher & Riley L. O’Neil, Access 17.02.2019 at <https://nabsa.net/wp-content/uploads/2017/09/Dockless-Bike-Regulation-Breakdown-12-Tone-Consulting-1.pdf>

¹⁴ Terms and Conditions of Use, Mobi Shaw Go, Accessed 17.02.2019 at <https://www.mobibikes.ca/en/terms-and-conditions-use/>

¹⁵ Charging Electric Scooters is a profitable, fun and occasionally dangerous youth trend. David Z. Morris. Accessed 17.02.2019 at <https://finance.yahoo.com/news/charging-electric-scooters-profitable-fun-171802650.html>

¹⁶ Charging Electric Scooters is a profitable, fun and occasionally dangerous youth trend. David Z. Morris. Accessed 17.02.2019 at <https://finance.yahoo.com/news/charging-electric-scooters-profitable-fun-171802650.html>

¹⁷ Electric Scooter vs. (Electric) Bikes – Thoughts on the new electric scooter share. Dylan Harris. Accessed 17.02.2019 at <https://biketoeverything.com/2019/01/04/electric-scooter-vs-electric-bicycle-thoughts-on-the-new-electric-scooter-share/>

¹⁸ The life of an electric scooter: Nasty, brutish and often short Peter Holley, Accessed 17.02.2019 at https://www.washingtonpost.com/technology/2018/07/27/life-an-electric-scooter-nasty-brutish-sometimes-short/?utm_term=.04d32538d3c9

¹⁹ Scooter Companies ride high on hope and hype, Heather Somerville & Jane Lanhee Lee, Accessed 17.02.2019 at <https://www.reuters.com/article/us-scooters-ninebot/scooter-companies-ride-high-on-hope-and-hype-idUSKBN1KE2QR>

²⁰ Bringing your Electric Scooter on Public Transportation, JoyScoot, Accessed 17.02.2019 on https://www.joyscoot.com/articles/bringing_your_electric_scooter_on_public_transport.html

²¹ Frequently Asked Questions, Mobi Shaw Go, Accessed 17.02.2019 at <https://www.mobibikes.ca/en/faq>

Type of transit	Autopiloted Aerial Vehicles (Drones) Share for Vertical Take-off and landing (VTOL) – Still under market research and development.
Description	<p>A vertical take-off and landing (VTOL) aircraft is an aircraft that can hover, take off, and land vertically. The following technology firms have publicised their research and investment in rolling out VTOL by 2020.</p> <ul style="list-style-type: none"> Uber Air, in partnership with Bell. Amazon Prime Air Drones Google Project Maven Drone AI Boeing NeXt Aeromobil (Slovakia) Pav-V Liberty (The Netherlands) – Current model available for purchase \$400,000USD. Legal to operate with driver and pilot licence. Ehang (China) Aston Martin (United Kingdom) Audi Airbus Rolls-Royce BlackFly
Width required	<ul style="list-style-type: none"> Vertiports are in the conceptual architectural design phase. However, architectural firm, Corgan, has proposed ‘skyports’ to have a small footprint, but have a large square footage area. Corgan’s design submission in July 2018 proposes a system that straddles existing roadways. Pal-V vehicles requires a landing space of 90-200x200m without obstacles to land and take off.[i]
Life expectancy considerations	<ul style="list-style-type: none"> Life expectancy has not been discovered or released by technology firms.
Power considerations	<ul style="list-style-type: none"> Exact voltage is still under research. However, VTOL, like other electric vehicles may utilize electrical energy from municipal power grids. This higher source of centralised power may be advantageous when compared to sourcing hydrocarbon fuels (petroleum, natural gas, or coal). Furthermore, FortisBC currently provides electric and gas power to Kelowna, and Kelowna is one of the headquarters of FortisBC. Proximity to the headquarters may be beneficial for piloting VTOL as a future transportation option.
Why it fits with the physical site considerations	<ul style="list-style-type: none"> VTOL does not require fixed routes and can travel independently on any specific path. However, VTOL will need to abide by the Canadian Aviation Regulations regarding restricted airspace access as described by the authority of the Chief of Flight, Ministry of Transportation[ii]. Uber announced plans to launch Uber Air service in Dallas-Fort Worth area and Los Angeles by 2023. Announcements for an international market has yet to be determined. The Kelowna International Airport and expanding YLW plans may provide integration for aeronautical policies and procedures that may serve as a pilot for VTOL. Kelowna may have the physical land assets to create a network for “vertiports” (VTOL hubs with multiple takeoffs and landing pads as well as charging structures). Repurposed tops of parking garages, existing helipads or unused land in surrounding highway intersections may be turned into an extensive VTOL traffic corridor.
Why it fits with the demographic considerations	<ul style="list-style-type: none"> As an experimental option for future transportation for Kelowna, VTOL seeks to provide an urban air transportation that will use three-dimensional air-space to alleviate transportation congestion on the ground. This may alleviate the congestion currently experienced on Highway 97.
Cost considerations	<ul style="list-style-type: none"> Potential of urban VTOL network may likely have significant cost advantages over heavy-infrastructure approaches such as roads, rail, bridges and tunnels. Repurposed tops of roof top parking garages, existing helipads and unused land surrounding highway interchanges could form an extensive network of distributed vertiports.
Construction considerations	<ul style="list-style-type: none"> Construction details will be pending research results by technology firms. However, Uber Air has released a whitepaper on their research and development for VTOL industries.
Considerations to not preclude this feasible options in the future	<ul style="list-style-type: none"> A high-level review of current municipal, provincial, and federal regulations in Canada as well as international regulations that impact drone technology, operations and deployment will be required as these may preclude the feasibility of VTOL as an option. A review of air space classifications (A, B, C, D, E, F and G) to assess the acceptable levels of risk appropriate to the operation and traffic density of future VTOL use will be required. Furthermore, ride-hailing is not yet available in British Columbia. The B.C Provincial government may allow ride-hailing in Fall 2019. However, individual municipalities may implement local bylaws that may or may not inhibit ride-hailing services, like Uber in Vancouver[iii].
Explicit explanation why this recommendation has been made	<ul style="list-style-type: none"> This is a blue sky, future transportation option on a long range, 5 – 20-year timeline.

