APPENDICES

BANFF RAILWAY LANDS

AREA REDEVELOPMENT PLAN

FOR PUBLIC ENGAGEMENT
BY LIRICON/NORQUAY
Preliminary Draft – April 2023

PREPARED BY:
Dialog
Shift Consulting
Jackson McCormick Design Group
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PROPONENT:

NORQUAY

LIRICON
SUSTAINABLE THINKING

IN CONJUNCTION WITH:

Banff

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APPENDIX A:
Banff Railway lands Transportation Impact Assessment

2022-08-31

Confidential

Randall McKay
Town of Banff
110 Bear Street
Banff, Alberta
T1L 1A1

Subject: Addendum to Transportation Impact Assessment: Parks Canada Comments - Transportation

Dear Randall:

I have reviewed the transportation related comments provided by Parks Canada (Parks) in the document entitled "Annex I - Draft Detailed Review by Parks Canada of the Town of Banff's Draft Railway Lands ARP May 2022". This letter has been prepared to address those comments and provide clarity on the relative transportation impacts, of three aspects of the ARP identified by Parks therein:

1. Gondola Terminus
2. Heritage Rail Buildings
3. Passenger Rail

The overarching concern stated by Parks in this regard is 'neither the ARP nor its appendices discuss how the site layout, concepts, policies, building and parking construction, restoration activities, traffic and pedestrian flow etc. will change if the Gondola Terminus / Heritage Rail Buildings and/or Passenger Rail is ultimately not approved, thus presenting the reader with an incomplete picture'.

The transportation impacts of the ARP have been assessed in the study "*Banff Area Redevelopment Plan Transportation Impact Assessment*" (WSP, Final Draft May 2021, 'TIA') provided as Appendix B in the ARP. The ARP contains a range of complementary land uses, each of which will attract visitors to the site. The interaction between the land uses has been considered from a trip generation perspective by considering cross-visitation. The attractiveness of each land use for persons already in Banff has also been considered through Pass-by and Diverted trips. If any land use were to be removed from the site, this would result in a net reduction of trips to the site:

- fewer New trips;
- fewer Pass-by trips; and
- fewer Diverted trips.

By assessing the site as a whole, with all aspirational land uses, the TIA provides an assessment of the highest probable impact to the transportation system. As stated in the last paragraph of the Executive Summary "*In summary, this study determined that with minor roadway improvements, the transportation network surrounding the Banff Railway Lands ARP site will work well in 2029 horizon and the site will support a significant mode shift to sustainable transportation within the town of Banff.*"

Throughout the TIA, the trip generation, mode share, and parking demand associated with each facet of the ARP are clearly stated, allowing the reader to understand how much each use contributes to the total travel profile for the site. Furthermore, given the number of assumptions required to develop the TIA, a section of the study has been dedicated to exploring the implications of changes to assumptions (**Section 11** Alternative Scenarios) including 'What if the Mass Transit Rail is not Implemented' (TIA page 113).

This letter has been prepared to provide an overview of the trip generation and parking demands associated with the three land uses queried by Parks.

GONDOLA TERMINUS

The Gondola Terminus location influences both background traffic and ARP traffic. The operational projections, in terms of visitors per day, associated with the proposed terminus in the ARP are discussed in **Section 5.3** of the TIA. The peak hour trip generation is discussed in:

Section 7.2.2 / 7.2.3 2023 Horizon – 270 people, 60 new vehicle trips, 101 parking spaces

Section 7.3.2 / 7.3.3 2026 Horizon – 350 people, 68 new vehicle trips, 117 parking spaces

Section 7.4.2 / 7.4.3 2029 Horizon – 430 people, 80 new vehicle trips, 140 parking spaces.

Pedestrian, shuttle, and rail mode use are also included in those sections.

If the terminus did not proceed with the ARP, traffic associated with Norquay's operations would continue to travel to Norquay, passing through the interchange of Highway 1 at Norquay Road. This would result in a reduction in traffic volumes associated with the ARP, within the Town of Banff. Furthermore, the new trips associated with the Gondola would not occur, nor would the diversion of some trips associated with the existing Sulphur Mountain Gondola.

Therefore, background traffic profiles would reflect current patterns, and New and Diverted trips associated with the Gondola would not occur. The TIA has assessed current (2019) traffic operations in **Section 4.4** and future background traffic operations (without the ARP traffic) in **Section 8.1** (2023, 2026 and 2029). The analysis demonstrates that all intersections operate well within acceptable limits. The TIA has assessed future traffic operations with ARP traffic in **Section 8.2** (2023, 2026 and 2029). The analysis demonstrates that for all horizons, intersections operate within acceptable limits; with a brief period of possible congestion for vehicles exiting the North Lot.

It can therefore be concluded that should the Gondola Terminus not go ahead, traffic operations would be within acceptable limits, operating better than assessed in **Section 8.2** and no worse than assessed in **Section 8.1**.

In consideration of parking, if the Gondola Terminus did not go ahead, it could free up more parking that would be available to serve as intercept parking.

HERITAGE RAIL BUILDINGS

As detailed in **Section 7.2.1** of the TIA, the Heritage Rail Buildings are not expected to be a significant trip generator. As shown in **Table 7-4**, they are expected to attract 104 new person trips to the site, and as shown in **Table 7.7** this would result in 16 new vehicle trips in the peak hour. Should these buildings not be included on the site, the relative impact would be negligible.

In consideration of parking, if the Heritage Rail Buildings did not go ahead, it could free up a small amount of parking that would be available to serve as intercept parking.

PASSENGER RAIL

Consideration of trips made by passenger rail is included in the TIA to quantify influence on vehicle use for both background traffic conditions (**Section 6.2**) and trips associated with the ARP (**Section 7.3** and **Section 7.4**). Based on the *Calgary-Bow Valley Mass Transit Feasibility Study* (CPCS, 2018), a very modest mode share of 2.5% for rail was adopted.

For background conditions, this mode share represents 114 people in the peak hour in 2026 and 133 people in the peak hour in 2029. For the ARP, a total of 26 people were assumed to travel by rail in 2026, and 28 people in 2029.

In addition to this quantification, four alternate scenarios were considered in **Section 11.1** to understand the implications of passenger rail.

1. What is the impact if a different mode split is realized for the Banff Railway Lands ARP development?
2. What if a mass transit shuttle is implemented instead of the mass transit rail?
3. Does a passenger train from Calgary have a meaningful impact on the number of vehicles driving to Banff and therefore on volumes over the bridge/GHG and intercept parking requirements?
4. What if the mass transit rail is not implemented?

Volumes (person trips and vehicles) were quantified and for all scenarios it was concluded that the mass passenger rail has a small impact on the transportation network in the study horizon and its absence would not change any recommendations.

In consideration of parking, if the passenger rail did not go ahead, there could be a slightly higher demand for parking for visitors to the Town.

I trust this letter has provided clarity on the transportation implications associated with the uses raised by Parks, and has provided clear reference as to where further detail can be found in the TIA. Please do not hesitate to contact me should you wish to discuss this further.

Yours sincerely,

ID 220255
2022-08-31

PERMIT TO PRACTICE
WSP CANADA INC.
RM SIGNATURE:
RM APEGA ID #: 277636
DATE 2022-09-01
PERMIT NUMBER: P007641
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Mariya (Mars) Otten-Andrew, P.Eng., PTOE
Principal Engineer
Transportation & Infrastructure

NORQUAY MYSTIC RIDGE LTD.

BANFF RAILWAY LANDS AREA REDEVELOPMENT PLAN

TRANSPORTATION IMPACT ASSESSMENT

MAY 2021 FINAL DRAFT

BANFF RAILWAY LANDS AREA REDEVELOPMENT PLAN

TRANSPORTATION IMPACT ASSESSMENT

NORQUAY MYSTIC RIDGE LTD.

FINAL DRAFT REPORT

PROJECT NO.: 19M-00448
DATE: MAY 13, 2021

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February 23, 2021

Norquay Mystic Ridge Ltd.
Box 684
Banff, Alberta
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Attention: Adam Waterous

Dear Adam:

Re: Banff Railway Lands Area Redevelopment Plan Transportation Impact Assessment

We are pleased to submit the draft Banff Railway Lands Area Redevelopment Plan Transportation Impact Assessment.

We look forward to receiving feedback for incorporation into the Final Report.

If you have any questions or further requirements, please contact me at (587) 475-4838.

Yours sincerely,

Mariya Otten-Andrew, P.Eng., PTOE
Manager – Transportation Planning Alberta

/dp

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REVISION HISTORY

FIRST ISSUE

January 29, 2020	Draft Report
Prepared by:	**Reviewed by:**
Destiny Piper, Transportation Planner	Mariya Otten-Andrew, Project Manager Kerra Mruss, Technical Advisor

SECOND ISSUE

February 23, 2021	Draft Report
Prepared by:	**Reviewed by:**
Destiny Piper, Transportation Planner	Mariya Otten-Andrew, Project Manager

THIRD ISSUE

May 13, 2021	Final Draft Report
Prepared by:	**Reviewed by:**
Destiny Piper, Transportation Planner	Mariya Otten-Andrew, Project Manager

SIGNATURES

PREPARED BY

Destiny Piper, P. Eng. Transportation Planner	Date

APPROVED[1] BY

Mariya Otten-Andrew, P.Eng., PTOE Principal Consultant	Date

The Banff Railway Lands ARP transportation assessment was completed with the information known as of February 2021. The transportation assessment provides an accurate representation for forecasting purposes at the time it was written based on the information provided; however, it should be noted that changes to the proposed development may occur over time as the plan evolves.

This report was prepared by WSP Canada Ltd. for the account of NORQUAY MYSTIC RIDGE LTD., in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP Canada Group Limited's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

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PRODUCTION TEAM

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Transportation Planner	Destiny Piper
Transportation Modeller	Maryam Tabeshian
Technical Advisor	Kerra Mruss

EXECUTIVE SUMMARY

The Banff Railway Lands ARP is a 12.9-hectare site that will significantly transform and enhance how visitors arrive and move around the town of Banff. The colocation of complementary land uses along with enhancements to mobility and parking that can function to intercept trips, are expected to result in a mode shift towards sustainable transportation options for many trips associated with the ARP site. The Plan addresses and builds on numerous policies and supporting documents notably the Banff National Park Management Plan (2010) and the Town of Banff's Community Plan (2008) and Strategic Plan (2019 – 2022). The Multi-Modal Transportation assessment builds on the Town of Banff's Transportation Master Plan (2012), the Banff Long Term Transportation Study (2016) as well as the Calgary-Bow-Valley-Mass-Transit-Feasibility-Study (2018).

The Banff Railway Lands ARP development provides the opportunity to become a vibrant, human-scaled and sustainable multimodal transportation hub that respects and enhances its historical, physical and social context. The plan will bring together elements of the public and private, local and regional mass transit systems that will improve the connections between all transportation modes. Once visitors arrive at the Banff Railway Lands, they will not need a personal vehicle to move about the destination. The overarching vision is to reinvigorate the railway lands as an innovative transportation arrival destination of national importance, accommodating visitors from across the region, country and continent, reducing the impact of personal vehicles on the Park and Town.

This Multi-Modal Transportation assessment has considered the vision of the site as documented through the Banff Railway Lands Area Redevelopment Plan (DIALOG[2]), and critically assessed its impact on the transportation network from a transportation planning and engineering perspective.

The key areas that this study has assessed include:

- Existing (2019) road network operations;
- Traffic generation of the Banff Railway Lands ARP site;
- Relative impact on surrounding road network;
- Parking Requirements;
- Active modes connectivity.

This study has determined that with minor roadway improvements and enhancements / connections to active modes provisions, the transportation network surrounding the Banff Railway Lands ARP site can support this development. The site will significantly enhance how visitors travel to points of interest in and around Banff and Park, by promoting walking, cycling, and transit trips from the Banff Railway Lands ARP site.

The Banff Railway Lands ARP site will also assist in alleviating future congestion in the town and across the Bow River Bridge by capturing visitors already on the road network (in the parking lots) prior to entering the downtown / crossing the bridge. This will result in more people walking and taking shuttles to the downtown versus driving all the way into town and parking there – supporting a significant mode shift to sustainable transportation.

[2] *DIALOG, Banff Railway Lands Area Redevelopment Plan, December 3, 2019*

EXISTING CONDITIONS

The Banff Railway Lands ARP site is well connected to the transportation network. The site is located adjacent to Mt Norquay Road, which provides direct access to the Town of Banff and to the Trans-Canada Highway (Highway 1). A variety of pedestrian and cycling facilities, such as sharrows, the Rocky Mountain Legacy Trail, and a multi-use pathway provide connections to the network beyond the Banff Railway Lands ARP site.

The site is currently served by a year-round transit service (Roam Transit), which provides both local and regional connections in the area. The existing train station, located on the Banff Railway Lands ARP site, currently serves the Rocky Mountaineer passenger rail service through the area. Around 168 Canadian Pacific (CP) trains per week travel through this area on the CP railway.

Recent turning movement counts were also collected at the study intersections. A traffic operations analysis was conducted using Synchro 10 and VISSIM traffic software packages. Based on the traffic operations analysis, all study intersections are currently operating at an acceptable level of service (LOS) during the typical summer weekend peak hour.

> ***Key Takeaway:*** ***The Banff Railway Lands ARP site is well connected to the existing transportation network which will facilitate how visitors choose to move through Banff by active modes.***

BANFF RAILWAY LANDS ARP DEVELOPMENT

The Banff Railway Lands ARP has two distinct operational generators that will contribute to the movement of people and vehicles on and near the site, including:

1 Heritage Rail District
2 Norquay Gondola Terminus

Two parking areas are included within the ARP – the existing South Lot with around 490 spaces, and the proposed North Lot that will provide an additional supply of around 410 new spaces plus incorporate a reconfiguration of the existing Fenlands parking supply (approximately 170 spaces). The North Lot includes RV parking spaces and a transit hub with 4 bus bays.

HERITAGE RAIL DISTRICT

The Heritage Rail site will feature a variety of developments, including the CPR gardens, commercial retail, and a hospitality district comprised of restaurant and café space. A heritage plaza and amphitheatre with room for approximately 200 guests, as well as 20 multi-family residential units, are also planned as part of the Heritage Rail site. The land use concept accommodates the potential for a future passenger train service from Calgary. The CPR Train Station will provide an alternative mobility choice for visitors and residents to visit the Bow Valley without the need for a personal vehicle.

NORQUAY GONDOLA TERMINUS

The Norquay Gondola Terminus is an important link for connecting visitors to Banff with the mountains, without the need to have a vehicle. Located within the ARP development, the gondola terminus will connect the Town of Banff to the Norquay Ski and Sightseeing Resort by an aerial tramway or gondola. The new gondola will create a substantial ecological gain by removing vehicles from a sensitive wildlife corridor and enhancing the environment by removing vehicle traffic.

Within its first year of operation, the Norquay Gondola is anticipated to see approximately 215,000 visitors and should grow to approximately 420,000 visitors per year within 10 years. The busiest season is anticipated to occur during the summer months. The Norquay Gondola is anticipated to attract 1,420 visitors per day during its first year of operations and grow to 2,270 visitors per day in the 2029 horizon.

> ***Key Takeaway:*** ***As an Arrival Centre, the Banff Railway Lands ARP site will be a public space that encourages mass transit use, pedestrian movement, and public gathering. It will connect people to the mountains without the need for a car. It is to be a special place that makes passenger travel a destination in itself and serves as a bridge to green transit.***

BANFF RAILWAY LANDS ARP TRAFFIC

The potential trip generation for this site has been estimated using a range of information to provide the most accurate traffic profiles possible at this stage of planning. The site was considered holistically, with an understanding that these adjacent complementary land uses will generate multi-purpose trips. Therefore, the total trip generation will be less than the sum of the independently calculated trips for each separate land use.

The Banff Railway Lands ARP site is located close to the downtown and is currently served by Roam Transit. The Calgary-Bow Valley mass passenger rail is assumed to be operational in the 2026 horizon. This mass passenger rail does not form part of the Banff Railway Lands ARP application, but is considered in this study as it provides a mode of transportation to the site. Visitors to the Banff Railway Lands ARP site will have the choice of walking, shuttling, driving, or using the mass passenger rail. The trip generation for the site first considered the number of visitors that are anticipated to visit the Banff Railway Lands ARP site during the summer weekend peak hour. The total person-trips were then divided into the various modes available for visitors to use.

Adjustments were completed for vehicle-trips that will be included in the driveway volumes to the site but will not increase the overall traffic volumes on the study roads (i.e. intercept parking lots, existing Mt Norquay visitors, captured Sulphur Mountain visitors, pass-by trips).

The Banff Railway Lands ARP is expected to generate 128 new vehicles-trips and 3 shuttle-trips during the 2029 summer weekend peak hour horizon. It is estimated that 45% of visitors will walk to the site, equalling over 500 total person trips. These trips were distributed onto the surrounding road and path network using the directional attractions observed in current travel patterns, and assigning trips using the assumption that motorists and pedestrians will use the most efficient route.

> ***Key Takeaway:*** ***The Banff Railway Lands captures a portion of traffic that would have originally traveled by car through the town. A large portion of Banff Railway Lands ARP visitors will arrive by foot due to the close proximity to the downtown.***

BACKGROUND TRAFFIC FORECAST

Background traffic accounts for traffic growth within the study area as a result of other developments that are not related to the subject site. Background traffic projections were developed for horizons 2023, 2026, and 2029. The future background traffic volumes are comprised of three components: the base background traffic, the mass passenger rail between Calgary and Banff, and the South Intercept Parking Lot traffic. The South Intercept Parking Lot became operational in the Fall 2019.

The Calgary-Bow Valley Mass Passenger Rail is estimated to have 316,240 annual rail boardings by the 2026 horizon and 330,700 annual rail boardings by the 2029 horizon, using an average annual growth rate of 1.8%. This equates to 495 summertime rail boardings in the 2026 horizon and 580 summertime rail boardings in the 2029 horizon. The mass passenger rail system provides visitors to Banff the opportunity to travel to the town without the use of a passenger vehicle. Therefore, a portion of visitors who would have originally arrived by car but now choose to arrive by rail, no longer need to be included in the background traffic forecast. It is estimated that approximately 51 parking spaces will no longer need to be included in the total intercept parking lot demand for the 2026 horizon and 59 parking spaces for the 2029 horizon.

The South Intercept Parking Lot has 436 standard vehicle parking stalls and approximately 325 metres of parallel parking space available for busses. The existing parking demand for the South Lot is estimated at 282 parking spaces in a non-Covid-19 year. Utilizing a 1.8% growth rate and accounting for the parking demand reduction, due to the mass passenger rail, it is estimated that 261 intercept parking spaces will be needed in the 2026 horizon and 269 parking spaces will be needed in the 2029 horizon.

The South Lot will divert traffic from Mt Norquay Road into the Lot. Although these trips will be included in the driveway volumes to the site, they will not increase the overall traffic volumes on the study roads. The diverted trips were removed from the through traffic on Mt Norquay Road and added to the turning movements at the Mt Norquay Road and Railway Avenue intersection and the Railway Avenue and Elk Street intersection to access the South Intercept Parking Lot. The South Intercept Parking Lot assists in reducing traffic congestion within Banff as vehicles will be "intercepted" and park before entering downtown Banff.

The sum of the base background traffic, the mass passenger rail impacts, and the diverted South Intercept Parking trip assignment results in the overall background traffic profile used for this study.

Key Takeaway: ***The South Lot helps to divert traffic prior to reaching the downtown, and the mass passenger rail will provide visitors to Banff the opportunity to travel to Banff without the use of a passenger vehicle.***

FUTURE OPERATIONAL CONDITIONS

The traffic operational analysis indicated that in the background forecast (i.e. without the Banff Railways Lands ARP site) the Mt Norquay Road and Railway Avenue and the Mt Norquay and Fenlands Access intersections will experience some delay (approximately 45 seconds) during the summer weekend peak hour.

Development trips were added to the background forecast to estimate the future demands during the summer weekend peak hour for the 2023, 2026, and 2029 horizons. The relative impact of the Banff Railway Lands ARP site on the surrounding road network is minimal.

Synchro analysis suggests the westbound left-turn at the Mt Norquay Road / Fenlands Access intersection will experience lengthy delays during the peak hour due to relatively high background volumes on Mt Norquay Road. An assessment of the proportion of the year that volumes on Mt Norquay Road are high enough (around 1,200 vehicles per hour) to create delays for left turns from the access determined that this is relatively short period. In 2029, it is projected that volumes on Mt Norquay Rd exceed 1,210 vehicles per hour 7% of the time in June, 28% of the time in July, and 22% of the time in August. Given that the remaining months of the year have lower traffic volumes, the percent of time that the westbound left-turn delay is greater than 45 seconds is anticipated to be minor.

The Synchro analysis indicated that the westbound approach at the Mt Norquay Road / Railway Avenue intersection will experience significant delay as a stop-controlled intersection, with approximately 3 minutes of vehicular delay and approximately 13 vehicles waiting to turn onto Mt Norquay Road. The model is very sensitive to pedestrian movements. At this intersection, 175 pedestrians were assumed to cross the westbound approach of Railway Avenue. The removal of pedestrians off the westbound approach, reduces the delay for vehicles to approximately 40 seconds during the weekend summer peak hour, which would be considered acceptable delay. As actual pedestrian movements may differ than what was assumed, and interactions between pedestrians and vehicles in a shared street are not able to be accurately modelled[3], it is recommended that the Mt Norquay Road / Railway Avenue intersection is monitored, and intersection improvements are tailored to the traffic patterns if or when needed.

The key modifications needed to support the Banff Railway ARP development include:

— **Mt Norquay Road & Fenlands Access** – Provide separate westbound left and right-turn lanes out of the North Intercept Parking Lot.

— **Mt Norquay Road & North Lot (South Access)** – Construct intersection as a right-in only intersection for shuttles.

The VISSIM model provides a more realistic prediction of network operations than Synchro. This model indicated that in the 2029 (no train crossing Mt Norquay Road scenario), all intersections operate well, with left turns from the Fenlands Access experiencing delays of around 40 seconds and left turn movements from Railway Avenue experiencing delay of under 2 minutes.

The VISSIM analysis also evaluated the impact that trains would have on the study network. It was found that the vehicle queues returned to normal 15 minutes after the train has passed in the 2023 horizon, and 20 minutes in the 2029 horizon. In both scenarios, the westbound queue at Railway Avenue does not dissipate and is persistent until the end of the simulation.

Key Takeaway: ***Minor road network upgrades are needed to support the Banff Railway Lands ARP development. The Mt Norquay and Railway Avenue intersection should be monitored, and intersection modifications tailored to the actual traffic and pedestrian travel patterns if or when needed.***

ACTIVE MODES

As an "Eco-Transit Centre" mobility and connectivity are key values for the development of this site. The Banff Railways Lands ARP site will change how visitors move around the town. It is anticipated that nearly 510 visitors per hour will be walking between the Banff Railway Lands ARP and the downtown during the 2029 summer weekend peak.

The following new facilities and improvements will be critical to link the Banff Railway Lands ARP to connections and pathways on the network beyond the site and to encourage active transportation.

— **Active Modes Network Connections –** To improve active modes connections between the site and the external network, a pedestrian path should be provided on the east side of Mt Norquay Road and a

[3] Robert Steuteville, "Shared space intersections mean less delay", Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay

pedestrian crosswalk located on the north leg of the Mt Norquay Road and Railway Avenue intersection, should be relocated to in front of the southbound left-turn lane to provide better visibility of pedestrians.

- **Cycling –** Cycle infrastructure plays a critical role in encouraging cycling as a mode choice. The following cycling facilities should be considered on the network as part of the Banff Railway Lands ARP development, including: bike parking (racks for public use, secure parking for employees), water station(s), maintenance stand(s), lockers and shower facilities (for employees); bike-sharing facilities, allowing members of the public a seamless transition from their arrival mode (e.g. transit, private vehicle) to cycling 'the last mile' to travel to their Banff destinations; and, storage/parking in association with the Norquay Gondola, station and shuttle centre.
- **Transit Facilities -** The vision for the Banff Eco-Transit Centre is to incorporate a Transit Hub on the site, where Roam transit, tourist coaches and local shuttles can service the public. To accommodate the transit Hub on the Banff Railway Lands ARP site, the design of transit stops on Railway Avenue and within the Transit Hub will encourage the use of transit by residents of, and visitors to, the town of Banff. Transit stops should accommodate suitable amenities such as shelter, a passenger drop off area, benches and waste receptacles, landscaping, lighting, and clear information on transit routes and wait times.
- **Potential Pedestrian Bridge over Rail Corridor –** An option for consideration (but not proposed as part of the ARP) is a pedestrian connection between the north side and south side of the Banff Railway Lands ARP, and ultimately the Downtown. A pedestrian bridge crossing the rail corridor would link the North Intercept Lot and Shuttle Centre with the Heritage Rail District, the Norquay Gondola, and the Downtown.

> ***Key Takeaway:*** ***The Banff Railway Lands ARP site will promote visiting points of interest, the town, and the Park through green modes of travel. Integral to the success of the development, there will be the ease of non-auto movement, through the construction of a shared space sheet, network connections, cycling facilities, and facilitation of transit.***

PARKING REQUIREMENTS

A priority of the Banff Railway Lands ARP development is to encourage walking, cycling, and use of public transportation while ensuring the needs of the concept are met in terms of parking. The development will provide an additional 397 parking spaces in the North Lot, alongside the 173 reconfigured spaces in the Fenlands Recreational Centre and the 486 spaces in the South Lot for a total of 1,056 parking spaces across the site. This more than meets the projected parking requirements for the long term and provides capacity for intercept parking, to reduce traffic demands heading into the Downtown.

Based on the investigations of the Town's Bylaws, future parking needs, and peak parking demands, a breakdown of parking spaces required to support the Banff Railway Lands ARP development is as follows:

- **2029 Summertime Parking Demand: 280 Parking Spaces + 40 Residential Parking Spaces**
  - 140 parking spaces for the Heritage Rail Site uses and 40 parking spaces for the multi-family residential, based on the Town of Banff's Bylaws; and,
  - 140 parking spaces to meet the 2029 summer weekend peak hour demand for the Norquay Gondola visitors.
- **2029 Wintertime Parking Demand: 660 Parking Spaces + 40 Residential Parking Spaces**
  - 85 parking spaces for the Heritage Rail Site uses and 40 parking spaces for the multi-family residential, based on the Town of Banff's Bylaws; and,
  - 575 parking spaces to meet the 2029 winter weekend parking demand for the Norquay Gondola visitors.

Key Takeaway: ***The Banff Railway Lands ARP site provides sufficient parking in the 2029 horizon to accommodate the Heritage Rail District and the Norquay Gondola. An additional nearly 800 parking spaces will be available for use by the Fenlands Recreation Centre or intercept parking during the summer and nearly 400 parking spaces are available in the winter.***

CONCLUSION

This study analyzed the future background and post-development operating conditions of the transportation network surrounding the proposed Banff Railway Lands ARP site. The Banff Railway Lands ARP site will transform how visitors visit points of interest in and around the town and Park, by promoting walking, cycling, and transit trips from the Banff Railway Lands ARP site. The construction of Railway Avenue as a shared space street, the network connections, cycling facilities, and facilitation of transit will be integral to the success of the development and promoting travel by alternate modes.

In summary, this study determined that with minor roadway improvements, the transportation network surrounding the Banff Railway Lands ARP site will work well in 2029 horizon and the site will support a significant mode shift to sustainable transportation within the town of Banff.

SUMMARY OF CALCULATIONS – 2029 HORIZON

TRIP GENERATION BY USE (Sum of Individual Rates) - People Trips		
Heritage Rail	1082	
Gondola	550	*120 Existing users - based on current operations*
		430 Future users - based on Sulphur Mountain operations

INTERNAL CAPTURE*	
Heritage Rail	42%
Gondola	10%
**Differs by land use - average based on total person trips*	

MODE SHARE	***Passenger Vehicle***	***Walking / Cycling***	***Shutle***	***Rail***
Heritage Rail ex Res	42.5%	45.0%	10.0%	2.5%
Residential	41.0%	54.0%	5.0%	0.0%
Gondola	42.5%	45.0%	10.0%	2.5%

TRIP GENERATION ACCOUNTING FOR CROSS VISITATION (multi-use trips) - People Trips	***Passenger Vehicle***	***Walking / Cycling***	***Shutle***	***Rail***	***Total***
Heritage Rail	267	285	62	15	630
Gondola	210	222	50	12	495

PASS BY TRIPS* (applies to Private Vehicle trips)		
Heritage Rail	32%	36
Gondola	10%	55
**Differs by land use - average based on total person trips*		

DIVERTED TRIPS* (applies to Private Vehicle trips)		
Heritage Rail	23%	26
Gondola	0%	0

NET TRIP GENERATION - NEW TRIPS	***Passenger Vehicle*** *(veh)*	***Walking / Cycling*** *(ppl)*	***Shuttle***** *(veh)*	***Rail*** *(ppl)*
Heritage Rail	49	267	2	62
Gondola	80	210	1	50
Total^	130	510	3	30
^rounded				
***occupancy 45 passengers per vehicle)*				

PARKING	***Summer***	***Winter***
Heritage Rail ex Res*^	140	84
Residential*^	40	40
Gondola^^	140	578
Total	320	702
**^Based on bylaw*		
^^Based on Sulphur Mountain operations		

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APPENDICES

1 INTRODUCTION

WSP was retained by Norquay Mystic Ridge Ltd. (Norquay) to prepare a Multi-modal Transportation Impact Assessment (TIA) to support and inform the development of the Banff Railway Lands Area Redevelopment Plan. The Banff Railway Lands are a 12.9-hectare (32-acre) site located in the Town of Banff, within the CR (Railway Lands) Land Use District, which includes the Canadian Pacific Railway right-of-way, the train station, and lands immediately adjacent to the south of the CR District.

The Banff Railway Lands Area Redevelopment Plan (ARP) will become a vibrant, human-scaled and sustainable multimodal transportation hub that respects and enhances its historical, physical and social context. The plan will bring together elements of the public and private, local and regional mass transit systems that will improve the connections between all transportation modes. Once visitors arrive at the Banff Railway Lands, they will not need a personal vehicle to move about the destination. The overarching vision is to reinvigorate the railway lands as an innovative transportation arrival destination of national importance, accommodating visitors from across the region, country and continent, reducing the impact of personal vehicles on the Park and Town.

The location of the Banff Railway Lands ARP site in relation to the surrounding area is illustrated in **Figure 1-1**.

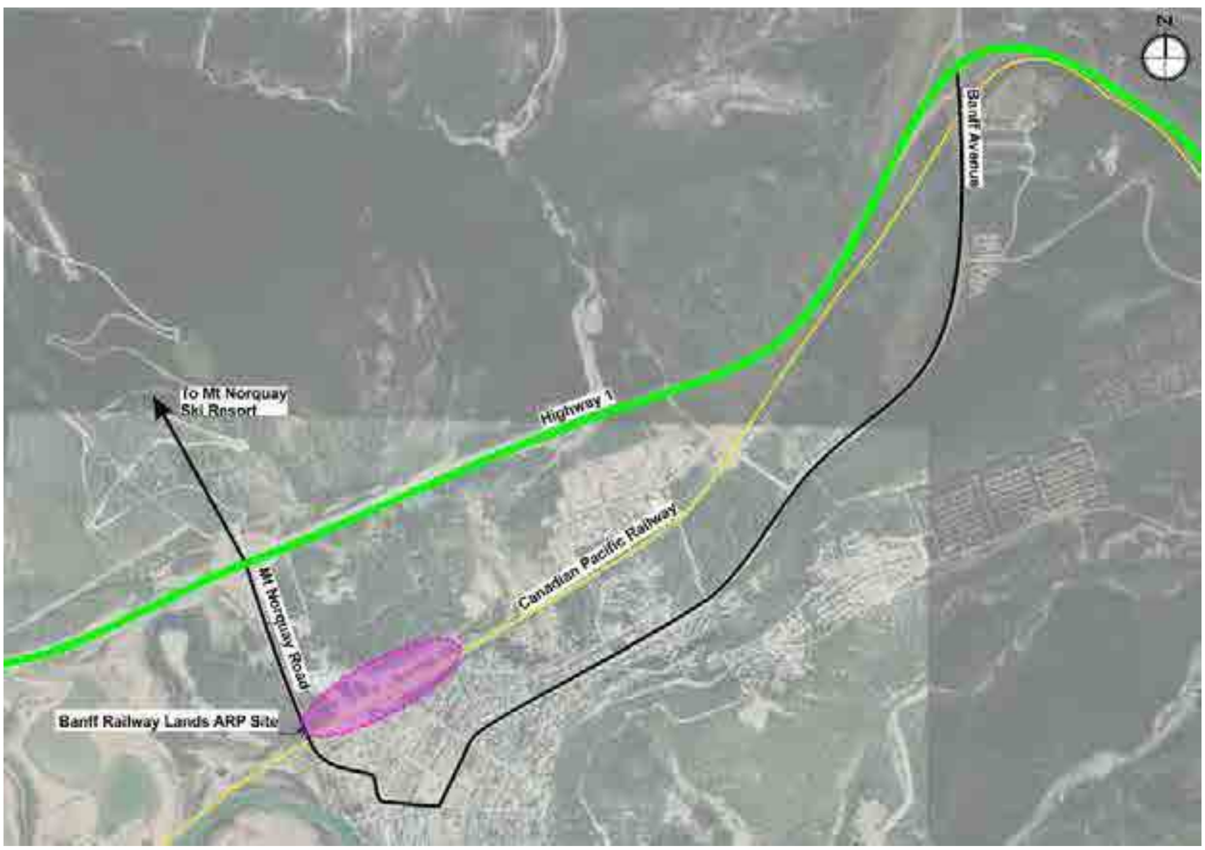


Figure 1-1 ***Regional Site Context***

1.1 STUDY PURPOSE AND OBJECTIVES

The purpose of this study is to identify and assess the potential transportation impacts at the study intersections associated with the redevelopment of the ARP site, and to identify the required mitigation measures (if any) to allow the adjacent roadways to accommodate traffic generated by the development. In addition, a key transportation priority of the site is to support walking and cycling in a safe, comfortable, and accessible environment, while being sensitive to the characteristics of the street network and accommodating the vehicular and loading needs of the proposed land uses.

The main objectives of this transportation assessment are to:

- Assess the existing geometric layout and traffic operations along Mt Norquay Road and at each of the study intersections, including:
  - Highway 1 / Mt Norquay Interchange;
  - Mt Norquay Road at proposed access points;
  - Mt Norquay Road / Railway Avenue; and,
  - Railway Avenue / Elk Street / Lynx Street; and,
- Identify the required infrastructure improvements including road network, intersection lane configuration, signals, pedestrian and transit accommodations to facilitate traffic and pedestrian flow, and to improve safety and operational performance along Mt Norquay Road based on the redevelopment plan.

1.2 METHODOLOGY

To meet the study objectives, the following methodology was utilized:

- Review available relevant studies and reports for the ARP project, including but not limited to, the Town of Banff Transportation Master Plan, the Long-term Transportation Study, the Calgary-Bow Valley Mass Transit Feasibility Study, and Banff Sulphur Mountain Redevelopment Project;
- Confirm peak traffic analysis period (i.e. summertime vs wintertime);
- Obtain existing transportation network characteristics including traffic volumes, geometry, and information on public transit services, pedestrian facilities, and parking facilities;
- Conduct weekend peak hour traffic counts at the study intersections;
- Estimate the future background traffic volumes on the surrounding roadways and study intersections which include the operations of the mass transit passenger rail and the South Intercept Parking Lot;
- Estimate the trips (car, transit, active modes) generated by the proposed development;
- Analyse the delay, level-of-service, and queue lengths of the study intersections for the summer weekend peak hour for the analysis horizons using Synchro Studio 10 (Synchro);
- Assess network operations when the Norquay Road railway level crossing is closed to traffic i.e. when a train crosses;
- Review internal traffic circulation, shuttle service, pedestrian traffic, and parking needs for the ARP development; and
- Identify any improvements necessary for the intersections and pedestrian facilities to accommodate the forecast vehicle and pedestrian volumes.

2 BACKGROUND REVIEW

A literature review of recent transportation studies was conducted to understand how the proposed development aligns with the Town's vision for transportation.

BANFF TRANSPORTATION MASTER PLAN

The Banff Transportation Master Plan (TMP) was undertaken to meet the community plan vision of developing a transportation system that:

- Encourages and complements pedestrian movement and cycling;
- Enhances the resident and visitor experience;
- Encourages the integration of local and regional transportation of people and goods; and
- Is economically and environmentally sustainable.

The TMP includes key recommendations that the proposed Banff Railway Lands ARP strongly aligns with, as summarised below:

- **Traffic Management**
  - Short Term Recommendation – Promote Mt. Norquay Road: *Seek to promote the use of Mt. Norquay Road as a prime access location to the Town core and associated parking areas* through signage located on the Trans Canada Highway and through promotional information.
  - Long Term Recommendation – It is recommended that the Town implement an *intercept parking* lot or lots (on Banff Avenue and Mt. Norquay Road at the edge of the Town boundaries if possible) with appropriate and effective shuttle or transit bus service from those lots to the Town core area. This will seek to capture inbound vehicular traffic prior to it reaching a location where its presence significantly affects Town roadway operations. At the 20-year horizon, based on the projected traffic growth, it is expected that an intercept parking lot or lots with a total capacity of approximately 350 to 450 parking spaces will be required to off-set the impacts in the downtown core.
- **Parking**
  - Long Term Recommendation – Consider the *provision of a new parking facility*. To this end, the TMP recommends that the Town consider the *development of intercept parking* lots on one or both of Banff Avenue and Mt. Norquay Road within 800 to 1,000 metres of the Downtown core to capture inbound traffic. This will necessitate corresponding enhancements to wayfinding so as to provide location data and routes for visitors (both vehicular to reach the facility, and then for pedestrians to reach the core from the facilities). It would also ideally include an expansion or adjustment to the existing transit service to include these lots and with an improved (reduced) headway[4].
- **Active Modes**
  - Long Term Recommendation – Ensure *active mode network* supports future parking facilities (intercept parking facilities) and encourages transit use.

BANFF LONG TERM TRANSPORTATION STUDY

The Town commissioned the Banff Long Term Transportation Study[5] (LTTS) with the objective of developing a context sensitive plan to accommodate increased visitation and reduce vehicle congestion with the goal of preserving Banff National Park for future generations. The study provides a comparative assessment of potential solutions to mitigate congestion caused by increased vehicle volume over time. As with the Town's TMP, the Banff Railway Lands ARP aligns with recommendations of the LTTS.

[4] *Bunt & Associates, Town of Banff 2012 Transportation Master Plan Update, (pp 149 to 158)*
[5] *Stantec, Banff Long Term Transportation Study (July 2016)*

Potential solutions investigated in the LTTS included:

- Expanding the road capacity by building additional roads (road bypass); and
- Moving people by mass transit (either conventional or aerial).

The road bypass option was not recommended, as it was fundamentally misaligned with the objectives of the Banff Community Plan (significant adverse environmental implications). The conventional or aerial transit options were recommended for further study and included the requirement for intercept parking. The study found that approximately 1,000 stalls are required in the short-term and up to 2,000 stalls are required in the long-term (2045). **Figure 2-1** shows the Lot stall requirements.

Year	Years from 2015	Months of congestion without action	Intercept lot stalls required
2015	0	2	927
2020	5	4	1,089
2025	10	5	1,259
2030	15	5	1,438
2035	20	5	1,626
2040	25	8	1,824
2045	30	9	2,032

Figure 2-1 Lot Stall Requirements[6]

The study identified Fenlands and Elkwood lands as two potential location options for a Lot. The study suggests that in order to promote intercept parking, free transit needs to be supplied for this portion of the transit service. The study showed that if none of the solutions are implemented, congestion would continue to increase in Banff.

CALGARY – BOW VALLEY MASS TRANSIT FEASIBILITY STUDY

The Town commissioned the Calgary-Bow Valley Mass Transit Feasibility Study[7] (Mass Transit Feasibility Study) to determine the feasibility of passenger mass transit, either through passenger rail or bus/coach, to provide visitors and residents a mobility choice to access the Bow Valley without the need for a personal vehicle. The study provides a comparative assessment of potential passenger mass transit options, and estimates potential ridership, revenues, capital and operating costs, and other metrics.

The Mass Transit Feasibility Study identified that the mass transit service would serve a demand for both visitors to the Bow Valley coming from or returning to Calgary and residents of the Bow Valley who travel or commute to Calgary. The study found that the ridership on a rail service would vary between 220,000 (low scenario) to 620,000 (high scenario) in the 2022 horizon. **Figure 2-2** shows the estimated boardings per day by station in the medium scenario at the 2022 horizon.

[6] *Stantec, Banff Long Term Transportation Study (July 2016)*
[7] *CPCS, Calgary-Bow Valley Mass Transit Feasibility Study (August 24, 2018)*

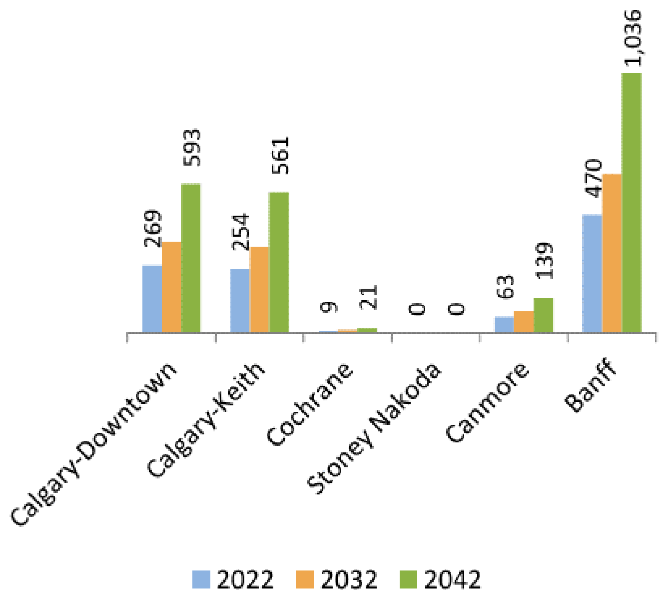


Figure 2-2 Boardings per Day by Station, Medium Scenario, Summer (2022)[8]

BANFF SULPHUR MOUNTAIN GONDOLA UPPER TERMINAL REDEVELOPMENT PROJECT

Brewsters Travel Canada submitted a development application for the redevelopment of the Sulphur Mountain Upper Terminal complex. The application documents how the Sulphur Mountain Gondola currently operates on typical summer days. A review of the Banff Sulphur Mountain Upper Gondola Terminal Redevelopment Report[9] indicates the following operational statistics of the Sulphur Mountain Gondola:

— Weekend Operations:	8:00 a.m. – 11:00 p.m.
— Length of Stay:	2- 2.5 hours
— Gondola Capacity:	650 people / hour
— Operating Capacity:	85%
— Parking Lot Capacity:	320 parking spaces and 5 motor coach stalls
— Average Summer Peak Visitors:	3,250 visitors / day
— By Car:	2,000 visitors / day (62%)
— By Shuttle:	1,250 visitors / day (38%)
— Occupancy Rate:	2.5 – 3.0 people / vehicle
— No. of Vehicles / Day:	800 vehicles (utilizing a 2.5 people / vehicle occupancy rate)
— Peak Hour Visitor Rate:	38%
— Average Parking Occupancy:	210 vehicles
— Peak Parking Occupancy:	320 vehicles

8 *CPCS, Calgary-Bow Valley Mass Transit Feasibility Study (August 24, 2018)*
9 *Brewsters Travel Canada, Banff Gondola Upper Terminal Development Project (June 20, 2014)*

3 TRAFFIC ANALYSIS PERIOD

Traffic volumes in and around Banff are highly seasonal. Peak volumes occur during the summer, with volumes reducing significantly in the shoulder season and winter.

Mount Norquay Ski Resort is located on the north side of the Trans-Canada Highway in Banff National Park, with base operations situated approximately 5.8 km (by road) from the Trans-Canada interchange at Mt Norquay Road. Mount Norquay Ski Resort offers both summer and winter programs. Each year, Mount Norquay Ski Resort sees approximately 25,000 summertime visitors and 145,000 wintertime visitors.

The Mount Norquay Gondola Feasibility Study[10] (Mt Norquay Feasibility Study) indicates that once the Norquay Gondola opens as part of the Banff Railway Lands ARP, traffic originally destined to Mount Norquay Ski Resort will relocate to the Intercept Parking Lots to utilize the Gondola. This is anticipated to add additional traffic to Mt Norquay Road south of Highway 1.

As Mount Norquay Ski Resort has a higher number of visitors during the winter months when compared to the summer months, it must be determined if the summertime or wintertime is the critical analysis period for the Banff Railway Lands ARP Transportation Impact Assessment (TIA).

Winter Program

Winter operations at Mount Norquay Ski Report are based around skiing and include snow schools, tubing, daycare and dining at the resort's four restaurants: Cliffhouse Bistro, North American Lodge, Lone Pine Pub and Cascade Lodge.

Summer Program

The Mount Norquay Ski Resort summer program operates from mid-June to mid-October and is based around the Via Ferreta and Sight-Seeing Chairlift. Summer operations include:

- **Via Ferrata:** A protected climbing route that includes steel cables that are fixed to a rock that climbers secure themselves to. Mount Norquay Ski Resort has four routes that vary in length and skill level.
- **Sight-Seeing Chairlift:** The chairlift reaches nearly 7,000 feet in elevation and accesses the Cliffhouse Bistro.
- **Hiking:** The Stoney Squaw Mountain and Cascade Amphitheatre trail heads can be found at the Mount Norquay Ski Resort main car park.
- **Dining:** Mount Norquay Ski Resort has four restaurants: Cliffhouse Bistro, North American Lodge, Lone Pine Pub and Cascade Lodge.
- **Weddings.**

Utilizing the 2017 Traffic Count Report for Mt Norquay Access Road, the 2017 average daily traffic volume on Mt Norquay Access Road 0.3 km north of Highway 1 (Counter ID 11300010) was:

- Summertime (July to August): 1,050 vehicles per day
- Wintertime (January to March): 1,300 vehicles per day

Utilizing the 2017 Monthly Traffic Analysis Report for Mt Norquay Road, the 2017 average daily traffic volume on Mt Norquay Road south of Highway 1 approximately 100 metres north of Railway Avenue (Counter ID 201300120) was:

- Summertime (July to August): 15,050 vehicles per day
- Wintertime (January to March): 8,400 vehicles per day

[10] *Mt. Norquay & Brent Harley and Associates Inc., Mount Norquay Gondola Feasibility Study Draft-Confidential (May 14, 2018)*

The critical analysis period can be determined by adding the average daily traffic volumes of both roads together for summertime and for wintertime, as the traffic will be higher on Mt Norquay Road south of Highway 1 once the gondola becomes operational. The season with the higher combined traffic volume is the critical season. The combined traffic volumes are estimated at:

— Summertime (July to August): 16,100 vehicles per day
— Wintertime (January to March): 9,730 vehicles per day

The combined summertime average daily traffic volumes are approximately 1.7 times higher than the combined wintertime average daily traffic volumes on Mt Norquay Road. The traffic volumes during the summer are therefore considered the critical period and will be used in the analysis in the Banff Railway Lands ARP TIA.

Traffic data for Mt Norquay Road shows that the peak hours for traffic occur on the weekends, in the afternoon. Therefore, the summer weekend peak hour will be the analysis period.

4 EXISTING CONDITIONS

This section of the assessment describes the existing transportation network and traffic conditions within the study area.

4.1 SITE CONTEXT

The Banff Railway Lands ARP site is located at the north-west edge of the town and is divided by the CP railway line. It is approximately 500 m (straight line) from the Downtown core, with an approximate walking distance of 600 m to 800 m, depending on route and end destination. There are existing pedestrian, cycling and transit facilities that provide for non-auto access to the site.

The site location in the context of the transportation network and the study intersections is shown in **Figure 4-1.**

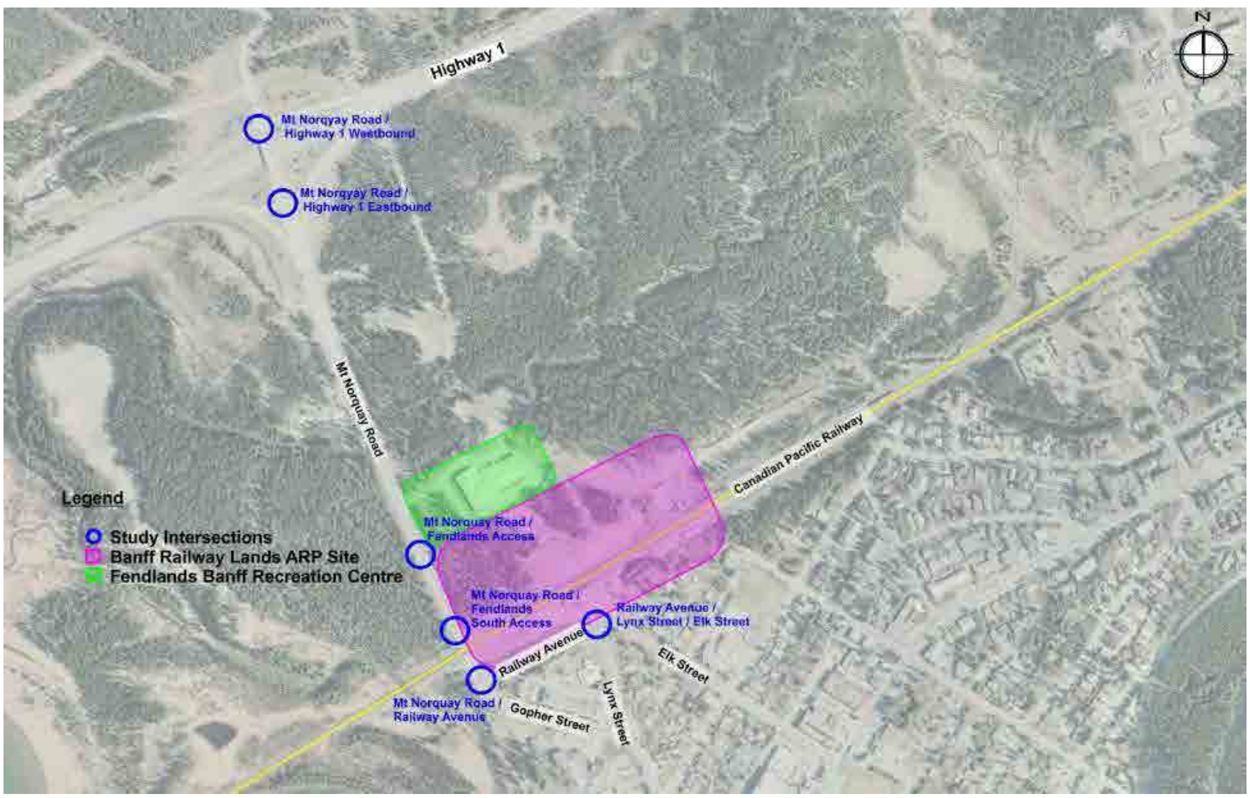


Figure 4-1 ***Site Context and Study Intersections***

4.1.1 ROAD NETWORK AND STUDY INTERSECTIONS

Vehicular access to the site is available via Mt Norquay Road (along the western boundary) and Railway Avenue (along the southern boundary).

MT NORQUAY ROAD

Mt Norquay Road is the 'West Gate' to the Town of Banff, providing connection to the Trans-Canada Highway (Highway 1). In the study area, Mt Norquay Road is a two-lane, two-way road with a north-south alignment and a 30 km/h to 40 km/h speed limit (speed limit reduces to 30 km/h on approach to Banff sign near Fenlands). Historical traffic data shows that Mt Norquay Road is becoming the more popular route to access Banff, with approximately 55% of all arrivals/departures to Banff occurring at this 'west entrance', and 45% travelling via Banff Avenue (the 'East Gate' or 'east entrance').

Based on the 2018 permanent count data for Mt Norquay Road[11], daily traffic volumes range between 10,000 and 17,000 vehicles during the summer months, with a weekend average of around 15,500 vehicles per day (vpd). During peak hours in the summer, there are around 1,300 vehicles per hour (vph) travelling on Mt Norquay Road. The directional distribution typically shows slightly higher volumes travelling southbound, with an average peak hour maximum of around 715 vehicles, and average northbound peak hour volumes of around 580 vehicles. This is well within the capacity of a two-lane two-way road.

RAILWAY AVENUE

Railway Avenue is a short local road with an east-west alignment that provides access to the existing Banff Railway parking area. It carries low traffic volumes, less than 1,000 vpd (note, this data precedes the opening of the South Intercept Parking Lot). Railway Avenue intersects Mt Norquay Road at a Stop controlled intersection (Stop for Railway Avenue) with Gopher Street forming the southern approach to the intersection.

Downtown can be accessed from Railway Avenue via Elk Street; however, traffic typically continues south on Gopher Street to reach Downtown. The new 456 stall intercept parking lot that opened in fall of 2019 is accessed from Railway Avenue.

4.1.2 EXISTING STUDY INTERSECTION CHARACTERISTICS

Highway 1/ Mt Norquay Road intersection is a service interchange with stop-controlled intersections at the eastbound and westbound ramps. Mt Norquay Road is 4-lanes at the service interchange and narrows to a 2-lane road either side of the interchange. The Mt Norquay Road / Highway 1 Eastbound Ramp intersection is served by a single approach that intersects Mt Norquay Road at 90-degrees. The eastbound-to-southbound right-turn and the northbound-to-eastbound right-turn are served by channelized right-turn lanes. The Mt Norquay Road / Highway 1 Westbound Ramp intersection is served by a westbound left-turn lane as well as a shared westbound left-through-right turn lane. The westbound on-ramp is a single lane that merges with Highway 1.

Mt Norquay Road / Fenlands Access intersection is currently a minor-street stop-controlled intersection. A small exclusive left-turn lane is provided on the southbound approach. Traffic calming features, such as planters, are present in the median at this location. A well used pedestrian crossing is located on the north leg of the intersection.

Mt Norquay Road / Railway Avenue intersection is currently a three-leg minor-street stop-controlled intersection. The northbound approach is four-lanes undivided, while the southbound and westbound approaches are two-lanes undivided. A short southbound left turn lane is presenting on Mt Norquay Road. Pedestrian crosswalks are provided on both the north and south approaches of the intersection.

Railway Avenue / Elk Street / Lynx Street intersection was converted to a single-lane roundabout using planters to create the central island, in the fall of 2019. This arrangement has been observed to work effectively.

[11] *Source: Town of Banff Permanent Count Data*

4.1.3 ACTIVE MODES NETWORK

There are existing sidewalks along all the key routes to the Downtown and a scenic pathway along the Bow River. Cycling facilities exist around the site, predominately 'sharrows' (bikes share lanes with cars, refer to **Figure 4-2)** and off-road tracks. A map showing the major pedestrian and bike connections is provided in **Figure 4-3.**

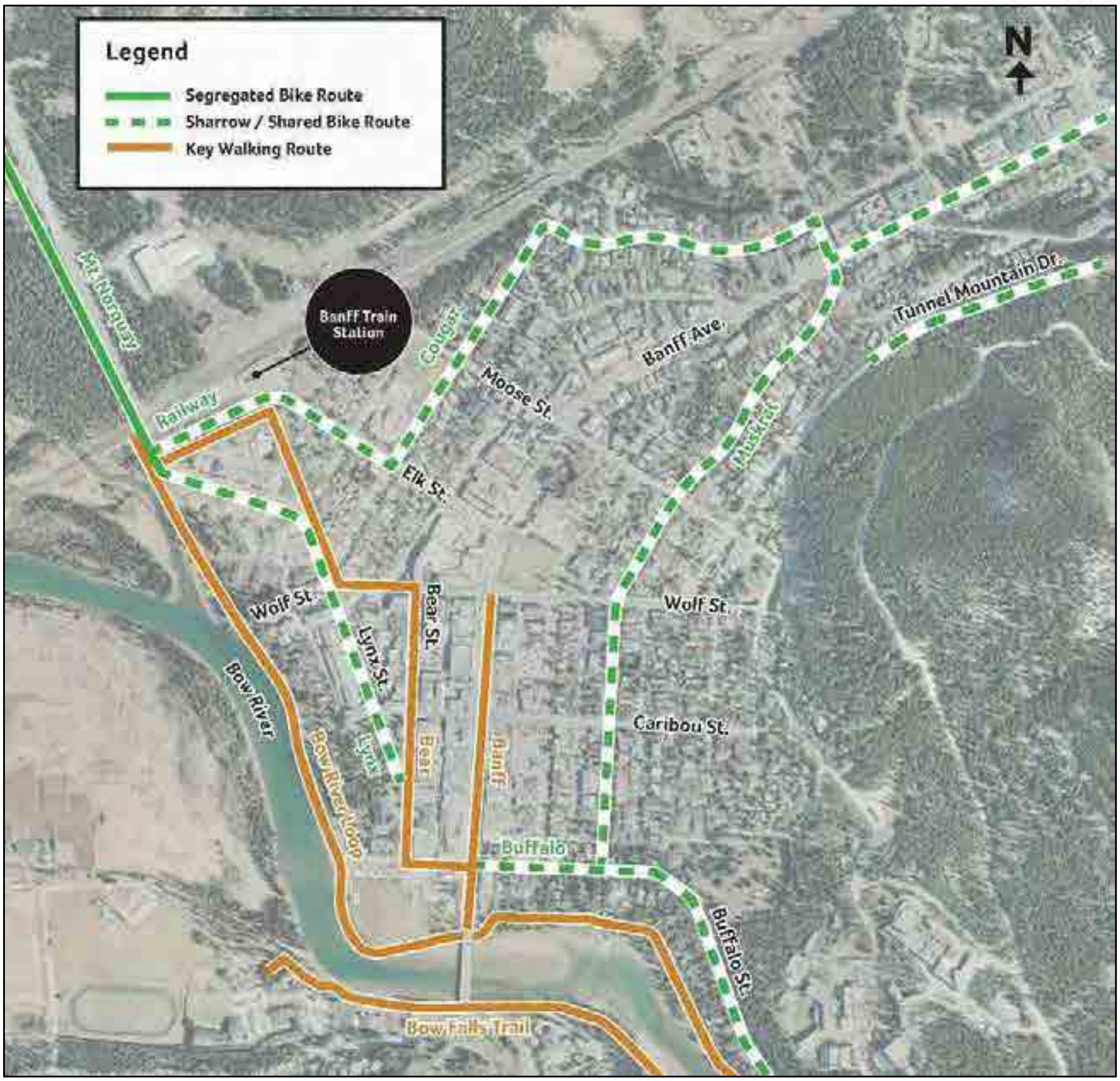


Figure 4-3 Key Pedestrian and Cycle Routes

Elk Street, Railway Avenue and Mt. Norquay Road are also part of the Rocky Mountain Legacy Trail cycle route that runs through Banff. The Rocky Mountain Legacy Trail includes 27 kilometers of paved cycle trails / roadways and runs from Canmore (Bow Valley Parkway) to the Banff 'West Gate'. A map of the Rocky Mountain Legacy Trail, through Banff, is shown in **Figure 4-4.**

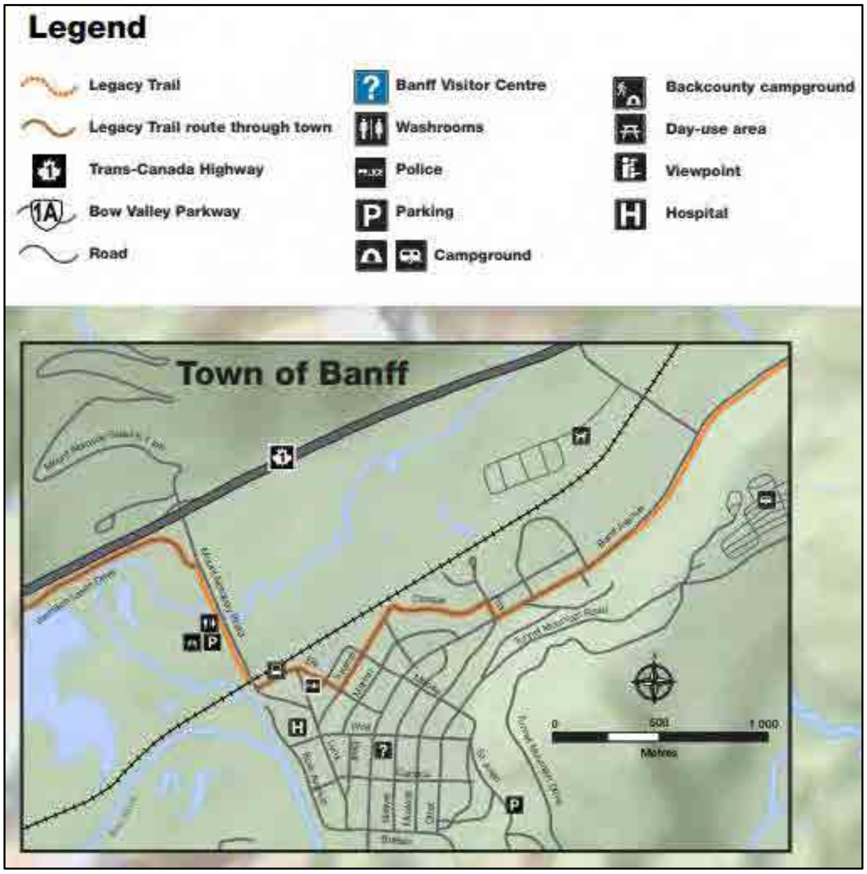


Figure 4-4 Banff Rocky Mountain Legacy Trail[12]

[12] *Parks Canada, Biking Trails in Banff Area*

4.1.4 TRANSIT NETWORK

The Banff Railway Lands ARP site is serviced by a number of Roam transit routes (refer to **Figure 4-5**) with stops located on Elk Street. Local services are provided year-round, with higher frequency typically offered in the summer. Additional Seasonal Tourist Services are also offered during the summertime to meet the demand. Current routes include:

Local Services:

— Banff-Canmore Regional, Route 3; and

— Banff-Lake Louise Regional, Route 8.

Seasonal Tourist Services:

— Cave and Basin, Route 4; and

— Lake Minnewanka, Route 6.

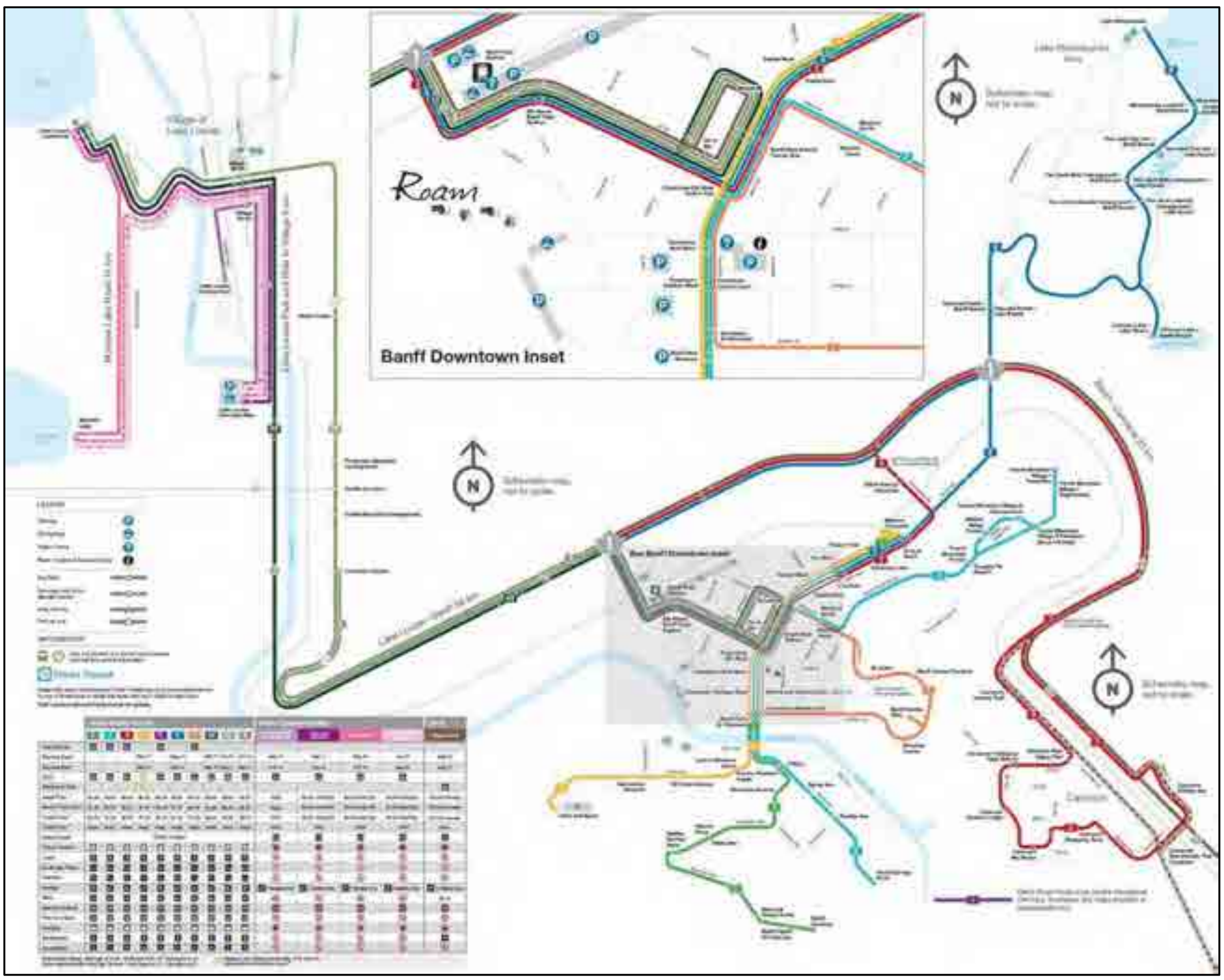


Figure 4-5 Banff Local Services, Roam

4.1.5 RAIL NETWORK

The Canadian Pacific (CP) mainline runs through the site, providing rail connection to the west coast for freight and tourist trains.

CANADIAN PACIFIC RAILWAY

Around 168 CP trains per week travel through this area on the CP railway. Schedules are variable, but on average over 20 trains per day cross Mt Norquay Road.

ROCKY MOUNTAINEER

The Rocky Mountaineer is a passenger rail service that offers tourist trips through the Rocky Mountains from Calgary, Alberta to Seattle, Washington. The Rocky Mountaineer also includes stops in Banff, Jasper, Lake Louise, Quesnel, Kamloops, Whistler, and Vancouver along its journey. The Rocky Mountaineer Routes are shown in **Figure 4-6**. The “First Passage to the West” service runs through Banff approximately three times per week and the “Coastal Passage” service runs through Banff once per week during the summer months. Passengers are transferred from the Banff Railway Station to their hotels by coach. Peak operations are during the summer, with around four trains stopping at Banff per week.

Figure 4-6 Rocky Mountaineer Routes

ROYAL CANADIAN PACIFIC

The Royal Canadian Pacific is another passenger rail service that stops in Banff. The route for the Royal Canadian Pacific is shown in **Figure 4-7**. Since 2014, the service has been exclusively available for private charter and only accepts bookings to charter the entire train privately. In 2018, there were approximately eight trains that travelled through Banff; however, prior to 2014, there were approximately 20 trains that travelled through Banff between May and September.

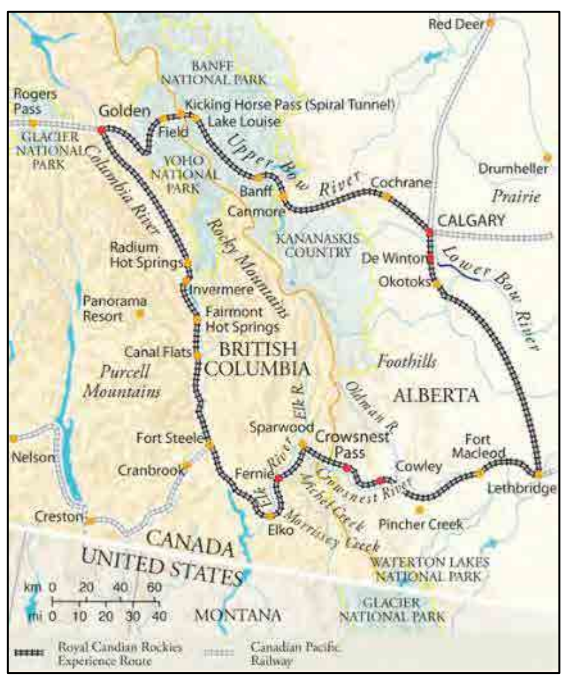


Figure 4-7 Royal Canadian Pacific Route

CALGARY – BANFF PASSENGER RAIL

In recent years, interest in re-introducing a regular passenger rail service between Calgary and Banff has increased, and the likelihood of this project going ahead appears increasingly probable.

In June 2020, the Canada Infrastructure Band (CIB) and the Province of Alberta signed a Memorandum of Understanding (MOU) to evaluate the benefits and cost of adding passenger rail service between Calgary and Banff. According to CIB *"The 130-kilometre sustainable passenger rail service would provide a modern and sustainable travel option from the airport to one of Canada's most popular tourism destinations. The focus is to stimulate tourism and to increase mobility options of Albertans and visitors. The project would also reduce vehicle greenhouse gas emissions and congestion in the Calgary to Banff National Park corridor. It has been almost 30 years since the Province of Alberta had regular rail service between its largest city and Canada's most visited national park. Residents of First Nations communities would see increased employment opportunities with easier access into Calgary and points in between."*[13]

In December 2020, the Alberta Minister of Infrastructure, Prasad Panda included this project in discussion on Alberta's Recovery Plan, saying *"This project would support the province's economy by creating an airport-rail link to downtown Calgary and Banff National Park. This is critical infrastructure to increase tourism opportunities while ensure workforces access, all the while protecting the environment by reducing greenhouse gas emissions and reducing congestion on Highway 1."*[14]

With the project gaining traction, it has been considered as a background condition for this study, that is, it has been assumed to be a Background Condition in **Section 6** and assumed to be in operation in the 'Pre-Development' scenarios assessed in Section 8.

4.1.6 PARKING

The Town of Banff provides a mix of on-street and off-street parking, with the highest parking density supplied in the downtown core in Zones A, B and C (refer to **Figure 4-8**). A total of 1,580 stalls are available in this downtown core area[15]. During the summer months, these spaces are well utilised. According to a series of parking surveys carried out by INIDGO between 2014 and 2018, average occupancy of parking spaces throughout the day is around 65%, with a peak occupancy up to 90% across the zones.

Duration of stay and turnover of parking spaces are partially a function of time limits, but also a function of trip purpose and adjacent land uses. Averaging these across the downtown core parking, shows a duration of between 1.5 hours and 2 hours and a turnover rate of around three vehicles per day (equating to six vehicle trips per space, i.e. one arrival and one departure times three cars).

In addition to the existing parking supply in Banff, a new 486 stall parking lot was constructed and opened in the fall of 2019. This 'South Lot' is situated east of the Banff Railway Station within the Banff Railway ARP lands, with access directly from Railway Avenue. The intent of this lot is to function as *intercept* parking, capturing traffic destined for Banff, and reducing parking and traffic demand in the Downtown.

[13] https://cib-bic.ca/en/projects/calgary-banff-rail/
[14] https://www.alberta.ca/article-alternative-financing-for-infrastructure-projects.aspx
[15] *Town of Banff 2018 Parking Study & Reports, Indigo, 2018*

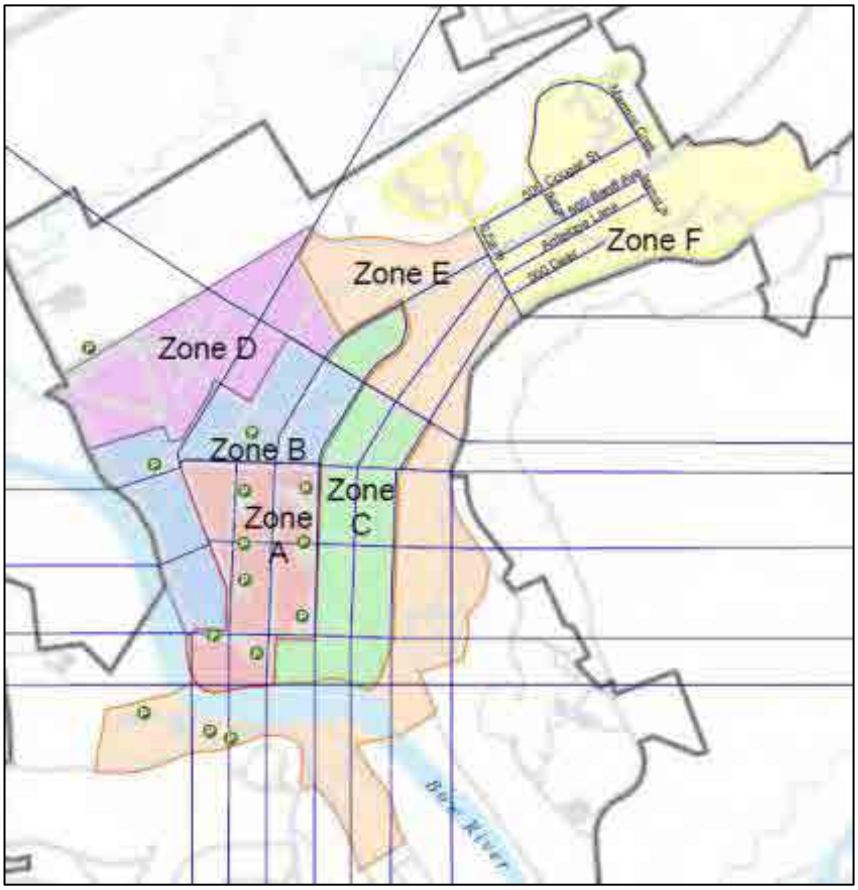


Figure 4-8 Banff Parking Zones[16]

The Town of Banff will introduce visitor-pay parking in the downtown core in May 2021. According to the Town, *"Visitor-Pay Parking is designed to increase the availability of short-term parking spaces in the downtown, while providing an incentive for visitors and commuters to use* ***free 9-hour parking*** *located at the Train Station Public Parking Lot, along the Bow River, and in the Bear Street parkade. The rate for parking in the paid zone will be $3 per hour when introduced for the summer. The rate drops to $2 per hour next winter."*[17]

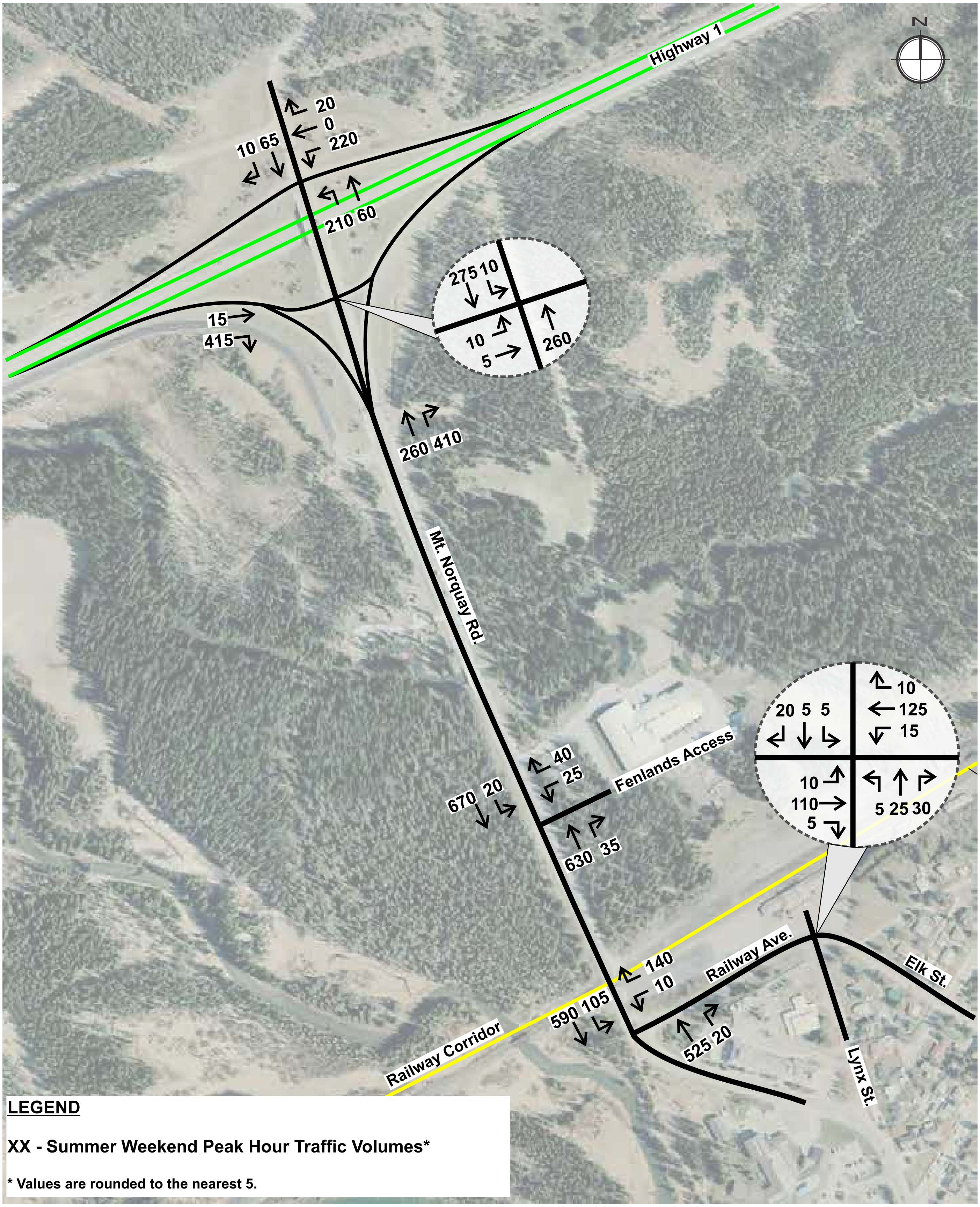
[16] *Town of Banff 2018 Parking Study & Reports, Indigo, 2018*
[17] Town of Banff, *Parking,* https://www.banff.ca/93/Parking. Accessed February 19, 2021

4.2 EXISTING TRAFFIC VOLUMES

Turning movement counts were conducted at the Mt Norquay Road study intersections between Friday, July 19th and Sunday, July 22, 2019. Thirteen-hour traffic counts (8:00 a.m. to 9:00 p.m.) were performed to identify the typical congested periods of operations throughout the network. Vehicle classification data was recorded during each count to develop a traffic profile at the various study intersections. A summary of these turning movement counts is provided in **Appendix B**.

The turning movement counts were reviewed against traffic volumes collected at the Mt Norquay Road permanent count station, at the Fenlands Access intersection, for Saturday, July 13th and Saturday, July 29th, 2019, to ensure the volumes captured represented typical summer traffic volumes. The peak hour was found to occur on Saturday, between 4:15 p.m. and 5:15 p.m., which is consistent with the historical peak hour observed from the Norquay Traffic counter summary in 2018.

The 2019 summer weekend peak hour traffic volumes are presented in **Figure 4-9.**



LEGEND

XX - Summer Weekend Peak Hour Traffic Volumes*

*** Values are rounded to the nearest 5.**

WSP Canada Inc.
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t. 403.266.2800
www.wsp.com

Issue Date: 2021-02-11
Scale:NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 4-9 - 2019 Summer Weekend Peak Hour Traffic Volumes

Banff Railway Lands Area Redevelopment Plan TIA

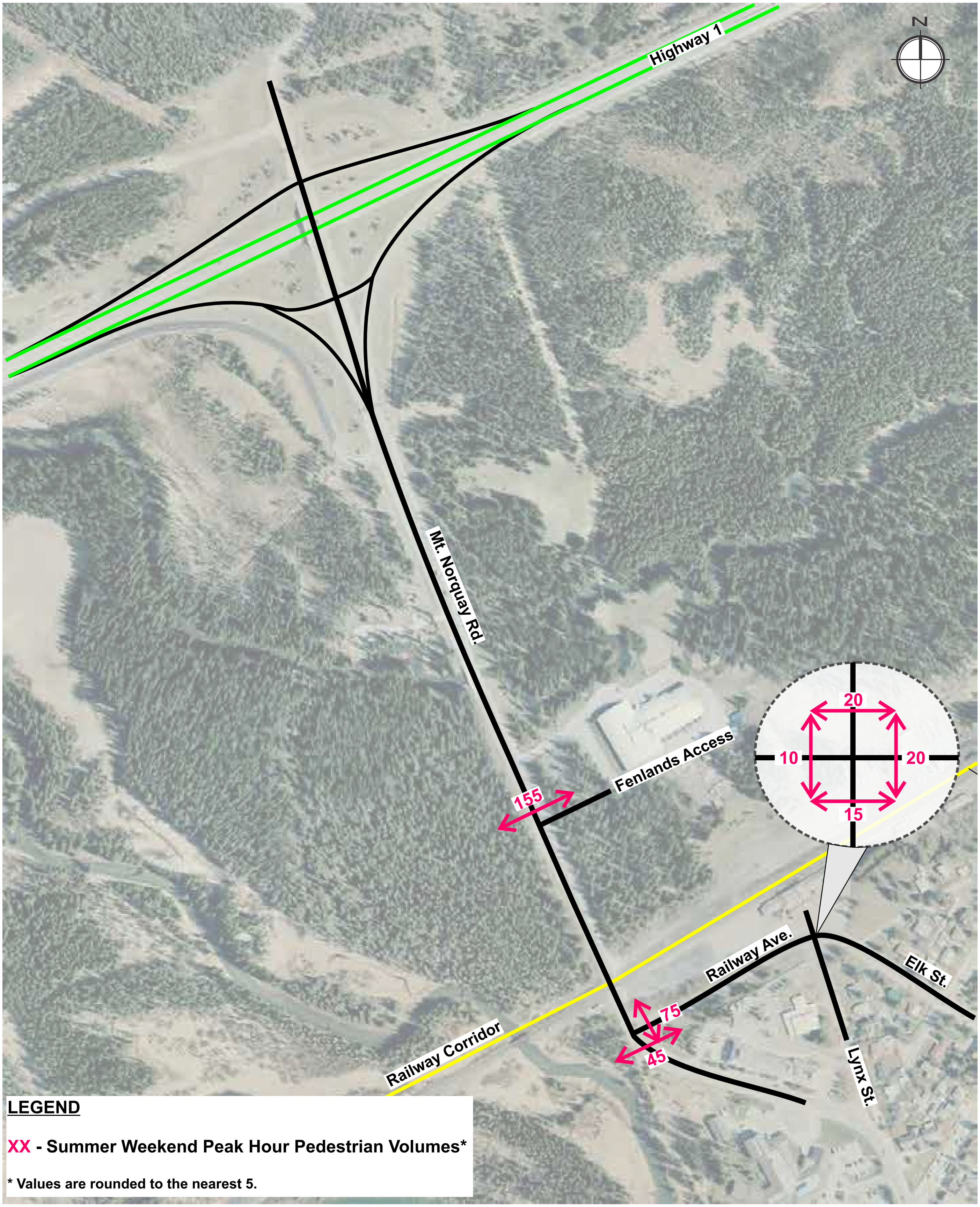
DRAWING: FIG-19M 004480-2019 Peak Hour Traffic Volumes (Summer).cdr DATE: 2019-11-27 DRAWN BY: piperde

4.3 EXISTING PEDESTRIAN VOLUMES

Pedestrian volumes were recorded at the study intersections during the turning movement counts. Pedestrians volumes from the Sunday traffic count were used to determine the pedestrian volumes at the study intersections, as it was anticipated that the weather conditions on the Saturday resulted in lower than typical pedestrian volumes. The estimated summer weekend pedestrian volumes during the peak hour (4:15 p.m. to 5:15 p.m.) are illustrated in **Figure 4-11**.

The “Banff” sign is a significant attractor for tourists and has been observed to generate large volumes of pedestrians crossing Mt Norquay Road. During the peak hour, it is noted there is a high number of pedestrians (155 pedestrians) crossing Mt Norquay Road at the Fenlands Access. Pedestrians were observed visiting the Banff sign (see **Figure 4-10**) located on the west side of Mt Norquay Road.

Figure 4-10 Pedestrians visiting Banff Sign on Mt Norquay Road



LEGEND

XX - Summer Weekend Peak Hour Pedestrian Volumes*

* Values are rounded to the nearest 5.

DRAWING: FIG-19M 004480-2019 Peak Hour Pedestrian Volumes (Summer).cdr DATE: 2019-12-03 DRAWN BY: piperde

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Scale:NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 4-11 - 2019 Pedestrian Volumes

Banff Railway Lands Area Redevelopment Plan TIA

4.4 EXISTING (2019) TRAFFIC OPERATIONS

The study area was analyzed using the existing roadway geometry, traffic control, and traffic volumes. A macroscopic analysis was completed using Synchro to identify how vehicle traffic moves throughout the corridor. A microscopic analysis was also completed using VISSIM to identify how trains, pedestrians, and cyclists impact the traffic and mobility within the study network.

4.4.1 INTERSECTION PERFORMANCE EVALUATION CRITERIA

The intersection capacity analysis was carried out at the study intersections during the summer weekend peak hour using Synchro 10 software package, which is based on the methodology outlined in the Highway Capacity Manual (HCM). The HCM methodology considers the intersection geometry, the traffic volumes, the type of intersection controls, and the pedestrian and cyclist volumes. The methodology then defines the Level of Service (LOS) is based on the average delay per vehicle.

The LOS criteria for signalized and unsignalized (stop-controlled) intersections, as outlined in the HCM, is presented in **Table 4-1**. LOS A indicates good traffic flow with minimal delay and LOS F indicates congested traffic operations with considerable delay.

Table 4-1 Level-of-Service Criteria

LEVEL-OF-SERVICE	SIGNALIZED INTERSECTION (SECONDS)	UNSIGNALIZED INTERSECTION (SECONDS)
A	≤ 10	≤ 10
B	>10 – 20	>10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

Source: Highway Capacity Manual

4.4.2 SYNCHRO ANALYSIS

The results of the existing conditions operation analysis area summarized in **Table 4-2**. The table features information on the overall intersection operations and details regarding the critical movement. The volume-to-capacity (v/c) criteria defines the ratio of demand volume to capacity. The critical movement is defined as the movement experiencing the greatest delay. The detailed Synchro outputs for the existing conditions are included in **Appendix B.** Note that while traffic volumes presented in **Figure 4-9** are rounded to the nearest 5 vehicles per hour (vph), the Synchro analysis utilized the raw traffic counts.

Table 4-2 2019 Existing Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	**Delay**	**Max (v/c)**	**Movement**	**LOS (Delay)**	**v/c**	**95th % Queue**
Mt Norquay Rd / Hwy 1 WB Ramp	B (11.4 s)	0.46	WB-L	C (23.5 s)	0.46	18 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s)	0.04	EB-LTR	B (12.3 s)	0.04	1 m
Mt Norquay Rd / Fenlands Access	A (1.7 s)	0.37	WB-LTR	D (34.9 s)	0.37	12 m
Mt Norquay Rd / Railway Ave	A (3.8 s)	0.53	WB-LTR	D (27.8 s)	0.53	22 m
Railway Ave / Elk St / Lynx St	A (3.2 s)	0.10	NB-LTR	B (11.2 s)	0.10	2 m

The existing operating conditions, presented in **Table 4-2**, represent typical traffic conditions without the influence of trains crossing Mt Norquay Road. To understand how the network functions when a train is crossing, it was modelled using VISSIM, a microsimulation model. The results of the assessment are presented in **Section 4.4.3.**

The capacity analysis results show that all study intersections operate well (LOS B or better) in the 2019 existing traffic conditions, with individual movements operating at a LOS D or better during the summer weekend peak hour. The Mt Norquay Road / Fenlands Access intersection experiences the greatest delay of the study intersections (around 35 seconds) but is still considered to operate within acceptable limits as a stop-controlled intersection. Note that the traffic data was collected prior to the South Intercept Parking lot opening and the Railway Avenue/Elk Street/Lync Street intersection being converted to a single-lane roundabout.

The Railway Avenue/Elk Street/Lynx Street intersection was also analyzed as a single-lane roundabout (using SIDRA software) to evaluate its operations under existing demands. The intersection was found to operate well (LOS A) as a single-lane roundabout with plenty of capacity available (v/c ratios less than 0.15) with existing traffic volumes.

The analysis demonstrates that no modifications are required to accommodate the existing traffic volumes.

4.4.3 VISSIM ANALYSIS

CP rail crosses Mt Norquay Road approximately 60 metres north of Railway Avenue. Based on the information provided by the Town, one train can block the northbound and southbound movements on Mt Norquay Road on average for about 4.5 minutes. To assess the effect of the rail crossing on the operating conditions along Mt Norquay road in the section between Highway 1 and Railway Avenue, a microsimulation model was created using VISSIM 11.0 software. This software is capable of analyzing the impacts between adjacent intersections and driveways in a network as well as the interactions between different modes of transportation and road users including general traffic, trains, transit, cyclists and pedestrians.

MODEL INPUTS

The model area covers Mt Norquay Road between Highway 1 and Railway Avenue and includes:

- Highway 1 / Norquay Road interchange;
- Mt Norquay Road / Fenlands Access intersection;
- Mt Norquay Road Pedestrian crossing (across from the Banff sign);
- Rail crossing located on Mt Norquay Road.
- Mt Norquay Road / Railway Avenue intersection; and,
- Railway Avenue / Lynx Street / Elk Street intersection.

The model includes 15 minutes of seeding time and 1 hour of simulation time to cover the afternoon peak hour that happens on Saturdays.

The 2019 weekend peak hour traffic volumes as shown in **Figure 4-9** were used in the model. Also, existing pedestrian volumes, as discussed in **Section 4.3**, were used at crosswalks at Fenlands Access and Railway Avenue. However, cyclists are not included in the model since the majority of cyclists tend to use the separate pathway located on the west side of Mt Norquay Road and do not mix with the general traffic in the VISSIM study area.

The rail crossing is also coded in the model. Since CP trains do not have a fixed schedule, it was assumed that only one train will pass through the study area during the modeled weekend peak hour. The length of the train and the number of cars also vary between different trains. For the purpose of this study, it was assumed that Mt Norquay Road will be blocked by the train for about 4.5 minutes. This is the average blockage time that was estimated using the train data provided by the Town.

