CITY OF KELOWNA

RAILS WITH TRAILS

FEASIBILITY STUDY

Engineering and
Planning Consultants

CITY OF KELOWNA

RAILS WITH TRAILS FEASIBILITY STUDY

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EXECUTIVE SUMMARY

An active railway currently runs from downtown Kelowna to the northern city limit. The City's Official Community Plan identified the rail right-of-way corridor as a potential cycling and pedestrian route, to be built if and when the railway ceased operation. In many other locations in North America trails have been successfully provided adjacent to active rail lines. For this reason, the City would like to examine the possibility of developing a cycling and pedestrian trail with the rail line in operation.

The purpose of this study is to assess the feasibility of creating a trail along the operating railway, between downtown Kelowna and the north city limit. The goal in providing the trail is to attract commuter cycling trips, although pedestrians are expected to use the trail as well.

The study examines whether the trail could physically be accommodated within the rail right-of-way, identifies constraints or issues that will need to be addressed, and provides a basis for an action plan.

The single-track railway, which connects to the national rail system, is owned by Canadian National Railways and is now operated by Kelowna Pacific Railway. The corridor is approximately 22 kilometres long and approximately 20 metres wide.

The location of the railway corridor is shown in FIGURE ES-1, along with the location of the eight study sections.

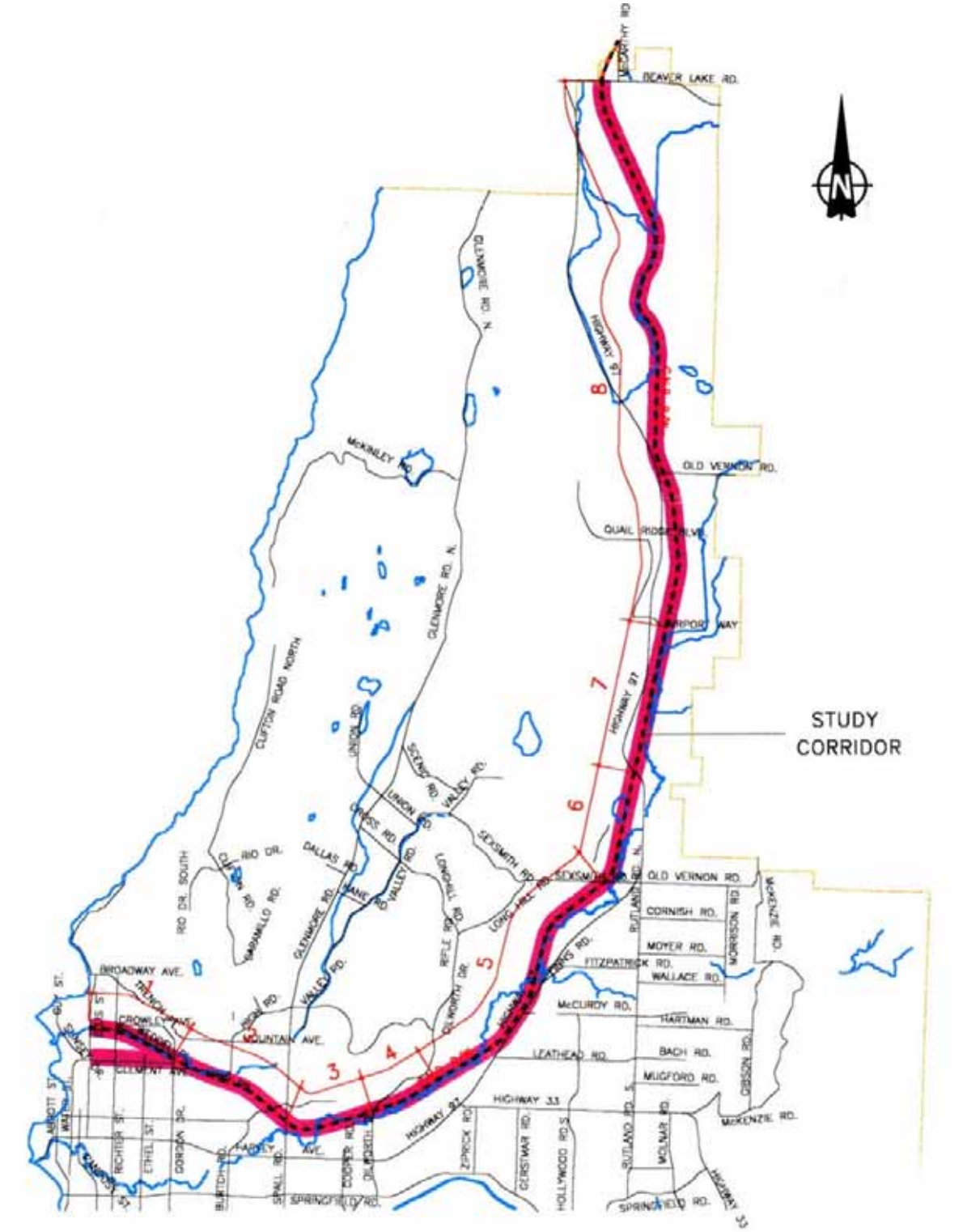

FIGURE ES-1 RAIL CORRIDOR, SHOWING STUDY SECTIONS

Background Information

Background material was reviewed as part of this feasibility study, including the City of Kelowna's planning documents and map, as well as current literature related to the relatively new practice of providing trails along rail corridors. Consultation was conducted with several stakeholders, including the provincial and federal Environment ministries, the Ministry of Transportation, the Kelowna Pacific Railway and Canadian National. The main points found were summarized to provide direction for the development of a trail concept.

- The route should provide a direct connection between City neighbourhoods and the College and connect with other bike routes.
- Although this assessment focuses on a trail within the rail right-of-way, alternate routes could be provided in the future by the proposed Mill Creek trail, the North End Connector, or existing bicycle routes or sidewalks.
- Special consideration must be taken of the environmental conditions around Mill Creek, Brandt Creek, Duck Lake, and other wet areas.
- The Ministry of Transportation may support the trail as an alternative to making Highway 97 accessible to bicycles near the Ellison Overpass.
- A physical barrier and adequate clearance are required by Kelowna Pacific Railway, the railway operator.
- The railway operator (KPR) is receptive to the trail proposal, but discussions should include the property owner, Canadian National.
- Most of the indirect stakeholders were supportive of the proposed trail.
- Impacts to and from agricultural (especially livestock) operations should be mitigated, likely through fencing. Some other property owners may request fencing.

- Rail-with-trail routes are typically safer for cyclists than alternate routes that involve cycling on or near roads.
- Adequate insurance should be in place and the railway operator may request indemnification by the trail operator.
- The standards and guidelines of the Transportation Association of Canada should be used. A 3.0 metre-wide paved trail is recommended to accommodate cyclists and pedestrians.