[i] First production road and air-legal flying car revealed. Jimi Beckwith – Autocar. Accessed 25.02.2019 at <https://www.autocar.co.uk/car-news/new-cars/first-production-road-and-air-legal-flying-car-revealed>

[ii] Designated Airspace Handbook, Ministry of Transportation, Accessed 24.02.2019 at https://www.navcanada.ca/EN/products-and-services/Documents/DAH_Current_EN.pdf

[iii] Ride-hailing not coming to British Columbia until fall 2019, Richard Zussman – Global News, Accessed 25.02.2019 at <https://globalnews.ca/news/4341276/ride-hailing-not-coming-to-british-columbia-into-fall-of-2019/>

[i] The life of an electric scooter: Nasty, brutish and often short Peter Holley, Accessed 17.02.2019 at https://www.washingtonpost.com/technology/2018/07/27/life-an-electric-scooter-nasty-brutish-sometimes-short/?utm_term=.04d32538d3c9

[ii] Dockless Bikes: Regulation Breakdown, Brandon Bordenkircher & Riley L. O’Neil, Access 17.02.2019 at <https://nabsa.net/wp-content/uploads/2017/09/Dockless-Bike-Regulation-Breakdown-12-Tone-Consulting-1.pdf>

[iii] Terms and Conditions of Use, Mobi Shaw Go, Accessed 17.02.2019 at <https://www.mobibikes.ca/en/terms-and-conditions-use/>

[iv] Charging Electric Scooters is a profitable, fun and occasionally dangerous youth trend. David Z. Morris. Accessed 17.02.2019 at <https://finance.yahoo.com/news/charging-electric-scooters-profitable-fun-171802650.html>

[v] Charging Electric Scooters is a profitable, fun and occasionally dangerous youth trend. David Z. Morris. Accessed 17.02.2019 at <https://finance.yahoo.com/news/charging-electric-scooters-profitable-fun-171802650.html>

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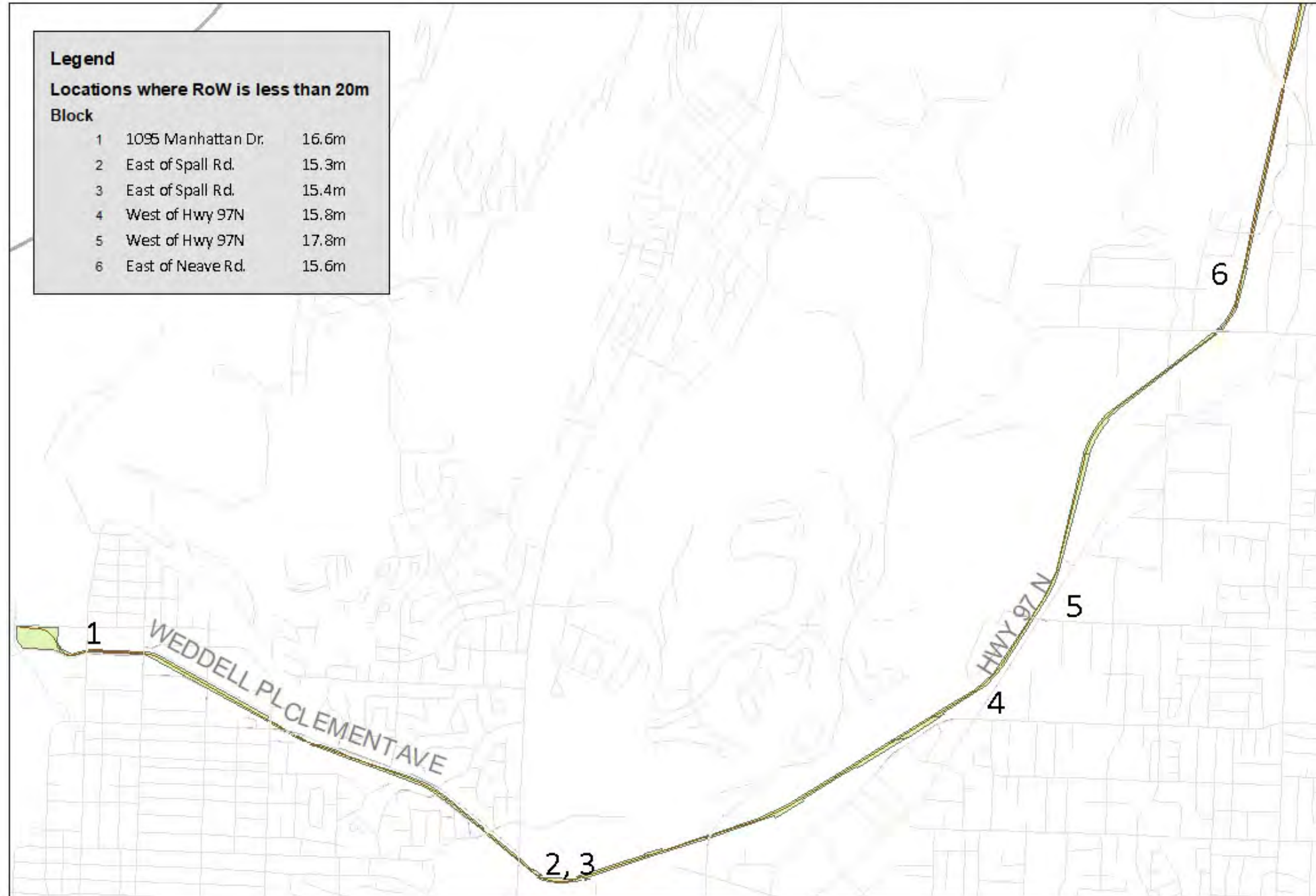
[vii] The life of an electric scooter: Nasty, brutish and often short Peter Holley, Accessed 17.02.2019 at https://www.washingtonpost.com/technology/2018/07/27/life-an-electric-scooter-nasty-brutish-sometimes-short/?utm_term=.04d32538d3c9