CALIBRATION

The model was calibrated based on the observed queue lengths along Mt Norquay Road in the northbound and southbound directions. Queue lengths were observed:

- During the site visits conducted on July 24th, 2019 and August 26th, 2019;
- Using footage from Miovision cameras installed at the study intersections to record videos and collected traffic volumes from July 19th to July 21st, 2019; and
- Using footage provided by the Town from the permanent cameras installed close to the "Banff" sign that record northbound and southbound movements along Mt Norquay Road.

In addition to the observed queues, observed drivers' behaviour in the study area specifically at the modeled intersections and pedestrian crossings were used to calibrate the model.

Also, speed data collected on August 15th, 2019 along Mt Norquay Road by the Town was provided for this study and was used in the calibration process. Speed data are summarized in **Table 4-3.**[18]

[18] *It is noted that after the data collection and model calibration, the Town made a change to the subject road network – introducing a southbound left turn lane from Mt Norquay Road to Railway Avenue. This change is not included in this Existing Conditions model, but has been incorporated in the future horizon models.*

Table 4-3 Speed Data along Mt Norquay Road

Northbound (15:10 – 15:45)			Southbound (15:12 – 15:45)		
Speed Range (km/h)	Number of Vehicles	Percentage of Total	Speed Range (km/h)	Number of Vehicles	Percentage of Total
20 - 25	82	37.3%	**20- 25**	70	57.9%
26 - 30	60	27.3%	**26-30**	45	37.2%
31 - 35	46	20.9%	**31-35**	4	3.3%
36 - 40	21	9.5%	**36-40**	1	0.8%
41 - 45	11	5.0%	**41-45**	1	0.8%
Total	**220**	**100%**	**Total**	**121**	**100%**

MODEL RESULTS

Initial observation of the microsimulation model indicated that interruptions to the through traffic on Mt Norquay Road forms queues along this road and causes delays for the through traffic. These interruptions include:

— CP trains block Mt Norquay Road at the rail crossing;
— Vehicles yield to high volumes of pedestrians crossing Mt Norquay Road to access “Banff” sign;
— Vehicles turning left at Fenlands Access and Railway Avenue sometimes block the southbound through movement; and,
— These model results are consistent with observations of traffic behaviour on this network.

A quantitative assessment of the queue lengths and the travel times along Mt Norquay Road was carried out using average results from 10 different runs of the model.

QUEUE RESULTS

Queue results were collected along Mt Norquay Road for the northbound and southbound directions at Fenlands Access, Railway Avenue, and at the rail crossing. Queue lengths on Highway 1 eastbound off ramp were also collected.

Table 4-4 summarizes the results of the average and maximum queues at different locations. It should be noted that maximum queue is the longest queue that is observed during the entire run of the model and it does not happen very often.

Table 4-4 Queue Results – Exiting Conditions "with train"

LINK	AVERAGE QUEUE (M)	MAX QUEUE (M)
Mt Norquay NB @ Fenlands Access	44	174
Mt Norquay SB @ Fenlands Access[1]	269	537
Mt Norquay NB @ Rail Crossing	15	84
Mt Norquay SB @ Rail Crossing	28	202
Mt Norquay NB @ Railway Ave	58	241
Mt Norquay SB @ Railway Ave	4	46
Hwy 1 EB Off Ramp[2]	13	162

Notes:
[1] Maximum queue extend to the bridge over Highway 1
[2] Queue on the ramp, measured from the end of the ramp

The model shows it takes approximately 17 minutes for the Highway 1 eastbound off-ramp to clear after the railway crossing gates are opened. The northbound and southbound traffic flows return to normal after approximately 8 minutes and 27 minutes, respectively. The westbound queue at Mt Norquay and Railway Avenue dissipates approximately 10 minutes after the gates are opened.

TRAVEL TIME RESULTS

Average travel times were estimated on Mt Norquay Road along the section between the end of Highway 1 eastbound ramp and Railway Avenue during the peak hour. Travel time also considers the time that the train blocks Mt Norquay Road which is around 4.5 minutes. Travel time results are included in **Table 4-5.**

Table 4-5 Travel Time Results – Exiting Conditions: Highway 1 to Railway Avenue

LINK	TRAVEL TIME (SEC)
Mt Norquay Road Southbound	220
Mt Norquay Road Northbound	126

5 BANFF RAILWAY ARP LAND USE

The Banff Railway Lands ARP will include seven distinct character areas, including:

1 Railway Station Plaza and Amphitheatre Community Hub
2 Canadian Pacific Railway Gardens
3 Norquay Gondola Terminus
4 Heritage Rail District
5 Intercept Parking
6 Fenlands Wildlife Corridor and Habitat Enhancement
7 Residential

The character areas are described in more detail in the sections below. An illustration of the Banff Railway Lands ARP is included in **Appendix A**.

5.1 RAILWAY STATION PLAZA AND AMPHITHEATRE COMMUNITY HUB

The Railway Station, and En Barhe Îchiyabi Plaza together form the spatial and symbolic centre of the site. The concept plan incorporates the proposed Wohengitha Amphitheatre, a 200 seat multi-functional amphitheatre to capitalize on scenic views and vistas from the site and a new building along its south edge to frame and enclose the plaza. The entry feature will provide an enhanced sense of arrival to the site and the preservation of public views will be an important consideration during design and development.

The entry is to serve as space for a mix of programmed functions associated with an amphitheatre development, plaza space for fronting buildings, and circulation. The plaza will be used for special events and act as a venue for fine arts and local school performances, as well as environmental and aboriginal education seminars. The plaza will offer attractions year-round utilizing summer and winter features, for both day and evening.

The land use concept accommodates the potential for a future passenger train service from Calgary. The CPR Train Station will provide an alternative mobility choice for visitors and residents to visit the Bow Valley without the need for a personal vehicle.

The *Calgary-Bow Valley Mass Transit Feasibility Study*[19] (the Mass Transit Feasibility Study) evaluated the feasibility of a passenger rail service that would provide service between the Calgary Region and the Bow Valley. The Mass Transit Feasibility Study estimated 268,000 annual rail boardings if the service was to become operational in 2016. Utilizing a 1.8% annual growth rate, which represents the average growth in visitor volume to Banff since 2007, a total of 316,200 annual rail boardings are estimated by the 2026 horizon, and 330,700 annual rail boardings are estimated by the 2029 horizon. The study also estimates that peak ridership will occur during the summer months. As mentioned in Section 4.1.5, in recent years, interest in re-introducing a regular passenger rail service between Calgary and Banff has increased, and the likelihood of this project going ahead appears increasingly probable.

[19] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)

5.2 CANADIAN PACIFIC RAILWAY GARDENS

The Canadian Pacific Railway (CPR) Gardens include three distinct garden landscape areas, approximately 1 ac in total size, that contribute to the site's character, including:

1. **CPR Garden:** Rock gardens and flower beds tended by Canadian Pacific's Banff Gardener, Victor Sugg, from 1923 to his retirement in 1952. The CPR Garden is located on the sand ridge to the east of the train station. The garden was built in the early 1900s and consists of Juniper and non-native Caragana as well as two rows of White Spruce.
2. **Golden Willow Trees:** The Golden Willows were planted prior to 1935 in anticipation of the 1939 royal visit. The life expectancy of these willow trees is approximately 100 years. There are 48 willow trees along an east-west alignment with trees located at the east end in the best condition and trees in worsening to poor condition at the west end. Core samples show the stems to be in varying stages of decay.
3. **Spruce Allee:** Historic (1910s to 1960s) entrance to Banff from the east side of the dune for visitors staying in sleeper cars located on 5 sidings that abutted the east end of the station (sidings were removed in the 1970s). These sidings were known as the Garden Tracks.

5.3 NORQUAY GONDOLA TERMINUS

The Norquay Gondola Terminus is an important link for connecting visitors to Banff with the mountains, without the need to have a vehicle. Located within the ARP development, the gondola terminus will connect the Town of Banff to the Norquay Ski and Sightseeing Resort by an aerial tramway or gondola. The new gondola will create a substantial ecological gain by removing vehicles from a sensitive wildlife corridor and enhancing the environment by removing vehicle traffic. It is noted that the road to Norquay is under the control of Parks Canada. While the proposed gondola will remove traffic travelling to the ski hill/via ferrata, Parks Canada may choose to keep the road open for other traffic. The gondola will operate throughout all seasons, providing summertime visitors site-seeing and hiking opportunities and wintertime visitors with site-seeing, ski runs, and tubing. The gondolas revenue stream will also enable the provision of free intercept parking.

There are three main questions that can help to determine future usage of the new Norquay Gondola:

1. *How likely is the Norquay Gondola to increase overall visitation to Banff National Park?*
2. *What are the likely effects of the Norquay Gondola on visitation patterns within Banff?*
3. *How many visitors will the Norquay Gondola attract?*

These questions are discussed in more detail in the sections below.

5.3.1 NORQUAY GONDOLA AND BANFF NATIONAL PARK

The Norquay Gondola + Banff National Park Visitation Study indicates that the Norquay Gondola is not likely to increase overall visitation to Banff National Park, due to the following four factors[20]:

1. **Primary vs Secondary Attractions:** The primary attraction to Banff National Park is the park itself. There are a variety of secondary attractions that enhance visitor experience, but do not necessarily drive visitation. The Norquay Gondola would be considered a secondary attraction and as such, compete with numerous other attractions.

[20] Joe Pavelka PHD., *(Norquay Gondola + Banff National Park Visitation* (April 2019)

2 **Repeat Visitation:** The majority of visitors to Banff National Park are from Western Canada. This group has a history of visiting Banff National Park with high intention for repeat visitation. Within the context of place attachment, this group is one that has a well-formed image of Banff National Park and will visit (or not) accordingly, not because of secondary attractions.
3 **Novelty Factor:** Because Banff already has a high functioning gondola operation (Sulphur Mountain Gondola), the Norquay Gondola will not likely provide a novelty-effect bump.
4 **Lack of Evidence:** A review of related literature did not yield any papers that would suggest a development such as the Norquay Gondola would drive an increase of visitation to Banff National Park.

5.3.2 NORQUAY GONDOLA AND THE TOWN OF BANFF

The Norquay Gondola + Banff National Park Visitation Study indicates that the Norquay Gondola will likely draw ridership away from the Sulphur Mountain Gondola and decrease traffic through the town of Banff, due to the following factors[21]:

1 **Market Capture:** It is unlikely that visitors will purchase two gondola experiences; therefore, Sulphur Mountain's existing gondola ridership (approximately 600,000 people annually) is likely to be divided in some way between the two gondolas, Sulphur Mountain and Norquay Gondola.
2 **Visitor Dispersal:** The gondola is likely to shift some summertime visitors away from existing points of interest within the park, such as the Sulphur Mountain Gondola, thereby helping to decrease crowding and improve overall visitor experiences. The Banff townsite in particular will see a decrease of traffic moving through the downtown and across the Banff Avenue bridge pinch-point.

5.3.3 NORQUAY GONDOLA VISITORS

Banff's existing gondola ridership (600,000 people annually) is likely to be divided in some way between the two gondolas, the existing Sulphur Mountain and the proposed Norquay Gondola. Joe Pavelka, PhD, who received his doctorate from the University of Calgary in examining tourism destination change and works as a consultant in the areas of Ecotourism & Nature Tourism, Tourism Destination Planning, Public Recreation: Revisiting Public Recreation, and Recreation/Tourism Planning for Rural Communities, provided the following information on the anticipated future visitation at the Norquay Gondola[22]:

— **Location:** The Norquay Gondola is located at one of the main entrances to Banff adjacent to the proposed Intercept Parking Lots (see Section 1.0). According to Travelocity data, about 80% of visitors to destinations (not Banff in particular) determine what they do once they arrive; therefore, having a gondola adjacent to your parking lot is a strong way to sell the gondola experience. The Norquay Gondola location upon entering Banff will also add to its visitation over having to travel across the Banff Avenue bridge to the Sulphur Mountain Gondola. Norquay Gondola's location is its key advantage.
— **Ticket Prices:** The Norquay Gondola is anticipated to have a lower ticket price than the Sulphur Mountain Gondola to maintain accessibility. This will increase visitation. However, it is not known at this time if the Sulphur Mountain Gondola can adjust their current ticket prices.
— **Promotion:** The Sulphur Mountain Gondola has a very strong presence on search engines as Banff's gondola. This will make is difficult for the Norquay Gondola to promote their facility.
— **Partnerships:** The Norquay Gondola will have few, if any, tour partnerships upon opening day and will have limited capacity in the winter. This will affect the Norquay Gondola visitation. The Norquay Gondola will need

[21] Joe Pavelka PHD., *(Norquay Gondola + Banff National Park Visitation* (April 2019)
[22] Joe Pavelka, (personal communication, October 2, 2019; *Norquay Gondola Visitation / Traffic Projection Notes*

to rely on fully independent travelers (visitors not part of a tour group) when it opens. Later it will have limited capacity to attract group/bus visitation because it also functions as a ski area gondola for skiing ticket holders.

- **Market Share:** There are approximately 2,000 gondola fully independent travelers per day presently in Banff. While no information is known specifically about these travelers, we know that about 52% of Banff visitation is by Albertans. Albertans have very strong awareness of Banff based on multiple repeat visits. Repeat visitors are likely to be loyal to a particular gondola.
- **Latent Demand:** While the level of latent demand of tour groups is unknown, it is unlikely that the tour groups serving the Sulphur Mountain Gondola will leave for the Norquay Gondola.

The Mount Norquay Gondola Feasibility Study, prepared by Mt. Norquay and Brent Harley and Associates Inc., indicates that the the Sulphur Mountain Gondola expects to average approximately 600,000 visitors per year by the year 2020, of which 75% (450,000) visit in the summer (May to September) with the average number of summer visitors approximately 4,000 per day [23]. The Banff Sulphur Mountain Upper Gondola Terminal Redevelopment Report[24] projects the 2019 summer average visitors at 3,983 per day, with an average increase in visitors at 2% per year, this equates to approximately 4,060 people per summer day in 2020.

The Mount Norquay Gondola Feasibility Study indicates that within its first year of operation, the Norquay Gondola is anticipated to see approximately 215,000 sightseeing visitors (about 35% of the numbers achieved by the Sulphur Gondola) and should grow to approximately 420,000 sightseeing visitors per year (about 70% of the current Sulphur Mountain visitors) by year 10. The distribution will be similar to the Sulphur Mountain Gondola, where 75% of visitors are attracted during the summer months (May to September)[25].

As Banff's existing gondola ridership (600,000 people annually) is likely to be divided in some way between the two gondolas, the existing Sulphur Mountain and the proposed Norquay Gondola, it has been assumed that the 4,060 daily visitors will be divided between the two gondolas over the study horizons.

Table 5-1 summarizes the anticipated number of visitors during a peak summer weekend to the Norquay Gondola for the study horizons. Study horizons 2026 and 2029 were interpolated assuming linear growth using the opening day and ten-year projections. These projections exclude existing gondola ridership to Norquay.

Table 5-1 Number of Summer Weekend Visitors to Norquay Gondola by Study Horizon

HORIZON	BANFF'S 2020 SUMMERTIME GONDOLA MARKET	NORQUAY % OF 2020 SULPHUR MOUNTAIN VISITORS	NORQUAY GONDOLA SUMMERTIME VISITORS
Year 1 - 2023	4,060 visitors/day	35%	1,420 visitors/day
Year 3 – 2026	4,060 visitors/day	46%	1,850 visitors /day
Year 6 – 2029	4,060 visitors/day	56%	2,270 visitors/day
Year 10 – 2033	4,060 visitors/day	70%	2,840 visitors/day

[23] Mt. Norquay & Brent Harley and Associates Inc., *Mount Norquay Gondola Feasibility Study Draft-Confidential* (May 14, 2018)
[24] *Brewsters Travel Canada, Banff Gondola Upper Terminal Development Project (June 20, 2014)*
[25] Mt. Norquay & Brent Harley and Associates Inc., *Mount Norquay Gondola Feasibility Study Draft-Confidential* (May 14, 2018)

5.4 HERITAGE RAIL DISTRICT

The Heritage Rail District is an area to the east of Mt Norquay Road, between Railway Avenue and the tracks of CPR main line. This area will allow for grade-oriented restaurants, cafes, and meeting spaces and support active open space through the day and evening, with a focus on Railway Avenue as a shared street supporting Legacy Trail, promenade walkway and vehicle traffic.

Railway Avenue and the area along its south side South of Railway Avenue is to be designed within an open space setting to accommodate selected former CPR railway associated buildings under threat of demolition elsewhere within the mountain parks.

Table 5-2 summarizes the proposed land uses and corresponding building size in the Heritage Rail District, the concept plan is illustrated in **Appendix A**.

Table 5-2 Heritage Rail District Land Uses and Areas

BUILDING	LAND USE	SIZE (SQ. FT.)
Building "A" Gift / Rental Shop	Gift / Rental Shop	2,600
Building "B" Plaza Pavilion	Commercial Retail Units	4,200
Building "C" Pavilion Restaurant	Restaurant / Fine Dining	9,400
Building "D" Station Restaurant	Restaurant / Fine Dining	7,000
Building "E" Water Tower	Restaurant / Bar	3,000
Existing Train Station	1st Floor – Railway Services / Cafeteria 2nd Floor – Railway Service Office	12,100 2,550
Rolling Stock	Restaurant / Bar	2,550
Glacier Station	Interpretive Cultural Space (70%) / Café/Gift Shop (30%)	2,160
Historic Field Station	Interpretive Cultural Space (70%) / Café/Gift Shop (30%)	4,375
CP Rail Historic Field Telegraph House	Interpretive Cultural Space (70%) / Café/Gift Shop (30%)	1,025
Station Master House	Interpretive Cultural Space (70%) / Café/Gift Shop (30%)	1,058
CP Rail Historic Ice House	Interpretive Cultural Space (70%) / Café/Gift Shop (30%)	955

5.5 PARKING

Provision of parking is a fundamental component of the Banff Railways Lands ARP. As a facility, its goal is to contribute to reducing parking demand, congestion, vehicle miles travelled and vehicle emissions by intercepting vehicles prior to reaching their final destination and transferring visitors safely, efficiently, and seamlessly to a non-vehicle mode (e.g. transit, aerial transit, bus, shuttle, walk, bicycle). Development of this site is envisioned to promote a change in travel behaviour for visitors to Banff, reducing dependency on and use of private vehicles and encouraging a shift to sustainable transportation modes including walking, cycling, rail, bus, and aerial transit (Norquay Gondola), resulting in a more pedestrian friendly Banff.

As part of the Banff Railways Lands ARP, 883 new parking spaces will be provided on site between the two parking lots: the South Lot and the North Lot. The South Lot opened in the fall of 2019. There are 436 standard vehicle stalls in the South Lot and approximately 325 metres of parallel parking space available for buses/RVs (recreational vehicle), which equates to approximately 20 parallel shuttle/RV stalls or 50 parallel vehicle stalls. The total passenger vehicle parking supply in the South Lot is 486 parking spaces. The current operating agreement for the South Lot encourages all day stays by providing free 9-hour parking. The proposed North Lot will include a reconfiguration of the existing Fenlands Parking Lot (123 parking spaces) and the existing Fenlands Overflow Parking Lot (50 parking spaces) to provide a single lot with a total of 562 standard vehicle stalls plus 4 bus parking spaces and 8 RV parking spaces. This North Lot will provide 397 new standard vehicle parking stalls (alongside the 173 reconfigured parking spaces for Fenlands Centre).

5.6 FENLANDS WILDLIFE CORRIDOR AND HABITAT ENHANCEMENT

The Banff Railway Lands ARP Development will protect and preserve the contiguous area of wildlife habitat located in the primary Fenland Wildlife Corridor within the ARP plan area east of the sand dune (approximately 5 ha or 53% of the Plan Area) and avoid new disturbance or activity encroachment into this sensitive area. The ARP development will also reclaim and rehabilitate the all industrial brownfield areas and disturbed lands located east of the sand dune adjacent to the CPR railway (approximately 1.2 ha) and restoring the land to a naturally vegetated state on the Montane.

The character area of the Fenlands Wildlife Corridor and Habitat Enhancement is not expected to contribute to the overall transportation demand of the Banff ARP development once complete.

5.7 RESIDENTIAL DISTRICT

The proposed Residential District is to serve as a transition from the existing lower density residential neighbourhood to the south of the Railway Lands to the principal commercial district. The residential area is located on the southern limits of the site, south of Railway Avenue, and is anticipated to be developed as multi-family housing. Twenty dwelling units have been planned for this area.

6 BACKGROUND CONDITIONS

Background conditions provide a point of reference to understand the relative impact of a development on the transportation network. Background conditions refer to the transportation network and how it is expected to operate, regardless of the proposed development. This includes traffic volumes growing over time, the anticipated passenger rail between Calgary and Banff, and a modest increase in pedestrian activity associated with the rail service.

The future background traffic and pedestrian volume estimates are comprised of three components: the existing traffic (vehicle and pedestrian) on the network with appropriate growth, applied, the influence that the introduction of the mass passenger rail, will have on how people move, and the traffic that has begun to use the South Lot for intercept parking.

6.1 BASE BACKGROUND TRAFFIC GROWTH

The base background traffic growth will be estimated by applying a 1.8% linear growth rate per year to the 2019 traffic data to estimate each of the assessment horizons. The 1.8% growth rate is based on the historical growth in traffic observed on Mt Norquay Road between 2013 and 2018 and is commensurate with growth in visitation to Banff National Park since 2007.

6.2 CALGARY-BOW VALLEY MASS PASSENGER RAIL

The Calgary-Bow Valley Mass Passenger Rail is estimated to have 316,240 annual rail boardings by the 2026 horizon and 330,700 annual rail boardings by the 2029 horizon, using an average annual growth rate of 1.8%.[26] The 1.8% growth rate represents the average growth in Banff's visitor volume since 2007.

Utilizing the medium scenario daily boarding projections presented in the Mass Transit Feasibility Study[27] and the 1.8% average annual growth rate, it is estimated that the Banff Station will see 495 summertime rail boardings in the 2026 horizon and 580 summertime rail boardings in the 2029 horizon. For this assessment, it is assumed that the number of boardings per day will equal the number of alightings per day.

The number of boardings and alightings during the peak hour was estimated by using the Time of Day Distribution presented in the Mass Transit Feasibility Study, presented in **Table 6-1.** Time of day distributions represents the percent of riders traveling between Calgary and the Bow Valley. The westbound distribution represents visitors arriving in Banff from Calgary and the eastbound distribution represents visitors leaving Banff traveling to Calgary.

Table 6-1 Mass Transit Time of Day Distribution

TIME PERIOD	WESTBOUND (INBOUND TRIPS TO BANFF)	EASTBOUND (OUTBOUND TRIPS LEAVING BANFF)
Before Morning Peak (7:00-10:00)	35%	8%
Morning Peak (10:00-13:00)	47%	6%
Mid-Day (13:00-17:00)	8%	15%
Evening Peak (17:00-20:00)	2%	52%
After Evening Peak (20:00-23:00)	8%	20%

[26] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)
[27] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)

A review of the Norquay 2018 daily traffic volumes indicates that the weekend peak hour occurs on a Saturday between 4:00 and 5:00 p.m. Therefore, the Mid-day Time of Day distribution was used to convert the daily rail boardings and alightings to peak hour rail boardings and alightings.

Table 6-2 summarizes the estimated number of people-trips utilizing the mass passenger rail during the summer weekend peak hour in the 2026 and 2029 horizon.

Table 6-2 Mass Transit Trip Summary

HORIZON	PEOPLE TRIPS IN	PEOPLE TRIPS OUT	TOTAL PEOPLE TRIPS
2026	40	74	114
2029	46	87	133

Visitors will have the option of walking or catching a shuttle to or from the Train Station. It is assumed that 25% of visitors will use the shuttle and the remaining 75% of visitors will walk. It is anticipated that 85 people (30 people entering / 55 people exiting) will walk to/from the Train Station and 28 people (10 people entering / 18 people exiting) will catch a shuttle to/from Train Station during the 2026 horizon. During the 2029 horizon, it is anticipated that 100 people (35 people entering / 65 people exiting) will walk to/from the Train Station and 33 people (12 people entering / 22 people exiting) will catch a shuttle to/from Train Station

The mass passenger rail system provides visitors to Banff the opportunity to travel to the town without the use of a passenger vehicle. Therefore, a portion of visitors who would have originally arrived by car but now choose to arrive by rail, no longer need to be included in the background traffic forecast. The mass passenger rail boarding and alightings includes a 30% induced demand (i.e. passengers that would have not traveled to the Banff prior to there being a passenger rail). The induced demand was removed prior to calculating the number of trips removed off the road network.

Utilizing an occupancy rate of 2.4 people per vehicle and the estimated number of visitors arriving by rail in the peak hour, but not visiting the Banff Rail Lands ARP site (i.e. total visitors during peak hour minus the total Banff Railway Lands ARP visitors arriving by rail during the peak hour), it is estimated that 40 vehicle-trips (15 trips in / 25 trips out) will be removed from Mt Norquay Road in the 2026 horizon and that 45 vehicle-trips (15 trips in / 30 trips out) will be removed from Mt Norquay Road in the 2029 horizon for this assessment.

6.3 SOUTH PARKING LOT

The South Parking Lot, location illustrated in **Figure 6-1**, opened in the fall of 2019. There are 436 standard vehicle stalls in the South Parking Lot and approximately 325 metres of parallel parking space available for busses, which equates to approximately 20 parallel bus stalls or 50 vehicle stalls. The Rocky Mountaineer buses are assumed to arrive after the afternoon peak hour, (train arrival is currently 7:00pm or later[28]), this assessment assumes the 325 m of parallel parking will be used for intercept parking, thus equalling a total of 486 available parking spaces during the afternoon peak hour. The current operating agreement for the South Parking Lot encourages all day stays by providing free 9-hour parking. This lot currently functions as Intercept Parking.

[28] Rocky Mountaineer, *Train Schedule & Station Locations*, https://www.rockymountaineer.com/plan-your-canadian-trip/train-schedule-station-locations, Accessed February 10, 2021

Figure 6-1 South Intercept Parking Lot Location

The Town of Banff collected parking occupancy data in the South Lot during the summer of 2020. The maximum observed occupancy, without a 'soft' or 'hard' parking diversion in place, was 227 vehicles (including both passenger vehicles and RV vehicles). It is recognized that the Covid-19 pandemic impacted the number of visitors to Banff during the summer, and this would have an impact of the utilization of the South Lot. The South Lot parking demand was adjusted for a non-Covid-19 year by comparing the Banff 'entrance' traffic volumes (that is, traffic entering Banff on Mt. Norquay Road and on Banff Avenue) between August 2019 and August 2020. The review indicated that traffic volumes were down 24% in August 2020 when compared to August 2019. To account for this, the South Lot parking occupancy (227 vehicles) was increased by 24% to estimate the Intercept Parking demand for a non-Covid-19 year, equaling 282 parking spaces.

Subsequently, the Intercept Parking demand was increased by 1.8% per annum to generate the future South Lot Intercept Parking demand for the study horizons, which is summarized in **Table 6-3**.

Table 6-3 South Lot Intercept Parking Demand, by Horizon

HORIZON	INTERCEPT PARKING DEMAND
2020	227
2020 (Adjusted Non-COVID Year)	282
2023	298
2026	312
2029	328

With the mass passenger rail becoming operational in the 2026 horizon, a portion of people who would have originally traveled to Banff by car, will now choose to arrive by rail and will not need to be counted in the Lot calculations. **Section 6.2** estimates that 495 people are anticipated to arrive to Banff by rail per day in the 2026 horizon and 580 people are anticipated to arrive to Banff by rail per day in the 2029 horizon. The Mass Transit Feasibility Study[29] identified that the passenger projections included up to a 30% increase for induced trips. Induced trips are trips that would not have occurred without the implementation of the passenger rail service. The parking space reduction is estimated by removing the 30% induced demand from the estimated total daily visitors, then for the remaining demand applying a 1.5 turnover rate (where turnover equates to two trips). Based on these calculations, the introduction of the passenger rail is estimated to reduce parking demand by approximately 51 parking spaces at the 2026 horizon and 59 parking spaces at the 2029 horizon.

Therefore, it is estimated that 261 intercept parking spaces will be needed in the 2026 horizon and 269 parking spaces will be needed in the 2029 horizon.

Reliable trip generation information is not yet available for the South Lot; however, the South Lot has similar parking characteristics to the existing City of Calgary City Hall Parkade in that is services short and long stays and is close to the downtown. The City Hall parkade is a heated parkade with 633 parking spaces. It provides paid parking for both short stays (under three hours) and long stays (over 3 hours). The majority of stalls are for long stays. The daily trip generation rate per stall at the City Hall Parkade is 3.0, representing an average turnover of 1.5 times per stall. [30] One turnover event represents two trips (i.e. arrival and departure from the parking stall).

In order to estimate the peak hour traffic generation of the South Intercept Parking Lot, the ratio between peak hour trips and daily trips on Mt Norquay Road (0.12), Banff Avenue (0.09), and for the City Hall Parkade (0.11) [31] were considered. To provide a conservative assessment, a peak hour ratio of 0.12 of the daily trip generation has been applied to the Calgary City Hall Parkade daily trip generation rate in order to estimate peak hour trip generation, as summarized in **Table 6-4**.

Table 6-4 Proposed Lot Peak Hour Trip Generation Rate

ZONE	DAILY TURNOVER RATE (PER STALL)	PEAK HOUR TRIP RATE (PER STALL)
Calgary City Hall Parkade	1.5	0.36

The northbound and southbound existing traffic distribution on Mt Norquay Road and Banff Avenue was used to estimate the inbound versus outbound trips during the weekend afternoon peak hour. The percent of traffic inbound was found to be 55% and the percent of traffic outbound was found to be 45% on Mt Norquay Road. The peak hour trip rate of 0.36 trips per stall was applied to the estimated parking demand to estimate the future trip generation potential of the South Lot. A vehicle occupancy rate of 2.4 persons per vehicle, as per the existing vehicle occupancy noted in the on the Town of Banff's website[32] was used to convert vehicle trips to people trips. **Table 6-5** summarizes the estimated number of passenger vehicle trips generated by the South Lot, by horizon, for the summer weekend afternoon peak hour, and the total number of people trips.

[29] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)
[30] WSP, *Transportation Opportunities and Constraints Assessment Stage 1 Access Investigation* (April 19, 2017)
[31] WSP, *Transportation Opportunities and Constraints Assessment Stage 1 Access Investigation* (April 19, 2017)
[32] Town of Banff, *Learn About Banff: Population,* https://banff.ca/252/Learn-About-Banff, Accessed January 1, 2021

Table 6-5 South Lot Passenger Vehicle Trip Generation, by Horizon

HORIZON	PASSENGER VEHICLE TRIPS IN	PASSENGER VEHICLE TRIPS OUT	PASSENGER VEHICLE TOTAL TRIPS	TOTAL PERSON TRIPS
2023	59	48	107	257
2026	52	42	94	225
2029	53	44	97	233

Note: values rounded to the nearest five (5).

A reduction in passenger vehicle trips is noticed in 2026 and 2029 horizons due to the introduction of the mass passenger rail which reduces the intercept parking demand.

Visitors will have the option of walking or catching a shuttle to or from the South Intercept Parking Lot and Downtown Banff. Based on observations at the South Intercept Parking Lot in the few weeks following the opening, it is assumed that 25% of visitors will use the shuttle and the remaining 75% of visitors will walk.

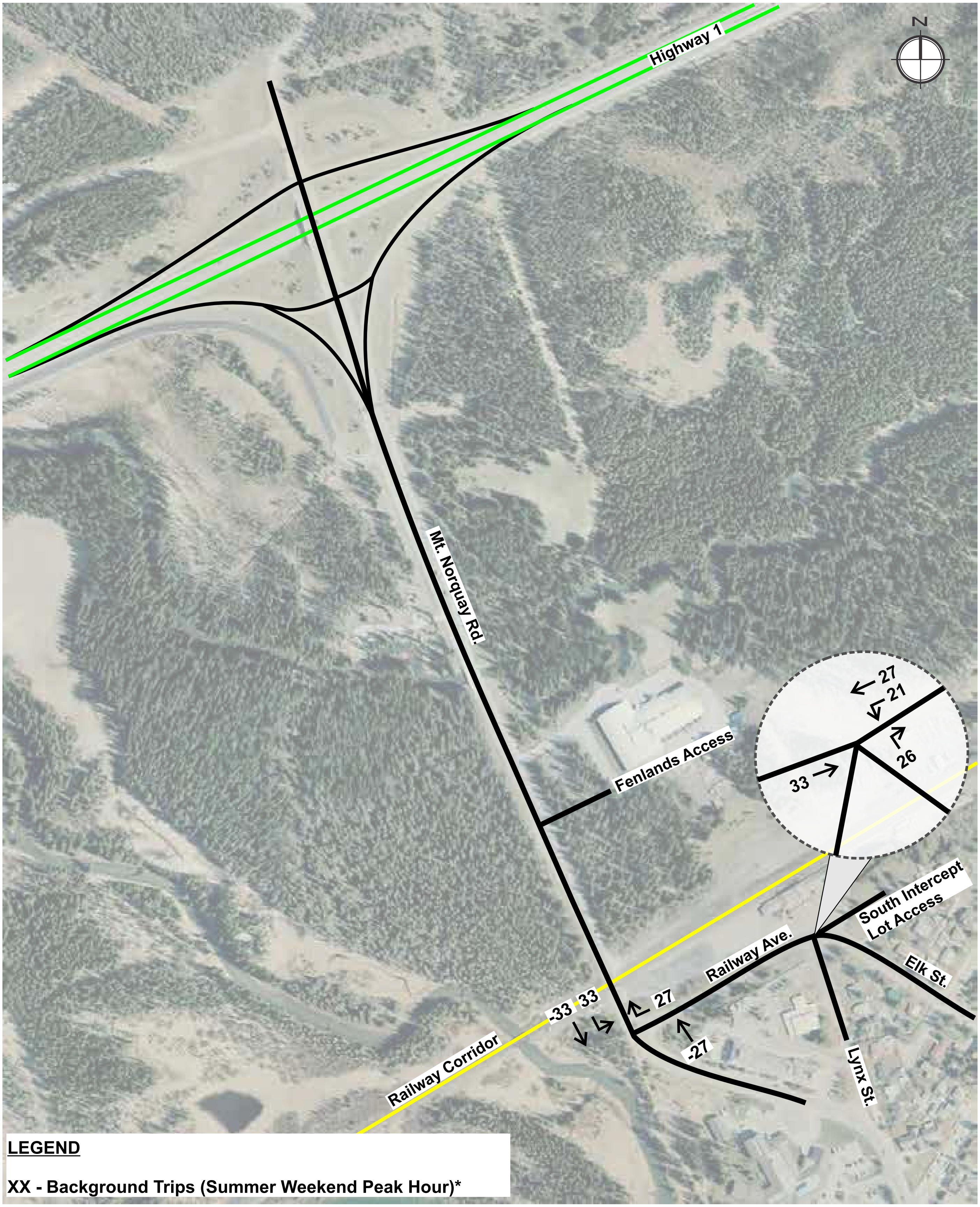
Of all the vehicles using the South Intercept Parking Lot, 55% were assumed use Mt Norquay Road from the north (55% is the amount of traffic entering Banff via Mt Norquay Road) and the remaining 45% are assumed to access the South Lot from the south via Elk Street (45% of traffic enters Banff via Banff Avenue).

The Intercept Parking function of the South Lot will divert traffic from Mt Norquay Road into the Lot. The diverted trips will be removed from the through traffic on Mt Norquay Road and added to the turning movements at the Mt Norquay Road and Railway Avenue intersection and the Railway Avenue and Elk Street intersection to access the South Intercept Parking Lot. The South Lot will therefore assist in reducing traffic congestion within Banff as vehicles will be “intercepted” and park before entering downtown Banff.

For example, in the 2023 horizon, the 55% of the inbound trips on Mt Norquay Road equates to 32 trips making a southbound left at the Mt Norquay Road and Railway Avenue intersection. As 32 trips are diverted into the South Intercept Parking Lot, 32 trips are removed from the southbound through movement, as they will no longer be traveling south on Gopher Street. Similarly, the remaining 45% of inbound trips, from Banff Avenue, equates to 27 new trips making a northbound right at the Railway Avenue / Lynx Street / Elk Street intersection. Similarly, 55% of the outbound trips on Mt Norquay Road equates to 26 trips making a westbound right at the Mt Norquay Road and Railway Avenue intersection. As these 26 trips were captured before they entered the downtown, 26 trips are removed from the northbound through movement at the Mt Norquay Road and Railway Avenue intersection. The remaining 45% of outbound trips are destined towards Banff Avenue (or another location to the south), which equates to 22 new trips making a westbound left at the Railway Avenue / Lynx Street / Elk Street intersection.

As the Intercept Parking Lots become more known, it is expected that this will result in a shift in arrival patterns to Banff, with more drivers choosing to enter via Mt Norquay Road for ease of access to parking. It has been assumed that in the 2026 horizon, 10% of the trips that would normally use Banff Avenue to access the Lots (i.e. making a northbound right, or westbound left) will now use Mt Norquay Road (i.e. now will make a southbound left or a westbound right) and would be considered “new” trips on Mt Norquay Road, this equates to 65% of trips using Mt Norquay Road and 35% using Banff Avenue. Similarly, in the 2029 horizon, it was assumed that 75% of the trips would used Mt Norquay Road and 25% would use Banff Avenue to access the South Lot.

The background trip assignment for the South Lot for each horizon is illustrated in **Figure 6-2, Figure 6-3** and **Figure 6-4**, respectively.



LEGEND

XX - Background Trips (Summer Weekend Peak Hour)*

DRAWING: FIG-19M 004480-2023 Bkgd Trip Assignment.cdr DATE: 2021-02-11 DRAWN BY: piperde

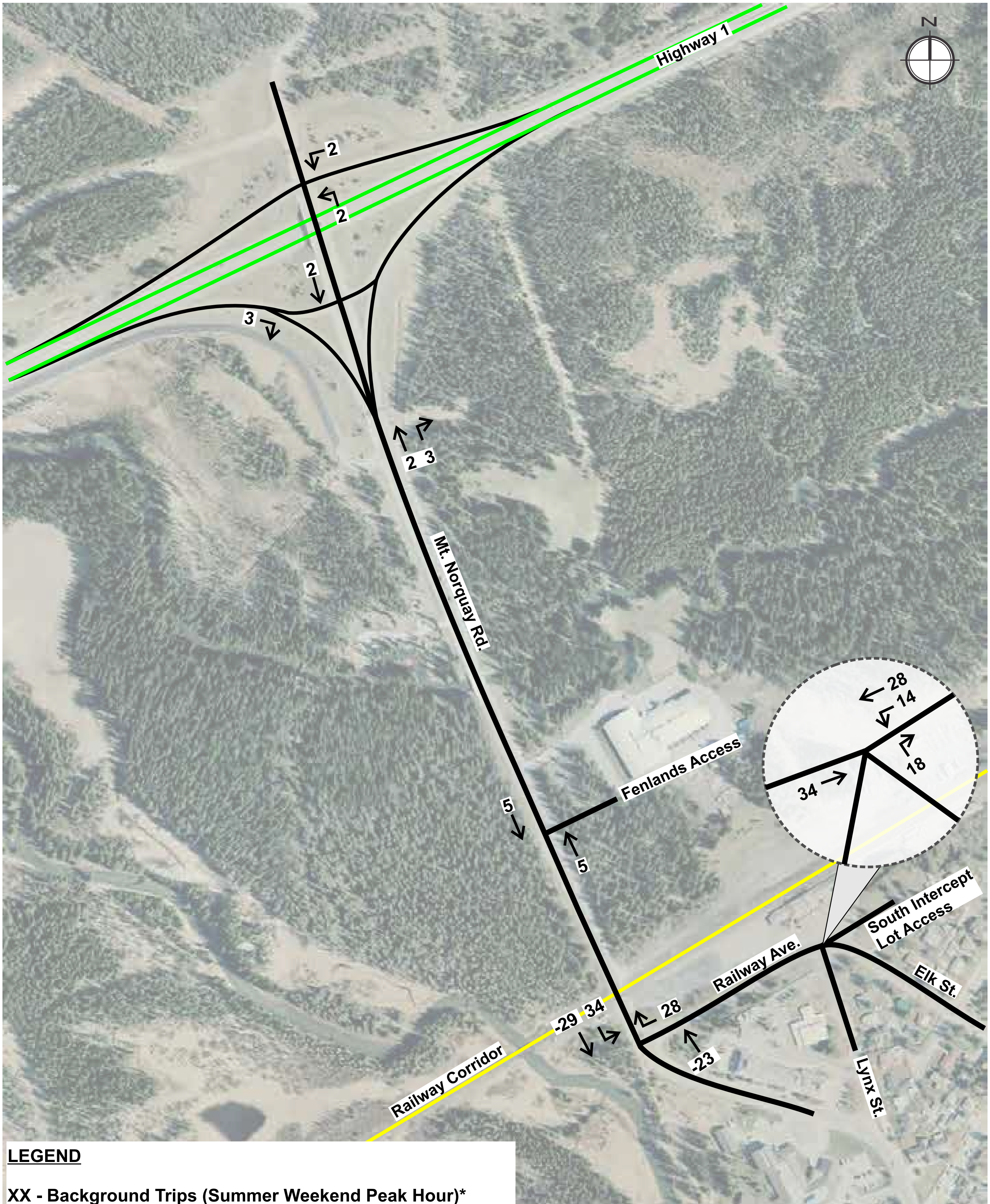
WSP Canada Inc.
237 4th Ave SW, Suite 3300 Fifth Ave Place
Calgary, AB T2P 4K3
t. 403.266.2800
www.wsp.com

Issue Date: 2021-02-11
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 6-2 - 2023 Background South Lot Trip Assignment

Banff Railway Lands Area Redevelopment Plan TIA

NOTE: These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entering into a contract.



DRAWING: FIG-19M 004480-2026 Bkgd Trip Assignment.cdr DATE: 2021-02-11 DRAWN BY: piperde

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Figure 6-3 - 2026 Background South Lot Trip Assignment

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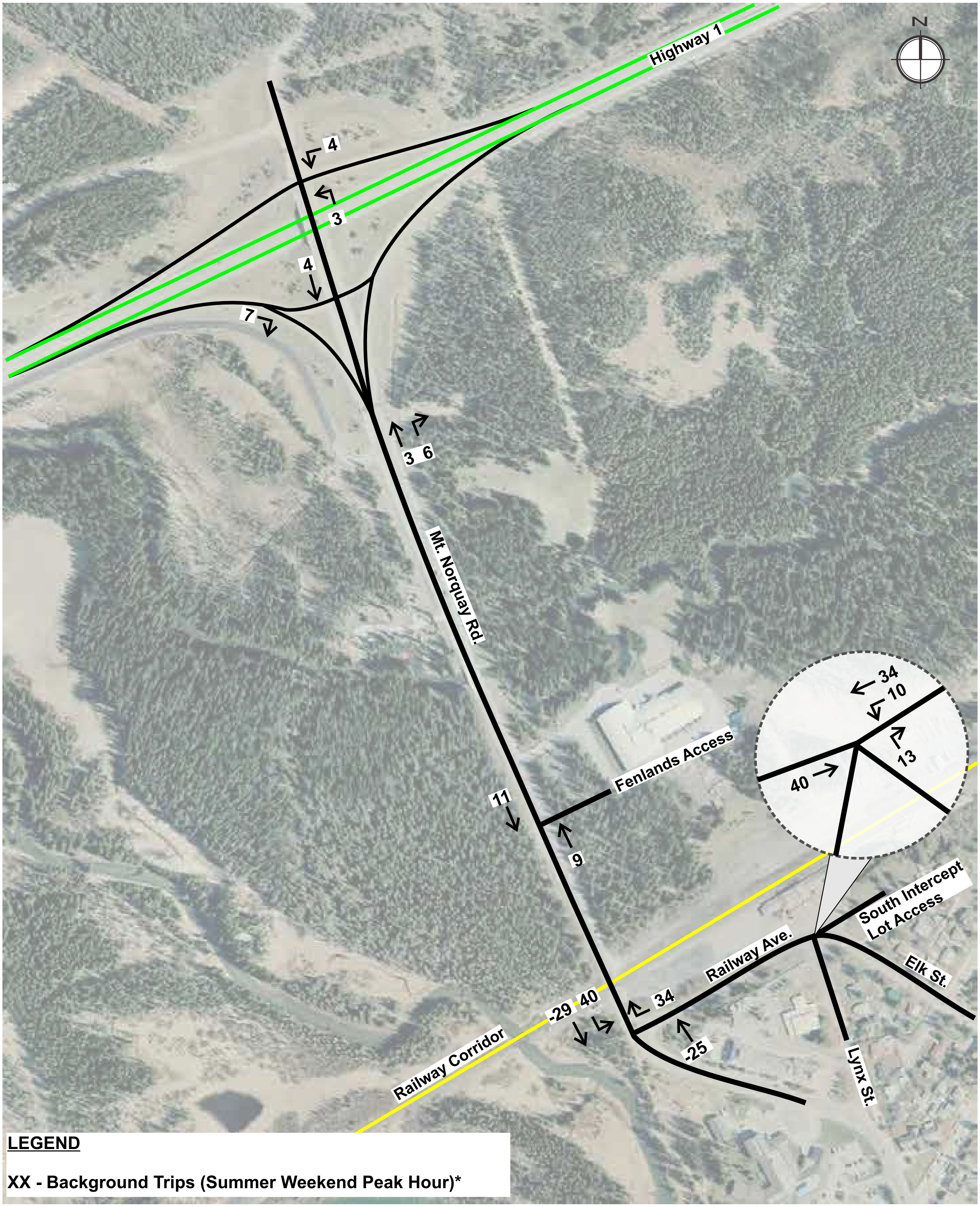

LEGEND

XX - Background Trips (Summer Weekend Peak Hour)*

DRAWING: FIG-19M 004480-2029 Bkgd Trip Assignment.cdr DATE: 2021-02-11 DRAWN BY: piperde

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Aerial Imagery:2009-04-30
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Figure 6-4 - 2029 Background South Lot Trip Assignment

Banff Railway Lands Area Redevelopment Plan TIA

6.4 TOTAL BACKGROUND TRIPS

The Total Background Trips combines the three components described in preceding sections:

- the existing traffic (vehicle and pedestrian) on the network with appropriate growth applied;
- trip changes resulting from the introduction of the mass passenger rail (person trips and associated changes to parking demand and Intercept Parking vehicle trips); and
- the traffic that has begun to use the South Lot for intercept parking.

Table 6-6, Table 6-7, and **Table 6-8** summarizes the background trip generation associated with the Passenger Rail (from 2026) and Intercept Parking in the South Lot, for the summer weekend peak hour for the 2023, 2026 and 2029 horizons, respectively.

Table 6-6 2023 Background Trips: Intercept Parking

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	59	48	107
Shuttles (Shuttle-trips) *	1	1	2
Walking (Person-trips)	105	85	190

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

Table 6-7 2026 Background Trip Trips: Intercept Parking & Passenger Rail

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	52	42	94
Shuttles (Shuttle-trips) *	1	1	2
Rail (People-trips)	40	74	114
Walking (Person-trips)	120	130	255

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

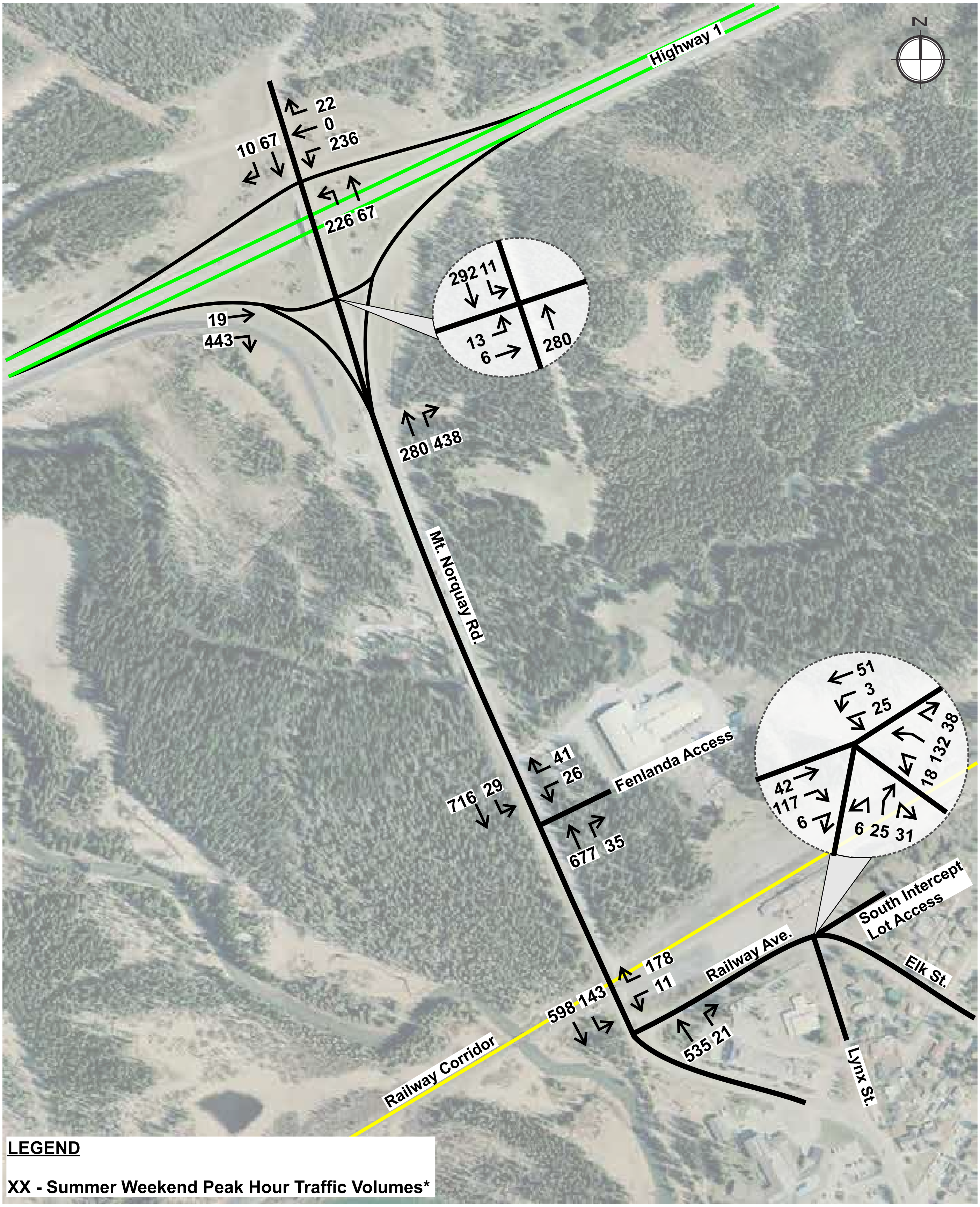
Table 6-8 2029 Background Trips: Intercept Parking & Passenger Rail

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	53	44	97
Shuttles (Shuttle-trips) *	1	1	2
Rail (People-trips)	46	87	133
Walking (Person-trips)	130	145	270

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

The Total Background Traffic forecast was estimated by combining the base background traffic growth described in **Section 6.1** with the passenger vehicle reduction described in **Section 6.2**, and the passenger vehicle and shuttle traffic anticipated to use the South Intercept Parking Lot described in **Section 6.3.**

The 2023, 2026, and 2029 background traffic forecasts are illustrated in **Figure 6-5**, **Figure 6-6**, and **Figure 6-7**, respectively.



LEGEND

XX - Summer Weekend Peak Hour Traffic Volumes*

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Aerial Imagery:2009-04-30
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Figure 6-5 - 2023 Background Traffic Forecast

Banff Railway Lands Area Redevelopment Plan TIA

DRAWING: FIG-19M 004480-2023 Background Traffic Volumes (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

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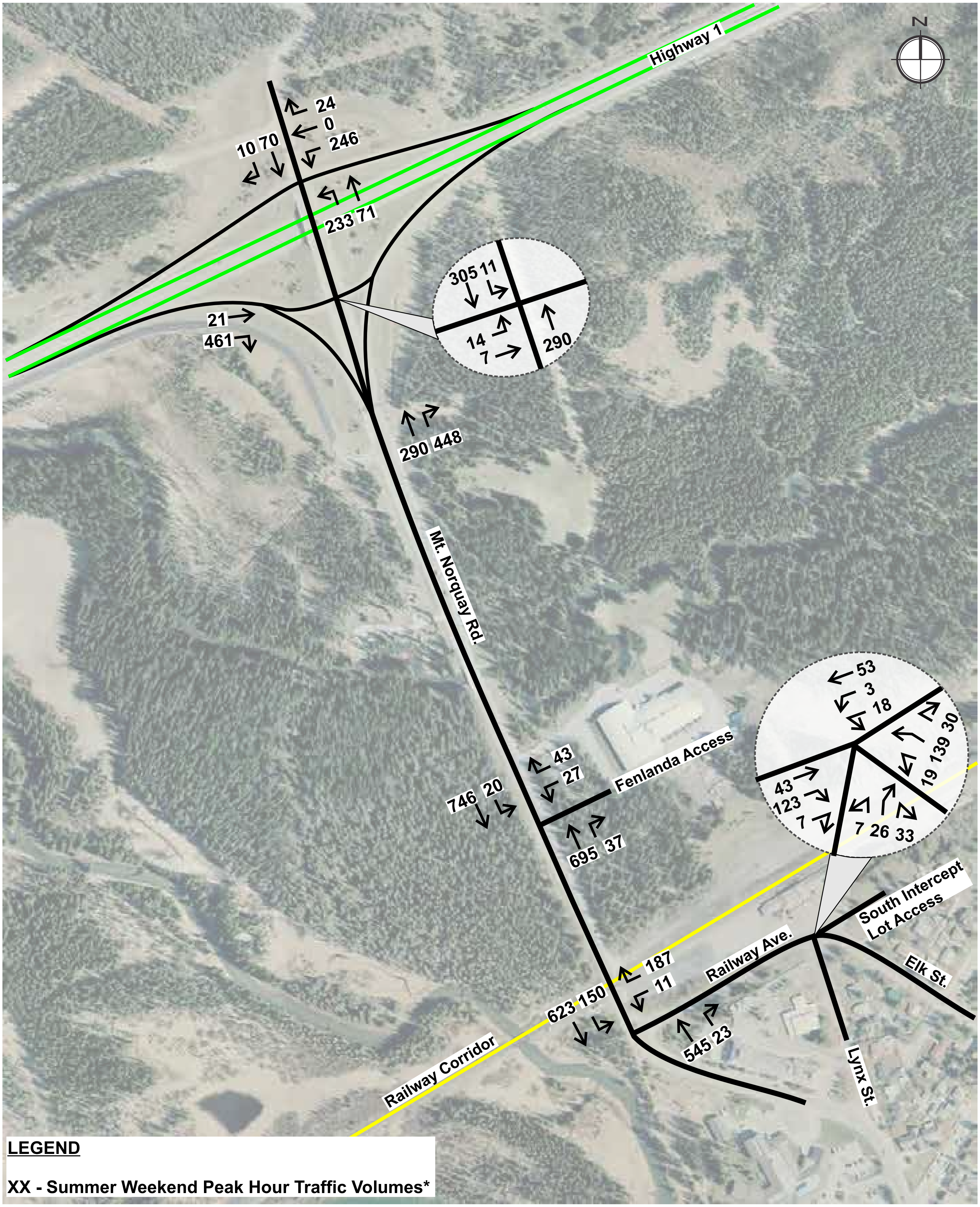

DRAWING: FIG-19M 004480-2026 Background Traffic Volumes (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

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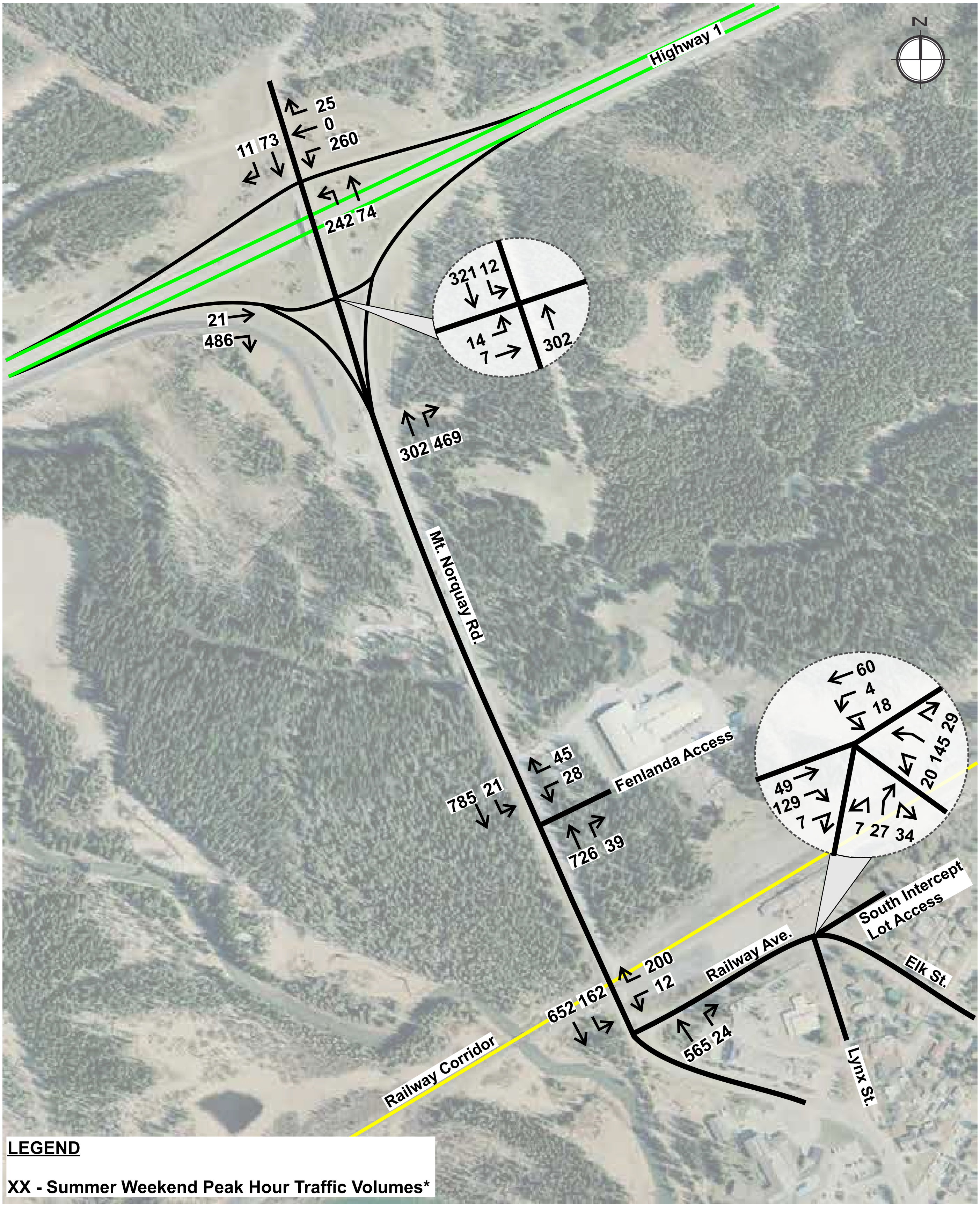
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 6-6 - 2026 Background Traffic Forecast

Banff Railway Lands Area Redevelopment Plan TIA



LEGEND

XX - Summer Weekend Peak Hour Traffic Volumes*

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Issue Date: 2021-02-11
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 6-7 - 2029 Background Traffic Forecast

Banff Railway Lands Area Redevelopment Plan TIA

DRAWING: FIG-19M 004480-2029 Background Traffic Volumes (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

7 BANFF RAILWAY LANDS MOBILITY

The following section identifies the trip generation, by mode, of the Banff Railway Lands ARP development, based on the information known at the time of this study, and will be used to determine the infrastructure modifications required to accommodate the site.

Section 11 addresses a series of specific 'what-if' questions of how changes to the assumptions used in **Section 7** may impact the traffic forecasts and presents a conservative high traffic forecast for consideration.

7.1 DEVELOPMENT HORIZONS

Of the seven special character areas of the Banff Railway Lands ARP, there are two distinct operational generators that will contribute to the movement of people and vehicles on and near the site:

1 Heritage Rail District
2 Norquay Gondola Terminus

To assist in understanding transportation system impacts and requirements over time, of the proposed Banff Railway Lands ARP development, three traffic forecasts were completed:

- 2023 horizon year: Opening Day of the development;
- 2026 horizon year: the mass passenger rail is anticipated to become operational; and,
- 2029 horizon year: ten years from the existing conditions analysis

7.2 2023 HORIZON MOBILITY

7.2.1 HERITAGE RAIL DISTRICT - TRIP GENERATION

The Banff Railway Lands ARP will feature an active and vibrant Heritage Rail District, complete with retail, restaurants, cafes, railway station and selected former CPR railway buildings. The use for the former CPR buildings is assumed to be a combination of interpretive cultural space (70% of gross sq. ft.) and small cafes (30% of gross sq. ft.). While the Banff Railway Lands ARP development is anticipated to include a small amount of ancillary office space (2,500 sq. ft.) on the second floor of the Train Station to facilitate train operations, this is not expected to be a weekend peak hour generator and has been excluded from the trip generation assessment. The Banff Railway Lands ARP concept plan is illustrated in **Appendix A**.

The Institute of Transportation Engineers (ITE) Trip Generation Manual 10th Edition was used to estimate the vehicle traffic generating potential of the Heritage Rail District for the summer weekend afternoon peak hour. The land use codes, trip rates and in/out ratios applied to the land uses within the proposed development are listed in **Table 7-1.** The ITE Trip Generation Manual provides the Saturday trips rates *for the peak hour of generator*. This can over estimate the number of vehicle trips entering and exiting the site during the assessment hour as different uses can peak at different times throughout the day. The time of day calibration shown in **Table 7-1**, obtained from the ITE Parking Generation Manual, 5th Edition, was used to adjust the vehicle trips generated for the peak hour of generator to the Saturday afternoon peak hour of the adjacent roadway (4:15-5:15 p.m. based on existing traffic counts) for a more accurate estimate of vehicle traffic. The weekend peak hour vehicle trips generated by the proposed Heritage Rail Site are presented in **Table 7-2.**

Table 7-1 Proposed Heritage Rail Site Trip Generation Rates

LAND USE	ITE LAND USE CODE	TRIP EQUATION	DIRECTIONAL DISTRIBUTION		TIME OF DAY CALIBRATION
			ENTER	EXIT	
CPR Gardens	411 – Public Park	T=0.20(A)+26.40	55%	45%	0.61
Heritage Plaza & Amphitheatre	444 – Movie Theatre	T=0.46(S)	56%	44%	0.81
CPR Heritage Buildings ***(70% Interpretative Culture Space / 30% Cafes)***	580 – Museum	T =0.66(X)	86%	14%	0.81
	936 – Coffee Shop without Drive-through	T=59.01(X)	49%	51%	0.32
Gift Shop/Rental Shop/CRUs	820 – Shopping Centre	Ln(T)=0.79Ln(L)+2.79	52%	48%	0.86
Cafeteria	930 – Fast Casual Restaurants	T=59.01(X)	55%	45%	0.43
Restaurants/Bars	932 – High-turnover (Sit-down) Restaurant	T=11.19(X)	51%	49%	0.58
Fine Dining	931- Quality Restaurant	T=10.68(X)	59%	41%	0.58
Residential	220 – Multi-Family Housing	T=0.70(D)	63%	37%	0.70

T = Average Vehicle Trips A = Number of Acres S = Number of Seats
L = 1,000 sq. ft. Gross Leasable Area X = 1,000 sq. ft. Gross Floor Area D = Dwelling Unity

Table 7-2 Heritage Rail Site Summer Weekend Peak Hour Vehicle Trip Generation

LAND USE	UNITS	TOTAL VEHICLE TRIPS		
		ENTER	EXIT	TOTAL
CPR Gardens	1 ac	9	7	16
Heritage Plaza & Amphitheatre	200 Seats	42	33	75
CPR Heritage Buildings ***(70% Interpretative Culture Space / 30% Cafes)***	6,700 sq. ft. GFA museum space	3	1	4
	2,870 sq. ft. GFA of café space	27	28	55
Gift Shop / Rental Shop / CRUs	5,440 sq. ft. GLA	34	31	65
Cafeteria	6,050 sq. ft. GFA	49	40	89
Restaurants/Bars	3,000 sq. ft. GFA	10	10	20
Fine Dining	18,950 sq. ft. GFA	69	48	117
Residential	20 dwelling units	6	4	10
Total		**249**	**202**	**451**

Note: The trip generation estimates were completed with information known as of January 2021.

To convert the vehicle-trips arriving/departing by personal vehicle to people trips, a 2.4 vehicle occupancy rate[33] was used. The weekend peak hour people trips generated by the proposed Heritage Rail Site are presented in **Table 7-3.**

[33] Town of Banff, *Learn About Banff: Population,* https://banff.ca/252/Learn-About-Banff, Accessed January 1, 2021

Table 7-3 Heritage Rail Site Summer Weekend Peak Hour Person Trip Generation

LAND USE	UNITS	TOTAL PEOPLE TRIPS		
		ENTER	EXIT	TOTAL
CPR Gardens	1 ac	21	18	39
Heritage Plaza & Amphitheatre	200 Seats	100	79	179
CPR Heritage Buildings ***(70% Interpretative Culture Space / 30% Cafes)***	6,700 sq. ft. GFA museum space	7	2	9
	2,870 sq. ft. GFA of café space	65	67	132
Gift Shop / Rental Shop / CRUs	5,440 sq. ft. GLA	82	74	156
Cafeteria	6,050 sq. ft. GFA	118	96	214
Restaurants/Bars	3,000 sq. ft. GFA	24	24	48
Fine Dining	18,950 sq. ft. GFA	166	115	281
Residential	20 dwelling units	14	10	24
Total		**597**	**485**	**1,082**

Note: The trip generation estimates were completed with information known as of January 2021.

During the 2023 horizon summer weekend peak hour, a total of 1,082 people (597 people trips in and 485 people-trips out) are estimated to arrive or depart the Heritage Rail District. It is recognized that there may be more people on site than the trip generation suggests, and this is the result of people staying different durations.

INTERNAL CAPTURE

The Heritage Rail District visitor numbers were estimated for individual land uses as if each land use was developed as an individual standalone development. However, internal trips should be considered for multi-use developments like the Banff Railway Lands ARP site. According to the ITE Trip Generation Handbook, a multi-use development is typically a single real-estate project that consists of two or more ITE land use classifications between which trips can be made without using the off-site road system.[34] The internal trips can be made either by walking or by vehicles using internal roadways. In this study, the Heritage Rail Site is deemed to be a multi-use development (recreational, restaurants, and retail), thus to estimate the trips made on the external streets, the internal trips that are not made on the major street system should be deducted from the total trips.

Table 7-4 summarizes the estimated internal trip capture percentages by land use and the estimated total new people trips for the Heritage Rail District. The internal capture of the site was estimated based on discussions with the proponent on the operating vision and aspirations for this development, along with personal and professional experience of how multi-use sites function. A high internal capture was assumed for the CPR Gardens and the Heritage Plaza & Amphitheatre as these land uses are expected to operate ancillary to the site, rather than being large visitor draws themselves. The Heritage Rail District's internal capture also considers the influence of the Norquay Gondola visitors, as it will be all contained on one site.

[34] Institute of Transportation Engineers, *Trip Generation Handbook 3rd Edition,* September 2017: page 43.

Table 7-4 Heritage Rail Site Internal Capture Rates (2023 Horizon)

LAND USE	INTERNAL CAPTURE PERCENTAGE	TOTAL NEW PEOPLE-TRIPS
CPR Gardens	90%	4
Heritage Plaza & Amphitheatre	90%	18
CPR Heritage Buildings ***(70% Interpretative Culture Space / 30% Cafes)***	25%	104
Gift Shop / Rental Shop / CRUs	50%	78
Cafeteria	50%	106
Restaurants/Bars	10%	43
Fine Dining	10%	253
Residential	0%	24
Total		**630**

MODE SPLIT

The Banff Railway Lands are located within walking distance (500 m) to Banff's downtown and are currently served by Roam Transit. **Table 7-5** summarizes the assumed mode split between passenger vehicles, shuttle, and walking or cycling for the Heritage Rail Site for the summer weekend peak hour assessment. This adopted mode split is based on the visitor mode split reported in the Banff TMP. The mode split for the residential units is based off the residential mode split presented in the Banff TMP.

Table 7-5 Heritage Rail Site Mode Split (2023 Horizon)

LAND USE	PASSENGER VEHICLE	WALKING / CYCLING	SHUTTLE
Heritage Rail District (excluding Residential)	45%	45%	10%
Residential	41%	54%	5%

Table 7-6 summarizes the total people-trips by mode for the 2023 horizon.

Table 7-6 Heritage Rail Site People-Trips by Mode (2023 Horizon)

LAND USE	PASSENGER VEHICLE	WALKING/CYCLING	SHUTTLE
CPR Gardens	2	2	0
Heritage Plaza & Amphitheatre	8	8	2
CPR Heritage Buildings *(70% Interpretative Culture Space / 30% Cafes)*	47	47	10
Gift Shop / Rental Shop / CRUs	35	35	8
Cafeteria	48	48	11
Restaurants/Bars	19	19	5
Fine Dining	114	114	25
Residential	10	13	1
Total	**283**	**286**	**62**

This equates to 283 people arriving or departing by passenger vehicle, 62 people arriving or departing by shuttle, and 286 people arriving or departing by active transportation to the Banff Railway Lands ARP site. To convert the people-trips arriving/departing by personal vehicle, a 2.4 vehicle occupancy rate was used.

A total of 118 passenger vehicle-trips associated with the Heritage Rail Site land uses are estimated to arrive or depart the Banff Railway Lands ARP site during the summer weekend afternoon peak hour.

PASS-BY TRIPS & DIVERTED TRIPS

Not all traffic entering or exiting a site driveway is necessarily new traffic added to the surrounding road network.

A portion of the existing Mt Norquay Road users will visit the Banff Railway Lands ARP site prior to reaching their final destination **by vehicle**. These users are assumed to arrive and leave by vehicle and are considered "pass-by trips."

> *Pass-by trips are trips made as intermediary stops along the course of a trip between an origin and a primary trip destination. Pass-by trips are attracted from traffic passing the site on an adjacent street or roadway that offers direct access to the site (i.e. Mt Norquay Road). Although these trips will be included in the driveway volumes to the site, they will not increase the overall traffic volumes on the study roads.*

The ITE Trip Generation Handbook (ITE, 2014) reports the average pass-by trip rate by land use. The average ITE pass-by rates for restaurants (43%) and retail (26%) were utilized and all other uses were assumed have a pass-by rate of 10% (excluding residential trips).

It is estimated that the pass-by trips will account for 40 trips (20 trips entering and 20 trips existing) during the summer weekend afternoon peak hour.

A portion of the existing Mt Norquay Road users will also visit the Banff Railway Lands ARP site prior to reaching their final destination by **walking or shuttle**. These users are assumed to leave their vehicles in the intercept parking lots, and these trips will function like intercept parking with a lower turnover rate. These trips are considered to be "diverted trips".

To estimate the number of diverted trips, the following methodology was adopted. The ITE Trip Generation Handbook (ITE, 2014) reports diverted trip rates by land use. The average ITE diverted rates for restaurants (26%) and retail (35%) were utilized and all other uses were assumed to have a diverted rate of 10% (excluding residential trips). The diverted trip percentages were applied to the vehicle trip generation in **Table 7-6** to reduce the overall new trips. The diverted trips equaled a 28 total trip reduction or 22% reduction of total trips. As it is assumed that these diverted trips will function like intercept parking with a lower turnover rate, it was assumed that 22% of the Banff Railway Lands parking demand (250 parking spaces from **Section 7.2.3**), would then function like intercept parking, approximately 54 parking spaces. The methodology in **Section 6.3** was utilized to estimate the trips from these parking spaces that are considered to stay longer.

It is estimated that the diverted trips will account for 20 vehicle trips (11 trips entering and 9 trips existing) during the summer weekend afternoon peak hour. These are added back onto the driveway volumes of the Lots, but do not contribute to added new traffic to the surrounding road network.

NEW TRIPS

The internal capture rates, mode split, diverted trips, and pass-by rates were applied to the trip generation to determine new vehicle trips at the Banff Railway Lands ARP site. **Table 7-7** summarizes the estimated new vehicle trips that will be generated by the proposed Heritage Rail District during the summer weekend peak hour in the 2023 horizon.

Table 7-7 Heritage Rail District Summer Weekend Peak Hour Vehicle Trip Generation (2023 Horizon)

LAND USE	TOTAL NEW TRIPS		
	ENTER	EXIT	TOTAL
CPR Gardens	1	1	2
Heritage Plaza & Amphitheatre	2	1	3
CPR Heritage Buildings	8	8	16
Gift Shop / Rental Shop / CRUs	3	3	6
Cafeteria	3	3	6
Restaurants/Bars & Fine Dining	10	7	17
Residential	2	2	4
Total	**29**	**25**	**54**

In addition to vehicle trips, it is anticipated that 285 people (159 people entering / 126 people exiting) will walk/cycle to/from the Banff Railway Lands ARP site and 62 people (34 people entering / 28 people exiting) will catch a shuttle to/from the Banff Railway Lands ARP Site during the summer weekend peak hour in the 2023 horizon.

7.2.2 NORQUAY GONDOLA TRIP GENERATION

The trip generation for the Norquay Gondola Terminus is assumed to be composed of two trips types:

1 Existing Norquay Users
2 Future Norquay Users

The following sections will describe the trip generation for each user type.

EXISTING NORQUAY USERS TRIP GENERATION

Existing Norquay Users are users who are already visiting Mt Norquay today, such as the Via Ferrata users. The Mount Norquay Gondola Feasibility Study[35] (Mt Norquay Feasibility Study) indicates that when the Norquay Gondola opens, the existing Norquay parking lot will be closed and it is assumed that these existing patrons will relocate to the Lots.

The Mt Norquay Feasibility Study also indicates that the current peak visitation period runs from mid-June to mid-September. During this period, the average number of visitors is approximately 260 people per day and they typically stay 2 to 3 hours per visit. The following outlines the current operating conditions of the Mount Norquay Ski Resort during the summer months:

- Existing Hours of Operation: 7:00 a.m. to 7:00 p.m.
- Peak Summer Visitors: 260 people / day

The summer peak hour people-trips were estimated by converting the summer peak daily visitors (260 people) to daily trips (520 daily two-way people trips). Assuming that 23% of people turnover during the peak hour, that equates to 120 peak hour people-trips (60 people-trips in and 60 people-trips out). An occupancy rate of 2.4 people per vehicle was used to convert the people-trips to vehicle-trips, equating to 50 total vehicle trips during the weekend summer peak hour at the current location. As discussed below, with the terminus located in Banff, the mode share is expected to change, and vehicle trips will be lower than this current estimate.

FUTURE NORQUAY USERS TRIP GENERATION

As previously noted, the Norquay Gondola is expected to see approximately 215,000 visitors within its first year of operation. This is approximately 35% of the visitors forecast to use the Sulphur Mountain Gondola in the year 2020[36].

As Banff's existing gondola ridership (600,000 people annually) is likely to be divided in some way between the two gondolas, the existing Sulphur Mountain and the proposed Norquay Gondola, it has been assumed that the total gondola market demand will be divided between the two gondolas. The total gondola market demand was estimated using the projected number of summer visitors at Sulphur Mountain Gondola in the year 2020, equaling 4,060 daily summertime visitors (see **Section 5.3.3**). The Norquay Gondola daily number of visitors in 2023 was then estimated at 35% of total gondola market demand. A total of 1,420 people is estimated to visit the Norquay Gondola daily during the 2023 summer horizon.

The Sulphur Mountain Gondola operation has been used as a reference to estimate trip generation of the Norquay Gondola[37]. Visitors typically stay at the Sulphur Mountain Gondola for between 2 and 2.5 hours. During the summer, during the busiest period of the day the site reaches capacity at around 1,250 people, which represents 38% of the total daily visitation of 3,250. Applying the same metrics to visitation to the Norquay Gondola: 38% of 1,420 daily visitors suggests around 540 visitors would be on site during the busiest period of the day. Assuming a 2 hour

[35] Mt. Norquay & Brent Harley and Associates Inc., *Mount Norquay Gondola Feasibility Study Draft-Confidential* (May 14, 2018)
[36] Mt. Norquay & Brent Harley and Associates Inc., *Mount Norquay Gondola Feasibility Study Draft-Confidential* (May 14, 2018)
[37] Brewster Travel Canada, B*anff Gondola Upper Terminal Development Project* (June 20, 2014)

stay, the turnover rate is 0.50 yielding approximately 270 people (135 people entering and 135 people leaving) visiting Norquay Gondola during the summer weekend peak hour.

INTERNAL CAPTURE

The Norquay Gondola visitors were estimated as an individual standalone development. However, internal trips should be considered because a portion of the gondola visitors are assumed to visit the Heritage Rail District uses. A 10% reduction has been assumed to account for the gondola's internal capture.

MODE SPLIT

The Norquay Gondola will be located close to the downtown and this location is currently served by Roam Transit. A pedestrian connection over the CP rail tracks is proposed to link the North Intercept Parking Lot to the rest of the site. As previously described, **Table 7-8** summarizes the assumed mode split for shuttle, walking or by bicycle, and by passenger vehicles for the summer weekend peak hour assessment.

Table 7-8 Norquay Gondola Users Mode Split (2023 Horizon)

LAND USE	PASSENGER VEHICLE	WALKING / CYCLING	SHUTTLE
Existing Norquay Users	45%	45%	10%
Future Norquay Users	45%	45%	10%

This equates to 158 people arriving or departing by passenger vehicle, 35 people arriving or departing by shuttle, and 158 people arriving or departing by walking to the Banff Railway Lands ARP site. To convert the people-trips arriving/departing by personal vehicle, a 2.4 vehicle occupancy rate was used. This equates to 66 total vehicle-trips during the peak hour.

PASS-BY TRIPS

As previously described, pass-by trips are trips made as intermediary stops along the course of a trip between an origin and a primary trip destination. Although these trips will be included in the driveway volumes to the site, they will not increase the overall traffic volumes on the study roads. In this study, it is assumed that 10% of the total vehicle trips generated by the future users of the Norquay Gondola will be pass-by trips for the summer weekend afternoon peak hour. It is estimated that the pass-by trips will account for 4 trips (2 trips entering and 2 trips exiting) during the summer weekend afternoon peak hour.

NEW TRIPS

The internal capture rates, mode split, and pass-by were applied to the trip generation to determine new vehicle trips at the Norquay Gondola. **Table 7-9** summarizes the estimated new vehicle trips that will be generated by the proposed Banff Railway Lands ARP site during the summer weekend peak hour in the 2023 horizon.

Table 7-9 Norquay Gondola Users Summer Weekend Peak Hour Vehicle Trip Generation (2023 Horizon)

LAND USE	TOTAL TRIPS		
	ENTER	EXIT	TOTAL
Existing Norquay Users	9	9	18
Future Norquay Users	21	21	42
Total	**30**	**30**	**60**

In addition to the vehicle trips, it is anticipated that 158 people (79 people entering / 79 people exiting) will walk to/from the Norquay Gondola and 36 people (18 people entering / 18 people exiting) will catch a shuttle to/from the Norquay Gondola during the summer weekend peak hour in the 2023 horizon.

7.2.3 2023 HORIZON PARKING DEMAND

The peak parking demand for the Banff Railway Lands ARP is estimated at 250 parking spaces during the weekend summer peak hour. This comprises 140 spaces for the Heritage Rail Site, 40 spaces for the residential units (assumed to park at their homes), and 110 spaces for the Norquay Gondola, as explained below.

HERITAGE RAIL SITE PARKING DEMAND

The Town of Banff's Land Use Bylaw, Section 8.16.0 Off-Street Parking was used to estimate the parking requirements of the Heritage Rail Site. The land use and corresponding parking generation rates are listed in **Table 7-10.**

As there is no rate in the Bylaw for the CPR Gardens, the ITE Land Use, Public Park (ITE Code 411) from the ITE Parking Generation Manual, 5th Edition was used to estimate the peak parking demand of the CPR Gardens for the summer weekend afternoon peak hour. The parking generation rate and time of day calibration ratio applied to the land use is listed in **Table 7-10.** The ITE Parking Generation Manual provides the Saturday parking demand rates for the peak hour of the land use. This can over estimate the parking demand during the summer weekend afternoon peak hour as different uses can peak at different times throughout the day. The time of day calibration used for the CPR Gardens is shown in **Table 7-10**, and was obtained from the ITE Parking Generation Manual, 5th Edition and used to adjust the parking demand generated for the peak hour to the Saturday afternoon peak hour of the adjacent roadway (4:15-5:15 p.m. based on existing traffic counts) for a more accurate estimate of peaking demand.

Table 7-10 Proposed Heritage Rail Parking Generation Rates

LAND USE	TOWN OF BANFF PARKING GENERATION RATE	ITE PARKING GENERATION RATE	TIME OF DAY CALIBRATION
CPR Gardens	--	P=0.47(A)	0.61
Retail	2.5 spaces per 100 m^2 of GFA	--	--
CPR Heritage Buildings	1 space per 50 m^2 of GFA	--	--
Restaurants	4 spaces per 100 m^2 of GFA	--	--
Office	2.5 spaces per 100 m^2 of GFA	--	--
Residential	2 spaces per Dwelling Unit		

P = Peak Parking Demand GFA = Gross Floor Area A – Number of Acres

The weekend peak hour parking demand generated by the proposed Heritage Rail Site development are presented in **Table 7-11.**

Table 7-11 Heritage Rail Site Parking Demand

LAND USE	UNITS	PARKING DEMAND
CPR Gardens	1 ac	0
Retail	632 m^2 GFA	15
CPR Heritage Buildings	1377 m^2 GFA	15
Restaurants	2600 m^2 GFA	105
Office	235 m^2 GFA	5
Residential	20 dwellings	40
Total	**-**	**180**

* Values rounded to the nearest five (5).

The parking requirements for the Heritage Rail Site is estimated at 140 parking spaces with an additional 40 parking spaces required for the adjacent multi-family residential (located south of Railway Avenue).

NORQUAY GONDOLA PARKING DEMAND

The peak parking demand for the existing Norquay Gondola users is estimated at 19 parking spaces during the summer weekend peak hour. The peak parking demand was estimated by assuming that 38% of visitors were on site during the summer afternoon peak period, that 45% arrived by personal vehicle, and utilizing a vehicle occupancy rate of 2.4 people per vehicle.

The peak parking demand for the future Norquay Gondola Users is estimated at 82 parking spaces during the summer weekend peak hour. The peak parking demand was estimated by using the number of visitors on-site during the peak hour who arrived by car (196 people) and dividing it by the vehicle occupancy rate of 2.4 people per vehicle.

The resulting total peak parking demand for the Norquay Gondola site, including existing and future users, is therefore estimated at 101 parking spaces during the summer weekend peak hour.

7.2.4 2023 HORIZON TRIP DISTRIBUTION & ASSIGNMENT

The trip assignment was completed by distributing the site-related traffic volumes and assigning them to the road network based on an estimate of how people will access and egress the site. Distribution refers to the origins and destinations of the site-generated trips. Trip assignment assesses the actual route that the vehicle will take between their origin and destination. The assignment process assumes that motorists will use the most efficient route.

Trip distribution was considered in layers. The top layer is person trips. The person-trip distribution is the overall distribution of people arriving or departing from the site and does not account for how individual modes might arrive or depart from the site. The overarching assumption is that the majority of person trips generated by the Heritage Rail Site and Norquay Gondola will be attracted from within the town (i.e. from the south – 70%) and the remaining will be attracted from the Highway (i.e. to the north – 30%).

However, trips have been calculated for three modes – passenger vehicle, walking (or cycling), and shuttles. Considering these modes is the second layer for trip distribution. It is assumed that 100% of visitors arriving to the site by walking/cycling, will arrive from the south (i.e. from the town) and not the north (i.e. from the Highway). It was also assumed that 90% of shuttles arrived/departed from the south.

Applying these assumptions and the adopted mode splits to the person trips yields the directional distribution of person trips. **Table 7-12** summarizes the person-trip distribution by mode for the Heritage Rail Site and the residential land use, and **Table 7-13** summarizes the person-trip distribution by mode for the Norquay Gondola.

Table 7-12 Heritage Rail District Person-Trip Distribution, by Mode Choice

	Arriving/Departing North	Arriving/Departing South	Total
Heritage Rail District	**182**	**425**	**607**
Walking (45% Mode Split)	*0*	*273*	*273*
Shuttle (10% Mode Split)	*6*	*55*	*61*
Passenger Vehicle (45% Mode Split)	*176*	*97*	*273*
Residential	**7**	**18**	**25**
Walking (54% Mode Split)	*0*	*14*	*14*
Shuttle (5% Mode Split)	*0*	*1*	*1*
Passenger Vehicle (51% Mode Split)	*7*	*3*	*10*

Table 7-13 Norquay Gondola Person-Trip Distribution, by Mode Choice

	Arriving/Departing North	Arriving/Departing South	Total
Existing Norquay Gondola Users	**31**	**77**	**108**
Walking (45% Mode Split)	*0*	*49*	*49*
Shuttle (10% Mode Split)	*0*	*10*	*10*
Passenger Vehicle (45% Mode Split)	*31*	*18*	*49*
Future Norquay Gondola Users	**72**	**170**	**242**
Walking (45% Mode Split)	*0*	*109*	*109*
Shuttle (10% Mode Split)	*2*	*22*	*24*
Passenger Vehicle (45% Mode Split)	*70*	*39*	*109*

The vehicle-trip distribution was determined by taking the number of people arriving/departing to or from the north by passenger vehicles and dividing it by the total number of people arriving/departing from the site by passenger vehicles (i.e. 176 people divided by 273 people equals 64% of people in passenger vehicles arrive from the north).

The 2023 vehicle-trip distribution is summarized in **Table 7-14**.

Table 7-14 2023 Horizon Vehicle-Trip Distribution

LAND USE	NORTH	SOUTH
Heritage Rail District	64%	36%
Residential	72%	28%
Existing Norquay Gondola Users	64%	36%
Future Norquay Gondola Users	64%	36%

It is assumed that the South Lot will reach capacity first, due to it being closer to downtown Banff. A parking lot is typically considered to be at practical capacity when it is 90% occupied, as this is the point at which drivers generally experience difficulty locating a parking spot even though there are spaces available (vehicles are circulating in search of a space and moving in and out of parking spaces). When the South Lot reaches 90% capacity or 438 occupied parking spaces, the remaining parking demand will use the North Intercept Parking.

It is assumed that 50% of the South Lot will be used for intercept parking, likely “all day stays”, this accounts for 219 parking spaces) and leaves an anticipated demand of 79 intercept parking spaces that are now assumed to park in the North Lot. The remaining 219 parking spaces will be used by the Banff Railway Lands ARP site, leaving a demand of 41 spaces for the North Lot.

The Banff Railway Lands ARP development is estimated to need 250 parking spaces during the peak hour, this equates to 87% of the peak hour parking being accommodated in the South Lot (219 parking spaces divided by 250 parking spaces is 87%). For the trip assignment purposes, it was assumed that 87% of the trips generated by the Banff Railway Lands ARP would be generated by the South Lot.

The existing distribution at the Highway 1 / Mt Norquay Road Interchange, summarized in **Table 7-15**, was used to assign the site-generated trips to the network at these study intersections.

Table 7-15 Existing Highway 1 Interchange Vehicle Distribution, Summer Weekend Peak Hour

DIRECTION	INBOUND	OUTBOUND
Highway 1 West	65%	35%
Highway 1 East	35%	65%

The Norquay Gondola is anticipated to divert a portion of existing and background traffic and these trips are therefore are not considered new trips. This includes:

- **Existing Norquay Users:** These users’ travel paths have been altered either by the new mode split that will result from proximity to Downtown, or by the relocation of the parking lots. A total of 50 trips (25 trips in / 25 trips out) were removed off the network, which represents Existing Norquay Users travel patterns (Section 7.2.2). Note, that the new vehicle trips (20 vehicle trips) were added back onto the network as part of the reroute and mode spit changes.
- **Future Norquay Gondola Users**: The gondola market share is likely to be divided in some way between the two gondolas, Sulphur Mountain and Norquay Gondola. In the 2023 horizon, it is assumed that 35% of trips originally destined to Sulphur Mountain will now visit the Norquay Gondola. For this assessment, the portion of visitors derived from Sulphur Mountain are considered diverted trips as they were already on the road network. Similar to pass-by trips, these trips will be included in the driveway volumes to the site, but they will not increase the overall traffic volumes on the study roads.