Trail Concept Plan

A forecast was prepared of the number of bicycle and pedestrian users expected to use the trail on its opening. The results are shown in FIGURE ES-2.

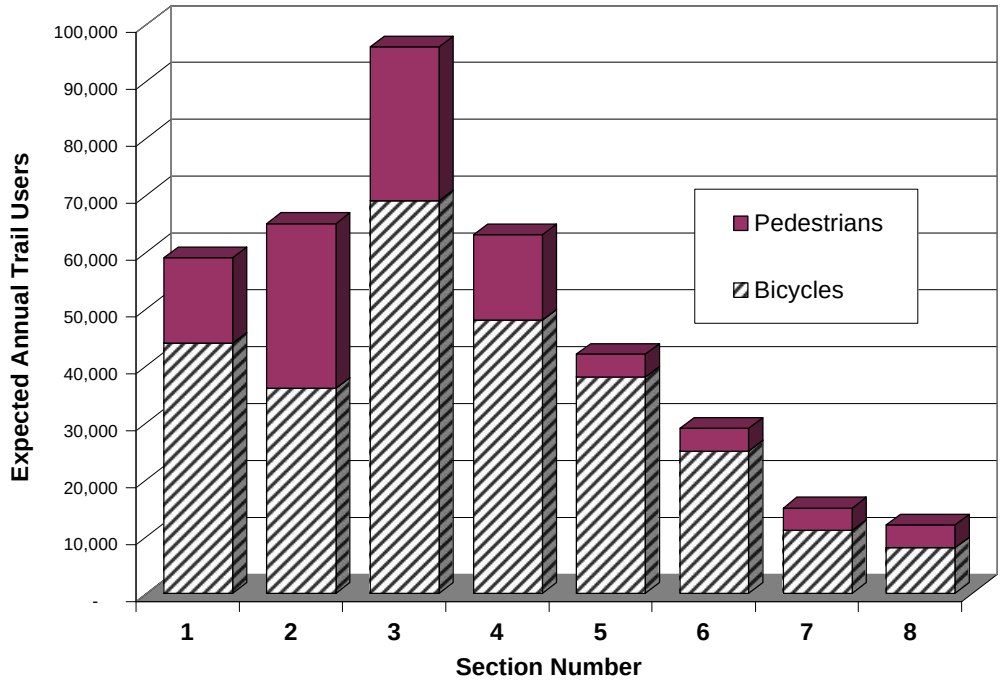

FIGURE ES-2 EXPECTED TRAIL USE

An analysis was conducted of the potential risk related to trail use. As a result, several features were incorporated into the trail concept plan:

- A fence between the railway property and the trail;
- Minimum lateral clearance from the centreline of the track to the near edge of the fence of 2.5 metres, and a greater distance where feasible; and
- Minimum number of track crossings, but where required the crossings are to be at right angles to the track.

An analysis was conducted of each road crossing that would be required and a specific recommendation made as to the crossing treatment to be provided. Specific locations for trail connections were also identified.

On this basis a trail concept plan was developed, with typical cross-sections prepared. Construction costs were estimated for the purpose of assessing feasibility and are shown in TABLE ES-1.

The total estimated construction cost of the trail is $6.8 Million.

TABLE ES-1 SUMMARY OF CONSTRUCTION COST ESTIMATE

SECTION		CAPITAL COST	LENGTH (km)	COST/KM
1	Ellis to Gordon	$100,000	1.2	$80,000
2	Gordon to Spall	$460,000	1.8	$250,000
3	Spall to Dilworth	$630,000	1.3	$480,000
4	Dilworth to Highway 33	$440,000	0.9	$490,000
5	Highway 33 to Sexsmith	$1,240,000	3.9	$320,000
6	Sexsmith to Ellison OP*	$500,000	2.4	$210,000
7	Ellison OP to Airport	$710,000	2.1	$340,000
8	Airport to Winfield	$2,690,000	8.7	$310,000
TOTAL*		$6,770,000	22.3	$300,000

* Includes the cost of construction of 0.8 km of trail to connect trail to Okanagan University College North Campus of $155,000 due to the importance of this link

Feasibility Assessment

To assess whether the rail-with-trail concept was feasible, five general feasibility criteria were developed based on the background research and consultation with the stakeholders:

- Safety – to minimize collision risk;
- Operations – to avoid disruption and delay to trains and trail users;
- Environment – to minimize impact;
- Legal – to achieve agreement among parties; and
- Implementation – to reduce cost and time to completion.

The review found construction of a trail within the rail corridor generally feasible. Most of the goals related to the above criteria for the trail can be achieved with a relatively low effort. A higher level of effort is expected to provide crossings at the roads and the spur lines and to protect Mill Creek. Based on this assessment, a reasonably safe and efficient trail could be built.

To implement the proposed trail, a recommended early step is to undertake negotiations with Kelowna Pacific Railway and Canadian National Railway. Features that can be discussed and/or confirmed include:

- The proposed conceptual plan, including the lateral setback required between the track and the trail and the need for fencing between the track and the trail;
- The form that a legal agreement might take, including liability and insurance conditions; and
- Any other conditions or financial considerations that might be involved.

It is recommended that the major points requiring agreement be summarized in a Memorandum of Understanding (MOU). The Memorandum would then be reviewed by the legal representatives of the City, the KPR, and CN. An example of an existing lease or license agreement for a rail-with-trail in British Columbia should be reviewed simultaneously.

Ongoing consultation is also recommended with the other stakeholders identified, including the government agencies and property owners.

Sections of the proposed trail could be built as funds become available. It is therefore necessary to evaluate which of the trail sections should receive the first priority on the basis of several factors:

- Cost of implementation;
- Expected use of the section;
- Availability of alternate routes; and
- Other factors (such as potential funding sources).

As a result, the Gordon Drive to Spall Road section was ranked first, followed by the Spall Road to Dilworth Drive section. The latter had the second-place ranking as its constructions costs were higher and because Enterprise Way could be considered a viable alternative. The Sexsmith Road to Ellison Overpass section was ranked third, although it could be considered a higher priority if funds are available immediately.

Finally, to implement the rail-with-trail, it is recommended that the following steps be completed:

- A review of the proposed rail-with-trail, the North East Connector, and the Mill Creek path for each segment to determine whether one, two, or three of these alternate routes are required and when;
- An environmental review, as a best practice, recommended based on American experience; and
- Design of the first phase of the trail.

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1.0 INTRODUCTION

1.1 Background

An active railway currently runs from downtown Kelowna to the northern city limit. The single-track railway, which connects to the national rail system, is owned by Canadian National Railways and is now operated by Kelowna Pacific Railway.

The City's Official Community Plan identified the rail right-of-way corridor as a potential cycling and pedestrian route, to be built if and when the railway ceased operation. In many other locations in North America trails have been successfully provided adjacent to active rail lines. For this reason, the City would like to examine the possibility of developing a cycling and pedestrian trail with the rail line in operation.