[viii] Scooter Companies ride high on hope and hype, Heather Somerville & Jane Lanhee Lee, Accessed 17.02.2019 at <https://www.reuters.com/article/us-scooters-ninebot/scooter-companies-ride-high-on-hope-and-hype-idUSKBN1KE2QR>

[ix] Bringing your Electric Scooter on Public Transportation, JoyScoot, Accessed 17.02.2019 on https://www.joyscoot.com/articles/bringing_your_electric_scooter_on_public_transport.html

[x] Frequently Asked Questions, Mobi Shaw Go, Accessed 17.02.2019 at <https://www.mobibikes.ca/en/faq>

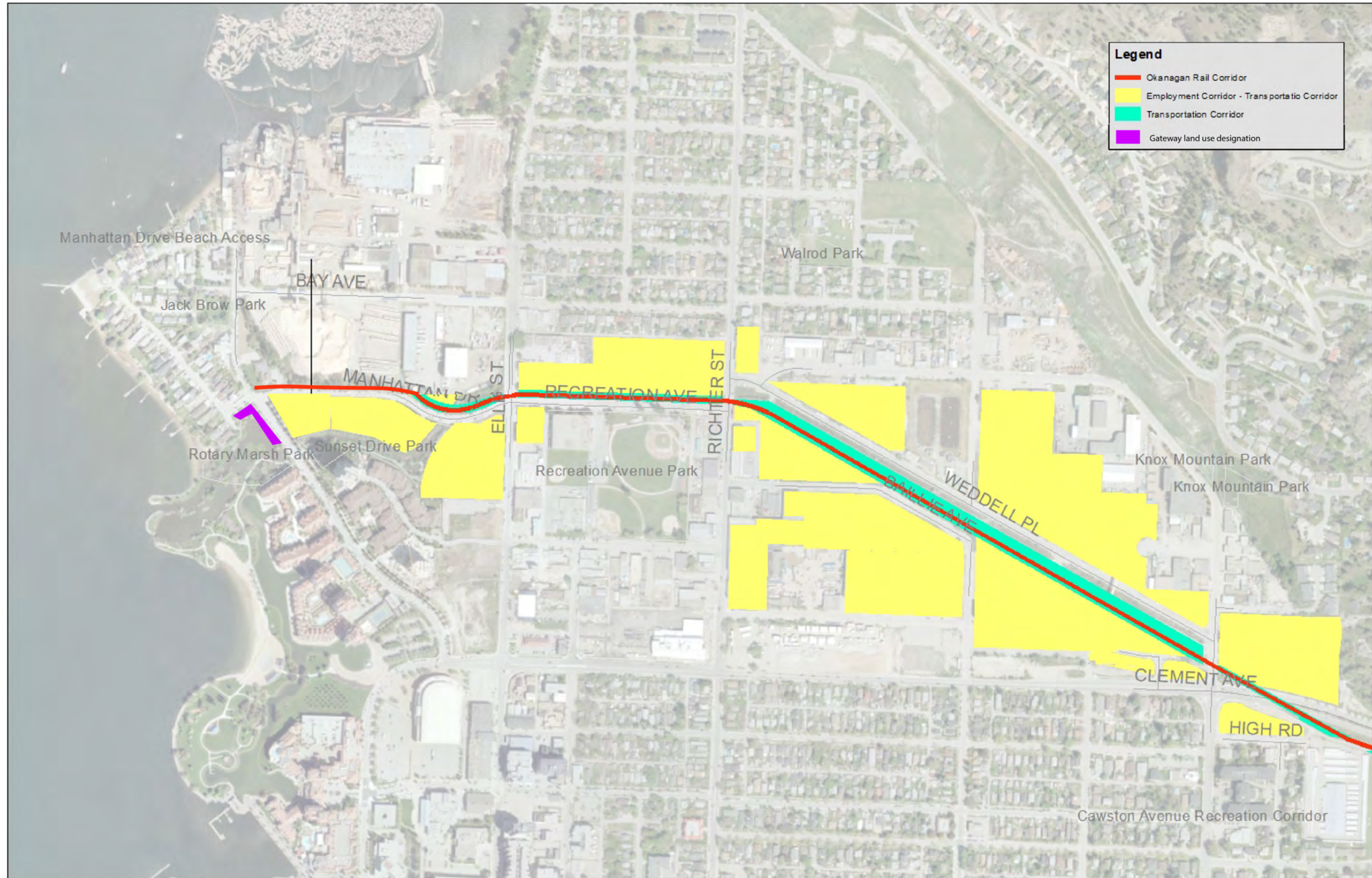
Locations with RoW less than 20 meters



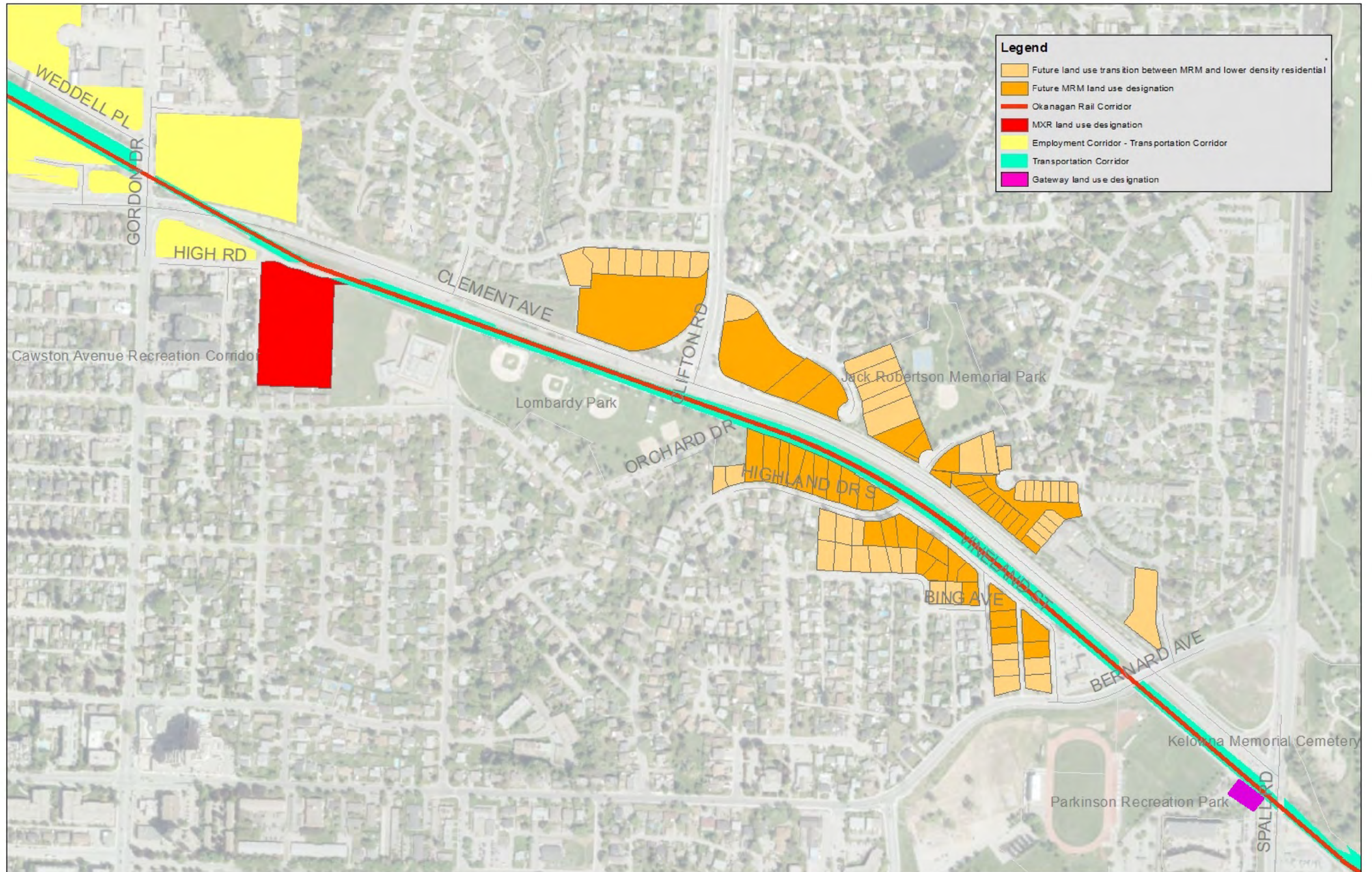
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1:32,000

Source: City of Kelowna data set. Spatial analysis conducted by S.Chin 26.02.2019