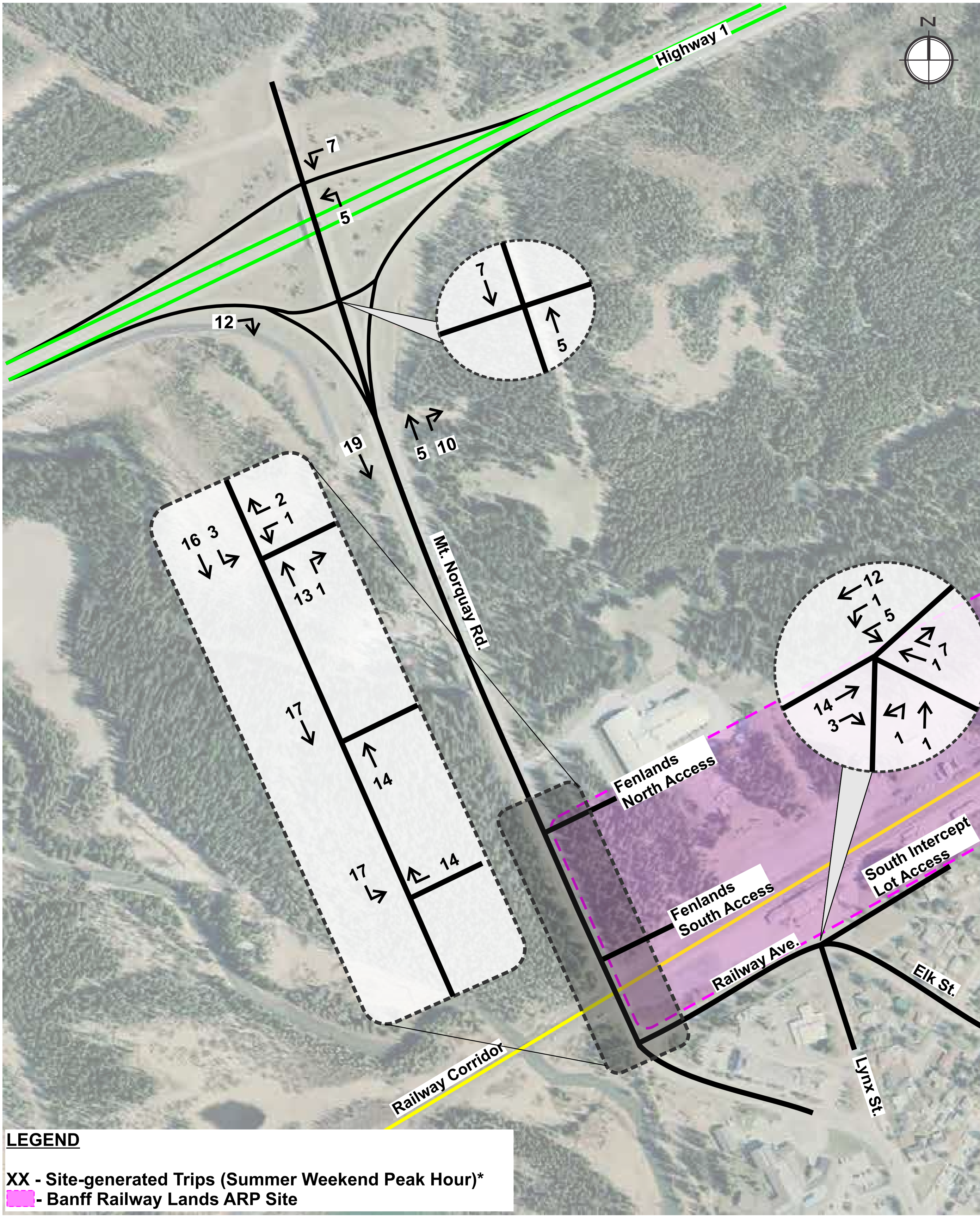
  Assuming that 35% of the Norquay Gondola ridership is derived from the Sulphur Mountain Gondola Ridership, this equates to approximately 497 daily visitors. Utilizing a 10% internal capture rate (from the Norquay Gondola Internal Capture calculations), a peak hour visitor rate of 38%, that 45% will arrive by passenger vehicle, a 2.4 vehicle occupancy rate, and a 0.50 turnover rate, approximately 16 trips (8 trips in and 8 trips out) will be diverted from Sulphur Mountain to Norquay Gondola with a 35% market share.

It was assumed that trips entering/exiting to the north (64%) via Mt Norquay Road would be diverted trips and be removed from the through traffic and added to the turning movements at the accesses. Trips entering from the south (36%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

This equates to 5 inbound trips that now make a southbound left into the Parking Lots and 5 trips are removed from the southbound through movement at the Mt Norquay Road and Railway Avenue intersection, as they will no longer be traveling south on Gopher Street. Similarly, there will be 5 outbound trips making a westbound right out of the Intercept Parking Lots. As these 5 trips would be captured before they entered the downtown, 5 trips would be removed from the northbound through movement at the Mt Norquay Road and Railway Avenue intersection. This equates to a total of 16 trips that will be removed from Gopher Street during the peak hour assuming a 35% capture of the market share.

Trips entering from the south (24%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

The Heritage Rail District site-generated trips for the 2023 summer weekend peak hour horizon are shown in **Figure 7-1** and the Norquay Gondola site-generated trip assignment for the 2023 horizon is shown in **Figure 7-2.**



LEGEND

XX - Site-generated Trips (Summer Weekend Peak Hour)*

- Banff Railway Lands ARP Site

WSP Canada Inc.
237 4th Ave SW, Suite 3300 Fifth Ave Place
Calgary, AB T2P 4K3
t. 403.266.2800
www.wsp.com

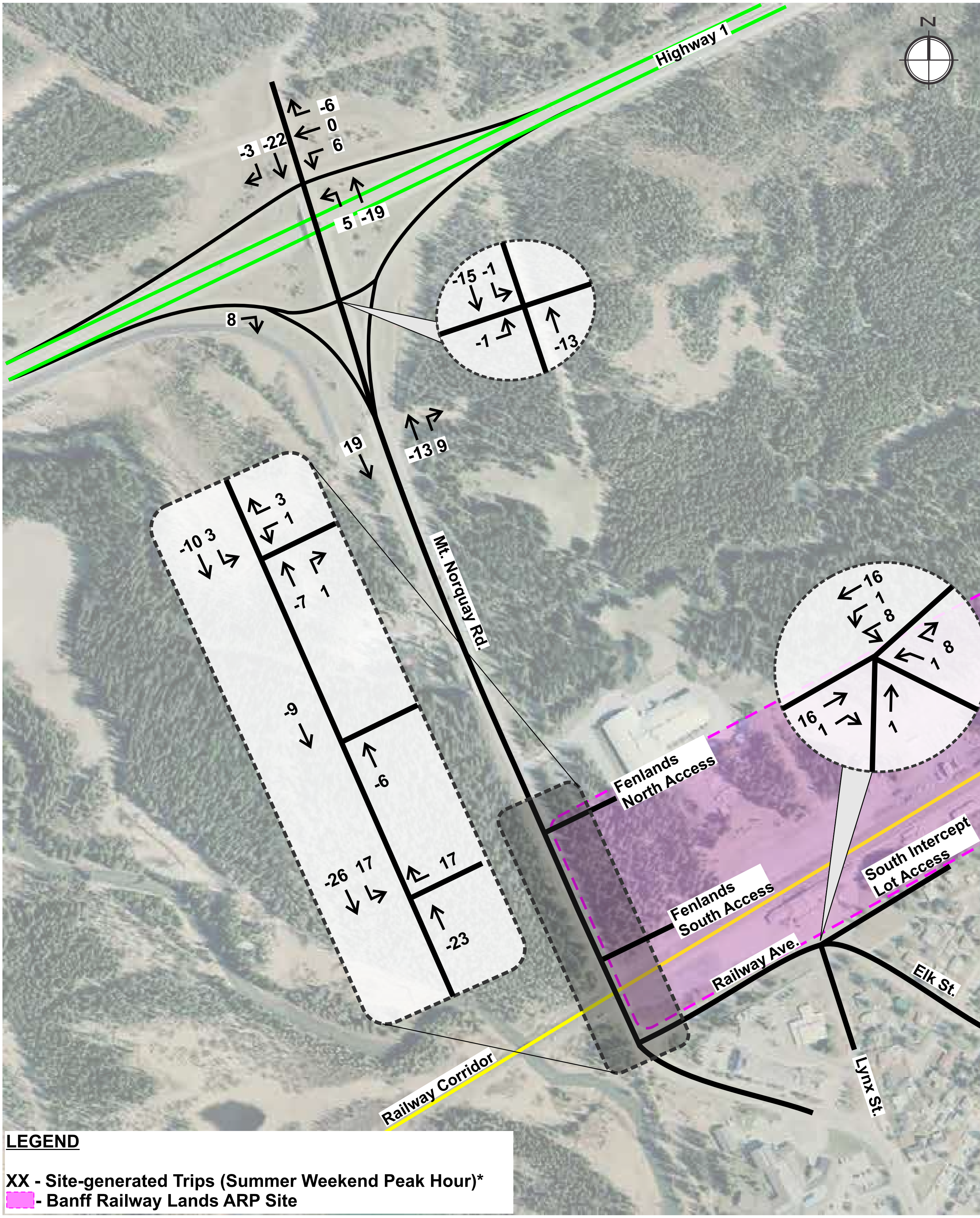
Issue Date: 2021-02-11
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 7-1 - 2023 Horizon Heritage Rail Site-generated Trips

Banff Railway Lands Area Redevelopment Plan TIA

DRAWING: FIG-19M 004480-2023 HR Site-gen.cdr DATE: 2021-02-11 DRAWN BY: piperde

NOTE: These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entering into a contract.



LEGEND

XX - Site-generated Trips (Summer Weekend Peak Hour)*

- Banff Railway Lands ARP Site

WSP Canada Inc.
237 4th Ave SW, Suite 3300 Fifth Ave Place
Calgary, AB T2P 4K3
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Issue Date: 2021-02-11
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 7-2 - 2023 Horizon Norquay Gondola Trip Assignment

Banff Railway Lands Area Redevelopment Plan TIA

DRAWING: FIG-19M 004480-2023 Gondola Site-generated Trips (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

7.2.5 2023 TRAFFIC FORECAST SUMMARY

Table 7-16 summarizes the 2023 trip generation for the Banff Railway Lands ARP site during the summer weekend peak hour.

Table 7-16 2023 Banff Railway Lands ARP Trip Generation Summary

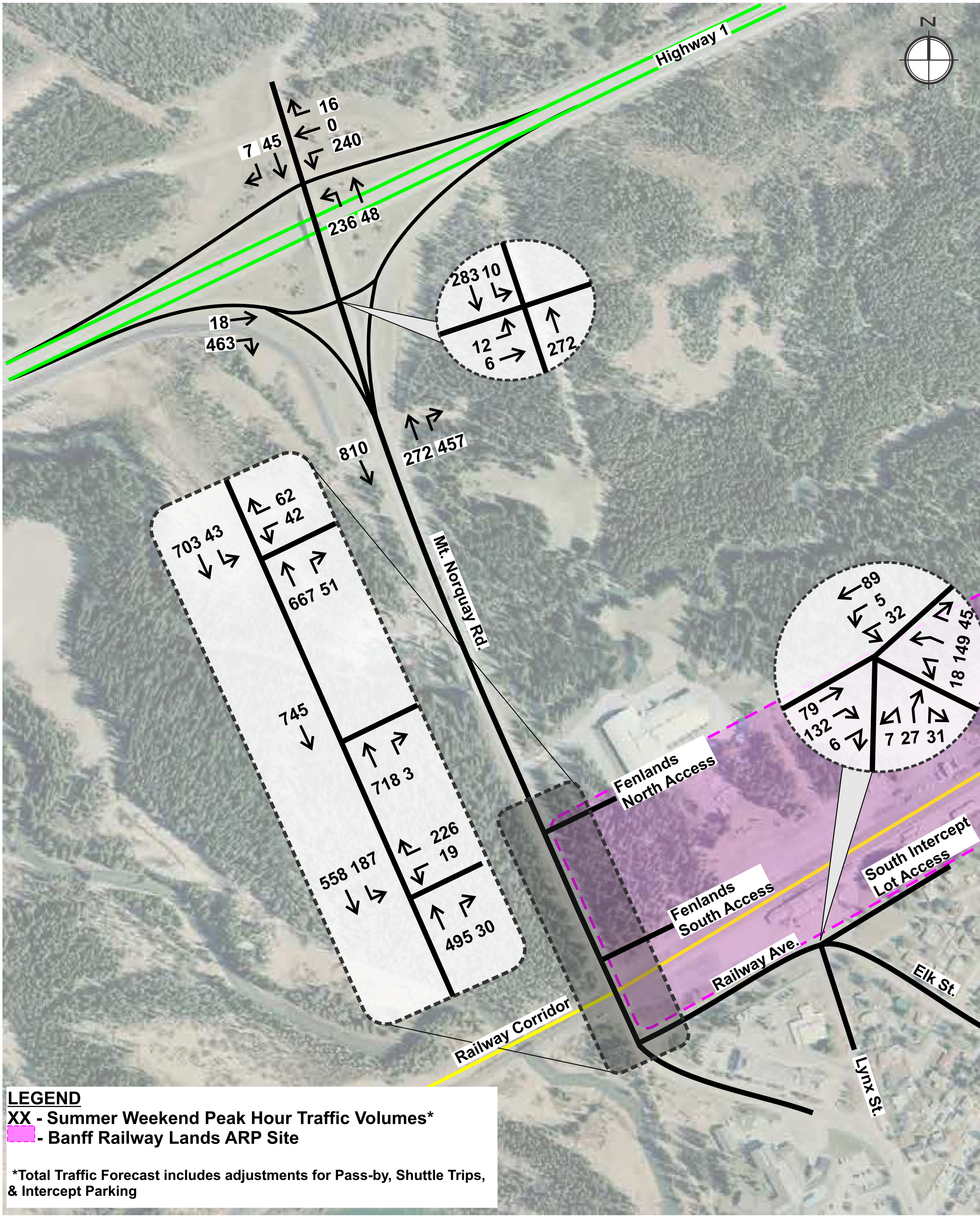
MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	58	53	111
Shuttles (Shuttle-trips) *	1	1	2
Walking (Person-trips)	238	205	443

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

It is estimated that the pass-by trips will account for 44 trips (22 trips entering and 22 trips existing) during the summer weekend afternoon peak hour.

The site-generated trips (Heritage Rail Site, Norquay Gondola), shuttle trips, pass-by trips and other minor adjustments to account for some intercept parking shifting to the North Lot were added to the projected 2023 background forecast to obtain the 2023 forecast total volumes, illustrated in **Figure 7-3**.

NOTE: These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entering into a contract.



DRAWING: FIG-19M 004480-2023 Total Traffic Volumes (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

WSP Canada Inc.
237 4th Ave SW, Suite 3300 Fifth Ave Place
Calgary, AB T2P 4K3
t. 403.266.2800
www.wsp.com

Issue Date: 2021-02-11
Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 7-3 - 2023 Horizon Total Traffic Forecast

Banff Railway Lands Area Redevelopment Plan TIA

7.3 2026 HORIZON MOBILITY

7.3.1 HERITAGE RAIL DISTRICT SITE TRIP GENERATION

The methodology for trip generation and internal capture for the Heritage Rail Site users for the 2026 horizon is the same as described in **Section 7.2.1**. and the person trips are as shown in **Table 7-3**. The following sections provides the assumptions for mode split of the 2026 horizon.

Section 7.2.1 describes the methodology for the trip generation and internal capture for the Heritage Rail Site users, which is assumed to be the same in 2026 as it is in 2023. The following sections provides the assumptions for internal capture and mode split of the 2026 horizon.

MODE SPLIT

In the 2026 horizon, a mass passenger rail service is anticipated to become operational and serve the Calgary and Bow Valley area. The Banff Railway Lands are also located close to the downtown and are currently served by Roam Transit. Utilizing the Mass Transit Feasibility Study[38], it is estimated that 2.5% of visitors to Banff will utilize the mass passenger rail service.

Table 7-17 summarizes the assumed mode split for shuttle, walking or by bicycle, by car, and by rail for the summer weekend peak hour assessment.

Table 7-17 Heritage Rail Site Mode Split (2026 Horizon)

LAND USE	PASSENGER VEHICLE	WALKING / CYCLING	SHUTTLE	RAIL
Heritage Rail District	42.5%	45%	10%	2.5%
Residential	41%	54%	5%	0%

This equates to 267 people arriving or departing by passenger vehicle, 62 people arriving or departing by shuttle, 285 people arriving or departing by walking, and 15 people arriving or departing by rail to the Banff Railway Lands ARP site. To convert the people-trips arriving/departing by personal vehicle to vehicle trips, a 2.4 vehicle occupancy rate was used.

PASS-BY TRIPS & DIVERTED TRIPS

As previously described in **Section 7.2.1**, it is assumed that the Heritage Rail site (excluding residential trips) will attract both pass-by trips and diverted trips. The same methodology was applied to calculate these trips at the 2026 horizon. The ITE Trip Generation Handbook (ITE, 2014) was used to estimate the pass-by trips and the diverted trip for the restaurant and retail land uses and 10% was used for all other uses, excluding residential trips.

It is estimated that the pass-by trips will account for 36 trips (18 trips entering and 18 trips existing) during the summer weekend afternoon peak hour.

It is estimated that the diverted trips will account for 21 trips (12 trips entering and 9 trips existing) during the summer weekend afternoon peak hour.

[38] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)

NEW TRIPS

The internal capture rates, mode split, pass-by trips and diverted trips were applied to the trip generation to determine new vehicle trips at the Heritage Rail site**. Table 7-18** summarizes the estimated new vehicle trips that will be generated by the proposed Heritage Rail site during the summer weekend peak hour in the 2026 horizon.

Table 7-18 Heritage Rail Site Summer Weekend Peak Hour Vehicle Trip Generation (2026 Horizon)

LAND USE	TOTAL TRIPS		
	ENTER	EXIT	TOTAL
CPR Gardens	1	1	2
Heritage Plaza & Amphitheatre	2	1	3
CPR Heritage Buildings	8	7	15
Gift Shop / Rental Shop / CRUs	3	2	5
Cafeteria	3	3	6
Restaurants/Bars & Fine Dining	9	7	16
Residential	2	2	4
Total	**28**	**23**	**51**

In addition to vehicle trips, it is anticipated that 285 people (159 people entering / 126 people exiting) will walk to/from the Banff Railway Lands ARP site and 62 people (34 people entering / 28 people exiting) will catch a shuttle to/from the Banff Railway Lands ARP site and 15 people (8 people entering / 7 people exiting) will use the mass passenger rail during the summer weekend peak hour in the 2026 horizon.

7.3.2 NORQUAY GONDOLA TRIP GENERATION

EXISTING NORQUAY USERS TRIP GENERATION

The methodology for the trip generation for the existing Norquay users is as described in **Section 7.2.2**. During the summer weekend peak hour, approximately 120 Existing Norquay Users (60 visitors in and 60 visitors out) will visit the Banff Railway Lands ARP site.

FUTURE NORQUAY USERS TRIP GENERATION

The Norquay Gondola is expected to see approximately 273,000 visitors within its third year of operation. This is approximately 46% of the numbers achieved by the Sulphur Mountain Gondola in 2020.

As Banff's existing gondola ridership (600,000 people annually) is likely to be divided in some way between the two gondolas, the existing Sulphur Mountain and the proposed Norquay Gondola, it has been assumed that the total gondola market demand will be divided between the two gondolas. The total gondola market demand was estimated using the projected number of summer visitors at Sulphur Mountain Gondola in the year 2020, equaling 4,060 daily summertime visitors (see **Section 5.3.3**). The Norquay Gondola daily number of visitors in 2026 was then estimated at 46% of total gondola market demand. A total of 1,850 people is estimated to visit the Norquay Gondola daily during the 2026 summer horizon.

Using the Sulphur Mountain Gondola peak hour visitor rate of 38% to convert daily visitors to peak hour visitors[39], approximately 700 people are estimated to be onsite during the summer weekend peak hour. The Mt Norquay Feasibility Study indicates that the duration of stay at Mt Norquay will be similar to that of Sulphur Mountain. For this study, it was assumed that the average visitor stayed for a duration of 2 hours. Using a turnover rate of 0.50, this equates to approximately 350 people (175 people entering and 175 people leaving) visiting Norquay Gondola during the summer weekend peak hour.

INTERNAL CAPTURE

The Norquay Gondola visitors were estimated as an individual standalone development. However, internal trips should be considered because a portion of the gondola visitors are assumed to visit the Heritage Rail District uses. A 10% reduction has been assumed to account for the gondola's internal capture.

MODE SPLIT

As previously described, a mass passenger rail service is anticipated to serve the Calgary – Bow Valley area in the 2026 horizon. Visitors to the Norquay Gondola will have the choice between walking, shuttles, driving, or rail to arrive or depart the site. **Table 7-19** summarizes the assumed mode split for the 2026 summer weekend peak hour assessment.

Table 7-19 Norquay Gondola Users Mode Split (2026 Horizon)

LAND USE	PASSENGER VEHICLE	WALKING / CYCLING	SHUTTLE	RAIL
Existing Norquay Users	42.5%	45%	10%	2.5%
Future Norquay Users	42.5%	45%	10%	2.5%

This equates to 181 people arriving or departing by passenger vehicle, 42 people arriving or departing by shuttle, 191 people arriving or departing by walking, and 11 people arriving or departing by rail to the Banff Railway Lands ARP site. To convert the people-trips arriving/departing by personal vehicle, a 2.4 vehicle occupancy rate was used. This equates to 75 total vehicle-trips during the peak hour.

PASS-BY TRIPS

As previously described, in **Section 7.2.2,** it is assumed that 10% of the total vehicle trips generated by the future users of the Norquay Gondola will be pass-by trips for the summer weekend afternoon peak hour. It is estimated that the pass-by trips will account for 6 trips (3 trips entering and 3 trips existing) during the summer weekend afternoon peak hour.

NEW TRIPS

The internal capture rates, mode split, and pass-by trips were applied to the trip generation to determine new vehicle trips at the Norquay Gondola. **Table 7-20** summarizes the estimated new vehicle trips that will be generated by the proposed Norquay Gondola during the summer weekend peak hour in the 2026 horizon.

[39] Brewster Travel Canada, B*anff Gondola Upper Terminal Development Project* (June 20, 2014)

Table 7-20 Norquay Gondola Users Summer Weekend Peak Hour Vehicle Trip Generation (2026 Horizon)

LAND USE	TOTAL TRIPS		
	ENTER	EXIT	TOTAL
Existing Norquay Users	9	9	18
Future Norquay Users	25	25	50
Total	**34**	**34**	**68**

In addition to vehicle trips, it is anticipated that 192 people (96 people entering / 96 people exiting) will walk, 42 people (21 people entering / 21 people exiting) will catch a shuttle, and 10 people (5 people entering / 5 people exiting) will use the rail service to visit the Norquay Gondola during the summer weekend peak hour in the 2026 horizon.

7.3.3 2026 HORIZON PARKING DEMAND

The parking demand for the Banff Railway Lands ARP site is 269 parking spaces (plus 40 spaces for the residential use, assumed to be provided at the residence) during the 2026 summer weekend peak hour horizon, as described below.

HERITAGE SITE PARKING DEMAND

Section 7.2.3 describes the methodology for the parking stall requirements for the Heritage Rail Site users, which is assumed to be the same in 2026 as it is in 2023.

The Heritage Rail Site parking requirements, based on the Town of Banff's Bylaws, is estimated at 140 parking spaces with 40 parking spaces required for the multi-family residential.

NORQUAY GONDOLA PARKING DEMAND

The methodology for calculating the parking demand for the existing Norquay users is described in **Section 7.2.3.** and this applies for 2026 also. The peak parking demand for the existing Norquay Gondola users is estimated at 17 parking spaces during the 2026 horizon summer weekend peak hour assuming a vehicle mode split of 42.5%.

The peak parking demand for the future Norquay Gondola Users is estimated at 100 parking spaces during the summer weekend peak hour. The peak parking demand was estimated by using the number of visitors on-site during the peak hour who arrived by car (241 people) and dividing it by the vehicle occupancy rate of 2.4 people per vehicle. The total peak parking demand for the Norquay Gondola site, including existing and future users, is estimated at 117 parking spaces during the summer weekend peak hour.

7.3.4 2026 HORIZON TRIP DISTRIBUTION & ASSIGNMENT

The trip assignment was completed by distributing the site-related trips and assigning them to the road network based on an assessment of how people will access and egress the site. As described in **Section 7.2**Error! Reference source not found., trip distribution was considered in layers. The top layer is person trips. The person-trip distribution is the overall distribution of people arriving or departing from the site and does not account for how individual modes might arrive or depart from the site. The overarching assumption is that the majority of person trips generated by the Heritage Rail Site and Norquay Gondola will be attracted from within the town (i.e. from the south – 70%) and the remaining will be attracted from the Highway (i.e. to the north – 30%). However, trips have been calculated for three modes – passenger vehicle, walking (or cycling), and shuttles. Considering these modes is the second layer for trip distribution. It is assumed that 100% of visitors arriving to the site by walking/cycling, will arrive from the south (i.e. from the town) and not the north (i.e. from the Highway). It was also assumed that 90% of shuttles arrived/departed from the south.

Table 7-21 summarizes the person-trip distribution by mode for the Heritage Rail District and **Table 7-22** summarizes the person-trip distribution by mode for the Norquay Gondola.

Table 7-21 Heritage Rail District Person-Trip Distribution, by Mode Choice

	Arriving/Departing North	Arriving/Departing South	Total
Heritage Rail Site	**182**	**424**	**606**
Rail (2.5% Mode Split)	*0*	*15*	*15*
Walking (45% Mode Split)	*0*	*273*	*273*
Shuttle (10% Mode Split)	*6*	*56*	*62*
Passenger Vehicle (42.5% Mode Split)	*174*	*82*	*256*
Residential	**7**	**17**	**24**
Rail (2.5% Mode Split)	*0*	*0*	*0*
Walking (54% Mode Split)	*0*	*13*	*13*
Shuttle (5% Mode Split)	*0*	*1*	*1*
Passenger Vehicle (51% Mode Split)	*7*	*3*	*10*

Table 7-22 Norquay Gondola Person-Trip Distribution, by Mode Choice

	Arriving/Departing North	Arriving/Departing South	Total
Existing Norquay Gondola Users	**32**	**77**	**109**
Rail (2.5 % Mode Split)	*0*	*3*	*3*
Walking (45% Mode Split)	*0*	*49*	*49*
Shuttle (10% Mode Split)	*1*	*10*	*11*
Passenger Vehicle (42.5% Mode Split)	*31*	*15*	*46*
Future Norquay Gondola Users	**95**	**223**	**318**
Rail (2.5 % Mode Split)	*0*	*8*	*8*
Walking (45% Mode Split)	*0*	*143*	*143*
Shuttle (10% Mode Split)	*3*	*29*	*32*
Passenger Vehicle (42.5% Mode Split)	*92*	*43*	*135*

The vehicle-trip distribution was determined by taking the number of people arriving/departing to or from the north by passenger vehicles and dividing it by the total number of people arriving/departing from the site by passenger vehicles (i.e. 174 people divided by 256 people equals 68% of people in passenger vehicles arrive from the north). The 2026 vehicle-trip distribution is summarized in **Table 7-23**.

Table 7-23 Heritage Rail Vehicle-Trip Distribution (2026 Horizon)

LAND USE	NORTH	SOUTH
Heritage Rail District	68%	32%
Residential	72%	28%
Existing Norquay Gondola Users	68%	32%
Future Norquay Gondola Users	68%	32%

It is assumed that the South Lot will reach capacity first, due to it being closer to downtown Banff. A parking lot is typically considered to be at practical capacity when it is 90% occupied, as this is the point at which drivers generally experience difficulty locating a parking spot even though there are spaces available (vehicles are circulating in search of a space and moving in and out of parking spaces). When the South Intercept Parking Lot reaches 90% capacity or 438 occupied parking spaces, the remaining parking demand will use the North Lot.

It is assumed that 50% of the South Intercept Parking Lot will be used for "all day stays" (approximately 219 parking spaces) as they will arrive earlier in the day, and the remaining parking spaces (219 parking spaces) will be used by the Banff Railway Lands ARP site. The remaining demand for intercept parking (43 spaces), are assumed to park in the North Lot.

The Banff Railway Lands ARP development is estimated to need 269 parking spaces during the peak hour (excluding the residential parking requirements which as assumed to park at their homes), this equates to 81% of the peak hour parking being accommodated in the south Lot (219 parking spaces divided by 269 parking spaces is 81%). For the trip assignment purposes, it was assumed that 81% of the trips generated by the Banff Railway Lands ARP would be generated by the South Lot.

The existing distribution at the Highway 1 Ramps and Mt Norquay Road intersections, previously summarized in **Table 7-15**, was used to assign the site-generated trips to the network at these study intersections.

The Norquay Gondola is anticipated to divert a portion of existing and background traffic and therefore are not considered new trips. This includes:

- **Existing Norquay Users:** These users travel paths have been altered either by the new mode split or by the relocation of the parking lots. A total of 50 trips (25 trips in / 25 trips out) were removed off the network, which represents Existing Norquay Users travel patterns (**Section 7.2.2**). Note, that the new vehicle trips (18 vehicle trips) were added back onto the network as part of the reroute and mode spit changes.
- **Future Norquay Gondola Users**: The gondola market share is likely to be divided in some way between the two gondolas, Sulphur Mountain and Norquay. In the 2026 horizon, it is assumed that 46% of trips originally destined to Sulphur Mountain will now visit Norquay. For this assessment, the portion of visitors derived from Sulphur Mountain are not considered new trips but diverted trips as they were already on the road network. Similar to pass-by trips, these trips will be included in the driveway volumes to the site, they will not increase the overall traffic volumes on the study roads.

  Assuming that 46% of the Norquay Gondola ridership is derived from the Sulphur Mountain Gondola Ridership, this equates to approximately 851 daily visitors. Utilizing a 10% internal capture rate (from the Norquay Gondola Internal Capture calculations), a peak hour visitor rate of 38%, that 42.5% will arrive by passenger vehicle, and a 2.4 vehicle occupancy rate, approximately 26 trips (13 trips in and 13 trips out) will be diverted from Sulphur Mountain to Norquay with a 46% market share.

  It was assumed that trips entering/exiting to the north (68%) via Mt Norquay Road would be diverted trips and be removed from the through traffic and added to the turning movements at the accesses. Trips entering from the south (32%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

  This equates to 9 inbound trips now make a southbound left into the Intercept Parking Lots and 9 trips are removed from the southbound through movement at the Mt Norquay Road and Railway Avenue intersection, as they will no longer be traveling south on Gopher Street. Similarly, there will be 9 outbound trips making a westbound right out of the Intercept Parking Lots. As these 9 trips would be captured before they entered the downtown, 9 trips would be removed from the northbound through movement at the Mt Norquay Road and Railway Avenue intersection. This equates to a total of 18 trips that will be removed from Gopher Street during the peak hour assuming a 46% capture of the market share.

Trips entering from the south (23%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

The Heritage Rail District site-generated trips for the 2026 summer weekend peak hour horizon are shown in **Figure 7-4** and the Norquay Gondola site-generated trip assignment for the 2026 horizon is shown in **Figure 7-5.**

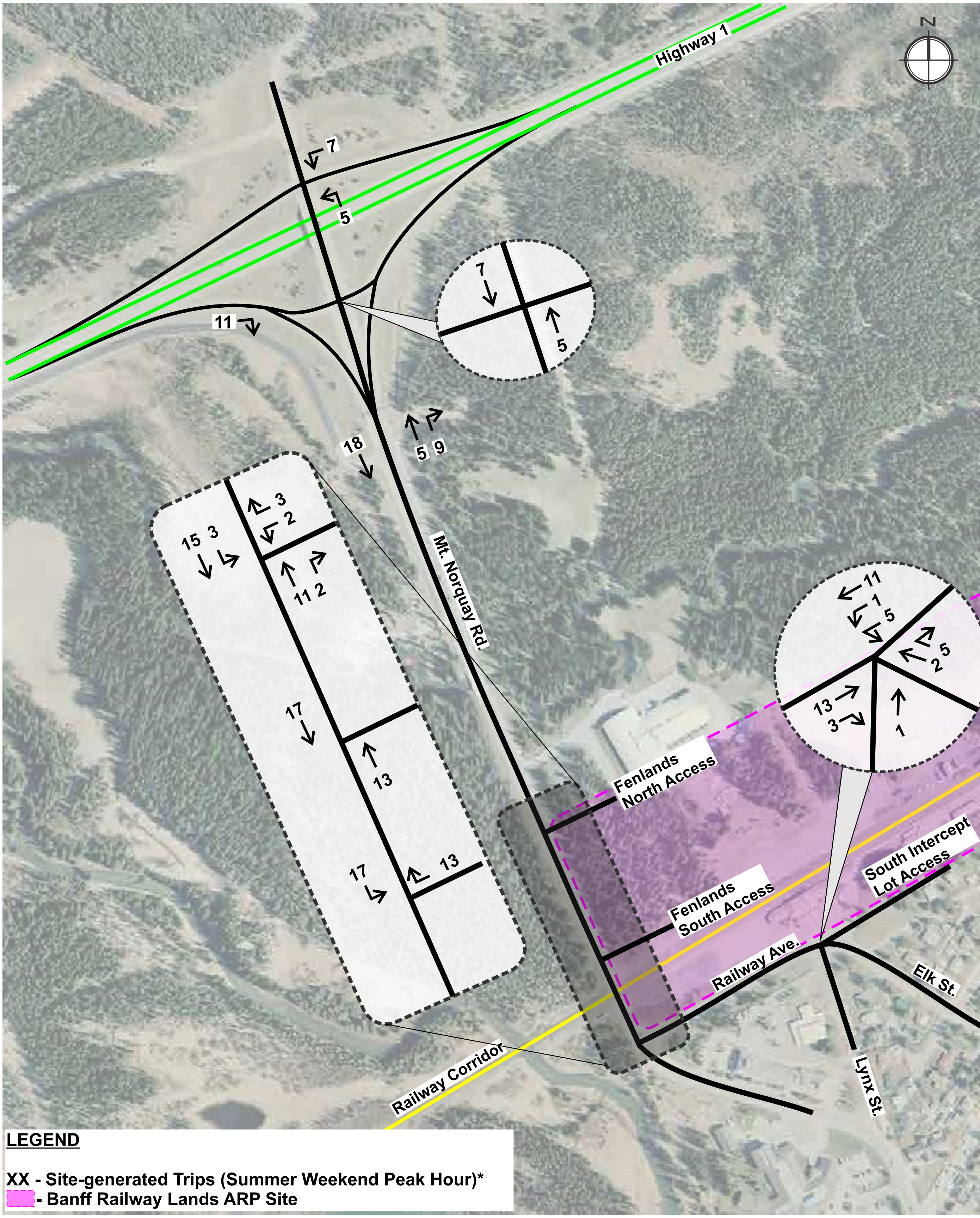


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Figure 7-4 - 2026 Horizon Heritage Rail Site-generated Trips

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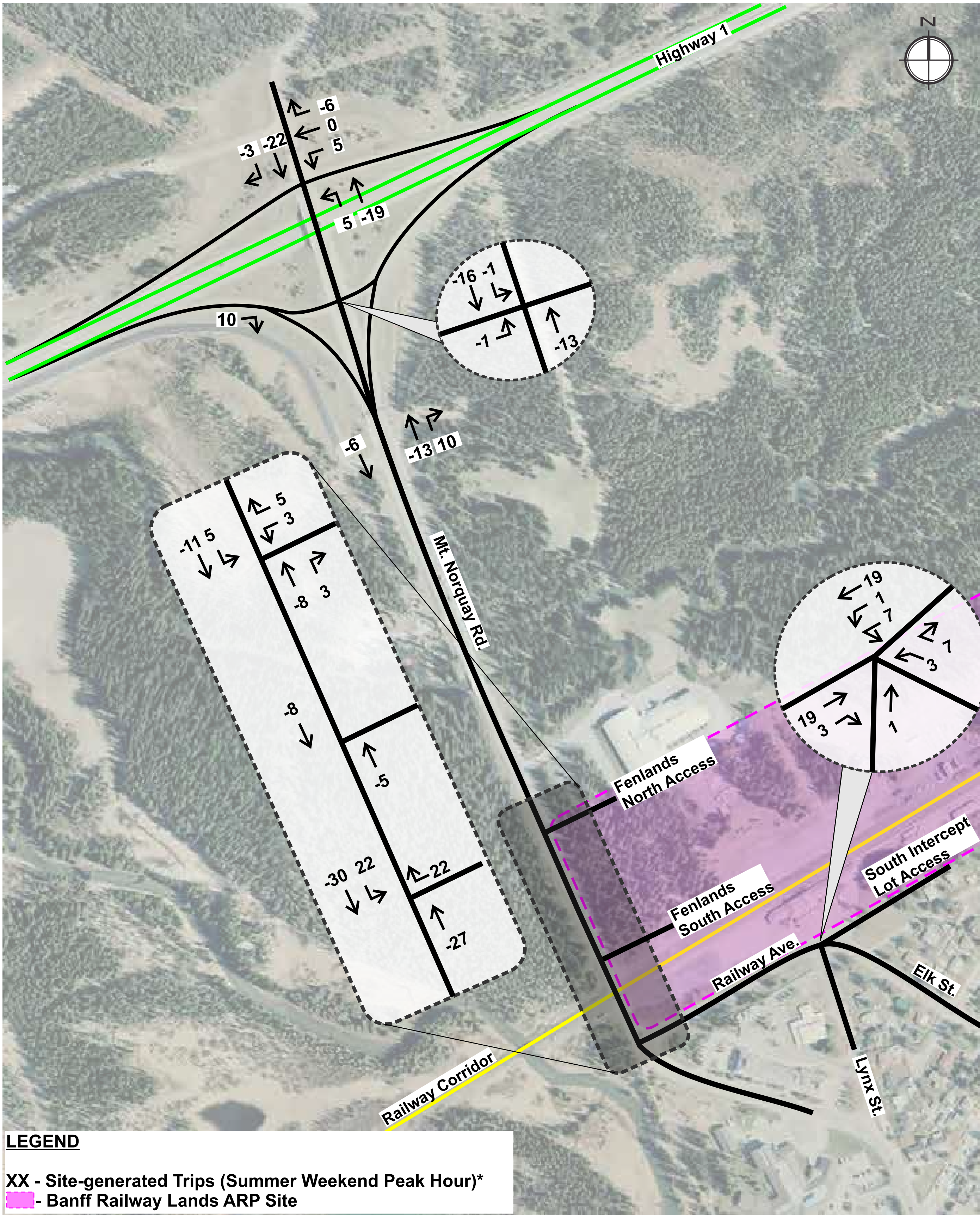

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Figure 7-5 - 2026 Horizon Norquay Gondola Trip Assignment

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7.3.5 2026 TRAFFIC FORECAST SUMMARY

Table 7-24 summarizes the 2026 trip generation for the Banff Railway Lands ARP site during the summer weekend peak hour.

Table 7-24 2026 Trip Generation Summary

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	61	56	117
Shuttles (Shuttle-trips) *	2	1	3
Walking (Person-trips)	255	222	477
Rail (Person-trips)	14	12	26

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

It is estimated that the pass-by trips will account for 42 trips (21 trips entering and 21 trips existing) during the summer weekend afternoon peak hour.

The site-generated trips (Heritage Rail Site, Norquay Gondola), shuttle trips, pass-by trips and other minor adjustments to account for some intercept parking shifting to the North Lot were added to the projected 2026 base background forecast volumes to obtain the 2026 forecast total volumes, illustrated in **Figure 7-6**.

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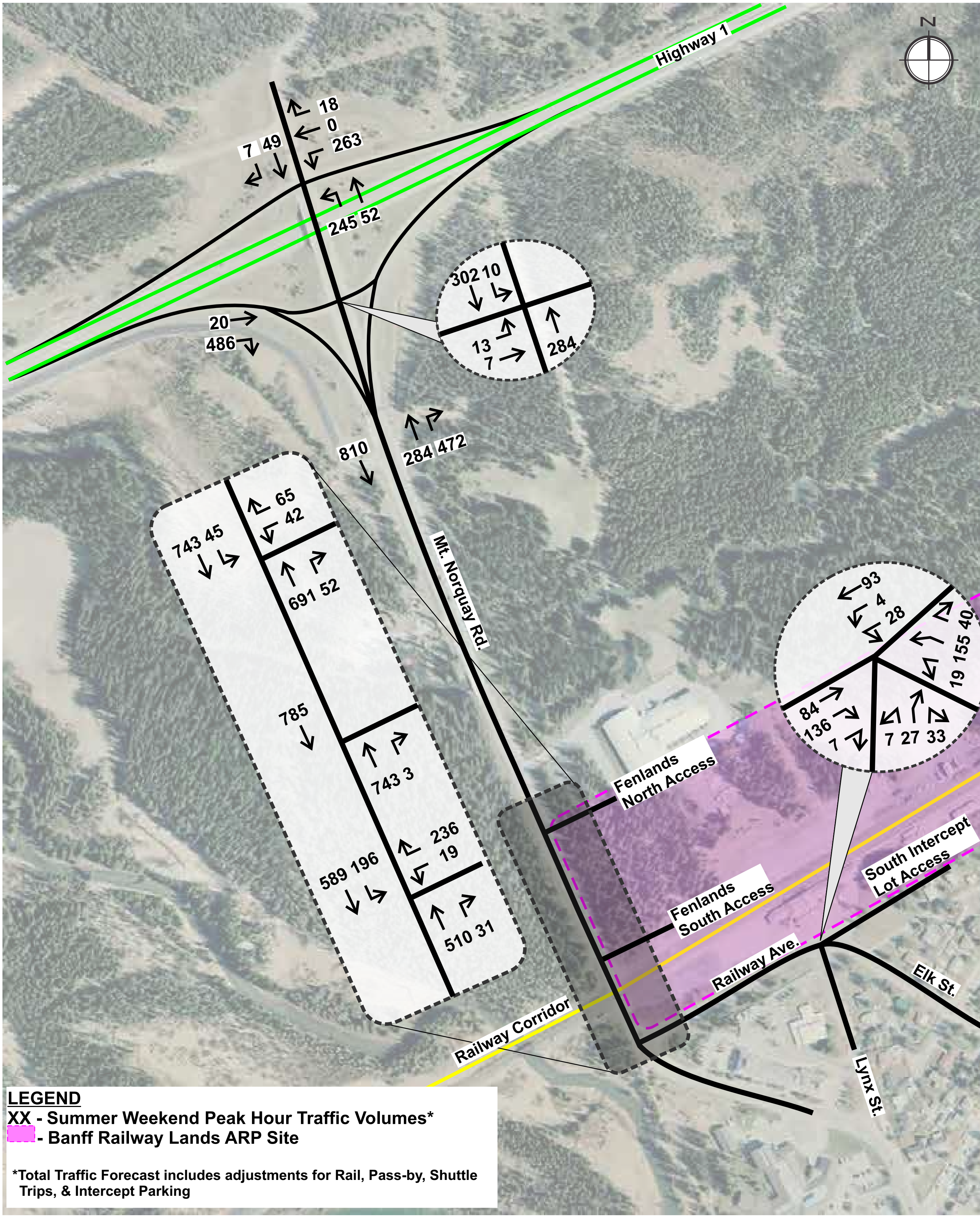

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Figure 7-6 - 2026 Horizon Total Traffic Forecast

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7.4 2029 HORIZON MOBILITY

7.4.1 HERITAGE RAIL DISTRICT SITE TRIP GENERATION

The methodology for the trip generation and internal capture for the Heritage Rail Site users is described in **Section 7.2.1.** This applies for 2029 as well as 2023 and 2026. Similarly, **Section 7.3.1** describes the methodology for the assumed mode split, pass-by and diverted trips, which is assumed to be the same in 2029 as it is in 2026

This equates to 267 people arriving or departing by passenger vehicle, 62 people arriving or departing by shuttle, 285 people arriving or departing by walking, and 15 people arriving or departing by rail to the Banff Railway Lands ARP site. To convert the people-trips arriving/departing by personal vehicle to vehicle trips, a 2.4 vehicle occupancy rate was used. This equates to 51 total vehicle-trips during the peak hour.

7.4.2 NORQUAY GONDOLA TRIP GENERATION

EXISTING NORQUAY USERS TRIP GENERATION

The methodology for the trip generation for the existing Norquay users is as described in **Section 7.2.2** During the summer weekend peak hour, approximately 120 Existing Norquay Users (60 visitors in and 60 visitors out) will visit the Banff Railway Lands ARP site.

FUTURE NORQUAY USERS TRIP GENERATION

The Norquay Gondola is expected to see approximately 336,000 visitors within its sixth year of operation. This is approximately 56% of the numbers achieved by the Sulphur Mountain Gondola in the year 2020.

As Banff's existing gondola ridership (600,000 people annually) is likely to be divided in some way between the two gondolas, the existing Sulphur Mountain and the proposed Norquay Gondola, it has been assumed that the total gondola market demand will be divided between the two gondolas. The total gondola market demand was estimated using the projected number of summer visitors at Sulphur Mountain Gondola in the year 2020, equaling 4,060 daily summertime visitors (see **Section 5.3.3**). The Norquay Gondola daily number of visitors in 2029 was then estimated at 56% of total gondola market demand. A total of 2,270 people is estimated to visit the Norquay Gondola daily during the 2029 summer horizon.

Using the Sulphur Mountain Gondola peak hour visitor rate of 38% to convert daily visitors to peak hour visitors[40], approximately 860 people are estimated to be onsite during the summer weekend peak hour. The Mt Norquay Feasibility Study indicates that the duration of stay at Mt Norquay will be similar to that of Sulphur Mountain. For this study, it was assumed that the average visitor stayed for a duration of 2 hours. Using a turnover rate of 0.50, this equates to approximately 430 people (215 people entering and 215 people leaving) visiting Norquay Gondola during the 2029 summer weekend peak hour.

Section 7.3.2 describes the methodology for the internal capture, mode split, and pass-by trips for the Norquay Gondola Users, which is assumed to be the same in 2029 as it is in 2026.

[40] Brewster Travel Canada, B*anff Gondola Upper Terminal Development Project* (June 20, 2014)

NEW TRIPS

The internal capture rates, mode split, and pass-by trips were applied to the trip generation to determine new vehicle trips at the Norquay Gondola. **Table 7-25** summarizes the estimated new vehicle trips that will be generated by the proposed Norquay Gondola during the summer weekend peak hour in the 2029 horizon.

Table 7-25 Norquay Gondola Users Summer Weekend Peak Hour Vehicle Trip Generation (2029 Horizon)

LAND USE	TOTAL TRIPS		
	ENTER	EXIT	TOTAL
Existing Norquay Users	9	9	18
Future Mt Norquay Users	31	31	62
Total	**40**	**40**	**80**

In addition to vehicle trips, it is anticipated that 222 people (111 people entering / 111 people exiting) will walk, 50 people (25 people entering / 25 people exiting) will catch a shuttle, and 12 people (6 people entering / 6 people exiting) will use the rail service to visit the Norquay Gondola during the summer weekend peak hour in the 2029 horizon.

7.4.3 2029 HORIZON ARP PARKING DEMAND

The parking demand for the Banff Railway Lands ARP site is 280 parking spaces (plus 40 spaces for the residential use, assumed to be provided at the residence) during the 2029 summer weekend peak hour horizon, as described below.

HERITAGE SITE PARKING DEMAND

Section 7.2.3 describes the methodology for the parking demand for the Heritage Rail Site users, which is assumed to be the same in 2029 as it is in 2023 and 2026. The Heritage Rail Site parking requirements, based on the Town of Banff's Bylaws, is estimated at 140 parking spaces with 40 parking spaces required for the multi-family residential.

NORQUAY GONDOLA PARKING DEMAND

The methodology for calculating the parking demand for the existing Norquay users is described in **Section 7.2.3** and this applies in 2029 also. The peak parking demand for the existing Norquay Gondola users is estimated at 17 parking spaces during the 2029 horizon summer weekend peak hour assuming a vehicle mode split of 42.5%.

The peak parking demand for the future Norquay Gondola Users is estimated at 123 parking spaces during the summer weekend peak hour. The peak parking demand was estimated by using the number of visitors arriving by car (296 people) in the peak hour and dividing it by the vehicle occupancy rate of 2.4 people per vehicle. The total peak parking demand for the Norquay Gondola site, including existing and future users, is estimated at 140 parking spaces during the summer weekend peak hour.

7.4.4 2029 HORIZON TRIP DISTRIBUTION & ASSIGNMENT

The trip assignment was completed by distributing the site-related trips and assigning them to the road network based on an assessment of how people will access and egress the site.

The Heritage Rail District person trip distribution is assumed to the same in 2029 as it is in the 2026 horizon. The Heritage Rail District person trip distribution was presented in **Section 7.3.4**, **Table 7-21**.

It is anticipated that the majority of person trips generated by the Norquay Gondola will be attracted from within the town (i.e. from the south – 70%) and the remaining will be attracted from the Highway (i.e. to the north – 30%). The person-trip distribution is the overall distribution of people arriving or departing from the site and does not account for how individual modes might arrive or depart from the site. It is assumed that 100% of visitors arriving to the site by walking/cycling, will arrive from the south (i.e. from the town) and not the north (i.e. from the Highway). It was also assumed that 90% of shuttles arrived/departed from the south. **Table 7-26** summarizes the person-trip distribution by mode for the Norquay Gondola.

Table 7-26 Norquay Gondola Person-Trip Distribution, by Mode Choice

	ARRIVING/DEPARTING NORTH	ARRIVING/DEPARTING SOUTH	TOTAL
Existing Norquay Gondola Users	**32**	**77**	**109**
Rail (2.5 % Mode Split)	*0*	*3*	*3*
Walking (45% Mode Split)	*0*	*49*	*49*
Shuttle (10% Mode Split)	*1*	*10*	*11*
Passenger Vehicle (42.5% Mode Split)	*31*	*15*	*46*
Future Norquay Gondola Users	**116**	**270**	**386**
Rail (2.5 % Mode Split)	*0*	*9*	*9*
Walking (45% Mode Split)	*0*	*174*	*174*
Shuttle (10% Mode Split)	*4*	*35*	*39*
Passenger Vehicle (42.5% Mode Split)	*112*	*52*	*164*

The vehicle-trip distribution was determined by taking the number of people arriving/departing to or from the north by passenger vehicles and dividing it by the total number of people arriving/departing from the site by passenger vehicles (i.e. 112 people divided by 164 people equals 68% of people in passenger vehicles arrive from the north). The 2029 vehicle-trip distribution is summarized in **Table 7-27**.

Table 7-27 2029 Horizon Vehicle-Trip Distribution

LAND USE	NORTH	SOUTH
Heritage Rail District	68%	32%
Residential	72%	28%
Existing Norquay Gondola Users	68%	32%
Future Norquay Gondola Users	68%	32%

It is assumed that the South Lot will reach capacity first, due to it being closer to downtown Banff. A parking lot is typically considered to be at practical capacity when it is 90% occupied, as this is the point at which drivers generally experience difficulty locating a parking spot even though there are spaces available (vehicles are circulating in search of a space and moving in and out of parking spaces). When the South Lot reaches 90% capacity (438 occupied parking spaces), the remaining parking demand will use the North Lot.

It is assumed that 50% of the South Intercept Parking Lot will be used for "all day stays" (approximately 219 parking spaces) as they will arrive earlier in the day, and the remaining parking spaces (219 parking spaces) will be used by the Banff Railway Lands ARP site. The remaining intercept parking demand, 50 spaces, are now assumed to park in the North Lot.

The Banff Railway Lands ARP development is estimated to need 294 parking spaces during the peak hour, this equates to 74% of the peak hour parking being accommodated in the south Lot (219 parking spaces divided by 294 parking spaces is 74%). For the trip assignment purposes, it was assumed that 74% of the trips generated by the Banff Railway Lands ARP would be generated by the South Lot.

The Norquay Gondola is anticipated to divert a portion of existing and background traffic and therefore are not considered new trips. This includes:

— **Existing Norquay Users:** these users travel paths have been altered as they must now travel to the Intercept Parking Lots instead of to the parking lot located on Norquay. A total of 50 trips (25 trips in / 25 trips out) were removed off the network, which represents Existing Norquay Users travel patterns (Section 7.2.2). Note, that the new vehicle trips (18 vehicle trips) were added back onto the network as part of the reroute and mode spit changes.

— **Future Norquay Gondola Users**: The gondola market share is likely to be divided in some way between the two gondolas, Sulphur Mountain and Norquay. In the 2026 horizon, it is assumed that 56% of trips originally destined to Sulphur Mountain will now visit Norquay. For this assessment, the portion of visitors derived from Sulphur Mountain are not considered new trips but diverted trips as they were already on the road network. Similar to pass-by trips, these trips will be included in the driveway volumes to the site, they will not increase the overall traffic volumes on the study roads.

  Assuming that 56% of the Norquay Gondola ridership is derived from the Sulphur Mountain Gondola Ridership, this equates to approximately 1,271 daily visitors. Utilizing a 10% internal capture rate (from the Norquay Gondola Internal Capture calculations), a peak hour visitor rate of 38%, that 42.5% will arrive by passenger vehicle, and a 2.4 vehicle occupancy rate, approximately 38 trips (19 trips in and 19 trips out) will be diverted from Sulphur Mountain to Norquay Gondola with a 56% market share.

  It was assumed that trips entering/exiting to the north (68%) via Mt Norquay Road would be diverted trips and be removed from the through traffic and added to the turning movements at the accesses. Trips entering from the south (32%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

  This equates to 13 inbound trips now make a southbound left into the Intercept Parking Lots and 13 trips are removed from the southbound through movement at the Mt Norquay Road and Railway Avenue intersection, as they will no longer be traveling south on Gopher Street. Similarly, there will be 13 outbound trips making a westbound right out of the Intercept Parking Lots. As these 13 trips would be captured before they entered the downtown, 13 trips would be removed from the northbound through movement at the Mt Norquay Road and Railway Avenue intersection. This equates to a total of 26 trips that will be removed from Gopher Street during the peak hour assuming a 56% capture of the market share.

  Trips entering from the south (32%) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

The existing distribution at the Highway 1 / Mt Norquay Road Interchange, previously summarized in **Table 7-15** was used to assign the site-generated trips to the network at these study intersections.

The Heritage Rail District site-generated trips for the 2029 summer weekend peak hour horizon are shown in **Figure 7-7** and the Norquay Gondola site-generated trip assignment for the 2029 horizon is shown in **Figure 7-8.**

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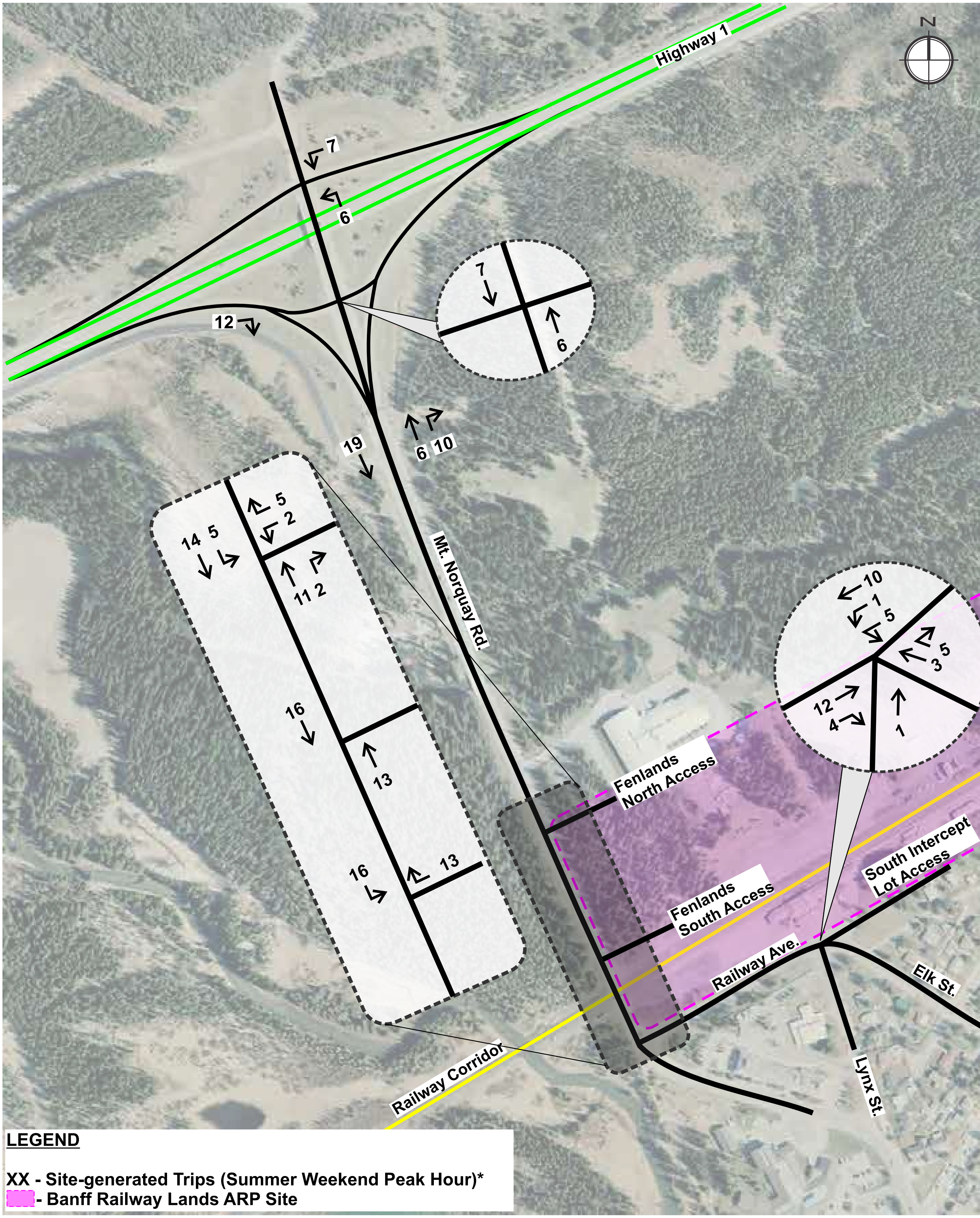

LEGEND

XX - Site-generated Trips (Summer Weekend Peak Hour)*

- Banff Railway Lands ARP Site

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Figure 7-7 - 2029 Horizon Heritage Rail Site-generated Trips

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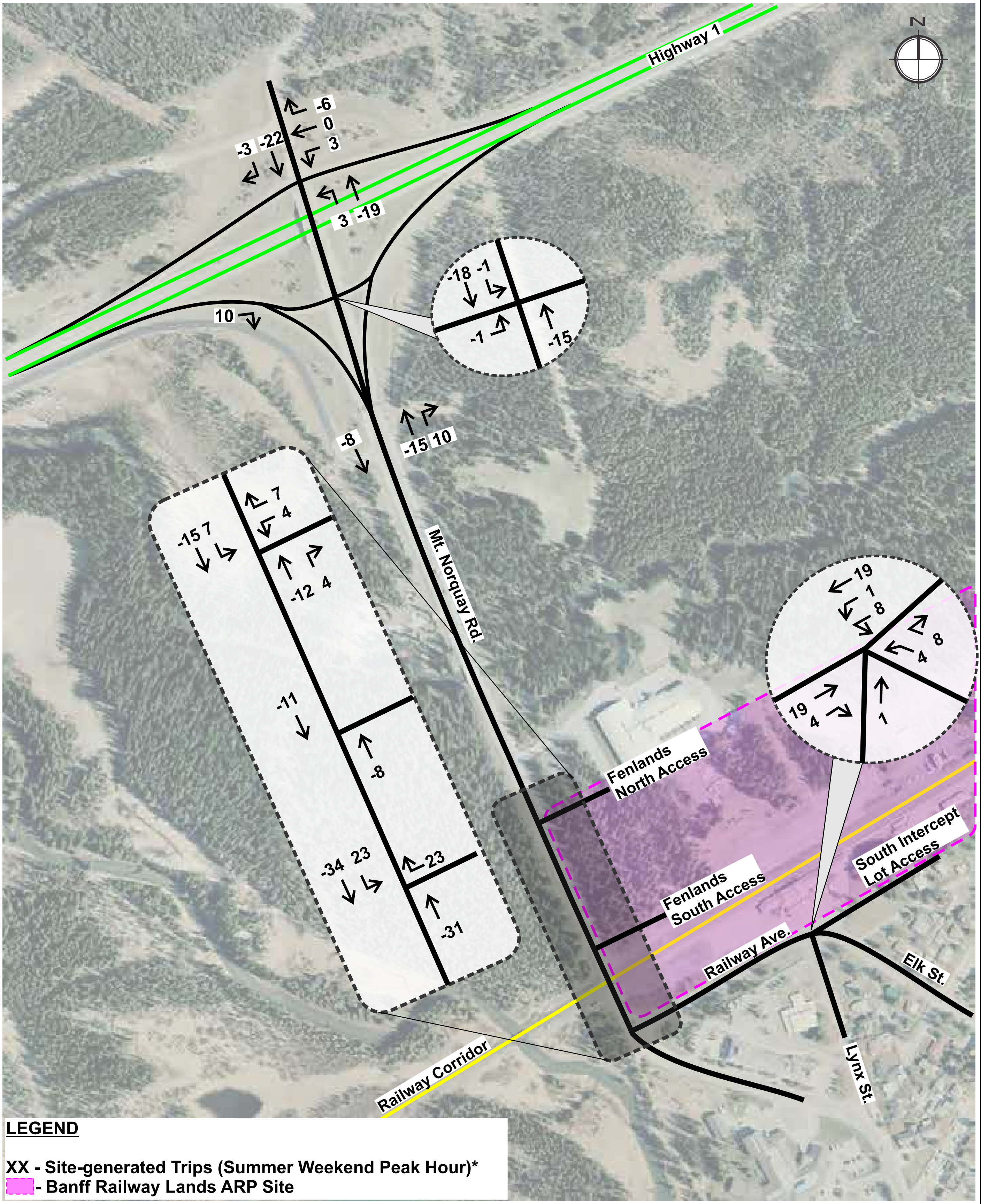

DRAWING: FIG-19M 004480-2029 Gondola Site-generated Trips (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

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Scale: NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 7-8 - 2029 Horizon Norquay Gondola Trip Assignment

Banff Railway Lands Area Redevelopment Plan TIA

7.4.5 2029 TRAFFIC FORECAST SUMMARY

Table 7-28 summarizes the 2029 trip generation for the Banff Railway Lands ARP site during the summer weekend peak hour.

Table 7-28 2029 Trip Generation Summary

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	67	61	128
Shuttles (Shuttle-trips) *	2	1	3
Walking (Person-trips)	270	238	508
Rail (Person-trips)	15	13	28

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.

It is estimated that the pass-by trips will account for 44 trips (22 trips entering and 22 trips existing) during the summer weekend afternoon peak hour.

The site-generated trips (Heritage Rail Site, Norquay Gondola), shuttle trips, pass-by trips and other minor adjustments to account for some intercept parking shifting to the North Lot were added to the projected 2029 base background forecast volumes to obtain the 2029 forecast total volumes, illustrated in **Figure 7-9**.

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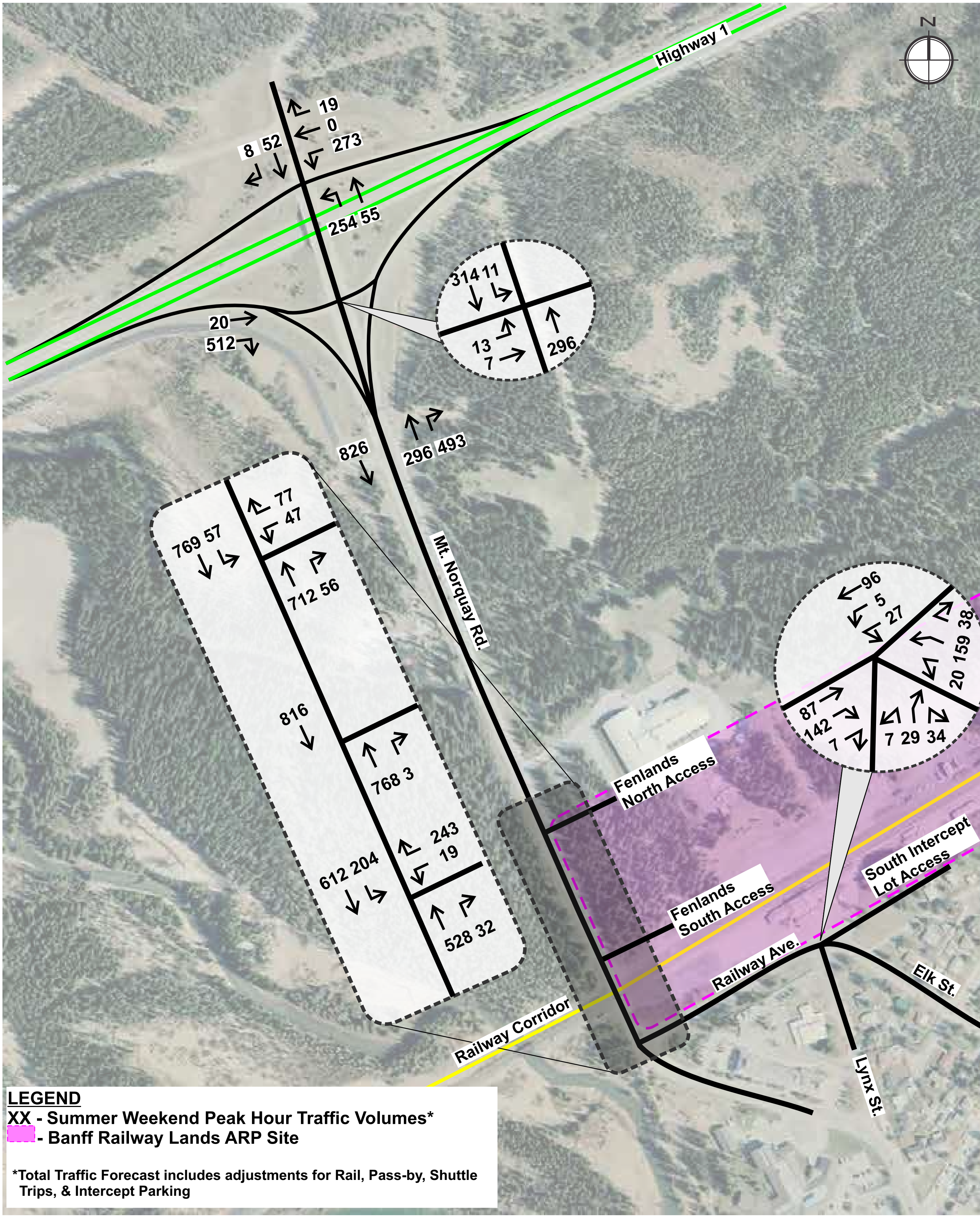

DRAWING: FIG-19M 004480-2029 Total Traffic Volumes (Summer).cdr DATE: 2021-02-11 DRAWN BY: piperde

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Issue Date: 2021-02-12
Scale: NTS
Aerial Imagery: 2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 7-9 - 2029 Horizon Total Traffic Forecast

Banff Railway Lands Area Redevelopment Plan TIA

8 OPERATIONAL ASSESSMENT

The study intersections have been modelled under pre-development and post-development traffic conditions using Synchro for priority control, and SIDRA for roundabout control, to determine its performance. The queues presented from Synchro in the following sections are for reference only and should not be considered for design of queue storage. VISSIM modeling was carried out for Post-Development at 2023 and 2029 to provide a more accurate understanding of network operations and queue storage requirements.

8.1 CAPACITY ANALYSIS – PRE-DEVELOPMENT

The pre-development capacity analysis evaluates the traffic conditions in the area that would occur if the development did not proceed. The study intersections were modeled with the existing infrastructure, including the new single-lane roundabout at Railway Avenue / Elk Street / Lynx Street.

The results of the capacity analysis for the 2023, 2026 and 2029 pre-development horizons are presented in **Table 8-1, Table 8-2**, and **Table 8-3**, respectively. These tables feature information on the overall intersection and critical movement. The critical movement is defined as the movement experiencing the greatest delay. Details regarding all movements can be found in the Synchro output reports in **Appendix B.**

Table 8-1 2023 Pre-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Hwy 1 WB Ramp	B (11.4 s)	0.47	WB-L	C (23.6 s)	0.46	18 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s)	0.04	EB-LTR	B (12.3 s)	0.04	1 m
Mt Norquay Rd / Fenlands Access	A (1.6 s)	0.37	WB-LR	D (34.2 s)	0.37	12 m
Mt Norquay Rd / Railway Ave	A (4.7 s)	0.58	WB-LR	D (29.2 s)	0.58	26 m
Railway Ave / Elk St / Lynx St	A (1.9 s)	0.18	WB-LTR	A (3.0 s)	0.18	7 m

Table 8-2 2026 Pre-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Hwy 1 WB Ramp	B (12.0 s)	0.50	WB-L	D (25.6 s)	0.50	20 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.6 s)	0.05	EB-LR	B (12.5 s)	0.05	1 m
Mt Norquay Rd / Fenlands Access	A (1.8 s)	0.41	WB-LR	E (37.9 s)	0.13	14 m
Mt Norquay Rd / Railway Ave	A (5.3 s)	0.63	WB-LR	D (32.9 s)	0.63	31 m
Railway Ave / Elk St / Lynx St	A (1.8 s)	0.19	WB-LTR	A (3.1 s)	0.19	7 m

Table 8-3 2029 Pre-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Hwy 1 WB Ramp	B (13.1 s)	0.56	WB-L	D (28.9 s)	0.56	24 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.6 s)	0.05	EB-LT	B (12.8 s)	0.05	1 m
Mt Norquay Rd / Fenlands Access	A (2.1 s)	0.46	WB-LR	E (43.7 s)	0.46	16 m
Mt Norquay Rd / Railway Ave	A (6.7 s)	0.73	WB-LR	E (42.5 s)	0.73	40 m
Railway Ave / Elk St / Lynx St	A (1.9 s)	0.19	WB-LTR	A (3.2 s)	0.19	8 m

The capacity analysis results indicate that the overall operation all intersections will be LOS B or better under the existing priority (stop) control during the summer weekend peak hour, in all horizons. Modelling shows that turning movements from the side roads will experience increasing delays over time.

The Mt Norquay Road and Fenlands Access intersection is anticipated to operate within acceptable limits under priority (stop) control in the 2029 horizon. Delays for vehicles exiting the Fenlands site are relatively long (nearly 45 seconds) but remain within acceptable limits in an urban context. The vehicle volumes exiting from Fenlands Access are relatively minor in comparison to the traffic volumes projected on Mt. Norquay Road in the forecast horizon.

The Mt Norquay Road and Railway Avenue intersection will experience some delay during summer weekend peak hour. By 2029, the westbound approach is expected to experience over a 40 seconds of delay per vehicle during the summer weekend afternoon peak hour.

8.2 CAPACITY ANALYSIS – POST-DEVELOPMENT

The post-development capacity analysis evaluates the traffic conditions in the area that would occur if the Banff Railway Lands ARP development proceeded. The results of the capacity analysis for the 2023, 2026 and 2029 post-development horizons are presented in following sections**.** Details regarding all movements can be found in the Synchro output reports in **Appendix B.**

8.2.1 2023 POST-DEVELOPMENT HORIZON: SYNCHRO/SIDRA ANALYSIS

The 2023 post-development horizon was modeled with existing infrastructure, except at the Fenlands Access, where separate westbound left and westbound right-turn lanes were assumed.

The North Lot will have two accesses - one full movements access will be located at the existing Fenlands Access (north access) and a second access (right in) is proposed just north of the railway corridor (south access) and will serve as an entrance for shuttles only. The capacity analysis results are summarized in **Table 8-4.**

Table 8-4 2023 Post-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	**LOS (Delay)**	**Max (v/c)**	**Movement**	**LOS (Delay)**	**v/c**	**95th % Queue**
Mt Norquay Rd / Hwy 1 WB Ramp	B (12.2 s)	0.47	WB-L	C (23.2 s)	0.47	18 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s)	0.04	EB-LT	B (12.1 s)	0.04	1 m
Mt Norquay Rd / Fenlands Access	A (2.6 s)	0.39	WB-L	F (56.0 s)	0.39	12 m
Mt Norquay Rd / Railway Ave	C (17.8 s)	1.01	WB-LR	F (100.6 s)	1.01	75 m
Railway Ave / Elk St / Lynx St	A (2.0 s)	0.23	WB-LTR	A (3.3 s)	0.23	9 m

The capacity analysis results indicate that the overall operation all intersections will be LOS C or better under the existing priority / roundabout control during the 2023 summer weekend peak hour. Synchro modelling shows that turning movements from the Fenlands Access and from Railway Avenue will experience lengthy delays however these values are indicative only as Synchro's accuracy for predicting delays under priority control is limited, particularly when a movement is nearing capacity. The VISSIM microsimulation modelling shows notably shorter delays on these movements (refer **Section 8.2.2**).

The capacity analysis results indicate that the westbound left-turn at the Mt Norquay Road / Fenlands Access intersection will experience 56 seconds of delay (LOS E) during the summer weekend peak hour. The analysis indicates this equates to approximately 2 cars queued waiting to turn left.

The Synchro analysis indicates that the westbound approach at the Mt Norquay Road / Railway Avenue intersection will experience significant delay as a stop-controlled intersection, with approximately 2 minutes of vehicular delay and approximately 10 vehicles waiting to turn onto Mt Norquay Road (note that the VISSIM results predict a delay of 48 seconds for this movement). The influence of pedestrians at this intersection is significant in the Synchro analysis. The model includes 180 pedestrians crossing the westbound approach of Railway Avenue, meaning that vehicles exiting Railway Avenue need to yield to these pedestrians as well as the traffic on Mt Norquay Road. To understand the influence of these pedestrian volumes, a Synchro model was run without them. The removal of pedestrians off the westbound approach, reduces the delay for vehicles to approximately 30 seconds during the weekend summer peak hour.

Railway Avenue is intended to be built as a shared space street. Shared space streets aim to improve the urban environment by removing the physical divide between pedestrians, cyclists, and motor vehicles. This creates a walkable area, improves the aesthetics, and provides a sense of place.

A thesis completed at the University of Connecticut suggests that pedestrians and drivers experience less delay in “shared space” intersections, where vehicles and pedestrians mingle at slow speeds with few traffic regulations, when compared to conventional intersections.[41] The study measured the actual pedestrian and vehicle characteristics and behaviours and compared them against the theoretical delays estimated using conventional intersection arrangements (roundabouts, stop signs, and signals) and traffic analysis software. In all study locations, the actual pedestrian wait times and the actual vehicle delays were significantly less than the delays identified using conventional software.

As actual pedestrian movements may differ than what was assumed, the Mt Norquay Road / Railway Avenue intersection should be monitored as a wait-and-see approach so that intersections improvements, if actually required, may be tailored to the specific traffic patterns at the intersection.

The following is recommended to accommodate the Banff Railway Lands ARP development in the 2023 horizon:

- **Mt Norquay Road & Fenlands Access**
  - Construct separate westbound left-turn and right-turn lanes.
- **Mt Norquay Road & Railway Avenue**
  - Monitor intersection operation determine modifications based on site observations.

All other study intersections are anticipated to operate within acceptable limits during the summer weekend peak hour.

8.2.2 2023 POST-DEVELOPMENT HORIZON: VISSIM ANALYSIS

Microscopic analysis was completed in VISSIM for the 2023 post-development horizon to provide a more accurate prediction of how the network would operate on opening day during the summer weekend peak hour. The existing calibrated model (refer **Section 4.4.3**) was used as the base to create the 2023 model. Some of the changes and adjustments that were made to the existing model include:

- Updating vehicle and pedestrian volumes to 2023 volumes as shown in **Figure 7-3**;
- Mt Norquay Road / Fenland Access intersection;
  - Providing a separate right turn lane on Fenland North Access (westbound approach);
- Mt Norquay Road / Railway Avenue intersection;
  - Extending the current short (~15 m) southbound left turn up to the rail crossing (~40 m).

Two scenarios were tested using the 2023 model:

- 2023 scenario without train: the rail crossing on Mt. Norquay Road will not be activated during the peak hour
- 2023 scenario with train: the rail crossing on Mt. Norquay Road will be activated once during the peak hour

[41] Robert Steuteville, "Shared space intersections mean less delay”, Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay

2023 SCENARIO WITHOUT TRAIN

The initial review of the microsimulation model indicated that with the minor changes to the road network described above, the additional traffic volumes can be accommodated on the study road network and at the study intersections. To complete a quantitative assessment of the model, average queue, delay, and travel time results out of 10 runs of the model at different locations along Mt Norquay Road were extracted. The results are summarized in **Table 8-5** through to **Table 8-15**.

Table 8-6 summarizes the average and maximum queue observed in VISSIM model. The VISSIM model results indicated that the average vehicle queue lengths do not queue back to adjacent intersections. The maximum queues, which are the longest queue observed during the entire run of the model (this does not occur very often) are:

— the southbound queue on Mt Norquay Road at Fenlands North Access extends north 242 m;
— the northbound queue on Mt Norquay Road at the Fenlands North Access extends south 155 m; and,
— the westbound queue on Railway Avenue at Mt Norquay Road extends east 133 m.

Table 8-5 Delays & LOS – 2023 Scenario without Train

Intersection	Movement	Delay (s)	LOS
Mt Norquay Road / Fenlands North Access	NB-T	13	B
	NB-R	13	B
	SB-T	10	A
	SB-L	14	B
	WB-L	32	D
	WB-R	24	C
Mt Norquay Road / Railway Ave	NB-T	2	A
	NB-R	4	A
	SB-T	1	A
	SB-L	12	B
	WB-LR	48	E

Table 8-6 Queues – 2023 Scenario without Train

Link	Average Queue (m)	Maximum Queue[1] (m)
Mt Norquay Road NB @ Fenlands North Access	22	155
Mt Norquay Road SB @ Fenlands North Access	24	242
Mt Norquay Road SBL @ Fenlands North Access	0	19
Fenlands North Access WBR	3	33
Fenlands North Access WBL	2	22
Mt Norquay Road NB @ Railway Avenue	1	46
Mt Norquay Road SB @ Railway Avenue	2	45
Railway Avenue WB @ Mt Norquay Road	27	133
Hwy 1 EB Off-Ramp[2]	0	0

Note:
[1] Maximum queue is the longest queue that is observed during the entire run of the model, these occurrences are infrequent
[2] Queue on the ramp, measured from the end of the ramp

The travel times on Mt Norquay Road in the northbound and southbound directions are shown in **Table 8-7**.

Table 8-7 Travel Time – 2023 Scenario without Train

LINK	TRAVEL TIME[1] (S)
Mt Norquay Road Southbound	87
Mt Norquay Road Northbound	92

Note:
[1] Travel time estimated between the end of highway 1 eastbound off-ramp and Railway Avenue

As shown in the tables, all movements are expected to operate at an acceptable LOS (LOS D or better), with the exception of the westbound approach at the Mt Norquay Rd and Railway Avenue intersection. The westbound approach is expected to experience some delay, nearly 50 seconds, during the summer weekend peak hour. Average travel time on Mt Norquay Road is 92 seconds in northbound direction and 87 seconds in the southbound direction which are equivalent to average travel speed of 28 km/h and 30 km/h, respectively.

2023 SCENARIO WITH TRAIN

In this scenario it was assumed that one train will pass through the study area and, triggering the boom gates to close Mt Norquay Road for about 4.5 minutes. According to the results as shown in **Table 8-8**, all movements at the intersections of Mt Norquay Road and Fenlands Access and Mt Norquay Road and Railway Avenue are expected to operate at acceptable LOS D or better except the westbound movement at Railway Avenue intersection which is expected to operate at LOS F with a 136 second delay.

Table 8-8 Delays & LOS – 2023 Scenario with Train

INTERSECTION	MOVEMENT	DELAY (S)	LOS
Mt Norquay Road / Fenlands North Access	NB-T	17	C
	NB-R	16	C
	SB-T	17	C
	SB-L	18	C
	WB-L	49	E
	WB-R	25	D
Mt Norquay Road / Railway Ave	NB-TR	15	B
	NB-R	6	A
	SB-T	1	A
	SB-L	19	C
	WB-LR	136	F

The queue results summarized in **Table 8-9** show some of the queues on Mt Norquay Road for 2023 “with train” scenario are lower when compared to the existing conditions “with train” scenario (refer **Table 4-4**). This is because the parking lots and ARP development capture a portion of existing traffic already on the road network (refer Section. The average and maximum queue results are included in **Table 8-9.**

Table 8-9 Queues – 2023 Scenario with Train

LINK	AVERAGE QUEUE (M)	MAXIMUM QUEUE[1] (M)
Mt Norquay Road NB @ Fenlands Access	32	165
Mt Norquay Road SB @ Fenlands Access	106	507
Mt Norquay Road SBL @ Fenlands Access	5	65
Fenlands Access WBR	3	34
Fenlands Access WBL	3	27
Mt Norquay Road NB @ Railway Avenue	19	237
Mt Norquay Road SB @ Railway Avenue	4	54
Railway Avenue WB @ Mt Norquay Road	95	180
Hwy 1 EB Off-Ramp[2]	6	96

Note:
[1] Maximum queue is the longest queue that is observed during the entire run of the model, these occurrences are infrequent
[2] Queue on the ramp, measured from the end of the ramp

Travel times on Mt Norquay Road in the northbound and southbound directions are shown in **Table 8-10**. The reduction in travel times between this and the existing "with train" scenario is a result of several factors: traffic previously travelling through on Mt Norquay Road being captured by intercept parking and ARP attraction, introducing turn bays that were not present on the network in the existing situation at the time of data collection and model calibration

Table 8-10 Travel Time – 2023 Scenario with Train

LINK	TRAVEL TIME[1] (S)
Mt Norquay Road Southbound	129
Mt Norquay Road Northbound	103

Note: [1] Travel time estimated between the end of highway 1 eastbound off-ramp and Railway Avenue

The model shows that traffic will be queued on the Highway 1 eastbound off-ramp, but the queue does not spill back onto Highway 1. After the rail crossing reopens, it takes around 10 minutes for this queue to clear.

8.2.3 2026 POST-DEVELOPMENT HORIZON: SYNCHRO/SIDRA ANALYSIS

The 2026 post-development horizon was modeled with the modifications identified in the 2023 horizon. The capacity analysis results are summarized in **Table 8-11.**

Table 8-11 2026 Post-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	**LOS (Delay)**	**Max (v/c)**	**Movement**	**LOS (Delay)**	**v/c**	**95th % Queue**
Mt Norquay Rd / Hwy 1 WB Ramp	B (13.2 s)	0.53	WB-L	D (26.1 s)	0.53	22 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.6 s)	0.04	EB-LT	B (12.4 s)	0.04	1 m
Mt Norquay Rd / Fenlands Access	A (2.8 s)	0.43	WB-L	F (64.0 s)	0.43	14 m
Mt Norquay Rd / Railway Ave	C (19.8 s)	1.05	WB-LR	F (113.6 s)	1.05	82 m
Railway Ave / Elk St / Lynx St	A (1.9 s)	0.24	WB-LTR	A (3.4 s)	0.24	9 m

The capacity analysis results indicate that the overall operation all intersections will be LOS C or better under the existing priority / roundabout control during the 2026 summer weekend peak hour. Again, Synchro modelling shows that turning movements from the Fenlands Access and from Railway Avenue will experience lengthy delays however these values are indicative only as Synchro's accuracy for predicting delays under priority control is limited, particularly when a movement is nearing capacity. As shown in the VISSIM microsimulation (refer **Section 8.2.2** for 2023 and **Section 8.2.5** for 2029), delays for these movements will be notably shorter than predicted by Synchro.

The capacity analysis results indicate that the westbound left-turn at the Mt Norquay Road / Fenlands Access intersection will experience approximately a minute of delay (LOS F) during the summer weekend peak hour. The analysis indicates this equates to approximately 2 cars in queue waiting to turn left.

The Synchro analysis indicates that the westbound approach at the Mt Norquay Road / Railway Avenue intersection will experience significant delay as a stop-controlled intersection, with approximately 2 minutes of vehicular delay and approximately 11 vehicles waiting to turn onto Mt Norquay Road. At this intersection, 165 pedestrians were assumed to cross the westbound approach of Railway Avenue. Fewer pedestrians were assumed crossing Railway Avenue at this location than in the 2023 horizon, due to the introduction of the mass passenger rail, which assumes a portion of people who would previous drive and park in the North Lot are now utilizing the rail as their mode of transport, thus no longer crossing at this location. To understand the influence of these pedestrian volumes, a Synchro model was run without them. The removal of pedestrians off the westbound approach, reduces the delay for vehicles to approximately 34 seconds during the weekend summer peak hour.

As actual pedestrian movements may differ than what was assumed, and interactions between pedestrians and vehicles in a shared street are not able to be accurately modelled[42], it is recommended that the Mt Norquay Road / Railway Avenue intersection is monitored, and intersection improvements are tailored to the traffic patterns if or when needed.

No additional modifications are anticipated for the 2026 post-development horizon.

[42] Robert Steuteville, "Shared space intersections mean less delay", Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay

8.2.4 2029 POST-DEVELOPMENT HORIZON: SYNCHRO/SIDRA ANALAYSIS

The 2029 post-development horizon was modeled with the modifications identified in the 2023 horizon. The capacity analysis results are summarized in **Table 8-12**, and represent typical traffic conditions without the influence of trains crossing Mt Norquay Road.

Table 8-12 2029 Post-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Hwy 1 WB Ramp	B (14.1 s)	0.57	WB-L	D (29.0 s)	0.57	26 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s)	0.05	EB-LT	B (12.7 s)	0.05	1 m
Mt Norquay Rd / Fenlands Access	A (3.7 s)	0.54	WB-L	F (84.1 s)	0.54	18 m
Mt Norquay Rd / Railway Ave	D (26.1 s)	1.16	WB-LR	F (153.5 s)	1.16	97 m
Railway Ave / Elk St / Lynx St	A (2.0 s)	0.25	WB-LTR	A (3.5 s)	0.25	9 m

The capacity analysis results indicate that the overall operation all intersections will be LOS D or better under the existing priority / roundabout control during the 2029 summer weekend peak hour. Again, Synchro modelling shows that turning movements from the Fenlands Access and from Railway Avenue will experience lengthy delays however these values are indicative only as Synchro's accuracy for predicting delays under priority control is limited, particularly when a movement is nearing capacity. As shown in the VISSIM microsimulation (refer **Section 8.2.5**), delays for these movements will be notably shorter than predicted by Synchro.

The capacity analysis results indicate that the westbound left-turn at the Mt Norquay Road / Fenlands Access intersection will experience over 80 seconds of delay (LOS F) during the summer weekend peak hour. The analysis indicates this equates to approximately 3 cars in queue waiting to turn left.

A sensitivity analysis was completed to determine how often the Mt Norquay / Fenlands Access intersection would experience delay over 45 s. Maintaining the 2029 peak hour turning volumes, the northbound and southbound through volumes were adjusted. The sensitivity analysis indicated that when the through two-way traffic volumes on Mt Norquay are 1200 vehicles per hour or less, the delay is anticipated to be 45 s or less. The July 2018 hourly traffic data for Mt Norquay Road, provided by the Town of Banff, was grown by 1.8% per year to estimate the hourly daily volumes for the 2029 horizon. It was found that the volumes on Mt Norquay exceed 1,210 vehicles per hour 28% of the time in the July 2029 horizon. The traffic volumes were found to exceed 1,120 vehicles per hour 7% of the time in the June 2029 estimate and 22% of the time in the August 2029 estimate.

Figure 8-1 illustrates the daily two-way traffic volumes for Mt Norquay for the 2018 horizon. The graph illustrates that July and August have the highest two-way traffic volumes during a year. Therefore, percent of time that the delay is greater than 45 s is anticipated to be minor for the remaining months. On this basis, it is clear that lengthy delays for vehicles exiting the Fenlands Access will only occur for a very small proportion of time during the year. As such, upgrades to address this relatively short fraction of the year have not been considered as it would result in significant overdesign for most of the time.

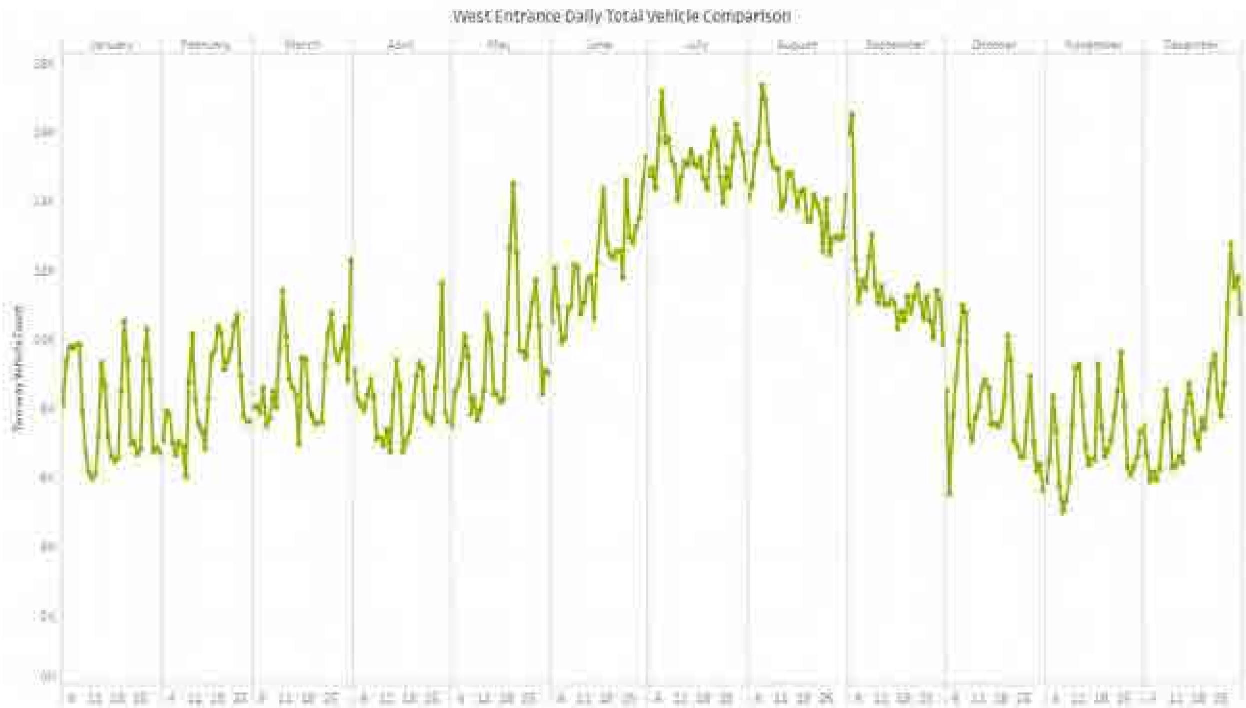

Figure 8-1 2018 Mt Norquay Two-way Daily Traffic Volumes[43]

The Synchro analysis indicates that the westbound approach at the Mt Norquay Road / Railway Avenue intersection will experience significant delay as a stop-controlled intersection, with approximately 3 minutes of vehicular delay and approximately 13 vehicles waiting to turn onto Mt Norquay Road. At this intersection, 175 pedestrians were assumed to cross the westbound approach of Railway Avenue. As discussed in previous sections, the model is heavily influenced by the number of pedestrians crossing. For the sensitivity test, the removal of pedestrians off the westbound approach, reduces the delay for vehicles to approximately 40 seconds during the weekend summer peak hour.

As actual pedestrian movements may differ than what was assumed, and interactions between pedestrians and vehicles in a shared street are not able to be accurately modelled[44], it is recommended that the Mt Norquay Road / Railway Avenue intersection is monitored, and intersection improvements are tailored to the traffic patterns if or when needed.

According to the Synchro capacity analysis, some delay (approximately 29 seconds) is anticipated for the westbound approach at the Mt Norquay Road and Highway 1 Westbound Ramp during the 2029 summer weekend peak hour horizon. The analysis indicates that if the northbound shared left-through lane was converted to a dedicated northbound left-turn lane, the westbound delay would reduce to approximately 27 seconds during the summer weekend peak hour.