1.2 Study Purpose

The purpose of this study is to assess the feasibility of creating a trail along the operating railway, between downtown Kelowna and the north city limit. The goal in providing the trail is to attract commuter cycling trips, although pedestrians are expected to use the trail as well. The study examines whether the trail could physically be accommodated within the rail right-of-way, identifies constraints or issues that will need to be addressed, and provides a basis for further study.

1.3 Corridor Description

The existing rail corridor is shown in FIGURE 1.1. The corridor is approximately 22 kilometres long and approximately 20 metres wide. For approximately half of its length, the rail corridor parallels the alignment of Highway 97. Two creeks run near and parallel to parts of the corridor: Brandt Creek and Mill Creek.

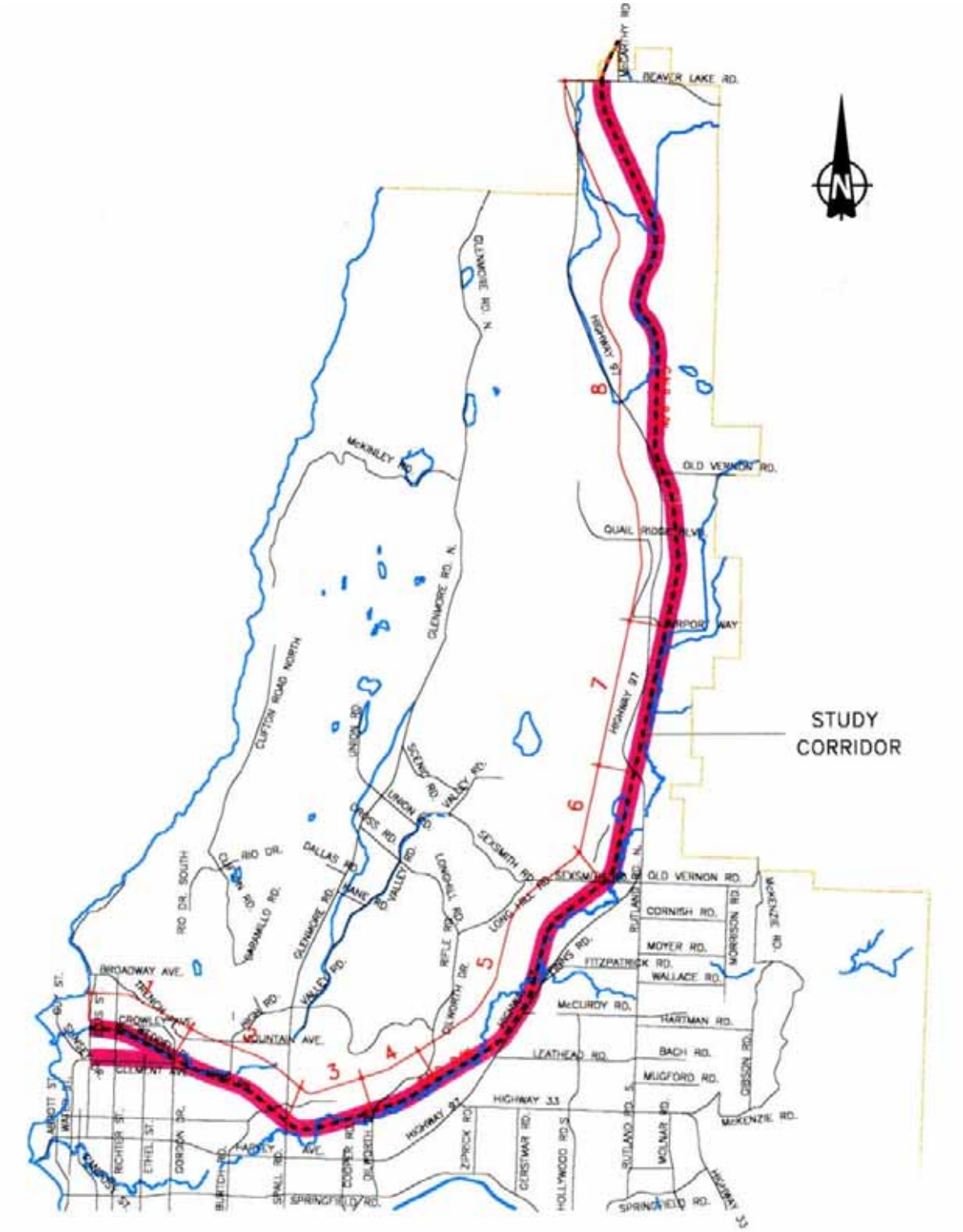

FIGURE 1.1 CORRIDOR LOCATION MAP

For the purpose of this study, the corridor was divided into eight sections. The sections were established to provide a consistent method of describing the conditions along the trail. From west to north, the section definitions are shown in TABLE 1.1, along with the general alignment and a brief description of each section. Photographs of the existing rail corridor are provided in FIGURES 1.2 and 1.3.

TABLE 1.1 SUMMARY OF CORRIDOR BY SECTION

SECTION OF TRAIL		LENGTH (km)	ALIGN -MENT	CORRIDOR CHARACTERISTICS
1	Ellis Street to Gordon Drive	1.2	E-W	Two alignments of rail corridor: northern has active rail, single bend in line; southern has rail removed and land sold, generally straight.
2	Gordon Drive to Spall Road	1.8	E-W	Minor horizontal curves.
3	Spall Road to Dilworth Drive	1.3	SW-NE	Major horizontal curve.
4	Dilworth Drive to Highway 33	0.9	SW-NE	Generally straight.
5	Highway 33 to Sexsmith Road	3.9	SW-NE	Multiple horizontal curves
6	Sexsmith Road to Ellison Overpass	1.6	S-N	Generally straight.
7	Ellison Overpass to Airport Way	2.1	S-N	Generally straight.
8	Airport Way to Winfield	8.7	S-N	Multiple horizontal curves.
TOTAL		21.4		

FIGURE 1.2 NEAR HIGH ROAD, FACING SOUTHEAST

FIGURE 1.3 NEAR McCURDY ROAD, FACING SOUTHWEST

1.4 Proposed Trail

The role of the proposed rail-with-trail facility, which is based on the City's transportation goals and was confirmed during the process of this study, is listed below.

- The primary purpose of the trail is to serve as a commuter route for cyclists. As such, the trail will be built to support relatively high travel speeds for bicycles, subject to safety and environmental considerations.
- Other uses will be permitted on the trail, but specific provision will not be made for their accommodation. They include walking, in-line skating, recreational cycling, wheelchairs, scooters, and baby strollers.
- Some uses would be specifically restricted including equestrian use and motorized vehicles, with the exception of authorized maintenance vehicles.