Zone 1: Recommended Future Land Use Designations



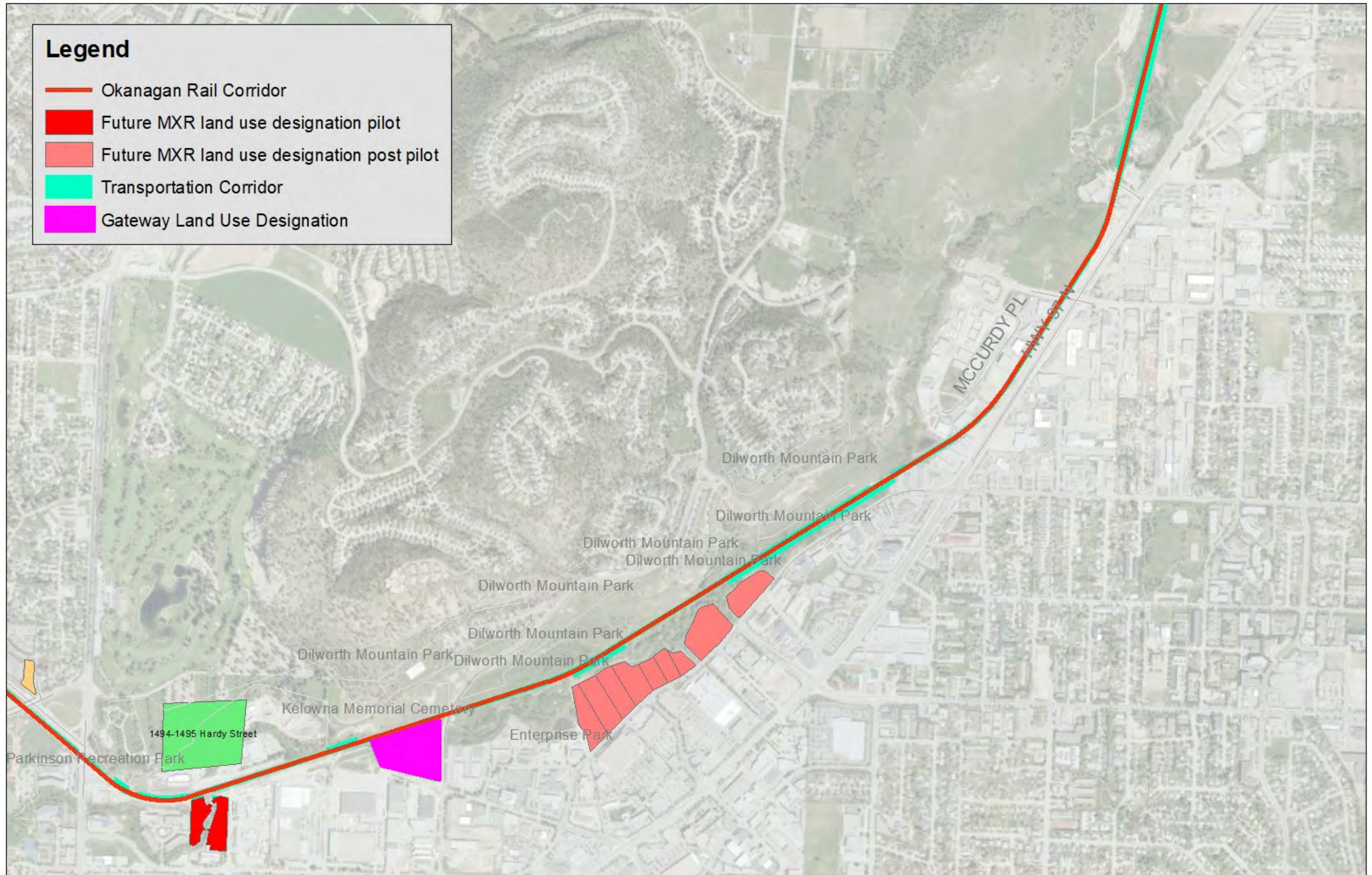
Zone 2: Recommended Future Land Use Designations



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* Future MRM Transition Zoning is designed to provide a gradual transition between different land-use designations