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[43] Banff GIS-Profile, *West Entrance Daily Total Vehicle Comparison,* https://public.tableau.com/profile/banff.gis#!/vizhome/CovidCombinedTWCountsMonthlyAnalysis/BothEntrances; Accessed February 2, 2012

[44] Robert Steuteville, "Shared space intersections mean less delay", Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay

8.2.5 2029 POST-DEVELOPMENT HORIZON: VISSIM ANALYSIS

Microscopic analysis was completed in VISSIM for the 2029 post-development horizon to evaluate how the network would operate during the summer weekend peak hour. The existing calibrated model was used as the base to create the 2029 model. Some of the changes and adjustments that were made to the existing model include:

- Updating vehicle and pedestrian volumes to 2029 volumes as shown in **Figure 7-9** and **Figure 9-2**;
- Mt Norquay Road / Fenland Access intersection;
  - Extending the southbound left turn lane;
  - Providing a separate right turn lane on Fenland North Access (westbound approach);
- Mt Norquay Road / Railway Avenue intersection;
  - Extending the current short (~15 m) southbound left turn up to the rail crossing (~40 m).

Three scenarios were tested using the 2029 model:

- 2029 scenario without train: the rail crossing on Mt. Norquay Road will not be activated during the peak hour
- 2029 scenario with train: the rail crossing on Mt. Norquay Road will be activated once during the peak hour
- 2029 scenario with two trains: the rail crossing on Mt. Norquay Road will be activated twice during the peak hour

2029 SCENARIO WITHOUT TRAIN

The initial review of the microsimulation model indicated that with additional turn lanes capacity described above, the 2029 traffic volumes, including those associated with the ARP, can be accommodated on the study road network and at the study intersections. To complete a quantitative assessment of the model, average queue, delay, and travel time results out of 10 runs of the model at different locations along Mt Norquay Road were extracted. The results are summarized in **Table 8-13** through to **Table 8-15**.

Table 8-14 summarizes the average and maximum queue observed in the VISSIM model. The VISSIM model results indicate that the average vehicle queue lengths do not queue back to adjacent intersections. The maximum queues, which are the longest queue observed during the entire run of the model (this does not occur very often) are:

- the southbound queue on Mt Norquay Road at Fenlands North Access extends north 323 m;
- the northbound queue on Mt Norquay Road at the Fenlands North Access extends south 167 m; and,
- the westbound queue on Railway Avenue at Mt Norquay Road extends east 177 m.

Table 8-13 Delays & LOS – 2029 Scenario without Train

INTERSECTION	MOVEMENT	DELAY (S)	LOS
Mt Norquay Road / Fenlands North Access	NB-T	20	C
	NB-R	19	C
	SB-T	12	B
	SB-L	17	C
	WB-L	40	E
	WB-R	34	D
Mt Norquay Road / Railway Ave	NB-T	4	A
	NB-R	6	A
	SB-T	1	A
	SB-L	16	C
	WB-LR	113	F

Table 8-14 Queues – 2029 Scenario without Train

LINK	AVERAGE QUEUE (M)	MAXIMUM QUEUE[1] (M)
Mt Norquay Road NB @ Fenlands North Access	44	167
Mt Norquay Road SB @ Fenlands North Access	46	323
Mt Norquay Road SBL @ Fenlands North Access	1	40
Fenlands North Access WBR	6	41
Fenlands North Access WBL	2	25
Mt Norquay Road NB @ Railway Avenue	2	77
Mt Norquay Road SB @ Railway Avenue	3	53
Railway Avenue WB @ Mt Norquay Road	76	177

Note:
[1] Maximum queue is the longest queue that is observed during the entire run of the model and it does not happen very often
[2] Queue on the ramp, measured from the end of the ramp

The travel times on Mt Norquay Road in the northbound and southbound directions are shown in **Table 8-15**.

Table 8-15 Travel Time – 2029 Scenario without Train

LINK	TRAVEL TIME[1] (S)
Mt Norquay Road Southbound	94
Mt Norquay Road Northbound	103

Note:
[1] Travel time estimated between the end of highway 1 eastbound off-ramp and Railway Avenue

As shown in the tables, the westbound left at the Mt Norquay and Fenlands Access intersection will experience about 40 s (LOS E) of delay during the summer weekend afternoon peak hour. Similarly, the westbound approach at the Mt Norquay and Railway Avenue intersection will experience almost 2-minutes of delay (LOS F). All other movements are expected to operate within acceptable limits during the 2029 summer weekend afternoon peak hour.

The average travel time on Mt Norquay Road is 94 seconds in northbound direction and 103 seconds in the southbound direction which are equivalent to average travel speed of 25 km/h and 27 km/h, respectively.

2029 SCENARIO WITH ONE TRAIN

In this scenario it was assumed that one train will cross Mt Norquay Road, closing the road to traffic for about 4.5 minutes. According to the results as shown in **Table 8-16**, the westbound approaches at the Fenlands Access and at the Railway Avenue are expected to experience delay, between 60 and 190 second respectively.

Table 8-16 Delays & LOS – 2029 Scenario without Train

Intersection	Movement	Delay (s)	LOS
Mt Norquay Road / Fenlands North Access	NB-T	22	C
	NB-R	20	C
	SB-T	20	C
	SB-L	21	C
	WB-L	60	F
	WB-R	35	E
Mt Norquay Road / Railway Ave	NB-TR	17	C
	NB-R	8	A
	SB-T	1	A
	SB-L	24	C
	WB-LR	190	F

The average and maximum queue results for the "with train" scenario is included in **Table 8-17.**

Table 8-17 Queues – 2029 Scenario with Train

Link	Average Queue (m)	Maximum Queue[1] (m)
Mt Norquay Road NB @ Fenlands Access	51	167
Mt Norquay Road SB @ Fenlands Access	194	549
Mt Norquay Road SBL @ Fenlands Access	3	108
Fenlands Access WBR	6	45
Fenlands Access WBL	4	31
Mt Norquay Road NB @ Railway Avenue	24	240
Mt Norquay Road SB @ Railway Avenue	6	54
Railway Avenue WB @ Mt Norquay Road	136	182
Hwy 1 EB Off-Ramp[2]	31	229

Note:
[1] Maximum queue is the longest queue that is observed during the entire run of the model, these occurrences are infrequent
[2] Queue on the ramp, measured from the end of the ramp

The travel times on Mt Norquay Road in the northbound and southbound directions are shown in **Table 8-18**.

Table 8-18 Travel Time – 2029 Scenario with Train

Link	Travel Time[1] (s)
Mt Norquay Road Southbound	155
Mt Norquay Road Northbound	112

Note:
[1] Travel time estimated between the end of Highway 1 eastbound off-ramp and Railway Avenue

The model shows that traffic will be queued on the Highway 1 eastbound off-ramp, but the queue does not spill back onto Highway 1. After the rail crossing reopens, it takes around 15 minutes for this queue to clear. The northbound and southbound traffic flows return to normal after approximately 8 minutes and 20 minutes, respectively. The westbound queue at Mt Norquay and Railway Avenue does not dissipate and is persistent until the end of the simulation run.

2029 SCENARIO WITH TWO TRAINS

In this scenario it was assumed that two trains will cross Mt Norquay Road within 25 minutes of each other, resulting in two closures at the railway crossing, each of 4.5 minutes. This is a rare occurrence. According to the results as shown in **Table 8-16**, the westbound approaches at the Fenlands Access and at the Railway Avenue are expected to experience delay, between 72 and 210 seconds respectively.

Table 8-19 Delays & LOS – 2029 Scenario without Train

Intersection	Movement	Delay (s)	LOS
Mt Norquay Road / Fenlands North Access	NB-T	23	C
	NB-R	22	C
	SB-T	27	D
	SB-L	25	C
	WB-L	72	F
	WB-R	32	D
Mt Norquay Road / Railway Ave	NB-TR	32	D
	NB-R	15	B
	SB-T	1	A
	SB-L	31	D
	WB-LR	210	F

The average and maximum queue results for the “two train” scenario is included in **Table 8-17.**

Table 8-20 Queues – 2029 Scenario with Train

Link	Average Queue (m)	Maximum Queue[1] (m)
Mt Norquay Road NB @ Fenlands Access	51	168
Mt Norquay Road SB @ Fenlands Access	246	592
Mt Norquay Road SBL @ Fenlands Access	17	174
Fenlands Access WBR	5	44
Fenlands Access WBL	5	36
Mt Norquay Road NB @ Railway Avenue	49	247
Mt Norquay Road NB @ Railway Avenue	9	56
Railway Avenue WB @ Mt Norquay Road	136	182
Hwy 1 EB Off-Ramp[2]	49	318

Note:
[1] Maximum queue is the longest queue that is observed during the entire run of the model, these occurrences are infrequent
[2] Queue on the ramp, measured from the end of the ramp

The travel times on Mt Norquay Road in the northbound and southbound directions are shown in **Table 8-18**.

Table 8-21 Travel Time – 2029 Scenario with Train

LINK	TRAVEL TIME[1] (S)
Mt Norquay Road Southbound	190
Mt Norquay Road Northbound	117

Note:
[1] Travel time estimated between the end of highway 1 eastbound off-ramp and Railway Avenue

It is not usual for two trains to cross Mt Northway Road in quick succession. The numbers presented for the "two train" scenario is an extreme worst case, not an event that would occur often.

9 ACTIVE MODES

As an "Eco-Transit Centre" mobility and connectivity are key values for the development of this site. Ensuring the ease of non-auto movement is integral to the success of the development. Supporting pedestrian and cyclist access to, and movement within, the site will be a specific focus throughout the design process. Development of this site is envisaged to support and promote a change in travel behaviour for visitors to Banff, reducing dependency on and use of private vehicles, and encouraging a shift to sustainable transportation modes including walking, cycling, rail, bus and aerial transit (Norquay Gondola).

The character areas on the south side of the railway corridor are the primary pedestrian oriented area. **Figure 9-1** illustrates the primary, secondary, and tertiary pedestrian desire lines to and from the Banff Railway Lands ARP in the 2029 horizon and **Figure 9-2** illustrates the estimated crossing volumes at the study intersections.

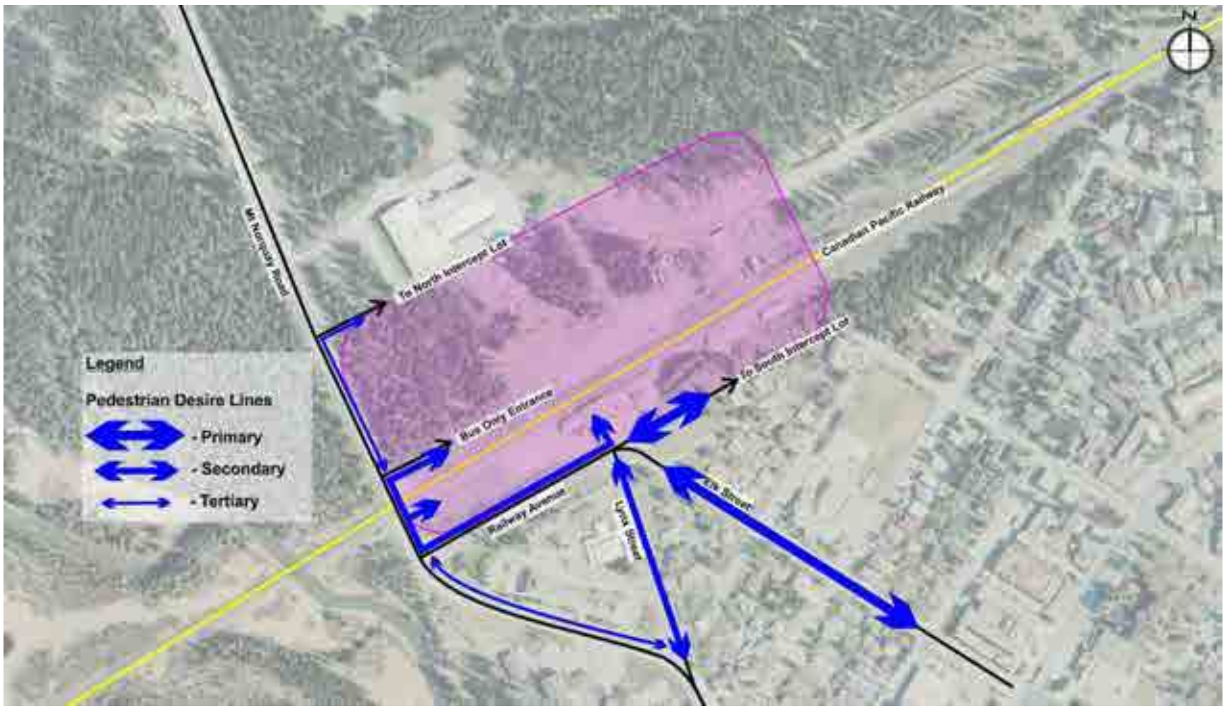
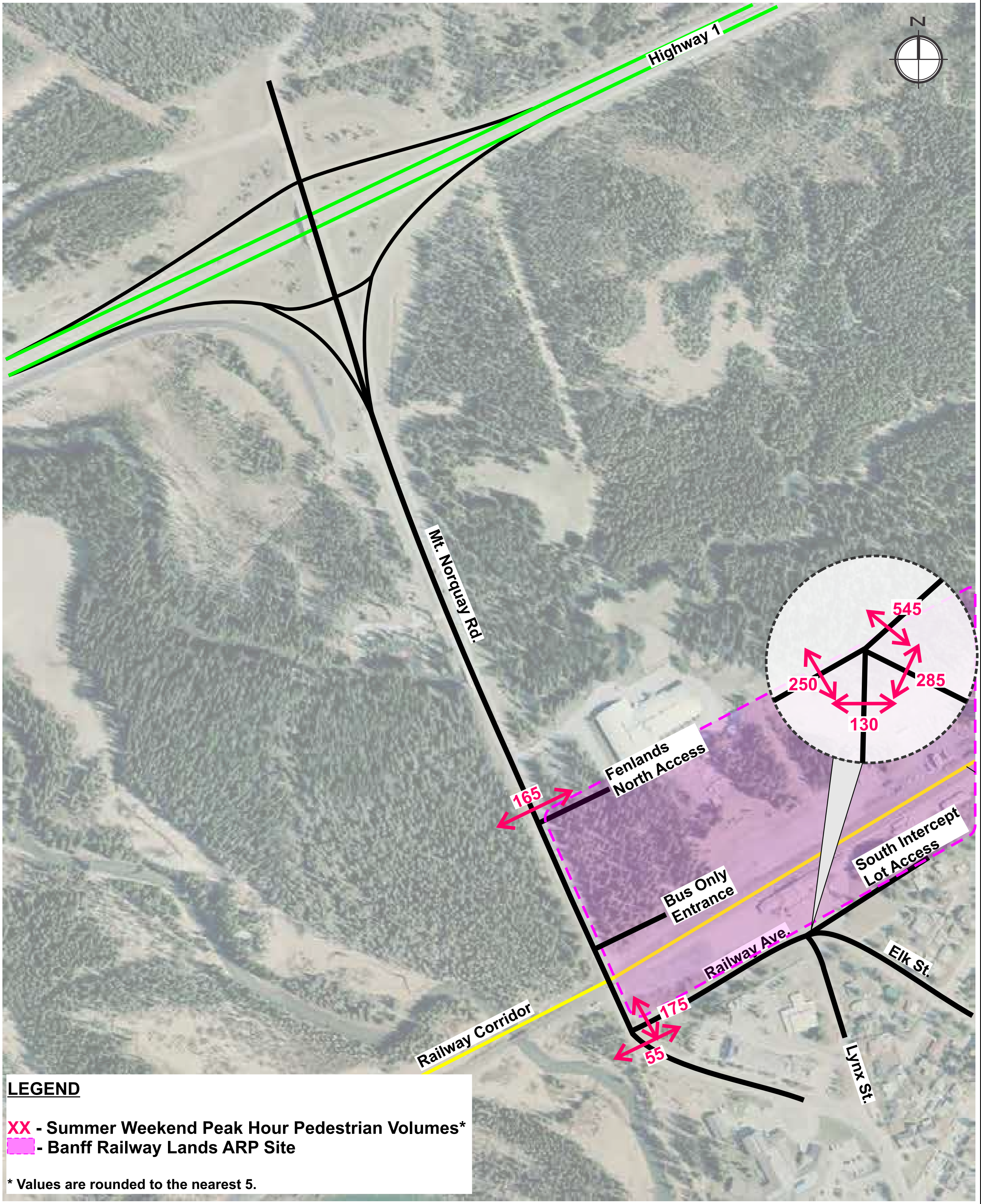


Figure 9-1 Pedestrian Desire Lines

The improvements identified below will be critical to link the Banff Railway Lands ARP to connections and pathways on the network beyond the site and to encourage active transportation.

NOTE: These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entering into a contract.



DRAWING: FIG-19M 004480-2040 Peak Hour Pedestrian Volumes (Summer).cdr DATE: 2021-02-12 DRAWN BY: piperde

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Issue Date: 2021-02-12
Scale:NTS
Aerial Imagery:2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 9-2 - 2029 Forecast Pedestrian Crosswalk Volumes

Banff Railway Lands Area Redevelopment Plan TIA

9.1 RAILWAY AVENUE SHARED SPACE

Railway Avenue will be reconfigured into a shared street – a shared space for active modes and vehicles. The design of this space will promote low vehicle speeds, high driver awareness, and ease of movement for walking, cycling and other rolling modes. Shared streets are becoming increasingly popular in areas with high pedestrian activity. According to the NACTO Urban Street Design Guide "Shared streets maintain access for vehicles operating at low speeds … they are designed to implicitly slow traffic speeds using pedestrian volumes, design, and other cues to slow or divert traffic."

9.1.1 SHARED SPACE CASE STUDIES

A thesis completed at the University of Connecticut suggests that pedestrians and drivers experience less delay in "shared space" intersections, where vehicles and pedestrians mingle at slow speeds with few traffic regulations, when compared to conventional intersections.[45] The thesis[46] examined six different intersections across five countries, each with a varying level of interaction between people and vehicles as well varying pedestrian and vehicle volumes. The pedestrian volumes ranged from 137 pedestrians per hour to 1,536 pedestrians per hour, and the vehicle volumes ranged from 81 vehicles per hour up to 680 vehicles per hour. It is noted that the thesis indicates that the pedestrian and vehicle volumes presented are from the intersection's approach with highest pedestrian volumes.

The study measured the actual pedestrian and vehicle characteristics and behaviours and compared them against the theoretical delays estimated using conventional intersection arrangements (roundabouts, stop signs, and signals) and traffic analysis software. In all locations, the actual pedestrian wait times were recorded as less than one second and the actual vehicle delays ranged from 1 to 16 seconds. In comparison, the theoretical vehicle delays, assuming the intersections were roundabouts, ranged from 5 to 346 seconds per vehicle.

Könizstrasse, Bern. Source: Google Maps

Specifically, Könizstrasse, was identified as having a moderate-to-high level of pedestrian and vehicle interaction at the intersection. The approach with the highest pedestrian volume was reported at 1,536 pedestrians per hour, and the corresponding vehicle volume was 600 vehicles per hour. The observed vehicle delay at the intersection was approximately 16 seconds per vehicle.

The conclusion of the thesis states that shared space promotes greater vehicle efficiency than conventional control systems and both pedestrians and vehicles experience less delay at shared space intersections than they do at intersections using conventional controls."[47]

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[45] Robert Steuteville, "Shared space intersections mean less delay", Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay
[46] Benjamin Wargo, "Share Space: *Measuring the Boundaries and Assessing the Efficiencies"*, 2011: https://opencommons.uconn.edu/cgi/viewcontent.cgi?article=1934&context=gs_theses
[47] Wargo, "Shared Space", pg. 49


Fountain Place, Poynton, Stockport. Source: Google Earth

Fountain Place in Poynton, Stockport revitalized their village centre by reconstructing the intersection of two busy arterials from a conventional intersection with traffic signals, to a shared space intersection with roundabouts. Prior to reconstruction, the intersection was generally considered very busy, unsafe, and it divided the community of Poynton. After reconstruction, the intersection is considered to safer, easier to navigate and pedestrians and motorists experienced less delay.[48] Persons with visual impairments were accommodated by introducing tactile paving, providing contrast in pavement markings and different light intensities where crossings may take place, and visibility bands were provided around the lamp posts. In addition, the lack of curb lines in the shared space also provided accessibility for those with varying mobility challenges.

The redesign of this street includes a pickup / drop off area and on the southern side.

9.1.2 RAILWAY AVENUE CONTEXT

The Railway Avenue / Elk Street / Lynx Street intersection is estimated to have 860 pedestrians crossing Railway Avenue / South Lot Access during the peak hour and 630 total vehicles entering the intersection during the peak hour. These volumes fall within the volumes of other shared spaces around the world.

Considering these volumes, and the holistic, multimodal design of the ARP lands, Railway Avenue is considered suitable for conversion to a shared space.

While shared streets and intersections are relatively common in Europe, there are two main considerations that would require careful planning prior to implementation in Banff, including:

— Accommodation of pedestrians for all ages and abilities. The lack of curbs and defined crossings can make shared space intersections challenging to navigate for those with vision impairments; and,
— A public education campaign would be required to educate motorists who use the shared space intersection. Additional traffic calming measures or well positioned speed management strategies may be required to ensure low vehicle speeds through the intersection.

9.2 ACTIVE MODES NETWORK CONNECTIONS

The following connections/modifications should be implemented on the network as part of the Banff Railway Lands ARP development:

— A pedestrian path should be provided on the east side of Mt Norquay Road to accommodate pedestrians coming from the North Lot;
— The pedestrian crosswalk located on the north leg of the Mt Norquay Road and Railway Avenue intersection should be relocated to the front of the southbound left-turn lane to provide better visibility of pedestrians; and,

[48] Martin Cassini, "*Poynton Regenerated*" January 31, 2013, Video 14:55. Poynton Regenerated - YouTube

- The site layout should incorporate wide pedestrian paths that connect the site to the Town's pedestrian network. The site design will respect and work with the Town's vision to promote Elk Street as the primary pedestrian route to Downtown and Lynx as a potential secondary pedestrian route to Downtown, with internal paths and signage directing pedestrian traffic towards Elk Street for travel to the town centre.

9.3 WAYFINDING

Wayfinding will be implemented on the network as part of the Banff Railway Lands ARP development to orient and direct visitors to key destinations:

- Wayfinding signage will indicate mode (walk / cycle / transit), distance and travel time.
- Wayfinding will apply the design themes (colours and materials) of the Town of Banff.

9.4 CYCLING

Recognizing the critical role that cycle infrastructure plays in encouraging cycling as a mode choice, the site design will provide for safe and efficient cycle movement within the site and connect to the Town's cycle infrastructure that is contiguous to the site. The following cycling facilities will be incorporated into the network as part of the Banff Railway Lands ARP development:

- Internal considerations including a comprehensive suite of end of trip facilities such as: bike parking (racks for public use, secure parking for employees), water station(s), maintenance stand(s), lockers and shower facilities (for employees);
- Site arrangement will incorporate a mix of shared use areas and dedicated cycle paths, to ensure that cyclists and pedestrians can enjoy traversing the site at low speeds, without conflicts, as appropriate; whilst cycle paths will allow cyclists to travel at higher speeds at the periphery of the site;
- Providing bike rental at this site, allowing members of the public a seamless transition from their arrival mode (e.g. transit, private vehicle) to cycling 'the last mile' to travel to their Banff destinations; and
- Provision of storage/parking in association with the Norquay Gondola, station and shuttle centre.

9.5 TRANSIT FACILITIES

The vision for the Banff Eco-Transit Centre is to incorporate a Transit Hub on the site, where Roam transit, tourist coaches and local shuttles can service the public. The site will include an area dedicated to transit, designed to provide adequate manoeuvring space for transit vehicles, set down / pick up areas and importantly, comfortable waiting areas for patrons. A shuttle service to take visitors Downtown is also a consideration for the Banff Railway Lands ARP. A small shuttle bus pick-up and drop-off lot is considered on the south side of Railway Avenue that would provide a loading zone time limit to facilitate the loading and unloading of passengers.

- **Figure 9-3** illustrates the roads that are identified to support future transit routing; however, the Town may allow other route options without amendment to this Plan.
- The design of transit stops on Railway Avenue and within the Transit Hub should encourage the use of transit by residents of, and visitors to, the town of Banff. Transit stops should be capable of accommodating suitable amenities such as a shelter, a passenger drop off area, benches and waste receptacles, landscaping, lighting, bicycling facilities, and clear information on transit routes and wait times.
- Implement a loading zone time limit for the shuttle pick-up and drop-off lot to allow turnover for shuttles to load and unload passengers.

Figure 9-3 Shuttle Circulation

10 PARKING AND LOADING ACCESS

10.1 PARKING ACCESS

Access to the North Lot and Shuttle Centre will be provided on Mt Norquay Road at the Fenlands Access. The existing single lane egress will be upgraded to provide two exist lanes (left turn and right turn). A right-in transit only access will be provided between the main access and the railway tracks.

At the southern edge of the Banff Railway Lands ARP site, Railway Avenue provides access to the South Lot.

10.2 SERVICE AND LOADING

Service and loading including deliveries and removals are to be managed to minimize conflict with pedestrian and personal vehicle movements. The site design will be developed with consideration for servicing requirements, including access and on-site manoeuvring. Loading and servicing for commercial uses for the Banff Railway Lands ARP site will be accommodated via Railway Avenue. Service vehicle movements for the station restaurant will be accommodated via an access road adjacent to the railway tracks in the South Intercept Parking Lot. The site design allows for circulation of emergency service vehicles also. Swept path assessments have been carried out for reference and are available in **Appendix D** for reference.

11 ALTERNATIVE SCENARIOS

The following sections outline the potential impacts of "what if" scenarios as stand-alone items. This will allow us to understand the standalone impact of each assumption on the transportation network. **Section 11.2** prepares a 2029 traffic forecast that could be considered to be the "high" scenario – if the Norquay Gondola attracts higher visitation than planned. This "high" scenario has been modeled in Synchro to determine if additional network modifications are needed based on the worst-case scenario.

11.1 "WHAT IF" SCENARIOS

WHAT IS THE IMPACT OF A 5% INCREASE IN THE TOTAL GONDOLA MARKET RIDERSHIP?

What if the overall gondola market share increases by 5% as a result of the Norquay Gondola, particularly because the Norquay Gondola is very visible and accessible from the Trans-Canada Highway?

Table 11-1 compares the baseline gondola ridership assumptions with the "what if" scenario.

Table 11-1 5% Increase in Gondola Market

INTERSECTION	OVERALL GONDOLA RIDERSHIP	DAILY VISITORS	PEAK HOUR VISITORS (PERSON-TRIPS) (38%)	TOTAL VEHICLE-TRIPS (42.5%)
2029 Baseline Scenario *(No Increase)*	600,000	2,270	388	62
2029 "What If" Scenario *(5% Increase)*	630,000	2,390	409	65
Total Impact	**+30,000**	**+120**	**+21**	**+3**

Answer: The 5% increase in the overall gondola market share has a negligible impact on the vehicle-trip generation, using original baseline assumptions.

WHAT IS THE IMPACT IF THE NORQUAY GONDOLA CAPTURES A LARGER PERCENTAGE OF THE MARKET SHARE THAN PROJECTED?

Table 11-2 compares the baseline gondola market share assumptions with the "what if" scenario.

Table 11-2 70% of Market Capture

INTERSECTION	OVERALL GONDOLA RIDERSHIP	DAILY VISITORS	PEAK HOUR VISITORS (PEOPLE-TRIPS) (38%)	TOTAL VEHICLE-TRIPS (42.5%)
2029 Baseline Scenario *(56% Market Share Captured)*	600,000	2,270	388	62
2029 "What If" Scenario *(70% Market Share Captured)*	600,000	2,840	1,079	77
Total Impact	**+30,000**	**+570**	**+661**	**+15**

If Norquay Gondola captures a larger percentage of the market (70%) than assumed by in the baseline scenario (in **Section 7.4.2**), the overall trip generation of the Norquay Gondola increases by 15 total trips during the summer weekend peak hour.

However, the portion of visitors derived from Sulphur Mountain are considered diverted trips instead of new trips as they were already on the road network. These trips will be included in the driveway volumes to the site, but they will not increase the overall traffic volumes on the study roads. Assuming that 70% of the Norquay Gondola ridership is derived from the Sulphur Mountain Gondola Ridership, this equates to approximately 1,589 daily visitors. Utilizing a 10% internal capture rate (from the Norquay Gondola Internal Capture calculations), a peak hour visitor rate of 38%, that 42.5% will arrive by passenger vehicle, and a 2.4 vehicle occupancy rate, approximately 48 trips (24 trips in and 24 trips out) will be considered trips diverted from Sulphur Mountain to Norquay. By comparison, the baseline 2029 scenario (**Section 7.4.2**) estimates that a total of 38 trips (19 trips in / 19 trips out) will be diverted from Sulphur Mountain to Norquay with a 56% market share.

Assuming that the trips entering/exiting to the north via Mt Norquay Road (68% - see **Section 7.4.2**), would be considered diverted trips and thus would be removed from the through traffic at the Mt Norquay Road and Railway Avenue intersection and added to the turning movements to the Intercept Parking Lots. Trips entering from the south (32% - **Section 7.4.2**) are considered new trips, as they would not have previously been on Mt Norquay Road if they were destined for Sulphur Mountain.

This equates to 16 inbound trips now make a southbound left into the Intercept Parking Lots and 16 trips are removed from the southbound through movement at the Mt Norquay Road and Railway Avenue intersection, as they will no longer be traveling south on Gopher Street. Similarly, there will be 16 outbound trips making a westbound right out of the Parking Lots. As these 16 trips would be captured before they entered the downtown, 16 trips would be removed from the northbound through movement at the Mt Norquay Road and Railway Avenue intersection. This equates to a total of 32 trips that will be removed from Gopher Street during the peak hour assuming a 70% capture of the market share. By comparison, the baseline 2029 scenario (**Section 7.4.2**) estimates that a total of 26 trips (13 trips in / 13 trips out) will be removed from Gopher Street during the peak hour.

An increase in Gondola market share (to 70%), will generate slightly more traffic at the accesses but has the potential to reduce the amount of traffic traveling to the Downtown or across the Bow River Bridge during the peak hour.

Answer: If Norquay Gondola captures a larger percentage of the market (70%) than assumed by in the baseline scenarios, there is a minor impact on the road network in the 2029 horizon.

WHAT ARE THE PARKING REQUIREMENTS 10 YEARS AFTER OPENING DAY?

The Norquay Gondola is expected to see approximately 420,000 visitors within its sixth year of operation. This is approximately 70% of the number of visitors to the Sulphur Mountain Gondola in 2020.

Utilizing the methodology outlined in **Section 7.2.2**, the Norquay Gondola daily number of visitors is estimated at 2,840 people during the 2032 summer horizon. Utilizing the Sulphur Mountain Gondola peak hour visitor rate of 38% to convert daily visitors to peak hour visitors[49], a 10% internal capture, a vehicular mode share of 42.5%, and a vehicle occupancy ratio of 2.4 people per vehicle, 172 parking spaces are needed to accommodate future Mt Norquay Uses. The total Norquay Gondola parking demand, including existing and future users, is estimated at 200 parking spaces for the 2032 horizon.

Table 11-3 compares the 2029 baseline parking requirements with the estimated 2032 parking requirements. The Fenlands and Intercept parking demand was estimated by using a 1.8% linear growth rate as a worse case scenario.

Table 11-3 2029 vs 2032 Parking Demand

USE	2029 BASELINE PARKING SPACES	3032 PARKING SPACES
Heritage Rail	140	140
Gondola	154	190
Fenlands	235	245
Intercept Parking	269	275
Total	**798**	**850** *(+52 parking spaces)*

Answer: A total of 1,048 parking spaces are provided between the North and South Lots. Assuming 850 parking spaces are needed during the 2032 summer weekend peak hour horizon, this leaves an additional 198 available parking spaces in the Lots.

It is estimated that enough parking has been provided between the two Lots to more than accommodate the parking requirements 10 years after opening day.

[49] Brewster Travel Canada, B*anff Gondola Upper Terminal Development Project* (June 20, 2014)

WHAT IF THE SOUTH LOT PROVES TO BE MORE OR LESS POPULAR?

Table 11-4 compares the all-day stay popularity of the South Lot with the "what if" scenario.

Table 11-4 South Lot Popularity (vehicle-trips)

INTERSECTION	ALL-DAY STAYS TOTAL TRIPS	BANFF ARP TOTAL TRIPS	TOTAL TRIPS
2029 Baseline Scenario *(50% of South Lot = All Day Stays)*	78	92	**170**
2029 "What If" Scenario: Less Popular *(25% of South Lot = All Day Stays)*	52	124	**176** *(+6 trips)*
2029 "What If" Scenario: More Popular *(75% of South Lot = All Day Stays)*	97	46	**143** *(-27 trips)*

Answer: The Banff Railway Lands ARP development has a higher trip generation rate than the long-term stays. If the South Lot attracts more All-day Stays (i.e. arriving earlier and filling the lot first), less traffic could be anticipated turning onto or out of Railway Avenue. This is due to the intercept parking having a lower turnover rate.

Note there is a balance as to whether visitors will travel to the South Lot first in hopes of finding a closer parking stall or whether they will pull into the North Lot first. Using electronic parking signage that clearly shows where parking spaces are available and when lots are full may help reduce circulation between the lots by providing clear direction to available parking spaces.

WHAT IF MORE VEHICLES USE MT NORQUAY TO ACCESS THE PARKING LOTS?

What if the distribution of trips for the intercept parking resulted in a larger share using Mt Norquay Rd to access the Parking Lots than Banff Avenue.

Table 11-5 compares the 2029 horizon baseline intercept outbound vehicle trips with the "what if" scenario".

Table 11-5 Intercept Parking Westbound Turning Movement Comparison

Scenario (North / South Distribution)	Intercept Parking Trips Mt Norquay / Fenlands Access		Intercept Parking Trips Mt Norquay / Railway Ave	
	Westbound Left	Westbound Right	Westbound Left	Westbound Right
2029 Baseline Scenario *(75% / 25% Distribution)*	5	14	0	32
2029 "What If" Scenario *(85% / 15% Distribution)*	3	16	0	33
Total Impact	**-2**	**+2**	**0**	**+1**

Table 11-6 compares the delay of the baseline scenario with the "what if" scenario.

Table 11-6 Approach Delay Comparison

Scenario (North / South Distribution)	Delay Mt Norquay / Fenlands Access		Delay Mt Norquay / Railway Ave	
	Westbound Left	Westbound Right	Westbound Left	Westbound Right
2029 Baseline Scenario *(75% / 25% Distribution)*	84.1 s	24.0 s	153.5 s	153.5 s
2029 Alternate Scenario *(85% / 15% Distribution)*	81.5 s	24.1 s	157.1 s	157.1 s
Total Impact	**-2.6 s**	**+0.1 s**	**+3.6 s**	**+3.6 s**

Answer: If an additional 10 percent of the intercept parking traffic chose to use Mt Norquay Road over Banff Avenue to access the intercept parking lots than assumed in the baseline, it is anticipated that an additional 3 outbound trips would be using Mt Norquay to head north to Highway 1. The westbound approach at the Mt Norquay / Fenlands Access would see a slight reduction in delay (< 3.0 s), and the westbound approach at the Mt Norquay / Railway Avenue interaction would see a slight increase in delay (+3.6 s). The slight increase is due to the additional trips routed away from Banff Avenue (i.e. via Elk Street) onto Mt Norquay Road.

The impact of a larger portion of vehicles using Mt Norquay vs Banff Avenue to access the Lots is negligible.

WHAT IF 100% OF THE PARKING WAS UTILIZED IN THE INTERCEPT PARKING LOTS?

Table 11-7 compares the 2029 horizon baseline intercept parking demand (269 intercept parking spaces) with the "what if" scenario.

For this "what if" scenario, the follow is assumed:

- Supply: 1,048 parking spaces
  - 486 spaces in the South Lot
  - 562 spaces in the North Lot.
- Demand: 1,048 parking spaces
  - Banff Railway Lands ARP: 294 parking spaces
  - Fenlands: 200 parking spaces
  - Intercept Parking: 554 parking spaces

Table 11-7 Lot Maximum Capacity

SCENARIO (WALKING / SHUTTLE)	TOTAL VEHICLE TRIPS (VEHICLE-TRIPS)	TOTAL SHUTTLE TRIPS (VEHICLE-TRIPS)	TOTAL WALKING TRIPS (PEOPLE-TRIPS)
2029 Baseline Scenario *(269 Intercept Parking Spaces)*	97	1	174
2029 "What If" Scenario (554 Intercept Parking Spaces)	199	3	359
Total Impact	**+102**	**+2**	**+185**

Answer: If the demand for intercept parking fills the available supply, the parking lots would be at maximum capacity in the 2029 horizon. It is estimated that an additional 102 vehicle trips would accessing or egressing the intercept parking lots as a result of this additional intercept parking use. This equates to an additional 8 vehicle trips at the south Lot and is considered negligible. However, an additional 94 trips would be anticipated at the North Lot, and this may result in additional traffic control be needed at the Fenlands access to maintain acceptable traffic operations.

WHAT IS THE IMPACT IF A DIFFERENT MODE SPLIT IS REALIZED FOR THE USERS OF INTERCEPT PARKING?

Table 11-8 compares the 2029 horizon baseline mode split assumptions (269 parking spaces) with the "what if" scenario.

Table 11-8 Lot Alternate Mode Split

SCENARIO (WALKING / SHUTTLE)	TOTAL WALKING TRIPS (PERSON-TRIPS)	TOTAL SHUTTLE PASSENGER TRIPS (PERSON-TRIPS)	TOTAL SHUTTLE TRIPS (VEHICLE-TRIPS)
2029 Baseline Scenario *(75% Walking / 25% Shuttle)*	174	58	1
2029 "What If" Scenario *(85% Walking / 15% Shuttle)*	197 *(+23)*	35 *(-23)*	1 *(0)*
2029 "What If" Scenario *(65% Walking / 35% Shuttle)*	151 *(-23)*	81 *(+23)*	2 *(+1)*

Answer: If an alternative mode split is realized for users of intercept parking, the impact on the transportation network would result in +/- 23 total people walking and +/- 1 total shuttle trips traveling to/from the Intercept Parking Lots. The impact on the transportation network is considered negligible.

WHAT IS THE IMPACT IF A DIFFERENT MODE SPLIT IS REALIZED FOR THE BANFF RAILWAY LANDS ARP DEVELOPMENT?

Table 11-9 compares the 2029 horizon baseline mode split assumptions with the "what if" scenario.

Table 11-9 Lot Alternate Mode Split

SCENARIO (WALKING / SHUTTLE)	TOTAL VEHICLE TRIPS (VEHICLE-TRIPS)	TOTAL SHUTTLE TRIPS (VEHICLE-TRIPS)	TOTAL WALKING TRIPS (PEOPLE-TRIPS)	TOTAL RAIL TRIPS (PEOPLE-TRIPS)
2029 Baseline Scenario *(42.5% Vehicles / 45% Walking / 10% Shuttle / 2.5% Rail)*	128	3	508	28
2029 "What If" Scenario *(52.5% Vehicles / 32.5% Walking / 10% Shuttle / 5% Rail)*	156	3	371	55
Total Impact	**+28**	**0**	**-137**	**+27**

Answer: If an alternative mode split is realized for the Banff Railway Lands ARP Development site, the impact on the transportation network would result in an addition 28 total vehicles trips on the road network. The impact on the transportation network is considered minor.

WHAT HAPPENS TO THE NON- NORQUAY CUSTOMERS WHO USE THE ACCESS ROAD NOW (E.G. HIKERS / GREEN PATCH LOOK OUT USERS / CYCLISTS) IF THE MT NORQUAY ACCESS ROAD IS CLOSED?

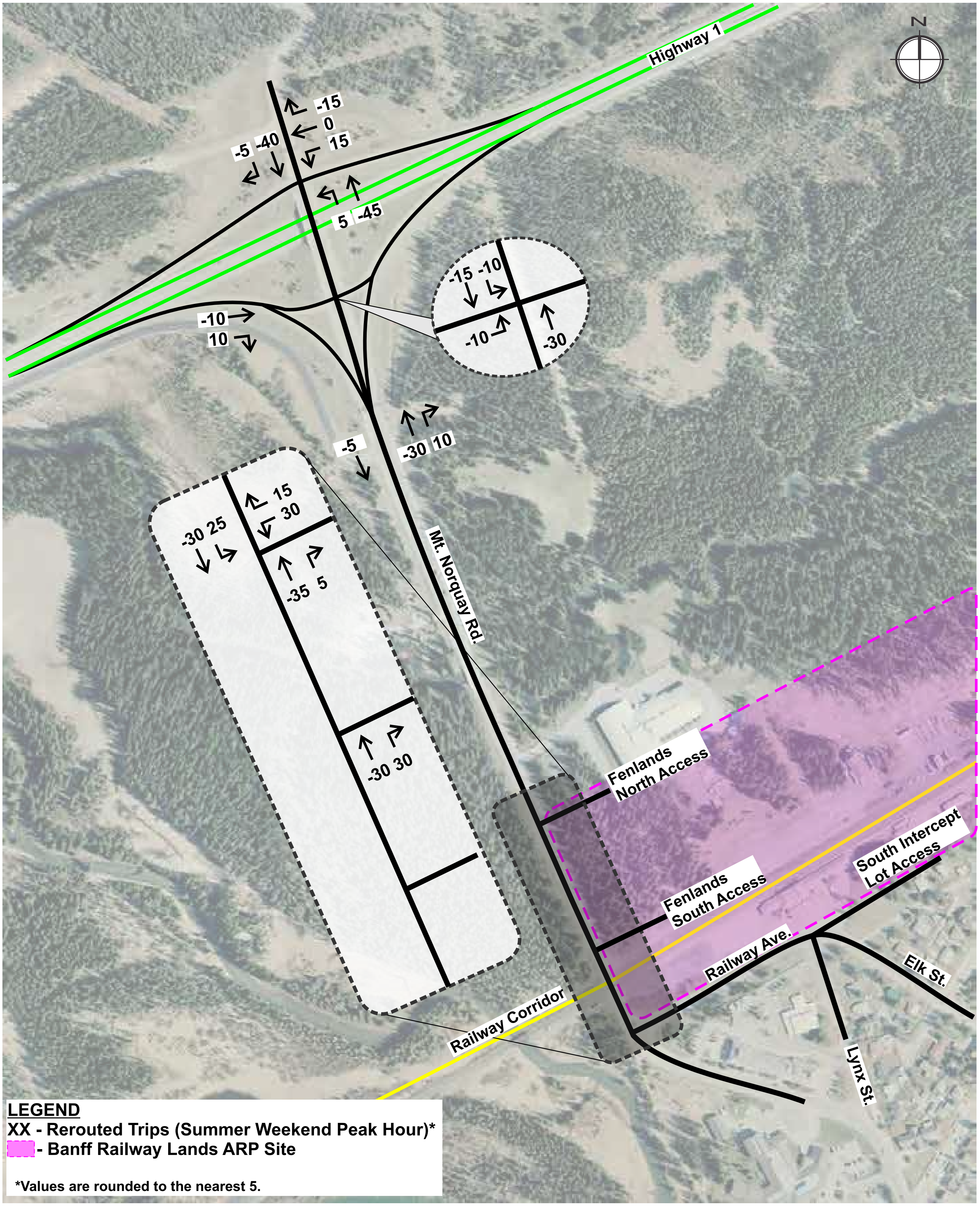
If Mt Norquay Access Road is closed to the public, the following impacts to the transportation network are estimated:

- Approximately 420 vehicles per day are rerouted based on 2019 traffic volumes;
- During the summer weekend peak hour, approximately 105 total trips (60 in / 45 out) are estimated to be rerouted based on 2019 Saturday peak hour traffic volumes; and,
- Utilizing the Mt Norquay Access Road traffic data, approximately 72% of the daily traffic visits the mountain between 9:00 a.m. and 6:00 p.m. (9 hours). Assuming an average length of stay of 1.6 hours (some may visitors may stay for about an hour, others may stay up to six hours), it is estimated that approximately 52 parking spaces will be required to meet the summer weekend peak hour demand.

The other Norquay user trips were rerouted on the network based on the existing travel patterns at the Highway 1 Interchange (i.e. if 15 vehicles took a westbound right towards Norquay previously, they will now take a westbound left towards the North Intercept Parking Lot). **Figure 11-1** illustrates the estimated traffic rerouting from Mt Norquay Access Road to the North Intercept Parking Lot.

Answer: If Mt Norquay Access Road is closed to the public, there is a minor impact on the road network in the 2019 horizon.

NOTE: These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entering into a contract.



DRAWING: FIG-19M 004480-2029 Total Traffic Volumes (Summer).cdr DATE: 2021-02-12 DRAWN BY: piperde

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Scale: NTS
Aerial Imagery: 2009-04-30
Note: All Dimensions shown in metres unless otherwise noted

Figure 11-1 - Other Mt Norquay Users Trip Rerouting (2019 Volumes)

Banff Railway Lands Area Redevelopment Plan TIA

WHAT IF A MASS TRANSIT SHUTTLE IS IMPLEMENTED INSTEAD OF THE MASS TRANSIT RAIL?

The Calgary-Bow Valley Mass Passenger Shuttle is estimated to have 250,500 annual transit boardings by the 2029 horizon, utilizing an average annual growth rate of 1.8%. The 1.8% growth rate represents the average growth in visitor volume since 2007.

Utilizing the medium scenario daily boarding projections presented in the Mass Transit Feasibility Study[50] and the 1.8% average annual growth rate, it is estimated that the Banff Station will see 445 summertime transit boardings in the 2029 horizon. For this assessment, it is assumed that the number of boardings per day will equal the number of alightings per day.

The number of boardings and alightings occurring during the peak hour was estimated by using the Time of Day Distribution presented in the Mass Transit Feasibility Study, presented in **Section 7.3.3**. The time of day distributions represents the percent of riders traveling between Calgary and the Bow Valley. The westbound distribution represents visitors arriving in Banff from Calgary and the eastbound distribution represents visitors leaving Banff traveling to Calgary.

A total of 100 people (35 trips in and 65 trips out) are estimated to use the Train Station during the summer weekend peak hour in the 2029 horizon.

Assuming shuttle occupancy capacity of 45 people per shuttle, it is estimated that the mass transit shuttle would add 3 additional trips (1 trip in / 2 trips out) during the summer weekend peak hour.

Answer: If a mass transit shuttle is implemented instead of a mass transit rail, it is considered to have a minor impact on the transportation network.

DOES A PASSENGER TRAIN FROM CALGARY HAVE A MEANINGFUL IMPACT ON THE NUMBER OF VEHICLES DRIVING TO BANFF AND THEREFORE ON VOLUMES OVER THE BRIDGE/GHG AND INTERCEPT PARKING REQUIREMENTS?

Utilizing the Mass Transit Feasibility Study[51] it is estimated that rail captures approximately 2.5% of the visitors destined to Banff. With the inclusion of the mass passenger rail becoming operational in the 2029 horizon, a portion of people who would have originally traveled to Banff by car, will now choose to arrive by rail and will not need to be counted in the Lot calculations. Assuming that the rail accounts for a 30% induced demand[52], and 1.5 turnover rate, it is estimated that approximately 55 parking spaces that will not need to be included in the intercept parking lot demand. This equates to an approximate 24 trip reduction on Mt Norquay Road during the 2029 summer weekend peak hour.

Answer: The mass passenger train has a small impact on the transportation network in the study horizon.

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[50] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)
[51] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)
[52] CPCS, *Calgary-Bow Valley Mass Transit Feasibility Study* (August 24, 2018)

WHAT IF THE MASS TRANSIT RAIL IS NOT IMPLEMENTED?

This "what if" scenario looks at what would happen if the Calgary-Bow Valley mass transit rail is not implemented. To account for this shift in mode split, the 2.5% of people that were originally assumed to arrive by rail were reallocated to passenger vehicle. The resulting mode split is 45% passenger vehicle, 45% walking and 10% shuttle. **Table 11-10** compares the 2029 baseline background horizon operations with the background horizon operations of this "what if" scenario.

Table 11-10 2029 Background Operating Conditions - No Mass Transit Rail

	OVERALL		CRITICAL MOVEMENT			
INTERSECTION	**DELAY**	**MAX (V/C)**	**MOVEMENT**	**LOS (DELAY)**	**V/C**	**95TH % QUEUE**
Mt Norquay Rd / Hwy 1 WB Ramp	B (14.0 s) *(+0.8 s)*	0.59 *(+0.03)*	WB-L	D (31.6 s) *(+2.5 s)*	0.59 *(+0.03)*	26 m *(+2 m)*
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.6 s) *(0 s)*	0.05 *(0)*	EB-LT	B (12.9 s) *(+0.01 s)*	0.05 *(0)*	1 m *(0 m)*
Mt Norquay Rd / Fenlands Access	A (2.2 s) *(+0.1 s)*	0.49 *(+0.03)*	WB-LR	E (48.6 s) *(+4.9 s)*	0.49 *(+0.03)*	18 m *(+2 m)*
Mt Norquay Rd / Railway Ave	A (7.7 s) *(+1.0 s)*	0.78 *(+0.05)*	WB-LR	F (50.0 s) *(+7.5 s)*	0.78 *(+0.05)*	46 m *(+6 m)*
Railway Ave / Elk St / Lynx St	A (1.9 s) *(0 s)*	0.20 *(+0.01)*	WB-LTR	A (3.3 s) *(+0.1 s)*	0.20 *(0.01)*	8 m *(0)*

Table 11-11 compares the 2029 baseline total horizon operations with the 2029 total horizon operations of this "what if" scenario.

Table 11-11 2029 Post Development Operating Conditions - No Mass Transit Rail

	OVERALL		CRITICAL MOVEMENT			
INTERSECTION	**DELAY**	**MAX (V/C)**	**MOVEMENT**	**LOS (DELAY)**	**V/C**	**95TH % QUEUE**
Mt Norquay Rd / Hwy 1 WB Ramp	B (15.2 s) *(+1.1 s)*	0.61 *(+0.04)*	WB-L	D (32.2 s) *(+3.2 s)*	0.61 *(+0.04)*	29 m *(+3 m)*
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s) *(0 s)*	0.04 *(-0.01))*	EB-LT	B (12.8 s) *(+0.01 s)*	0.04 *(-0.01)*	1 m *(0 m)*
Mt Norquay Rd / Fenlands Access	A (4.0 s) *(+0.3 s)*	0.57 *(+0.03)*	WB-LR	F (94.9 s) *(+10.8 s)*	0.57 *(+0.03)*	19 m *(+1 m)*
Mt Norquay Rd / Railway Ave – with peds	E (42.5 s) *(+16.4 s)*	1.40 *(+0.24)*	WB-LR	F (253.5 s) *(+100 s)*	1.40 *(+0.24)*	124 m *(+27 m)*
Mt Norquay Rd / Railway Ave – without peds	A (8.7 s)	0.80	WB-LR	E (45.9 s)	0.80	51 m
Railway Ave / Elk St / Lynx St	A (2.0 s) *(0 s)*	0.25 *(0)*	WB-LTR	A (3.6 s) *(+0.1 s)*	0.25 *(0)*	9 m *(0)*

In the 2029 Background scenario, there is a minor increase in delay at study intersections (i.e. 1.0 s increase or less). In the 2029 Post Development scenario, there is also a relatively minor increase in delay at most intersections. The largest impact is observed at Mt Norquay Road / Railway Avenue where the overall intersection delay increases by 16 s however the delay for vehicles turning from Railway Avenue increases by 100 s. This disproportionate increase for delay on the westbound movement has been discussed at length in Section 7 and is primarily a result of: Synchro's accuracy for predicting delays under priority control being limited, particularly when a movement is nearing capacity; and Synchro's sensitivity to pedestrians volumes. As previously discussed, 175 pedestrians were assumed to cross the westbound approach of Railway Avenue, which heavily influences the model results. For the sensitivity test, removal of pedestrians from the westbound approach results in a reduced delay for westbound vehicles of approximately 46 seconds. Consequently, the original recommendation (i.e. monitoring of Mt Norquay Road / Railway Avenue to tailor improvements to the actual traffic / pedestrian patterns) remains appropriate for this scenario.

The removal of the mass transit rail also increases the demand for parking:

- Background: the Intercept Parking demand would increase from 269 parking spaces to 328 parking spaces, an increase of 59 spaces, without the implementation of the mass transit rail.
- ARP: Parking requirements increase from 295 parking spaces to 305 parking spaces for the Heritage Rail District and Norquay Gondola.

  The parking provided on-site is anticipated to accommodate this increase in demand.

Answer: The removal of the Calgary-Bow Valley mass transit rail:

- does not have a significant impact on overall intersection operations;
- will increase parking demand by a total of 69 spaces, which is within the available supply; and
- does not change any recommendations.

11.2 2029 "WHAT IF – HIGH" SCENARIO

The post-development "What If - High" scenario is used to evaluate the network if the Norquay Gondola captures 70% of the market demand and has a 5% increase in latent demand. The following provides a comparison in estimated daily number of visitors by scenario and horizon:

— **2029 Horizon**: 1,420 daily summertime visitors
— **2029 Horizon (High)**: 2,980 daily summertime visitors
— **2032 Horizon**: 2,840 daily summertime visitors

The following what if assumptions will be used to generate the 2029 post-development high scenario:

— 5% increase in Gondola Market Ridership
— 70% capture of the Gondola Market Ridership
— Banff Railway Lands ARP Mode Split: 42.5% Car / 10% Shuttle / 45% Walking / 2.5% Rail
— Intercept Parking Lot Mode Split: 25% Shuttle / 75 % Walking
— South Lot fills with 50% of the All-day Stays

Utilizing the same methodologies previously presented in **Section 7**, **Table 11-10** summarizes the 2029 trip generation for the Banff Railway Lands ARP post-development high scenario during the 2029 summer weekend peak hour.

Table 11-12 2029 Trip Generation Summary (High)

MODE	TRIPS IN	TRIPS OUT	TOTAL
Personal Vehicle (Vehicle-trips)	72 (+5)	67 (+6)	139 (+11)
Shuttles (Shuttle-trips) *	26 (+3)	1 (0)	3 (0)
Walking (Person-trips)	287 (+17)	254 (+16)	541 (+33)
Rail (Person-trips)	15 (0)	14 (+1)	29 (+1)

* Shuttle trips are estimated assuming a shuttle capacity of 45 passengers per vehicle.
Values shown in brackets is the impact of the "What If" compared to the baseline values.

It is estimated that the pass-by trips will account for 46 trips (23 trips entering and 23 trips existing) during the summer weekend afternoon peak hour. The 2029 total traffic forecast for the high scenario is shown in **Figure 11-2.**

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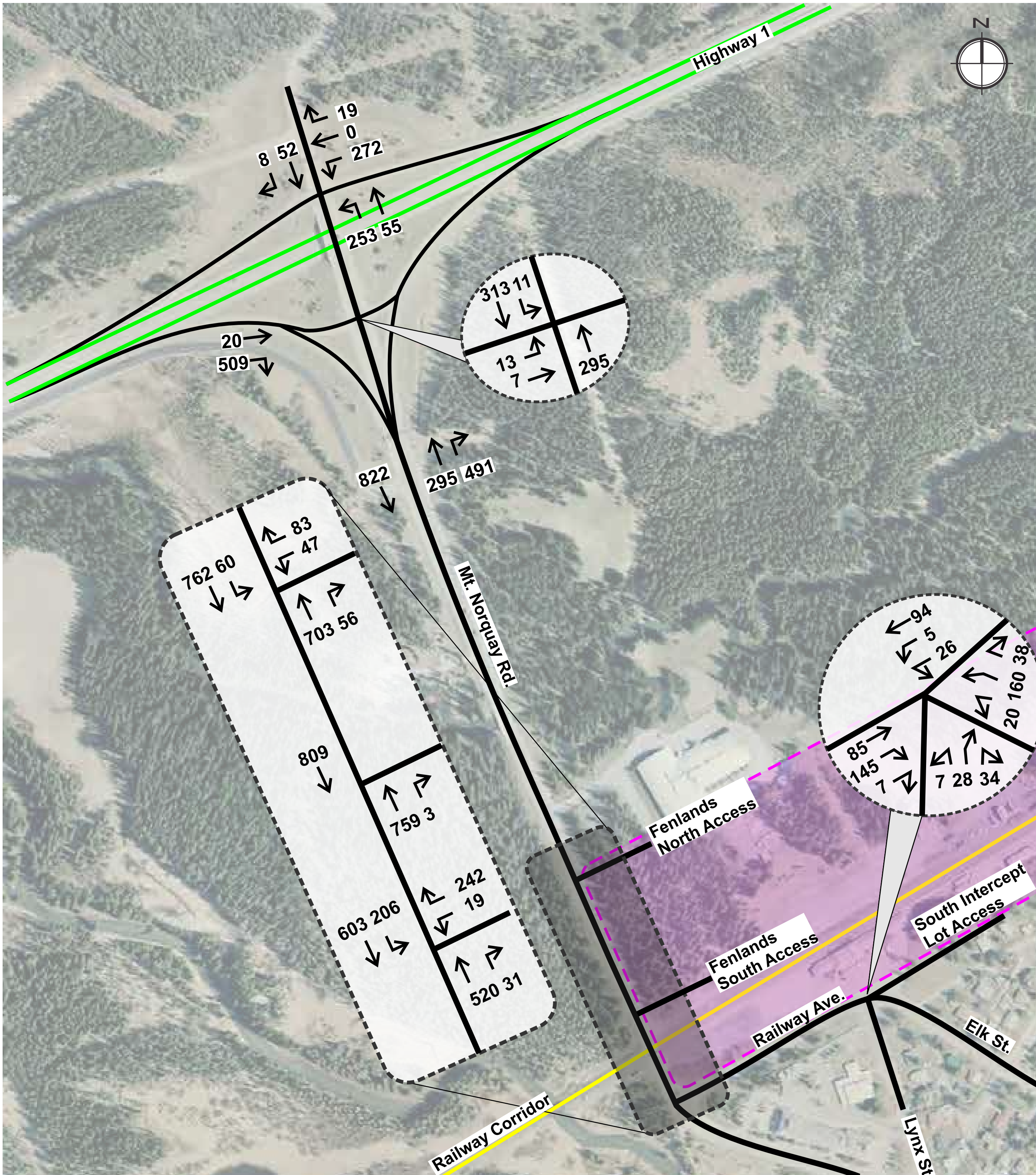

LEGEND

XX - Summer Weekend Peak Hour Traffic Volumes*

- Banff Railway Lands ARP Site

***Total Traffic Forecast includes adjustments for Rail, Pass-by & Shuttle Trips**

DRAWING: FIG-19M 004480-2029 Total Traffic Volumes (Summer) - High.cdr DATE: 2021-02-12 DRAWN BY: piperde

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Figure 11-2 - 2029 Total Traffic Forecast High Scenario

Banff Railway Lands Area Redevelopment Plan

11.2.1 2029 POST-DEVELOPMENT (HIGH) CAPACITY ANALYSIS

The 2029 “What If - High” scenario was modeled with the recommended infrastructure modifications identified in **Section 8.2**, including:

- **Mt Norquay Road & Fenlands South Access**
  - Implement a right-in only intersection for shuttles
- **Mt Norquay Road & Fenlands North Access**
  - Construct separate westbound left-turn and right-turn lanes

The capacity analysis results are summarized in **Table 11-13.** Details regarding all movements can be found in the Synchro output reports in **Appendix B.**

Table 11-13 2029 Post-Development Operating Conditions (Summer Weekend Peak Hour)

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Hwy 1 WB Ramp	B (14.0 s)	0.57	WB-L	D (28.8 s)	0.57	25 m
Mt Norquay Rd / Hwy 1 EB Ramp	A (0.5 s)	0.05	EB-LT	B (12.6 s)	0.04	1 m
Mt Norquay Rd / Fenlands Access	A (3.8 s)	0.54	WB-L	F (84.1 s)	0.54	18 m
Mt Norquay Rd / Railway Ave	D (25.8 s)	1.15	WB-LR	F (150.1 s)	1.15	95 m
Railway Ave / Elk St / Lynx St	A (1.9 s)	0.25	WB-LTR	A (3.5 s)	0.25	9 m

The capacity analysis results indicate that the overall operation all intersections will be LOS D or better under the existing priority / roundabout control during the 2029 summer weekend peak hour “What If – High” scenario. The results do not materially differ from the 2029 Post Development scenario (refer **Section 8.2.4**). It is also noted that the intersection operations slightly improve in the 2029 post-development high scenario when compared to the baseline scenario. The slight improvement in intersection operations is the result of a larger market capture (70%) which diverts additional traffic off Mt Norquay Road, therefore improving the intersection operations.

11.3 2029 POST-DEVELOPMENT WINTER

The Mount Norquay Gondola Feasibility Study indicates that the historic wintertime visitation is 140,000 skiers and 5,000 winter sight seeing visitors. The Norquay gondola is anticipated to grow to 157,500 skiers and 75,000 winter sightseeing visitors by the 2029 horizon. Utilizing a 145-day wintertime season, this equates to a historic average of 1,000 people per day and an anticipated daily visitor rate of 1,600 visitors per day in the 2029 horizon. It is recognized that the Saturday daily visitor rate will be higher than the average daily visitor rate. Utilizing daily visitor rate data provided by Mt Norquay, it is estimated that the Saturday visitor rate is 1.8 times higher than the average daily visitor rate. **Table 11-12** provides a breakdown of the 2029 wintertime visitation estimates.

Table 11-14 2029 Wintertime Visitor Projections

HORIZON	WINTER SKIERS	WINTER SIGHTSEEINGS	TOTAL
HISTORIC DATA			
Historic Visitation	140,000 skiers/season	5,000 visitors/season	145,000 visitors/season
Winter Season	145 days / season		
Average Daily Visitor Rate	965 skiers / day	35 visitors / day	1000 visitors / day
2018 / 2019 Average Saturday Number of Visitors	1,750 skiers / day	--	--
Saturday Visitor to Average Day Ratio	1.8		
2029 HORIZON			
2029 Visitor Projections	157,500 skiers/season	75,000 visitors/season	232,500 visitors/season
Winter Season	145 days / season		
2029 Projected Average Daily Visitor Rate	1,085 skiers/day	515 visitors/day	1,600 visitors/day
Saturday Skiers to Average Day Ratio	1.8		
2029 Projected Average Saturday Wintertime Visitors	1,970 skiers/day	940 visitors/day	2,910 visitors/day

According to the operators, the existing typical Saturday peak parking demand at the Mt Norquay Gondola is around 550 stalls. It is estimated that the current mode split is 90% arriving by personal vehicles (due to current location of base operations). This equates to a vehicle occupancy of 2.9 people per vehicle.

The following assumptions are used to calculate peak hour vehicle trips from daily visitors with the Gondola located on the ARP lands:

- Assume 40% of visitors leave the mountain between 3:00 and 4:00 p.m.
- Occupancy rate of 2.9 people per vehicle

- Mode Split: 57.5% passenger vehicle / 30% walking / 10% shuttle / 2.5% rail
- Internal Capture: 10%
- Pass-by: 10%
- Trips In / Trips Out Split of 15% / 85%

This equates to a total of 187 to vehicle trips (predominately leaving the site) during the winter between 3:00 and 4:00 p.m. utilizing the Norquay Gondola.

2029 HORIZON WINTERTIME PARKING DEMAND

As described above, anecdotal evidence suggests that for winter visitation, vehicle occupancy is around 2.9 people per vehicle. In the 2029 horizon, the wintertime Saturday visitation is expected to grow to 2,910 visitors, 1.66 times greater than the existing visitation. However, with the base operations being located on the ARP lands, a mode shift is anticipated, with a significant proportion of Banff residents and overnight visitors walking or taking a shuttle, and some visitation using the passenger rail. The 2029 wintertime peak daily parking demand for the Norquay Gondola was estimated by applying a mode share of 57.5% to the 2,910 visitors, yielding 1,675 visitors arriving by car; and applying a vehicle occupancy of 2.9, the resulting peak demand is 578 spaces.

As determined in **Section 7.4.3**, the parking requirements for the Heritage Rail site are 140 spaces. Based on tourism patterns in Banff, it is expected that the Heritage Rail Site will not be as busy during the winter as it is during the summer and as such, not all of the 140 parking spaces determined through application of the by-law would be occupied. As outlined in **Section 3**, winter traffic volumes on Norquay Road are less than 60% of the summer volumes. Assuming that the winter Heritage Rail parking demands are 60% of summer results in a demand for 84 spaces.

It is therefore estimated that the wintertime peak parking demand for the Banff Railway Lands ARP site would be 662 parking spaces at 2029.

The total available parking supply (including the 173 stalls for the Fenlands Recreation Centre) is 1,056 parking spaces between the North Lot and the South Lot, which leaves 394 parking spaces for the Fenlands Recreation Centre and intercept parking.

11.3.1 2029 POST-DEVELOPMENT WINTER CAPACITY ANALYSIS

The 2029 Post-development winter capacity analysis analyzed the Mt Norquay / Fenlands Access intersection during a winter Saturday afternoon, when the majority of the Mt Norquay visitors are assumed to be leaving the mountain (3:00 pm – 4:00 p.m.). To adjust the total summer Saturday weekend peak hour (**Section 7.4.5**) to a winter Saturday peak hour, the following traffic pattern modifications were assumed:

- The 2029 base northbound and southbound through volumes on Mt Norquay Road were decreased by 35%.
  - The decrease was based on comparing the 2018 average summertime Saturday peak hour volumes to the 2018 average wintertime Saturday peak hour volumes on Mt Norquay.
- The 2029 base turning movements into and out of the Fenlands Access were increased by 13%.
  - The increased was based on comparing the average summertime parking occupancy of the existing Fenlands parking lot to the average wintertime parking occupancy. The parking occupancy data showed that the Fenlands parking was busier in the wintertime, and thus it was assumed that the turning movements would be higher. No wintertime turning movement data was available at the time of this study.
- No adjustments were made to the trip generation for the Heritage Rail District (though as stated in **Section 11.3**, winter tourism sees lower visitation in Banff and so the trip projections would likely overestimate actual winter weekend trips).
- No background intercept parking was assumed for the wintertime peak.
- The Norquay gondola trips were adjusted to represent the wintertime conditions (**Section 11.3**).

The capacity analysis results for the Mt Norquay and Fenlands Access are summarized in **Table 11-15.**

Table 11-15 2029 Post-Development Winter Operating Conditions – Fenlands Access

	Overall		Critical Movement			
Intersection	LOS (Delay)	Max (v/c)	Movement	LOS (Delay)	v/c	95th % Queue
Mt Norquay Rd / Fenlands Access	A (3.8 s)	0.35	WB-L	D (33.1 s)	0.35	11 m

The capacity analysis results show that the overall intersection operation will be LOS A. The results indicate that the westbound left-turn at the Mt Norquay Road / Fenlands Access intersection will experience approximately 33 seconds of delay (LOS D) during winter Saturday peak hour, this is significantly less than during the summer peak hour. The analysis indicates this equates to approximately 2 cars in queue waiting to turn left.

12 SUMMARY AND CONCLUSION

WSP was retained by Norquay to prepare a multi-modal transportation impact assessment (TIA) to support and inform the development of the Banff Railway Lands Area Redevelopment Plan. This study considered how people currently travel and how the proposed development will influence both mode choice and route choice.

Capacity assessment has been completed for the following intersections:

- Railway Avenue / Elk Street / Lynx Street
- Mt Norquay Road / Railway Avenue
- Mt Norquay Road / Fenlands Access
- Mt Norquay Road / Highway 1 Eastbound Ramp
- Mt Norquay Road / Highway 1 Westbound Ramp

This study analyzed the future background and post-development operating conditions to identify the potential impacts and improvements required at the study intersections as a result of the additional traffic generated by the proposed development.

The analysis was carried out for three future horizons:

- 2023 horizon year: Opening Day of the development;
- 2026 horizon year: the mass passenger rail is anticipated to become operational; and,
- 2029 horizon year: ten years from the existing conditions analysis

The results of the study led to the following conclusions:

- **Existing (2019) Operating Conditions**
  - All study intersections are operating well overall, with individual movements operating at LOS D or better, with v/c ratios below 0.53. Therefore, no improvements are required to accommodate the existing traffic volumes at the study intersections.
- **2023, 2026, 2029 Pre-development Operating Conditions**
  - All study intersections are operating well overall with individual movements operating at LOS E or better with v/c ratios below 0.73.
  - No improvements are required to support the background traffic.
- **2023, 2026, 2029 Post-Development Operating Conditions**
  - The Mt Norquay Road / Highway 1 interchange intersections will remain well within capacity with individual movements operating at LOS D or better with v/c ratios below 0.57.
  - Mt Norquay Road / Fenlands Access will experience delays for vehicles exiting from the Fenlands Access. Synchro suggests delays of up to 90 seconds by 2029, however VISSIM predicts delays would be 40 seconds or less. A sensitivity analysis for the Synchro results determined that the Fenlands Access would experience delay greater than 45 s for a very small proportion of time throughout the year: approximately 7% of the time in June 28% in July, and 22% in August.
    - It is recommended that the Mt Norquay and Fenlands Access intersection is monitored, and any intersection improvements are tailored to the traffic patterns if or when needed.
  - The Synchro modeling at the Mt Norquay and Railway Avenue intersection indicates that the westbound approach may experience approximately 3 minutes of delay during the summer afternoon peak hour whilst VISSIM predicts less than 2 minutes. This was primarily caused by assumed number of pedestrians crossing Railway Avenue.

- As actual pedestrian movements may differ than what was assumed, and interactions between pedestrians and vehicles in a shared street are not able to be accurately modelled[53], it is recommended that the Mt Norquay Road / Railway Avenue intersection is monitored, and intersection improvements are tailored to the traffic patterns if or when needed.
- To accommodate pedestrians destined to and from the Banff Railways Lands ARP site, the following infrastructure modifications are recommended:
  - Construct a sidewalk on the east side of Mt Norway Road to accommodate pedestrians.
  - Convert Railway Avenue to a shared space street, with a dedicated promenade on the north side of Railway Avenue.
- The VISSIM analysis also evaluated the impact that trains crossing Mt Norquay Road would have on the study network. It was found that the vehicle queues returned to normal 15 minutes after the train has passed in the 2023 horizon, and 20 minutes in the 2029 horizon. In both scenarios, the westbound queue at Railway Avenue does not dissipate and is persistent until the end of the simulation.

- **2029 Post-Development "What If - High" Scenario**
  - These intersections operate slightly better in the 2029 post-development high scenario when compared to the baseline scenario. The slight improvement in intersection operations is the result of a larger market capture (70%) which diverts additional traffic off Mt Norquay Road, therefore improving the intersection operations.

[53] Robert Steuteville, "Shared space intersections mean less delay", Public Square A CNU Journal (February 10, 2016): https://www.cnu.org/publicsquare/shared-space-intersections-mean-less-delay

APPENDIX

A CONCEPT PLAN

APPENDIX

THIS INFORMATION IS AVAILABLE ELECTRONICALLY UPON REQUEST

APPENDIX

B

TURNING MOVEMENT COUNTS

Study Name **Banff ARP TIA**
Start Date **06/20/2017**
Start Time **7:00 AM**
Site Code **Mt Norquay & WB Ramp**

Type **Road**
Classification **Totals**

	Mt Norquay Road Southbound				Hey 1 WB Ramp Westbound				Mt Norquay Road Northbound				Hey 1 WB Ramp Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
8:00 AM	2	3	0	0	5	0	22	0	0	7	46	0	0	0	0	0
8:15 AM	2	2	0	0	2	0	20	0	0	5	57	0	0	0	0	0
8:30 AM	1	5	0	0	4	0	39	0	0	6	46	0	0	0	0	0
8:45 AM	4	3	0	0	4	0	44	0	0	8	60	0	0	0	0	0
9:00 AM	2	12	0	0	2	0	33	0	0	5	59	0	0	0	0	0
9:15 AM	1	2	0	0	2	1	43	0	0	10	77	0	0	0	0	0
9:30 AM	3	16	0	0	5	1	46	0	0	4	66	0	0	0	0	0
9:45 AM	2	10	0	0	3	0	53	0	0	5	72	0	0	0	0	0
10:00 AM	0	4	0	0	3	0	52	0	0	8	72	0	0	0	0	0
10:15 AM	5	4	0	0	4	0	57	0	0	11	60	0	0	0	0	0
10:30 AM	8	12	0	0	6	1	62	0	0	8	84	0	0	0	0	0
10:45 AM	10	11	0	0	8	1	67	0	0	13	80	0	0	0	0	0
11:00 AM	4	7	0	0	2	0	81	0	0	4	91	0	0	0	0	0
11:15 AM	3	11	0	0	3	0	78	0	0	9	63	0	0	0	0	0
11:30 AM	1	7	0	0	7	1	83	0	0	10	74	0	0	0	0	0
11:45 AM	5	7	0	0	9	0	95	0	0	8	58	0	0	0	0	0
12:00 PM	3	15	0	0	7	0	66	0	0	7	53	0	0	0	0	0
12:15 PM	7	9	0	0	4	0	89	0	0	13	82	0	0	0	0	0
12:30 PM	3	13	0	0	6	0	109	0	0	8	60	0	0	0	0	0
12:45 PM	2	17	0	0	5	0	85	0	0	12	67	0	0	0	0	0
1:00 PM	1	8	0	0	6	0	78	0	0	7	64	0	0	0	0	0
1:15 PM	7	6	0	0	7	0	78	0	0	13	62	0	0	0	0	0
1:30 PM	2	9	0	0	5	3	62	0	0	13	60	0	0	0	0	0
1:45 PM	2	8	0	0	3	0	54	0	0	16	61	0	0	0	0	0
2:00 PM	3	13	0	0	6	0	67	0	0	9	54	0	0	0	0	0
2:15 PM	0	15	0	0	4	0	43	0	0	7	60	0	0	0	0	0
2:30 PM	3	9	0	0	7	0	59	0	0	13	53	0	0	0	0	0
2:45 PM	2	14	0	0	4	0	66	0	0	17	64	0	0	0	0	0
3:00 PM	2	23	0	0	5	0	46	0	0	19	45	0	0	0	0	0
3:15 PM	1	27	0	0	6	2	44	0	0	14	51	0	0	0	0	0
3:30 PM	0	13	0	0	7	1	43	0	0	21	35	0	0	0	0	0
3:45 PM	3	10	0	0	9	0	48	0	0	15	42	0	0	0	0	0
4:00 PM	4	17	0	0	2	0	45	0	0	9	39	0	0	0	0	0
4:15 PM	3	14	0	0	2	0	41	0	0	14	49	0	0	0	0	0
4:30 PM	0	16	0	0	2	0	51	0	0	12	54	0	0	0	0	0
4:45 PM	2	10	0	0	4	0	46	0	0	12	47	0	0	0	0	0
5:00 PM	2	10	0	0	9	0	38	0	0	15	29	0	0	0	0	0
5:15 PM	1	12	0	0	4	1	38	0	0	15	47	0	0	0	0	0
5:30 PM	3	9	0	0	3	0	51	0	0	8	27	0	0	0	0	0
5:45 PM	1	17	0	0	1	0	36	0	0	21	39	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Study Name Banff Railway ARP-Town of Banff_19M0044800
Start Date 43666
Start Time 8:00 AM
Site Code Banff Railway ARP
Project 19M-00448-00

Type Road
Classification Totals

	Mt. Norquay Road Southbound				Railway Ave Westbound				Gopher St Northbound				0 Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
8:00 AM	0	32	1	0	12	0	0	0	0	61	0	0	0	0	0	0
8:15 AM	0	17	3	0	27	0	1	0	2	45	0	0	0	0	0	0
8:30 AM	0	45	3	0	24	0	1	0	2	48	0	0	0	0	0	0
8:45 AM	0	52	9	0	21	0	2	0	0	66	0	0	0	0	0	0
9:00 AM	0	51	7	0	30	0	0	0	3	59	0	0	0	0	0	0
9:15 AM	0	58	6	0	33	0	3	0	1	76	0	0	0	0	0	0
9:30 AM	0	77	5	0	31	0	0	0	2	70	0	0	0	0	0	0
9:45 AM	0	69	9	0	21	0	4	1	4	84	0	0	0	0	0	0
10:00 AM	0	78	8	0	32	0	7	0	6	92	0	0	0	0	0	0
10:15 AM	0	77	7	0	22	0	0	0	2	90	0	0	0	0	0	0
10:30 AM	0	89	8	0	26	0	2	0	2	103	0	0	0	0	0	0
10:45 AM	0	87	13	0	40	0	3	0	4	99	0	0	0	0	0	0
11:00 AM	0	109	4	0	33	0	6	0	2	90	0	0	0	0	0	0
11:15 AM	0	125	13	0	25	0	4	0	5	93	0	0	0	0	0	0
11:30 AM	0	126	17	0	30	0	3	0	5	86	0	0	0	0	0	0
11:45 AM	0	142	14	0	17	0	3	0	8	101	0	0	0	0	0	0
12:00 PM	0	111	9	0	25	0	2	0	4	99	0	0	0	0	0	0
12:15 PM	0	155	9	0	37	0	3	0	5	117	0	0	0	0	0	0
12:30 PM	0	159	17	0	23	0	1	0	5	114	0	0	0	0	0	0
12:45 PM	0	140	15	0	27	0	5	0	11	111	0	0	0	0	0	0
1:00 PM	0	136	14	0	28	0	1	0	4	106	0	0	0	0	0	0
1:15 PM	0	120	14	0	39	0	4	1	7	96	0	0	0	0	0	0
1:30 PM	0	123	9	0	27	0	7	0	5	103	0	0	0	0	0	0
1:45 PM	0	103	14	0	28	0	4	0	5	91	0	0	0	0	0	0
2:00 PM	0	121	12	0	21	0	4	0	4	100	0	0	0	0	0	0
2:15 PM	0	117	13	0	14	0	2	0	6	111	0	0	0	0	0	0
2:30 PM	0	117	16	0	28	0	4	0	6	107	0	0	0	0	0	0
2:45 PM	0	160	18	0	25	0	2	0	7	133	0	0	0	0	0	0
3:00 PM	0	112	15	0	19	0	1	0	2	121	0	0	0	0	0	0
3:15 PM	0	122	20	0	20	0	1	0	1	97	0	0	0	0	0	0
3:30 PM	0	102	17	0	27	0	1	0	6	110	0	0	0	0	0	0
3:45 PM	0	98	11	0	19	0	2	1	2	92	0	0	0	0	0	0
4:00 PM	0	93	12	0	21	0	3	0	4	106	0	0	0	0	0	0
4:15 PM	0	131	14	0	22	0	4	0	7	129	0	0	0	0	0	0
4:30 PM	0	116	17	0	26	0	2	0	2	104	0	0	0	0	0	0
4:45 PM	0	125	21	0	22	0	3	0	3	108	0	0	0	0	0	0
5:00 PM	0	83	27	0	23	0	2	0	5	88	0	0	0	0	0	0
5:15 PM	0	126	12	0	27	0	2	0	7	107	0	0	0	0	0	0
5:30 PM	0	125	18	0	25	0	0	0	2	82	0	0	0	0	0	0
5:45 PM	0	134	17	0	33	0	6	0	8	115	0	0	0	0	0	0
6:00 PM	0	105	19	0	23	0	0	0	5	110	0	0	0	0	0	0
6:15 PM	0	114	19	1	18	0	1	0	2	87	0	0	0	0	0	0
6:30 PM	0	99	25	0	13	0	4	0	2	81	0	0	0	0	0	0
6:45 PM	0	90	17	0	12	0	1	0	2	80	0	0	0	0	0	0
7:00 PM	0	81	11	0	13	0	2	0	2	73	0	0	0	0	0	0
7:15 PM	0	70	12	0	11	0	1	0	3	69	0	0	0	0	0	0
7:30 PM	0	65	11	0	20	0	2	0	3	64	0	0	0	0	0	0
7:45 PM	0	75	16	0	12	0	2	0	1	82	0	0	0	0	0	0
8:00 PM	0	75	5	0	13	0	0	0	2	76	0	0	0	0	0	0
8:15 PM	0	55	7	0	13	0	0	0	5	81	0	0	0	0	0	0
8:30 PM	0	66	13	0	17	0	0	0	1	64	0	0	0	0	0	0
8:45 PM	0	30	11	0	14	0	0	0	0	78	0	0	0	0	0	0
9:00 PM	0	30	8	0	13	0	3	0	1	69	0	0	0	0	0	0
9:15 PM	0	63	7	0	16	0	1	0	2	62	0	0	0	0	0	0
9:30 PM	0	60	6	0	9	0	2	0	2	67	0	0	0	0	0	0
9:45 PM	0	41	17	0	12	0	0	0	2	54	0	0	0	0	0	0
10:00 PM	0	54	12	0	11	0	0	0	1	41	0	0	0	0	0	0
10:15 PM	0	34	9	0	10	0	0	0	1	40	0	0	0	0	0	0

Study Name **Banff ARP TIA**
Start Date **06/20/2017**
Start Time **7:00 AM**
Site Code **Mt Norquay Road & Eastbound Ramp - Camera 1**

Type **Road**
Classification **Totals**

	Mt Norquay Road Southbound				EB Ramp Westbound				Mt Norquay Road Northbound				EB Ramp Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
8:00 AM	0	26	1	0	0	0	0	0	0	53	0	0	0	0	1	0
8:15 AM	0	20	1	0	0	0	0	0	0	62	0	0	0	0	2	0
8:30 AM	0	43	3	0	0	0	0	0	0	44	0	0	0	0	3	0
8:45 AM	0	45	0	0	0	0	0	0	0	65	0	0	0	0	1	0
9:00 AM	0	44	1	0	0	0	0	0	0	62	0	0	0	0	1	0
9:15 AM	0	44	0	0	0	0	0	0	0	82	0	0	0	0	2	0
9:30 AM	0	62	3	0	0	0	0	0	0	71	0	1	0	0	0	0
9:45 AM	0	56	2	0	0	0	0	0	0	77	0	0	0	0	0	0
10:00 AM	0	54	4	0	0	0	0	0	0	82	0	0	0	0	0	0
10:15 AM	0	60	3	0	0	0	0	0	1	68	0	0	0	0	2	0
10:30 AM	0	68	5	0	0	0	0	0	0	91	0	0	0	0	3	0
10:45 AM	0	74	3	0	0	0	0	0	0	92	0	0	0	0	0	0
11:00 AM	0	76	6	0	0	0	0	0	0	93	0	0	0	0	3	0
11:15 AM	0	90	1	0	0	0	0	0	0	76	0	0	0	0	0	0
11:30 AM	0	85	3	0	0	0	0	0	0	79	0	0	0	0	0	0
11:45 AM	0	101	2	0	0	0	0	0	0	66	0	0	0	0	1	0
12:00 PM	0	81	2	0	0	0	0	0	0	66	0	0	0	1	1	0
12:15 PM	0	97	2	0	0	0	0	0	0	92	0	0	0	1	1	0
12:30 PM	0	116	6	0	0	0	0	0	0	63	0	0	0	0	1	0
12:45 PM	0	93	7	0	0	0	0	0	0	75	0	1	0	0	0	0
1:00 PM	0	86	3	0	0	0	0	0	0	73	0	0	0	0	0	0
1:15 PM	0	81	1	0	0	0	0	0	0	75	0	0	0	0	2	0
1:30 PM	0	64	7	0	0	0	0	0	0	71	0	0	0	0	3	0
1:45 PM	0	60	1	0	0	0	0	0	0	71	0	0	0	0	2	0
2:00 PM	0	75	9	0	0	0	0	0	0	62	0	0	0	0	2	0
2:15 PM	0	51	7	0	0	0	0	0	0	62	0	0	0	0	2	0
2:30 PM	0	62	7	0	0	0	0	0	0	57	0	0	0	0	6	0
2:45 PM	0	73	7	0	0	0	0	0	1	82	0	0	0	0	1	0
3:00 PM	0	61	10	0	0	0	0	0	0	53	0	0	0	1	2	0
3:15 PM	0	63	9	0	0	0	0	0	0	61	0	0	0	0	1	0
3:30 PM	0	50	3	0	0	0	0	0	0	53	0	0	0	0	3	0
3:45 PM	0	52	8	0	0	0	0	0	0	53	0	0	0	0	0	0
4:00 PM	0	50	13	0	0	0	0	0	0	46	0	0	0	3	1	0
4:15 PM	0	48	8	0	0	0	0	0	0	62	0	1	0	0	3	0
4:30 PM	0	54	9	0	0	0	0	0	0	64	0	0	0	1	2	0
4:45 PM	0	52	3	0	0	0	0	0	0	57	0	0	0	0	1	0
5:00 PM	0	45	4	0	0	0	0	0	0	39	0	0	1	1	4	0
5:15 PM	0	45	5	0	0	0	0	0	0	63	0	0	0	0	2	0
5:30 PM	0	56	4	0	0	0	0	0	0	31	0	0	0	0	5	0
5:45 PM	0	49	3	0	0	0	0	0	0	50	0	0	0	0	5	0
6:00 PM	0	50	5	0	0	0	0	0	0	52	0	0	1	0	0	0
6:15 PM	0	52	2	0	0	0	0	0	0	30	0	0	0	0	0	0
6:30 PM	0	41	6	0	0	0	0	0	0	31	0	0	0	0	1	0
6:45 PM	0	38	3	0	0	0	0	0	0	30	0	0	0	1	2	0
7:00 PM	0	44	2	0	0	0	0	0	0	28	0	0	0	0	2	0
7:15 PM	0	30	7	0	0	0	0	0	0	24	0	0	0	0	1	0
7:30 PM	0	29	3	0	0	0	0	0	0	31	0	0	0	0	2	0
7:45 PM	0	29	5	0	0	0	0	0	0	35	0	0	0	0	2	0
8:00 PM	0	35	8	0	0	0	0	0	0	32	0	0	0	0	0	0
8:15 PM	0	23	5	0	0	0	0	0	0	28	0	0	0	1	2	0
8:30 PM	0	24	3	0	0	0	0	0	0	23	0	0	0	0	5	0
8:45 PM	0	24	4	0	0	0	0	0	0	22	0	0	1	0	1	0
9:00 PM	0	16	8	0	0	0	0	0	0	22	0	0	0	0	1	0
9:15 PM	0	26	6	0	0	0	0	0	0	16	0	0	0	1	0	0
9:30 PM	0	22	4	0	0	0	0	0	0	20	0	1	0	0	2	0
9:45 PM	0	20	5	0	0	0	0	0	0	25	0	0	0	0	0	0
10:00 PM	0	17	5	0	0	0	0	0	0	16	0	0	0	0	0	0
10:15 PM	0	13	3	0	0	0	0	0	0	16	0	0	0	0	1	0
10:30 PM	0	14	2	0	0	0	0	0	0	5	0	0	0	0	0	0

Study Name **Banff ARP TIA**
Start Date **06/20/2017**
Start Time **7:00 AM**
Site Code **Mt Norquay Road & Eastbound Ramp - Camera 2**

Type **Road**
Classification **Totals**

	Road A Southbound				Road C Westbound				Road B Northbound				Road D Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
8:00 AM	0	25	1	0	0	0	0	0	20	50	0	0	6	0	1	0
8:15 AM	0	21	1	0	0	0	0	0	11	50	0	0	6	0	1	0
8:30 AM	0	42	2	0	0	0	0	0	14	48	0	0	8	0	4	0
8:45 AM	0	47	0	0	0	0	0	0	23	59	0	0	24	0	1	0
9:00 AM	0	44	1	0	0	0	0	0	26	55	0	0	12	0	2	0
9:15 AM	0	43	0	0	0	0	0	0	20	76	0	0	20	0	2	0
9:30 AM	0	65	1	0	0	0	0	0	20	65	0	0	27	0	0	0
9:45 AM	0	63	0	0	0	0	0	0	26	68	0	0	18	0	0	0
10:00 AM	0	57	1	0	0	0	0	0	42	60	0	0	30	0	0	0
10:15 AM	0	67	1	0	0	0	0	0	38	59	0	0	28	0	2	0
10:30 AM	0	72	2	0	0	0	0	0	38	84	0	0	24	0	3	0
10:45 AM	0	70	2	0	0	0	0	0	42	75	0	0	32	0	0	0
11:00 AM	0	86	2	0	0	0	0	0	34	76	0	0	34	0	2	0
11:15 AM	0	91	1	0	0	0	0	0	39	59	0	0	53	0	0	0
11:30 AM	0	84	2	0	0	0	0	0	42	69	0	0	54	0	0	0
11:45 AM	0	109	2	0	0	0	0	0	53	52	0	0	55	0	1	0
12:00 PM	0	80	2	0	0	0	0	0	48	51	0	0	50	1	1	0
12:15 PM	0	101	0	0	0	0	0	0	73	78	0	0	61	1	1	0
12:30 PM	0	116	2	0	0	0	0	0	68	57	0	0	60	0	0	0
12:45 PM	0	107	0	0	0	0	0	0	57	65	0	0	64	0	0	0
1:00 PM	0	95	0	0	0	0	0	0	61	64	0	0	76	0	0	0
1:15 PM	0	87	1	0	0	0	0	0	44	66	0	0	59	0	2	0
1:30 PM	0	67	2	0	0	0	0	0	39	68	0	0	63	0	3	0
1:45 PM	0	62	0	0	0	0	0	0	51	68	0	0	58	0	2	0
2:00 PM	0	82	4	0	0	0	0	0	56	58	0	0	58	0	2	0
2:15 PM	0	56	0	0	0	0	0	0	50	58	0	0	92	0	2	0
2:30 PM	0	66	4	0	0	0	0	0	69	54	0	0	73	0	6	0
2:45 PM	0	79	3	0	0	0	0	0	106	66	0	0	87	0	1	0
3:00 PM	0	63	5	0	0	0	0	0	74	48	0	0	81	1	5	0
3:15 PM	0	67	4	0	0	0	0	0	77	61	0	0	65	0	1	0
3:30 PM	0	56	2	0	0	0	0	0	68	51	0	0	67	0	5	0
3:45 PM	0	56	2	0	0	0	0	0	67	47	0	0	93	0	1	0
4:00 PM	0	50	3	0	0	0	0	0	83	43	0	0	74	4	3	0
4:15 PM	0	47	5	0	0	0	0	0	103	58	0	0	81	1	3	0
4:30 PM	0	54	2	0	0	0	0	0	69	55	0	0	83	2	2	0
4:45 PM	0	56	1	0	0	0	0	0	74	53	0	0	90	1	1	0
5:00 PM	0	45	0	0	0	0	0	0	75	39	0	0	76	1	4	0
5:15 PM	0	44	0	0	0	0	0	0	70	57	0	0	82	0	2	0
5:30 PM	0	48	1	0	0	0	0	0	71	34	0	0	87	0	2	0
5:45 PM	0	39	1	0	0	0	0	0	90	48	0	0	96	0	7	0
6:00 PM	0	41	1	0	0	0	0	0	85	47	0	0	99	0	0	0
6:15 PM	0	37	2	0	0	0	0	0	75	28	0	0	77	0	0	0
6:30 PM	0	37	0	0	0	0	0	0	65	30	0	0	87	0	3	0
6:45 PM	0	38	1	0	0	0	0	0	62	31	0	0	60	1	3	0
7:00 PM	0	32	0	0	0	0	0	0	63	26	0	0	59	0	2	0
7:15 PM	0	22	2	0	0	0	0	0	56	24	0	0	61	0	1	0
7:30 PM	0	23	1	0	0	0	0	0	53	28	0	0	43	0	3	0
7:45 PM	0	24	2	0	0	0	0	0	58	31	0	0	58	0	4	0
8:00 PM	0	31	5	0	0	0	0	0	58	32	0	0	46	0	1	0
8:15 PM	0	21	1	0	0	0	0	0	63	25	0	0	54	1	3	0
8:30 PM	0	28	0	0	0	0	0	0	53	26	0	0	41	0	5	0
8:45 PM	0	23	2	0	0	0	0	0	70	21	0	0	49	0	5	0
9:00 PM	0	13	6	0	0	0	0	0	62	20	0	0	22	0	3	0
9:15 PM	0	19	6	0	0	0	0	0	53	17	0	0	48	1	0	0
9:30 PM	0	23	4	0	0	0	0	0	58	20	0	1	35	0	1	0
9:45 PM	0	25	3	0	0	0	0	0	46	23	0	0	32	0	0	0
10:00 PM	0	16	4	0	0	0	0	0	44	16	0	0	40	0	1	0
10:15 PM	0	13	1	0	0	0	0	0	37	17	0	0	25	1	1	0
10:30 PM	0	14	1	0	0	0	0	0	33	6	0	0	22	0	0	0