1.5 Study Organization

This study was funded by the Provincial Greening Communities Initiative. The feasibility study was conducted in four phases as follows:

- Phase 1 Project Start-Up and Communications Plan;
- Phase 2 Operations and Design;
- Phase 3 Consultation and Revision; and
- Phase 4 Final Documentation.

This report summarizes the background information, operations and design issues, trail options, and provides preliminary cost estimates. An assessment is made of the feasibility of providing the proposed rail-with-trail facility and some alternative route alignments are presented and discussed.

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2.0 BACKGROUND INFORMATION

This section summarizes the background material reviewed as part of this feasibility study. The material includes City of Kelowna's planning documents and map, as well as current literature related to the relatively new practice of providing trails along rail corridors.

As part of this feasibility study, consultation was conducted with several stakeholders. The results of that consultation are summarized in this section and additional background information is provided in APPENDIX A.

2.1 City Planning Documents

Relevant documents from the City of Kelowna that were reviewed as background material included:

- Official Community Plan;
- Transportation Plan;
- Mill Creek Linear Park Master Plan (draft);
- Sidewalk Master Plan;
- Consolidated Zoning Bylaw No. 8000;
- Subdivision, Development and Servicing Manual;
- Utility Location Maps; and
- Crime Prevention through Environmental Design, 1999.

As stated in the documents, the City of Kelowna wishes to increase the proportion of commuter trips made by walking and/or cycling. A trail along the railway corridor was proposed by the City to promote cycling. The trail would connect City neighbourhoods and the Okanagan University College North Campus and would provide an alternate bicycle route to Highway 97.

Two options for providing parallel or alternative routes were identified in the background documents: a gravel path along Mill Creek that would parallel approximately half of the rail corridor, and a new road called the North End Connector that would generally parallel the corridor for its western half. The Mill Creek path would be expected to cater to pedestrians and recreational cyclists, while the North End Connector may provide a road route for cyclists. All three routes would need special consideration of their environmental impact on both Brandt Creek and Mill Creek.

The City's records of the location of utilities within the corridor were compiled. The crossing locations of the known utilities are shown in FIGURE 2.1. At this time, information about utility locations has not been provided by the railways and will need to be verified during any detailed design of the trail.

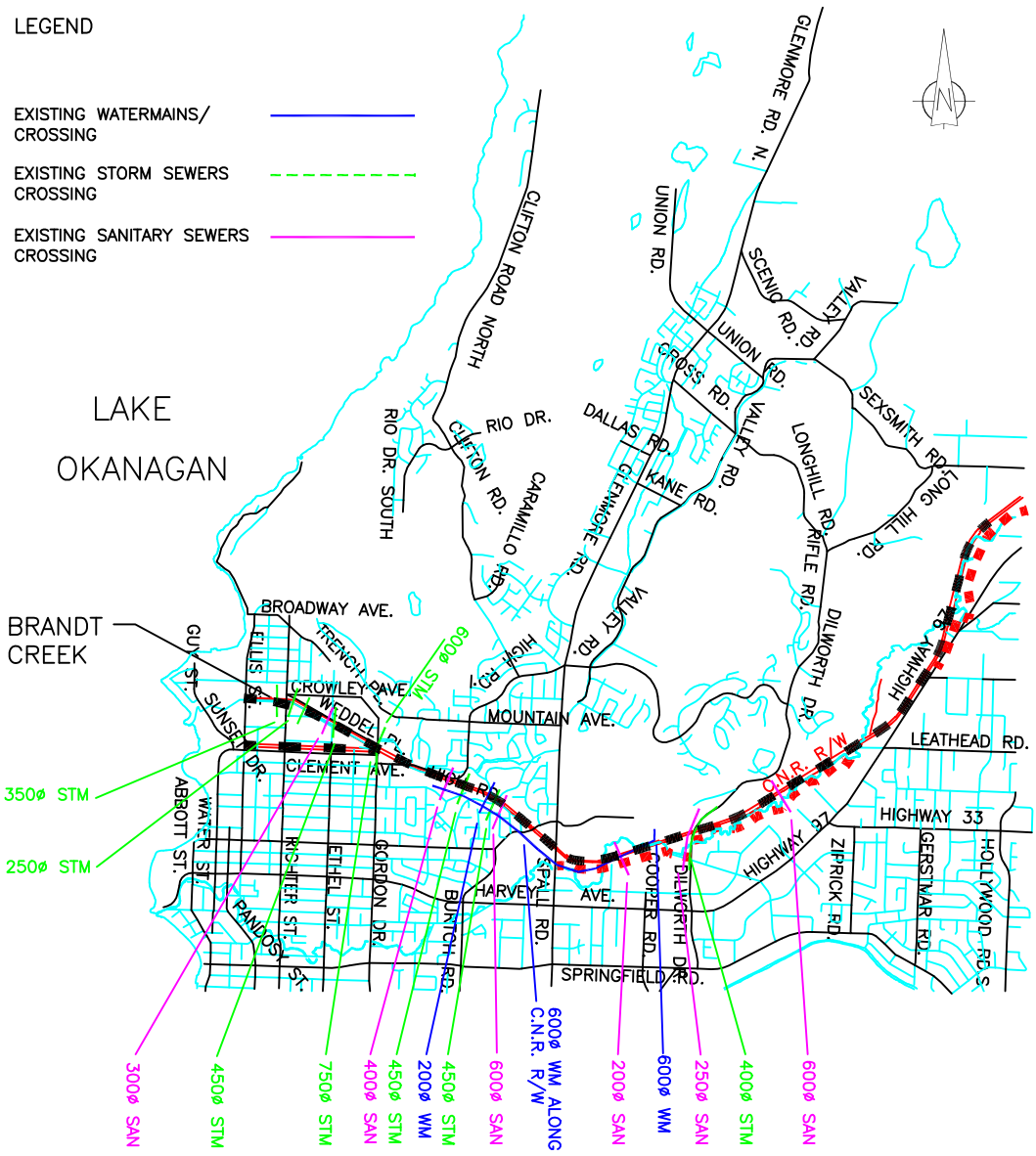
Finally, the documents indicate that the design guidelines of the Transportation Association of Canada (TAC) would be used for the trail.

2.2 Stakeholder Consultation

Three groups of stakeholders were considered to have a major interest in the proposed trail within the rail right-of-way:

- Environment Ministries;
- Ministry of Transportation; and
- Kelowna Pacific Railway and Canadian National Railway.

The comments received from these organizations to date are summarized here. The details of all these preliminary discussions with each agency are provided in APPENDIX A.



Note: Information provided by the City indicates that no rail corridor utilities are located outside the area shown.

FIGURE 2.1 UTILITY LOCATIONS

(City of Kelowna Information Only)

Environmental issues were discussed with: Fisheries and Oceans, Canada; the Ministry of Sustainable Resource Management; and the Ministry of Water, Land and Air Protection. The primary environmental concern identified is to ensure that the fish habitat of Mill Creek remains undisturbed with the construction of a trail. An impervious trail surface, produced for example through asphalt paving, is not desirable within 15 metres of the creek.