Zone 3: Recommended Land Use Designations



CHANGING TRACKS

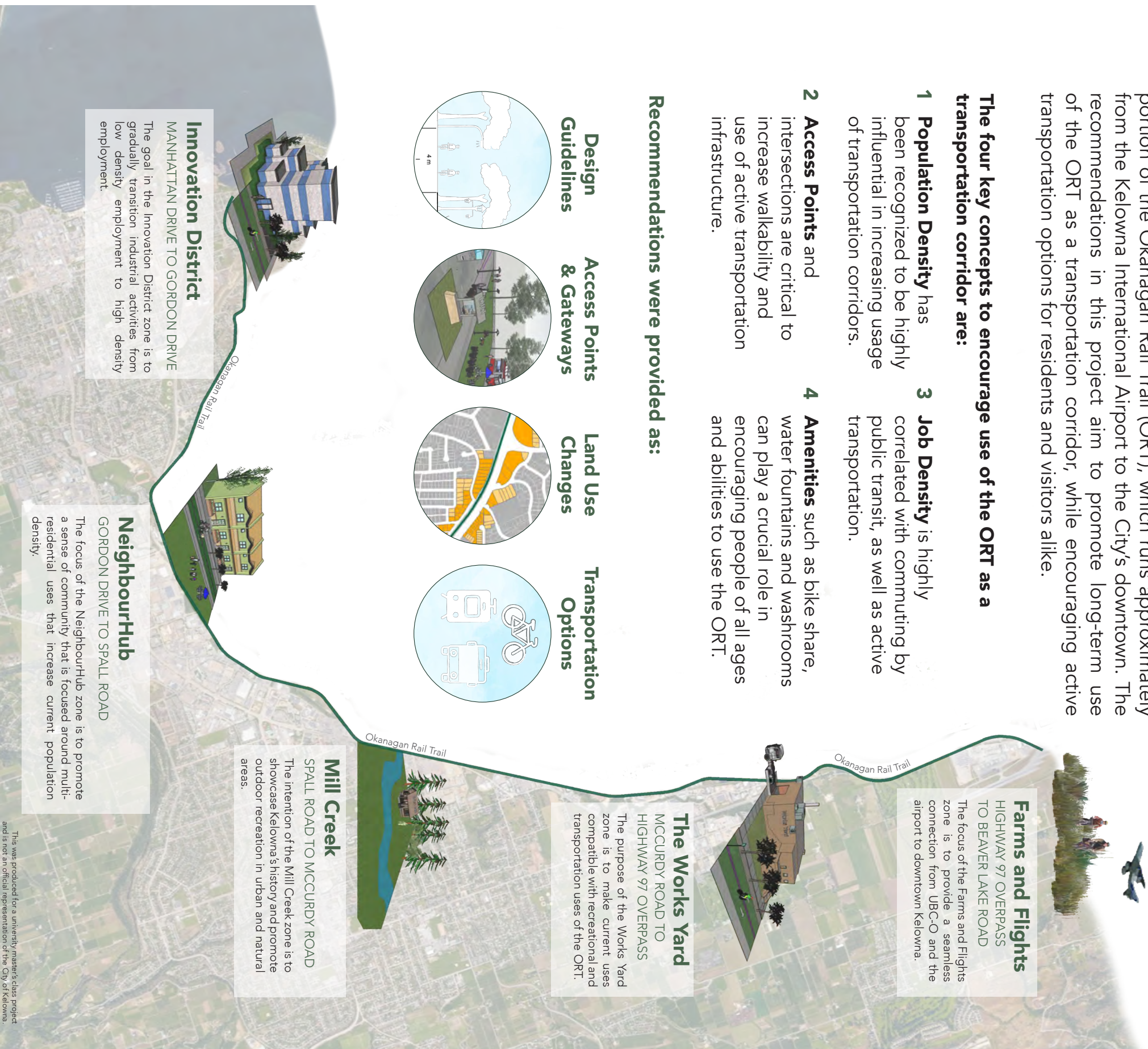
Supporting the Okanagan Rail Trail as a thriving transportation corridor

The City of Kelowna is interested in planning and enhancing its 18 km portion of the Okanagan Rail Trail (ORT), which runs approximately from the Kelowna International Airport to the City's downtown. The recommendations in this project aim to promote long-term use of the ORT as a transportation corridor, while encouraging active transportation options for residents and visitors alike.

The four key concepts to encourage use of the ORT as a transportation corridor are:

- 1 Population Density** has been recognized to be highly influential in increasing usage of transportation corridors.
- 2 Access Points** and intersections are critical to increase walkability and use of active transportation infrastructure.
- 3 Job Density** is highly correlated with commuting by public transit, as well as active transportation.
- 4 Amenities** such as bike share, water fountains and washrooms can play a crucial role in encouraging people of all ages and abilities to use the ORT.

Recommendations were provided as:



Farms and Flights
HIGHWAY 97 OVERPASS
TO BEAVER LAKE ROAD
The focus of the Farms and Flights zone is to provide a seamless connection from UBC-O and the airport to downtown Kelowna.

The Works Yard
MCCURDY ROAD TO
HIGHWAY 97 OVERPASS
The purpose of the Works Yard zone is to make current uses compatible with recreational and transportation uses of the ORT.