Study Name **Banff Railway ARP-Town of Banff_19M0044800**
Start Date **07/13/2019**
Start Time **9:00 AM**
Site Code **Banff Railway ARP**
Project **19M-00448-00**

Type **Road**
Classification **Totals**

	Mt Norquay Rd Southbound				Parking lot Access Westbound				Mt Norquay Rd Northbound				0 Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
9:00 AM	0	62	2	0	3	0	4	0	3	140	0	0	0	0	0	0
9:15 AM	0	66	3	0	2	0	1	0	4	136	0	0	0	0	0	0
9:30 AM	0	90	4	0	3	0	2	0	5	114	0	0	0	0	0	0
9:45 AM	0	86	11	0	4	0	8	0	2	113	0	0	0	0	0	0
10:00 AM	0	101	7	0	2	0	3	0	4	128	0	0	0	0	0	0
10:15 AM	0	94	0	0	2	0	5	0	4	130	0	0	0	0	0	0
10:30 AM	0	86	7	0	6	0	5	0	9	131	0	0	0	0	0	0
10:45 AM	0	117	7	0	0	0	8	0	5	123	0	0	0	0	0	0
11:00 AM	0	148	10	0	2	0	6	0	4	105	0	0	0	0	0	0
11:15 AM	0	131	0	0	1	0	2	0	4	130	0	0	0	0	0	0
11:30 AM	0	140	6	0	5	0	5	0	3	120	0	0	0	0	0	0
11:45 AM	0	154	12	0	2	0	2	0	8	111	0	0	0	0	0	0
12:00 PM	0	144	5	0	2	0	9	0	3	127	0	0	0	0	0	0
12:15 PM	0	117	11	0	5	0	9	0	6	97	0	0	0	0	0	0
12:30 PM	0	115	8	0	6	0	5	0	6	82	0	0	0	0	0	0
12:45 PM	0	157	5	0	5	0	4	0	5	137	0	0	0	0	0	0
1:00 PM	0	155	10	0	4	0	3	0	4	102	0	0	0	0	0	0
1:15 PM	0	146	9	0	5	0	2	0	4	125	0	0	0	0	0	0
1:30 PM	0	159	6	0	2	0	5	0	11	128	0	0	0	0	0	0
1:45 PM	0	130	7	0	7	0	4	0	9	120	0	0	0	0	0	0
2:00 PM	0	156	9	0	8	0	4	0	8	135	0	0	0	0	0	0
2:15 PM	0	172	7	0	10	0	2	0	4	146	0	0	0	0	0	0
2:30 PM	0	140	5	0	3	0	12	0	9	112	0	0	0	0	0	0
2:45 PM	0	203	2	0	4	0	3	0	7	143	0	0	0	0	0	0
3:00 PM	0	157	4	0	5	0	4	0	4	139	0	0	0	0	0	0
3:15 PM	0	178	4	0	4	0	8	0	3	131	0	0	0	0	0	0
3:30 PM	0	128	10	0	9	0	7	0	4	108	0	0	0	0	0	0
3:45 PM	0	141	0	0	8	0	1	0	6	161	0	0	0	0	0	0
4:00 PM	0	181	9	0	11	0	9	0	11	131	0	0	0	0	0	0
4:15 PM	0	169	6	0	5	0	7	0	13	130	0	0	0	0	0	0
4:30 PM	0	133	0	0	15	0	6	0	4	102	0	0	0	0	0	0
4:45 PM	0	129	4	0	3	0	5	0	17	160	0	0	0	0	0	0
5:00 PM	0	185	7	0	4	0	8	0	6	136	0	0	0	0	0	0
5:15 PM	0	175	2	0	12	0	8	0	8	149	0	0	0	0	0	0
5:30 PM	0	180	2	0	5	0	5	0	7	158	0	0	0	0	0	0
5:45 PM	0	41	1	0	8	0	1	0	0	53	0	0	0	0	0	0
6:00 PM	0	189	2	0	4	0	8	0	9	200	0	0	0	0	0	0
6:15 PM	0	167	4	0	4	0	6	0	5	131	0	0	0	0	0	0
6:30 PM	0	131	3	0	3	0	9	0	4	122	0	0	0	0	0	0
6:45 PM	0	130	2	0	3	0	4	0	4	110	0	0	0	0	0	0
7:00 PM	0	111	2	0	7	0	3	0	4	123	0	0	0	0	0	0
7:15 PM	0	110	1	0	2	0	1	0	2	109	0	0	0	0	0	0
7:30 PM	0	100	3	0	5	0	5	0	6	107	0	0	0	0	0	0
7:45 PM	0	90	0	0	4	0	1	0	3	86	0	0	0	0	0	0
8:00 PM	0	77	1	0	5	0	3	0	3	102	0	0	0	0	0	0
8:15 PM	0	82	2	0	4	0	3	0	5	51	0	0	0	0	0	0
8:30 PM	0	56	0	0	4	0	2	0	4	132	0	0	0	0	0	0
8:45 PM	0	63	0	0	3	0	1	0	6	109	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Study Name Banff Railway ARP-Town of Banff_19M0044800
Start Date 07/27/2019
Start Time 9:00 AM
Site Code Banff Railway ARP
Project 19M-00448-00

Type Road
Classification Totals

	Mt Norquay Rd Southbound				Parking lot Access Westbound				Mt Norquay Rd Northbound				0 Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
9:00 AM	0	74	4	0	0	0	3	0	2	120	0	0	0	0	0	0
9:15 AM	0	68	4	0	0	0	3	0	4	124	0	0	0	0	0	0
9:30 AM	0	60	4	0	1	0	3	0	2	122	0	0	0	0	0	0
9:45 AM	0	83	4	0	3	0	1	0	5	101	0	0	0	0	0	0
10:00 AM	0	79	10	0	6	0	4	0	4	111	0	0	0	0	0	0
10:15 AM	0	78	4	0	4	0	5	0	4	125	0	0	0	0	0	0
10:30 AM	0	102	5	0	2	0	3	0	5	112	0	0	0	0	0	0
10:45 AM	0	109	8	0	5	0	8	0	2	136	0	0	0	0	0	0
11:00 AM	0	95	4	0	3	0	4	0	5	132	0	0	0	0	0	0
11:15 AM	0	128	4	0	1	0	6	0	6	110	0	0	0	0	0	0
11:30 AM	0	135	5	0	5	0	2	0	2	127	0	0	0	0	0	0
11:45 AM	0	126	8	0	7	0	1	0	3	113	0	0	0	0	0	0
12:00 PM	0	139	6	0	6	0	7	0	5	138	0	0	0	0	0	0
12:15 PM	0	151	2	0	4	0	4	0	3	121	0	0	0	0	0	0
12:30 PM	0	163	7	0	3	0	2	0	3	108	0	0	0	0	0	0
12:45 PM	0	151	7	0	2	0	14	0	5	110	0	0	0	0	0	0
1:00 PM	0	177	3	0	1	0	3	0	5	103	0	0	0	0	0	0
1:15 PM	0	190	9	0	2	0	7	0	5	149	0	0	0	0	0	0
1:30 PM	0	165	7	0	5	0	1	0	9	140	0	0	0	0	0	0
1:45 PM	0	168	11	0	7	0	4	0	8	103	0	0	0	0	0	0
2:00 PM	0	113	13	0	3	0	5	0	5	107	0	0	0	0	0	0
2:15 PM	0	103	10	0	5	0	2	0	6	125	0	0	0	0	0	0
2:30 PM	0	171	17	0	5	0	4	0	6	147	0	0	0	0	0	0
2:45 PM	0	130	8	0	3	0	7	0	8	94	0	0	0	0	0	0
3:00 PM	0	182	5	0	11	0	5	0	9	169	0	0	0	0	0	0
3:15 PM	0	193	10	0	5	0	10	0	6	134	0	0	0	0	0	0
3:30 PM	0	158	13	0	18	0	6	0	7	157	0	0	0	0	0	0
3:45 PM	0	174	5	0	10	0	7	0	5	145	0	0	0	0	0	0
4:00 PM	0	172	4	0	8	0	3	0	3	164	0	0	0	0	0	0
4:15 PM	0	153	8	0	8	0	5	0	5	129	0	0	0	0	0	0
4:30 PM	0	163	4	0	13	0	7	0	9	174	0	0	0	0	0	0
4:45 PM	0	153	2	0	11	0	2	0	8	132	0	0	0	0	0	0
5:00 PM	0	180	9	0	12	0	3	0	6	204	0	0	0	0	0	0
5:15 PM	0	172	5	0	16	0	9	0	4	153	0	0	0	0	0	0
5:30 PM	0	181	6	0	5	0	9	0	2	147	0	0	0	0	0	0
5:45 PM	0	152	2	0	11	0	0	0	5	119	0	0	0	0	0	0
6:00 PM	0	128	3	0	5	0	3	0	5	137	0	0	0	0	0	0
6:15 PM	0	158	4	0	8	0	5	0	8	144	0	0	0	0	0	0
6:30 PM	0	158	2	0	6	0	6	0	3	140	0	0	0	0	0	0
6:45 PM	0	134	0	0	7	0	7	0	2	131	0	0	0	0	0	0
7:00 PM	0	71	0	0	4	0	2	0	3	81	0	0	0	0	0	0
7:15 PM	0	122	1	0	9	0	2	0	5	144	0	0	0	0	0	0
7:30 PM	0	106	3	0	8	0	12	0	4	115	0	0	0	0	0	0
7:45 PM	0	82	2	0	19	0	8	0	2	107	0	0	0	0	0	0
8:00 PM	0	83	2	0	14	0	7	0	5	105	0	0	0	0	0	0
8:15 PM	0	57	2	0	7	0	12	0	2	101	0	0	0	0	0	0
8:30 PM	0	72	2	0	2	0	7	0	0	86	0	0	0	0	0	0
8:45 PM	0	73	5	0	6	0	2	0	1	95	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX

C SYNCHRO REPORTS

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	109	6	17	123	10	6	23	29	3	3	22
Future Vol, veh/h	8	109	6	17	123	10	6	23	29	3	3	22
Conflicting Peds, #/hr	20	0	15	15	0	20	20	0	20	20	0	20
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	13	22	1	0	13	10	1	1	1	1	1	1
Mvmt Flow	9	127	7	20	143	12	7	27	34	3	3	26

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	175	0	0	149	0	0	388	379	166	408	376	189
Stage 1	-	-	-	-	-	-	164	164	-	209	209	-
Stage 2	-	-	-	-	-	-	224	215	-	199	167	-
Critical Hdwy	4.23	-	-	4.1	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.317	-	-	2.2	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1338	-	-	1445	-	-	573	555	881	555	557	855
Stage 1	-	-	-	-	-	-	840	764	-	795	731	-
Stage 2	-	-	-	-	-	-	781	727	-	805	762	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1315	-	-	1427	-	-	527	527	855	487	529	826
Mov Cap-2 Maneuver	-	-	-	-	-	-	527	527	-	487	529	-
Stage 1	-	-	-	-	-	-	823	749	-	776	708	-
Stage 2	-	-	-	-	-	-	729	704	-	728	747	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.9	11.2	10.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	652	1315	-	-	1427	-	-	728
HCM Lane V/C Ratio	0.103	0.007	-	-	0.014	-	-	0.045
HCM Control Delay (s)	11.2	7.8	0	-	7.6	0	-	10.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	141	525	20	103	590
Future Vol, veh/h	10	141	525	20	103	590
Conflicting Peds, #/hr	45	0	0	75	75	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	11	3	0	24	2
Mvmt Flow	11	160	597	23	117	670

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1621	672	0	0	695	0
Stage 1	672	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	6.5	6.31	-	-	4.34	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.399	-	-	2.416	-
Pot Cap-1 Maneuver	108	440	-	-	807	-
Stage 1	493	-	-	-	-	-
Stage 2	364	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	82	412	-	-	756	-
Mov Cap-2 Maneuver	82	-	-	-	-	-
Stage 1	390	-	-	-	-	-
Stage 2	350	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.8	0	1.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	325	756	-
HCM Lane V/C Ratio	-	-	0.528	0.155	-
HCM Control Delay (s)	-	-	27.8	10.6	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	2.9	0.5	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	38	633	33	18	669
Future Vol, veh/h	24	38	633	33	18	669
Conflicting Peds, #/hr	0	154	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	4	11	5	3	17	6
Mvmt Flow	27	43	719	38	20	760

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1538	892	0	0	757	0
Stage 1	738	-	-	-	-	-
Stage 2	800	-	-	-	-	-
Critical Hdwy	6.44	6.31	-	-	4.27	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.399	-	-	2.353	-
Pot Cap-1 Maneuver	126	328	-	-	790	-
Stage 1	469	-	-	-	-	-
Stage 2	439	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	123	285	-	-	790	-
Mov Cap-2 Maneuver	123	-	-	-	-	-
Stage 1	457	-	-	-	-	-
Stage 2	439	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.9	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	189	790	-
HCM Lane V/C Ratio	-	-	0.373	0.026	-
HCM Control Delay (s)	-	-	34.9	9.7	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	1.6	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	6	0	0	0	0	0	262	0	10	273	0
Future Vol, veh/h	12	6	0	0	0	0	0	262	0	10	273	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	7	0	0	0	0	0	298	0	11	310	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	481	630	-	-	0	-	298	0	0
Stage 1	332	332	-	-	-	-	-	-	-
Stage 2	149	298	-	-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-	-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-	-	-	-	2.2	-	-
Pot Cap-1 Maneuver	519	311	0	0	-	0	1275	-	0
Stage 1	705	537	0	0	-	0	-	-	0
Stage 2	869	559	0	0	-	0	-	-	0
Platoon blocked, %					-			-	
Mov Cap-1 Maneuver	514	0	-	-	-	-	1275	-	-
Mov Cap-2 Maneuver	514	0	-	-	-	-	-	-	-
Stage 1	698	0	-	-	-	-	-	-	-
Stage 2	869	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.3	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	514	1275	-
HCM Lane V/C Ratio	-	0.04	0.009	-
HCM Control Delay (s)	-	12.3	7.8	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	221	0	21	211	63	0	0	63	9
Future Vol, veh/h	0	0	0	221	0	21	211	63	0	0	63	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	6	0	0	5	2	0	0	2	0
Mvmt Flow	0	0	0	248	0	24	237	71	0	0	71	10

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				621	626	36	81	0	-	-	-	0
Stage 1				545	545	-	-	-	-	-	-	-
Stage 2				76	81	-	-	-	-	-	-	-
Critical Hdwy				6.69	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1				5.89	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.49	5.5	-	-	-	-	-	-	-
Follow-up Hdwy				3.557	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver				427	403	1035	1495	-	0	0	-	-
Stage 1				537	522	-	-	-	0	0	-	-
Stage 2				936	832	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				357	0	1035	1495	-	-	-	-	-
Mov Cap-2 Maneuver				357	0	-	-	-	-	-	-	-
Stage 1				448	0	-	-	-	-	-	-	-
Stage 2				936	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.8	6.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1495	-	357	418	-	-
HCM Lane V/C Ratio	0.159	-	0.464	0.254	-	-
HCM Control Delay (s)	7.9	0.1	23.5	16.5	-	-
HCM Lane LOS	A	A	C	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.4	1	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	178	535	21	143	598
Future Vol, veh/h	11	178	535	21	143	598
Conflicting Peds, #/hr	45	0	0	80	80	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	9	9	3	0	17	2
Mvmt Flow	12	187	563	22	151	629

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1619	643	0	0	665	0
Stage 1	643	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Critical Hdwy	6.49	6.29	-	-	4.27	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	-	-	2.353	-
Pot Cap-1 Maneuver	109	461	-	-	857	-
Stage 1	510	-	-	-	-	-
Stage 2	355	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	79	430	-	-	799	-
Mov Cap-2 Maneuver	79	-	-	-	-	-
Stage 1	386	-	-	-	-	-
Stage 2	342	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.2	0	2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	342	799	-
HCM Lane V/C Ratio	-	-	0.582	0.188	-
HCM Control Delay (s)	-	-	29.2	10.5	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	3.5	0.7	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	41	677	35	19	716
Future Vol, veh/h	26	41	677	35	19	716
Conflicting Peds, #/hr	0	155	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	9	5	3	16	5
Mvmt Flow	27	43	713	37	20	754

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1526	887	0	0	750	0
Stage 1	732	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Critical Hdwy	6.44	6.29	-	-	4.26	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.381	-	-	2.344	-
Pot Cap-1 Maneuver	128	333	-	-	799	-
Stage 1	472	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	125	289	-	-	799	-
Mov Cap-2 Maneuver	125	-	-	-	-	-
Stage 1	460	-	-	-	-	-
Stage 2	442	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.2	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	192	799	-
HCM Lane V/C Ratio	-	-	0.367	0.025	-
HCM Control Delay (s)	-	-	34.2	9.6	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	1.6	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	6	0	0	0	0	0	280	0	11	292	0
Future Vol, veh/h	13	6	0	0	0	0	0	280	0	11	292	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	6	0	0	0	0	0	295	0	12	307	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	479	626	-				-	0	-	295	0	0
Stage 1	331	331	-				-	-	-	-	-	-
Stage 2	148	295	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	521	313	0				0	-	0	1278	-	0
Stage 1	706	537	0				0	-	0	-	-	0
Stage 2	870	562	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	515	0	-				-	-	-	1278	-	-
Mov Cap-2 Maneuver	515	0	-				-	-	-	-	-	-
Stage 1	698	0	-				-	-	-	-	-	-
Stage 2	870	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.3	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	515	1278	-
HCM Lane V/C Ratio	-	0.039	0.009	-
HCM Control Delay (s)	-	12.3	7.8	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	236	0	22	226	67	0	0	67	10
Future Vol, veh/h	0	0	0	236	0	22	226	67	0	0	67	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	248	0	23	238	71	0	0	71	11

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	624	629	36	82	0	-	-	-	0
Stage 1	547	547	-	-	-	-	-	-	-
Stage 2	77	82	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	427	402	1035	1494	-	0	0	-	-
Stage 1	538	521	-	-	-	0	0	-	-
Stage 2	937	831	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	356	0	1035	1494	-	-	-	-	-
Mov Cap-2 Maneuver	356	0	-	-	-	-	-	-	-
Stage 1	449	0	-	-	-	-	-	-	-
Stage 2	937	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.9	6.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1494	-	356	416	-	-
HCM Lane V/C Ratio	0.159	-	0.465	0.255	-	-
HCM Control Delay (s)	7.9	0.1	23.6	16.6	-	-
HCM Lane LOS	A	A	C	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.4	1	-	-

Intersection	
Int Delay, s/veh	5.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	187	545	23	150	623
Future Vol, veh/h	11	187	545	23	150	623
Conflicting Peds, #/hr	51	0	0	84	84	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	9	9	3	0	17	2
Mvmt Flow	12	197	574	24	158	656

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1681	658	0	0	682	0
Stage 1	658	-	-	-	-	-
Stage 2	1023	-	-	-	-	-
Critical Hdwy	6.49	6.29	-	-	4.27	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	-	-	2.353	-
Pot Cap-1 Maneuver	100	452	-	-	844	-
Stage 1	502	-	-	-	-	-
Stage 2	337	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	71	420	-	-	784	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	372	-	-	-	-	-
Stage 2	323	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	32.9		0		2.1	
HCM LOS	D					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	330	784	-
HCM Lane V/C Ratio	-	-	0.632	0.201	-
HCM Control Delay (s)	-	-	32.9	10.7	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	4.1	0.7	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	43	695	37	20	746
Future Vol, veh/h	27	43	695	37	20	746
Conflicting Peds, #/hr	0	155	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	9	4	3	15	5
Mvmt Flow	28	45	732	39	21	785

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1579	907	0	0	771	0
Stage 1	752	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Critical Hdwy	6.44	6.29	-	-	4.25	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.381	-	-	2.335	-
Pot Cap-1 Maneuver	119	324	-	-	788	-
Stage 1	462	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	116	281	-	-	788	-
Mov Cap-2 Maneuver	116	-	-	-	-	-
Stage 1	450	-	-	-	-	-
Stage 2	426	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.9	0	0.3
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	181	788	-
HCM Lane V/C Ratio	-	-	0.407	0.027	-
HCM Control Delay (s)	-	-	37.9	9.7	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	1.8	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	7	0	0	0	0	0	290	0	11	305	0
Future Vol, veh/h	14	7	0	0	0	0	0	290	0	11	305	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	15	7	0	0	0	0	0	305	0	12	321	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	498	650	-				-	0	-	305	0	0
Stage 1	345	345	-				-	-	-	-	-	-
Stage 2	153	305	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	507	302	0				0	-	0	1267	-	0
Stage 1	694	528	0				0	-	0	-	-	0
Stage 2	865	555	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	501	0	-				-	-	-	1267	-	-
Mov Cap-2 Maneuver	501	0	-				-	-	-	-	-	-
Stage 1	686	0	-				-	-	-	-	-	-
Stage 2	865	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	501	1267	-
HCM Lane V/C Ratio	-	0.044	0.009	-
HCM Control Delay (s)	-	12.5	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	246	0	24	233	71	0	0	70	10
Future Vol, veh/h	0	0	0	246	0	24	233	71	0	0	70	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	259	0	25	245	75	0	0	74	11

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	645	650	38	85	0	-	-	-	0
Stage 1	565	565	-	-	-	-	-	-	-
Stage 2	80	85	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	415	391	1032	1490	-	0	0	-	-
Stage 1	526	511	-	-	-	0	0	-	-
Stage 2	934	828	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	344	0	1032	1490	-	-	-	-	-
Mov Cap-2 Maneuver	344	0	-	-	-	-	-	-	-
Stage 1	436	0	-	-	-	-	-	-	-
Stage 2	934	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.3	6.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1490	-	344	405	-	-
HCM Lane V/C Ratio	0.165	-	0.502	0.276	-	-
HCM Control Delay (s)	7.9	0.1	25.6	17.2	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.7	1.1	-	-

Intersection	
Int Delay, s/veh	6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	200	565	24	162	652
Future Vol, veh/h	12	200	565	24	162	652
Conflicting Peds, #/hr	53	0	0	89	89	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	8	8	3	0	15	2
Mvmt Flow	13	211	595	25	171	686

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1765	684	0	0	709	0
Stage 1	684	-	-	-	-	-
Stage 2	1081	-	-	-	-	-
Critical Hdwy	6.48	6.28	-	-	4.25	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	-	-	2.335	-
Pot Cap-1 Maneuver	89	438	-	-	833	-
Stage 1	490	-	-	-	-	-
Stage 2	317	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	61	405	-	-	770	-
Mov Cap-2 Maneuver	61	-	-	-	-	-
Stage 1	353	-	-	-	-	-
Stage 2	303	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	42.5	0	2.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	307	770	-
HCM Lane V/C Ratio	-	-	0.727	0.221	-
HCM Control Delay (s)	-	-	42.5	11	-
HCM Lane LOS	-	-	E	B	-
HCM 95th %tile Q(veh)	-	-	5.3	0.8	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	45	726	39	21	785
Future Vol, veh/h	28	45	726	39	21	785
Conflicting Peds, #/hr	0	155	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	9	5	3	14	5
Mvmt Flow	29	47	764	41	22	826

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1655	940	0	0	805	0
Stage 1	785	-	-	-	-	-
Stage 2	870	-	-	-	-	-
Critical Hdwy	6.44	6.29	-	-	4.24	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.381	-	-	2.326	-
Pot Cap-1 Maneuver	107	310	-	-	769	-
Stage 1	446	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	104	269	-	-	769	-
Mov Cap-2 Maneuver	104	-	-	-	-	-
Stage 1	433	-	-	-	-	-
Stage 2	407	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	43.7	0	0.3
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	167	769	-
HCM Lane V/C Ratio	-	-	0.46	0.029	-
HCM Control Delay (s)	-	-	43.7	9.8	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	2.1	0.1	-

Intersection												
Int Delay, s/veh	0.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	7	0	0	0	0	0	302	0	12	321	0
Future Vol, veh/h	14	7	0	0	0	0	0	302	0	12	321	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	15	7	0	0	0	0	0	318	0	13	338	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	523	682	-				-	0	-	318	0	0
Stage 1	364	364	-				-	-	-	-	-	-
Stage 2	159	318	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	489	287	0				0	-	0	1253	-	0
Stage 1	679	516	0				0	-	0	-	-	0
Stage 2	859	546	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	483	0	-				-	-	-	1253	-	-
Mov Cap-2 Maneuver	483	0	-				-	-	-	-	-	-
Stage 1	670	0	-				-	-	-	-	-	-
Stage 2	859	0	-				-	-	-	-	-	-

Approach	EB						NB			SB		
HCM Control Delay, s	12.8						0			0.3		
HCM LOS	B											

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	483	1253	-
HCM Lane V/C Ratio	-	0.046	0.01	-
HCM Control Delay (s)	-	12.8	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	13.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	260	0	25	242	74	0	0	73	11
Future Vol, veh/h	0	0	0	260	0	25	242	74	0	0	73	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	274	0	26	255	78	0	0	77	12

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	671	677	39	89	0	-	-	-	0
Stage 1	588	588	-	-	-	-	-	-	-
Stage 2	83	89	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	400	377	1031	1485	-	0	0	-	-
Stage 1	512	499	-	-	-	0	0	-	-
Stage 2	932	825	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	328	0	1031	1485	-	-	-	-	-
Mov Cap-2 Maneuver	328	0	-	-	-	-	-	-	-
Stage 1	420	0	-	-	-	-	-	-	-
Stage 2	932	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.7	6.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1485	-	328	387	-	-
HCM Lane V/C Ratio	0.172	-	0.556	0.304	-	-
HCM Control Delay (s)	7.9	0.1	28.9	18.3	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.6	-	3.2	1.3	-	-

Intersection						
Int Delay, s/veh	17.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	226	495	30	187	558
Future Vol, veh/h	19	226	495	30	187	558
Conflicting Peds, #/hr	48	0	0	182	182	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	125	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	8	4	0	13	3
Mvmt Flow	20	238	521	32	197	587

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1732	703	0	0	735	0
Stage 1	703	-	-	-	-	-
Stage 2	1029	-	-	-	-	-
Critical Hdwy	6.4	6.28	-	-	4.23	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.372	-	-	2.317	-
Pot Cap-1 Maneuver	98	428	-	-	822	-
Stage 1	495	-	-	-	-	-
Stage 2	348	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	57	362	-	-	695	-
Mov Cap-2 Maneuver	57	-	-	-	-	-
Stage 1	300	-	-	-	-	-
Stage 2	334	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	100.6	0	3.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	256	695	-
HCM Lane V/C Ratio	-	-	1.007	0.283	-
HCM Control Delay (s)	-	-	100.6	12.2	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	10	1.2	-

Intersection						
Int Delay, s/veh	2.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	42	62	667	51	43	703
Future Vol, veh/h	42	62	667	51	43	703
Conflicting Peds, #/hr	0	160	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	7	6	5	0	9	5
Mvmt Flow	44	65	702	54	45	740

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1559	889	0	0	756	0
Stage 1	729	-	-	-	-	-
Stage 2	830	-	-	-	-	-
Critical Hdwy	6.47	6.26	-	-	4.19	-
Critical Hdwy Stg 1	5.47	-	-	-	-	-
Critical Hdwy Stg 2	5.47	-	-	-	-	-
Follow-up Hdwy	3.563	3.354	-	-	2.281	-
Pot Cap-1 Maneuver	120	336	-	-	824	-
Stage 1	469	-	-	-	-	-
Stage 2	420	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	113	290	-	-	824	-
Mov Cap-2 Maneuver	113	-	-	-	-	-
Stage 1	443	-	-	-	-	-
Stage 2	420	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	35.1	0	0.6
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	113	290	824	-
HCM Lane V/C Ratio	-	-	0.391	0.225	0.055	-
HCM Control Delay (s)	-	-	56	21	9.6	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	1.6	0.8	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	6	0	0	0	0	0	272	0	10	283	0
Future Vol, veh/h	12	6	0	0	0	0	0	272	0	10	283	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	13	6	0	0	0	0	0	286	0	11	298	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	463	606	-				-	0	-	286	0	0
Stage 1	320	320	-				-	-	-	-	-	-
Stage 2	143	286	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	533	323	0				0	-	0	1288	-	0
Stage 1	715	545	0				0	-	0	-	-	0
Stage 2	875	568	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	528	0	-				-	-	-	1288	-	-
Mov Cap-2 Maneuver	528	0	-				-	-	-	-	-	-
Stage 1	708	0	-				-	-	-	-	-	-
Stage 2	875	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	528	1288	-
HCM Lane V/C Ratio	-	0.036	0.008	-
HCM Control Delay (s)	-	12.1	7.8	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	12.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	248	0	16	236	48	0	0	45	7
Future Vol, veh/h	0	0	0	248	0	16	236	48	0	0	45	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	261	0	17	248	51	0	0	47	7

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				598	601	26	54	0	-	-	-	0
Stage 1				547	547	-	-	-	-	-	-	-
Stage 2				51	54	-	-	-	-	-	-	-
Critical Hdwy				6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1				5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy				3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver				443	417	1050	1530	-	0	0	-	-
Stage 1				538	521	-	-	-	0	0	-	-
Stage 2				963	854	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				369	0	1050	1530	-	-	-	-	-
Mov Cap-2 Maneuver				369	0	-	-	-	-	-	-	-
Stage 1				448	0	-	-	-	-	-	-	-
Stage 2				963	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.8	6.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1530	-	369	412	-	-
HCM Lane V/C Ratio	0.162	-	0.472	0.252	-	-
HCM Control Delay (s)	7.8	0.1	23.2	16.7	-	-
HCM Lane LOS	A	A	C	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.4	1	-	-

Intersection	
Int Delay, s/veh	19.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	236	510	31	196	589
Future Vol, veh/h	19	236	510	31	196	589
Conflicting Peds, #/hr	51	0	0	165	165	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	8	4	0	13	3
Mvmt Flow	20	248	537	33	206	620

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1785	702	0	0	735	0
Stage 1	702	-	-	-	-	-
Stage 2	1083	-	-	-	-	-
Critical Hdwy	6.4	6.28	-	-	4.23	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.372	-	-	2.317	-
Pot Cap-1 Maneuver	91	428	-	-	822	-
Stage 1	495	-	-	-	-	-
Stage 2	328	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	53	368	-	-	707	-
Mov Cap-2 Maneuver	53	-	-	-	-	-
Stage 1	302	-	-	-	-	-
Stage 2	314	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	113.6		0		3	
HCM LOS	F					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	255	707	-
HCM Lane V/C Ratio	-	-	1.053	0.292	-
HCM Control Delay (s)	-	-	113.6	12.2	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	10.9	1.2	-

Intersection						
Int Delay, s/veh	2.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	42	65	691	52	45	743
Future Vol, veh/h	42	65	691	52	45	743
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	7	6	5	0	9	5
Mvmt Flow	44	68	727	55	47	782

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1631	920	0	0	782	0
Stage 1	755	-	-	-	-	-
Stage 2	876	-	-	-	-	-
Critical Hdwy	6.47	6.26	-	-	4.19	-
Critical Hdwy Stg 1	5.47	-	-	-	-	-
Critical Hdwy Stg 2	5.47	-	-	-	-	-
Follow-up Hdwy	3.563	3.354	-	-	2.281	-
Pot Cap-1 Maneuver	109	323	-	-	805	-
Stage 1	455	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	103	278	-	-	805	-
Mov Cap-2 Maneuver	103	-	-	-	-	-
Stage 1	429	-	-	-	-	-
Stage 2	399	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	38.5	0	0.6
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	103	278	805	-
HCM Lane V/C Ratio	-	-	0.429	0.246	0.059	-
HCM Control Delay (s)	-	-	64	22.1	9.8	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	1.8	0.9	0.2	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	7	0	0	0	0	0	284	0	10	302	0
Future Vol, veh/h	13	7	0	0	0	0	0	284	0	10	302	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	7	0	0	0	0	0	299	0	11	318	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	490	639	-				-	0	-	299	0	0
Stage 1	340	340	-				-	-	-	-	-	-
Stage 2	150	299	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	512	307	0				0	-	0	1274	-	0
Stage 1	698	532	0				0	-	0	-	-	0
Stage 2	868	559	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	507	0	-				-	-	-	1274	-	-
Mov Cap-2 Maneuver	507	0	-				-	-	-	-	-	-
Stage 1	691	0	-				-	-	-	-	-	-
Stage 2	868	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	507	1274	-
HCM Lane V/C Ratio	-	0.042	0.008	-
HCM Control Delay (s)	-	12.4	7.8	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	13.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	263	0	18	245	52	0	0	49	7
Future Vol, veh/h	0	0	0	263	0	18	245	52	0	0	49	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	5	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	277	0	19	258	55	0	0	52	7

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	627	630	28	59	0	-	-	-	0
Stage 1	571	571	-	-	-	-	-	-	-
Stage 2	56	59	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.575	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.575	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.575	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4.0475	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	425	393	1047	1524	-	0	0	-	-
Stage 1	523	498	-	-	-	0	0	-	-
Stage 2	958	839	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	351	0	1047	1524	-	-	-	-	-
Mov Cap-2 Maneuver	351	0	-	-	-	-	-	-	-
Stage 1	431	0	-	-	-	-	-	-	-
Stage 2	958	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.9	6.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1524	-	351	396	-	-
HCM Lane V/C Ratio	0.169	-	0.526	0.281	-	-
HCM Control Delay (s)	7.8	0.1	26.1	17.6	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.9	1.1	-	-

Intersection	
Int Delay, s/veh	26.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	243	528	32	204	612
Future Vol, veh/h	19	243	528	32	204	612
Conflicting Peds, #/hr	53	0	0	176	176	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	7	3	0	12	2
Mvmt Flow	20	256	556	34	215	644

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1859	732	0	0	766	0
Stage 1	732	-	-	-	-	-
Stage 2	1127	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.22	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.308	-
Pot Cap-1 Maneuver	82	413	-	-	804	-
Stage 1	480	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	46	351	-	-	684	-
Mov Cap-2 Maneuver	46	-	-	-	-	-
Stage 1	280	-	-	-	-	-
Stage 2	298	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	153.5	0	3.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	237	684	-
HCM Lane V/C Ratio	-	-	1.164	0.314	-
HCM Control Delay (s)	-	-	153.5	12.7	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	12.9	1.3	-

Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	47	77	712	56	57	769
Future Vol, veh/h	47	77	712	56	57	769
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	5	5	0	7	5
Mvmt Flow	49	81	749	59	60	809

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1708	944	0	0	808	0
Stage 1	779	-	-	-	-	-
Stage 2	929	-	-	-	-	-
Critical Hdwy	6.46	6.25	-	-	4.17	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	-	-	2.263	-
Pot Cap-1 Maneuver	98	314	-	-	796	-
Stage 1	445	-	-	-	-	-
Stage 2	378	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	91	270	-	-	796	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	412	-	-	-	-	-
Stage 2	378	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	46.8	0	0.7
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	91	270	796	-
HCM Lane V/C Ratio	-	-	0.544	0.3	0.075	-
HCM Control Delay (s)	-	-	84.1	24	9.9	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.4	1.2	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	7	0	0	0	0	0	296	0	11	314	0
Future Vol, veh/h	13	7	0	0	0	0	0	296	0	11	314	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	7	0	0	0	0	0	312	0	12	331	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	511	667	-				-	0	-	312	0	0
Stage 1	355	355	-				-	-	-	-	-	-
Stage 2	156	312	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	497	294	0				0	-	0	1260	-	0
Stage 1	686	522	0				0	-	0	-	-	0
Stage 2	862	550	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	491	0	-				-	-	-	1260	-	-
Mov Cap-2 Maneuver	491	0	-				-	-	-	-	-	-
Stage 1	678	0	-				-	-	-	-	-	-
Stage 2	862	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	491	1260	-
HCM Lane V/C Ratio	-	0.043	0.009	-
HCM Control Delay (s)	-	12.7	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	14.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	273	0	19	254	55	0	0	52	8
Future Vol, veh/h	0	0	0	273	0	19	254	55	0	0	52	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	287	0	20	267	58	0	0	55	8

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	651	655	29	63	0	-	-	-	0
Stage 1	592	592	-	-	-	-	-	-	-
Stage 2	59	63	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	411	388	1046	1518	-	0	0	-	-
Stage 1	510	497	-	-	-	0	0	-	-
Stage 2	955	846	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	336	0	1046	1518	-	-	-	-	-
Mov Cap-2 Maneuver	336	0	-	-	-	-	-	-	-
Stage 1	417	0	-	-	-	-	-	-	-
Stage 2	955	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25	6.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1518	-	336	381	-	-
HCM Lane V/C Ratio	0.176	-	0.57	0.304	-	-
HCM Control Delay (s)	7.9	0.1	29	18.5	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.6	-	3.4	1.3	-	-

Intersection	
Int Delay, s/veh	26.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	238	528	32	204	611
Future Vol, veh/h	20	238	528	32	204	611
Conflicting Peds, #/hr	53	0	0	176	176	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	7	3	0	12	2
Mvmt Flow	21	251	556	34	215	643

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1858	732	0	0	766	0
Stage 1	732	-	-	-	-	-
Stage 2	1126	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.22	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.308	-
Pot Cap-1 Maneuver	82	413	-	-	804	-
Stage 1	480	-	-	-	-	-
Stage 2	313	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	46	351	-	-	684	-
Mov Cap-2 Maneuver	46	-	-	-	-	-
Stage 1	280	-	-	-	-	-
Stage 2	299	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	157.1	0	3.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	232	684	-
HCM Lane V/C Ratio	-	-	1.171	0.314	-
HCM Control Delay (s)	-	-	157.1	12.7	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	12.9	1.3	-

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	79	712	51	59	771
Future Vol, veh/h	43	79	712	51	59	771
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	5	5	0	7	5
Mvmt Flow	45	83	749	54	62	812

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1712	941	0	0	803	0
Stage 1	776	-	-	-	-	-
Stage 2	936	-	-	-	-	-
Critical Hdwy	6.46	6.25	-	-	4.17	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	-	-	2.263	-
Pot Cap-1 Maneuver	97	315	-	-	799	-
Stage 1	447	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	89	271	-	-	799	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	412	-	-	-	-	-
Stage 2	375	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	44.3	0	0.7
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	89	271	799	-
HCM Lane V/C Ratio	-	-	0.509	0.307	0.078	-
HCM Control Delay (s)	-	-	81.5	24.1	9.9	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.2	1.3	0.3	-

Intersection	
Int Delay, s/veh	7.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	206	591	24	171	659
Future Vol, veh/h	12	206	591	24	171	659
Conflicting Peds, #/hr	53	0	0	89	89	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	8	8	3	0	15	2
Mvmt Flow	13	217	622	25	180	694

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1818	711	0	0	736	0
Stage 1	711	-	-	-	-	-
Stage 2	1107	-	-	-	-	-
Critical Hdwy	6.48	6.28	-	-	4.25	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	-	-	2.335	-
Pot Cap-1 Maneuver	83	423	-	-	813	-
Stage 1	476	-	-	-	-	-
Stage 2	308	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	56	391	-	-	752	-
Mov Cap-2 Maneuver	56	-	-	-	-	-
Stage 1	335	-	-	-	-	-
Stage 2	294	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	50	0	2.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	294	752	-
HCM Lane V/C Ratio	-	-	0.781	0.239	-
HCM Control Delay (s)	-	-	50	11.3	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	6.1	0.9	-

Intersection						
Int Delay, s/veh	2.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	45	758	39	21	802
Future Vol, veh/h	28	45	758	39	21	802
Conflicting Peds, #/hr	0	155	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	9	5	3	14	5
Mvmt Flow	29	47	798	41	22	844

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1707	974	0	0	839	0
Stage 1	819	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Critical Hdwy	6.44	6.29	-	-	4.24	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.381	-	-	2.326	-
Pot Cap-1 Maneuver	99	296	-	-	746	-
Stage 1	430	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	96	257	-	-	746	-
Mov Cap-2 Maneuver	96	-	-	-	-	-
Stage 1	418	-	-	-	-	-
Stage 2	399	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	48.6	0	0.3
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	156	746	-
HCM Lane V/C Ratio	-	-	0.493	0.03	-
HCM Control Delay (s)	-	-	48.6	10	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	2.4	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	7	0	0	0	0	0	313	0	12	326	0
Future Vol, veh/h	14	7	0	0	0	0	0	313	0	12	326	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	15	7	0	0	0	0	0	329	0	13	343	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	534	698	-				-	0	-	329	0	0
Stage 1	369	369	-				-	-	-	-	-	-
Stage 2	165	329	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	481	280	0				0	-	0	1242	-	0
Stage 1	675	513	0				0	-	0	-	-	0
Stage 2	853	539	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	475	0	-				-	-	-	1242	-	-
Mov Cap-2 Maneuver	475	0	-				-	-	-	-	-	-
Stage 1	666	0	-				-	-	-	-	-	-
Stage 2	853	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	475	1242	-
HCM Lane V/C Ratio	-	0.047	0.01	-
HCM Control Delay (s)	-	12.9	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	265	0	25	253	74	0	0	73	11
Future Vol, veh/h	0	0	0	265	0	25	253	74	0	0	73	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	279	0	26	266	78	0	0	77	12

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	693	699	39	89	0	-	-	-	0
Stage 1	610	610	-	-	-	-	-	-	-
Stage 2	83	89	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	387	366	1031	1485	-	0	0	-	-
Stage 1	499	488	-	-	-	0	0	-	-
Stage 2	932	825	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	315	0	1031	1485	-	-	-	-	-
Mov Cap-2 Maneuver	315	0	-	-	-	-	-	-	-
Stage 1	406	0	-	-	-	-	-	-	-
Stage 2	932	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.8	6.2	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1485	-	315	372	-	-
HCM Lane V/C Ratio	0.179	-	0.59	0.321	-	-
HCM Control Delay (s)	8	0.1	31.6	19.2	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.7	-	3.5	1.4	-	-

Intersection	
Int Delay, s/veh	42.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	248	546	32	211	612
Future Vol, veh/h	20	248	546	32	211	612
Conflicting Peds, #/hr	53	0	0	215	215	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	7	3	0	12	2
Mvmt Flow	21	261	575	34	222	644

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1931	790	0	0	824	0
Stage 1	790	-	-	-	-	-
Stage 2	1141	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.22	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.308	-
Pot Cap-1 Maneuver	74	382	-	-	764	-
Stage 1	451	-	-	-	-	-
Stage 2	307	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	37	312	-	-	625	-
Mov Cap-2 Maneuver	37	-	-	-	-	-
Stage 1	238	-	-	-	-	-
Stage 2	293	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	253.5	0	3.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	201	625	-
HCM Lane V/C Ratio	-	-	1.404	0.355	-
HCM Control Delay (s)	-	-	253.5	13.9	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	16.5	1.6	-

Intersection						
Int Delay, s/veh	4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	83	735	56	63	778
Future Vol, veh/h	45	83	735	56	63	778
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	7	5	4	0	6	5
Mvmt Flow	47	87	774	59	66	819

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1755	969	0	0	833	0
Stage 1	804	-	-	-	-	-
Stage 2	951	-	-	-	-	-
Critical Hdwy	6.47	6.25	-	-	4.16	-
Critical Hdwy Stg 1	5.47	-	-	-	-	-
Critical Hdwy Stg 2	5.47	-	-	-	-	-
Follow-up Hdwy	3.563	3.345	-	-	2.254	-
Pot Cap-1 Maneuver	91	304	-	-	783	-
Stage 1	432	-	-	-	-	-
Stage 2	368	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	83	262	-	-	783	-
Mov Cap-2 Maneuver	83	-	-	-	-	-
Stage 1	396	-	-	-	-	-
Stage 2	368	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	49.9	0	0.8
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	83	262	783	-
HCM Lane V/C Ratio	-	-	0.571	0.333	0.085	-
HCM Control Delay (s)	-	-	94.9	25.5	10	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	2.5	1.4	0.3	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	7	0	0	0	0	0	307	0	11	320	0
Future Vol, veh/h	13	7	0	0	0	0	0	307	0	11	320	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	7	0	0	0	0	0	323	0	12	337	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	523	684	-	-	0	-	323	0	0
Stage 1	361	361	-	-	-	-	-	-	-
Stage 2	162	323	-	-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-	-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-	-	-	-	2.2	-	-
Pot Cap-1 Maneuver	489	286	0	0	-	0	1248	-	0
Stage 1	682	518	0	0	-	0	-	-	0
Stage 2	856	543	0	0	-	0	-	-	0
Platoon blocked, %					-			-	
Mov Cap-1 Maneuver	483	0	-	-	-	-	1248	-	-
Mov Cap-2 Maneuver	483	0	-	-	-	-	-	-	-
Stage 1	674	0	-	-	-	-	-	-	-
Stage 2	856	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	483	1248	-
HCM Lane V/C Ratio	-	0.044	0.009	-
HCM Control Delay (s)	-	12.8	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	15.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	280	0	19	265	55	0	0	52	8
Future Vol, veh/h	0	0	0	280	0	19	265	55	0	0	52	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	295	0	20	279	58	0	0	55	8

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				675	679	29	63	0	-	-	-	0
Stage 1				616	616	-	-	-	-	-	-	-
Stage 2				59	63	-	-	-	-	-	-	-
Critical Hdwy				6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1				5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy				3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver				397	376	1046	1518	-	0	0	-	-
Stage 1				495	485	-	-	-	0	0	-	-
Stage 2				955	846	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				322	0	1046	1518	-	-	-	-	-
Mov Cap-2 Maneuver				322	0	-	-	-	-	-	-	-
Stage 1				401	0	-	-	-	-	-	-	-
Stage 2				955	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.4	6.6	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1518	-	322	365	-	-
HCM Lane V/C Ratio	0.184	-	0.61	0.324	-	-
HCM Control Delay (s)	7.9	0.1	32.2	19.5	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.7	-	3.8	1.4	-	-

Intersection	
Int Delay, s/veh	25.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	242	520	31	206	603
Future Vol, veh/h	19	242	520	31	206	603
Conflicting Peds, #/hr	53	0	0	180	180	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	7	3	0	12	2
Mvmt Flow	20	255	547	33	217	635

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1849	727	0	0	760	0
Stage 1	727	-	-	-	-	-
Stage 2	1122	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.22	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.308	-
Pot Cap-1 Maneuver	83	416	-	-	808	-
Stage 1	482	-	-	-	-	-
Stage 2	314	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	46	353	-	-	685	-
Mov Cap-2 Maneuver	46	-	-	-	-	-
Stage 1	279	-	-	-	-	-
Stage 2	300	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	150.1	0	3.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	238	685	-
HCM Lane V/C Ratio	-	-	1.154	0.317	-
HCM Control Delay (s)	-	-	150.1	12.7	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	12.7	1.4	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	47	83	703	56	60	762
Future Vol, veh/h	47	83	703	56	60	762
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	5	5	0	7	5
Mvmt Flow	49	87	740	59	63	802

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1698	935	0	0	799	0
Stage 1	770	-	-	-	-	-
Stage 2	928	-	-	-	-	-
Critical Hdwy	6.46	6.25	-	-	4.17	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	-	-	2.263	-
Pot Cap-1 Maneuver	99	318	-	-	802	-
Stage 1	450	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	91	274	-	-	802	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	414	-	-	-	-	-
Stage 2	379	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	45.9	0	0.7
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	91	274	802	-
HCM Lane V/C Ratio	-	-	0.544	0.319	0.079	-
HCM Control Delay (s)	-	-	84.1	24.2	9.9	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.4	1.3	0.3	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	7	0	0	0	0	0	295	0	11	313	0
Future Vol, veh/h	13	7	0	0	0	0	0	295	0	11	313	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	50	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	14	7	0	0	0	0	0	311	0	12	329	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	509	664	-				-	0	-	311	0	0
Stage 1	353	353	-				-	-	-	-	-	-
Stage 2	156	311	-				-	-	-	-	-	-
Critical Hdwy	6.8	7.5	-				-	-	-	4.1	-	-
Critical Hdwy Stg 1	5.8	6.5	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.8	6.5	-				-	-	-	-	-	-
Follow-up Hdwy	3.5	4.5	-				-	-	-	2.2	-	-
Pot Cap-1 Maneuver	499	295	0				0	-	0	1261	-	0
Stage 1	688	523	0				0	-	0	-	-	0
Stage 2	862	551	0				0	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	493	0	-				-	-	-	1261	-	-
Mov Cap-2 Maneuver	493	0	-				-	-	-	-	-	-
Stage 1	680	0	-				-	-	-	-	-	-
Stage 2	862	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBL	SBT
Capacity (veh/h)	-	493	1261	-
HCM Lane V/C Ratio	-	0.043	0.009	-
HCM Control Delay (s)	-	12.6	7.9	0
HCM Lane LOS	-	B	A	A
HCM 95th %tile Q(veh)	-	0.1	0	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	272	0	19	253	55	0	0	52	8
Future Vol, veh/h	0	0	0	272	0	19	253	55	0	0	52	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	500	-	-	-	-	-	0
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	0	0	5	5	0	0	5	0
Mvmt Flow	0	0	0	286	0	20	266	58	0	0	55	8

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	649	653	29	63	0	-	-	-	0
Stage 1	590	590	-	-	-	-	-	-	-
Stage 2	59	63	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.5	6.9	4.175	-	-	-	-	-
Critical Hdwy Stg 1	5.875	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.475	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4	3.3	2.2475	-	-	-	-	-
Pot Cap-1 Maneuver	412	389	1046	1518	-	0	0	-	-
Stage 1	511	498	-	-	-	0	0	-	-
Stage 2	955	846	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	337	0	1046	1518	-	-	-	-	-
Mov Cap-2 Maneuver	337	0	-	-	-	-	-	-	-
Stage 1	419	0	-	-	-	-	-	-	-
Stage 2	955	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.9	6.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1518	-	337	382	-	-
HCM Lane V/C Ratio	0.175	-	0.566	0.302	-	-
HCM Control Delay (s)	7.9	0.1	28.8	18.5	-	-
HCM Lane LOS	A	A	D	C	-	-
HCM 95th %tile Q(veh)	0.6	-	3.3	1.3	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	65	114	501	61	51	489
Future Vol, veh/h	65	114	501	61	51	489
Conflicting Peds, #/hr	0	165	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	550	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	5	5	0	7	5
Mvmt Flow	68	120	527	64	54	515

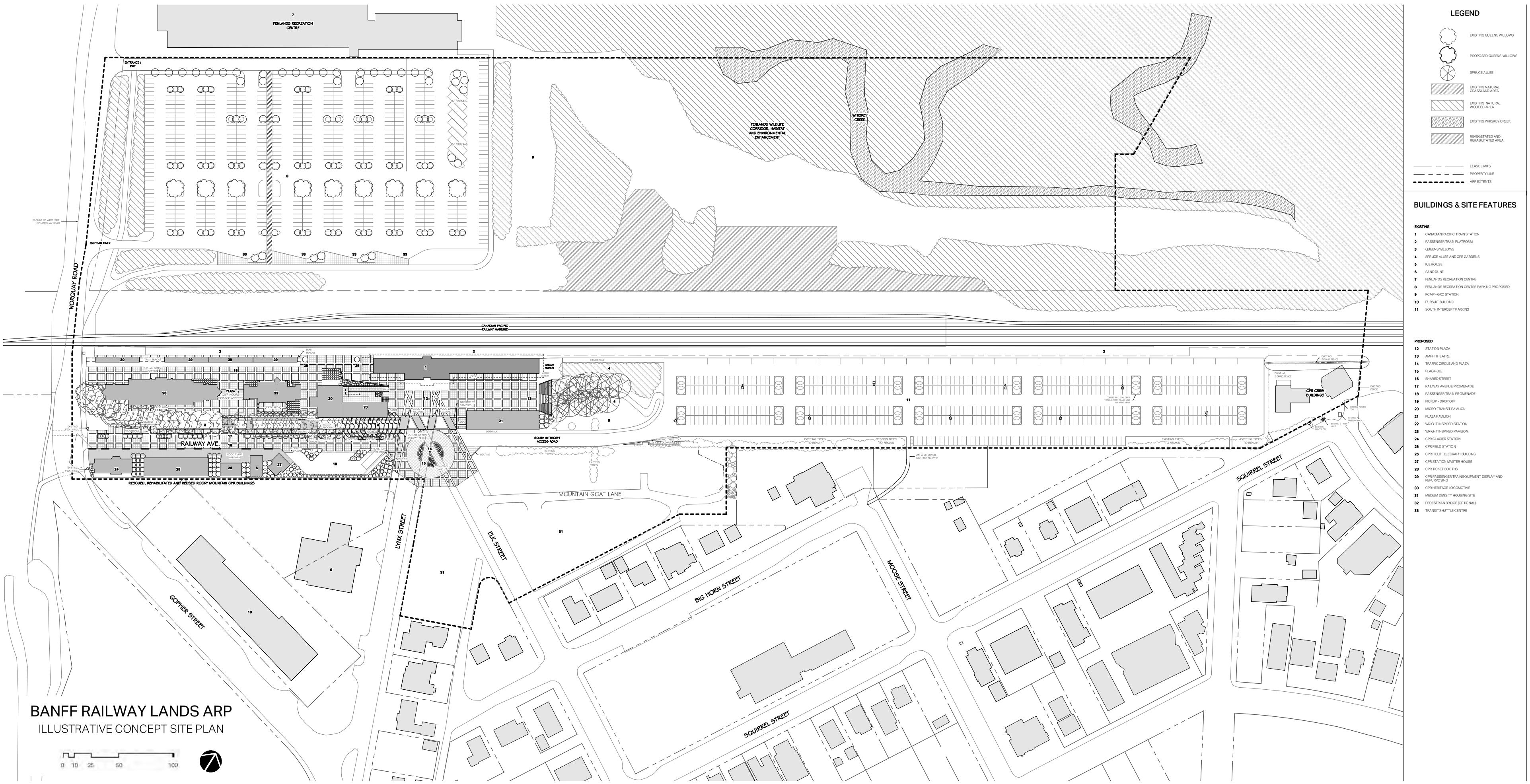
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1182	724	0	0	591	0
Stage 1	559	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Critical Hdwy	6.46	6.25	-	-	4.17	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	-	-	2.263	-
Pot Cap-1 Maneuver	206	421	-	-	960	-
Stage 1	565	-	-	-	-	-
Stage 2	527	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	194	362	-	-	960	-
Mov Cap-2 Maneuver	194	-	-	-	-	-
Stage 1	533	-	-	-	-	-
Stage 2	527	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.7	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	194	362	960	-
HCM Lane V/C Ratio	-	-	0.353	0.331	0.056	-
HCM Control Delay (s)	-	-	33.3	19.8	9	-
HCM Lane LOS	-	-	D	C	A	-
HCM 95th %tile Q(veh)	-	-	1.5	1.4	0.2	-

APPENDIX

D SWEPT PATH ASSESSMENT

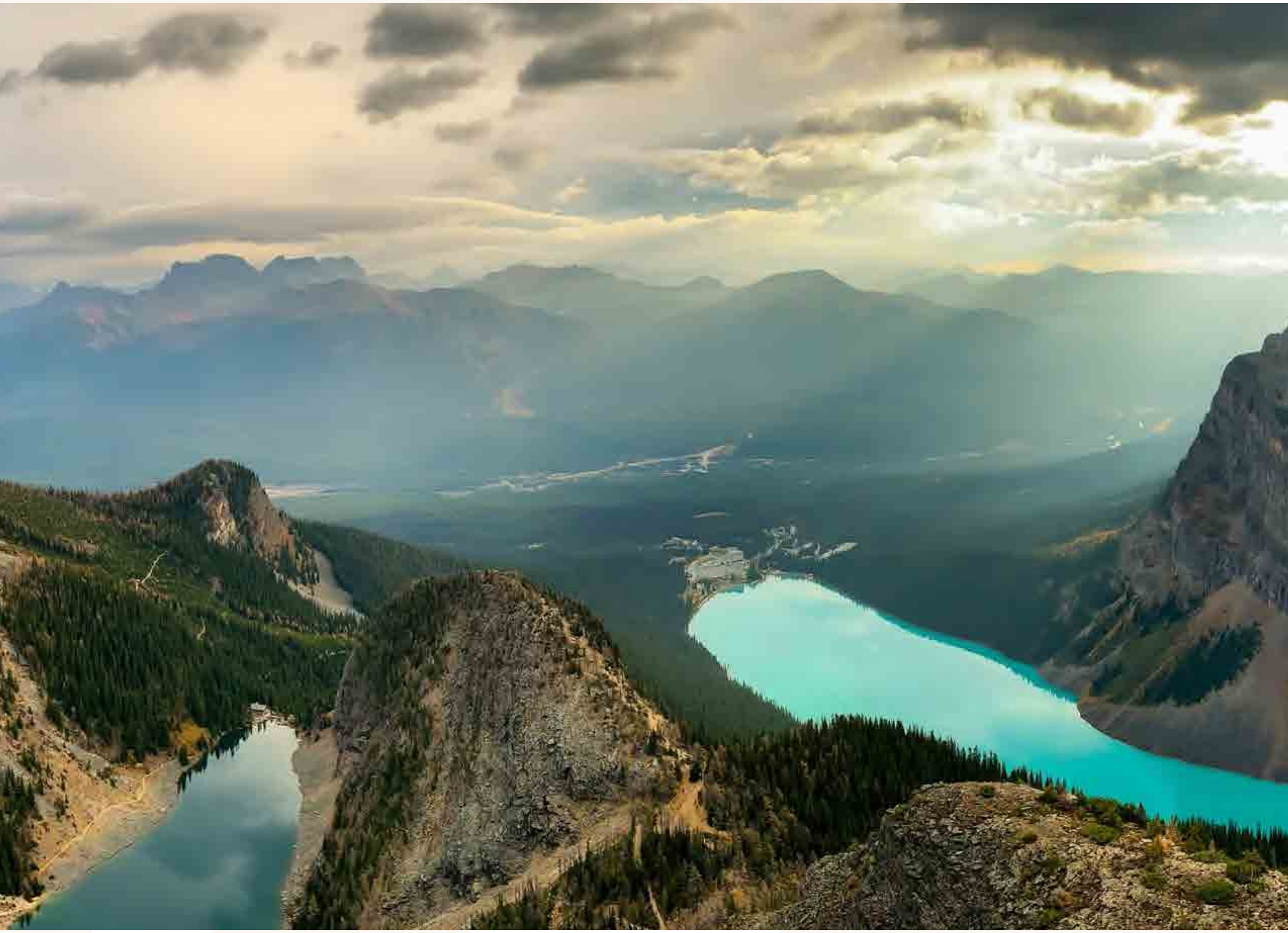


LEGEND
EXISTING QUEENS WILLOWS
PROPOSED QUEENS WILLOWS
SPRUCE ALLEE
EXISTING NATURAL GRASSLAND AREA
EXISTING NATURAL WOODED AREA
EXISTING WHISKEY CREEK
REVEGETATED AND REHABILITATED AREA
LEASE LIMITS
PROPERTY LINE
ARP EXTENTS
BUILDINGS & SITE FEATURES
EXISTING
1 CANADIAN PACIFIC TRAIN STATION
2 PASSENGER TRAIN PLATFORM
3 QUEENS WILLOWS
4 SPRUCE ALLEE AND CPR GARDENS
5 ICE HOUSE
6 SAND DUNE
7 FENLANDS RECREATION CENTRE
8 FENLANDS RECREATION CENTRE PARKING PROPOSED
9 RCMP - GRC STATION
10 PURSUIT BUILDING
11 SOUTH INTERCEPT PARKING
PROPOSED
12 STATION PLAZA
13 AMPHITHEATRE
14 TRAFFIC CIRCLE AND PLAZA
15 FLAG POLE
16 SHARED STREET
17 RAILWAY AVENUE PROMENADE
18 PASSENGER TRAIN PROMENADE
19 PICKUP - DROP OFF
20 MICRO-TRANSIT PAVILION
21 PLAZA PAVILION
22 WRIGHT INSPIRED STATION
23 WRIGHT INSPIRED PAVILION
24 CPR GLACIER STATION
25 CPR FIELD STATION
26 CPR FIELD TELEGRAPH BUILDING
27 CPR STATION MASTER HOUSE
28 CPR TICKET BOOTHS
29 CPR PASSENGER TRAIN EQUIPMENT DISPLAY AND REPURPOSING
30 CPR HERITAGE LOCOMOTIVE
31 MEDIUM DENSITY HOUSING SITE
32 PEDESTRIAN BRIDGE (OPTIONAL)
33 TRANSIT SHUTTLE CENTRE
FENLANDS RECREATION CENTRE
NORQUAY ROAD
RAILWAY AVE.
MOUNTAIN GOAT LANE
LYNX STREET
ELK STREET
BIG HORN STREET
MOOSE STREET
SQUIRREL STREET
GOPHER STREET
SOUTH INTERCEPT ACCESS ROAD
CPR CREW BUILDINGS
RESCUED, REHABILITATED AND REDUCED ROCKY MOUNTAIN CPR BUILDINGS
BANFF RAILWAY LANDS ARP
ILLUSTRATIVE CONCEPT SITE PLAN
0 10 25 50 100

APPENDIX B:
Expert Advisory Panel on Moving People Sustainably in the Banff Bow Valley

AUGUST 2022

Expert Advisory Panel on Moving People Sustainably in the Banff Bow Valley



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Introduction

MOVING PEOPLE SUSTAINABLY in Banff National Park is a key priority for Parks Canada to ensure a world class experience for visitors and that the nationally significant resources of the park are maintained, enhanced and become more accessible and inclusive to visitors and residents alike. The current approaches and systems for transporting visitors, workers and residents are not effective to meet the full needs of park visitors and achieve resource protection goals, especially during the busy summer months. Parking lots, urban roadways and access roads to trailheads and day-use areas are beyond capacity and negatively impacting the visitor experience.

A targeted and collaborative effort on moving people about the Bow Valley in a more sustainable fashion can and must contribute to maintaining or improving ecological integrity and greenhouse gas (GHG) emission reduction. If successfully managed, the experience for visitors to the park will be improved, and transportation-related GHG emissions will be reduced – all of which contributes to Banff National Park's reputation as an international tourist attraction.

Visitation in the Bow Valley of Banff National Park has increased dramatically in the last decade. Demand for vehicular parking at key destinations exceeds supply, road systems are beyond capacity, traffic congestion has become common at popular nodes, and there is a lack of infrastructure and access for individuals living with disabilities. Parks Canada has taken steps to reduce car dependency as an access mode to key nodes by implementing public transit solutions for popular areas in Banff National Park, but these measures are proving insufficient to efficiently and effectively manage demand, while also ensuring resource protection and inclusive and quality visitor experiences. Parks Canada remains committed to public transit and is seeking expert advice to build on this work and explore innovative new solutions to

PHOTO CREDIT: PARKS CANADA

The current approaches and systems for transporting visitors, workers and residents are not yet effective to meet the full needs of park visitors and achieve resource protection goals.

achieve and maintain desired conditions. The final section of this report discusses the need to further define these desired conditions to guide ongoing and future management.

In May 2021, Parks Canada established an expert advisory panel to assist with the development of a sustainable people-moving system for Banff National Park. The panel was asked to make recommendations to Parks Canada on how to develop a sustainable people moving framework for the park. The scope of the work included the management and coordination of access, use and infrastructure at key park destinations in, and adjacent to, the Bow Valley in the park. The panel was asked based upon their expertise, and Indigenous, public, and stakeholder consultation to recommend possible innovative solutions for Parks Canada to consider in the development of a people-moving framework.

A Terms of Reference was established for the panel and was subject to Indigenous, public and stakeholder consultation. Collectively, comments from consultation were generally supportive and constructive and informed an improved version of the Terms of Reference *(page 6)*. Comments focused on how to further clarify the panel's role, intent of the project, clear link to the government's 2050 net zero goal regarding GHG emissions and re-affirming the commitment to environmentally sustainable transportation solutions.

The panel met virtually and in-person between June 2021 and June 2022. This report is a result of its discussion and deliberations. It is intended to be a high-level overview and provide recommendations for a future system that is based on the collective experience of the panel.

The scope of the work included the management and coordination of access, use and infrastructure at key park destinations in, and adjacent to, the Bow Valley in the park.

PHOTO CREDIT: BANFF LAKE LOUISE TOURISM / SHANNON MARTIN

INTRODUCTION

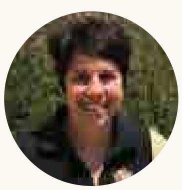
Who is the Panel?

The President & CEO of Parks Canada sought individuals to form the panel with knowledge or experience relevant to protected area management or expertise relevant to the challenges and opportunities facing Banff National Park including in the following areas of interest:

- Intelligent Transportation Systems: including traveller information, advanced traffic technologies, smart parking, emerging multi-modal transportation options, MaaS (mobility as a service), transportation wireless communication, and micro mobility;
- Transportation planning: including connecting modes of transportation with each other;
- Transit planning: including links to regional networks, funding mechanisms, scheduling, systems planning, first / last mile planning;
- Accessibility, active modes and inclusion;
- Green transit technology;
- Wayfinding and integration;
- Tourism, marketing and promotion;
- Visitor use management;
- Recreation Planning;
- Behavioral Economics (Specializing in travel behavior and mode choice in leisure context); and
- Communications.

During the consultation period for the Terms of Reference, members of the public were given the opportunity to volunteer to join the panel while identifying their areas of expertise. Several members of the panel were selected in this manner. Some areas of interest however were not represented. The panel secretariat conducted a search process to identify potential individuals to fill these roles. The President and CEO of Parks Canada appointed the following members to the panel:

Leslie Bruce
President & CEO
Banff & Lake Louise Tourism



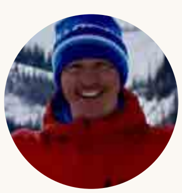
Dr. Kerri Cahill
Branch Manager
US National Park Service,
Denver Service Center

Bill Fisher
Chair
Retired Parks Canada

Kelly Gibson
Town Manager
Town of Banff

Dr. Emily Grisé
Assistant Professor
University of Alberta

Jen Malzer
Transportation Engineer
Canadian Institute of
Transportation Engineers



Jamie McCulloch
Executive Director
Rocky Mountain Adaptive

Selby Thannikary
Team Lead, Transp. Planning
Stantec / WSP

Dr. Dan Wicklum
CEO
Transition Accelerator

Panel Goals

TERMS OF REFERENCE

The **Terms of Reference** outlines many considerations to guide development of a sustainable transportation framework. It states that a people-moving framework for Banff National Park will:

- integrate the experience and build on the work of key stakeholders, local governments, regional transit providers and Indigenous partners;
- make efficient use of land and other natural resources, while ensuring the preservation of connectivity, vital habitat and other requirements for maintaining biodiversity;
- promote the use of alternative and renewable energy while reducing waste, fossil fuel consumption, emissions and discharges of contaminants to surface and ground water;
- offer diverse mobility options, giving people more choices as to how they meet their access needs including self-propelled or micro transportation as an alternative to cars;
- build upon Parks Canada's demonstrated commitment to mass transit;
- think beyond transportation modes, and look at other demand management strategies;
- be integrated into existing land use management and not result in cumulative effects that would have significant adverse effects on the quality of the visitor experience, visitor safety or park resources;
- be adaptable and scalable;
- provide value for money and identify and recognize public subsidies (hidden or otherwise) and social, economic and environmental costs;
- offer equity of access;
- ensure options consider private sector alternatives;
- consider research and development of innovative alternative technologies that improve access and help protect the environment and reduce GHG emissions;
- be coordinated with private sector tourism objectives;
- reflect visitor expectations and demographics; and
- be integrated with broader regional transportation networks.

INTRODUCTION

The expert panel have worked to become oriented to the park and have met with officials from Roam Transit, Town of Banff and local park managers and Field Unit Superintendents to better understand their role and how their work supports the goals for the park. Ultimately the panel's goal is to develop an exemplary case study for other parks in Canada and around the world to serve as a model of effective visitor use management in a busy national park.

Ultimately the panel's goal is to develop an exemplary case study for other parks in Canada and around the world to serve as a model of effective visitor use management in a busy national park.

TOUCHSTONES

The panel has established a briefer **set of principles as touchstones** to return to when considering various strategies. Our goal is to create a framework that:

- Reduces GHG emissions from people movement in Banff National Park;
- Improves ecological integrity and does not contribute to net impairment of ecological function;
- Makes transportation an integral and valuable part of the visitor experience, key to providing a welcoming, inclusive, and accessible environment for all visitors;
- Improves the level and quality of service across the transportation network;
- Must be efficient and careful with any new development and land use; and
- Must have efficient, effective, inclusive and accessible access for all visitors and residents.

Alignment with the new Banff National Park Management Plan

While the panel was undertaking its work, a new draft Banff National Park Management Plan was completed and presented to Canadians for feedback. The panel was careful to consider the direction of the new proposed management plan in setting the context for its work. Key Strategy 8: Moving People Sustainably, targets the need for a comprehensive people moving plan that considers local, regional, municipal and private transportation offers, existing pathways and trails, key attractions, and current and projected levels and patterns of visitor use. The plan states:

> *For a sustainable future, Banff National Park needs to go beyond accommodating increasing visitor demand with more traffic-related infrastructure. Instead, the strategy is aimed at a system that goes beyond buses and parking lots, to capture the whole experience of being in and enjoying a national park. That is, a system where the ways of getting to places and moving about are as much a part of the national park experience and legacy, as its landscapes, and natural and cultural resources. Rather than relying solely on large-scale mass transit and built infrastructure, it would be comprised of multiple medium and small-scale components that can be assembled, added to, increased or decreased, as visitor preference, circumstances and technology change. It would recognize the unique context of national park exploration and that one approach does not fit all. Such a people-moving system would be an example of how big-picture thinking, comprehensive planning and 'green' transport can help secure an environmentally and economically sustainable future for the park, and solidify Parks Canada's reputation as a leader in environmental protection and a provider of heritage experiences.*

The goal of this strategy is to ensure that current and potential park visitors and residents are able to move about the park comfortably, efficiently, and sustainably, while optimizing accessible and inclusive experiences that are compatible with resource protection. The proposed transport system needs to be resilient and capable of delivering a quality and comfortable experience all year long, both in nice summer months and during harsh Alberta winters. This will involve consideration for infrastructure capacity, visitor experience and ecological objectives, and for reducing potential visitor conflicts and safety issues. The panel was careful to consider its recommendations in the context of the draft management plan. Ultimately the panel sees its work tying directly into the first target of the moving people strategy to build a plan:

> *A comprehensive people movement plan for the park is developed that: sets 10-year goals, objectives and measurable targets, and considers local, regional, municipal and private transportation offers, existing pathways and trails, key attractions, and current and projected levels and patterns of visitor use. As reliability, frequency and affordability are known factors in promoting public uptake of mass transit in lieu of private vehicle use, the plan clearly addresses these factors in its approach.*

The panel believes its work can be a catalyst and inform the creation of a master plan for transportation in the Bow Valley.

INTRODUCTION

What we heard from Indigenous Peoples, public, stakeholders

The Terms of Reference stated that the panel shall determine the consultation plan and the list of interveners with whom it wishes to meet directly, including Indigenous Peoples and a broad cross-section of interested groups, organizations and individuals during its review in order to gain an understanding of issues and opportunities related to its mandate. The panel extended an invitation to stakeholders for written submissions and requested that like-minded groups join efforts to make presentations directly to the Panel.

The panel received 15 written submissions from a range of stakeholders including environmental groups, ski areas, local transit providers, tourism associations and local governments. Four key groups chose to make presentations directly to the panel via video conference. The panel also had access to the comments from the public consultation on the Draft Management Plan. These submissions greatly assisted the panel in better understanding the current issues and management context in Banff National Park. The panel Chair and some panel members have also engaged with Indigenous representatives from most Treaty 7 First Nations and Métis Region #3.

Public comments showed alignment with most of these issues. Additionally, visitors expressed real concern for value for money and being able to have continued access to the places they want to visit.

The panel received 15 written submissions from a range of stakeholders

THEMES

There was much congruence in the stakeholder comments and several themes emerged from their submissions. These included:

- Ecological integrity and protecting the character and nature of Banff National Park must remain the top priority.
- There is a clear need for continued partnership and increased integration among transit providers and tourism operators for more effective and efficient delivery of transportation services.
- The process for designing transit options needs to improve – we must define problems and work toward solutions.
- Parks Canada and all operators need to consider a wider variety of management tools to deal with the complex issues of visitor use management.
- There is increasing need for demand management techniques at various nodes but less desire to see this for Banff in general i.e. use should not be capped at the gate.
- Communications, wayfinding, sense of arrival and signage could greatly improve and would help facilitate behavioural change in visitors.
- The panel needs to consider spillover effects into other jurisdictions and to ensure displacement of visitors doesn't create problems elsewhere.
- A people-moving framework must consider visitor movement year-round.

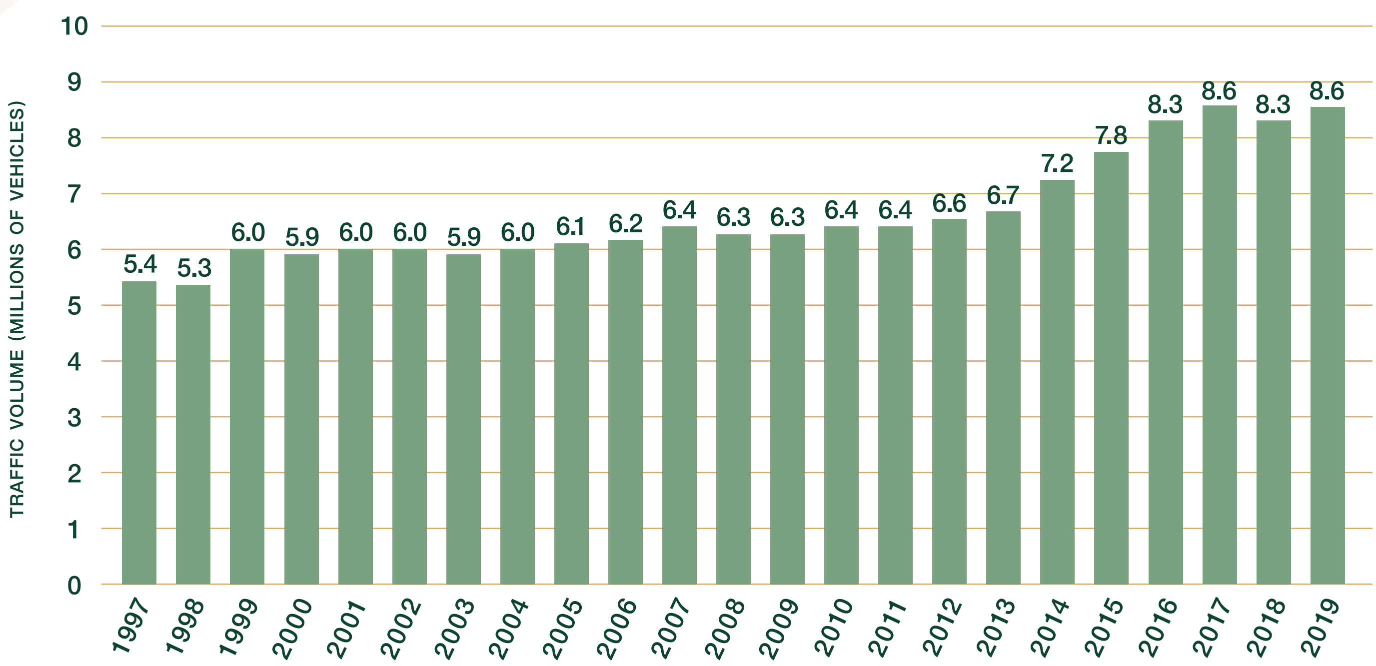
Background of the transportation issues in Banff National Park

BANFF NATIONAL PARK is Canada's most popular national park and one of the country's most important tourism destinations. Over four million people visit the park annually and visitation increases every year. Between 2010 and 2019, there was a 29% increase in visitation.

Banff National Park is a complex land base containing two communities, a national highway and national rail line, three ski areas, a golf course, ten front-country campgrounds, and many outlying commercial accommodations. Most of these spaces are in a relatively small portion of the park. 97% of the park is declared wilderness where development is prohibited. All of this occurs in a landscape with complex ecological issues such as species at risk, invasive species, fragmented wildlife corridors and human wildlife conflict. Banff also hosts a diverse group for visitors from around the globe that experience the landscape in very different ways that continue to change and evolve.

Some roadways in the national park and the Town of Banff have become very congested (e.g. Lake Louise Drive, Mountain Avenue to Sulphur Mountain). With increased visitation levels, the past decade has seen a steady rise in vehicle traffic. Prior to the COVID-19 pandemic, there were over 8.5 million vehicles on Banff highways. It is estimated that 50% of all traffic on the Trans-Canada Highway in Banff National Parks is through traffic.

Annual Traffic Volume at Banff East Gate, 1997-2019

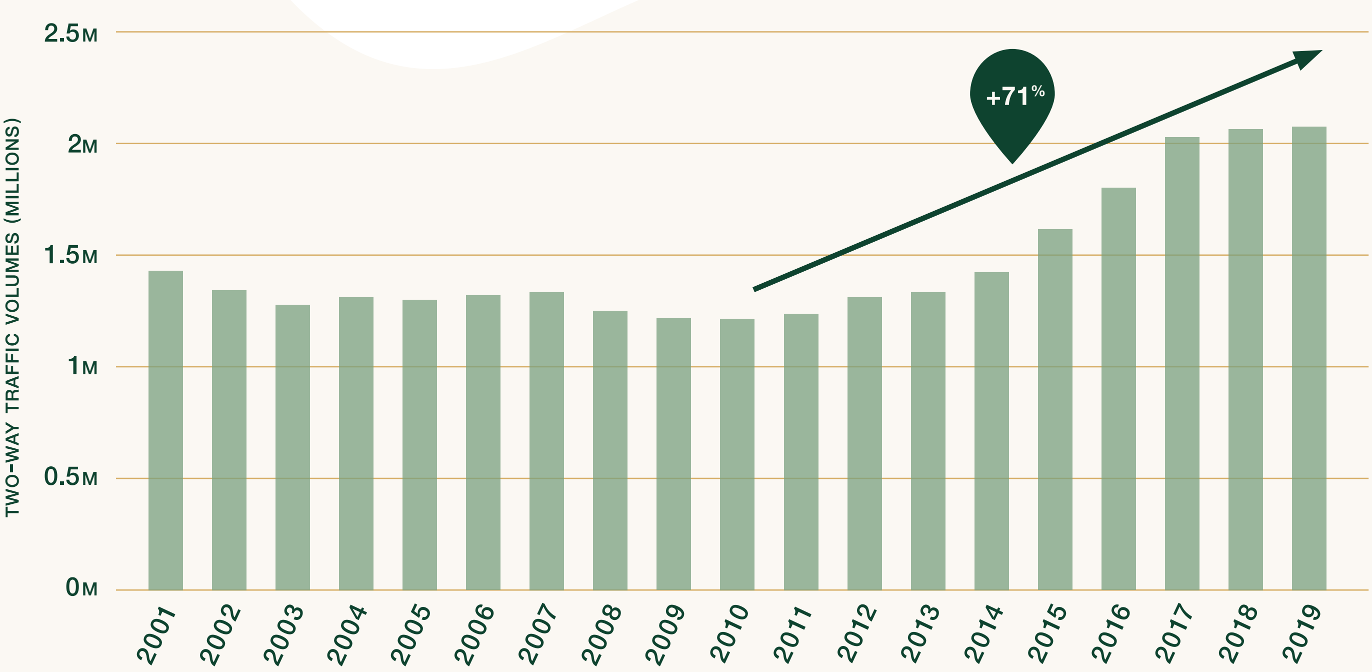


BACKGROUND

This rise is even greater at some of the park's main attractions. At Lake Louise, for example, there has been a 71% increase in traffic volume over the past decade. This has led to significant congestion issues. Parking lots at Moraine Lake and Lake Louise are often full by 7:00 AM from June to September. Motorists will circle the parking lots and drive up and down Lake Louise Drive hoping to eventually secure a spot. This has also led to the proliferation of parking along roadways leading to popular destinations, further negatively impacting the ecological areas along roadways and contributing to roadway traffic congestion. This causes great frustration for visitors, produces GHG emissions, and poor porosity for wildlife moving through the area.

Parks Canada has taken steps to address these issues in various areas of the park. Visitors can ride a paid shuttle system at Lake Louise that allows them to leave their cars in the valley bottom where parking is more plentiful. The Agency has taken steps over the past several years to continually try to improve the effectiveness and efficiency of the system such as introducing a reservation system, adding flaggers at significant cost to manage traffic flow, launching paid parking at Upper Lake Louise and moving the intercept lot to the Lake Louise Ski Area in 2022 where there are better facilities and access. The Roam public transit system has also expanded service over the past several years with more routes connecting popular destinations and communities in the Bow Valley. However, the implementation of these measures were in isolation of a broader framework to address the transportation and mobility issues within the park which limited their effectiveness at resolving the underlying congestion issues.

Annual Traffic Volumes along Lake Louise Drive, 2001-2019



A vision for transit in Banff National Park

THE EXPERT ADVISORY PANEL envisions a very different future for seamlessly moving through Banff National Park in 5-10 years. This is a long-term vision that Parks Canada could choose to work towards in incremental stages, adapting its approach as conditions change and feedback is received from the public and partners. However much can be done starting today to make this vision a reality in the near future.

LONG-TERM VISION

Most day visitors arrive in Banff National Park by public transit, without a personal vehicle. They find easy connections from the Calgary airport, downtown or somewhere near the edge of the city. The trip, be it on a train, bus or some other mode is frequent, comfortable, efficient and relaxing. There is room for gear, strollers, mobility devices and other effects and they are able to enjoy the trip confident they'll see the most popular sites without ever needing a private vehicle. Locals and workers also use the system to commute and for recreation. They have the option of having planned their trip in advance or spontaneously, using a centralized information system to help plan aspects of their visit and what to expect when they visit.

Some visitors still choose to drive their vehicles because they know they have parking at their campsite or hotel. They park their vehicles and visit attractions on transit or other active modes. They may have longer and more complex trips that require the convenience of their own vehicle and are willing to pay more to park and know they can still access an integrated public/private transit system.

Visitors arrive at well-serviced hubs – welcome centres to start their trip. These spaces are complete with intercept parking, information services (park staff, ambassadors and self-serve kiosks), visitor infrastructure (gear rental, food services, washrooms, wifi, playgrounds and other services) and educational experiences. There are frequent connections to their next or final destination in Banff National Park. Visitors will return to these hubs and then return to their home, campsite or hotel via numerous options.

Heading out for day trips, most visitors will have more than one option for moving about sustainably. Shuttles, buses, autonomous vehicles, e-bikes, bicycles and others are all on the same flexible payment system – seamless and no hassles, and interconnected. Active mode infrastructure is available for all ages and abilities. Whether they are heading to a ski hill, a popular hiking trail or just a scenic tour, it is simple and convenient to access different options. While different companies may provide these services, visitors access them via a unified pay system and integrated reservations, accessible through a variety of tools and payment options. All facilities, technologies, infrastructure and services used, will be fully accessible making ease of use for everyone.

When they arrive at very popular destinations such as Lake Louise and Moraine Lake they find that opportunities for close connection with nature can be found, and although busy with other people, it does not feel consistently crowded. Private vehicles are no longer able to access these areas and there are no longer congested parking lots. In some cases, the parking lots have been reduced in size and the area restored to a natural state. Smaller hubs and trail heads may not be connected by public transit initially but also promote sustainable transportation through charging stations, secure bike parking, and others. Roadways are quieter and wildlife becomes more visible and abundant.

Key Strategies overview

THE FOLLOWING EIGHT sections provide an overview of the main concepts that the panel discussed while considering the transportation situation in Banff. These are the big ideas that the panel feels can move forward a framework based on its expertise and experience from other jurisdictions. The panel feels this provides a roadmap to a more sustainable future while acknowledging much work remains to be done. The framework can be thought of in three broad categories with key strategies to support each.

Each strategy begins with an overview of the current situation and the issue the panel recommends addressing. This is followed by a discussion of how each strategy can contribute to a more sustainable future. The panel proposes a list of specific actions that Parks Canada and partners could consider to help achieve the overall goal. Finally, there is a brief discussion of feasibility and the relative cost, ease, and timing of implementation.

Much research, planning, consultation and development would be required to advance many of these strategies, especially major initiatives. Others can be advanced sooner or be pilots. Pilots provide an opportunity to introduce ideas to the public and test these initiatives, and then refine them before significant investment is made. Metrics that define success should be outlined in advance with supporting data collection and evaluation to measure their effectiveness of achieving stated goals.

ARRIVING IN BANFF NATIONAL PARK

KEY STRATEGY 1
Reduce private vehicle arrivals

KEY STRATEGY 2
Create mobility hubs

MOVING AROUND THE PARK

KEY STRATEGY 3
Improve & diversify public transportation options

KEY STRATEGY 4
Develop & encourage active transportation

KEY STRATEGY 5
Create a comprehensive and unified transportation service

ENABLING CHANGE

KEY STRATEGY 6
Develop partnerships with stakeholders & Indigenous Peoples

KEY STRATEGY 7
Use pricing as a tool to influence behaviour

KEY STRATEGY 8
Better understand visitor experience & transportation use

1

ARRIVING IN BANFF NATIONAL PARK

PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

KEY STRATEGY 1:

Reduce private vehicle arrivals in Banff National Park

Current situation

The volume of vehicles arriving in Banff National Park during the summer season and on many weekends throughout the year is beyond levels that can be managed sustainably. Traffic congestion within the Banff Townsite is common and severe. Motorists have taken over 90 minutes to traverse from one end of town to another. In places like Lake Louise the traffic on highway ramps can back far onto the main highway lanes creating safety concerns for through traffic. Parking lots at many day use nodes are overflowing with spillover parking stretching for a kilometre or more onto the highway.

Currently there are limited options for travellers who wish to leave their vehicle in Calgary or Banff. There are also not well-defined areas to receive visitors or places where those who do take a vehicle can leave it for the duration of their trip. Additionally, there are also poor options for 'last-mile' connectivity within the park that could get visitors from a transportation hub to their hotel, campground or attraction.

There are also significant constraints for current and future parking options in the park and surrounding areas, and the impacts of congestion to its environmentally sensitive areas. The panel does not see the merit of alienating montane habitat by expanding parking lots at each destination, nor would that approach be consistent with protecting the ecological integrity of the park. Those on overnight stays generally have parking options at their hotels or campground but those arriving as day users do not.

KEY STRATEGY 1

Contribution to a sustainable system

Reducing private vehicle arrivals in the park will be a critical step to achieving a more sustainable system, along with considering the management of the overall system with regards to the pace and flow of visitation. Fewer vehicles entering the park will result in fewer downstream congestion issues and will also reduce GHG emissions.

The actual mode of transportation needs to match the need it is trying to fill and the goals for resource management and inclusive visitor experiences. In this case, the mode would likely involve high-capacity mass transportation services. Today there are currently only two transportation options that can reduce private vehicle arrivals from Calgary, motor coaches/ buses and passenger rail. If these transport services are powered by electricity or hydrogen, additional reductions may be realized.

A high-volume transport system must be accessible, convenient and well-priced to encourage sustainable travel and make it a preferred alternative to personal vehicle usage. Offering frequent service at peak periods and spanning across the day is a must for any form of transport. A service must be convenient and accessible for all sorts of visitors and visit purposes. A well-priced service is cost-competitive with driving, a feature all the more essential in this time of high gas prices. Well-priced also means having fare schemes that are favourable to families and people of all abilities.

Further, shared transport providers must understand that their clients are not commuters but rather visitors en route to a national park. The amenities and facilities provided on a train or bus must be designed to accommodate outdoor gear (such as skis/ snowboards, large packs, picnic baskets, strollers, bikes, etc.). Even the design and layout of passenger seating should be considered. 'First mile/last mile' connectivity is also key to the success of the system. For day visitors to the park originating in Calgary, access to the mass transit services in the city must be convenient. When visitors arrive at a hub in Banff National Park they will need frequent, convenient and affordable connections to their final destination. This mode of transit will also be an asset to the local workforce if it is designed properly from a routing and service frequency perspective. It will broaden the range of housing opportunities that will be of great value to local businesses.

A high-volume transport system must be accessible, convenient and well-priced to encourage sustainable travel and make it a preferred alternative to personal vehicle usage.

A scalable transit system could also present options for future expansion. A train from Edmonton to Calgary has long been discussed in Alberta and a passenger rail connection to Banff National Park could be an asset. Extending the rail system to Lake Louise could significantly reduce the volume of traffic within the park and provide a quick, easy connection to the most popular destination in the park. Extending transit services by bus to Kananaskis Country, Jasper, Yoho and Kootenay national parks and points further west are possible. Needless to say, planning and constructing a transit system would be complex and require a considerable investment. It would involve approval and permitting at all three levels of government including several municipalities. The environmental assessment and associated mitigations would need to address significant wildlife movement concerns and other ecological issues.