Consideration of the proposed trail's environmental impact would also be required near Brandt Creek. Although Brandt Creek does not carry major fish species, it must still remain open and undisturbed. Similarly, care should be taken not to disturb the environment where the trail passes east of Duck Lake.

The major issue raised by the Ministry of Transportation relates to the Ellison Overpass, where Highway 97 passes over the rail tracks. As shoulders are not provided on the highway bridge structure, the Ministry is interested in providing an alternate north-south route for cyclists.

Discussions with the railway operator provided information about the current operation of the railroad. The Kelowna Pacific Railway (KPR) has a lease with the Canadian National Railway (CNR) that would expire in 2019. It moves wood products, metal, salt and other products to several industrial customers along the line. Trains move at a speed of 40 kilometres per hour or less, although if the line is upgraded, speeds could approach 65 kilometres per hour. It is estimated that the frequency of trains on the rail line is less than one per hour.

KPR representatives have stated a clear preference for a physical barrier to be provided between a trail and the railway tracks. The fence should be a minimum of 3.0 metres from the centre of the tracks. In addition, the railway operator would like to ensure the trail is designed to prevent unauthorized vehicle access and provide emergency access, while ensuring adequate sight distance if track crossings are required.

The KPR appeared to be receptive to the trail proposal, provided certain design and operating conditions are met to discourage trespassing, improve safety, and minimize railway liability. The trail could be permitted through a lease or license agreement with the City.

Canadian National is the owner of the railroad property and would therefore have an involvement in any long term land agreement made with the City. CN will be most concerned about maintaining the safe operations of the railway, especially as it relates to maintaining adequate setbacks between the trail and the active tracks.

The role of Transport Canada is to inspect the railway for safety. Although implementation of the trail would not need prior approval from Transport Canada, they have the authority to remove anything found unsafe. Advising Transport Canada early of the proposed trail is therefore recommended.

Any new track crossings will require an agreement between the City of Kelowna and the railway. A 60-day notice to all adjacent property owners may also be required for new crossings. The Canadian Transportation Agency would only become involved if there were to be a dispute.

2.3 Consultation with Indirect Stakeholders

As part of the consultation for this study, letters were sent both in July and November of 2001 to stakeholders considered to have an interest in the trail:

- Adjacent property owners;
- School District;
- Land Reserve Commission;
- Central Okanagan Access Awareness Team;
- Okanagan University North Campus;
- Kelowna and Area Cycling Coalition;
- R.C.M.P.; and
- South Glenmore, KSCAN, North End and Rutland Residents Associations.

Comments were received and compiled by City staff. Many had concerns about safety between bicycles and pedestrians on the trail and at the road crossings, but most respondents were in favour of the trail.

Some stakeholders expressed specific concerns. The Land Reserve Commission preferred not to have the trail adjacent to farmland, but suggested the impact of the trail could be mitigated with measures such as fencing. Other agricultural operators did not want a trail along their property and one suggested the Mill Creek path be built instead. A residents' association supported not locating the trail near the feedlot adjacent to McCurdy Road for the reason that the view and smell might be offensive.

Some businesses were concerned about the security of their operation, as the trail would bring the public in closer contact with their operation. Some owners suggested a fence be built along the common boundary. Finally, one landowner objected on the basis that pedestrians and bicycles might affect access for trucks on Recreation Avenue and Richter Street.

2.4 Consultation with the Public-at-Large

An open house was held in November of 2001 to present the findings of the feasibility study. Comments were solicited from the attendees. In addition, the material was displayed at Kelowna City Hall.

Most of those who commented supported the proposed trail, many enthusiastically. A number wanted to ensure that dogs would be permitted. Several people expressed particular support for the section near the Highway 97 Ellison Overpass as an alternate route to the Okanagan University College.

2.5 Other Documents Reviewed

Three American documents were reviewed to summarize the current best practices for implementing trails within active rail corridors. Guidelines for planning and designing trails, as recommended by the Transportation Association of Canada, were also reviewed.

Staff from the City of Kelowna also conducted interviews with the managers of several Canadian and American rails-with-trails. The points of interest from the best practices documents and the notes from the interviews with the American and Canadian agencies are summarized here, with details provided in APPENDIX A.

The relevant documents reviewed were:

- Rails with Trails, Rails-to-Trail Conservancy, 2000;
- Rails-Trails and Liability, Rails-to-Trail Conservancy, 2000;
- Rails-with-Trails: Lessons Learned Report, Phases 1 and 2, (Drafts, 2001), U.S. Department of Transportation;
- Geometric Design Guide for Canadian Roads, Transportation Association of Canada, 1999; and
- Examples of Rails with Trails, City of Kelowna staff, 2001.

The best practices documents found that a rail-with-trail route is typically safer than an alternate route, when the alternate would involve cycling on or next to roads. However, railways typically have safety and liability concerns related to cyclists and pedestrians near their tracks.

Methods to reduce risk and to alleviate the concerns of the railway include:

- Using accepted design and signing standards for the trail (clarify that trail users are to keep off the railway tracks, guide them when the trail must cross the tracks, and position or slow cyclists as required for road crossings);
- Providing physical separation if needed; and

- Ensuring adequate insurance is in place, typically funded by the trail operator.

The documents also recommend an environmental assessment be conducted with the feasibility study. In this case, a preliminary review of environmental issues is being conducted as part of this feasibility study, but a complete environmental assessment is not planned at this time. Such an assessment may need to be considered.

Applicable suggestions to improve safety through environmental design include having unobstructed sight lines and clearly delineating the division between private and public areas.

The TAC design guidelines indicate the type of trail that would be needed to encourage bicycle commuting. Generally it should have a smooth surface, follow a direct route, and separate pedestrians from cyclists. A minimum trail width of 3.0 metres is indicated for a two-way trail to be shared by bicycles and pedestrians. Guidance is also provided for road and track crossings.

Based on the review of other trail projects, rails-with-trails are generally supported by the public. Much of this is due to the perception that cycling on the trail is safer than cycling on city streets. Because of this, rails-with-trails tend to generate additional cycling trips.

2.6 Summary of Background Information

This section summarizes the issues derived from the review of background information. The key points to be incorporated in the assessment of feasibility of a rail-with-trail in Kelowna are listed here.

- The route should provide a direct connection for cyclists traveling between City neighbourhoods and the College and should connect with other bike routes.