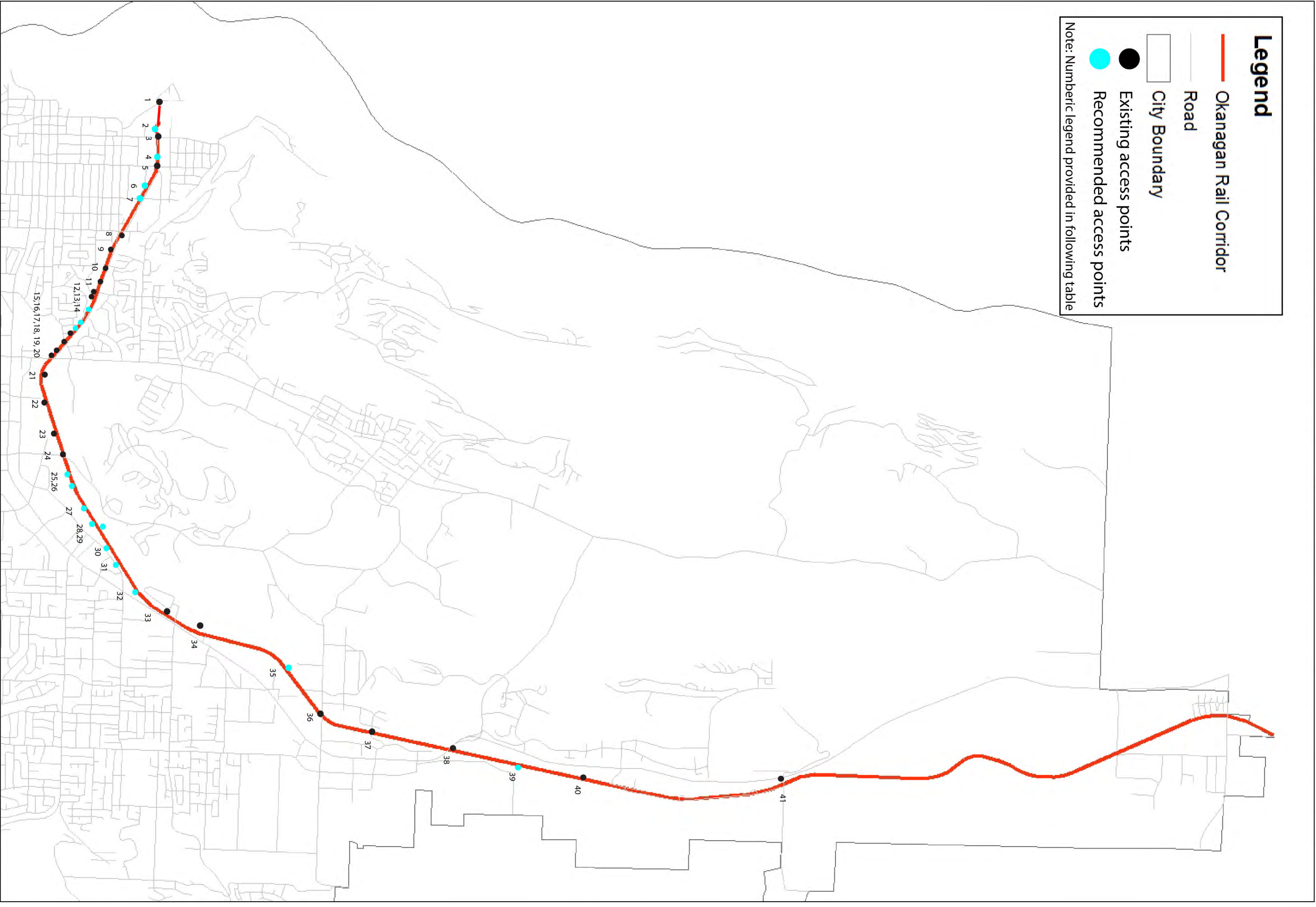
Mill Creek
SPALL ROAD TO MCCURDY ROAD
The intention of the Mill Creek zone is to showcase Kelowna's history and promote outdoor recreation in urban and natural areas.

NeighbourHub
GORDON DRIVE TO SPALL ROAD
The focus of the NeighbourHub zone is to promote a sense of community that is focused around multi-residential uses that increase current population density.

Innovation District
MANHATTAN DRIVE TO GORDON DRIVE
The goal in the Innovation District zone is to gradually transition industrial activities from low density employment to high density employment.

This was produced for a university master's class project and is not an official representation of the City of Kelowna.