There is an opportunity for continuous learning and adaptive management. It is unlikely that a functioning mass transit system such as a train from Calgary to Banff could be designed and built immediately. Rather a staged approach that might involve first buses, dedicated bus lanes or other options could test the viability of the system while utilizing the existing transportation infrastructure. The system should be designed and adaptively managed to ensure the pace and flow of visitation to different areas of the park supports the achievement and maintenance of desired conditions for resources and visitor experiences. Bus service provides the needed flexibility for adaptive planning.

a staged approach that might involve first buses, dedicated bus lanes or other options could test the viability of the system while utilizing the existing transportation infrastructure.

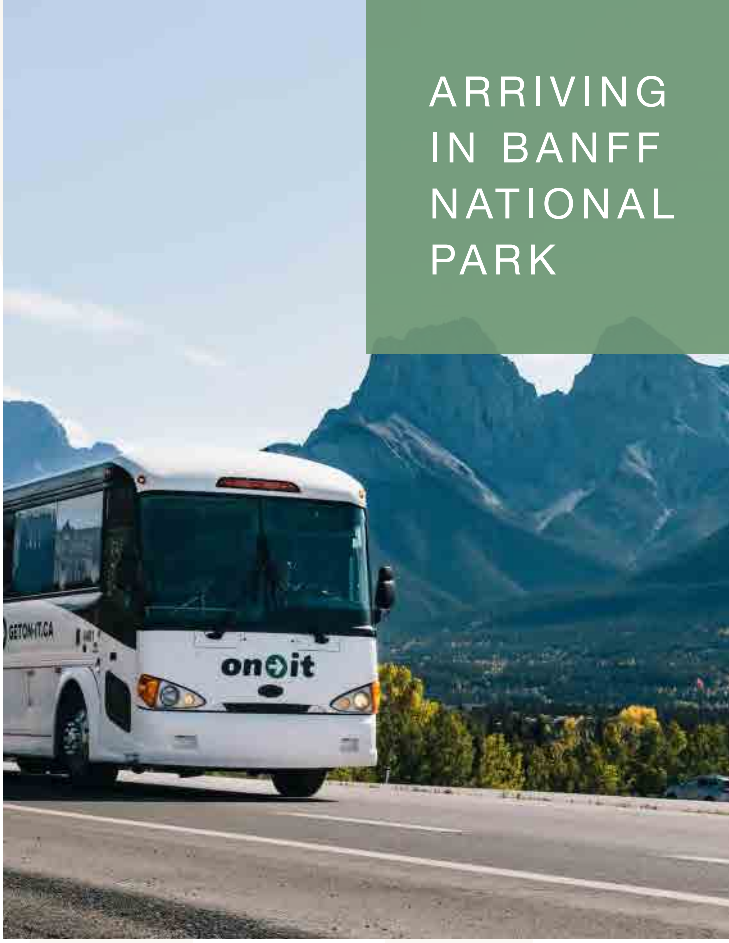


PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

Any system that is designed must accommodate many different types of visitors – international, local, day vs. overnight, activities etc. Ultimately a well-designed system would either provide alternative (non-personal vehicle) transportation modes for a visitor's entire trip, or allow a visitor to arrive in Banff and only park once if they choose to bring a vehicle. An appropriate set of incentives, such as a reduced park pass fee or discounts at other attractions, will need to be offered to convince visitors to take this option.

The panel strongly believes there is an opportunity for the broader community of interests in the Bow Valley to demonstrate leadership and make Banff a showcase for the world. Banff is one of the most popular tourist sites in the country. If we can't do outstanding public transit in Banff, where can we do it?

KEY STRATEGY 1

Summary of potential actions

The panel recognizes that many of these actions may be beyond the current scope of Parks Canada alone. However, Parks Canada could lead a broader conversation with partners on mass transit.

Improve pricing mechanisms →	Pricing plays a critical role in public transit usage and this will be explored further in a subsequent section. It is worth noting here that the cost for the user must make sense and account for equity considerations in order to make the system attractive. This can be achieved with a low enough price point for public transit but also through disincentives for private vehicle usage. Parks Canada could offer variable pricing based on arrival by mass transit or private vehicle. Parking fees could also be raised to a point where public transit becomes a much more affordable option. Park access fees could also be increased for vehicles with solo travellers versus those with passengers to incentivize group travel. Getting the public to shift transportation modes will require different tactics.
Expand current offer where possible →	There are currently transit options such as the On-It Transit system that moves people from Calgary to Banff. At present, there has been positive uptake in ridership yet it has been insufficient to reduce the number of vehicles entering the park. Exploring opportunities to expand a service such as this in line with visitor demand would be a good start to reducing vehicles and providing a meaningful test of a transit system. An adaptive approach to expanding transit options allows planners to better understand and design a future system.
Communicate transit goals →	Communication is a powerful tool for shifting behaviour. A concerted effort should be made to link all the values of mass transit including reduced congestion, improved travel time, improved convenience and GHG reduction as part of an expanded service.

Consider range of options →

Parks Canada and regional partners should consider the range of options for moving people into and within Banff National Park. The panel is aware of the proposal to build a dedicated passenger rail line connecting Calgary and Banff. If this option proves feasible it could be an ideal solution to reducing vehicles. Train service is efficient, comfortable and environmentally responsible and could remove a significant number of vehicles from the road. There are options for connecting into the system from the airport, downtown Calgary and other areas around the city. However, there may be significant policy, economic, and land use challenges to overcome with building a passenger rail line.

There are other alternatives to a train. Dedicated high occupancy vehicle (HOV) lanes on the Trans-Canada Highway (TCH) could encourage car-pooling and fewer vehicles. An expanded bus service, either public or private, could provide many of the same benefits as a train with lower capital infrastructure costs. Bus service is also a scalable option that can be responsive to market changes. In the future, dedicated bus lanes could be considered within the existing footprint of the TCH and road network within the Park to further increase the attractiveness of a bus service and ensure a timely and reliable service can be provided in the event of highway congestion.

Engage in genuine discussions of public transit options →

Parks Canada should play an active and leadership role in advancing public transit solutions connecting Banff to other places in Alberta. They should engage in genuine conversation with a range of partners, stakeholders, local governments and the public to find a solution that is consistent with Parks Canada's mandate. This may require a shift in thinking for Parks Canada managers. The panel believes that reducing the number of vehicle arrivals in Banff, along with better management of the pace and flow of visitation to different areas, is a critical tool for protecting the ecological integrity of the park, reducing GHG emissions and improving the visitor experience. It will become necessary in the future to change tactics in order to protect the same things.

Consider partnerships →

Parks Canada will not be able to do this work alone. It does not have the capacity to build a fully realized mass transit system that is well beyond its borders. Partnering with others will be critical to making this a reality. Other local governments are interested in expanding services for their residents and visitors. Private operators are willing to invest in new systems. Indigenous Peoples are eager to explore options near Calgary to provide parking and services for a new system. These partnerships should be actively pursued and fostered.

KEY STRATEGY 1

Feasibility

The proposed recommendations may be challenging for Parks Canada to implement but they are fundamental to reducing traffic congestion. Some elements of the proposals are long-term in nature and complex from a land-use and ecological conservation perspective. While some may consider these actions beyond the scope and mandate of Parks Canada, they are for the long term protection of the park and Canadians experience of the park. They cover multiple jurisdictions and pose significant environmental and policy challenges. However, Parks Canada is best positioned to create and lead a discussion with partners. Changing visitor expectations and behaviour will be challenging but this is achievable. With higher gas prices, younger generations with lower vehicle ownership rates, and with an excellent public transit system, we can be optimistic that people will make use of it. Parks Canada can be an active voice at the table and encourage a broader conversation around mass transit from Calgary and must participate fully.

Changing visitor expectations and behaviour will be challenging but this is achievable.

FUTURE VISITOR SCENARIO

Linda & Louise

DATELINE: OCTOBER 5, 2024

Linda and Louise are notorious last-minute planners. In their mid-40's, their work shifts rarely line up, so finding some time to relax and go hiking or snowboarding together in the mountains is always a challenge. Linda has switched a shift and would like to go hike to Sentinel Pass in the Moraine Lake area tomorrow to see the larch trees. Louise says it might be busy. Linda scoffs and says, "we'll get an early start." Linda and Louise get up early and the weather sounds perfect for an autumn hike. As they enter Banff National Park, a digital sign advises that the Moraine Lake parking lot is full and all timed ticket entries and shuttle seats are full. After a heated discussion, they decide to continue on to Moraine Lake Road but upon arrival note that access is indeed restricted to shuttles only and passengers must have a reservation. They bump into a Parks Canada staff member who advises them that there are other options. The attendant opens a mobile app and notes there are multiple timed-entries available at Bourgeau Lake, Boom Lake and Rockbound Lake if they are still interested in going for a hike today. She also notes that there are several openings to Sentinel Pass later in the week and adds that the larches are a bit late turning this year. Linda and Louise vow to be better planners and are quick to download the app.

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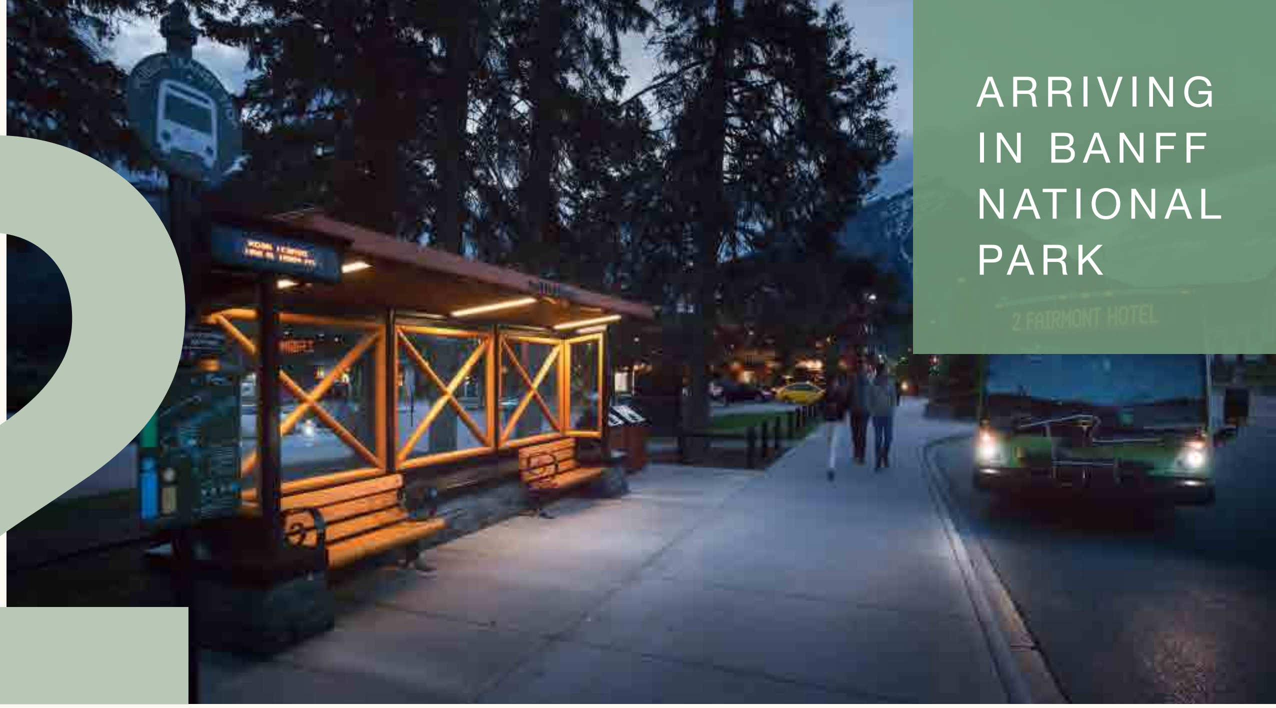


PHOTO CREDIT: BANFF TOURISM / NICK FITZHARDINGE

KEY STRATEGY 2:

Create mobility hubs

Current situation

Banff National Park does not currently have well defined welcome hubs. Most visitors will pass through an entry gate but there are few services, limited information and no connections to other services at the entry gates. Hubs do exist at the Parks Canada information centres in Banff and Lake Louise. However, neither is particularly well located to welcome and provide multiple services, including intercept parking.

> **Hubs can be thought of as welcome centres; places for information, opportunities for education, to access a washroom, to find easy connections to your next or final destination.**

KEY STRATEGY 2

Contribution to a sustainable system

A transportation hub is an efficient way to centrally locate services. Hubs can be thought of as welcome centres; places for information, opportunities for education, to access a washroom, to find easy connections to your next or final destination.

Many jurisdictions are trying to create effective transportation hubs. The new Union Station in New York City is an example where new infrastructure was constructed to support a variety of transportation modes. The facility connects incoming train users with a variety of transportation modes and an extensive network of walking connections. Areas of downtown Calgary can be thought of the same way where transit stations connect with buses, e-scooters, the plus 15 network, walking paths and others.

Banff already has what can be thought of as a distributed network of mini-hubs that would include places like hotels and campgrounds. These areas allow for parking of personal vehicles but then do require the need for first and last mile connection into the broader system.

Banff already has what can be thought of as a distributed network of mini-hubs that would include places like hotels and campgrounds.

Hubs would provide a variety of services, suited to destinations, that could include:

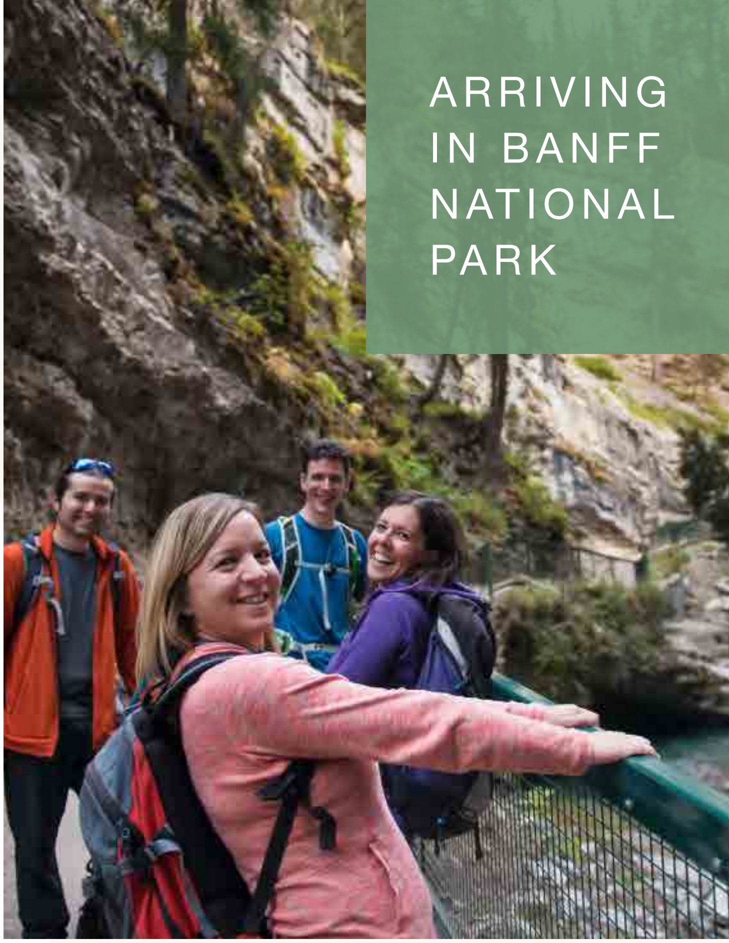
- Options for access to multi-modal forms of transit (buses, shuttles, on-demand vehicles, autonomous shuttles, etc.);
- High capacity parking options;
- Connectivity with active transportation options such as cycling and hiking;
- Be fully accessible in line with the *Accessible Canada Act* and be able to educate visitors on all the accessible options and opportunities around the whole park;
- Connectivity with private sightseeing and guiding companies;
- Educational and orientation information readily available from park staff, ambassadors and self-serve kiosks;
- Wifi hotspots;
- Appropriate shelter in all seasons;
- Become part of the user experience – hubs are pleasant places to be and set your trip up for success;
- A variety of amenities such as washrooms, playgrounds, commerce and potentially food services;
- Electric charging services for vehicles and e-bicycles;
- Gear hubs and rental services for activities such as biking, paddle boarding and even camping equipment. Food services, gear rentals, and other commercial amenities would have to respect any relevant commercial development caps.

KEY STRATEGY 2

ARRIVING IN BANFF NATIONAL PARK

Transportation hubs provide unique options for future management planning. There are many day-use parking areas that struggle with demand exceeding supply. Effective transportation hubs should have the ability to increase and decrease levels of service to accommodate surges in visitors interested in going to and returning from areas such as Johnson Lake, Johnston Canyon and Helen Lake. In fact, there are innovative options for strategically managing the pace and flow of visitation to certain trailheads and destinations that can be considered. Namely, some of these high use areas could be accessed only by public or private transit at busier times of year through reservations that deliver the appropriate volume of use to achieve desired conditions. Although not a perfect example, accessing Lake O'Hara in Yoho National Park requires some pre-trip planning and reservations for most users.

Over the last two years, the eastern section of the Bow Valley Parkway has seen seasonal closures to vehicle traffic as a response to visitor congestion and crowding at Johnston Canyon during the pandemic. The panel is aware that Parks Canada is conducting a two-year pilot to further explore options and gain a better understanding of how visitors responded to this change and how this strategy influenced visitor experiences to the area and the achievement of resource protection goals.



JOHNSTON CANYON / PHOTO CREDIT: PARKS CANADA

some of these high use areas could be accessed only by public or private transit at busier times of year through reservations that deliver the appropriate volume of use to achieve desired conditions.

KEY STRATEGY 2

Summary of potential actions

Create vision for hubs →

A short-term action would be to create a vision for what these transportation hubs should look like. This could be a multi-stakeholder process (e.g. design charette) to explore options for where hubs could be located and what would make an effective hub. Having a vision for hubs can lead to design work and eventually building the temporary and permanent pieces to make a functional hub. A fully realized hub will likely have many businesses and partnerships involved so early collaboration will improve the likelihood for success. Piloting designs and amenities can help test user priorities and accelerate behaviour change.

Develop hubs in two locations →
The panel sees two areas being particularly well positioned to serve as transportation hubs:

Banff Townsite Area:

- While ecological constraints will be a factor, it would be advantageous to consider a large transportation hub at the north (Mt Norquay Road) or east (Banff Avenue) end of town. This hub would ideally be co-located with public and private mass transit from Calgary either by train or bus.
- Banff also presents many options for 'decentralized hubs' or parking areas. Hotels, Outlying Commercial Accommodations, hostels, campgrounds, and others can be considered 'mini-hubs' if the connectivity is good within the park. Ideally visitors will be able to leave their vehicle where they sleep and have linkage into the broader transportation system.

Lake Louise Area:

- The hub can be thought of as the broader Lake Louise Area, with the Lake Louise Ski Area as the main intercept parking lot. The lot currently contains space for 1,800 vehicles but will be expanded to accommodate 3,100 vehicles under the approved Long Range Plan. There are already many services here in terms of washrooms and food services that could be expanded to support active modes and transit.
- The Parks Canada Park and Ride location east of Lake Louise on the Trans-Canada Highway was not an effective or cost-efficient intercept parking lot. It lacked services, clear wayfinding signage and was difficult to access from the highway. The panel supports the relocation to the Lake Louise Ski Area. The former Park and Ride area should be rehabilitated.

Develop hubs in two locations → (continued)

- If rail connectivity is made available in the future, the train station could be another link in the system.
- The hub provides connectivity options to all the main sites in the area including the hamlet/Samson Mall, Upper Lake Louise, and Moraine Lake. Modes of transit will be determined by the needs and engineering feasibility. This transit hub also offers potential connections to other areas in the future such as Emerald Lake and Takakkaw Falls in Yoho National Park, and popular hiking destinations along the Icefields Parkway.

Make gradual infrastructure improvements to support future hub →

There are universal pieces of infrastructure that are required regardless of the mobility options from hubs. There will be a need for access roads, pathways, lights, power, water among others regardless of exactly how a hub is intended to function. The panel recognizes the work Parks Canada has done in places like Lake Louise where incremental steps have been taken to improve arrival areas, bus stops, off-ramps, etc. that could support a variety of modes in the future. With a clearer vision for an overall hub design, even better decisions could be taken in the mid-term. Similar efforts are being made in the Town of Banff, with the approval of intercept parking at the Banff Train Station, paid parking zones and signage to encourage visitors to take a bus to the Sulphur Mountain attractions.

Expand available modes from each Hub →

Part of the overall goal will be to increase mobility options from each hub. Of particular interest are larger people moving options that fit the context and include options like buses, trains, autonomous vehicles and aerial transit. These pieces should all connect into the hubs and offer visitors options for accessing key destinations.

But hubs will also need connections for smaller scale and active modes of transportation. Pathways should connect from the hubs so that visitors can walk or ride to the same destinations accessed by motor vehicle. Hubs should then offer services to rent modes such as bicycles, e-bikes, scooters or whatever other technology might be appropriate.

Work on first and last mile connectivity →

While hubs can be very effective at centralizing user amenities, there still needs to be first and last mile connections to key destinations and overnight accommodations to truly make them viable and functional for visitors. This is challenging in Banff National Park as some of the connections may not truly be 'last mile' but the last 5-25 miles. If a visitor travels to a transportation hub like the Town of Banff or the Hamlet of Lake Louise, how do they then get to a trailhead like Bourgeau Lake or Helen Lake? Will there be on-demand public or private services, chartered shuttles or scheduled drop off and pick up times?

The panel recommends that Parks Canada focus on connecting the most popular areas first (e.g. Lake Louise, Moraine Lake, Johnston Canyon, Minnewanka Loop) where traffic congestion and visitation is most pronounced. As the visiting public becomes more comfortable with "giving up the keys" and accustomed to using a variety of public transit and other options then the more complicated "last mile" challenges can be examined. By experiencing tiny nudges, creating a culture of how to move sustainably in Banff National Park will have a greater chance of success.

Access to and from Sulphur Mountain during many weekends and most days in the summer is particularly challenging. Parks Canada needs to continue working with the Town of Banff and impacted stakeholders to encourage visitors to leave their private vehicles at an intercept parking lot, hotel or campsite and take advantage of other forms of transit to access the attractions on the mountain.

Adaptively manage modes from each hub →

The panel recommends taking a measured and adaptive approach to any new modes of transit that might be considered from a hub. Currently in the Lake Louise area, buses are relatively effective at moving people. This service could likely be expanded and lessons learned in the process, particularly as it relates to the appropriate volume and frequency of buses to support visitation needs, and related influences on both resources and visitor experiences from the pulsing of visitation at drop off/pick up points. Eventually it may make sense to consider moving to autonomous shuttles, aerial transportation or some other large people-mover system.

KEY STRATEGY 2

Feasibility

Visioning and planning for hubs in a collaborative manner is a critical first step and this work should begin immediately. Within the Banff townsite a comprehensive review of potential locations along Banff Avenue or Mt Norquay Road will be required and can begin once some initial visioning is done. The Lake Louise area may be easier as the intercept lot moves to the ski area.

Once a vision and plan are established, medium term actions could include constructing infrastructure pieces to support the long-term plan. This could include not only the physical assets but also potentially piloting various modes of transport from each hub.

FUTURE VISITOR SCENARIO

Fiona & Angus

DATELINE: SEPTEMBER 15, 2028

Fiona and Angus are fulfilling a long-awaited dream to visit Banff National Park. They left the United Kingdom a week ago today – their itinerary included five days with a group tour and then a further five days of independent travel options. Upon arriving in Calgary, the tour group had a short walk through the airport to the new passenger rail service to Banff. For the next four days, they had the opportunity to visit popular attractions – all ably managed by the tour company. Angus was surprised to see that restoration work was underway at a number of former large parking lots. Their tour guide stated that with restrictions on private vehicle use, Parks Canada was in the process of restoring these areas to a more natural state. The number of visitors coming to these locations was similar to past years but the congestion and traffic snarls were happily gone.

Fiona and Angus have been building their own itinerary for the next few days. The Banff Lake Louise Tourism website had links to multiple options. Reservations and payments were seamless and secure. The hotel concierge, information staff and local volunteers also provided some great tips to enhance their visit. After dinner tonight, they plan to enjoy a concert at The Banff Centre. Tomorrow they will spend the day with an Indigenous guide and explore the latest exhibits at the Whyte Museum.

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PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

KEY STRATEGY 3:

Improve & diversify public transportation options

Current situation

Significant progress has been made toward developing public transportation options in Banff National Park. Presently, there are a variety of motorized transportation options that cater to visitors, residents, and commuters, however these offers largely come as one-off modes of transportation that have no interconnection with one another, making it difficult for users to use one to access another in a seamless fashion. The On It system connects Calgary to Banff, Roam transit provides service around the Bow Valley and Parks Canada runs shuttles to Upper Lake Louise and Moraine Lake. These services have expanded and improved in ways such as increased service hours, expanded routes, reservable shuttles for Lake Louise and offering electric bus service on Roam.

These services are divided between private and public sector providers that currently lack any concerted effort to collaborate and work together. Because of the disconnected nature of the current public and private transportation systems, it leaves little room to motivate individuals to completely replace the use of their own vehicles as a more convenient and consistent travel mode. In order to change this, there needs to be an integrated and accessible system that provides an incentive to get visitors out of their cars and conveniently connects them to the systems available to reach major destinations.

Public transit is not yet at its full potential. The diversity of users and related needs are not fully considered. The current system does not have capacity for all visitors to Banff, and has not been fully planned in coordination with private vehicle access to deliver the appropriate pace and flow of visitation to different areas throughout the park. Some areas of the park are not serviced by public transit and experience significant congestion. While Parks Canada has made significant improvements to its service it is not best positioned to operate a public transit system in the future. The current hybrid model of paid parking at Lake Louise and public transit has not eliminated traffic congestion and is an expensive system to operate annually.

There is no one solution for moving people around the park but rather a variety of options based on their needs. User needs should always dictate the actual mode of transportation chosen for any given area.

Contribution to a sustainable system

The panel recommends that Parks Canada takes an approach where mass transportation becomes the de facto way of seeing the busiest places in Banff National Park. In places like Upper Lake Louise and Moraine Lake, eliminating personal vehicle access combined with an effective and appropriately managed public transit option, would be a significant step toward reducing congestion, improving the visitor experience and ecological integrity. This concept has applicability in other areas of the park and may become necessary in more areas as time passes.

In the future, there should be a diversity of seamless and accessible options for moving around Banff once you have arrived as well as accessibility of knowledge of these options. There is no one solution for moving people around the park but rather a variety of options based on their needs. User needs should always dictate the actual mode of transportation chosen for any given area. The panel has developed a table that can help guide which mode might work best in various situations and locations (*Appendix 1*). Planners can use this table to help inform recommendations for each area and as a tool to be used in an iterative way for future planning.

In order to support an integrated system of transportation that motivates users to get out of their private vehicles, there needs to also be a system of amenities in place that supports users in their desired activities. For example, if a paddler wants to go to Two-Jack Lake, they are unlikely to take public transportation if they have no ability to take their watercraft. Therefore, gear share programs, or pop-up amenities to support a wide variety of activities also needs to be taken into account. Research indicates that changing family structure (i.e. having kids) is a pivotal point for transitioning adults to using public transportation. Transit with children (strollers, gear, etc.) poses unique challenges that must be addressed in transportation infrastructure design.

KEY STRATEGY 3

Summary of potential actions

Articulate that public transportation becomes the way to visit busy places →	This recommendation is conceptual but would represent a significant step toward a new framework for Banff. Acknowledging that private vehicle access in many places is not sustainable from an ecological, visitation and GHG emission perspective, would be a shift in thinking with implications for other places in Banff and across the country. It could help set the context for future planning and expansion of a transit system. This shift in thinking may require a broader discussion with Canadians as it could fundamentally change the way many people experience national parks.
Eliminate parking in some areas →	The current system of allowing paid parking in places like Lake Louise while simultaneously running a shuttle is not sufficiently reducing congestion in the area. This is compounded by the fact that presently the relative price for parking and the shuttle does not incentivize the use of the public system. Moreover, given the choice, many people will continue to use parking to access the lake regardless of the cost. Over time, the panel sees a shift of vehicle access restricted to the intercept lot or transportation hub with no private vehicle access to Moraine Lake and Upper Lake Louise. This may become necessary to adequately protect these environmentally and ecologically sensitive areas.
Examine feasibility of new modes of transit →	Parks Canada should be open to considering new and emerging modes of transportation such as autonomous (on-demand) shuttles and aerial transport. These modes could be considered long-term options, especially in places such as Lake Louise. If part of a larger system that is managed to deliver the appropriate pace and flow of visitation, the panel sees these options as effective modes of moving large volumes of people, not as attractions in and of themselves. Any new service that limits private vehicle ownership would need to be affordable to maintain access for visitors. Aerial transportation such as gondolas can easily adjust their capacity and frequency, are efficient and have small footprints as compared with roads. This mode of transportation is widely used across the world, including in many Asian, European and Latin

Examine feasibility of new modes of transit →
(continued)

American countries such as China, Singapore, Columbia, Bolivia, Mexico, Austria, Switzerland and France. Aerial trams exist in Portland and New York City and aerial transit systems are being considered in Toronto, Vancouver, Edmonton, Chicago, London and Boston. There are a number of benefits to the use of urban gondolas and other forms of aerial transit. They have been shown to be efficient, relatively easy to install, reduce staffing needs, and can be powered by green energy. Additionally, gondolas are more accessible and inclusive for all users and people of all abilities, and provide opportunities for education and interpretation. In certain areas, gondolas may also have the potential to improve ecological integrity by reducing vehicle, cycling and pedestrian disturbance at ground level but also have impacts from structure placement. There are three gondolas currently operating in Banff National Park (Sulphur Mountain, Lake Louise Ski Area and Sunshine Village) along with numerous chairlifts in the three ski areas.

Lake Louise is one area within Banff National Park that may be particularly well suited to the use of a gondola system. Lake Louise sees a very high volume of visitors that results in significant congestion on roadways in the area, often spilling out to the Trans-Canada Highway. This high volume of traffic poses significant barriers to wildlife. An aerial transit mode offers a way of removing vehicles from the system allowing for a more porous wildlife corridor. Additional wildlife crossing structures are already planned for the Whitehorn corridor as part of the Lake Louise Ski Area's Long Range Plan.

The primary purpose of this gondola is as a people-moving mode of transit. However, there are additional benefits. The gondola would provide an opportunity for interpretation, education and a high quality visitor experience. A gondola could provide connectivity with the hamlet and Upper Lake Louise but could also incorporate train service if this could be extended to the Lake Louise area. It also offers a truly unique way for visitors to experience the park's majesty.

Examine feasibility of new modes of transit → (continued)

Moraine Lake would still likely require its own mode of transit such as autonomous vehicles or buses. There are many examples of autonomous/driverless vehicles being tested in closed loops and real traffic situations world-wide. The panel has noted that there may be some situations where an autonomous shuttle could transport visitors along a particular route safely. There is potential to mitigate demand for parking and minimize operational costs. However, a private driverless vehicle likely has a similar impact on traffic congestion as a family sedan with a driver and it still requires a space to occupy in a parking lot. There also remain gaps in federal guidance on the future of autonomous vehicles such as the ability of private citizens to own them as opposed to companies and fleet operators. It is also unclear if they will be allowed on all roads or what criteria will be established for their deployment and unclear what supporting infrastructure may be required and where it would need to be installed.

Expand services adaptively →

Parks Canada and partners should learn from each step they take toward advancing public transit and the related improvements and influences on resource protection, GHG reduction, goals and providing inclusive and high quality visitor experiences throughout the park. Over the past several years, incremental steps have been taken to improve the delivery of bus service in Lake Louise. It is possible that this system could be continually expanded and no additional modes of service are needed. While a gondola may prove in the long run to be an effective solution, an improved bus service may be adequate. A robust research and monitoring of the system will improve long-term decision making.

Transit service coordination →

The current public transit offers are managed as separate entities and they are not interconnected in scheduling, cost, ticket purchase mechanisms or destinations. To appeal to a variety of user groups, and dissuade use of private vehicles, there is a need for a singular system for use of transportation, booking, and associated user and visitor experiences. In doing so, this type of system would work towards a more coordinated delivery of the pace and flow of visitation throughout the park to achieve desired conditions, and a seamless experience for users, reducing the stress of deciphering multiple systems and how to connect them, and providing more incentive for use.

Expand 5G services →

Autonomous and connected shuttles are expected to rely on 5G network technology in order to communicate in real time with other vehicles, road alignments, traffic signals, etc. According to industry promotions, small cell base stations, a major feature of 5G networks, are designed to blend in with the existing landscape, take up minimal real estate, and are distributed in clusters in device-dense areas to provide continuous connection and complement the macro network that provides wide-area coverage. The cells rely on many small antennas that transmit and receive data from many devices.

Visitors and travellers through Banff National Park often assume that there is a reliable mobile network. The existing networks are not complete, extensive or dependable. Many tourist attractions (e.g. Moraine Lake) are at the end of a lengthy road with no mobile network and electrical power is “off-grid”. Some visitors enjoy the lack of mobile network access and accept that as part of the experience of visiting more wild and remote locations while others simply assume there is always cellular service.

KEY STRATEGY 3

Feasibility

Much of the ground work has been laid for improving public transit. Roam transit has done excellent work in expanding local services and is well positioned to expand its role as a regional transit operator. The above mentioned actions are long-term planning actions that will likely require partnerships. Design and consultation portions could begin in the short-term.

FUTURE VISITOR SCENARIO

Amara & Bruni

DATELINE: MAY 19, 2027

Amara and her three-year old son Bruni, arrived in Canada nearly two years ago. Sponsored by a local community group, they now rent a small fully accessible apartment in a bedroom community outside of Calgary. Amara has significant mobility challenges and requires the use of a wheel chair when outside her home. She has secured employment and Bruni is adapting to a nearby day-care. Through her sponsors, Amara has an opportunity to take Bruni on a trip to Banff National Park with a group of recent arrivals to Canada. The community group applied to Parks Canada for a significantly reduced entry fee for the group based on its equitable access program. The regional transit authority, several businesses and the municipality of Banff have partnered with Parks Canada to provide a first-hand tour of the park, complete with a bag lunch and any necessary gear suitable for the season. Amara has been reassured that the buses and shuttles they will be boarding and the public and private facilities and attractions they will use in the park all meet or exceed the requirements outlined in the Accessible Canada Act *and its regulations. What began as a pilot program is now offered on a weekly basis, year-round and on varying days of the week to accommodate work schedules and family commitments.*

4

PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

KEY STRATEGY 4:

Develop and encourage active transportation

Current situation

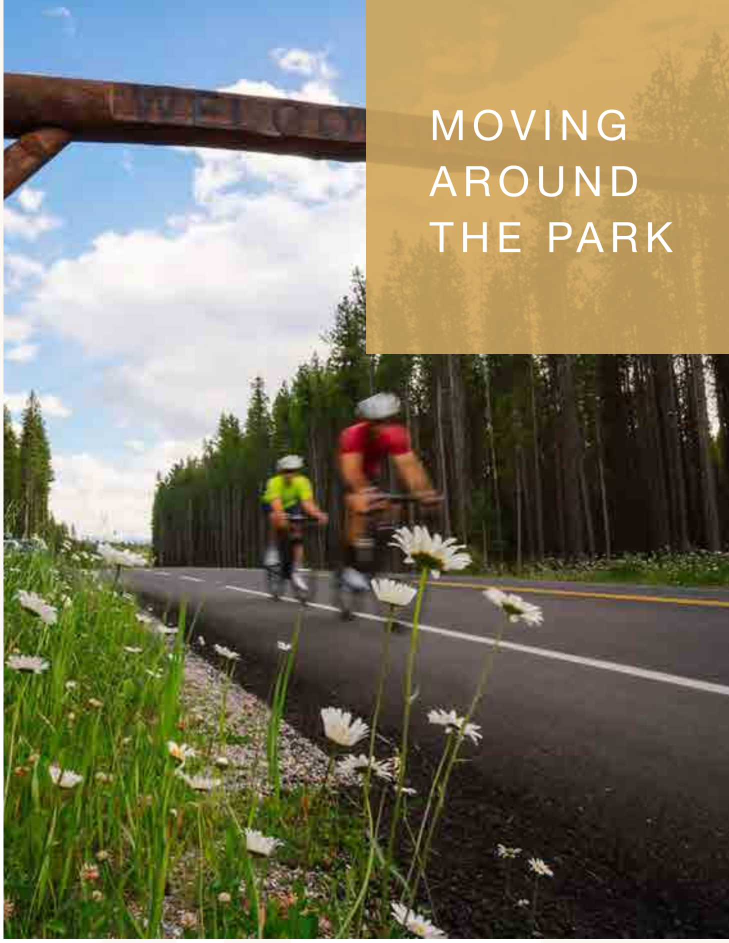
Banff National Park is very large and all trailheads, picnic areas and other attractions have been designed and built primarily around automobile access. Active transportation means using your own power to move around the park. Active transportation networks are not well developed, linked or understood. There is limited information and promotion of opportunities. The focus is currently on active modes as ends unto themselves in terms or cycling or hiking, but not as ways to move about the park.

There is a desire from many user groups to use active modes of transport such as walking or cycling. Existing infrastructure limits these options. For example, currently the Minnewanka Loop is a two-way road open to all modes of traffic (i.e. bus, private vehicles, RV's, cyclists, pedestrians). It is a highly desirable destination for all user-types, however the current traffic system is limiting to pedestrians and cyclists, largely due to safety considerations with other traffic modes within the limited right-of-way.

KEY STRATEGY 4

Contribution to a sustainable system

The use of pathways to connect destinations within the Banff Bow Valley would open options to a diversity of users and audiences, and increase year-round connectivity across multiple destinations. The panel would like Parks Canada to consider the following concept: “if you can drive there, there should be an adjacent path there” (if resource conditions and safety considerations allow). For the purpose of this concept, pathways are paved routes, as opposed to hiking trails, and are accessible to a variety of personal mobility devices (ex. Scooters, wheel chairs, strollers, bicycles). They are safe and separated from vehicles and are guided by a minimum design standard.



BIKING IN THE BOW VALLEY / PHOTO CREDIT: PARKS CANADA

Pathways should be considered as a complementary mode of movement alongside roads.

Pathways should be considered as a complementary mode of movement alongside roads. The use of pathways can act as a link into the current system of hubs and existing paths, including those within the Town of Banff. When implemented correctly, users should be able to easily interchange their mode of transport from pathways to buses/gondolas and vice versa. This could be enhanced by the addition of pop-up amenities such as equipment rentals and drop-offs and food and beverage options. As previously mentioned, the Lake Minnewanka loop/ area is an ideal location to pilot a new pathway system in Banff National Park and connect it to adjoining pathway systems such as Cascade Ponds, Vermilion Lakes, the Legacy Trail and the Town of Banff.

Parks Canada has already seen strong public reactions by introducing and now piloting active transport on the eastern section of the Bow Valley Parkway and restricting private vehicle access.

KEY STRATEGY 4

Summary of potential actions

Accessibility review of Banff National Park facilities →	An accessibility review of current Banff National Park facilities would highlight areas where immediate and future improvements could be made. This review would look at the current options for active transport in Banff and how they function for various abilities. This should be a review of the four-season offer.
Expand infrastructure that supports active transport →	Infrastructure improvements can be made, where appropriate given resource conditions and safety conditions, that help support an active transport network. In the short and medium term, investment can be made in things like bicycle, e-bike and scooter rentals. This can be facilitated through partnerships with local businesses. With these additions there will be a need for supporting infrastructure such as racks and e-bike charging stations. A longer term action could involve the development of separate pathways for active transport. This can take a variety of forms. One such strategy is already happening in Banff with the closure of a road to allow a non-motorized experience for part of the year. New pathways could be considered such as the Legacy Trail that connects Banff townsite to Canmore. There are also designs that could allow separation of motorized and non-motorized modes within the current footprint. The panel is aware that the Minnewanka Loop, for example, has been considered for physical separation of bikes and vehicles with a potential one-way traffic flow. Speed limit reductions and traffic calming options could also be considered on some of the secondary roads to make the experience friendlier to active transport.
Improve way-finding and education →	Communicating routes and options for active transport will help to increase appeal for these activities and build constituency. Many visitors would choose active transport modes if they knew they were available and meant they could avoid congested roadways and parking lots. Routes could be better signed and mapped in brochures and on-line resources. Education campaigns could encourage visitors and residents to leave vehicles behind and use more active methods. Group events could be conducted to draw attention to these modes and engage new users.
Explore four-season opportunities →	Active transport can happen year round and does not need to be restricted to the summer season only. Trail networks could support fat biking and Nordic skiing for example. Winter maintenance could allow other routes to be kept snow free to allow for walking, strollers and wheelchairs.

KEY STRATEGY 4

Feasibility

Expanding active transport is one of the more immediate and least costly ways to make gains in reducing vehicle traffic. Some of the network is in place but could benefit from enhanced communication, public engagement and links between existing pathways. Working with partners to add more supply of active transport options can also begin quickly and with low investment. Planning can also commence for longer term solutions such as more pathways or separated access.

Providing commercial amenities such as gear rentals at popular day-use destinations will involve policy discussions around the pros and cons of providing such services vs. private vehicle use and associated parking congestion.

PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

MOVING AROUND THE PARK

KEY STRATEGY 5:

Create a comprehensive and unified transportation service

Current situation

As previously discussed, there are currently multiple options available for public ground transport within the Banff Bow Valley (i.e. Roam, Pursuit, Parks Canada). However, these are managed as separate entities and they are not interconnected in scheduling, cost, ticket purchase mechanisms or destinations. To cohesively manage the pace and flow of visitation, appeal to a variety of user groups, and dissuade use of private vehicles, there is a need for a singular system for transportation, booking, and associated user and visitor experiences. In doing so, this type of system would work towards a seamless experience for users, reducing the stress of deciphering multiple systems and how to connect them, and providing more incentive for use.

there is a need for a singular system for transportation, booking, and associated user and visitor experiences.

KEY STRATEGY 5

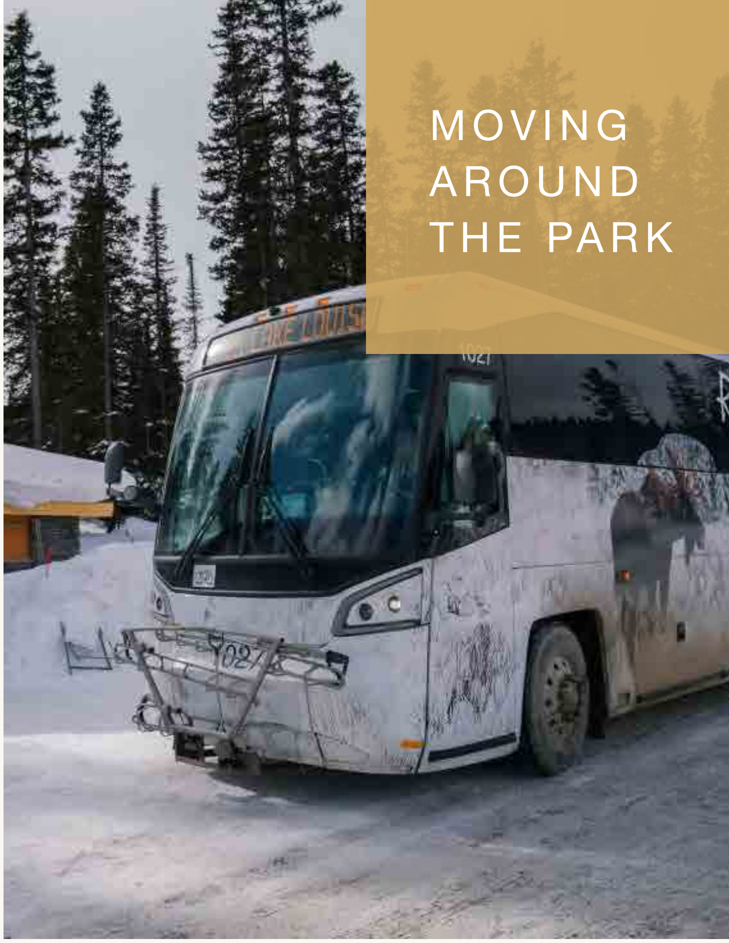
Contribution to a sustainable system

A unified transportation network would be a significant step forward in the Banff Bow Valley. An effective, coordinated and unified transit system would be very attractive to most visitors and increase its usage. It is an essential piece of the puzzle in removing vehicles from the system. Planners should think about the entire trip cycle and relate back to the vision at the beginning of this document. Regardless of how visitors arrive in Banff National Park, if they can connect into a seamless system that gets them to the places most want, it would be a huge leap forward.

In order to achieve a successfully unified system, it will require consideration of an overarching agency or joint collaboration among multiple private and public sector parties to manage all connected transportation options in Banff National Park and regionally. This would result in the need to consider a number of factors, including:

- Who would be required to be involved in such a collaboration, and how/who decides who is responsible for overseeing management?
- How are costs allocated and revenues shared?
- How do you make a singular system cost effective to promote equality among user groups, and make public transit attractive to users, encouraging less use of personal vehicles?

In addition to joint collaborations to manage transportation, it is essential to also create opportunities to create partnerships with private businesses to carry out the systems to support an overarching unified system. For example, gear sharing amenities at hubs and food and beverage opportunities. As a result, there is an additional requirement to identify how such contracts would be formulated and what needs could be met.



ROAM TRANSIT SERVICE / PHOTO CREDIT: PARKS CANADA

it will require consideration of an overarching agency or joint collaboration among multiple private and public sector parties to manage all connected transportation options in Banff National Park and regionally.

KEY STRATEGY 5

Summary of potential actions

Build vision and partnerships towards a new agency →

The panel sees the first step in this process as a visioning exercise with partners to determine what might be possible in the future. This would include not just the major public transit providers but also private operators like the ski areas, hotel shuttles, private shuttles, and private guiding services among others. This could be lead by a transit planning contractor. This expertise is not held within Parks Canada and an external contractor, with experience in this field, could facilitate advancing a unified strategy. Other regions have seen some success in this field (e.g. public transit in the Washington, DC area) and there is no need to reinvent the wheel.

Create or modify a standalone agency →

To further support the development of a unified system, it will require either a standalone agency or overarching regulator to be responsible for the bigger transit system, and who has the authority to oversee and enforce regulations. Parks Canada is not well positioned as an agency to take on this role but would be an important partner. For example, a unified system might include multiple modes of transit including roadways, pathways, bus use, and aerial transit. Having a regulator in place would ensure legislation such as the *Accessible Canada Act*, among others, is implemented and enforced. For this specific example, this would ensure that public transit fits a wide variety of users and caters to all ability levels. Further, while several independent operators may be contracted to deliver service, a regulator would ensure that each operator adheres to uniform fare policies, branding, and service quality levels.

It may not be necessary to create a new agency but rather consider a scope change for the Bow Valley Regional Transit Services Commission (BVRTSC). The BVRTSC operates the Roam bus service and is well positioned with many of the partners already at the table. It may be possible to consider a 'revamp' of operations and strategy to coordinate with Parks Canada shuttle service and explore opportunities for other private operators such as the shuttle services operated by the ski hills to join the regional transit service.

A future system may allow some partners to completely relinquish operation of their own transit systems and instead contribute financially to a unified system. This may be an attractive option for some private operators to focus solely on their own operations and not having to also move their customers. There are likely efficiencies that can be achieved with fewer providers and a more centralized means of scheduling and coordinating service.

Build new digital tools →

To further support a unified transit system, proactive support systems must be put into place and be utilized to further ease use of the system for users and increase the appeal. Tools such as an app or website where all information is stored centrally and is available to the user, and where bookings can be made through a central connected reservation system, would remove the multiple steps that users are currently required to undertake to plan their trip. In addition, a one card/one app system where all payments are centralized for the user would also reduce the fatigue on users when making bookings. The challenge here, however, is deciphering when and how those payments are made and allocated where they need to be, and if this type of system is possible without the need for an overarching regulator. Accessible digital systems are needed for full inclusivity of experience.

An overarching goal of creating a unified system is to create a world-renowned experience that resonates with users and circulates via word of mouth and other outlets. This “word of mouth” experience would empower all user types to make good choices and choose the preferred experience (ex. using public transit) based on the experiences of other users they can relate to. To achieve this, the quality of the products and experiences available to the user needs to outweigh the quantity. This can be achieved by easing the burden on users in making decisions on how and when they are going to arrive/depart, what products and experiences they will partake in, and reducing/removing the stress that can take away from their overall experience.

Digital tools can also benefit the park by providing insight into future demand periods, based on booking information and usage. This will allow service providers to proactively “ramp up” in anticipation of future peak activity periods to maintain a positive visitor experience, as opposed to the reactive environment of the current operations. This includes quickly enhancing mobility service offerings, and staffing as needed. Over time, this will allow Parks Canada to improve the predictability and growth of visitation and allow for future mitigation measures to be implemented to continue to preserve the ecological environment while also increasing park visitation. It also allows Parks Canada to understand future demand for specific areas within the park and modify the strategy accordingly - from specific locations within the

Build new digital tools → (continued)

park, to amenity usage and mobility preferences. For example, future bookings may suggest an increase in demand for an aerial transport service this weekend, allowing the vendor to pre-emptively increase services in anticipation of the anticipated demand, minimizing wait times and delays for park visitors when they arrive.

Align stakeholders →

The panel believes there are advantages of developing a unified transit system that provides a variety of options and amenities to a wide range of user groups in order to more effectively and efficiently move people around the Bow Valley and Banff to achieve a shared vision and support desired conditions for resources and visitor experiences. To do this, it is essential that the proper steps are taken, and an adequate amount of time and detail is spent listening to and understanding the specific needs and wants of those groups, and that no demographic of user is left out. Specific questions that need to be asked are:

- What does it mean to live and travel in Banff National Park, Canmore and regionally, and how can this be or does this need to be considered when implementing changes to how people move around?
- What types of opportunities will allow users to make more meaningful connections with the Banff Bow Valley and as a result lead to better quality experiences?
- Where are the current gaps in equity and what solutions can be pursued to close them?
- How can regional recreation opportunities and connections, and other gateways, support development and infrastructure, and economic and transportation patterns?
- How do we engage with Indigenous Peoples to best understand whether and/or how they would like to be involved from an economic, cultural and social perspective?
- What challenges need to be overcome to achieve full and equal inclusivity and accessibility
- How do we collectively support the management of visitation to achieve desired conditions?

Feasibility

The creation of a single provider with coordinated services is a long term goal. This effort will take years to build and execute in a meaningful way. Work could commence in the short term to start building a vision and bringing partners together.

FUTURE VISITOR SCENARIO

Preeya & Raj

DATELINE: AUGUST 22, 2026

Preeya and Raj are avid campers. Retired a few years ago, they used to enjoy making a summer camping tour of the mountain national parks but traffic jams and parking congestion in Banff National Park have prompted them to avoid the park … until now. Preeya made all the camping reservations through the new "unified reservation and payment system". As their travel plans came together, Preeya went back in to their trip itinerary folder and reserved a private sector shuttle company and a timed ticket entry at the Helen Lake trailhead for the two of them plus their daughter and her family who are coming out to join them. Preeya's daughter is choosing to drive her private vehicle from Calgary and will meet her parents at the Lake Louise mobility hub. She knows that parking is limited at the trailhead and with her Mom's timed ticket entry and decision to use a private shuttle service, they do not have to worry about being turned away at the Helen Lake trailhead. The private shuttle company will take the entire party up to the trailhead and then pick them up four hours later. Preeya and Raj will enjoy the evening at their campsite while their daughter and her family travel further west to their condo in Golden.

6

PHOTO CREDIT: MICHELLE MACULLO

KEY STRATEGY 6:

Develop partnerships with stakeholders and Indigenous Peoples

Current situation

A common theme through this report, highlighted in different sections, is the missed opportunity of more coordination with stakeholders and Indigenous Peoples. There are services and opportunities that would be much better provided by private operators. Indigenous Peoples are also not significantly involved in moving people in Banff National Park and have much to contribute.

> **A common theme through this report ... is the missed opportunity of more coordination with stakeholders and Indigenous Peoples.**

KEY STRATEGY 6

Contribution to a sustainable system

Partnerships will be key to an effective transportation system. Parks Canada cannot create a sustainable transportation system on its own. Genuine coordination among a range of providers will result in the best experience for visitors and residents of the Bow Valley. There are also unexplored opportunities for working with Indigenous Peoples. Indigenous Peoples have lived on these lands for millennia and offer a unique perspective on how to maintain them for generations.

PHOTO CREDIT: MICHELLE MACULLO

Indigenous Peoples have lived on these lands for millennia and offer a unique perspective on how to maintain them for generations.

REPLACE IMAGE OF INDIGENOUS BANFF

Summary of potential actions

Engage with third party providers →

While this has already been part of previous recommendations, the panel encourages Parks Canada to pursue partnerships for a range of opportunities. This can be from something as simple as the provision of e-bikes at transit nodes to more complex issues such as a passenger train connection between Banff and Calgary.

Although the panel has not spent much time considering funding, it is anticipated that some recommendations in this report will require multi-party investments from all or some levels of government and private sector sources.

Explore the range of Indigenous partnerships →

The panel chair and members met with several Indigenous Peoples and were struck by their knowledge and deep connections to the Banff area. There were interesting discussions regarding potential economic development opportunities although they were less focused on investment or ownership of transportation related initiatives. Indigenous Peoples see real employment possibilities given the current staffing challenges in the Bow Valley and the need for their members to find employment off reserve. A train or bus commuter service between Banff and Calgary might help encourage people in Calgary to consider employment in Banff National Park. Some of the First Nations near Calgary also see potential partnership opportunities where their lands could be part of staging areas for transportation services. They also believe there are opportunities to share their history and culture through mass transit solutions.

Indigenous Peoples are interested in continuing the conversation about sustainable transportation with Parks Canada as this work advances. They were appreciative in discussing their interests with the panel but feel the long term conversation needs to continue into the future with parks officials. They believe there are real opportunities and true partnerships to be realized through dialogue and working together.

Feasibility

The panel is confident that Parks Canada will continue to see the value of its role in creating, and as importantly, maintaining long-lasting relationships with a variety of partners. The panel acknowledges that Parks Canada also has a regulator role. Nevertheless, the panel encourages Parks Canada to engage with potential partners and clearly state how it can play a participatory role but may also have to make decisions related to policy and regulations. Continuing and expanding this is very feasible. This work can begin immediately and is not costly. Pathways for conversation with Indigenous Peoples are already in place through mechanisms such as the Indigenous Advisory Circle.

FUTURE VISITOR SCENARIO

Tom

DATELINE: FEBRUARY 2029

Tom has been working in Banff for the past nine months. He graduated from a Tourism and Hospitality program and is enjoying the variety of roles he has experienced. A career in the tourism industry interests him as does remaining close to his Indigenous family living in Calgary. A few years earlier that would have been impossible but now he can commute, either by train or bus. The commute is still over one hour one-way but it does provide him with a chance to relax, work on a correspondence class and not worry about having to drive nor purchase a vehicle. Tom's employer and his First Nation subsidize his commuting costs.

ENABLING CHANGE

PHOTO CREDIT: BANFF TOURISM / NICK FITZHARDINGE

KEY STRATEGY 7:

Use pricing as a tool to influence behaviour

Current situation

The current pricing system in Parks Canada does not properly reflect operating costs nor does it incentivize desired action. For example, it costs more for a family to ride the shuttle in Lake Louise than it does to park a car at the upper Lake Louise parking lot. With this pricing scheme there is little incentive for visitors to ride a public transit system than to attempt to park at the upper lake. The current pricing strategy also does not consider income levels, which can create equity issues and discourage lower income persons from experiencing the park.

Pricing also does not reflect the impact of different types of visitation on the park. A solo visitor arriving with a large SUV or motorhome pays the same as one arriving by bus. Activities within the park follow a similar pattern. There is no difference in entry fee costs to someone moving through the park by active transport, public or private vehicle.

Pricing is also not coordinated among different providers. Different modes of transit, both private and public, have very different pricing schemes.

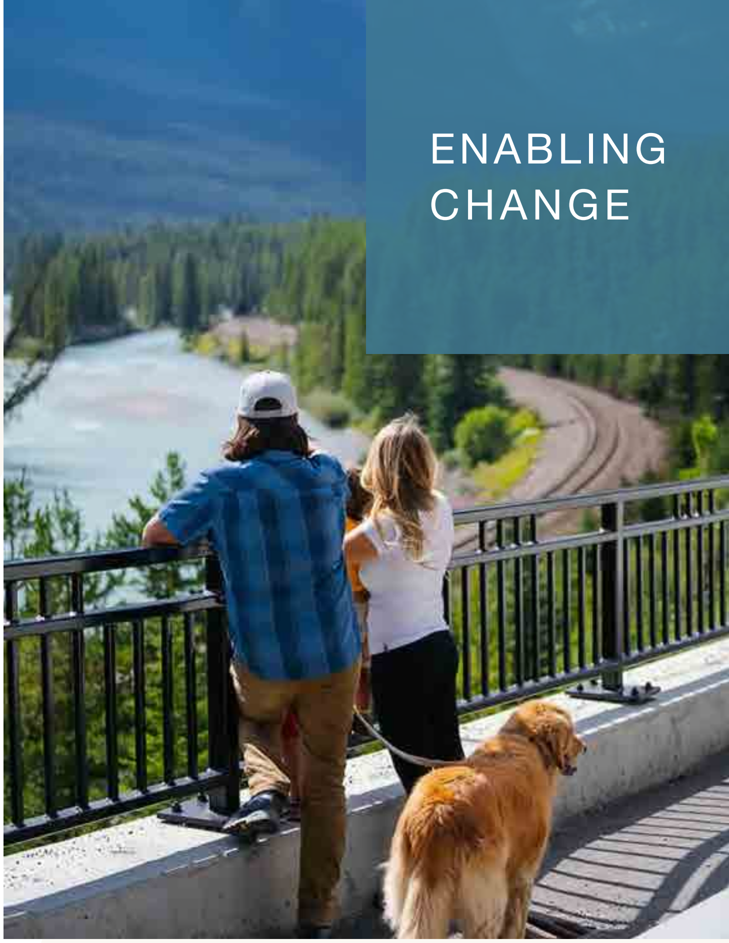


PHOTO CREDIT: PARKS CANADA

Contribution to a sustainable system

Based on the panel's research and expertise, one of the most powerful tools for addressing congestion is influencing visitor behavior, expectations, and supporting management tools. One approach to influencing a change in behavior is to examine the total financial cost of an individual or family visiting the park. The panel recommends a critical review of the Parks Canada entry pass. There are many technological innovations (license plate readers, location-based services (cellular) data, Strava data, traffic data via mobile phone GPS, unified payment systems, mobile applications and QR code readers) that could eliminate the hang tag park pass and potentially eliminate the need for entry kiosks where backups and delays occur. These systems could also provide alternate compliance approaches. This type of technology also affords an opportunity to collect social science information that can help build a better understanding of visitors and therefore the opportunity to build a better experience. The panel also realizes that there are public concerns about general access to data gathered from mobile phones, however providers routinely anonymize this data to address privacy concerns, and a multitude of industries are already using this type of technologies to improve service offerings.

A revamped park pass could also be used as a tool with multiple benefits. Some tourist destinations are employing a pass that has multiple benefits. Your park pass not only allows entry to the destination but can be the key for your hotel room, entry on to a transit system or admission to an attraction. The pass could even assist with timed ticket entry and help manage the pace and flow of visitation in particularly highly congested areas. For example, you could use your pass to book a time slot to hike a popular trail such as Helen Lake. Information kiosks can also be used to download educational information to passes, allowing visitors to "bring home" a piece of the park and extend their visitor experience long after their visit. This can enhance their appreciation of the park, share it with others and incentivize them to return again in the future. Similar kiosks are being used at some of the Smithsonian museums in downtown Washington D.C.

> **Pricing should make public transit more attractive and personal vehicle use less so.**

The panel recommends that Parks Canada look at the pricing scheme to see where pricing can better incentivize and de-incentivize certain behaviors. Pricing should make public transit more attractive and personal vehicle use less so. It is a key motivator that drives behavioral change. Proper pricing is key to the success of the system overall.

Summary of potential actions

Examine pricing policy and legislation →

While Parks Canada has recently amended its pricing structure, the panel encourages a further review of existing policy and legislation to understand where additional flexibilities may exist. There may be other options for Parks to consider in the implementation of fees, including amending or no longer using the *Service Fees Act*. As an Agency, Parks Canada has more ability to control its fee structure than other government departments and a thorough review of legal responsibilities, authorities and accountabilities could be productive.

Reflect true costs in pricing →

The panel recommends looking at a range of variable pricing schemes. One important principle would be to have the cost of a visitor's access to the park reflective of their impact. For example, a person arriving by public transit and only using the coordinated system within the park would pay substantially less than a person arriving by private vehicle. This could be reflected in the park pass or day entry fees. It could also be reflected in the cost for tickets for whatever mass transit option from Calgary exists in the future.

Variable pricing could also be used to incentivize behaviours that will help reduce congestion. Pricing could be changed based on dates and times of visits (e.g. weekends vs. weekdays or summer vs. shoulder season).

Pricing should also be adjusted for parking fees. In Lake Louise for example, it is cheaper for two people to attempt to park at the lake than it is to ride the transit system. Implementing variable rate pricing mechanisms would allow the price to change to reflect the true cost of the convenience of parking there. Prices could be increased until the lot always has some empty spaces. This additional fee collection would also help offset the cost of running the system.

The panel feels it would be useful for the Agency to demonstrate what proportion of operational and capital costs in Banff National Park are covered by an entry fee vs. what is covered by taxes. In other words, Parks Canada could demonstrate the level of taxpayer burden associated with a visit to Banff National Park. This may help make the case to create a separate class of fees specifically for Banff National Park given the congestion challenges it faces.

Reward advance planning →

Advance planning will likely need to become more common on trips to Banff in the future. The Lake Louise shuttle has demonstrated the value and acceptability of using reservations and has reduced wait times making trips more enjoyable. Expanding reservations will help make trips more predictable and gives Parks Canada another tool to manage volumes. Reservations can ensure that no more spots are available once a venue is considered full.

Communication will be key to new reservation systems. It will be a shift in culture and planning for many visitors, especially those in the local area.

Technology for pricing →

There are new technologies that could simplify the annual pass and eliminate the need for hang tags and potentially park entry gates. Licence plate readers and mobile apps can replicate the function of the park pass. This is more in line with typical customer experiences and could be a more efficient delivery mechanism for Parks Canada.

A new park pass would also offer an opportunity to develop a one-pass system that connects with other components of the transportation system. For example, a digital pass could also provide a visitor access to transit from Calgary, shuttle buses within the park, and even access to rental bikes or other mobility modes. It could also be used to book access to high use nodes or trails that require reservations. This would provide a seamless experience for visitors and help facilitate the unified transportation system.

Partnership with private sector →

Building partnerships with private operators could expand the functionality of a new pass system. A digital tool could be used just as easily to access everything from hotel rooms to private shuttles and rentals.

Feasibility

Parks Canada has the enabling powers in the *Parks Canada Agency Act* to develop the most appropriate pricing mechanisms. To enable these powers, regulatory changes to remove Parks Canada from the *Service Fees Act* are required. This should not be perceived as a reason not to seriously and aggressively explore and implement pricing solutions. Legislation and regulations are not immutable, they are a reflection of conditions and context when they are created. If the context changes, governments have a responsibility to update to ensure efficient and responsible operations and service provision.

FUTURE VISITOR SCENARIO

James & his extended family

DATELINE: JULY 15, 2025

James and his family, along with his parents and his brother's family are interested in coming out to Banff National Park for a picnic. In discussions since April, they finally agreed on a Saturday in late July. If everyone can make it there will be 14 coming out from Calgary. James has been to Banff National Park a few times but always finds it difficult to find a place to park. His 20-year-old son mentioned that his social media feed from Banff Lake Louise Tourism was promoting the use of a new bus rapid transit service from their C-Train station in Calgary direct to the Banff mobility hub. The cost of the bus fees and entry fees to the park are less than driving two vans out to the park with seven adults and seven children. Further, James can get his parents on a regular Roam transit bus to Cascade Ponds for free. His son adds that he can rent a cargo e-bike at the Banff mobility hub to transport their picnic supplies and the younger kids can rent bikes as well. Although still skeptical, James says it is worth the adventure.

ENABLING CHANGE

PHOTO CREDIT: BANFF TOURISM / DAMIAN BLUNT

KEY STRATEGY 8:

Better understand visitor experience and transportation use

Current situation

While the social science program in Parks Canada was robust in the past it now focuses mainly on broad market research and understanding visitors on a park wide scale. There are no dedicated resources within Banff National Park to collect social science information. Attendance factors are well out of date having not been updated since 2003. There is often insufficient information to understand visitor patterns of use, motivations and behaviours.

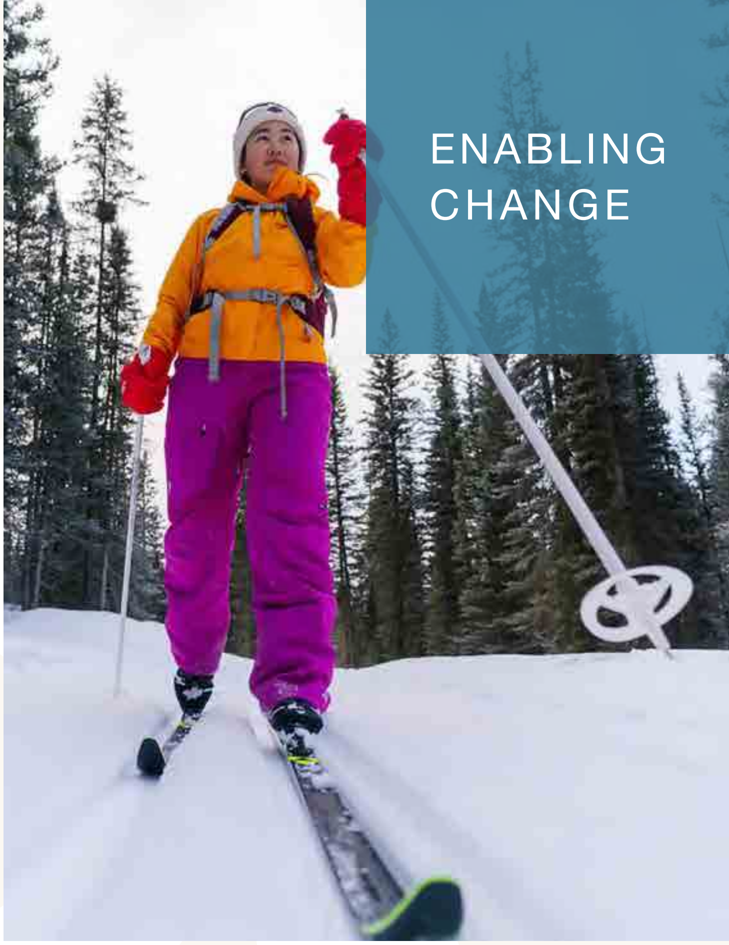
There is a lack of current data and user information to draw upon in working to identify user preferences. The lack of current social science data is cause for an examination of the existing Parks Canada/Government of Canada policies regarding collection of social science data, and a need to utilize resources such as mobility apps to collect data and provide information that will feed into park user information to inform the recommendations being made.

There are no dedicated resources within Banff National Park to collect social science information.

KEY STRATEGY 8

Contribution to a sustainable system

Current, accurate information is critical to understanding current and potential visitors, and their preferences, needs, and expectations that will result in better designed systems and adaptive management needs. In addition to utilizing sources of data and user information, exercises—such as a cost comparison of transportation options and associated group dynamics—should be completed to determine what is most economical for the user. There will also be a need to develop metrics to help evaluate and guide the implementation of the plan to ensure that goals are being achieved. Good social science information is critical for monitoring, testing pilot programs, and adaptive management.



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In addition to utilizing sources of data and user information, exercises—such as a cost comparison of transportation options and associated group dynamics—should be completed to determine what is most economical for the user.

Summary of potential actions

Develop a social science strategy →

While Banff National Park would benefit from an overall social science strategy, one specific to development of a long-term plan for moving people sustainably would be very beneficial. This would involve a review of existing data sources to understand what Parks Canada and partners are already collecting to support better delivery of transportation solutions. Then a plan can be developed with a structured format to fill gaps. The following questions can guide the development of the framework:

- What do we know about current visitation as it relates to the scope of the project: **amounts, types, timing, and spatial distribution**?
- What do we know about visitor characteristics as it relates to the scope of the project: **group size, origin, demographics, use history**?
- What information do we have about the **quality of current visitor experiences** as it relates to the scope of the project?
- What do we know about **audiences we aren't fully reaching** as it relates to the scope of the project?
- What information do we have about **how current visitor use is influencing natural and cultural resources** in relation to the scope of the project?
- Based on the previous questions and needs/opportunities of the specific project, **does new data need to be collected, or will existing data suffice for decision making**? If new data is needed, can it be collected with existing resources, or will outside or technical assistance be required?

An initial review and suggested strategy is presented in *Appendix II*.

Pursue partnership opportunities →

Parks Canada does not need to fill all the gaps in knowledge alone. There are likely willing partners who are already collecting some of this information or who could tailor their work to help fill gaps. This task is made easier with a well constructed guiding plan. Local marketing organizations, businesses and NGO partners all have a stake in collecting this information. Banff National Park is a unique, high profile case study and would be attractive to academic partners and new sources of research funding. Parks Canada should be prepared to engage in partnerships by developing formal data sharing agreements to support data collection.

Explore new methods of data collection →

There are many innovative and cost effective new methods for Parks Canada to explore. Some of these are beyond the traditional realm of social science but can provide quality information on people movement. Bluetooth counters are starting to be employed by Parks Canada for these purposes. There is also a wealth of cell phone data that is becoming more readily available and cost-effective. Companies such as Streetlight and Cellint are a couple of the larger companies offering these services.

Feasibility

Social science research is critical for the Park to deliver sustainable transportation solutions, and the park's mandate. Parks Canada currently collects basic visitor information and developing a broader program is very feasible. By building partnerships and making some financial investments, the agency could significantly advance its research program and further enhance the visitor experience.

> **By building partnerships and making some financial investments, the agency could significantly advance its research program and further enhance the visitor experience.**

Managing for success

THE PANEL HAS provided a broad structure for a framework to move people sustainably. It is intended to generate further discussion and exploration of some concepts. Further research will be required to test the validity of some of the ideas. In order to achieve success, there are steps Parks Canada can take to move from concept to concrete action. There are planning frameworks for protected areas that may prove helpful as the work advances

Many of the previous sections have highlighted the concept of taking an adaptive management approach. This approach involves trying new management strategies, monitoring the results and then adjusting actions going forward. Six federal agencies that manage visitor use and recreation in the United States formed the Interagency Visitor Use Management Council and have collaboratively developed a planning framework that builds on these concepts. Given the dynamic nature of visitor use management, the shared *Visitor Use Framework* is a tool to guide discussions, identify issues and desired conditions, and look for creative and appropriate management solutions, along with continual monitoring to inform adaptive management. It could serve as a useful method to further the discussion on sustainable transportation.

The Visitor Use Management Framework uses four major elements for analyzing and managing visitor use. These can be seen in the diagram below (IVUMC, 2016). Managers use the framework to understand the existing conditions, define objectives, identify management strategies and then implement, monitor, evaluate and adjust those strategies. The program is scalable and adaptable to a range of management issues. Additional guidance is available on best practices for specific elements of the framework, including monitoring and also for identifying visitor capacities. Parks Canada has begun adopting this framework in some locations and is finding success with its application.

Visitor Use Management Framework (IVUMC, 2016)

MANAGING FOR SUCCESS

The United States National Park Service is actively integrating the Visitor Use Management Framework into its planning and management efforts. In addition, the NPS has also identified many unique management strategies to deal specifically with congestion needs in national park units and implemented numerous congestion assessments to identify the appropriate strategy for different locations and issues.[1]

The panel believes there should be a shift to focus from managing to accommodate demand to managing to enhance the quality and inclusiveness of the visitor experience when planning a people-moving framework. Collaboratively setting desired conditions for resources and visitor experiences, and using those to guide evaluation and implementation of management strategies will provide a shared vision and roadmap for a successful outcome. This applies to both visitor experience and ecological integrity.

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The panel believes there should be a shift to focus from managing to accommodate demand to managing to enhance the quality and inclusiveness of the visitor experience when planning a people-moving framework.

[1] https://www.nps.gov/orgs/1548/upload/Congestion_Management_2021-508.pdf

Visitor experience

The panel recognizes that the visitor experience to Banff National Park is world class and should begin even before the arrival to the park. From planning through to execution, providing high-quality and inclusive experiences, it is essential to understand what contributes to a 'high quality visit' for a diversity of people. One of the biggest challenges here is that a high quality visit may not look the same to every user, leaving a need to fulfill a variety of desired experiences and modes of travelling to desired destinations within the park. The panel is aware of the need for better and more detailed information collected through public consultation processes, observational studies, and visitor surveys and the need to continue to build upon these to better understand what the current and potential user wants and how best to provide a welcoming and inclusive environment for all, regardless of physical ability, financial means, or cultural tradition.

From planning through to execution, providing high-quality and inclusive experiences, it is essential to understand what contributes to a 'high quality visit' for a diversity of people.

ELEMENTS CONTRIBUTING TO A QUALITY EXPERIENCE

Elements that have been identified as contributing to a quality experience fall under a broad variety of categories. These include (but are not limited to):

- Weather
- Safety
- A hassle-free experience
- Convenience
- Accessibility
- Physical satisfaction
- Mental satisfaction
- Spiritual satisfaction
- Meets and exceeds expectations

In considering how to deliver high quality and inclusive visitor experiences while moving people around Banff National Park, it is essential that it be done so in a way that continues to protect and enhance the park's natural and cultural resources.

Ecological Integrity

The panel recognizes that ecological integrity and protecting the character and nature of Banff National Park must remain Parks Canada's top priority.

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KEY CONTRIBUTIONS TO ECOLOGICAL BENEFIT

The key contributions to ecological benefit that have been identified are:

- Disturbed areas are returned to a natural state
- Wildlife corridors are functioning better
- Presence of people and vehicles on the landscape is predictable
- Invasive species (both plants and animals) are reduced and ultimately eliminated
- Native biodiversity is healthy and thriving
- Species at risk receive special attention

Keeping this in mind, the recommendations from the panel are taking into consideration the limited capacity that the park has to withstand use, and that the cumulative effects of human use and facilities should not be a strain on that capacity. Further research will be required into the impacts of a new framework on wildlife movement, aquatics, vehicle/animal collisions, hazardous spills, and noise among other variables.

Further research will be required into the impacts of a new framework on wildlife movement, aquatics, vehicle/animal collisions, hazardous spills, and noise among other variables.

Conclusion

TODAY'S MOBILITY OPTIONS cause issues like traffic congestion. Efforts to address this challenge have had limited success in Banff National Park. Visitors come to the park for many reasons – sightseeing, hiking, skiing, camping or enjoying a picnic with family and friends. Their ideal experience does not include being caught in traffic jams and long searches for parking. Simply expanding parking lots may provide relief for a few years but it is not sustainable, prudent over the long term, nor practical in some locations. Further, in a national park loved by millions of visitors, and cherished by Canadians, is it appropriate to have future generations lament "they paved paradise and put up a parking lot" (lyrics from Big Yellow Taxi, Joni Mitchell)?

The expert advisory panel has spent the last 12 months examining the challenges, both on-site and by reviewing public input and listening to comments and suggestions from local Indigenous Peoples, stakeholders and Parks Canada officials. The collective expertise and dedication of the panel members and secretariat have culminated in a final report to Parks Canada as per the panel's Terms of Reference. The observations, analysis and recommendations are wide ranging, bold in some cases and they should be subject to public consultation and an appropriate level of environmental assessment. The panel will leave those processes to Parks Canada to consider and ultimately execute.

Although the panel focused its work on how to move people sustainably in the Banff Bow Valley, many of the recommendations have application at other busy protected areas in Canada and possibly elsewhere around the globe. The panel benefitted from access to the soon to be approved Banff National Park management plan. That plan underwent significant public consultation and review. Concurrent with the panel's work, a new Tourism Master Plan for Banff National Park is being developed. Some panel members have been involved in its early stages. Both of these planning processes have helped inform the drafting of the Moving People Sustainably report.

The greatest challenge in implementing many of the recommendations in this report involves changing the behaviour of visitors, stakeholders, residents and staff of Parks Canada itself.

The greatest challenge in implementing many of the recommendations in this report involves changing the behaviour of visitors, stakeholders, residents and staff of Parks Canada itself. While the current infrastructure and services for moving people about in the Banff Bow Valley are effective in off-season periods, those periods are becoming shorter every year. Moving people sustainably requires innovative solutions and those solutions will only be successful if they are implemented in a collaborative and collective effort year-round - learning, adapting and responding to the feedback and monitoring from ecological and social indicators. It may take 5-10 years to implement a few of the panel's recommendations but the panel is confident that other work can and must begin immediately

CONCLUSION

(e.g. more focused social science data collection and analysis). Changing behaviour at an individual, corporate and society level will also take time and will be uneven. There are numerous behaviour change models to explore and the panel urges Parks Canada to examine appropriate models and consider the potential interventions in policy, pricing, communications, incentives, etc. that have been recommended in this report. Although Parks Canada needs to take the lead in advancing some of the recommendations, it must also be prepared to be a willing and active partner. Indigenous Peoples, stakeholders, visitors and residents all have much to offer in building a more sustainable "people moving" system in the Banff Bow Valley and beyond. Multi-party funding arrangements and governance structures will need to be negotiated and/or existing ones expanded. There are numerous references to transit services in this report, but the panel does not believe that Parks Canada needs to operate any of those services.

CREDIT: PARKS CANADA

Banff National Park has faced many challenges over the past 137 years. Its creation and development have impacted Indigenous Peoples and its history is a reflection of Canadian society and values as they have evolved over the decades. A new challenge - how to move people sustainably in the Banff Bow Valley – is now before us. It is now time for Parks Canada, its stakeholders and Canadians to tackle this new challenge head-on, with courage and an open mind to try new and innovative solutions. The international reputation of Banff National Park as a spectacular protected area and major tourism destination will be diminished if actions are not taken to address traffic congestion. No animals, no plants, no visitors and no residents will benefit from maintaining the status quo.

The panel wishes to express its thanks to Parks Canada for the opportunity to develop a framework and recommendations for how to move people sustainably in the Banff Bow Valley. It involved many stimulating and lively discussions. Some of the panel's recommendations are bold and the panel is confident they are doable. The panel looks forward to how Parks Canada responds to the report. This is yet another opportunity to demonstrate that Banff National Park is dedicated to the people of Canada for their benefit, education and enjoyment and the park is to be maintained in such a manner and made use of so as to leave it unimpaired for the enjoyment of future generations.

Acknowledgments

THE PANEL REACHED out to a variety of individuals and groups to help us gain a better understanding of the "people moving" issues and also hear their comments and suggestions about how to address the challenges. We thank you for your input and interest in this project.

The panel also benefitted from presentations, field trips and discussions with Parks Canada staff. Without their insights, it would have been impossible for the panel to fully understand the breadth and depth of some challenges and how staff, on the ground, are working to resolve these issues. The panel would also like to acknowledge the many staff who provided logistical, administrative and financial support to us over the past 14 months.

WE ACKNOWLEDGE AND SAY THANK YOU TO:

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Martin Bean, Roam Public Transit

Dwight Bourdin, Parks Canada

Reg Bunyan, Bow Valley Naturalists

Stacie Calf Robe, Siksika Nation

Andrew Campbell, Parks Canada

Seth Cherry, Parks Canada

Jed Cochrane, Parks Canada

Katheline Conway, Parks Canada

Chelsey Dawes, Parks Canada

Sarah Elmeligi, Canadian Parks and Wilderness Society (CPAWS)

Adrian Field, Town of Banff

Tao Gui, Parks Canada

Stefanie Jones, Travel Alberta

Yannis Karlos, AMPPE

Michaela Kent, Parks Canada

Jenny Klafki, Parks Canada

Rick Kubian, Parks Canada

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Sheila Luey, Parks Canada

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Violet Maguinis, Tsuut'ina Nation

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Michael Nadler, Parks Canada

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JJ Shade, Kainai Nation

Cedric Solway, Siksika Nation

Whitney Smithers, Town of Canmore

Joe Stepaniuk, Stoney Nakoda Nation

Mike Tailfeathers, Kainai Nation

Christie Thomson, Parks Canada

Jan Waterous, Banff Net Zero 2035

Jesse Whittington, Parks Canada

Patti Youngberg, Parks Canada

And finally, none of the panel's work would have been accomplished without the guidance and management provided by Michael den Otter. Michael had the unenviable task of managing the day-to-day operations of the panel's work while also playing the key liaison role with his Parks Canada colleagues. Thanks for keeping us on track.

Appendix I: Modes Table

ATTRIBUTE	SHARED MOBILITY MODE							PRIVATE MOBILITY MODE						
	SMALL BUS / SHUTTLE	STANDARD BUS	MOTOR COACH	PASSENGER OR HIGH-SPEED TRAIN	GONDOLA / AERIAL TRAM	TAXIS / RIDE SHARE	CAR SHARE	PRIVATE CAR / TRUCK / VAN	MOTORCYCLE	SCOOTERS	PERSONALLY OWNED BICYCLES	SHARED BICYCLE FLEET	E-BIKES	WALK / RUN / SKI
OVERALL APPLICABILITY TO SUBJECT AREA (E.G. ENTIRE PARK, DAY-USE AREA, PARKWAY, ETC.)														
GREEN POWERED CAPABILITY TODAY														
GREEN POWERED CAPABILITY IN 2-3 YEARS														
DRIVERLESS / AUTONOMOUS														
Timing														
SHORT-TERM HORIZON IMPLEMENTATION (1-5 YEARS)														
MEDIUM-TERM HORIZON IMPLEMENTATION (6-10 YEARS)														
LONG-TERM HORIZON IMPLEMENTATION (10-20 YEARS)														
Pre-Trip Planning														
DOES THIS MODE OFFER GEAR-CARRYING CAPACITY?														
IS IT WINTER-FRIENDLY?														
HOW MUCH ADVANCE TRIP PLANNING IS REQUIRED TO USE THIS MODE?														
Arriving in Banff National Park														
CAN THIS MODE BE USED TO CONNECT BANFF NATIONAL PARK FROM CALGARY FOR A MAJORITY OF USERS?														
CAN IT BE IMPLEMENTED INDEPENDENTLY OF ADDITIONAL PLANNING / INFRASTRUCTURE / COORDINATION WITH CALGARY?														
CAN IT BE USED BOTH TO ARRIVE IN BANFF NATIONAL PARK AND GET AROUND?														
IS IT A SERVICE THAT REQUIRES A USER TO RETURN / DROP-OFF EQUIPMENT?														

APPENDIX I

ATTRIBUTE	SHARED MOBILITY MODE: SMALL BUS / SHUTTLE	STANDARD BUS	MOTOR COACH	PASSENGER OR HIGH-SPEED TRAIN	GONDOLA / AERIAL TRAM	TAXIS / RIDE SHARE	CAR SHARE	PRIVATE MOBILITY MODE: PRIVATE CAR / TRUCK / VAN	MOTORCYCLE	SCOOTERS	PERSONALLY OWNED BICYCLES	SHARED BICYCLE FLEET	E-BIKES	WALK / RUN / SKI
Moving Around Banff National Park														
DOES THIS MODE ENHANCE OR PROVIDE ACCESSIBILITY NEEDS?														
WHAT IS ITS RELATIVE MOBILITY RANGE?														
IF HIGH SERVICE FREQUENCY IS NOT PROVIDED, IS RIDERSHIP AFFECTED?														
DOES THE MODE HAVE A HIGH PEOPLE-CARRYING CAPACITY?														
IS IT EASILY SCALABLE TO MEET HIGHER DEMAND PERIODS?														
Making It Happen / Structural Barriers to Overcome														
DOES THIS MODE REQUIRE A NEW ROADWAY OR RIGHT-OF-WAY?														
DOES THIS MODE REQUIRE CELLULAR OR 5G WIRELESS NETWORK WITHIN BANFF NATIONAL PARK TO FUNCTION?														
DOES THIS MODE REQUIRE NEW INFRASTRUCTURE (E.G. PARKING) OR ADDITIONAL LAND?														
WHAT ARE THE CONSTRUCTION / ACQUISITION COSTS?														
ARE THERE LOCAL OR REGIONAL ECONOMIC DEVELOPMENT BENEFITS TO SUPPORTING THIS MODE?														
WHAT ARE THE OPERATING COSTS?														
DOES IT REQUIRE FEDERAL POLICY CHANGES TO IMPLEMENT?														
DOES IT REQUIRE SUPPORT FROM PARKS CANADA, TOWN OF BANFF AND/OR NEIGHBOURING MUNICIPALITIES?														

APPENDIX I

	SHARED MOBILITY MODE							PRIVATE MOBILITY MODE						
ATTRIBUTE	SMALL BUS / SHUTTLE	STANDARD BUS	MOTOR COACH	PASSENGER OR HIGH-SPEED TRAIN	GONDOLA / AERIAL TRAM	TAXIS / RIDE SHARE	CAR SHARE	PRIVATE CAR / TRUCK / VAN	MOTORCYCLE	SCOOTERS	PERSONALLY OWNED BICYCLES	SHARED BICYCLE FLEET	E-BIKES	WALK / RUN / SKI
Visitor Experience Benefits														
CAN THIS MODE CONTRIBUTE TO A “WORLD CLASS” VISITOR EXPERIENCE?														
DOES THIS MODE REFLECT “MOUNTAIN CULTURE”?														
CAN THIS MODE ENHANCE INTERPRETION AND INFORMATION SERVICES?														
CAN THIS MODE ENHANCE INDIGENOUS TEACHINGS?														
HOW EASY COULD IT BE FOR USERS TO LEARN OR USE?														
Ecological Benefits														
WHAT ARE TYPICAL GHG EMISSIONS FROM THIS MODE?														
WILL THE ONGOING OPERATIONS OF THIS MODE HAVE AN ECOLOGICAL BENEFIT?														
WILL THE ONGOING OPERATIONS OF THIS MODE HAVE AN ECOLOGICAL IMPACT?														
IS IT A CLEAN ENERGY OR SUSTAINABLE MODE?														
DOES CONSTRUCTION FOR THIS MODE CREATE AN ECOLOGICAL IMPROVEMENT?														
DOES CONSTRUCTION FOR THIS MODE CREATE AN ECOLOGICAL IMPACT?														

Appendix II: Potential Social Science Framework

INFORMATION NEED	HOW IT HELPS	EXISTING AND POSSIBLE NEW METHODS
Visitation at Unit		
• Amount • Type - Vehicular, pedestrian, bike; permitted, recreation activities, commercial vs. noncommercial • Timing - temporal distribution throughout the day, week, month and year • Spatial distribution	• Understand current conditions (i.e. Improve understanding amounts of use, types of use, visitor behaviors, characteristics of visitor use) and issues • Establish baseline & monitor trends over time • Inform the development of desired conditions • Inform possible management strategies and estimating their effects • Identify new and emerging uses	• Permit/Use data • Partner use or financial reports • Monitoring data (including field staff observations) • Site history (i.e., number of users to a websites) • Social media platforms (e.g., twitter, Strava) • Additional trail or road counters • Cameras (e.g., game cameras) • Self-registration check points • Patrol Reports • Consider additional voluntary/required reporting from partners
Visitor Characteristics		
• Group Size • Visitor Origin/Home Location • Demographics • Personal Use History	• Inform the development of desired conditions • Inform possible management strategies	• Visitor surveys • Social media platforms (e.g., twitter, strava) • Permit/Use data • Commercial use reporting • E-commerce i.e. park pass purchase and/or reservation system work flow • Partnership with local marketing organizations and governments

APPENDIX II

INFORMATION NEED	HOW IT HELPS	EXISTING AND POSSIBLE NEW METHODS
Visitor Experience Characterization and Quality		
	• Understand current motivations, expectations, and desired experiences	• Visitor surveys • Focus groups • Social media
Visitor Safety		
	• Impact Risk • Identifying leading causes of visitor injury/deaths so the park can prioritize which hazards to address • Identifying type of visitor (e.g. gender, age, state and country of residence) with the highest risk of experiencing injury and/or a fatal injury so prevention efforts can be targeted	• Track types, nature and locations of calls for service that law enforcement respond to - specific to park • Law enforcement citations, warnings, visitor assists • Visitor Injury Data • Annual Park Reports • Validated complaints
Staffing & Budget Levels		
	• Impact Risk • Compare historic visitation levels to historic staffing and budget levels over time	• Funding and revenue • Number of full time and seasonal employees

APPENDIX II

INFORMATION NEED	HOW IT HELPS	EXISTING AND POSSIBLE NEW METHODS
Transportation		
• Traffic counts, parking lot usage, parking turnover rates • Wait times - entrance station, shuttle stops • Origin information of visitors & mode of transportation (potentially also methods of travel available or considered by visitors) • Insight on Roam usage (beyond ons and offs) & OD pairs • Mobility once within park: modes used and modes visitors *would* use such as shared mobility services (e-scooters or e-bikes) or on-demand transit services	• Understand current visitor use patterns • Understand intensity of use • Understand changing mode choice of visitors to the parks • Could estimate GHG emissions associated with traveling to park if detailed vehicle information were collected (make & model & year of vehicle) • Understand who uses Roam services, how, and where people travel (local travellers vs visitors, bringing strollers on bus, families vs single users, etc) • Consider a business case for mobility services in town of Banff such as e-Scooters or e-Bikes providing a way for visitors to seamlessly travel within town for short trips OR expand Roam transit to include On-Demand transit services • GHG emissions and reduction trends	• Deploy traffic counters • License plate study • Monitor wait times by placing an object at a meaningful point and documenting when line is past that point • Intercept surveys at park entrances, key park attractions, Roam bus stops, and key destinations within town- can consider academic partnerships to collect data • Cell phone data (advantages: large sample size, longitudinal sample is possible, disadvantages: lack of socio-demographic information, *traditionally costly*) • Internet surveys to engage with recent visitors and the general public about various transport-related topics (advantages: cost-effective and can reach both visitors and non-visitors & collect a wide range of information, disadvantages: sample can bias towards younger and more tech-savvy crowd (although this is changing)
Facilities		
	• Impact Risk • Legal Requirements	• Water Usage • Energy Usage

APPENDIX II

INFORMATION NEED	HOW IT HELPS	EXISTING AND POSSIBLE NEW METHODS
Interpretation, Education and Volunteers		
	• How funding and staff time are allocated to provide Interpretation and Education Programs - includes number of visitor contacts • Documents and datasets related to natural and cultural resources in the park	
Natural and Cultural Resources		
	• International data collection effort on 'when and where' species occur - necessarily requires a visitor to record the species and is therefore a record of visitors and species	
Gateway Community Socioeconomic Conditions		
	• Understanding economic and social context • Predicting the effects of management decisions beyond park boundaries	• Bow Valley municipalities • Bow Valley Chamber of Commerce • Banff Lake Louise Hospitality Association • Banff Canmore Community Foundation
Visitation at Surrounding Recreation Opportunities		
	• Provide a regional view of the importance of park visitor experiences • Informing possible management strategies (e.g. coordinated dispersal)	• Alberta Provincial Parks / Kananaskis Country • BC Parks • Jasper, Yoho & Kootenay national parks

APPENDIX II

INFORMATION NEED	HOW IT HELPS	EXISTING AND POSSIBLE NEW METHODS
Recreation Activity Participation and Trends		
	• Describe current conditions (e.g. visitor experiences currently desired by local residents, historically excluded visitors, and others) • Inform management strategies to increase relevancy, diversity and inclusion • Inform the development of desired conditions • Anticipate trends	
Regional Tourism Trends		
	• Improve awareness of park relationships to regional travel patterns; understand visitor characteristics	• Banff Lake Louise Tourism • Tourism Canmore Kananaskis • Calgary Tourism • Tourism Jasper • Travel Alberta • Destination BC • Destination Canada

APPENDIX C:
Expert Panel - ARP Alignment

PARKS CANADA EXPERT PANEL ALIGNS WITH BANFF ECO-TRANSIT HUB VISION

Dec. 5, 2022, Parks Canada shared the final report from the Expert Advisory Panel on Moving People Sustainably in the Banff Bow Valley. The report was informed by member's expertise and consultation with Indigenous Peoples, public feedback and stakeholder input. Banff Eco-Transit Hub can accelerate the Expert Panel's long-term vision.