- Although this assessment focuses on a trail within the rail right-of-way, alternate routes could be provided in the future by the proposed Mill Creek trail, the North End Connector, or existing bicycle routes or sidewalks.
- Special consideration must be taken of the environmental conditions around Mill Creek, Brandt Creek, Duck Lake, and other wet areas.
- The Ministry of Transportation may support the trail as an alternative to making Highway 97 accessible to bicycles near the Ellison Overpass.
- A physical barrier and adequate clearance are required by Kelowna Pacific Railway, the railway operator.
- The railway operator (KPR) appears to be receptive to the trail proposal, but any discussions would require the approval of the property owner, Canadian National Railway.
- Most of the indirect stakeholders and the public-at-large were supportive of the proposed trail.
- Impacts to and from agricultural (especially livestock) operations should be mitigated, likely through fencing. Some property owners may request fencing between along the common boundary.
- One landowner was opposed due to the possible affect to truck access caused by bicycles and pedestrians, should the route along Recreation Avenue be selected for the trail (located along the northern of the two possible alignments at the western end of the corridor).
- Rail-with-trail routes are typically safer for cyclists than alternate routes that involve cycling on or near roads.
- Adequate insurance should be in place and the railway operator may request some indemnification from the trail operator.

- The standards and guidelines of the Transportation Association of Canada should be used to design the trail, the crossings, and the signs. A 3.0 metre-wide paved trail is indicated to accommodate cyclists and pedestrians.

3.0 PROPOSED TRAIL CONCEPT

This section provides a description of the proposed rail-with-trail. This concept was developed from on the information described in Section 2, inspections of the site, and further analysis of the potential operation. A description is provided of the:

- Numbers of trail users forecast;
- Potential risk and measures required to mitigate it, both on the trail and at the road crossings; and
- The recommended connections to maximize the use of the trail by commuter cyclists and pedestrians.

A map of the proposed trail concept, as discussed in this Section, is provided as FIGURE 3.1, provided in a folder at the end of this document.

3.1 Forecast of Trail Use

In this section, a preliminary forecast is made of the bicycle and pedestrian traffic expected to use the trail. The methodology used to arrive at the estimates is expected to be adequate for this feasibility study. If more precise estimates are required in the future, additional data can be obtained.

The 1996 census revealed that 2 percent of commuters in the City of Kelowna traveled to work by bicycle, while pedestrians represented 5 percent. Local information about other travel modes that might use the trail such as joggers, skateboarders, and in-line skaters is unavailable at this time; however, these types of activities appear to be increasing.

Bicycle Traffic

The OCP suggested that there is a latent demand for cycling, and that this mode may increase if more facilities were provided. To develop a forecast of expected trail use, the results of a commuter cyclist survey in Calgary were reviewed. The survey, completed during the summer of 2000, showed that 5 to 7 percent of vehicles entering the downtown are cyclists, and that this is the fastest growing mode of transportation in that city.

It was found that cyclists often go out of their way to use a linear pathway. Calgary cyclists stated that riding along an arterial roadway is over four times as onerous as riding along a pathway in a park. The survey showed that 77 percent of all cyclists cycled seven months of the year and 29 percent cycled year round. Assuming the Calgary results can be applied to Kelowna, the survey indicates that an off-road cycling facility connecting to the downtown could attract commuting trips.

To forecast the expected bicycle demand, a review was conducted of the current intersection bicycle demand at 52 intersections near the rail corridor. It was assumed that most cyclists who now use routes parallel to the rail corridor would be diverted to a new trail because of the improved comfort, speed, and safety. Cyclists have already been observed using the railway as a cycle route, although this currently constitutes trespassing.

The resulting expected bicycle volumes near the rail corridor are summarized in TABLES 3.1 and 3.2.

TABLE 3.1 BICYCLE VOLUMES ON INTERSECTING ROADS

INTERSECTING ROADWAY	AVERAGE BICYCLE TRIPS PER DAY, TWO WAYS (Rounded)
Water Street at Sunset Drive	230
Ellis Street	140
St Paul Street	60
Richter Street	40
Ethel Street	40
Gordon Street	100
Spall Road	60
Dilworth Drive	70
Sexsmith Road	60

TABLE 3.2 BICYCLE VOLUMES ON MAJOR PARALLEL ROADS

ROADWAY CORRIDOR	AVERAGE BICYCLE TRIPS PER DAY, TWO WAYS (Rounded)
Clement Avenue	200 at Sunset Drive
	100 at Ellis
	70 at Gordon
Bernard Avenue	200 at Ellis
	150 at Gordon
	200 at Richmond
	90 at Spall
Enterprise Way	250 between Cooper and Dilworth
Springfield Road	250 at Dilworth
Highway 97*	20 north of Sexsmith
	50 south of Sexsmith

The trail would likely provide an attraction for latent demand. For example, some people will choose to make a bicycle trip instead of using their automobile for work or shopping trips. New trips will come from recreational users and tourists who will find the dedicated trail attractive.

The Okanagan University College (OUC), north campus, has been seeking ways to make the campus more accessible to students who wish to cycle. The trail along the railway would satisfy this need as most students would travel along this route. For these reasons, the proposed trail is expected to attract a relatively large proportion of student users.

Rutland residents north of Highway 33 would also likely find the trail attractive. Residents living in the adjacent residential areas will also likely be attracted to make new recreational and commuting trips.

Based on the results from other cities and elsewhere in Kelowna, and on the existing bicycle use near the proposed trail, a forecast was developed. The forecast volumes would be expected on opening day, assuming the trail opens within the next few years. As such forecasts involve uncertainty, a most-likely range is shown by the low and high volumes. However, the high forecast could be exceeded if the trail proves extremely popular. The results are shown in TABLE 3.3. The volumes shown represent all expected bicycle trips, not just commuter trips.

TABLE 3.3 FORECAST OF BICYCLE TRIPS

SECTION	EXPECTED BICYCLE TRIPS UPON TRAIL OPENING							
	DAILY							ANNUAL** Average
	Diverted		Latent Demand (New)		Total			
	Low	High	Low	High	Low	Average	High	
Ellis to Gordon	100	160	60	100	160	210	260	44,000
Gordon to Spall	80	120	60	80	140	170	200	36,000
Spall to Dilworth	180	250	80	150	260	330	400	69,000
Dilworth to Highway 33	120	180	70	90	190	230	270	48,000
Highway 33 to Sexsmith	60	100	80	120	140	180	220	38,000
Sexsmith to Ellison OP*	10	30	80	120	90	120	150	25,000
Ellison OP to Airport	10	20	30	40	40	50	60	11,000
Airport to Winfield	10	20	20	30	30	40	50	8,000

NOTES: ** Assumes a connector at the Ellison Overpass to the north campus of the Okanagan University College*
*** Assumes six months of 100% usage, two months at 50% and no traffic for four months.*
Yearly average traffic is calculated using the mid range of the daily estimates.
Section volumes cannot be added to obtain a total expected trail use.

On this basis, it is expected that the daily volumes of bicycles would range from 30 to 400 users, depending on the section of trail. The section between Spall Road and Dilworth Drive is expected to be the most-heavily used, with a forecast in the range of 260 to 400 users daily. Lower volumes are expected on the northern sections due to the lower density and the distances involved.