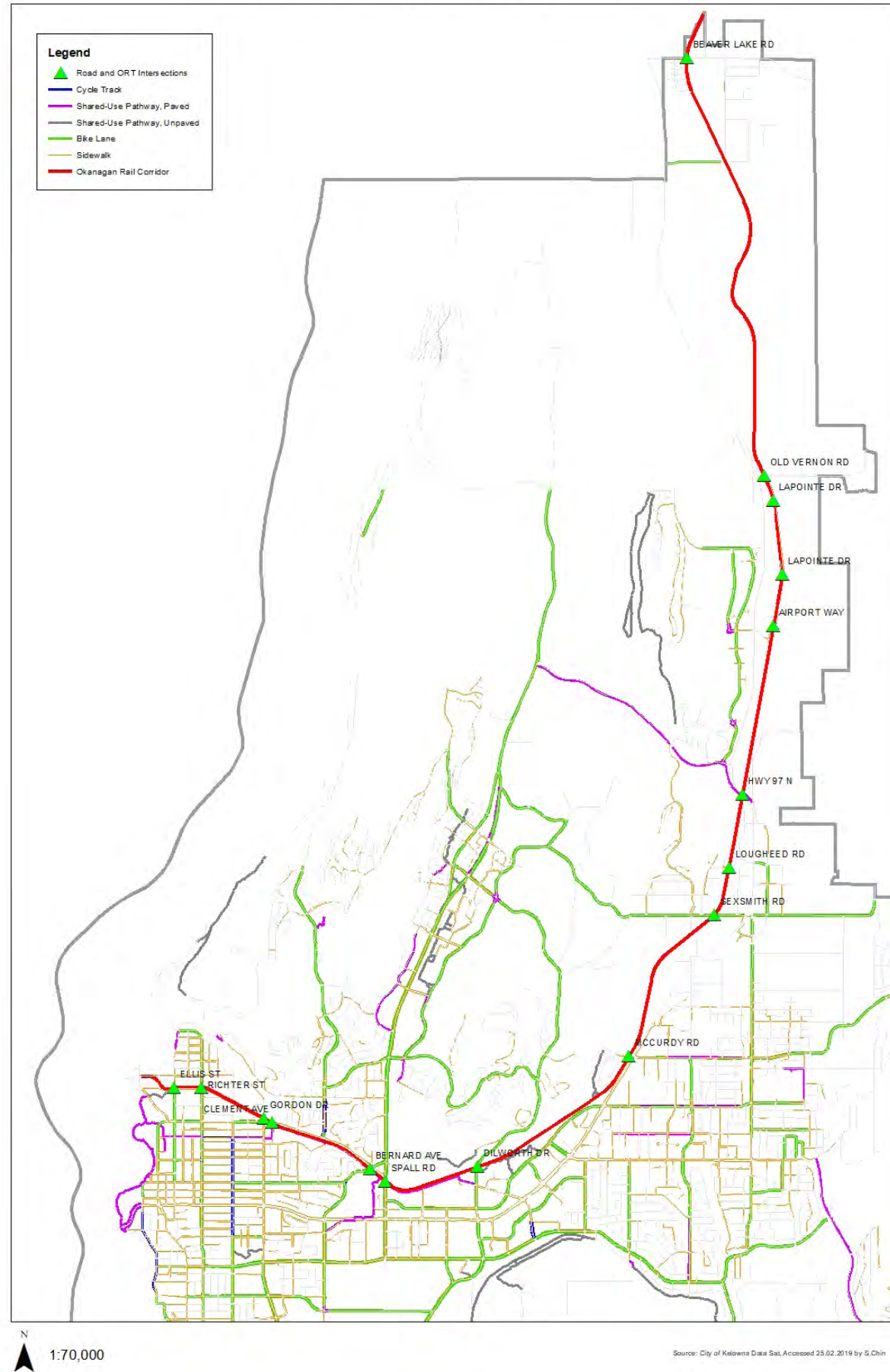
Access Points: Existing and Recommended



Location	Type of access	Existing / Recommended / Possible*
1. Guy St. and Manhattan Dr.	Road	Existing
2. On Manhattan Dr. between Guy St. and Ellis St.	Walking path	Recommended - Mid-block crossing as suggested in the Zone 1 Gateway design guidelines could be a continuation of the walking path
3. Ellis St. and Manhattan Dr.	Road	Existing
4. Recreation Avenue Park (including the parking lot, grass, and lane)	Multiple	Recommended - Mid-block crossing for access to Recreation Avenue Park
5. Richter St. and Recreation Ave.	Road	Existing
6. Baillie Ave	Road	Recommended - Open fence to allow bike and pedestrian access
7. Ethel St.	Road	Recommended - Allow bike and pedestrian only access
8. Gordon Dr. and Clement Ave.	Road	Existing
9. High Rd.	Bike and Pedestrian Only	Existing
10. Bankhead Elementary School	Bike and Pedestrian Only	Existing
11. Lombardy Park	Bike and Pedestrian Only	Existing
12. Clifton Rd.	Bike and Pedestrian Only	Existing
13. Orchard Dr.	Bike and Pedestrian Only	Existing
14. Highland Dr. S and Vineland St.	Bike and Pedestrian Only	Recommended - Pave and make an official Access Point
15. Cherry Cr.	Bike and Pedestrian Only	Recommended - Provide a gap in the concrete planter boxes for bike and pedestrian access. (concrete planter boxes are recommended to replace Jersey Barrier in the design guidelines)
16. Lane between Cherry Cr. and	Bike and	Recommended -Provide a gap

Location	Type of access	Existing / Recommended / Possible*
17. Vineland St.	Bike and Pedestrian Only	Existing
18. Bernard Ave.	Pedestrian only	Existing
19. Okanagan Park Run	Bike and Pedestrian Only	Existing
20 Spall Rd.	Road	Existing
21. Alphonse Rd.	Lane	Existing
22. Hardy St.	Road	Existing
23. Leckie Pl.	Road	Existing
24. Dilworth Dr.	Road	Existing
25. ~150m E of Dilworth Dr.	Bike and Pedestrian Only	Recommended - Provide bike and pedestrian access from Enterprise Park
26. ~280m E of Dilworth Dr.	Bike and Pedestrian Only	Recommended - Provide bike and pedestrian access from Enterprise Park
27. Enterprise Park trail via Enterprise Way	Bike and Pedestrian Only	Existing access through Enterprise Park. Recommended - Add protected bike lane on Enterprise Way to allow safe connection to Enterprise Park Trail
28. Hwy 33 extension	Bike and Pedestrian Only	Recommended - Provide access to ORT over stream
29. Glacier Cr.	Bike and Pedestrian Only	Recommended - Maintain path to connect residents North of the ORT
30. Commerce Ave.	Bike and Pedestrian Only	Recommended - Provide crossing over stream
31. Jenkins St.	Bike and Pedestrian Only	Existing (as of 2020)
32. Hwy 97 across from Kelowna Nissan	Bike and Pedestrian Only	Recommended - Provide access over Hwy, near Kelowna Nissan
33. McCurdy Rd.	Bike and Pedestrian Only	Existing
34. Fenwick Rd.	Road	Recommended - Provide paved pedestrian and bike only access
35. Cambro Rd.	Bike and Pedestrian Only	Existing
36. Sexsmith Rd.	Road	Existing
37. Lougheed Rd.	Road	Existing
38. Bulman Rd. multi use pathway	Bike and Pedestrian Only	Existing

Current Active Transportation and Road Intersections



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