Banff Eco-Transit Hub designed to deliver Expert Panel's main concepts:

The Banff Eco-Transit Hub will be a shuttle centre for buses and passenger train services for the planned Calgary Airport Banff Rail project. As an integrated arrival centre, the Hub will provide access to multiple transit options, micro-mobility gear (bicycles, scooters), food and beverage outlets, and be a venue for learning opportunities. Approximately 1,000 intercept parking stalls would be available for visitors arriving by personal vehicle.

ARRIVING IN BANFF NATIONAL PARK

Report recommendation: Expand available modes from each Hub

"Part of the overall goal will be to increase mobility options from each hub. Of particular interest are larger people moving options that fit the context and include options like buses, trains, autonomous vehicles and aerial transit."

Report recommendation: Work on first and last mile connectivity

"Access to and from Sulphur Mountain during many weekends and most days in the summer is particularly challenging. Parks Canada needs to continue working with the Town of Banff and impacted stakeholders to encourage visitors to leave their private vehicles at an intercept parking lot, hotel or campsite and take advantage of other forms of transit to access the attractions on the mountain."

Report Strategy: Contribution to a Sustainable System

"A scalable transit system could also present options for future expansion. A train from Edmonton to Calgary has long been discussed in Alberta and a passenger rail connection to Banff National Park could be an asset. Extending the rail system to Lake Louise could significantly reduce the volume of traffic within the park and provide a quick, easy connection to the most popular destination in the park."

Report recommendation: Consider range of options

"Train service is efficient, comfortable and environmentally responsible and could remove a significant number of vehicles from the road. There are options for connecting into the system from the airport, downtown Calgary and other areas around the city."

– EXPERT PANEL REPORT

How the Banff Eco-Transit Hub can support these recommendations:

The Hub will be able to host multiple transit options. By providing intercept parking, the Hub allows visitors to leave their vehicle at the Train Station and take transit to Sulphur Mountain, reducing congestion in downtown and the Bow River Bridge chokepoint. The Hub will be terminus of the planned Calgary Airport Banff Rail project, with potential to be extended to Lake Louise in the future.

MOVING AROUND THE PARK

Report recommendation: Examine feasibility of new modes of transit

"Parks Canada should be open to considering new and emerging modes of transportation such as autonomous (on-demand) shuttles and aerial transport."

"Aerial transportation such as gondolas can easily adjust their capacity and frequency, are efficient and have small footprints as compared with roads."

"There are a number of benefits to the use of urban gondolas and other forms of aerial transit. They have been shown to be efficient, relatively easy to install, reduce staffing needs, and can be powered by green energy ... Additionally, gondolas are more accessible and inclusive for all users and people of all abilities, and provide opportunities for education and interpretation. In certain areas, gondolas may also have the potential to improve ecological integrity by reducing vehicle, cycling and pedestrian disturbance at ground level but also have impacts from structure placement."

"An aerial transit mode offers a way of removing vehicles from the system allowing for a more porous wildlife corridor."

– EXPERT PANEL REPORT

How the Banff Eco-Transit Hub can support these recommendations:

The Hub will have the potential to host multiple modes of emerging forms of transit, including hydrogen-powered passenger rail, driverless shuttles and aerial transit, including serving as a gondola terminus to Norquay. Any potential gondola would be subject to a separate regulatory approval process led by Parks Canada.

ENABLING CHANGE

Potential action: Engage with third party providers

"(The) panel encourages Parks Canada to pursue partnerships for a range of opportunities. This can be from something as simple as the provision of e-bikes at transit nodes to more complex issues such as a passenger train connection between Banff and Calgary."

"The panel is confident that Parks Canada will continue to see the value of its role in creating, and as importantly, maintaining long-lasting relationships with a variety of partners. The panel acknowledges that Parks Canada also has a regulator role. Nevertheless, the panel encourages Parks Canada to engage with potential partners and clearly state how it can play a participatory role but may also have to make decisions related to policy and regulations."

Potential action: Explore the range of Indigenous partnerships:

"Indigenous Peoples see real employment possibilities given the current staffing challenges in the Bow Valley and the need for their members to find employment off reserve, ... potential partnership opportunities where their lands could be part of staging areas for transportation services ... (and) opportunities to share their history and culture through mass transit solutions."

Potential action: Reflect true costs in pricing:

"The panel recommends looking at a range of variable pricing schemes. One important principle would be to have the cost of a visitor's access to the park reflective of their impact ... This could be reflected in the park pass or day entry fees. It could also be reflected in the cost for tickets for whatever mass transit option from Calgary exists in the future."

– EXPERT PANEL REPORT

How the Banff Eco-Transit Hub can support these actions:

The Hub is designed to serve as a platform for public-private-partnerships, including creating passenger rail services to the Calgary Airport and expanding the existing partnership whereby Norquay provides intercept parking free of charge to the Town of Banff. As an arrival centre for the town and the park, Norquay looks forward to working with the Town of Banff and Parks Canada on how pricing can be used to incentivize visitors to use mass transit.

Through the Banff Eco-Transit Hub, Norquay, Liricon Capital, and partners are committed to make the investments needed to accomplish the goals of Parks Canada, the Town of Banff, and various stakeholders. In our next ad, we'll share how the Hub vision supports the Banff National Park Management Plan.

Visit **banffecotransithub.ca** for more information or to find a link to the report: Expert Advisory Panel on Moving People Sustainably in the Banff Bow Valley.

THE LONG-TERM VISION SUMMARY

- Day visitors arrive in Banff National Park by public transit, without a personal vehicle
- The trip, be it on a train, bus or some other mode is frequent, comfortable, efficient and relaxing
- Locals and workers also use the system to commute and for recreation
- Visitors arrive at well-serviced hubs ... complete with intercept parking, information service, visitor infrastructure, and educational experiences
- Frequent connections to their next or final destination in Banff National Park
- Heading out for day trips, most visitors will have more than one option for moving about sustainably.

– EXPERT PANEL REPORT

Visit **banffecotransithub.ca** for more information or to find a link to the Expert advisory panel

NORQUAY SUSTAINABLE THINKING®

LIRICON SUSTAINABLE THINKING®

APPENDIX D:

CP - Liricon Lease Amending Agreement Map, 2018

BANFF, ALBERTA

SKETCH PLAN

OF

CPR LANDS INCLUDED IN LEASE

INCLUDING

PART OF PARCEL "F", PLAN RW126 (32230)
PART OF PARCEL "G", PLAN RW126 (32230)
PARCEL "G-1", PLAN 9310667 (74964)
(INCLUDED WITHIN PARCEL G, PLAN 32230)
PART OF PARCEL "H", PLAN RW126 (32230)
PARCEL "J", PLAN RW126 (32230)
PARCEL "M", PLAN RW181 (33332)
PARCEL "M-1", PLAN 9310667 (74964)
(INCLUDED WITHIN PARCEL M, PLAN 33332)
PARCEL "N", PLAN RW181 (33332)
PART OF PARCEL "O", PLAN RW181 (33332)
PART OF PARCEL "P", PLAN RW181 (33332)
PART OF PARCEL "T", PLAN RW502 (40402)
PARCEL "W", PLAN 7058HF (43029)

PREPARED FOR:
LIRICON CAPITAL LTD.

SCALE = 1:2500

NOTES:

[illegible]

INITIAL LEASE AREAS

PREMISES (Yellow)

PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
PART OF F	[illegible]	[illegible]	
PART OF G	[illegible]	[illegible]	INCLUDES G-1
PART OF H	[illegible]	[illegible]	
PART OF J	[illegible]	[illegible]	
M	[illegible]	[illegible]	INCLUDES M-1
N	[illegible]	[illegible]	
PART OF O	[illegible]	[illegible]	
PART OF P	[illegible]	[illegible]	
PART OF T	[illegible]	[illegible]	
TOTAL = [illegible]			

CP OPERATIONS AREAS

DESCRIPTION	AREA (Hectares)	AREA (Acres)
RAILWAY PARCEL	[illegible]	[illegible]
EXISTING CP RESIDENCES PARCEL	[illegible]	[illegible]
CP RESIDENCES AREA	[illegible]	[illegible]
EXISTING CP BUNKHOUSE PARCEL	[illegible]	[illegible]
CP BUNKHOUSE/YARD AREA	[illegible]	[illegible]
PLATFORM AREA	[illegible]	[illegible]
TOTAL =	[illegible]	[illegible]

AREA USE DESIGNATION

DEVELOPMENT AREA [illegible]
TEMPORARY [illegible] [illegible]

EXCLUDED FROM INITIAL LEASE AREAS

PLATFORM AREA (Red)

PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
PART OF T	[illegible]	[illegible]	
TOTAL = [illegible]			

EXISTING CP BUNKHOUSE PARCEL (Green)

PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	INCLUDES G-1
[illegible]	[illegible]	[illegible]	
TOTAL = [illegible]			

EXISTING CP RESIDENCES PARCEL (Blue)

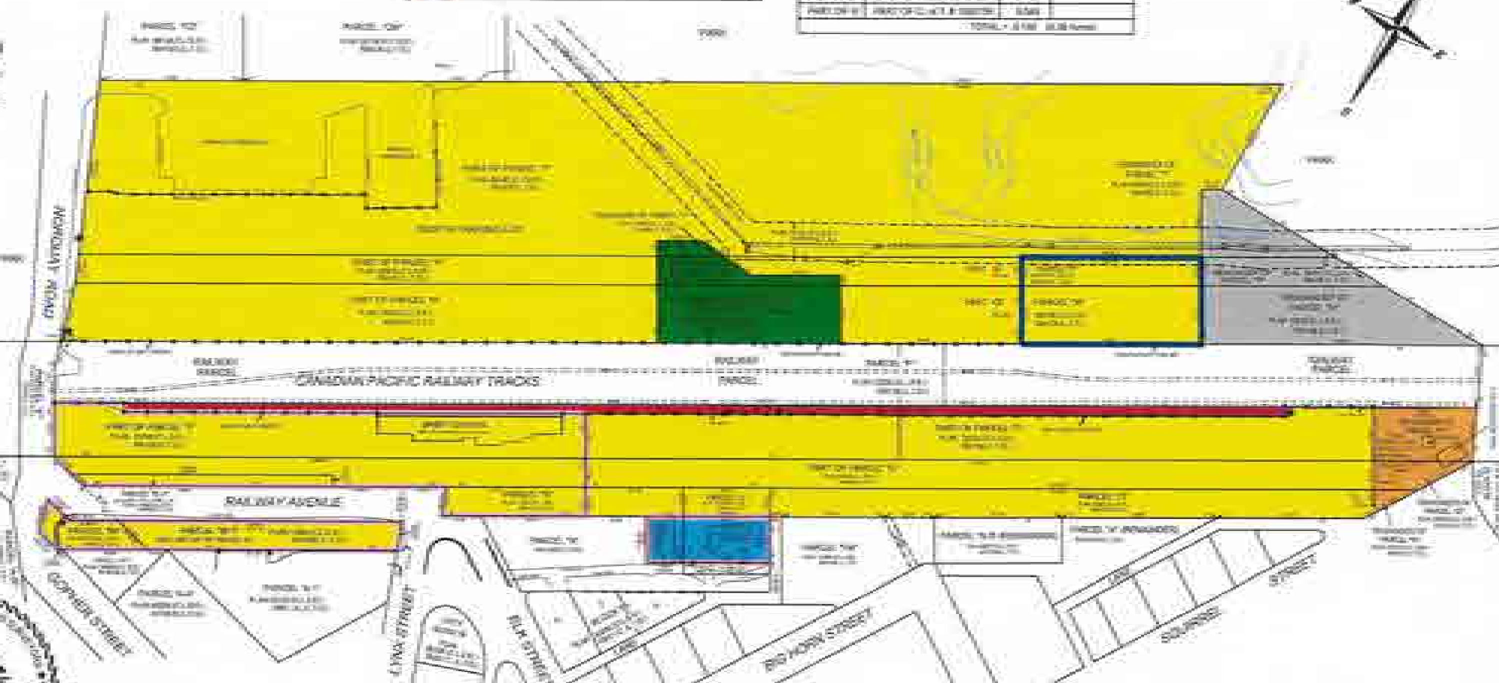
PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
PART OF J	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
TOTAL = [illegible]			

CP RESIDENCES AREA (Orange)

PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
TOTAL = [illegible]			

CP BUNKHOUSE/YARD AREA (Grey)

PARCEL	CERTIFICATE OF TITLE No.	AREA (Hectares)	COMMENTS
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
TOTAL = [illegible]			



CERTIFIED CORRECT THIS [illegible] DAY OF OCTOBER, [illegible]

WARREN LIPPITT, C.L.S.

ACLS-AATC
Warren Lippitt
Comm. No. 1881

McElhanney
Consulting Geomatics Services Ltd.
[illegible]

FILE: 08-112

APPENDIX E:
Canadian Pacific, July 8, 2022 letter to Town of Banff

James Clements
Senior Vice-President Strategic Planning and Technology Transformation

7550 Ogden Dale Road SE
Calgary Alberta
Canada T2C 4X9

T 403 319 7470
E James_Clements@cpr.ca

July 8, 2022

VIA EMAIL

Town of Banff
Box 1260
Banff, AB T1L 1A1

Attention: Randall McKay
Manager, Strategic Initiatives & Special Projects
randall.mckay@banff.ca

Re: Banff Railway Land Proposed Area Redevelopment Plan (ARP)

We understand that Parks Canada has requested, as part of its ongoing review of the ARP, that Canadian Pacific Railway Company (CP) comment on the alignment of the activities / uses under the ARP with the uses described in the Letters Patent granted in respect of the Banff Railway Lands.

As you are aware, the Letters Patent granted to CP for certain of the parcels comprising the Banff Railway Lands make reference to the use of those parcels for "station grounds". CP continues to own the Banff Railway Lands and has leased a portion of those lands to Norquay Mystic Ridge Inc. (Norquay). CP has express rights under that lease arrangement with Norquay which permits it to exercise control over the use and development of all of the Banff Railway Lands. With the benefit of these rights, CP is comfortable that Norquay's permitted use and development of the Banff Railway Lands will enable, and be compatible with, CP's ongoing and future use of its lands for station grounds/rail operations.

We trust that this letter satisfactorily addresses your request.

Sincerely,

James Clements
SVP Strategic Planning & Technology
Canadian Pacific Railway Company

cc. Norquay Mystic Ridge Inc.

APPENDIX F:
Order in Council, Banff Train Station

Government of Canada Gouvernement du Canada

PC Number: 2013-0441

Date: 2013-04-25

His Excellency the Governor General in Council, on the recommendation of the Minister of the Environment, pursuant to section 8 of the *Heritage Railway Stations Protection Act*, authorizes the Canadian Pacific Railway Company to lease its railway station in Banff, Alberta, to Banff Caribou Properties Ltd. by way of a long-term lease for a period of ten years with an option to extend for three additional terms of ten years, and to make alterations to the exterior and interior of the station building, in accordance with the terms and conditions set out in the attached schedule.

Sur recommandation du ministre de l’Environnement et en vertu de l’article 8 de la *Loi sur la protection des gares ferroviaires patrimoniales*, Son Excellence le Gouverneur général en conseil autorise la Compagnie de chemin de fer du Canadien Pacifique à louer sa gare située à Banff (Alberta) à la Banff Caribou Properties Ltd. au moyen d’un bail à long terme pour une période de dix ans avec une possibilité de prolongation pour trois périodes supplémentaires de dix ans et à apporter des modifications à l’extérieur et à l’intérieur du bâtiment de la gare, selon les modalités figurant à l’annexe ci-jointe.

Back to Form

Date modified: 2022-11-22

APPENDIX G:
Historic Sites and Monuments Board of Canada, Heritage Railway Stations, Heritage Character Statement, Canadian Pacific Railway Station, Banff, Alberta

HISTORIC SITES AND MONUMENTS BOARD OF CANADA

HERITAGE RAILWAY STATIONS

HERITAGE CHARACTER STATEMENT

Canadian Pacific Railway Station
Banff, Alberta

The Canadian Pacific Railway (CPR) station at Banff, Alberta, was constructed in 1910 to handle the dramatic increase in tourist traffic to this major resort centre during the first decade of the century. It continues to serve all tourists who arrive in Banff via train service between Vancouver and Calgary. Refer to Railway Station Report 64.

Reasons for Designation

The Canadian Pacific Railway station at Banff has been designated a heritage railway station because of its historical associations, its architectural qualities and its environmental significance.

The station reflects the direct association of the CPR with the development of Canada's national parks and with the evolution of Canada's tourism industry. William C. Van Horne, general manager of the CPR, saw the commercial potential of the mountain landscape and launched a tourism campaign that played a major role in shaping foreign views of Canada. Van Horne entered into an informal agreement in 1885 with the government of Sir John A. Macdonald for establishment of a national park around the hot springs at the base of Sulphur Mountain, near the main CPR line.

The townsite of Banff was laid out as a direct result of the need for ready access to the federal government's planned resort. In 1888 the first permanent station was erected. Tourism traffic increased dramatically through the first decade of the new century, and by 1910 agreement was made for year-round development of the resort. The current station reflected a continuing commitment by the CPR to the improvement of facilities for visitors.

The station was designed in a rustic Arts and Crafts style intended to reflect the architectural idiom of the national parks at the time. Its main roofs were gabled rather than hipped, in a chalet style, and it featured the rustic use of fieldstone, stucco, heavy timbering and wood shingles in a manner characteristic of contemporary park buildings and private residences in Banff. The rustic look was reinforced by the relatively complex massing.

The station remains an important heritage feature within the Banff townsite and its dramatic mountain setting. The station has been recommended for designation as a Provincial Historic Resource by Alberta Culture and Multiculturalism.

Character Defining Features

The heritage character of the Banff station is defined by its exterior facades, by certain surviving features of its interior, and by elements of its setting.

The exterior massing is characterized by the long, staggered, hip-roofed lower storey surmounted by the more compact, gable-roofed upper level. The long axis of the lower storey is parallel to the tracks; the upper storey bays provide a shorter cross axis, creating a central focus picked up in the gable-roofed entrance portico on the south side. The horizontal character at both levels is reinforced by the low-slope roofs and the deep bracketed eaves. It is important that this massing be maintained. The recent incompatible additions at the east end do not enhance the heritage character of the station; their removal during future rehabilitation would be appropriate.

The walls are composed of a rough fieldstone wall to sill height, a continuous cut-stone sill course, and stucco above and at the second storey. Half-timbering is used to provide an accent at the original entrance portico. Heavy timber brackets, custom designed for this station, support the broad wood-lined eaves at both the lower and the upper levels. These wall surfaces and eave details would benefit from a regular program of maintenance, repair, repointing and refinishing. Appropriate conservation expertise would assist in ensuring the use of proper materials and techniques. When the exterior facades require repainting, it would be appropriate to return them to their original colour scheme, using historical descriptions confirmed by in situ paint analysis. This would restore some of the intended visual balance between the various elements of the station.

The windows were grouped to reflect interior functions and emphasize the horizontal character of the facades. Lower windows had simple one over one sash, while the upper windows had decorative small-paned upper sash. These original glazing patterns, some of which have recently been modified, are part of the heritage character of the station which would benefit from their restoration when any future window refurbishment occurs.

The original roofing material was wood shingle. This continues to be used today, and should be maintained as the finish most compatible with the original design intentions.

The interior of the building was given a high level of finish compatible with the station's national and international clientele. It was outfitted with the latest building services, and contained fine plaster finishes and brick fireplaces. Surviving elements of these original finishes warrant preservation and restoration as part of the ongoing use of the building. If changing patterns of use permit, the station would benefit from the reinstatement of the original entrance under the entrance portico, to recover the logic of the original design. It would be appropriate for original colour schemes to be continued for the interior of the building, where possible.

The landscaping was an historically significant aspect of many CPR stations, and the grounds at Banff were regarded as some of the best in the system. Reasonable historical documentation exists on which to base a partial or full restoration program for the grounds.

January 1992

APPENDIX H:
Banff Railway Lands Infrastructure Analysis

BANFF RAILWAY LANDS AREA REDEVELOPMENT PLAN

APPENDIX B INFRASTRUCTURE - DRAFT

INTRODUCTION

Details herein supports information presented in the Banff Railway Lands ARP, Section 7 – Infrastructure regarding water and sanitary servicing and stormwater management to the proposed Development as well as analysis of impact to the wider Town of Banff infrastructure network.

COMMERCIAL DEVELOPMENT SOUTH OF THE TRACKS

WATER

The existing Train Station Building is serviced by a 150mm PVC water service and distribution comes from the Town of Banff's water main on Railway Ave, there is also a line heading north across the tracks towards the Fenlands Recreation Centre, see Figure 1. Current water usage at the Banff Train Station is relatively low, with the main contribution being two sets of public washrooms. Fire protection for the existing building is provided via an internal sprinkler system and a fire hydrant at the intersection of Railway Avenue and Lynx Street, approximately 45 metres from the main entrance.

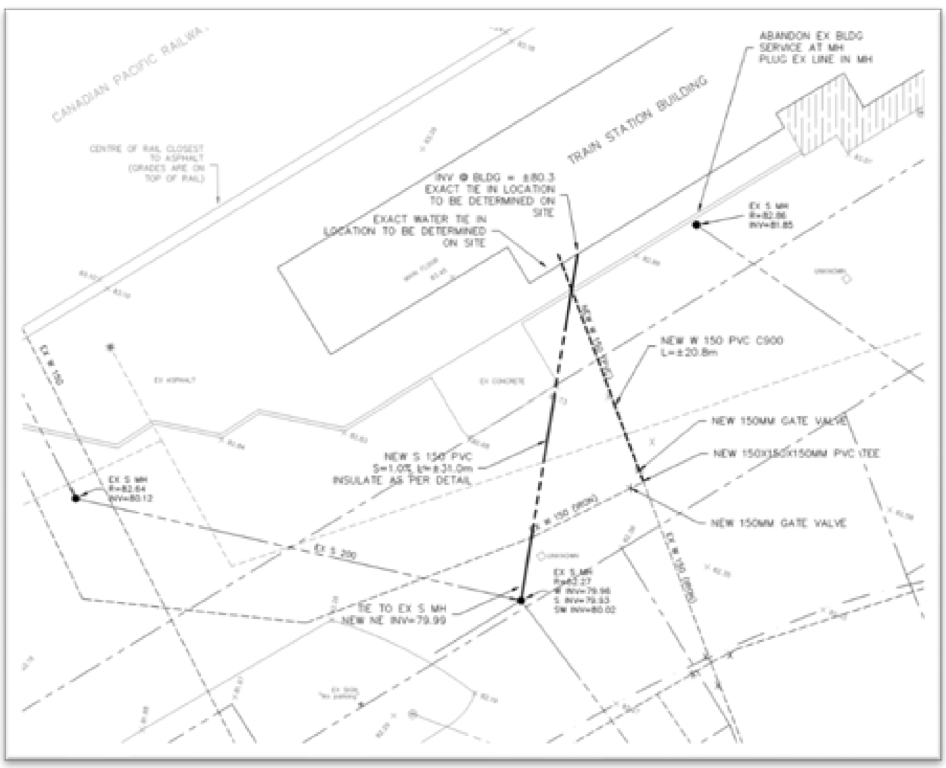


Figure 1 - Existing Onsite Water and Sanitary Services

Unit 203
729, 10 Street
Canmore, AB, Canada T1W 2A3
T: +1 403 609-6534

wsp.com

FIRE FLOW

The proposed development south of the tracks is comprised of proposed commercial buildings to the south and west of the existing train station building, a parking lot to the east (completed Summer 2019) and proposed parking north of the tracks. Fire flow requirements for the proposed development were calculated using the Fire Underwriters Survey (FUS). Only proposed buildings require fire protection, therefore only the area to the south and west of the existing train station building were considered. Required fire flows were calculated using the FUS, based on the following assumptions:

- Buildings are wood frame construction
- Sprinklered buildings conforming to NFPA13
- Layout and separation of buildings as indicated in the overall site plan.

In consideration of the above, the maximum calculated fire flow requirement was 165 L/s for the site, FUS calculations are attached.

Hydrant flow tests for existing nearby hydrants were completed by the Town of Banff in 2016, this data was provided by the Town of Banff for analysis of the water network near the proposed development. Locations and Hydrant IDs are shown in Figure 2. Hydrants 127, 128 and 130 are located closest to the proposed development and were used to estimate existing fire flow capacity, shown in Table 1.

Figure 2 – Existing Hydrants

Table 1 - Results of Hydrant Flow Tests for Town of Banff - Hydrants near Banff Train Station Lands
Date of Flow Tests - 2016 (completed by Town of Banff)

Hydrant ID	Static Pressure Ps (psi)	Residual Pressure during Test Pt (psi)	Flow from Hydrant Test Qt (USGPM)	Desired Residual Pressure Pr (psi)	Projected Fire Flow Available at 20 psi Qr (USGPM)	Projected Fire Flow Available at 20 psi Qr (L/s)
127	100	80	2,021	20	4,272	269.6
128	100	75	1,846	20	3,459	218.3
130	94	80	2,625	20	6,451	407.0

Qr = Qt x ((Ps - Pr)/(Ps - Pt))0.54 Formula to determine available flow as per AWWA M17

NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Town of Banff in 2016

Projected fire flows calculated based on hydrant flow test provided by the Town of Banff exceed the maximum calculated fire flow requirements for the site. As fire flow pressures are achievable, we can assume that daily water usage demand can also be met. This analysis of the existing nearby hydrants show that the existing water network can support the proposed development and no system upgrades are required.

As each building within the proposed development comes online, detailed assessment of fire protection and water demand requirements should be completed to confirm the capacity of the existing system.

SANITARY

WSP conducted a desktop review of existing reports pertaining to the Elk Street Lift Station and previous sanitary flow monitoring programs throughout the Townsite to determine the existing capacity and impact of the proposed development on the Town of Banff's sanitary infrastructure. Field testing of the Elk Street Lift Station was also performed to confirm and validate the findings of the desktop review.

As each building within the proposed development comes online, detailed assessment of sanitary demand requirements should be completed as well as further analysis of the existing system, taking into account upgrades made to date to confirm capacity.

ELK STREET LIFT STATION ASSESSMENT

BACKGROUND

Sanitary flows from the Train Station, Juniper Hotel, Mount Norquay Ski Resort and Fenlands Recreation Centre all combine to enter the Elk Street Lift Station located south east of the intersection of Railway Avenue and Elk Street in Banff. The Elk Street Lift Station currently uses two Flygt Model NP-3085 3 hp submersible pumps. It uses a 75mm header to discharge flows into a sewage manhole which is approximately 9 m away. The submersible pump's alternate run times and the total run time is approximately 90 hours/week.

SCOPE

In evaluation of the Elk Street Lift Station, the following was included:

- Review existing as-builts provided by the Town of Banff;

- Evaluate assumed system flows;
- Determine the theoretical flow capacity of the Elk Street Lift Station system;
- Outline improvements required to use the Elk Lift Station to convey excess flows from the proposed Development.

PREVIOUS REPORTS, STUDIES AND DATA

WSP has reviewed the existing as-builts for the lift station, and due to limited information available to be supplied by the Town of Banff, WSP has assumed design criterions based on Engineering best practices for the evaluation of the lift station.

WASTEWATER FLOW

The evaluation of flow contribution within the existing Elk Street Lift Station is based on projected wastewater flows from the proposed Railway Lands development, Juniper Hotel, Mount Norquay Ski Resort and Fenlands Recreation Centre, as they are all combined to enter the Elk Street Lift Station.

WASTEWATER FLOW ESTIMATES

Actual wastewater flows entering the Elk Street Lift Station are unknown. Existing and future wastewater flows have been estimated using the Alberta Private Sewage Systems Standard of Practice, 2015 and are presented in Table 2. Estimated waste water flow values were averaged to present an average day dry weather wastewater flow to the Elk Street Lift Station.

Table 2 Wastewater Flow Estimates

Location	Existing Wastewater Flow (estimated, L/day)	Projected Wastewater Flow (estimated, L/day)
Banff Railway Lands	900	238,400
Juniper Hotel	34,720	34,720
Mount Norquay Ski Resort	29,030	29,030
Fenlands Recreation Centre	6,400	6,400

A breakdown of existing and projected wastewater flows is attached. For the purposes of analyzing the impact of the proposed Railway Lands Development on the Town's infrastructure, it has been assumed that the Juniper Hotel and Fenlands Recreation Centre wastewater flows remain constant.

The Mount Norquay wastewater flows are also assumed to remain constant based on the Mount Norquay Gondola Feasibility Study, May 2018, which states "*The wastewater system at Norquay meets the needs of 3,800 ppd (maximum daily capacity) during peak periods. Wastewater is collected in a centralized septic tank before being transferred down to the Town of Banff for treatment and disposal. The current system is in good condition and not in need of replacement or major repair. With the use of water saving technologies and the existing capacity of the wastewater system, the projected increase in visitors will not require Norquay to upgrade its existing wastewater infrastructure*". The Banff Railway Lands Redevelopment Plan Draft Transportation Impact Assessment, December 2019 states *"Using the Sulphur Mountain Gondola estimated daily visitors as reference, a total of 1,850 people are estimated to visit the Norquay Gondola daily during the 2026 summer horizon."* Taking both of these reports into account, the existing system has enough capacity to accommodate the projected increase in visitation due to the Railway Lands development and has no impact on the downstream network, provided that the existing sanitary flow rate from the Mt Norquay septic tank is maintained.

In the Alberta Environment Wastewater & Storm Drainage Systems, January 2006 guidelines, it is stated that the minimum peaking factor to be used in design is 2.5. A more conservative Dry Weather Peak Flow Factor of 5 was chosen for this analysis due to the commercial nature of the development.

EXISTING SYSTEM DESKTOP ASSESSMENT

This existing system desktop assessment evaluated the current capacity of the pumps and pipe sections in the Elk Street Lift Station using available data provided by the Town of Banff. It should be noted that the term 'firm pumping capacity' refers to the theoretical capacity of the duty pump, without considering the standby/backup pump, and is based upon the calculated total dynamic head (TDH) in conjunction with the pump curves for the existing duty pump. Pumps curves and data sheets for the Lift Station are attached to this report.

EXISTING PUMPING SYSTEM

The existing Elk Lift Station is located south east of the intersection of Railway Avenue and Elk Street in Banff, and services the Train Station, Juniper Hotel, Mount Norquay Ski Resort and Fenlands Recreation Centre. Wastewater is pumped to a manhole via a 75 mm black cast iron pipe/forcemain. From the manhole, flow enters the Town's gravity main sewer system. The Lift Station was originally designed and constructed in 1991 and upgraded in 1999 and then again in 2013 with the following components:

- Two existing pumps and motors were replaced with two pumps with a design point of 21 l/s at 6.0 m TDH;
- Pump 1 was upgraded in 2015;
- Pump 2 was refurnished in 2019.

The following Figure 3 shows the theoretical system curves for LS, based Hazen Williams C values of 75 to 105 for the existing 75 mm black cast iron forcemain considering it has been in service for approximately 28 years.

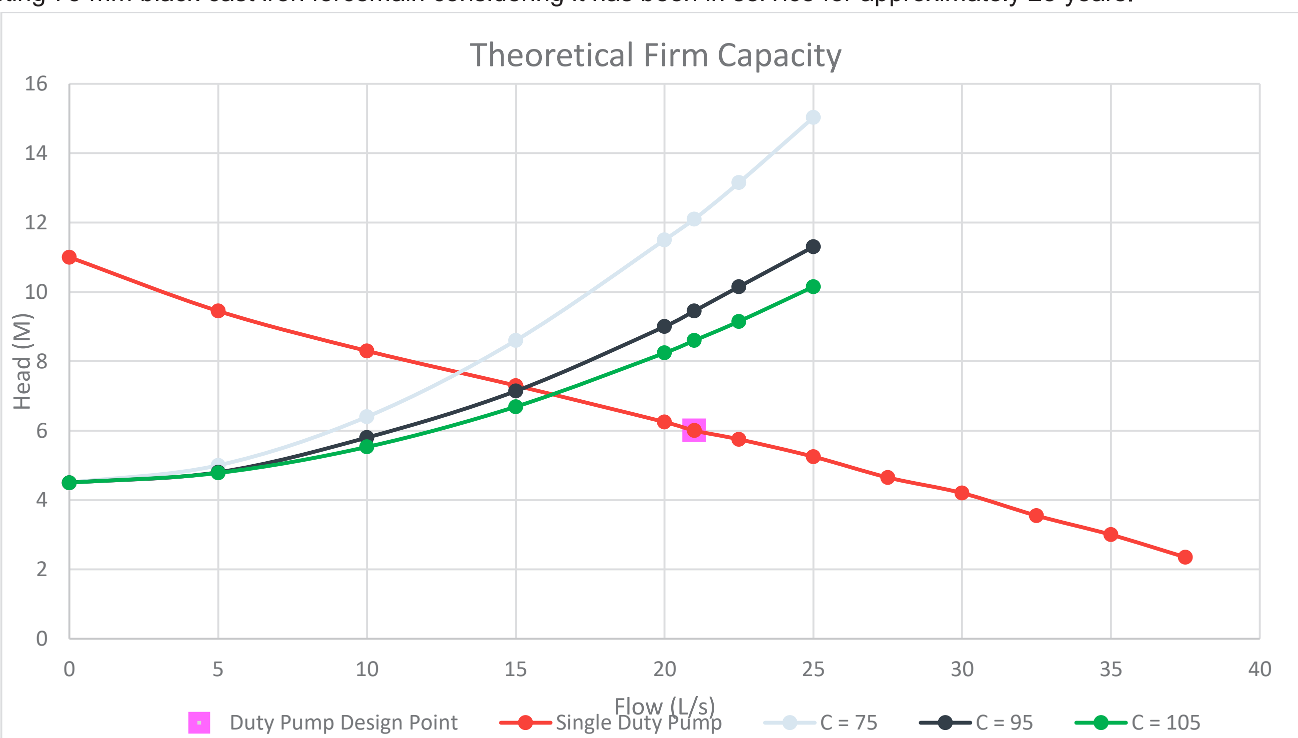


Figure 3 – Theoretical Firm Pumping Capacity at Elk Street Lift Station

Figure 3 illustrates the ranges of theoretical pumping capacity at the lift station depending on the Hazen-Williams C value in the downstream 75 mm cast iron forcemain. The theoretical firm capacity of the lift station is within the range of 13 l/s to 16.5 l/s.

Based on the Figure, a Hazen-Williams C value of approximately 150 can be estimated for the existing 75 mm cast iron forcemain directly downstream of the lift station which results in a forcemain capacity of 20 l/s.

EXISTING PIPE CAPACITY

The existing 75 mm cast iron forcemain runs approximately 9.0 m from the lift station to the receiving manhole. The capacity of the forcemain was calculated based on an assumed flow velocity.

The capacity of forcemain can be summarized as follows:

- If Velocity is 1.0 m/s, the 75mm pipe has a capacity of 4.4 l/s
- If Velocity is 2.0 m/s, the 75mm pipe has a capacity of 8.8 l/s
- If Velocity is 3.0 m/s, the 75mm pipe has a capacity of 13.2 l/s
- If Velocity is 5.0 m/s, the 75mm pipe has a capacity of 21.0 l/s

Based on Wastewater & Storm Drainage Systems (January 2006), for sanitary sewer lines it is stated that the minimum velocity at the average flow not be less than 0.6 m/s for self-cleaning purposes, and the maximum velocity at the peak design flow not be greater than 3.0 m/s to minimize turbulence and erosion.

ELK STREET LIFT STATION ASSESSMENT SUMMARY

The existing lift station pumps and downstream forcemain theoretical assessment can be summarized as follows:

- The existing pumps have a theoretical firm pumping capacity in the range of 13 l/s to 16.5 l/s;
- The existing 75 mm cast iron forcemain can potentially provide 21 l/s with a velocity of 5.0 m/s.
- It is estimated that the existing 7 mm cast iron forcemain directly downstream of the Elk Street lift station has a Hazen-Williams C value of approximately 150, which results in a forcemain capacity of 20 l/s.

FIELD TESTING

FIELD TESTING METHODOLOGY

On December 10, 2019, WSP completed draw-down tests at the Elk Street Lift Station. During the draw down test at the lift station, all pumps were run individually. Water levels were recorded measured below the ground elevation. Wet well dimensions and static head conditions were taken from the 1991 as-constructed record drawings (Reid, Crowther, and Partners Ltd. 1991).

Each pump draw-down test was completed twice using the following procedure:

1. Fill the wet well with incoming sewage flows;
2. Record the water level in the wet well;
3. Start the pump(s) and record time;
4. Stop the pump(s) and record time;
5. Record the water level in the wet well when the pumps are stopped.

Draw-down tests were typically in the range of 89 to 125 seconds in length. The total volume of wastewater pumped was calculated and divided by the time for each test to determine the flow rate for each draw-down test.

The following sections describe the results of the field tests for the lift station.

FIELD TESTING RESULTS

Error! Reference source not found.3 presents the average pumping rates calculated and the outlet pressure for each of the draw-down tests conducted.

Table 3: Draw-down Test Results – Elk Street Lift Station

Pump	Avg. Pump Rate
No.	(l/s)
1	13.0
2	15.2
1	15.7
2	18.4

The results from the field tests at the lift station suggest the following:

- Excessive friction exists in the forcemain downstream of the lift station increasing the total dynamic head of the pump, and causing turbulence and erosion in the existing forcemain and the receiving manhole. Turbulence of sewage flows promote odor the environment.
- The design points of the existing pump No.1 which was installed in 2015 match roughly with the actual operational conditions;
- The design points of the existing pump No.2 which was refurbished in 2019 match roughly with the actual operational conditions;
- Assuming a Hazen-Williams C value of 1505 for the downstream forcemain, the flow rates calculated from the field tests roughly match with the theoretically calculated capacity of the lift station

SUMMARY OF EXISTING SYSTEM

The following Table *4*4 summarizes the information presented in Sections 2.0 and 4.0, for pump and pipe components associated with the Elk Street lift station.

Table 4: Summary of Existing System

Elk Street Lift Station System	Theoretical Firm Pumping Capacity	Pipe Capacity without Turbulence and Erosion	Field Tested Pumping Rates (Average Value of 2 tests)
Lift Station Pump No. 1	21 l/s	13.2 l/s	14.35 l/s
Lift Station Pump No. 2	21 l/s	13.2 l/s	16.80 l/s

FLOW PROJECTIONS AND CAPACITY COMPARISON

This Section compares the flow projection data from Section 2.0, the existing system desktop assessment data discussed in Section 3.0, and the field testing data discussed in Section 4.0.

The existing pumping system at the lift station has a measured firm pumping capacity of 16.1 l/s which is sufficient to handle estimated existing flows from the Banff Train Station, Juniper Hotel, Mount Norquay Ski Resort and Fenlands Recreation Centre

Observed flow capacities show that the system is currently limited by the forcemain capacity downstream of the lift station to the receiving manhole, located approximately 9.0 m away. The forcemain is only capable of transmitting 13.2 L/s without excessive turbulence and erosion.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

- Higher than 3.0m/s velocity is experienced in the forcemain downstream of the lift station and results in excessive friction loss, increases the total dynamic head of the pump, and causes turbulence and erosion in the existing forcemain and the receiving manhole. Turbulence of sewage flows promote odor in the environment and is not recommended;
- The design points of the existing pump No.1 which was installed in 2015 match roughly with the actual operational conditions;
- The design points of the existing pump No.2 which was refurbished in 2019 match roughly with the actual operational conditions;
- Assuming a Hazen-Williams C value of 105 for the downstream forcemain, the flow rates calculated from the field tests roughly match with the theoretically calculated capacity of the lift station.
- LS has a field measured capacity of approximately 15 l/s, which results in a Hazen-Williams C factor of 105 for the downstream forcemain. The theoretical firm pumping capacity and field testing capacity suggest that LS #1 can transmit the existing calculated peak wet weather flow conditions.

RECOMMENDATIONS

- The existing lift station is suitable for the existing wastewater flows that based on forcemain capacity and velocity of 3.0m/s to minimize turbulence and erosion. Velocity in the forcemain above 3.0 m/s is not recommended based on Engineering best practices.
- To accommodate future wastewater flows, four options should be considered and future evaluation of the following:
    - Option A: An upgrade to the existing Lift Station and Forcemain to handle future flows and maintain a forcemain velocity of 3.0 m/s. This would require by-passing the existing lift station during construction and increase the risk of serviceability. This option is dependent on receiving manhole capacity.
    - Option B: An expansion of the existing Lift Station wet well to accommodate the future wastewater. This option would consist of another pre-cast manhole for equalization storage of the incoming wastewater and some disturbance to the operation of the lift station with minimal requirement of by-passing.
    - Option C: A new lift station to accommodate the future flows. This entitles minimal risk of serviceability during construction.

- Option D: On site wastewater storage of the future expansion locations to limit the incoming flow to the existing lift station. This option has no disturbance of operation of the existing lift station.

- Further investigation is required to evaluate the receiving manhole capacity and peak hourly flows during the spring run offs.
- Flow monitoring to observe inflow and infiltration (I/I) in the Town of Banff's existing system should be conducted to find its contribution during the wet weather conditions. The Town's sanitary manholes and manhole characteristics should be inspected to find if any rehabilitation is required to reduce the I/I contributions.
- During any upgrades to the existing lift station, the active storage of the lift station should be analyzed to ensure adequate pump cycle times can be maintained with the additional flows to the system as well reviewing building code requirements and implementing required upgrades.
- An Option Analysis Study is recommended to evaluate the best investment based on the factors including but not limited to operation, safety, ease of operation during construction, risk management factors as well as net present value representation of future upgrades, maintenance, residual value and life expectancy.
- Life expectancy of the lift station and forcemain under existing conditions could not be determined and should be analysed further, prior to any upgrades implemented to support the proposed Railway Lands development.

DOWNSTREAM PIPE NETWORK

A desktop review of previous reports submitted to the Town of Banff analysing the sanitary network was completed including:

- Town of Banff, AB Sanitary Sewer Flow Monitoring, September 2010;
- Tunnel Mountain Campground Connection the Banff Sanitary Sewage System, December 2008;
- Parks Canada Connection to Banff Sewer, January 2010;
- Parks Canada Connection to Banff Sewer, January 2011.

These reports indicated a known pinch point downstream of the Bow River, along Glen Avenue that would require upsizing. In a review of report "Town of Banff, AB Sanitary Sewer Flow Monitoring, September 2010", two locations downstream of the proposed development were assessed; manhole 37 on Glen Avenue and manhole 56 on Bow Falls Road. Based on findings of this report, manhole 37 on Glen Avenue is a pinch point in the wider network (supported by 2008, 2010 and 2011 reports noted above), and was approaching capacity during peak times during the monitoring period.

It could not be confirmed if the sections of the main have been upsized per previous recommendations or if there are updated conditions based on the installation of the Bow River Lift Station.

CONCLUSIONS & RECOMMENDATIONS

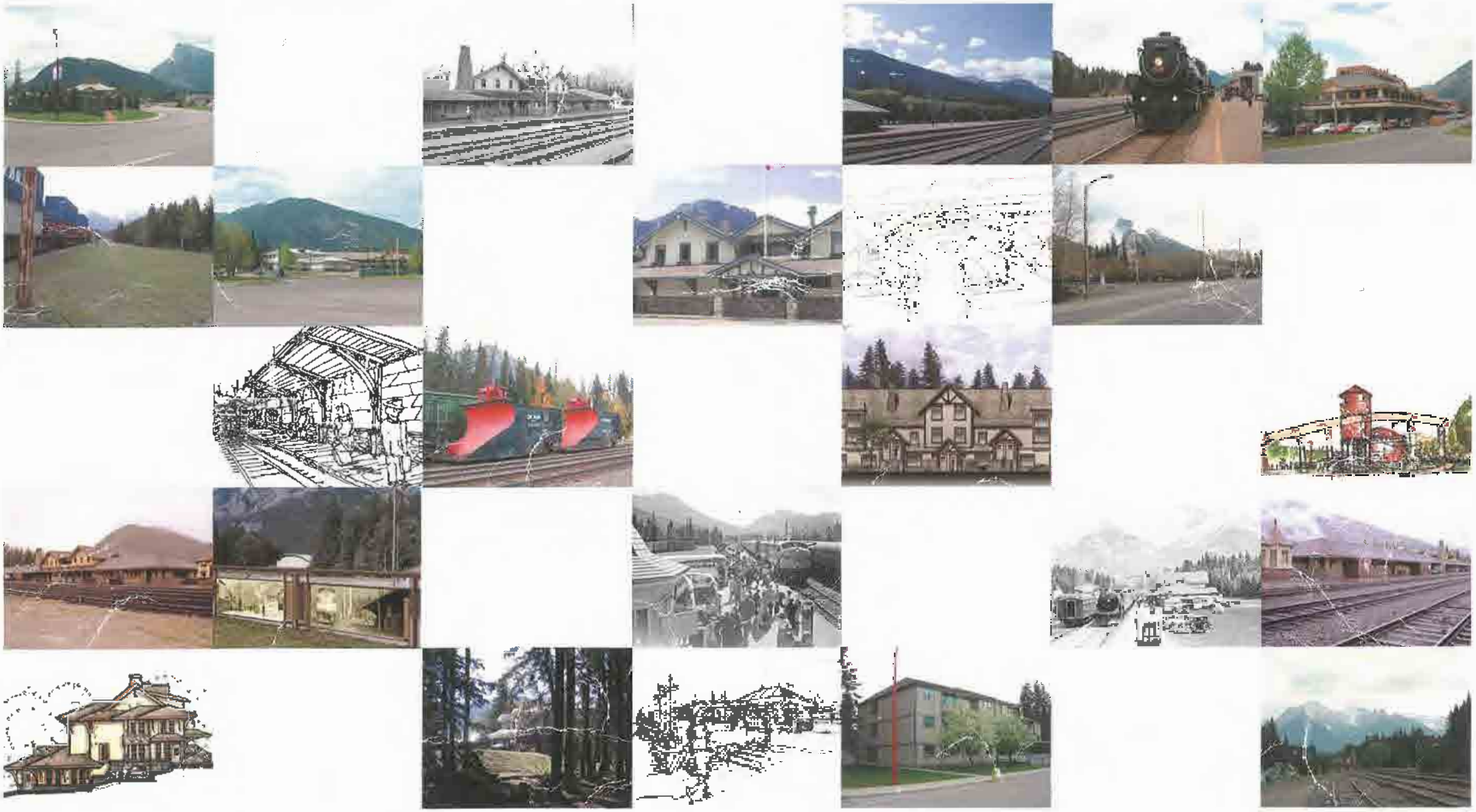
If additional wastewater flows are generated from the proposed development, the known pinch points in the Town's sanitary network should be re-evaluated and required sizing confirm. Wastewater flow rates may be able to be controlled based on the upgrades completed upstream of these locations, specifically the Elk Street Lift Station. If the existing outflow of the proposed development and/or the Elk Street Lift Station can be maintained, no further downstream upgrades / upsizing will be required.

STORMWATER

There is limited Town of Banff stormwater infrastructure adjacent to the site, therefore runoff generated by the site will need to be managed, treated and discharged at a controlled rate and in conformance with Town of Banff and Parks Canada policies. The stormwater management plan for the south parking lot is attached; this system retains and treats up to 1 in 100 year stormwater flows generated by the site. A similar system will likely be implemented for the commercial development south of the tracks and the parking lot north of the tracks, subject to environmental and geotechnical investigation.

APPENDIX I:
Banff Train Station Heritage Plan

BANFF STATION PLACE - AREA REDEVELOPMENT PLAN



PREPARED FOR THE TOWN OF BANFF

DRAFT: MARCH 15, 2004

Banff Station - Glenbow Museum - NA-841-11

Present -2003

Past -Glenbow Na-841-328

Executive Summary

The Banff Train Station was constructed in 191Oby the Canadian Pacific Railway (CPR) to replace a log station on the site. It was designed to meet the needs of rail passengers traveling to Banff for recreation and for years it was the gateway into Banff. With the advent of the automobile and road infrastructure tourists began to travel to Banff ever more frequently by car and the need for a passenger station declined . Today passenger rail service is limited to Rocky Mountaineer Railtours that provides passenger services between Calgary and Vancouver stopping at the Banff Station three times a week on a seasonal and year-to-year basis.

Over the years, there have been several changes to the building. Most of the interior of the Station has been altered with little evidence of original layout, finishes or fixtures remaining. The original exterior of the building has been modified but retains a significant amount of its original character and building fabric.

In the late 1930's or early 1940's, a central gable roof addition was constructed to protect the two upper balconies from rain and snow. In the early 1970's, the main floor of the station was remodeled to accommodate a restaurant. This alteration significantly modified the original floor plan, removed interior finishes and replaced windows. At the same time, the central entrance was displaced and the circular garden in front of the Station was removed. In 1978, the upper floor was modified to accommodate office requirements. The cumulative effect of these changes and the introduction of Gopher Street have significantly diminished the presence of the Station and its relationship with Lynx Street.

This Heritage Plan will protect the Banff Train Station for future generations as it provides for both the preservation and restoration of the character defining elements of the building. The plan facilitates the rehabilitation of the Station with minimal impact on the remaining original materials, finishes and details. The Station will be economically viable as the plan supports ongoing compatible contemporary uses. This Heritage Plan enables the Station to be rehabilitated for the Alberta Centennial Celebrations in Banff National Park scheduled for July 2005.

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Table of Contents

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1. Heritage Value

1.1 Character Defining Features

In 1991, the Historic Sites and Monuments Board of Canada (HSMB) designated the CPR Railway Station at Banff as a heritage railway station because of its historical associations, its architectural qualities and its environmental significance (see Part4.1 -Appendices). In stating its reasons for designation, the HSMB noted that 'the station was designed in a rustic Arts and Crafts style intended to reflect the architectural idiom of the national parks at the time. Its main roofs were gabled rather than hipped, in a chalet style, and it featured the rustic use of fieldstone, stucco, heavy timbering and wood shingles in a manner characteristic of contemporary park buildings and private residences in Banff. The rustic look was reinforced by the relatively complex massing.' The Station was the first building in Banff to use rustic fieldstone elements for the lower walls and chimneys, as a major decorative feature. This set precedents for the form and materials for a large number of buildings in Banff and shaped the origin of the Town of Banff Design Guidelines.

The building's exterior massing is a long one storey hip roof with a compact gable roofed upper storey. The lower storey parallels the tracks with the shorter upper storey gables creating a focus from the town and the approach from Lynx and Elk Streets. The massing is horizontal in nature with large overhangs and low-sloped roof forms.

The building's materials incorporate a rough fieldstone wall base, a continuous cut sandstone sill with rough textured stucco walls on both the main and upper storey. Heavy timber brackets support the large wood lined overhangs as well as the gable ends on the upper storey. The roofing material was and still remains a wood shingle roof system. While the detailing on the building is typically simple in nature, the original main entrance gable and the 1940 upper floor gable above both incorporate half-timber decorative detailing to reinforce the entrance as the main focus. Window patterns help to reinforce the horizontal nature of the building. The original one over one sash windows, remain on a small number of the windows on the north elevation and east wing of the building. Historically the upper storey windows had a decorative small paned upper sash. The contemporary window types and opening locations have been altered significantly from the original.

The interior of the Banff Train Station has been heavily altered. With the exception of a few areas of original wall/ceiling finishes together with one of the two original fireplaces, little remains of the original interior.

1.2 Significant Cultural Landscape Features

Historically and culturally the Banff Train Station was the arrival point for residents and visitors, and as such, was directly linked to the town site of Banff. The 191O Station was built as a replacement for the earlier 1888 log building, as the original was unable to meet the needs of the increasing tourist traffic.

In addition to the cultural landscape, the Heritage Character Statement for the Banff Train Station makes specific mention of the importance of the original landscaping of CPR stations of the period. The Banff Station gardens were at one time held in high regard. The original station grounds included the station platform, the entry turn-around and the gardens. The vista and views up Lynx Street toward the Town of Banff is an important component of the cultural landscape of the site.

The original circular garden and turnaround in front of the Station was asignificant design feature, which helped establish a focal point for travelers approaching on Lynx Street. While this feature has been removed, there is good photographic evidence of its design. In addition to the gardens in front of the Station, a rock garden was located to the east on the side of the dune. While there is still in-situ evidence of this rock garden little photographic evidence of its original appearance exists. At the south of the rock garden, on top of the dune, is a twin row of spruce trees that led to the garden sidings.

Another landscape feature on the site that has some cultural significance is the row of willows, located to the west, that paralleled an earlier siding which accommodated the 1939 Royal Train.

1.3 Standards for the Conservation and Rehabilitation

The federal government has guidelines for interventions to heritage buildings as well as standards for conservation of Historic Places. Part 4.2 of the appendix contains excerpts of the documents from the Parks Canada web site.

1.4 Character Defining Features to be Preserved, Rehabilitated or Restored.

While the exterior of the Banff Train Station has been altered, there still remains significant evidence of the character defining features and original materials and finishes which can be addressed, including:

- fieldstone base;
- cut sandstone sills;
- rough stucco plaster;
- heavy timber roof brackets;
- wooden soffits to lower roof overhangs;
- examples of original windows and doors;
- original roof forms; and,
- second floor balcony and railing.

The original roof shingles have been replaced and the original exterior wood finishes and rough stucco have been painted over a number of times using a variety of colour schemes. Earlier roof gutters and downspouts have been removed. There is no evidence of original exterior light fixtures and there is little remaining of the original interior of the building. The original main entry has been relocated.

1.5 Historical Colours

The colours on the exterior of the Station have varied over the years. Historically, the original colours were described as grayish white stucco, with dark green paintwork on the underside of eaves and orange on the borders. Windows and doors were green oak tint inside with green and orange outside. These colours were reported in a newpaper article "The New Railway Station at Banff" from the Banff Crag and Canyon, 24 September 191O, p.3. and quoted in a report prepared for the HSMB, titled: 'Canadian Pacific Railway Station Banff, Alberta' by Heritage Research Associated, Ottawa and Great Plains Research Consultants, Calgary (RSR-64). Appendix 4.4 illustrates the colour history of the Station based upon paint samples taken at the site.

1.6 Historic Drawings and Illustrations

1.6.1 Historical Drawings - 1955 Site
1.6.2 Historical Drawings - Elevations
1.6.3 Historical Drawings - Floor Plans
1.6.4 Historical Drawings - Sections
1.6.5 Historical Drawings - Exterior Bracket Details
1.6.6 Historical Drawings - Exterior Wall and Window Details
7. Historical Drawings - Interior Details
8. Historical Drawings - CPR Standards
9. Historical Images - Exterior
10. Historical Images - Interior
11. Historical Images - Landscape - Site
12. Historical Images - Landscape Gardens

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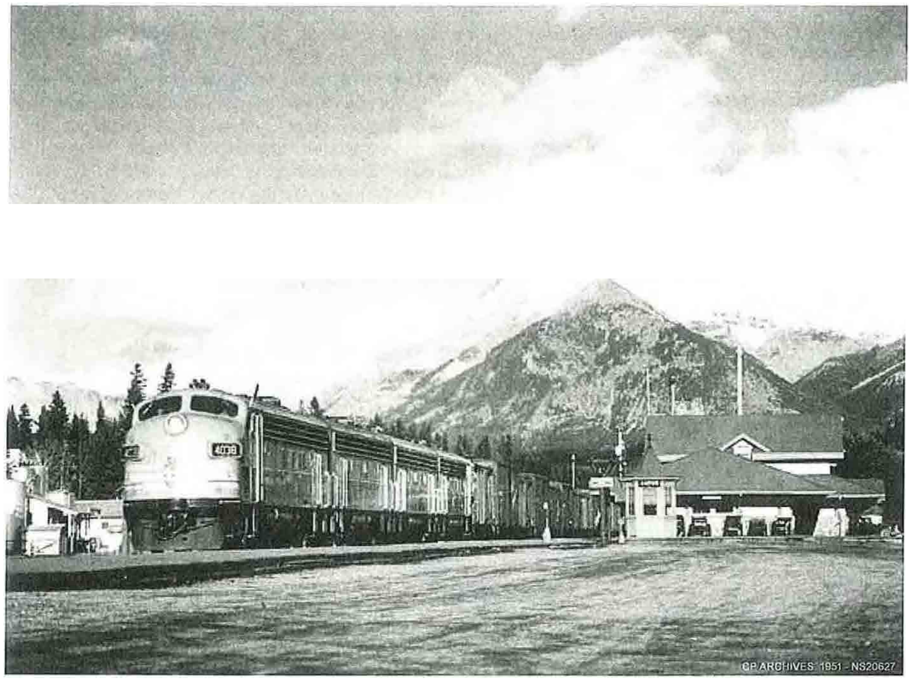
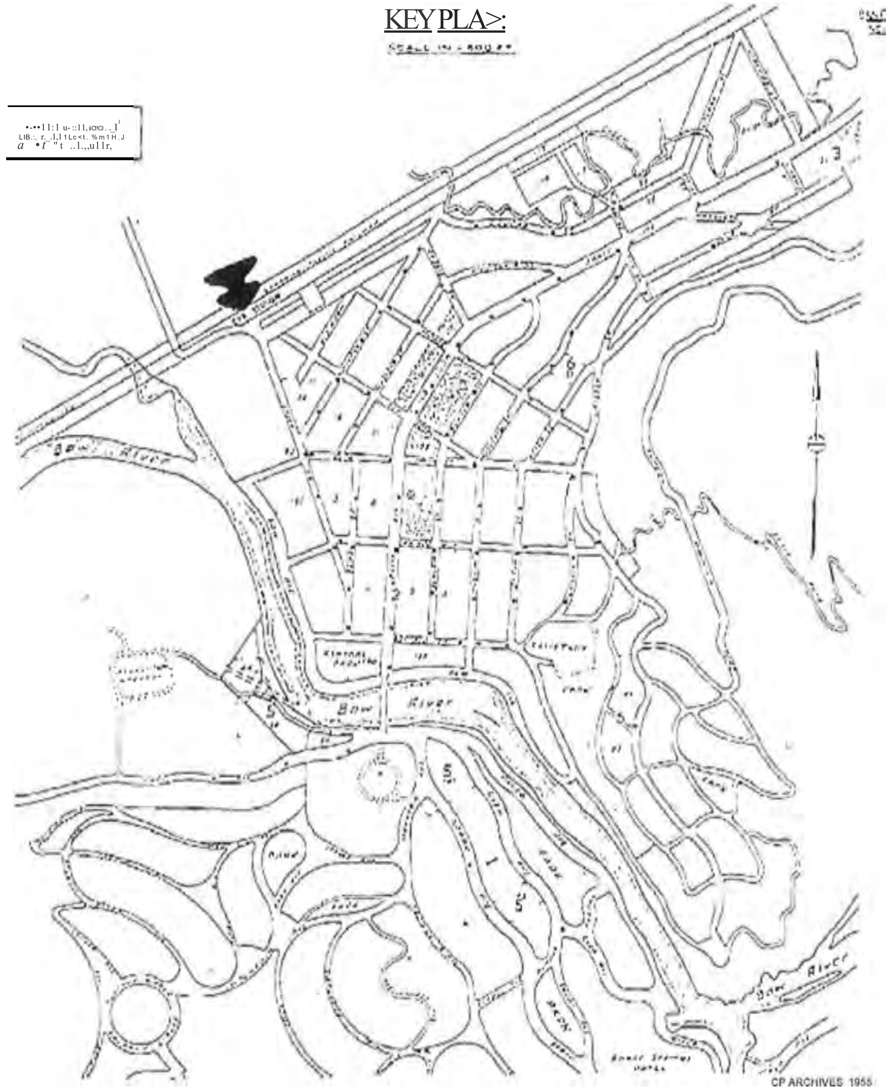
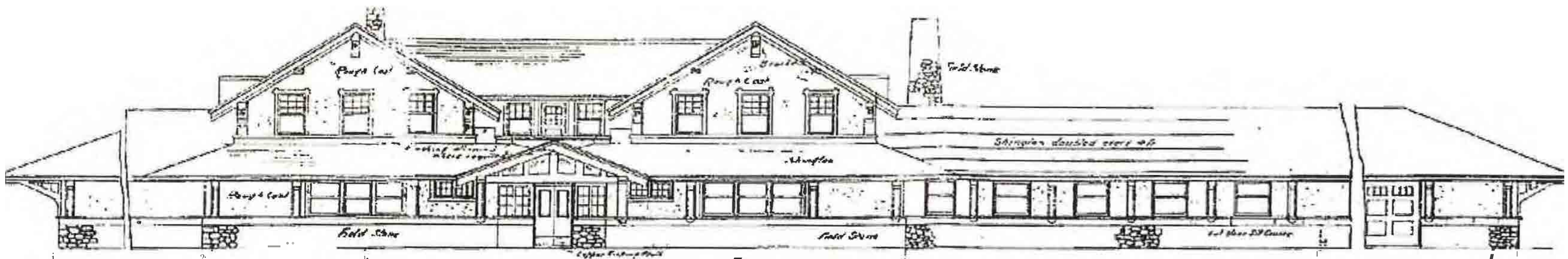


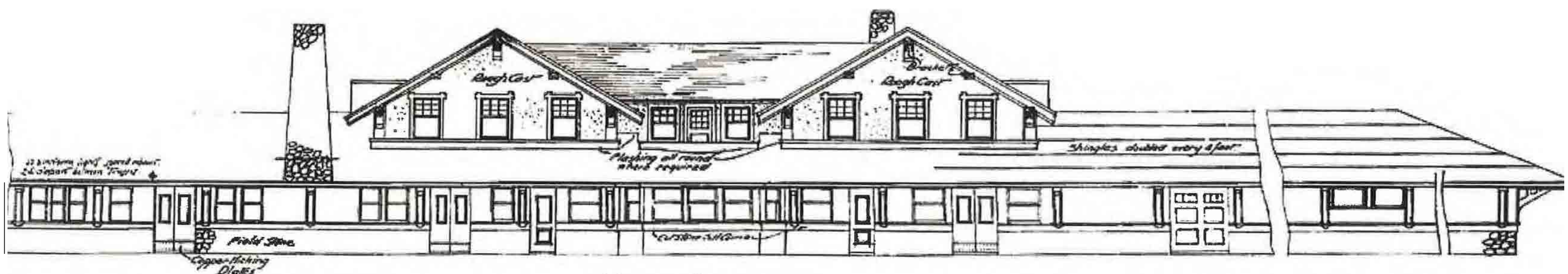
IMAGE NO.: 1-0.5
Banff Train Station & Freight Train C. 1951

KEY PLA>:





CP ARCHIVES 3438-11



TRACK ELEVATION.

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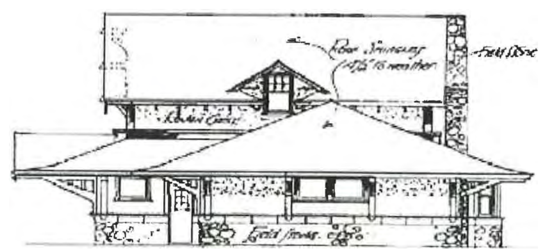


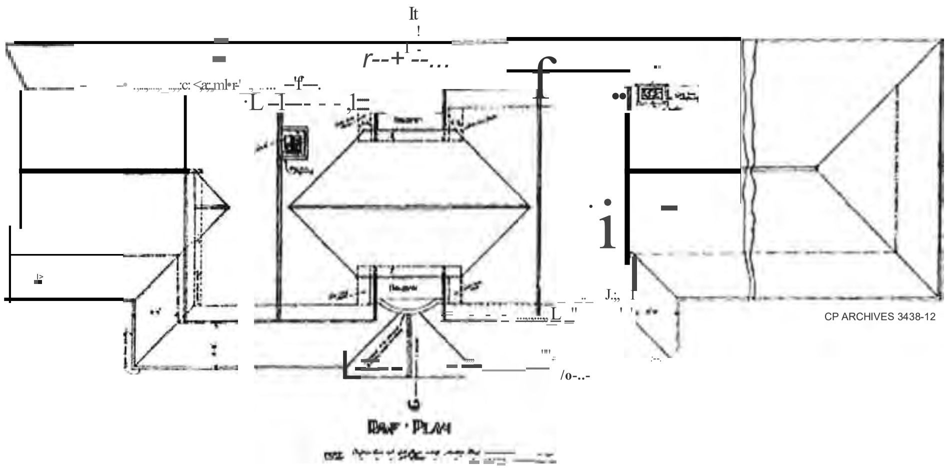
END ELEVATION.

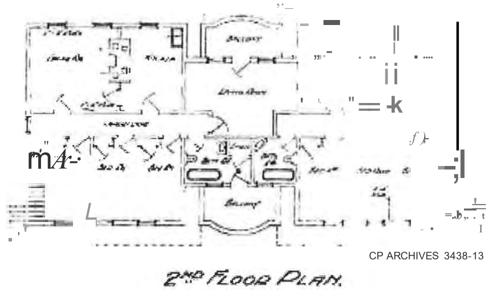
CP ARCHIVES 3438-11

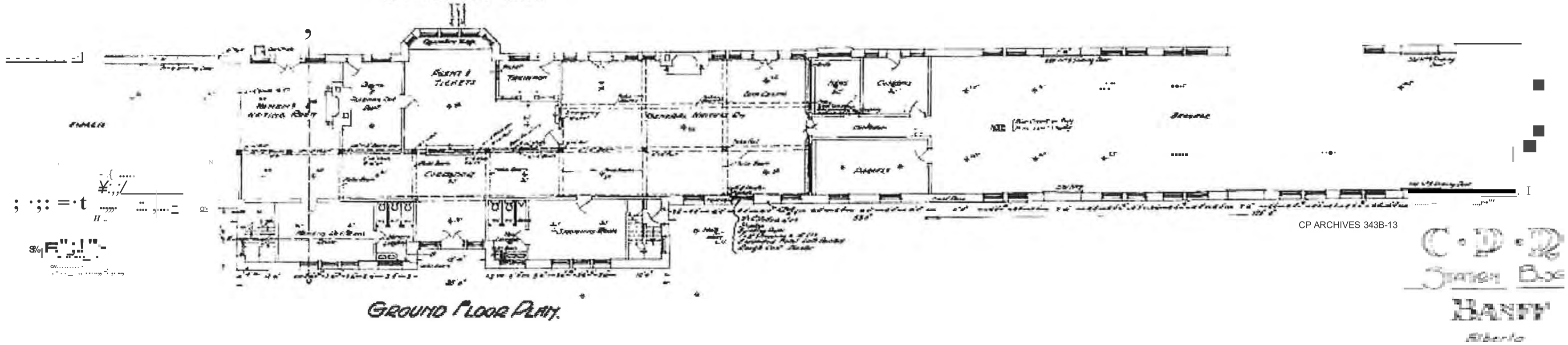
C · P · R
STATION BLDG
BANFF
Alberta

Banff Train Station - Historical Drawings - Elevations

J1.62







Banff Train Station - Historical Drawings - Floor Plans

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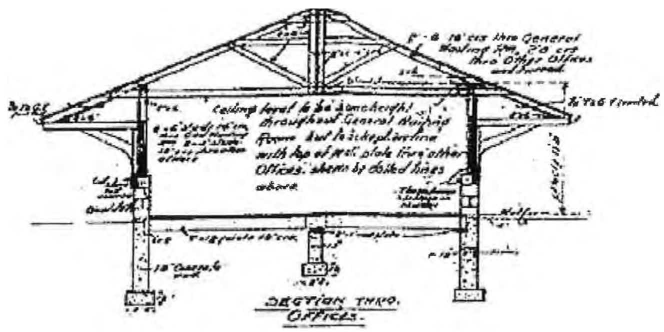

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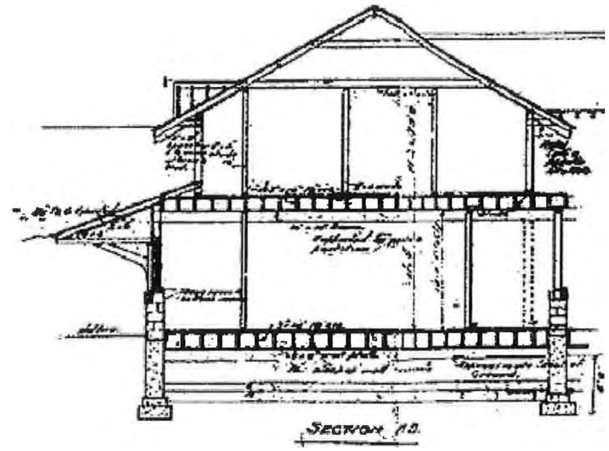

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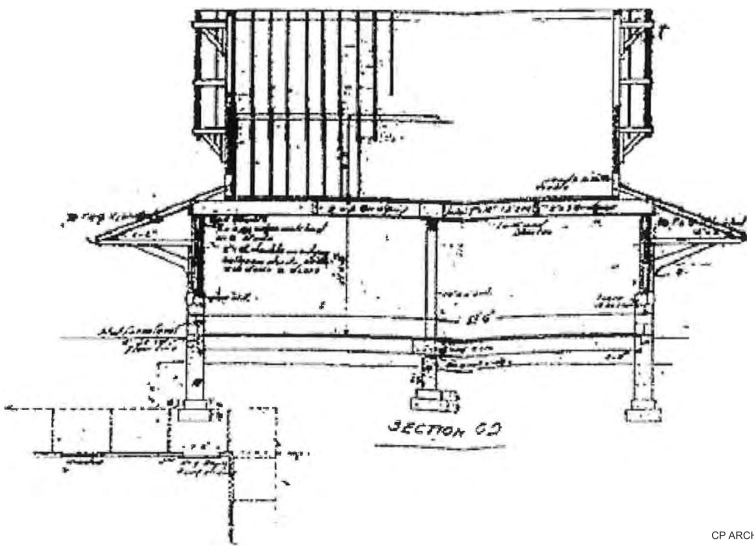

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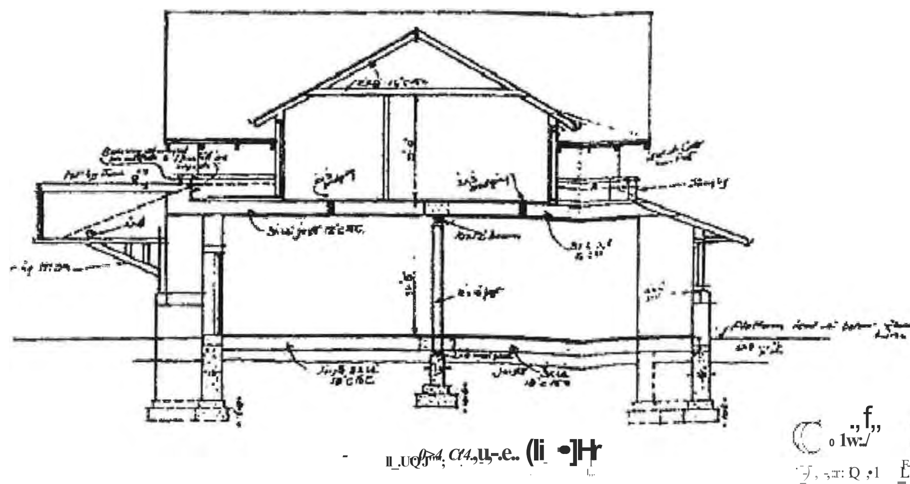

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Banff
Alberta

CANADIAN
PACIFIC
RAILWAY

Banff Train Station - Historical Drawings - Sections

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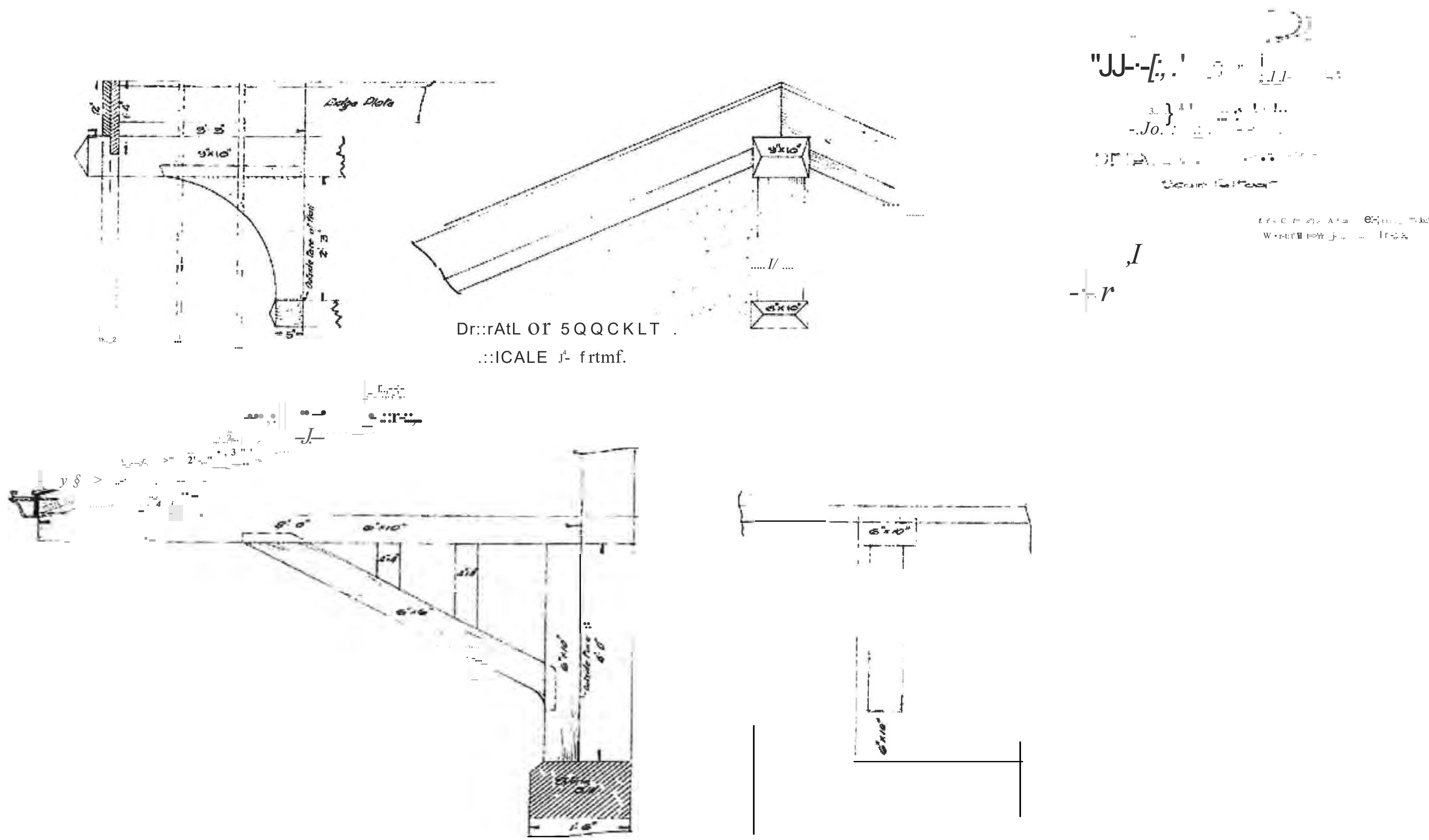

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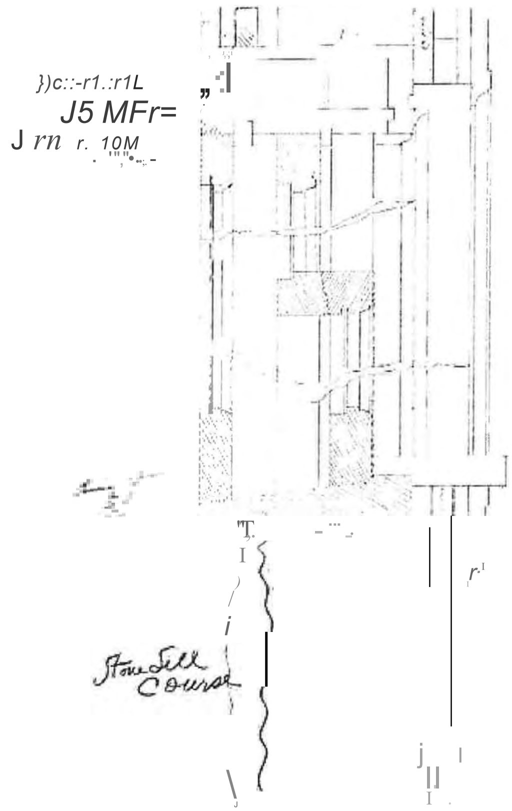

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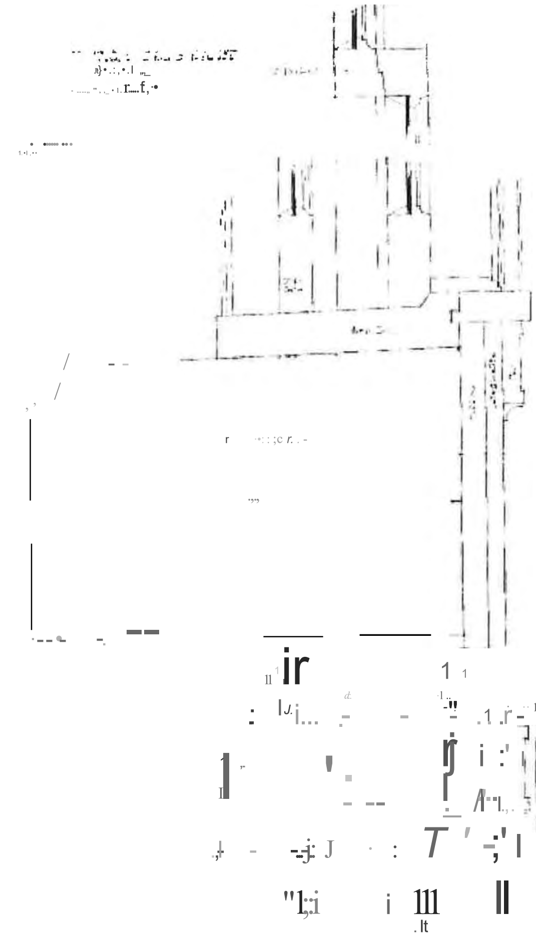

CP ARCHIVES A9-24-v3+2

THE LEBLOND PARTNERSHIP Architects • Planners

CANADIAN PACIFIC RAILWAY

Banff Train Station - Historical Drawings - Exterior Wall & Window Details

1.66

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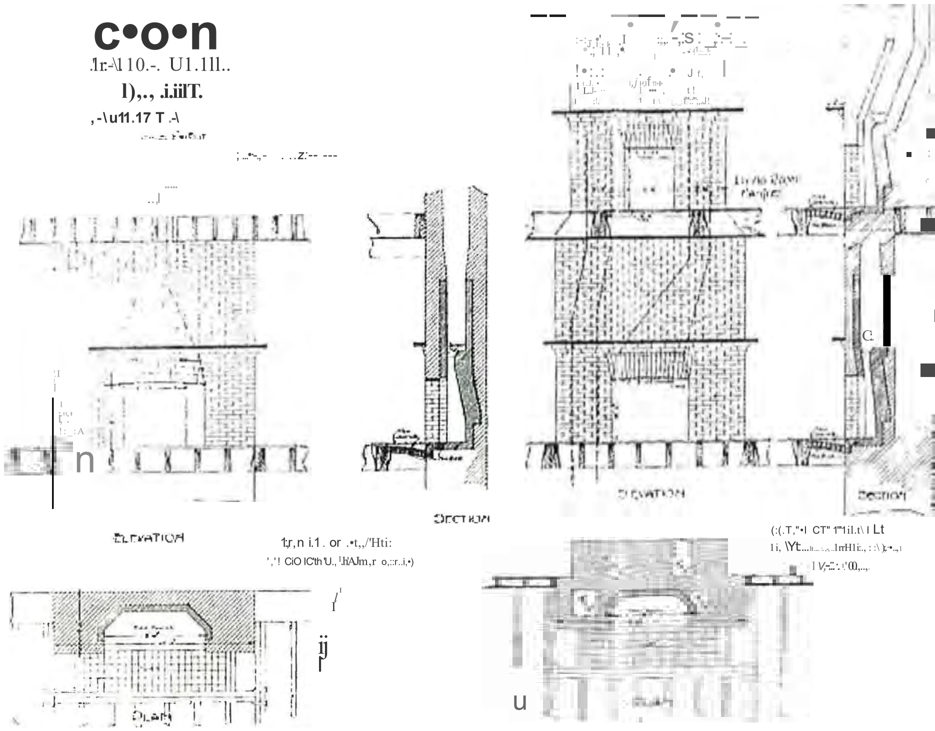

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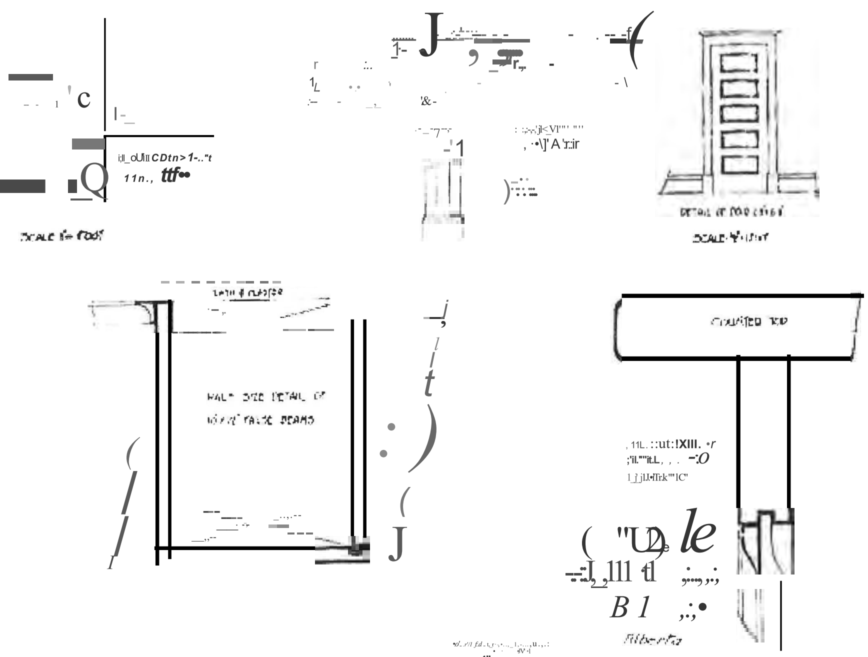

CP ARCHIVES 3438-8

CANADIAN

Banff Train Station — Historical Drawings - Interior Details

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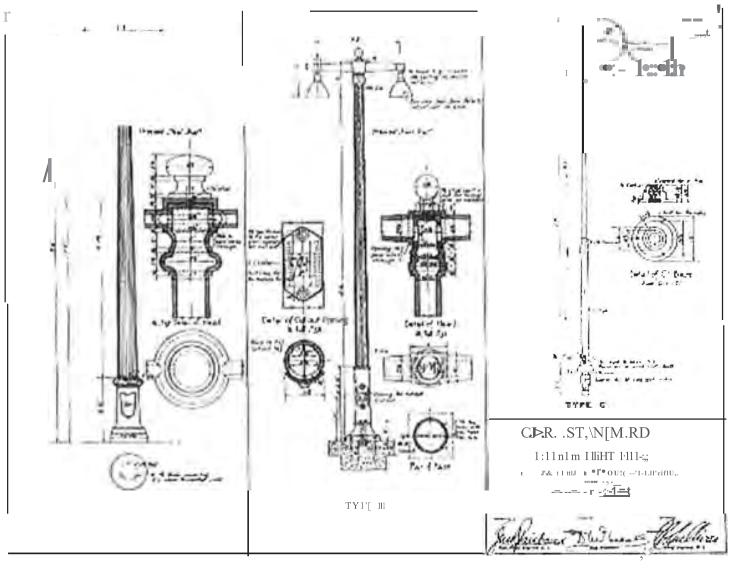

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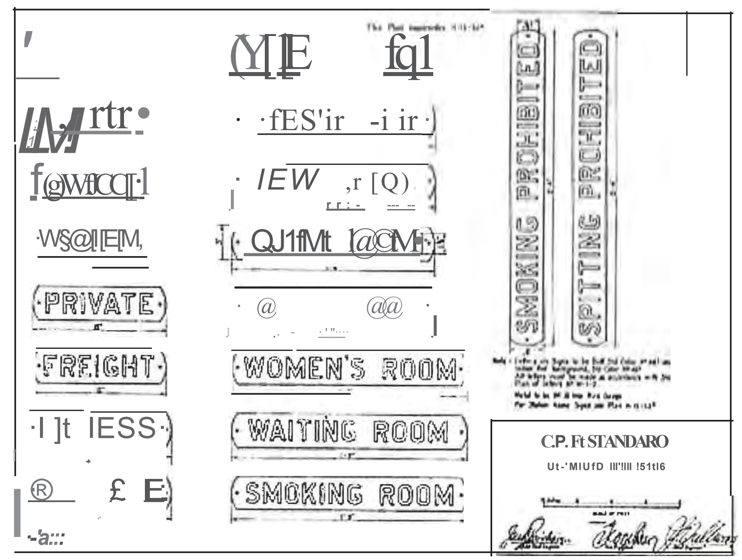
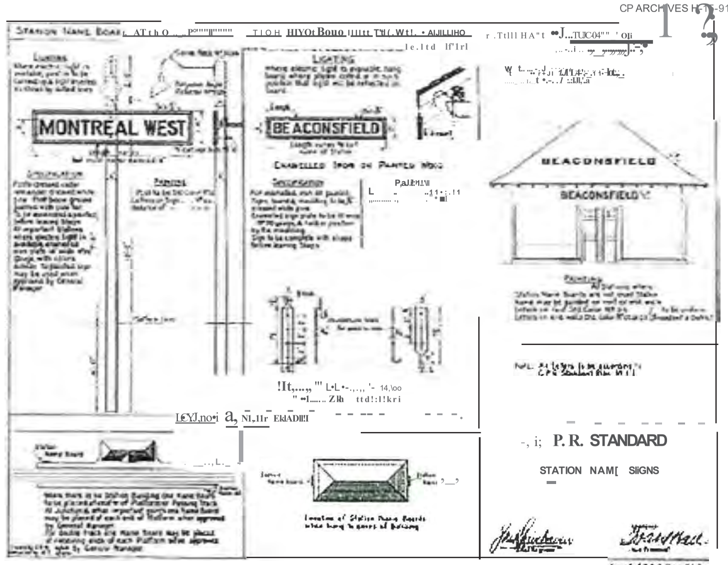
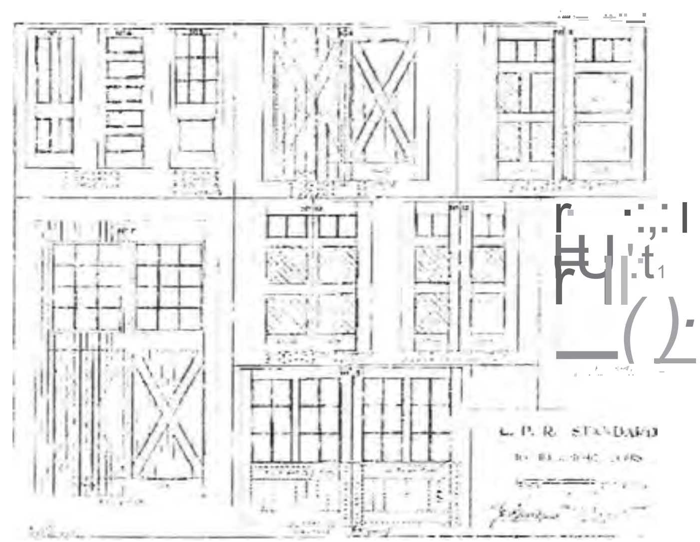


CP ARCHIVES H-15-30b



CP ARCHIVES H-15-52b



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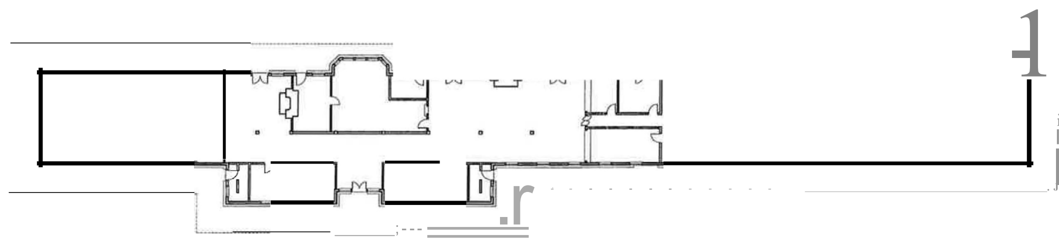


KEYPLAN

191:i'GLENIIOW MUSEUM -NA-2126-22

IMAGE NO.: 1-01

VIEW OF SOUTHWEST CORNER OF STATION C. 1912

IMAGE NO.: 1-02

SOUTH ELEVATION C. AUGUST 1946

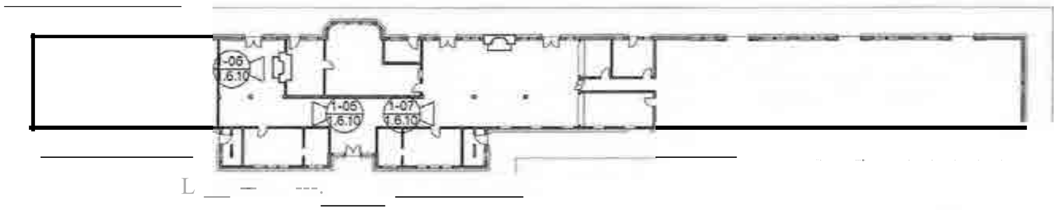
IMAGE NO.: 1-03

VIEW OF THE CENTRAL PORTION OF THE STATION FROM SOUTHEAST C. 1945

IMAGE NO.: 1-04

VIEW OF NORTH ELEVATION OF STATION C. AUGUST 05, 1958

Banff Train Station - Historical Images - Exterior



KEYPLAN

IMAGE NO.: 1-06

FIREPLACE AT WOMEN'S WAITING AREA C. 1945 (DEMOLISHED)

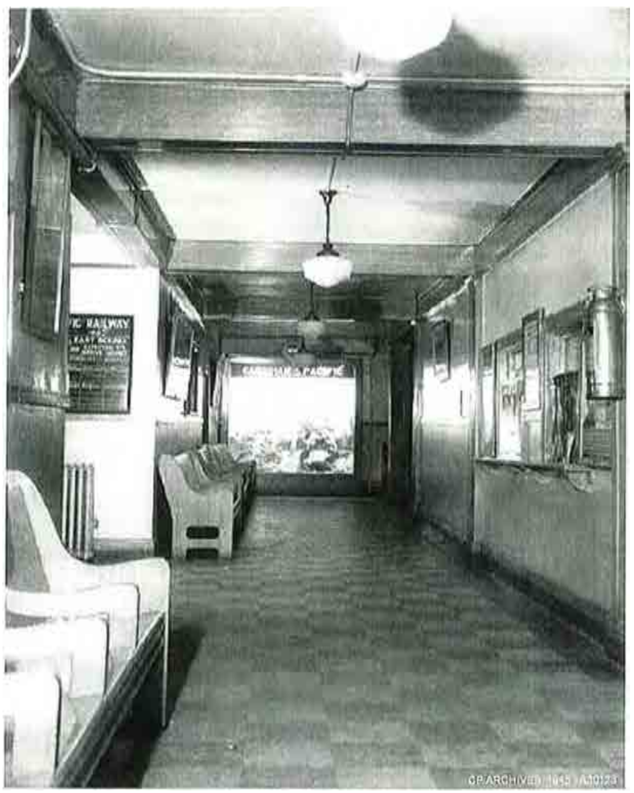


IMAGE NO.: 1-05

INTERIOR CORRIDOR LOOKING WEST C. 1945

IMAGE NO.: 1-07

INTERIOR CORRIDOR LOOKING EAST C. 1945

INTERIOR WALL PARTITIONS HAVE BEEN MODIFIED FROM THE ORIGINAL PLAN TO ACCOMMODATE ALTERNATE USES.