The forecasts indicate that up to 70,000 potential users may be expected in this busiest section of the trail annually. As population and employment increase in Kelowna over the next years, it is expected that the number of trail users would increase beyond the volumes forecast in TABLE 3.3.

Pedestrian Traffic

Although the primary users are expected to be cyclists, pedestrians, joggers, skateboarders, and in-line skaters may also use the trail. These other users need to be considered in the planning, design and operation of the linear trail. During the public consultation for this study, an interest was expressed in permitting leashed dogs on the trail, provided that suitable waste facilities were provided. However, leashed dogs may conflict with cyclists on the trail, particularly during times when bicycle volumes are high. Therefore, the City may wish to restrict access for dogs, particularly during times when commuter cycling volumes are high.

Surveys documented in the OCP found twice as many pedestrian trips as cycling trips, city-wide. However, it is not expected that this ratio will apply to the proposed trail as:

- Walking trips are sensitive to distance and are typically shorter than cycling and auto trips;
- The trail corridor passes through only a few neighbourhoods that would generate short commuter or shopping pedestrian trips; and

- The aesthetics of the trail will likely be mixed, ranging from some pleasant sections near Mill Creek to sections in the industrial areas that might be less attractive to pedestrians.

It is expected that most pedestrian use of the trail will be for recreation, rather than for commuting or shopping. The high recreational use of Kelowna's Mission Creek Greenway may provide an indication of the latent demand for recreational walking facilities (between 1,660 and 3,000 persons daily in the year 2000), although the Greenway is not a facility that is physically similar to the proposed trail in that it is unpaved and does not directly connect major destinations.

There is evidence of current pedestrian use of the corridor as shown by the existing footpaths along the rail line between High Road and Spall Road. School age children and adults were observed walking along the tracks in this area, an activity that now constitutes trespassing.

Pedestrian demand estimates were developed with these considerations in mind, as well as the intersection pedestrian counts provided by the City. Adjustments were made based on nearby pedestrian traffic generators such as schools, retail shopping, and recreation areas. It was assumed that most recreational walkers would use the trail during off peak hours when traffic volumes are lower, for example evenings and weekends, and not conflict directly with commuting cyclists.

The forecast of pedestrian demand expected if the trail were to open in the next few years is shown in TABLE 3.4. Pedestrian trips include joggers, skateboarders, and in-line skaters.

TABLE 3.4 FORECAST OF PEDESTRIAN TRIPS

SECTION	EXPECTED PEDESTRIAN TRIPS UPON TRAIL OPENING							
	DAILY							ANNUAL** Average
	Diverted		Latent Demand (New)		Total			
	Low	High	Low	High	Low	Average	High	
Ellis to Gordon	20	40	30	50	50	70	90	15,000
Gordon to Spall	40	60	60	120	100	140	180	29,000
Spall to Dilworth	40	50	60	110	100	130	160	27,000
Dilworth to Highway 33	20	40	30	50	50	70	90	15,000
Highway 33 to Sexsmith	0	10	10	20	10	20	30	4,000
Sexsmith to Ellison OP	0	10	10	20	10	20	30	4,000
Ellison OP to Airport	0	10	10	20	10	20	30	4,000
Airport to Winfield	0	10	10	20	10	20	30	4,000

*** Assumes six months of 100% usage, two months at 50% and no traffic for four months.*
Yearly average traffic is calculated using the mid range of the daily estimates.
Section volumes cannot be added to obtain a total expected trail use.

The number of pedestrians on the trail is expected to range from 10 to 180 each day. This would result in an average maximum of 29,000 pedestrians annually on the busiest section of the trail.

Combined Traffic

An estimate of total trail use was developed by adding cycling and pedestrian trips. The results are shown in TABLE 3.5.

As shown, the use of the trail is expected to range between approximately 40 trips daily in the northern section to 560 trips daily in the busiest section. This level of use would result in up to 97,000 users annually in the busiest section. Lower trip volumes are expected in the northern sections due to the lower population densities and the relatively longer distances involved for commuters. On average, approximately half of the trail users are expected to be attracted to cycling or walking from other transportation modes.

TABLE 3.5 COMBINED FORECAST OF TRIPS

SECTION	EXPECTED BICYCLE AND PEDESTRIAN TRIPS UPON TRAIL OPENING							
	DAILY							ANNUAL** Average
	Diverted		Latent Demand (New)		Total			
	Low	High	Low	High	Low	Average	High	
Ellis to Gordon	120	200	90	150	210	280	350	59,000
Gordon to Spall	120	180	120	200	240	310	380	65,000
Spall to Dilworth	220	300	140	260	360	460	560	97,000
Dilworth to Highway 33	140	220	100	140	240	300	360	63,000
Highway 33 to Sexsmith	60	110	90	140	150	200	250	42,000
Sexsmith to Ellison OP	10	40	90	140	100	140	180	29,000
Ellison OP to Airport	10	30	40	60	50	70	90	15,000
Airport to Winfield	10	30	30	50	40	60	80	13,000

*** Assumes six months of 100% usage, two months at 50% and no traffic for four months.*
Yearly average traffic is calculated using the mid range of the daily estimates.
Section volumes cannot be added to obtain a total expected trail use.

The above forecasts were prepared for trail opening, assuming that this occurs in the next few years. If the trail is completed and proves to be popular and the proportion of people cycling and walking increases, the forecast trip volumes may be expected to double in the five to ten-year time period. This could result in almost 200,000 users annually on the busiest section of the trail between Spall Road and Dilworth Drive.

3.2 On-Trail Safety

This section includes a discussion of the safety requirements for the proposed trail. Safety at road crossings is discussed separately. The concepts that safety is relative and that all transportation modes involve risk and are not absolutely safe are incorporated. The challenge is to maximize safety by minimizing and managing risk.

The review by the Rails-to-Trails Conservancy of 61 rails-with-trails in the United States indicates that these trails are just as safe as any other trail not associated with an active railway. Every day thousands of persons across the United States and Canada safely use trails located alongside operational railways.

The maximum number of users expected on the proposed trail is approximately 560 per day in the busiest section. The risk of riding or walking alongside a rail line with a few low speed trains can be compared to the risk adjacent to 60,000 vehicles per day on Harvey Ave (Highway 97), 13,000 vehicles per day on Bernard Avenue, and/or 20,000 vehicles per day on Enterprise Way. A trail along the railway corridor would likely be a safer alternative than the sidewalks and bicycle lanes along the high traffic volume city streets.

The review of existing rail-with-trail installations in the United States and Canada reveals only one collision between a train and a trail user. Therefore, although the risk of a collision has not been quantified, it appears to be quite low.

Setback

Safety along the trail is generally achieved by providing adequate setback between the trains and trail users. The draft of Rails-with-Trails: Lessons Learned (discussed in Section 2) recommends a setback between the track centreline and the closest edge between 3.0 and 7.6 metres, depending on the volume, speed and type of train operation, as well as the technique used to separate the rail and the trail.