IMAGE NO.: 1-08

VIEW OF THE STATION FROM THE ORIGINAL WATER TOWER C. 1915

IMAGE NO.: 1-09

VIEW OF THE STATION FROM THE ORIGINAL WATER TOWER C. 1926

IMAGE NO: 1-10 TURNAROUND GARDEN C. 1931

IMAGE NO.: 1-11

VIEW OF THE STATION FROM THE ORIGINAL WATER TOWER

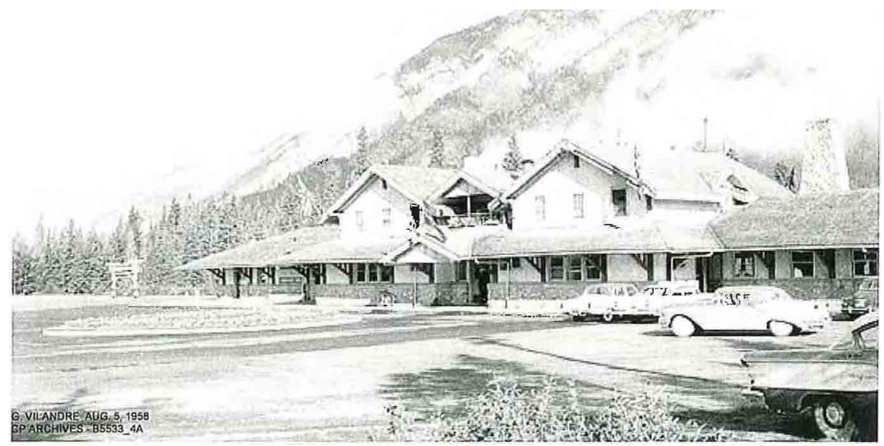


IMAGE NO.: 1-12

VIEW OF THE CENTRAL PORTION OF THE STATION SHOWING THE TURNAROUND C. 1958

CANADIAN
PACIFIC
RAILWAY

Banff Train Station - Historical Images - Landscape - Site

1611
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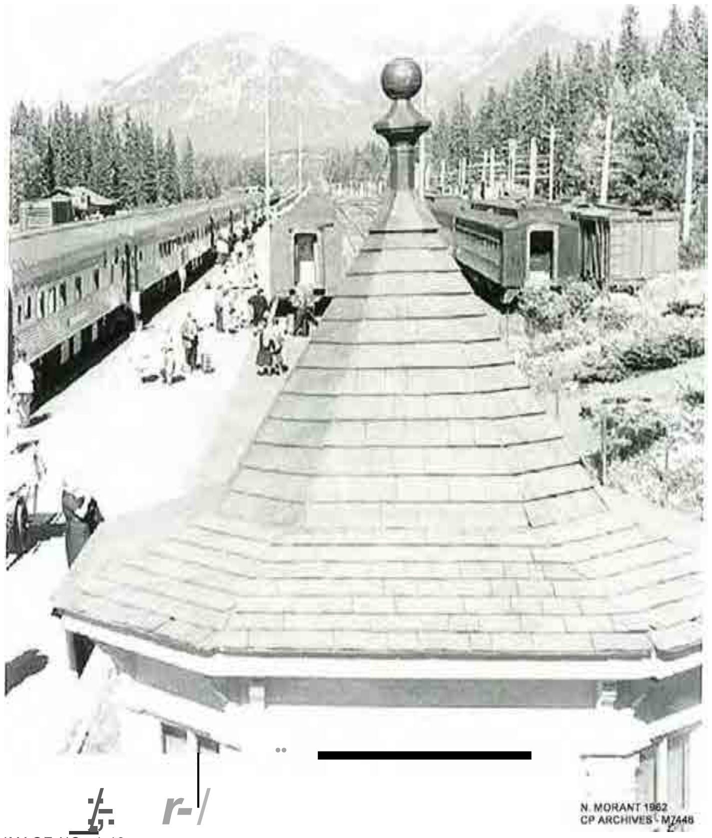

IMAGE NO.: 1-13

GARDEN SIDING WITH ROCK GARDEN ON NORTH SIDE OF DUNE, C. 1962

IMAGE NO.: 1-14

TWIN ROWS OF SPRUCE AND TURNAROUND C. 1947


IMAGE NO.: 1-15

TWIN ROWS OF SPRUCE AND TURNAROUND C. 1926


IMAGE NO.: 1-16

THE WILLOWS C. 1958

Banff Train Station - Historical Images - Landscape - Gardens

DRAFT

Banff Station - June 2003

2. PRESENT CONDITION

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2. Present Condition

2.1 Structural Integrity, Significant Alterations and Present Day Context

The building is generally in good condition with no areas under threat of immediate collapse or failure. The most significant structural problem is the uneven settling of the eaves of the lower roof.

Several significant changes occurred to the building prior to its historic designation. In 1940, the roof line was altered to add a central upper gable probably to protect the upper exterior decks . Renovations conducted between 1973 and 1978, altered the east wing of the building, displaced the main entrance, and gutted the west wing and the upper floor. In 1970, the circular garden originally developed for circulation and aesthetics was removed to allow easier access by larger motor transport.

Today the building is set within a large area of asphalt. The area to the west is a parking area that at one time was used to pile railway materials. The trees and plants that are against the building are overgrown and hide the horizontal massing of the original building form. These trees also obscure existing mechanical and chimney vents (See Images No. 2-11 & 2-13).

The remainder of the adjacent gardens and trees have been reviewed and evaluated. The rock garden to the east is in decline. The plants that remain are mainly caragana and junipers. The double rows of spruce are generally healthy with the north row (viewed from the tracks) being less dense and visibly in better condition. Between the rows, the trees have mainly dead branches. The Golden Willows west of the Station are in decline. The healthiest willows are on the east end of the row while the remaining are in quite poor condition. Some of these trees are competing with naturalized native spruce that are growing within the row. Poor pruning practices has increased the rate of decay and shortened the expected lives of the trees.

2.2 Exterior

The key exterior building finishes are the field stone base, the cut sandstone sill, the rough stucco, heavy timber members, wooden soffits to the lower roof overhangs and the wood roofing shingles.

The field stone base is generally in good condition. There are many areas that have been patched to infill where previous door and window openings occurred. There is a crack located at the south elevation of the west wing as well but for the most part the stone is sound.

The continuous cut sandstone cap and sills are generally intact, with hand written graffiti being a problem. One cap is cracked but does not appear to be structurally unsound. There are several infill areas that were formed in concrete that do not match the sandstone in both colour and texture.

The rough stucco is generally in good condition with cracks at previous alteration and infill areas. Deteriorated stucco occurs where there were roof failures.

The paint on the heavy timber braces has dried and broken to deep cracks exposing the underlying wood. At some point the timber brackets were removed from the central area of the upper two main gables on both the north and south elevations of the building. Columns were added under the two main brackets, at the original main entrance. It appears that the ends of these entrance brackets were altered, although archival drawings are not conclusive as to the original detail. The wood soffits, many of which are the original boards, need to be re-attached and refinished with attention to the original details. Fascia boards on the building gables are and typically were two layers of 'one by' material. The main roof fascias are also 'one by' material. Many of these fascia boards are warped and damaged. In sporadic locations roof gutters (not original) exist on the north elevation and are in poor condition. The current roofing appears in good condition and there is no new evidence of water damage to the interior of the building. The roof shingles are in keeping with the intent of the building, although originally the shingles were doubled every four feet to create continuous horizontal lines on the roof form. An investigation will be conducted to determine the estimated life expectancy of the existing roof.

2.3 Interior

Inte rnally, there are few original remaining interior elements of the Station. Those that remain include the brick fireplace located in what was the general waiting room, the plaster ceiling in the existing restaurant and a few interior storage room partition walls. The existing brick fireplace has been sandblasted and the mantle has been replaced.

2.4 Building Systems - Mechanical, Electrical and Structural

The existing mechanical system is out-dated. A new system is required. With the exception of a few radiators, there is little evidence of the original mechanical or electrical systems of the building. Electrical service will also require upgrading . Structural review, and reinforcing if necessary, will be required to correct sagging fascias. Additi onal reinforcement may also be required for the structure to be in compliance with present building codes.

2.5 Existing Building Code Issues

The Banff Train Station as a passenger station and depot, with restaurant, is classified as an assembly use (Group A Division 2) major occupancy. The existing Station is a two-storey combustible building with no sprinkler system and facing two streets for firefighter's access. The existing building area including all additions is 1280 sq. m. It does not conform to the current building code.

2.6 Existing Drawings and Illustrations

2.6.1 Existing Exterior Images - Existing Train Station - West

2.6.2 Existing Exterior Images - Existing Train Station - Central - South

2.6.3 Existing Exterior Images - Existing Train Station - Central- North

2.6.4 Existing Exterior Images - Existing Train Station - Southeast

2.6.5 Existing Exterior Images - Existing Train Station - Northeast

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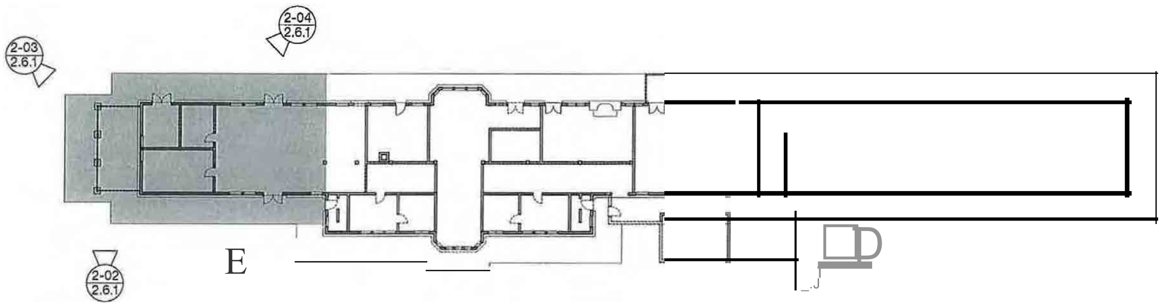


KEY PLAN

IMAGE NO.: 2-01

GENERAL VIEW OF THE WEST SEC TION OF THE SOUTH ELEVATION

IMAGE NO.: 2-02

GENERAL VIEW OF THE WEST END OF THE SOUTH ELEVATION

IMAGE NO.: 2-03

GENERAL VIEW OF THE WEST ELEVATION FROM THE N.E. CORNER OF THE SITE

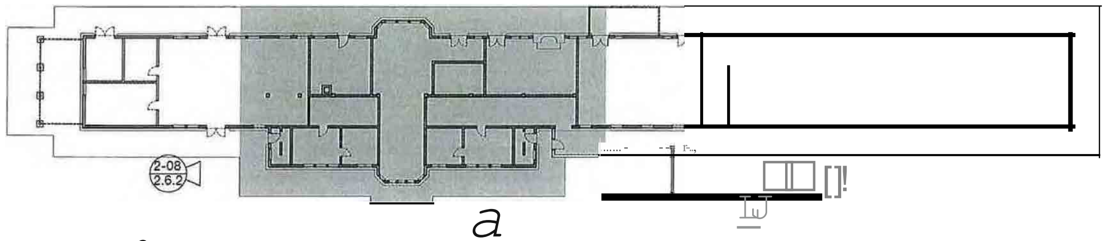
IMAGE NO.: 2-04

PARTIAL VIEW OF THE WEST PORTION OF THE NORTH ELEVATION

CANADIAN PACIFIC RAILWAY

Banff Train Station - Existing Images - West

12.6.11



KEY PLAN

IMAGE NO.: 2-05

GENERAL VIEW OF THE EAST PORTION OF THE CENTRAL SECTION OF THE SOUTH ELEVATION

IMAGE NO.: 2-06

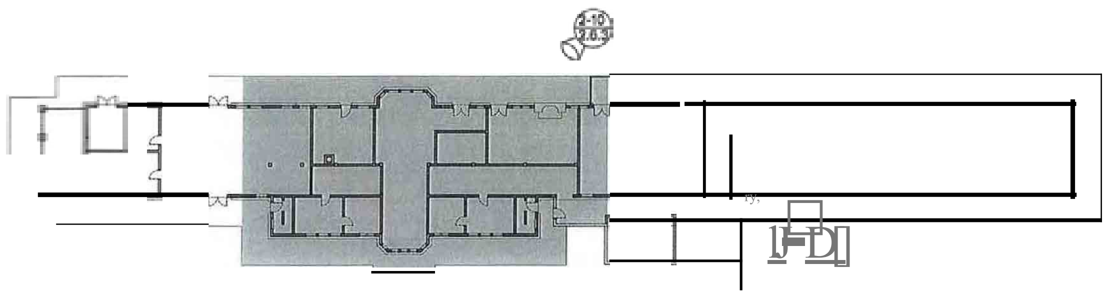
GENERAL VIEW LOOKING N.E. OF THE CENTRAL SECTION OF THE SOUTH ELEVATION

IMAGE NO.: 2-07

GENERAL VIEW OF THE WEST & CENTRAL PORTION OF THE CENTRAL SECTION OF THE SOUTH ELEVATION

IMAGE NO.: 2-08

PARTIAL VIEW OF THE SOUTH SECTION OF THE WEST ELEVATION



KEYPLAN

IMAGE NO.: 2-09

PARTIAL VIEW OF THE WEST PORTION OF THE CENTRAL SECTION OF THE NORTH ELEVATION

IMAGE NO.: 2-10

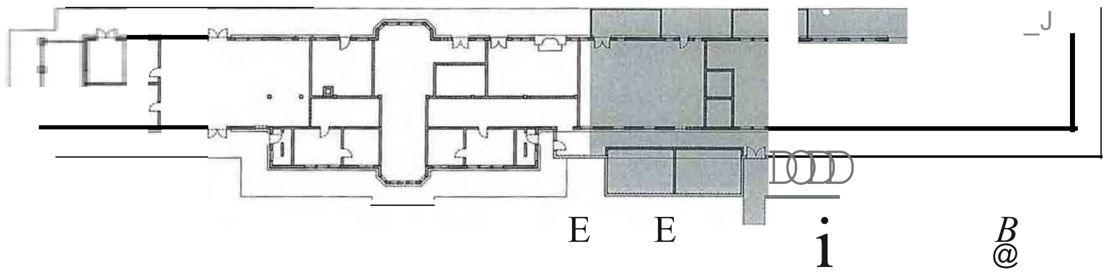
GENERAL VIEW OF THE EAST CEN TRAL SECTION OF THE NORTH ELEVA TION

OCTOBER 19, 2003

The LEBLOND PARTNERSHIP Architects • Planners

CANADIAN PACIFIC RAILWAY

Banff Train Station - Existing Train Station - Central North



KEY PLAN

IMAGE NO.: 2-11

PARTIAL VIEW OF THE WEST PORTION OF THE EAST SECTION OF THE SOUTH ELEVATION

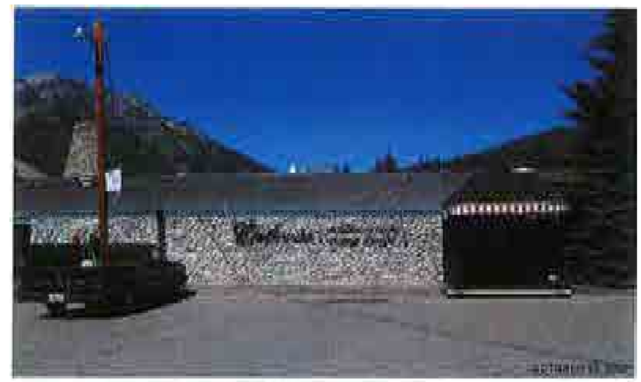


IMAGE NO.: 2-12

GENERAL VIEW OF THE WEST PORTION OF THE EAST SECTION OF THE SOUTH ELEVATION

IMAGE NO.: 2-13

GENERAL VIEW OF THE CENTRAL POR TION OF THE EAST SECTION OF THE SOUTH ELEVATION

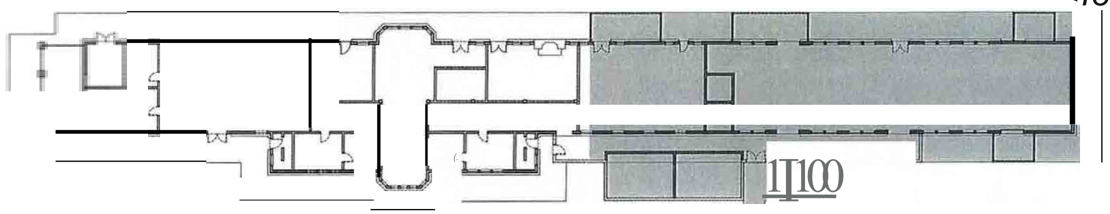
IMAGE NO.: 2-14

GENERAL VIEW OF THE EAST PORTION OF THE EAST SECTION OF THE SOUTH ELEVATION

CANADIAN PACIFIC RAILWAY

Banff Train Station - Existing Train Station - Southeast

WQW



KEY PLAN

IMAGE NO.: 2-15

GENERAL VIEW OF THE NORTH ELEVATION FROM THE N.W.CORNEA OF THE SITE

IMAGE NO.: 2-16

PARTIAL VIEW OFTHE EAST SECTION OF THE NORTH ELEVATION

JUNE 18,2002

IMAGE NO.: 2-17

PARTIAL VIEW OF THE CENTRAL SEC TION OF THE NORTH ELEVATION

CANADIAN PACIFIC RAILWAY

Banff Train Station - Existing Train Station - Northeast

Proposed Banff Train Station

Note: The colours as printed here are indicative of the colours proposed.
Please see paint chips of the colours as noted in Appendix 4.4 for true colours.

3. Heritage Plan

3.1 Banff Station Place Area Redevelopment Plan

CPR is working with the community, the Town, and Parks Canada to develop new land use guidelines for lands adjacent to the Station. Central to these guidelines is having the character, scale and form of new site developments compliment and positively contribute to the heritage character of the Station. These new guidelines are being brought forward as a municipal Area Redevelopment Plan (the ARP).

There are several elements of direct relevance to the Station addressed by the ARP; the prominence and view-scapes of the Station, the re-creation of the former turnaround, the creation of platforms and promenades, the creation of a sense of place, the re-establishment of the former station gardens and twin rows of spruce, the enhancement of the Golden Willows and the introduction of a rail spur for specialty trains (Refer to 3.7.1 and 3.7.2).

One of the objectives of the ARP is to re establish the Station as a focus of the western portion of the site and as a connection to the Town. To achieve this, the ARP encourages the enhancement of the view-scape from Lynx Street north towards the Station. In addition, the ARP promotes the re-establishment of a circular turnaround with a central garden element, with pedestrian links, benches and low level lighting that are at a scale which preserves and improves views to and from Lynx Street. Upgrading Lynx Street, as envisioned in the Downtown Enhancement Plan, including re-aligning the intersection of Gopher and Lynx, improving lighting, sidewalk patterns and planting is also encouraged by the ARP as it will re-establish Lynx Street as a major axis between the Station and Banff.

A primary goal of the ARP is to improve safety. As such, it directs that a separation between the site and the operating rail corridor be created. One form of separation provided for within the ARP for the area east of the Station includes the formalization of a platform separating the site with gates, low walls and fences. This will direct pedestrian movements away from the tracks, while maintaining open view-scapes and providing for Rocky Mountaineer Railtours passenger needs. For the area to the west of the Station, the ARP provides for a raised promenade which separates the tracks from the public while creating train viewing vantage points and offering an interpretation of the historic and current relevance of railways in Banff and in Canada.

Another key objective of the ARP is to provide for a development which has a sense of place created through a unified composition. To promote this sense of integration, the ARP anticipates improving the views into the site from Norquay Road so that the Station and the area west of the Station can be viewed in unison. It also directs that new buildings and pavilions on the west side of the site reflect the heritage character of the original station. Scale, massing, colour, materials, site lighting and roof-scapes are amongst the attributes to be considered in new designs. As illustrated in the ARP, buildings resembling boxcars sitting on spur tracks would enhance the rail theme throughout the site.

Establishing cohesion through the heritage aspects of the site is further promoted by the ARP's direction to re-establish the station gardens, establish the twin rows of spruce as a pedestrian link between the Station and the eastern portion of the site, and its provision for a look out at the top of the dune from where the Station, the site, mountains and trains can be viewed and photographed. The turnaround, with the gardens in the centre, will become the visual focus of the area immediately in front of the Station. Distinctive paving patterns, strategic tree planting reinforcing the circle, low level bollard lighting and colorful planting in the circle will create an appropriate setting for the Station.

Selected traffic calming strategies in the turnaround will be used to encourage a safe integration of pedestrian movement and automobile circulation. It is intended that these will be reminiscent of the origins of the Station and similar to today's Eau Claire Market in Calgary or Granville Island in Vancouver.

Central to the area west of the Station are the Golden Willows which line a siding which was used during a Royal visit in the 1930's. The ARP provides for this linear grove of trees to be enhanced by relocating vehicular circulation away from the willows to protect their root structure and thereby celebrating the willows as a centre piece.

Introducing new features, which assist the site in achieving its goal of creating a vibrant mixed use space, are also encouraged by the ARP. A new rail spur through the site allows for special trains such as the Holiday Train or the Royal Canadian to park on the site for special occasions and for educational and interpretative functions. This is a good example of how new attractions can improve the site in a manner that reinforces the Station's presence.

The vision and guiding principles of the Banff Station Place ARP state that the project be economically viable and sustainable, while being an integral part of the culture aesthetic and working life of Banff, symbolic of how our past defines our future. A more complete understanding of the ARP can be gained by visiting www.banffstationplace.ca.

3.2 Preservation

While the Heritage Plan is primarily a rehabilitation project, preservation of the character defining elements is important.

To protect, maintain and stabilize the past form, materials and integrity of the Station, several portions of the building need to be removed. The existing bay window and stone base located centrally on the south elevation are to be removed to reinstate the original entrance, recreating a new recessed door in keeping with the original 1910 station. This will help to reestablish the original focus and circulation patterns through the building. The feasibility of removing the two structural columns presently supporting the original entrance roof will be investigated.

Additions for the restaurant made in the 1970's (glazing, stone, etc) are to be removed to expose existing original station walls. Wood slat additions (1 on south and 3 on north), along with any existing mechanical equipment, will be demolished. Restaurant roof equipment is to be removed to re establish the simple massing of the roof forms. Existing exterior lighting, both decorative and functional, with all associated attachments, are to be removed. The lattice enclosing an earlier addition at the west end of the station will be removed, but the roof and columns will be retained, as the roof is in keeping with the station form and can provide shelter from the weather for the passengers and or baggage. All newer windows (metal and vinyl) will be replaced with wood windows sympathetic to the original window forms. Window boxes (not original and in poor condition) will be removed. Trees and shrubs immediately adjacent to the station will be removed to expose the original building massing and form.

It is proposed that the upper cross gable from a 1940 addition be retained. Although this is not original, the function of protecting the upper decks from snow and rain is valid for the longevity of the building and the safety of use. This 1940 addition has become a character defining element in its own right, as it further enhances the focus of the building to the main entrance.

Although some of the character defining features will need to be repaired, and in some cases replaced, each will be evaluated to ensure a gentle way of intervention is applied.

3.3 Restoration

Although rehabilitation is proposed as the primary treatment for the Station, restoration of certain character defining elements will help to accurately preserve the historic details of the period. It is proposed that the stone sills that cannot be repaired and earlier concrete sill replicas, as well as, the soffits and fascia boards that are badly damaged and missing, be replaced with new examples which replicate the original features. There are four upper timber brackets missing on the central portion of the upper gables and one lower heavy timber roof bracket. These will be replaced with new brackets whose form, material and detailing will be based on the existing bracke ts.

3.4 Rehabilitation

For the most part, the Banff Train Station Heritage Plan will be a rehabilitation project, using preservation and restoration principals to protect character defining elements. The goal is to sensitively adapt this historic place to house sustainable contemporary uses.

Repairs will be appropriate and gentle interventions. Such repairs include the re painting of mortar areas with cracks and replacement of previously poorly installed in fills (Refer to 3.7.12.1). Stucco areas that are cracked or badly damaged will be repaired or replaced to match the existing rough textured stucco (Refer to 3.7.12.7). The half-timber detailing on the main entrance roof will be re instated (Refer to 3.7.12.8).

The paint on the timber brackets will be removed as it has deteriorated to the point of exposing the raw wood, and the timbers will be properly prepared and refinished. Any timbers that have sagged will be reinforced back to the inside of the wall (refer to 3.7.12.3 and 3.7.12.4). Soffit wood will be repaired and replaced with like boards, only if deterioration is beyond repair (Refer to 3.7.12.5). Modern roof venting will be removed and replaced with appropriate roof venting to meet the codes of t@day with a more sensitive vent detail (recessed venting screen the same width as the wood would be a more appropriate treatment than the rectangular metal vents).

As the longevity of wood shingle roofs are limited, and with the scale of rehabilitation, it may be prudent to replace the shingle roof at this time. An investigation into the expected life of the existing roof will be undertaken. The roofing will be replaced, when required, with a wood shingle roofing system and installed on the lower roof as per the original drawings and historical images, with a double shingle approximately every 4'- 0", further reinforcing the horizontal nature of the building massing.

Architecturally, railway stations were designed in a modular format with flexibility in both form and function. Interior partitions were changed as needs evolved. Stations were designed with the idea that doors and window openings would be added or modified on an as need basis. Unique to the Banff Station is the extended east wing which was designed with an unusually large baggage room to accommodate long term luggage storage. As the need changed so did the form. Adaptability has always been key to Station designs.

Historically, there were three types of windows on the Station. The upper windows were one over one double sash with the upper sash being nine-pane. The lower windows were either one over one sash or smaller single upper units grouped horizontally in pairs. There are existing examples of both types used on the lower portion of the building. All existing original windows have an outer storm window. The original window layout reinforced the horizontal nature of the building. All existing metal and vinyl windows will be replaced with modern wood windows sympathetic to the original window forms . The upper windows will be wood double hung with a nine pane authentic or true divided light upper unit. Photographic images of the 1910 building, does not support the trim detailing shown on the original elevations. The existing trims will be retained and reused if at all possible. The lower tall windows will be modern wood double hung units. The upper-paired units will be awning or hopper windows to provide natural ventilation. Window locations will be re-instated wherever possible. The original horizontal nature and groupings of windows should not be affected. (Refer to 3.7.12.9).

A series of five double doors will be introduced to the south fagade (refer to 3.7.3 through 3.7.8). Four of the five doors are in locations of original doors and restore the elevation to its original fenestration (refer to 1.6.2 and 1.6.3. for historic plans and elevations). A new entrance will be located on the east side of the general waiting area wall to allow additional access to the east portion of the building. Architecturally, the result of adding this new door is to remove one double hung window bay with a double door that bookends a rhythm of two double window bays (3.7.3). This door is consistent with the utilitarian nature of the station and how it has been adapted to meet the needs of the day. The design and construction of the new doors allow the rustic historical materials to be seen while creating sun lit entrances for new tenants.

New signs for the tenants are to be made of wood as per the Banff Design Guidelines and designed in a style corresponding to the 1917 CPR standard (refer to 1.6.8). The signs are to be hung under the soffit perpendicular to the main fagade and viewed along the pedestrian walkway under the large overhangs. This design approach will have minimal impact on the overall building form.

From the original drawings for the station, it appears there were three types of exterior doors used: half light double doors, single half light panel doors, and double sliding paneled doors with the upper panel a three pane light (CPR Standard no. 9). (Refer to 1.6.8). The CPR standard drawings are dated 1914 while the Station was built in 1910. This may explain why the one partial existing No. 9 door has two large panels for the exterior rather than four smaller panels indicated on the drawing. Overtime single doors were typically equipped with screen doors, although it appears that only one may be original. All original doors and screens will be repaired, retained or reused. All original door openings will be retained and re-instated as per the original drawings. All newer metal doors will be replaced with doors sympathetic to the original in form and proportions, while complying with modern accessibility and exiting requirements. New proposed doors will be wood paneled half light doors, similar to CPR Standard No. 11, as these allow more visibility and natural light required by new users.

A new mechanical upgrade will be implemented. The new mechanical intakes and exhaust requirements should be located on the north side of the building and will be done to minimize the impact on the form and visual focus of the station from Gopher, Lynx and Elk Streets. Individual tenants will not be permitted to make alterations to the exterior and the roof of the building. It is proposed to re-instate a new gutter and downspout system to direct the storm water to the new on site drainage system and to protect the fascia boards.

Electrical service will be upgraded. The existing exterior and interior fixtures should be removed and replaced with appropriate fixtures. Existing exterior decorative eave lighting and all associated attachments will be removed. The pendant light fixtures located in the restaurant will be retained and relocated to the general waiting area, to be in keeping with the historic photographs.

Structurally, the eave bracing should be reviewed and reinforced as required to correct the sagging fascias. The roof and the second floor framing will be reviewed and reinforced to meet the load requirements for the proposed use, and will be in compliance with present day building codes.

Since little of the original interior of the building exists, it is proposed to re establish the general waiting room with the remaining of the interior (east wing, west wing, and upper floor) to be developed with contemporary materials for contemporary uses. Historically, the waiting room portion of the building was the heart of the public space and this area could remain the public reception and waiting area for the Station and could also be used by Rocky Mountaineer Railtours. The re-establishment of the original entrance location along with the trackside door locations, will restore the original passenger circulation patterns, which allows one to experience the Station in away that is consistant with the original design.

The one remaining fireplace is also in this space, although the brick has been sandblasted and the mantle has been replaced (Refer to 3.7.13.1). The false ceiling beams and columns will be reconstructed based on the original drawings. Wall finishes were typically plaster finish with a wood chair rail. It is proposed that the existing wood in the restaurant (originally 3" V-joint wallboard from the baggage area that was sawn in half), be retained and reused as a wainscoting in the waiting area. The retention and reuse of the original material would be in keeping with the era and would contribute to the overall character of the station. The upper wall finish would be a rough textured faux finish to reflect the plaster finish of the past. Existing bench seating in the restaurant, as well as the pendant light fixtures will be obtained for reuse (Refer to 3.7.13.2).

It is proposed that the upper floor be used for offices. The stairs serving the upper floor will be reconstructed to meet building code exiting and access requirements. Floor structures will be reviewed and if required reinforced to support the required loads and fire separations. The membranes on the upper floor exterior decks will be replaced and the existing guard repaired as required (Refer to 3.7.12.12).

The exterior colours of the Station have changed over time and aside from localized painting of new or repaired areas, it appears the station has seen three different paint schemes. The original colour of the wood trim, frames and doors was a reddish brown and the stucco a light ocher colour. At some point, perhaps for the occasion of 1939 royal visit, the Stations' window and door trim were painted grey. By 1978 the Station was repainted with a chocolate brown colour over the wooden trim and frames and the stucco was painted deep yellow. Today the Station has bluish green trim and green grey stucco. The proposed colour scheme is based upon the original Station colours and, for added detail we propose to follow the variation of the 1930's scheme of different trim and window frame colours. To illustrate the Station's colour history, layered paint samples have been taken from the Station and matched for your reference in Appendix 4.4. Also included in this appendix are the proposed Station colours.

3.5 Standards and Guidelines for Heritage Conservation Activities

The Heritage Plan has applied preservation, rehabilitation, and restoration standards as outlined in Appendix 4.2. It is the intent of this Plan to conserve the character defining elements as well as elements that have become character defining features in their own right. The Heritage Plan and the ARP recognize the Station and the grounds as a physical record of its time place and use. Although modifications will be made to the Station, it is intended that the rehabilitation will not detract from the historical significance of the original building form and railway connection.

Tenancies, which encourage people to visit the Station for reasons beyond its history, will help the station reestablish additional relevance and thereby continue the viability of the structure and grounds. The Station should be the focus of the sites mix of transportation, commercial and public service activities. Potential uses for the Station should include railway uses and passenger services, traveler and tour services, car rental agencies, gift shops, heritage interpretation, art studios and galleries, equipment rentals, food and beverage outlets, business, professional and medical offices, financial services, convenience stores, drop-in clinics and pharmacies. Originally, trains brought people to the Station to create the vitality; now, tenants must attract people to the Station to support the future.

The ARP will be staged over time. The HSMB is recognized as an ongoing partner throughout the development to ensure the character defining elements of the Station and the site are protected. All elements will be evaluated to ensure appropriate and gentle intervention is used (repair rather than replace). Ongoing maintenance by the tenants will be critical to the longevity of the Station and the grounds. Interventions required to preserve character defining elements, such as the demolition of earlier additions, will be fully documented. The ARP proposes new construction that will be physically and visually compatible with, yet distinguishable from, the historic Station.

3.6 Contemporary and Alberta Building Code Requirements

A goal of the Area Redevelopment Plan (ARP) is for the project to be certified under the Leadership through Energy and Environmental Design (LEEDS) program. However, to protect original character defining elements there will be areas of the Station that may not be able to be upgraded to today's energy efficient levels. Every attempt will be made to meet preferred insulation and ventilation levels of today without significantly impacting the existing elements.

The Station will be upgraded to conform to the current Alberta Building Code requirements. The Station as a passenger station and depot, is classified as an assembly use (Group A Division 2) major occupancy. The proposed new uses of exhibition halls, markets and shops - mercantile uses (Group E), and offices - business and personal service uses (Group D), will be adjoining occupancies.

Based on the two storey station and a proposed building area of 1040 sq.m., the station can be classified by the building code (Article 3.2.2.26) as Group A, Division 2, up to 3 Storeys, Increased Area, Sprinklered. In summary, the building can be of combustible construction with floor assemblies and supporting structure requiring a fire resistance rating not less than 45 minutes. Separations between Group A-2 and Group E are required to have a fire separation meeting a minimum fire-resistance rating of 2 hour, while separations between Group A-2 and Group D to be a minimum of 1 hour. Partitions between Group D and Group E uses do not require a fire-resistance rating.

Sprinkler protecting the building will help preserve the historic materials from fire for future generations, while allowing site landscape flexibility, since multiple street accesses for firefighting will not be required.

Access for fire safety will be to the new main entrance of the building. All public doors will meet the accessibility requirements.

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Power operators are not .required due to the relatively small suite areas (less than 500 sq. m). The upper floor is not required to be accessible as the area is less than 600 sq.m. The two existing stairs from the upper floor will be rebuilt to meet modern codes for access and egress as well as fire separation. The existing window adjacent to the west exit stair and the existing wall opening adjacent to the east exit stair will be in-filled to protect the exits (within 3 m). The structure of the upper floor and the roof will be reviewed to ensure it meets modern codes for loads and seismic requirements. Existing lead paint and asbestos will be removed and disposed of in accordance with relevant regulations.

3.7Proposed Drawings and Illustrations

1. ARP Concept Plan
2. ARP West Concept Plan
3. Proposed Building Elevations
4. Proposed Building Plans
5. Partial Building Plan - West
6. Partial Building Plan - Central
7. Partial Building Plan - Central-East
8. Partial Building Plan - East
9. Proposed Second Floor Plan
10. Proposed Building Perspectives
11. Proposed Building Perspective Details
12. Images of Character Defining Elements
    1. Existing Stone Base Details
    2. Existing Cut Sandstone Sill Details
    3. Existing Lower Roof Heavy Timber Brackets

    3.7.12.4 Existing Upper Roof Timber Brackets - Upper Roof

    5. Existing Wooden Soffit and Fascia Boards
    6. Existing Upper Roof Soffit
    7. Existing Stucco Images
    8. Main Entrance Images
    9. Existing Windows
    10. Existing Doors
    11. Existing Roof Forms
    12. Existing Upper Floor Exterior Guard
    13. Existing Landscape
13. Interior Images
    1. Existing Fireplace
    2. Proposed General Waiting Area

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Scale: 1:2000

Banff Train Station - ARP Concept Plan

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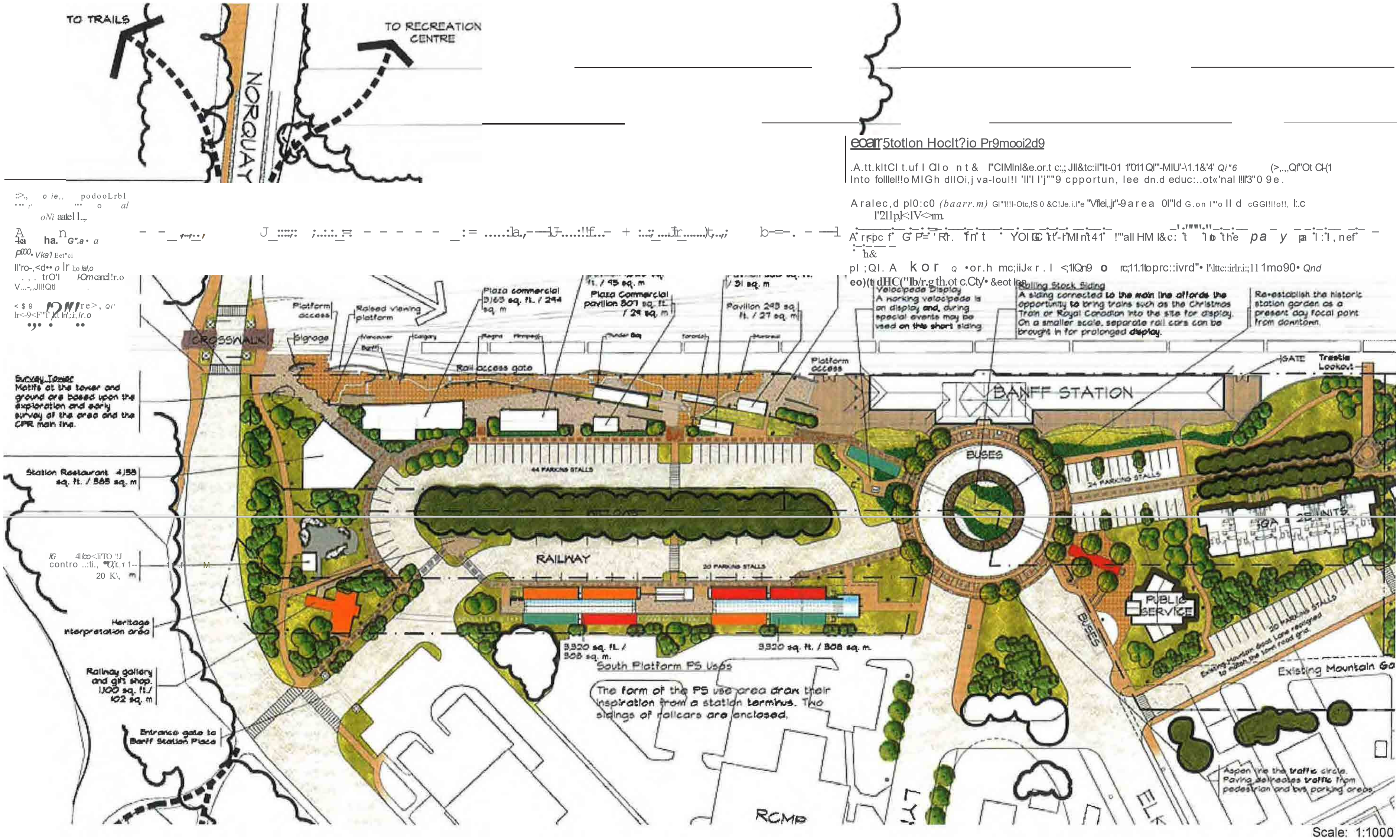
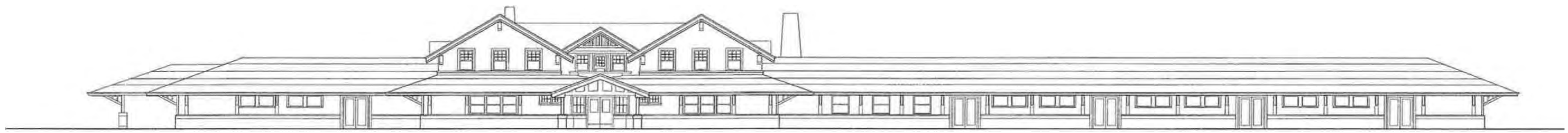
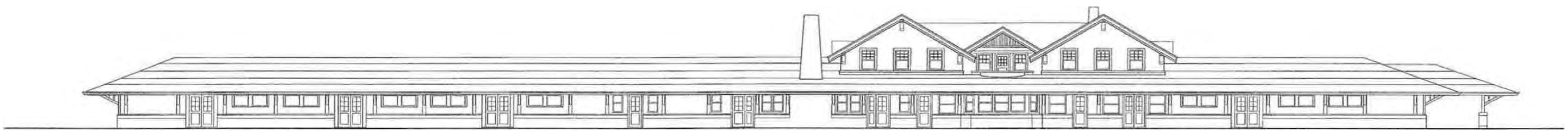


Banff Train Station - ARP West Concept Plan



SOUTH ELEVATION



NORTH ELEVATION

WEST ELEVATION

EAST ELEVATION

N.T.S.

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CANADIAN PACIFIC RAILWAY

Banff Train Station - Proposed Building Elevations

3.7.3

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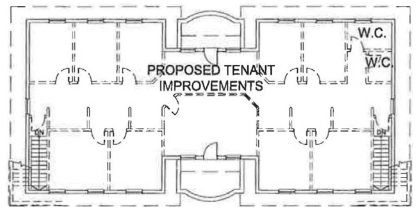
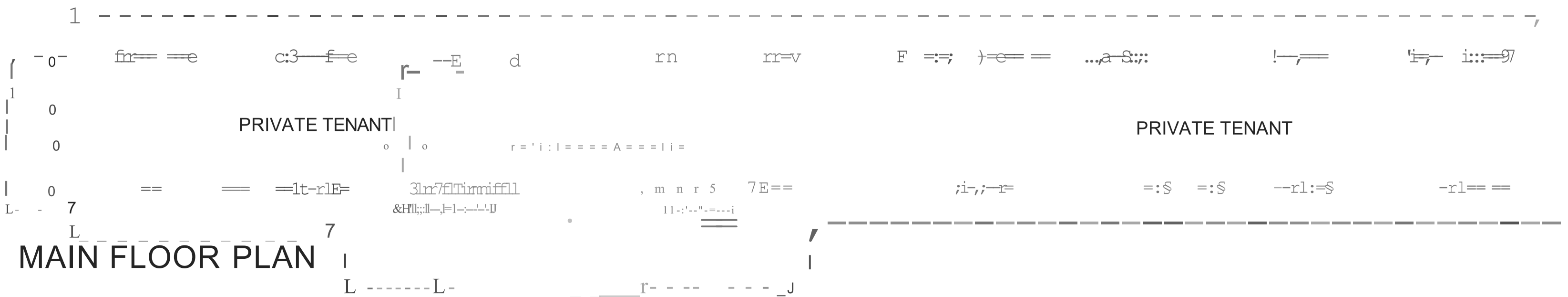
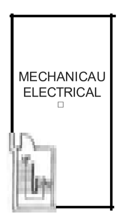


SECOND FLOOR PLAN



MAIN FLOOR PLAN



BASEMENT FLOOR PLAN

N.TS.

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CANADIAN PACIFIC RAILWAY

Banff Train Station - Proposed Building Plans

3.7.4

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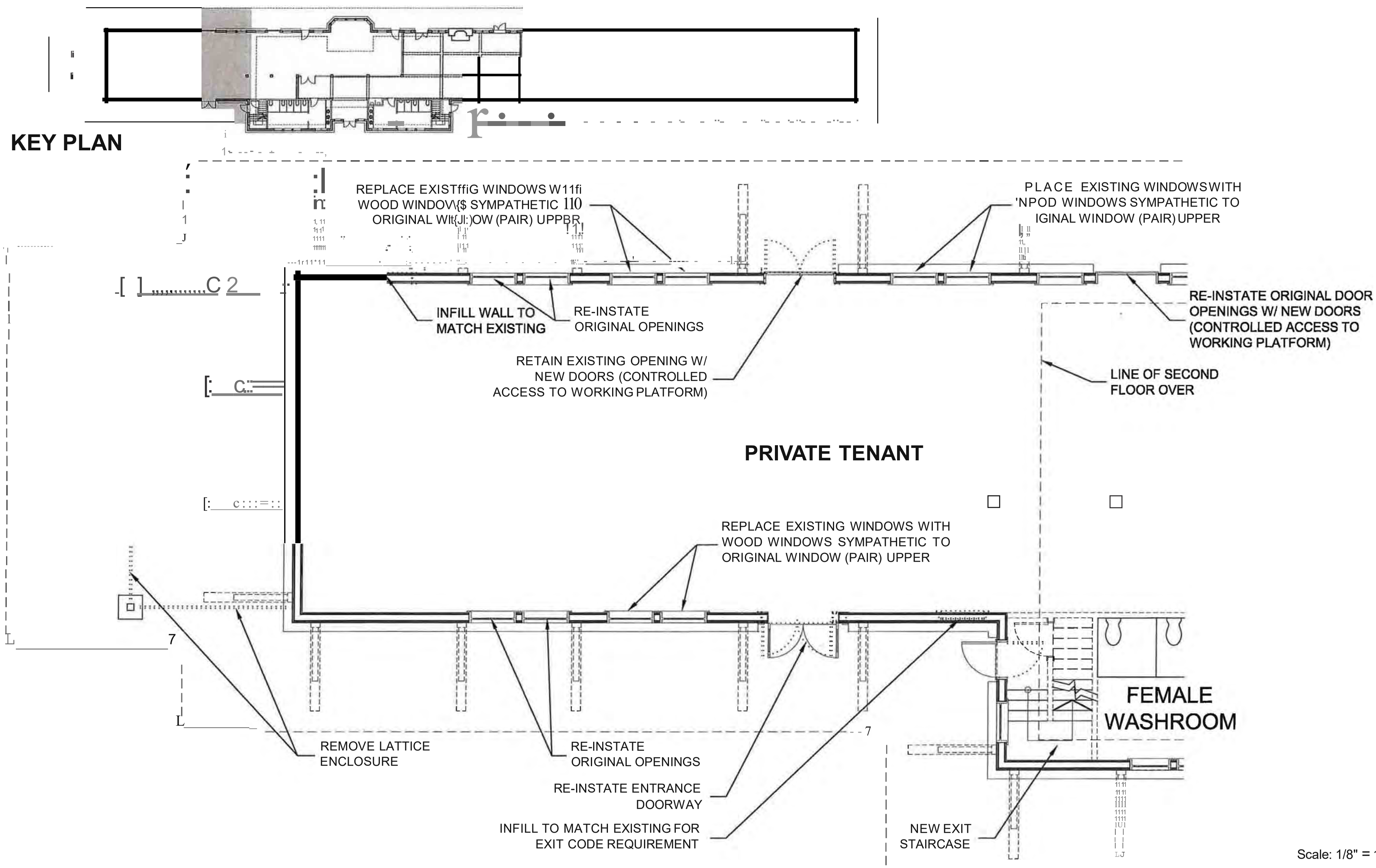


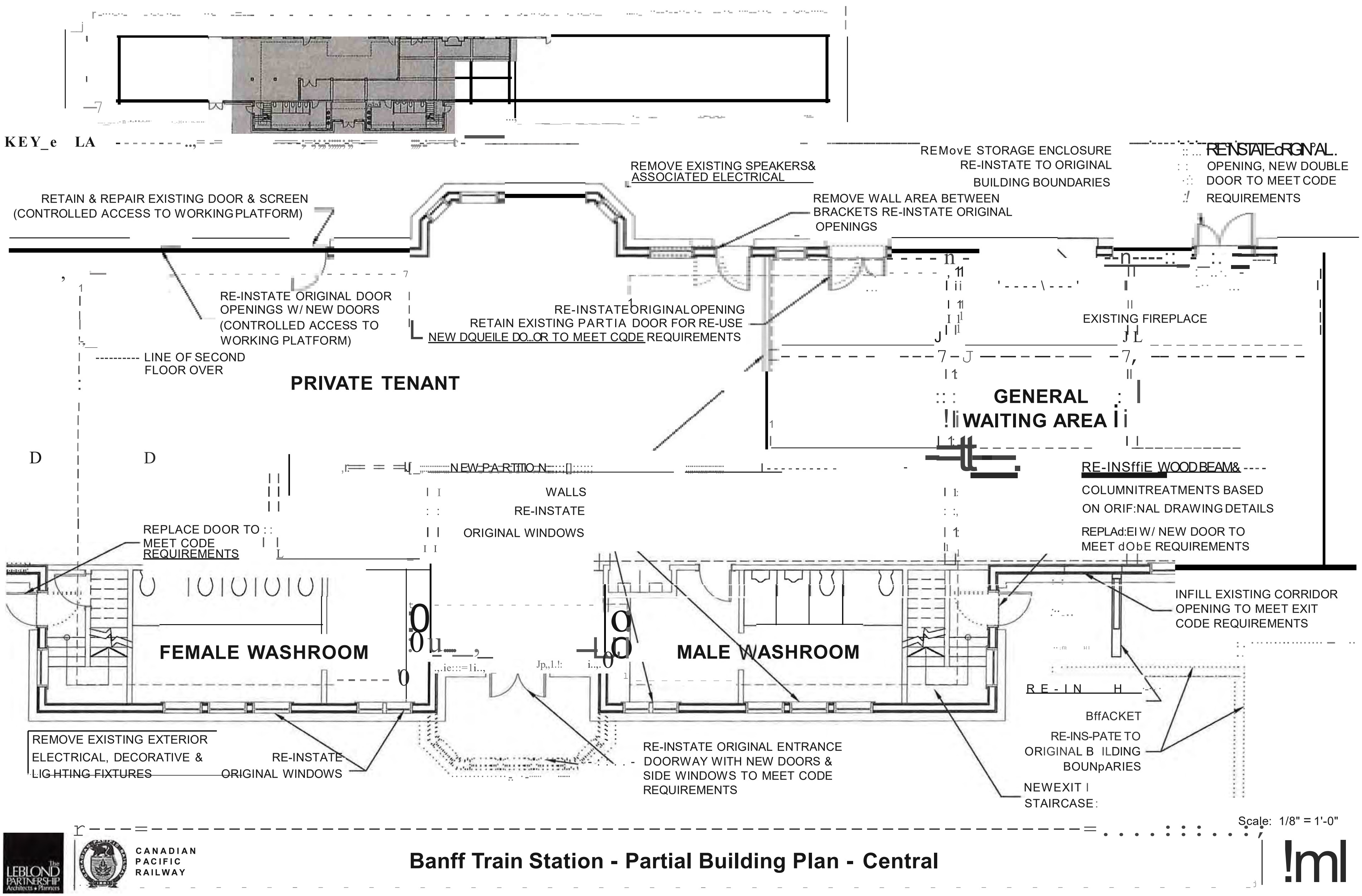
Scale: 1/8" = 1'-0"

CANADIAN

Banff Trainstation - Partial Building Plan - west

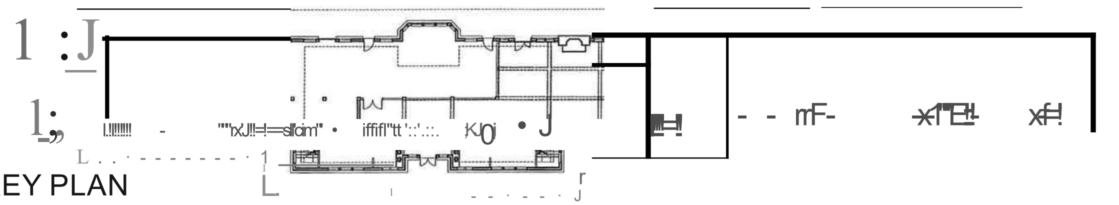
3.7.5

DRAFT

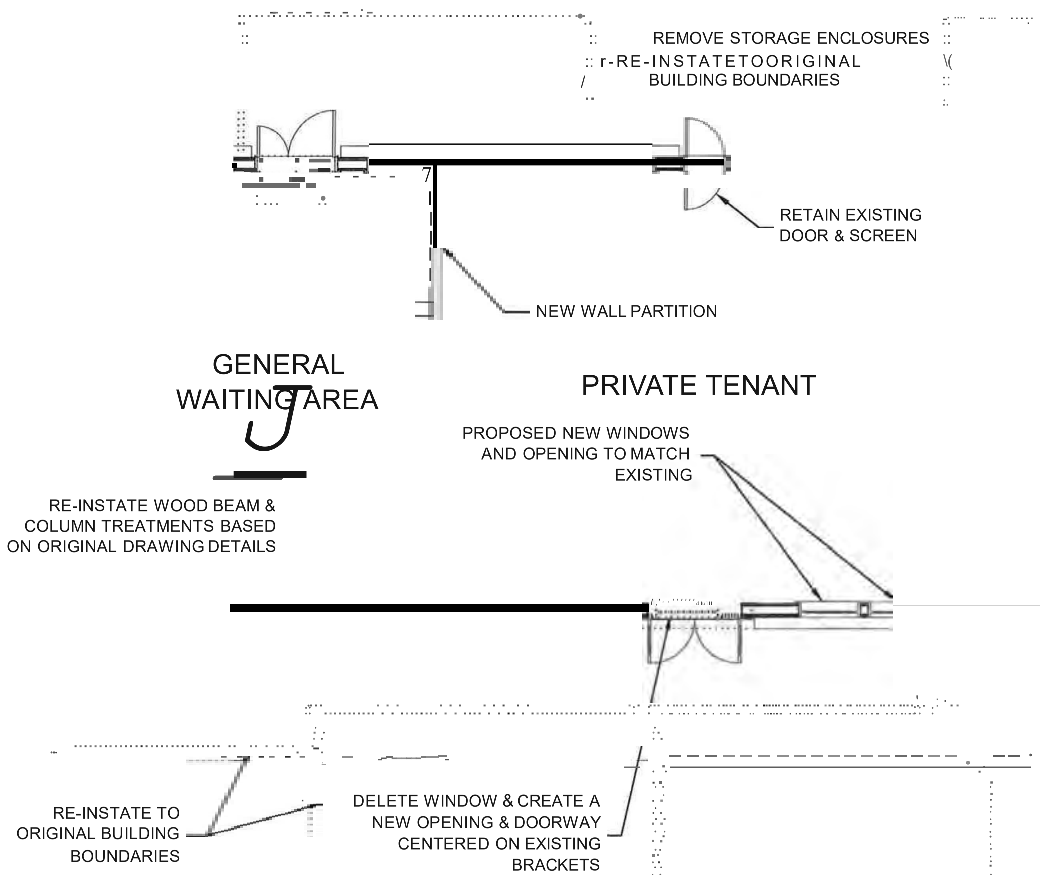


Scale: 1/8" = 1'-0"

Banff Train Station - Partial Building Plan - Central



KEY PLAN



Scale: 1/8" = 1'-0"

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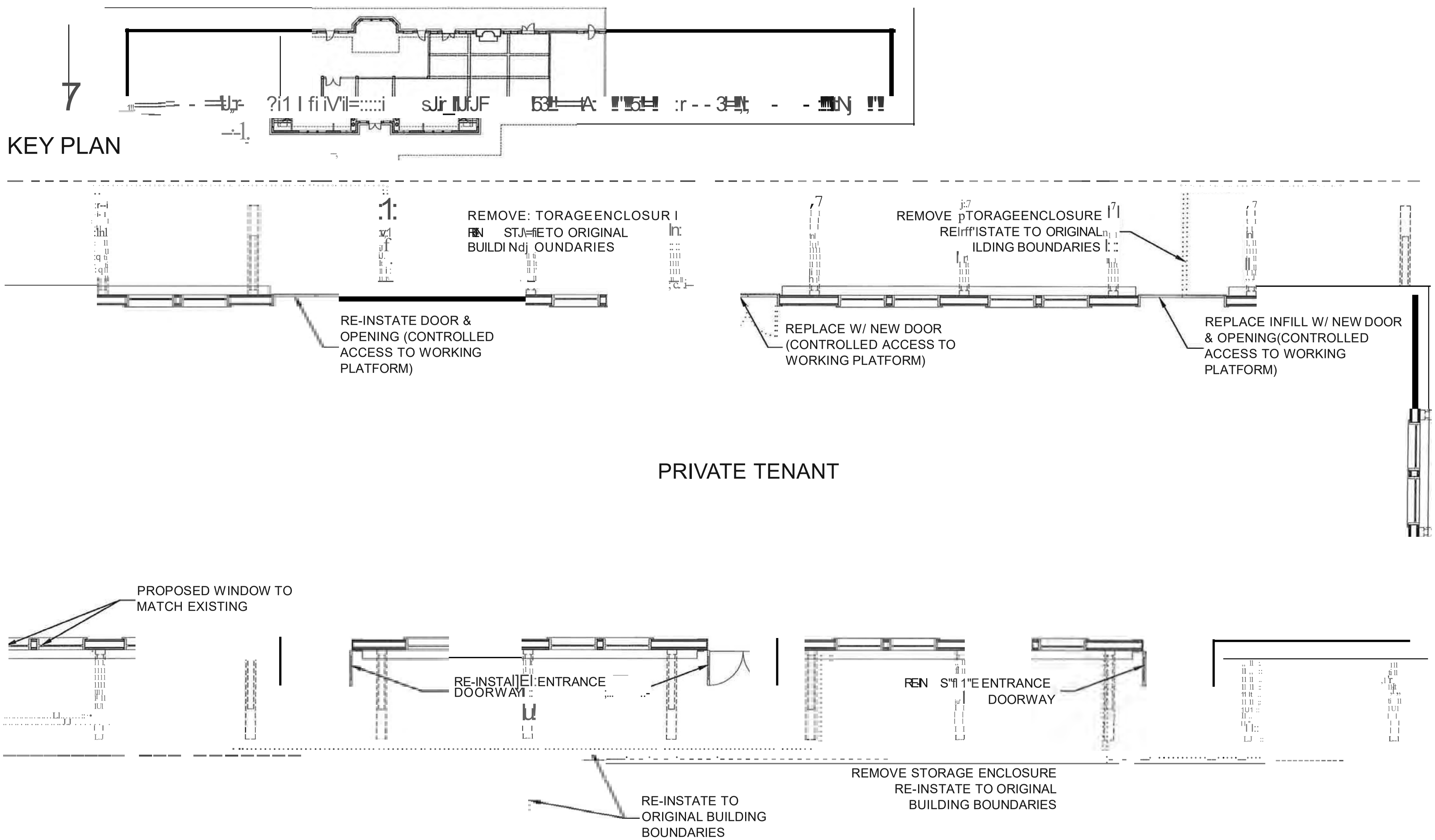
CANADIAN PACIFIC

Banff Train Station - Partial Building Plan - Central East



Scale: 1/8" = 1'-0"

CANADIAN
PACIFIC
RAILWAY

Banff Train Station - Partial Building Plan - East

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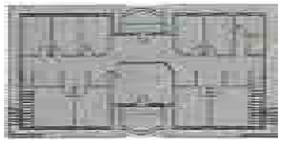

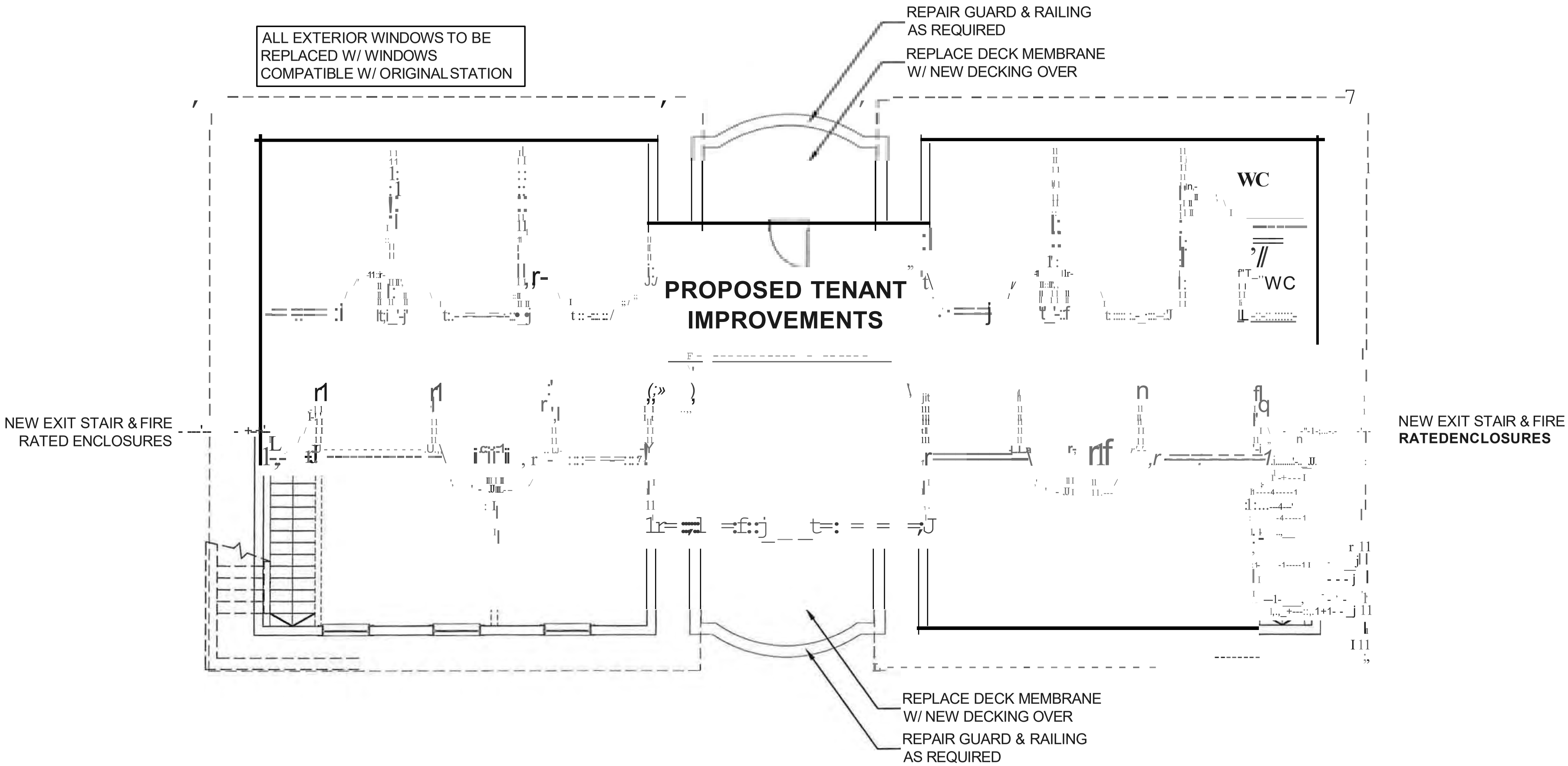

Scale: 1/8" = 1'-0"

CANADIAN
PACIFIC
RAILWAY

Banff Train Station - Proposed Second Floor Plan

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SOUTHEAST VIEW

SOUTHWEST VIEW

Note: The colours as printed here are indicative of the colours proposed. Please see paint chips of the colours as noted in Appendix 4.4 for true colours.

The LEBLOND PARTNERSHIP Architects & Planners

Banff Train Station - Proposed Building Perspectives

710

SOUTH MAIN ENTRANCE

Note: The colours as printed here are indicative of the colours proposed.
Please see paint chips of the colours as noted in Appendix 4.4 for true colours.

IMAGE NO.: 3-01

SOUTHWEST WALL AT EXIT STAIR

- Repair and re-point mortar.
- Window above to be infilled to satisfy exit separation. Stucco to match existing.

IMAGE NO.: 3-02

SOUTH VIEW OF ORIGINAL ENTRANCE AREA

- Remove bay window addition installed 1973-1977.
- Retain cutstone sills and fieldstone for re-use.
- Re- establish original entrance location.
- New stone base to match existing.

IMAGE NO.: 3-03

NORTH CENTRAL WALL EAST OF BAY

- Re-instate original openings.
- Retain cutstone sill.
- Remove previous stone infill.
- New stone base to match existing.

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Banff Train Station - Existing Stone Base Details

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IMAGE NO.:3-04

SOUTHWEST SILL CRACKED BUT APPEARS STABLE

IMAGE NO.: 3-05

NORTHWEST BUILDING CORNER

- Example of graffiti vandalism.

IMAGE NO.: 3-06

VIEW OF SOUTHWEST DOOR INFILL

- Concrete sill to be replaced with a new sandstone sill to match existing.
- Mortar to be re-pointed to match existing.

IMAGE NO.: 3-07

NORTH CENTRAL WALL EAST OF BAY

- Re-instate original openings.
- Retain cutstone sill for re-use.
- Remove previous stone infill.
- New stone base and cutstone sills to match existing.

IMAGE NO.: 3-08

SOUTHWEST BRACKET

IMAGE NO.: 3-09

LOOKING WEST ON THE SOUTH SIDE OF THE STATION

GENERAL NOTES:

- Paint to be removed and timbers properly prepared and re-finished.
- Missing brackets to be replicated using original drawings and on-site brackets.

IMAGE NO.: 3-10

INTERIOR OF EXISTING RESTAURANT CORRIDOR

IMAGE NO.: 3-11

LOOKING EAST AT BRACKETS AND BAY WINDOW ADDITION WITH SUPPORT COLUMNS BEYOND

IMAGE NO.: 3-12

LOOKING EAST ON NORTH TRACKSIDE

IMAGE NO.: 3-13

PAINT DETAIL

IMAGE NO.: 3-14

BRACKET AT SOUTHEAST CORNER

IMAGE NO.: 3-15

SOUTH ELEVATION AT CENTER BAY
(ORIGINAL ENTRANCE)

IMAGE NO.: 3-16

NORTHEAST GABLE

IMAGE NO.: 3-17

NORTHWEST GABLE

GENERAL NOTES:

-Replicate soffit brackets to match original drawings and existing brackets.

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Banff Train Station - Existing Upper Roof Timber Brackets

DRAFT

October 19, 2003

IMAGE NO.: 3-18

LOWER SOFFIT DETAIL AT SOUTH CENTRAL AREA

IMAGE NO.: 3-19

VIEW LOOKING WEST FROM SOUTHEAST CORNER OF THE STATION

IMAGE NO.: 3-20

SOFFIT AT EAST EXIT STAIR AND EXISTING RESTAURANT ADDITION

IMAGE NO.: 3-21

FASCIA CORNER DETAIL

IMAGE NO.: 3-22

SOFFIT AT NORTHEAST

IMAGE NO.: 3-23

SOUTHWEST CORNER OF EXISTING ROOF

- Missing fascia board.

GENERAL NOTES:

- Repair wood soffits. Replace boards with matching boards where deterioration is beyond repair.
- Fascia boards that are deteriorated (rotten), damaged, warped or are missing to be replaced to match existing.
- New gutter and rainwater system to be Installed.

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Banff Train Station - Existing Wood Soffit & Fascia Boards

37.125

IMAGE NO.: 3-24
SOUTHWEST GABLE

IMAGE NO.: 3-25
NORTHWEST GABLE

GENERAL NOTES:

- Repair existing stucco soffitas required to match existing.
- Remove exterior decorative lights and attachments.

IMAGE NO.: 3-26
NORTHEAST GABLE

IMAGE NO.: 3-27
SOUTHEAST GABLE

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Banff Train Station - Existing Upper Roof Soffit

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IMAGE NO.: 3-28

WEST SIDE OF NORTH BAYWINDOW

- Remove speaker.
- Remove kitchen exhaust fan.
- Repair stucco to match existing.
- Replace and install stucco to match existing when badly damaged or at new Infills.

IMAGE NO.: 3-29

NORTHEAST DOOR

- Remove conduit.
- Repair damage, match original finish.

IMAGE NO.: 3-30

NORTHEAST WINDOW

- Repair stucco to match existing.
- Rep lace and Install stucco to match existing when badly damaged or at new Infills.

IMAGE NO.: 3-31

SOUTHEAST EXIT

- Repair stucco to match existing.
- Replace and Install stucco to match existing when badly damaged or at new Infills.

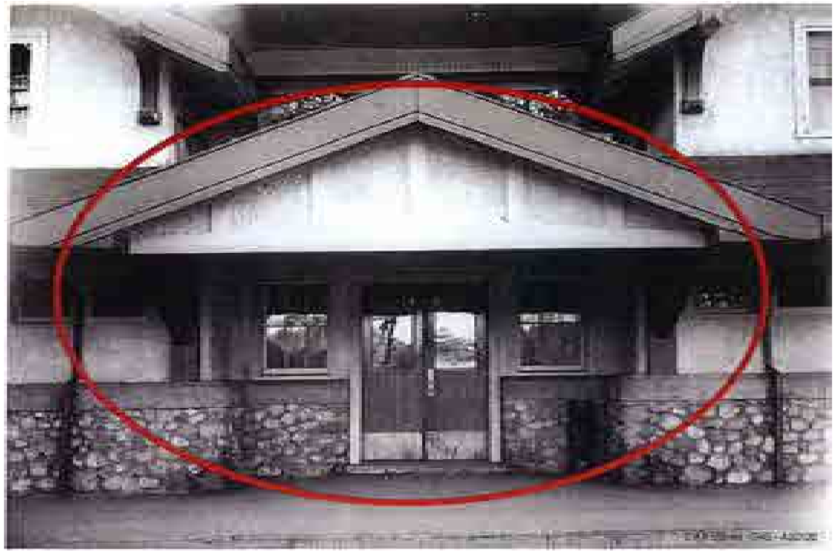
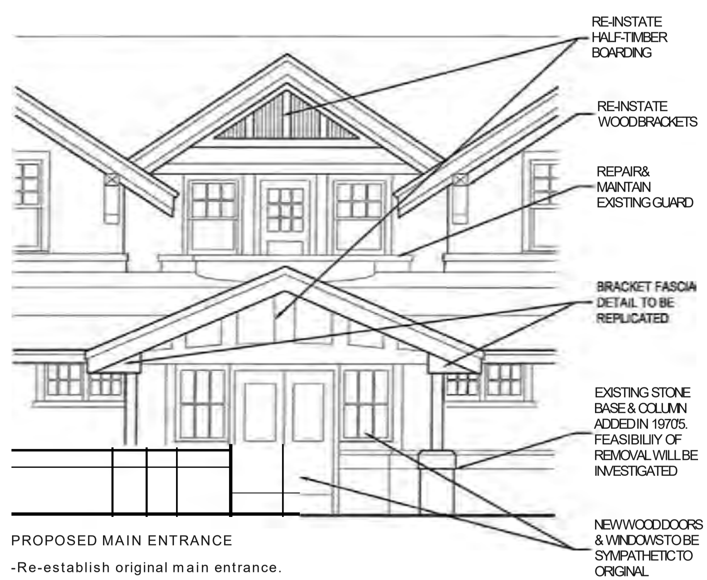


IMAGE NO.: 3-32

SOUTH CENTRAL- ORIGINAL MAIN ENTRANCE C.1945



PROPOSED MAIN ENTRANCE

-Re-establish original main entrance.

IMAGE NO.: 3-33

SOUTH CENTRAL - EXISTING BAY WINDOW

- Remove existing bay window and stonebase. Retain cut sandstone sills and fieldstones for re-use.
- Re-instate entrance with two side 6 pane windows.
- Re-instate original window to east & west of main entrance.
- Remove decorative fascia lighting.
- Install new brackets to upper eaves.
- Remove second floor planter boxes.

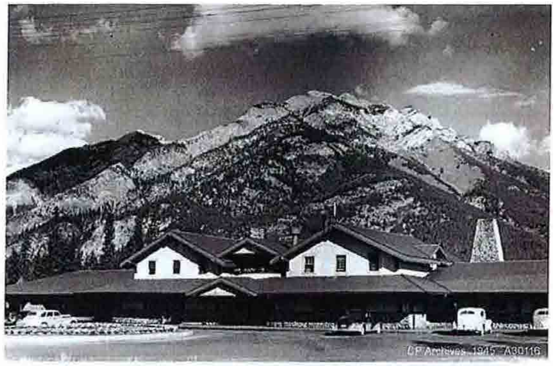


IMAGE NO.: 3-34

VIEW OF SOUTH ELEVATION SHOWING ORIGINAL UPPER WINDOW FORMS C.1945

IMAGE NO.: 3-35

VIEW OF SOUTHEAST UPPER GABLE

- Replace existing aluminum and vinyl windows with wood windows sympathetic to the original windows.

IMAGE NO.: 3-36

NORTH CENTRAL BAY LOWER WINDOWS WITH EXISTING STORM WINDOWS

- Windows to be maintained.

IMAGE NO.: 3-37

NORTH ELEVATION WINDOWS

- Aluminum/ vinyl windows to be removed, new wood windows matching original window configurations to be installed.

IMAGE NO.: 3-38

FORMER WINDOW LOCATION WEST OF **MAIN** ENTRANCE

- Infill to be removed, windows to be reinstated.

IMAGE NO.: 3-39

EXISTING WINDOWS ON NORTHEAST UPPER WINDOWS ORGANIZED HORIZONTALLY IN PAIRS

- Windows to be maintained.
- Door to be replaced with half-lite door.

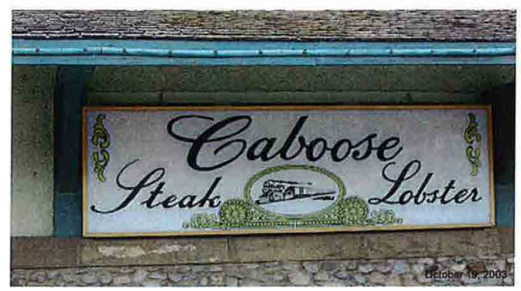


IMAGE NO.: 3-40

EXISTING RESTAURANT SIGNAGE

- Sign to be removed.
- Original windows (behind) to be reinstated.

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Banff Train Station - Existing Windows

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IMAGE NO.: 3-41

MAIN ENTRANCE
ROCKY MOUNTAINEER
RAILTOURS

IMAGE NO.: 3-42

NORTHWEST DOORS

IMAGE NO.: 3-43

SOUTHEAST STAIR EXIT DOOR

-Screen door to be removed.

IMAGE NO.: 3-44

SOUTHWEST EXIT DOOR

- Existing window to the left to be infilled (code requirement).

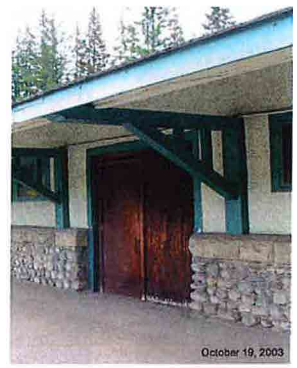

IMAGE NO.: 3-45

INFILL DOOR NORTHEAST

- Door to be removed, new door with half- lite to be installed.

IMAGE NO.: 3-46

PARTIAL ORIGINAL NO. 9 DOOR

IMAGE NO.: 3-47

ORIGINAL HALF-LITE PANEL DOOR (SCREEN NOT ORIGINAL)

- Screen door to be removed. Panel door to be preserved.

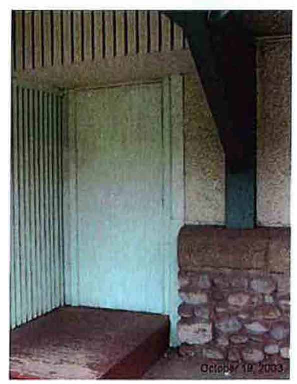

IMAGE NO.: 3-48

INFILL DOOR NORTHEAST

- Door, wood screen to be removed, new door with half- lite to be Installed.

IMAGE NO.: 3-49

ORIGINAL SCREEN DOOR

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RAILWAY

Banff Train Station - Existing Doors

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IMAGE NO.: 3-50

SOUTH CENTRAL GABLE

IMAGE NO.: 3-51

NORTHWEST GABLE

IMAGE NO.: 3-52

NORTHEAST GABLE

IMAGE NO.: 3-53

VIEW OF SOUTH CENTRAL
ELEVATION FROM THE SOUTHWEST

IMAGE NO.: 3-54

NORTH CENTRAL GABLE

GENERAL NOTES:

- Retain three main cross gables and roof forms. The original two large gables and the 1940 central gable.
- Remove existing decorative lighting.
- Re-instate the half-timber detailing to both the south gable and the entrance gables.
- Repair and reinforce the lower roof at any areas that may be sagging.

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Banff Train Station - Existing Roof Forms

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IMAGE NO.: 3-55

SOUTHWEST ELEVATION SHOWING SOUTH DECK

IMAGE NO.: 3-56

SOUTH DECK

IMAGE NO.: 3-57

NORTHWEST ELEVATION WITH NORTH DECK

IMAGE NO.: 3-58

NORTH DECK DETAIL

GENERAL NOTES:

- Replace deck membrane.
- Repair existing guard as required.

CANADIAN PACIFIC RAILWAY

Banff Train Station - Existing Upper Floor Exterior Guard

3.7.12.12

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IMAGE NO.: 3-59

EXISTING ROCK GARDEN VIEWED FROM NORTH SIDE OF TRACKS WITH DOUBLE ROW OF SPRUCE BEHIND

IMAGE NO.: 3-60

EXISTING DOUBLE ROW OF SPRUCE - EAST OF STATION

IMAGE NO.: 3-61

EXISTING ROCK GARDEN WITH STONE STAIRS- WEST

IMAGE NO.: 3-62

THEWILLOWS VIEWED LOOKING WEST FROM SOUTH OF RAILWAY STREET

IMAGE NO.: 3-63

EXISTING ROCK GARDEN WITH CARAGANA AND JUNIPERS

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Banff Train Station - Existing Landscape

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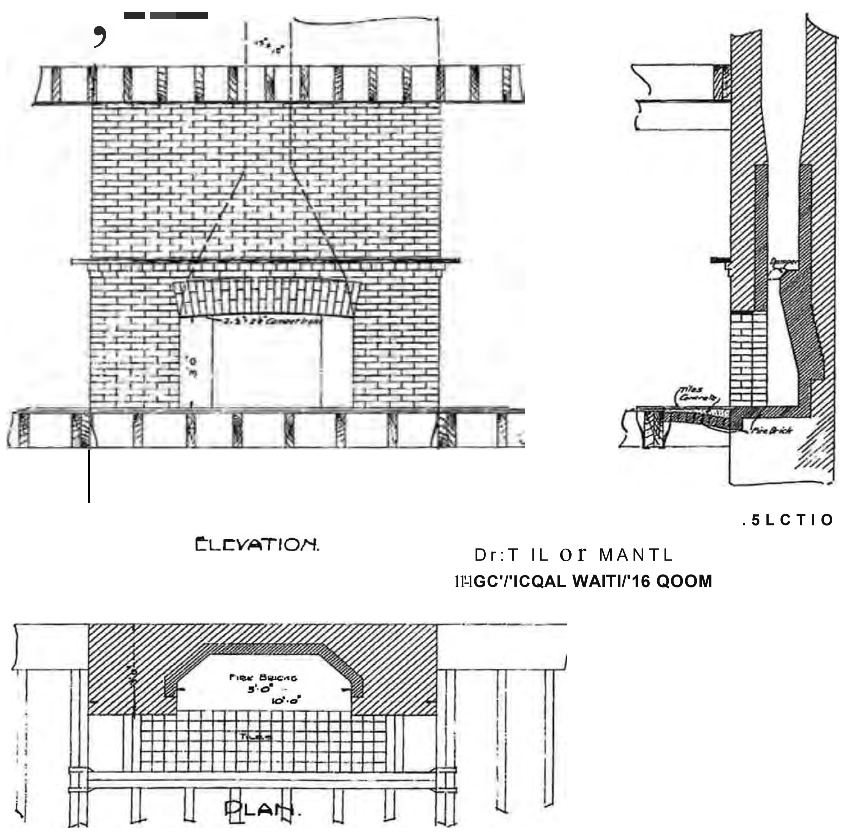
Asst Chief Engineer



CP ARCHIVES 3438-10

IMAGE NO.: 3-64

- Reta in existing fireplace and repair and re-point if required.
- Wood boarding to be retained for revised woodwork.

IMAGE NO.: 3-65

- Remove existing schedule board and retain for re-use in historic interpretation display.
- Restore stonework as required.

Banff Train Station - Existing Fireplace

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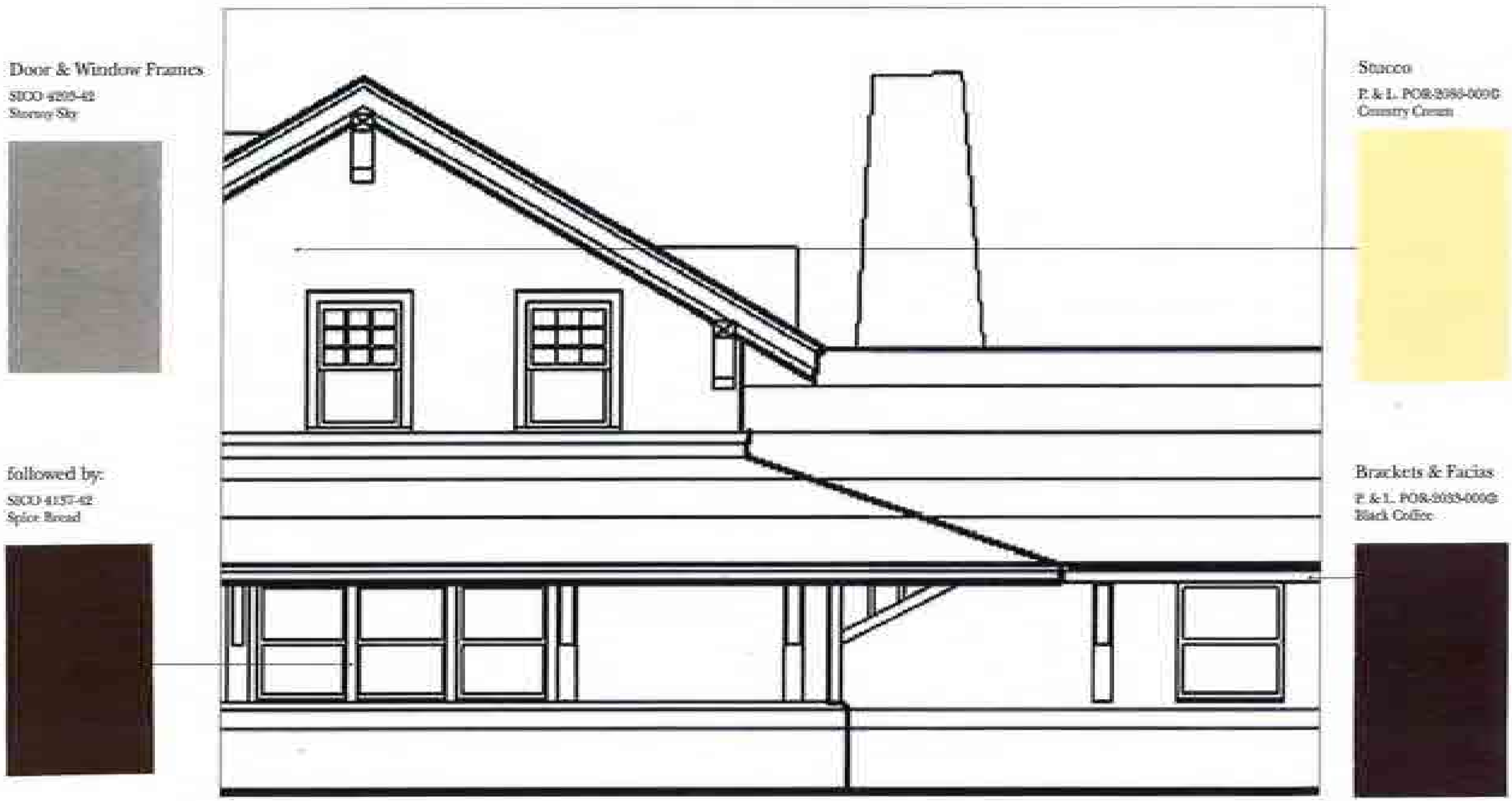
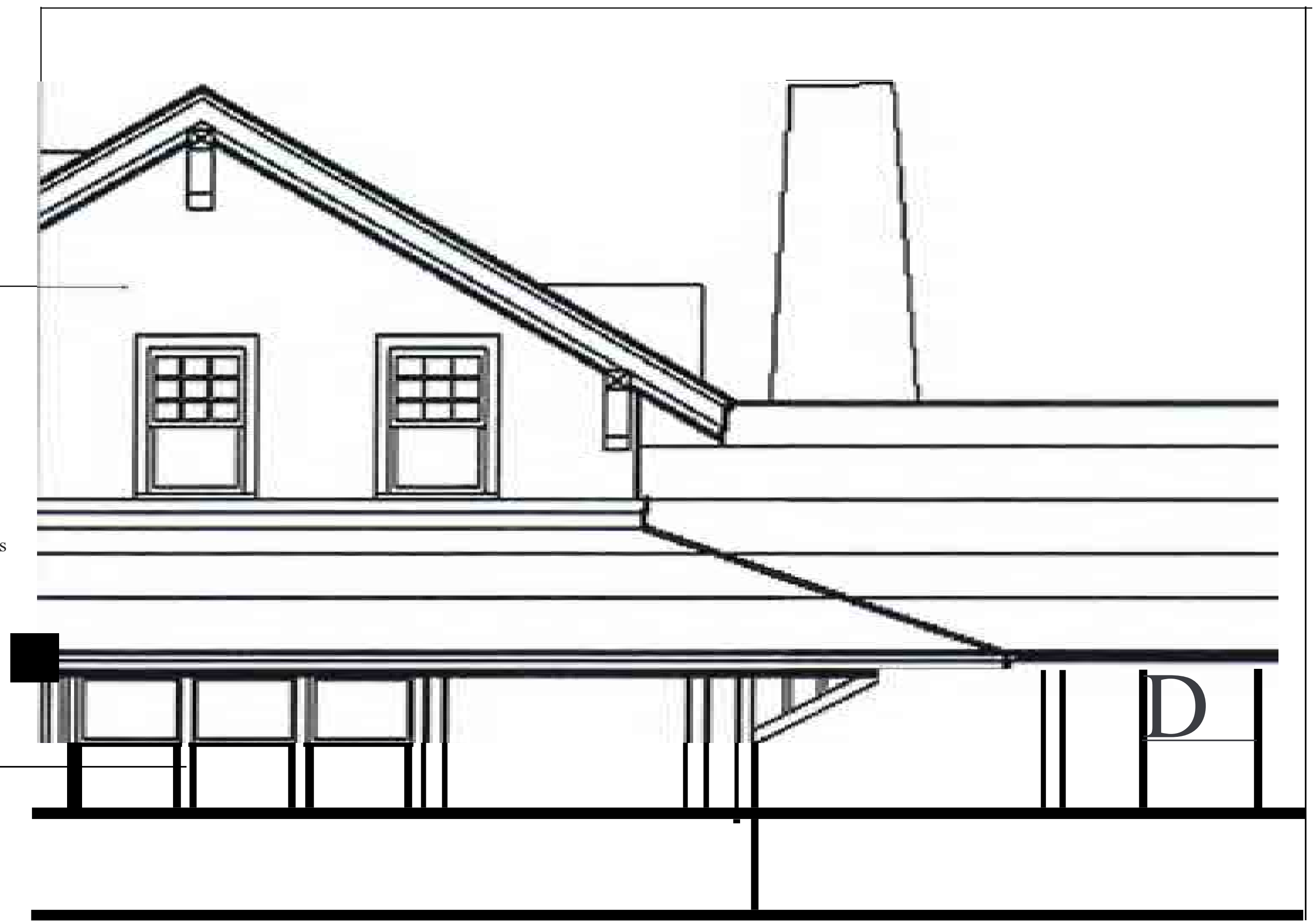
Station Colours – Pre 1977



APPENDIX 4.4

Station Colours - 2004

Stucco
P. & L. POR-2209-000©
Haze Green



Door & Window Frames
SICO 4174-53
Anchor

Brackets and Facias
SICO 4174-53
Anchor

APPENDIX 4.4

APPENDIX J:
Illustrative Concept Site Plan

APPENDIX E

BANFF RAILWAY LANDS ARP

ILLUSTRATIVE CONCEPT SITE PLAN