Many existing trails have setbacks less than 7.6 metres and have had few problems, particularly those that provide physical separation through fences or walls. The railway operator, Kelowna Pacific Railway, has indicated that as much lateral setback as possible should be provided and that a minimum setback of 2.5 metres from the centre of the track will be required, with 3.0 metres preferred.

The 2.5-metre minimum setback appears to be adequate for the current train volume of approximately one train per hour. The setback would likely continue to be adequate if train volumes increase somewhat since physical separation is provided by a fence. A more detailed review may be required if train volumes and/or speeds increase considerably.

Physical Barrier

A physical barrier between the trail and the rails can reduce potential conflicts between trains and trail users. In the United States, 70 percent of the trails studied have separation provided a fence, vegetation, ditch, walls, and/or grade difference. Fences are effective at deterring most trespassing, but are costly to install and maintain. The erection of signs alone that prohibit trespassing has not been found to be effective in deterring trespassing activity.

For the proposed trail in Kelowna, the railway operator has requested that a physical barrier (generally a fence) be installed between the track and the trail. The operator has expressed concerns that trespassing now exists, although the frequency of trespassing has not been documented. Provision of a fence approximately 1.5 metres high between the track and the trail will virtually eliminate any trespassing that may exist now, and would therefore improve safety compared to the current situation.

Track Crossings

Safety along the trail can also be maximized by reducing the number of locations where the trail crosses the tracks. If possible, such crossings should occur at roadways. If track crossings are required, they should be positioned perpendicular (80 to 90 degrees is recommended) to the track. In the conceptual plan, only five track crossings are envisioned (shown in FIGURE 3.1). Two of the track crossings would be at roadways (Spall Road and Dilworth Drive) and one would be at an existing track crossing near High Road.

The track also crosses several track sidings or spur lines. The spur lines are typically short sections of rail that service industrial users adjacent to the main rail line. The railway operator does not foresee difficulties if the proposed trail crosses these sidings, particularly as each siding is likely used on average less than once daily.

The conceptual plan was developed to position the proposed trail such that a minimum number of siding or spur lines are crossed. As such, only three such crossings would be required. The locations where spur line or siding crossings would be required are summarized in TABLE 3.6 and are illustrated in the FIGURE 3.1 map.

If a fence is built between the trail and the track, openings will be required where a spur or siding crosses. As the number of such openings is expected to be relatively low with the proposed conceptual plan, no special treatment has been applied to the openings, although signs and markings will be needed. This aspect should be further examined during subsequent stages of trail design. For example, an alternative solution would be required if train cars were stored on the spurs or sidings for long periods of time in a position that would obstruct the trail.

TABLE 3.6 SUMMARY OF SIDINGS OR SPUR LINE CROSSINGS

SEGMENT		NUMBER OF SIDINGS OR SPURS CROSSED in CONCEPTUAL PLAN	COMMENTS
1	Ellis to Gordon	0	
2	Gordon to Spall	0	
3	Spall to Dilworth	2	Near Hardy Street
4	Dilworth to Highway 33	0	
5	Highway 33 to Sexsmith	1	At McCurdy Road
6	Sexsmith to Ellison OP	0	
7	Ellison OP to Airport	0	
8	Airport to Winfield	0	
TOTAL		3	

In summary, the three measures that will be incorporated in the design for the Kelowna rail-with-trail to optimize trail safety are:

- A fence between the railway property and the trail, although the option for deterring access through grade separation should be explored in certain sections;
- Minimum lateral clearance from the centreline of the track to the near edge of the fence of 2.5 metres, and a greater distance where feasible; and
- Minimum number of track crossings, but where required the crossings are to be at right angles to the track.

In addition, a number of devices are available to provide legal and financial protection to the trail operator and the railway. Insurance arrangements and/or indemnification agreements can be developed by and between the parties.

3.3 Road Crossing Safety

The highest potential for a trail user to be involved in a collision occurs at locations where the trail would cross heavily-used roadways. These crossings would often be mid-block and therefore not ideal, because drivers do not expect pedestrians and cyclists between road intersections.

A review was conducted to determine more specifically what measures may need to be taken to provide safety for pedestrians and cyclists crossing streets. The Transportation Association of Canada's Pedestrian Crossing Control Manual, March 1998 was used as the basis to develop the range of traffic control measures shown in TABLE 3.7. Cyclists were treated as pedestrians for purpose of applying the warrant.

TABLE 3.7 PROPOSED TREATMENT AT ROAD CROSSINGS

CROSS STREET	EXPECTED VOLUMES AT ROAD CROSSING (Afternoon Peak Hour)		CROSSING TREATMENT	
	Vehicles on Road	Pedestrians and Cyclists on Trail	As warranted by TAC* Manual	Recommended
Ellis Street	400	30	Nothing	Depends on route alignment selected (north, south, or City street). Direct trail users to City intersections.
Richter Street	300	30	Nothing	
Ethel Street	100	30	Nothing	
Gordon Drive	600	30	Nothing	
High Road	1,200	30	Signed and marked crosswalk	Special crosswalk. Try to combine with school crossings.
Spall Road	1,800	50	Special crosswalk	Special crosswalk or pedestrian signal.
Dilworth Drive	1,200	30	Signed and marked crosswalk	Special crosswalk.
Sexsmith Road	1,000	10	Nothing	Overhead signs and marked crosswalk.

**Transportation Association of Canada, Pedestrian Crossing Control Manual, March. 1998.*

The following discussion is provided to describe the features specific to each crossing and to provide the rationale for the recommended treatment. Treatments common to all crossings are described first, with the individual cross streets following. The proposed treatments are illustrated schematically in FIGURE 3.1 (attached at the end of this report).

All Crossings

The measures listed below are recommended for all road crossings:

- Railings should be installed to prevent the entrance of motor vehicles onto the trail as described in the City Bylaw;
- STOP signs should be installed facing the trail users to remind trail users to wait until it is safe to cross the road;
- Advanced signing and trail markings should be used to warn cyclists about the stop condition and road crossing ahead;
- The trail should approach the cross road at right angles;
- Warning signs should be installed to alert motorists of the impending crossing; and
- Adequate sight distance for trail users to see approaching vehicles should be provided.

Ellis Street, Richter Street, Ethel Street, and Gordon Drive

These four roads have similar volumes and characteristics. Therefore, similar treatments can be applied where the trail crosses each road. However, there are three possible alignment options for the proposed trail in this area:

- Northern rail alignment;
- Southern rail alignment; and
- On-street alignment, assumed to be Clement Avenue.

The northern route is still used as an active railway. The tracks have been removed from the southern route, and while the right-of-way appears to be available, the property is now owned by Canada Lands.

If the northern alignment is used for the western section of the trail (between Ellis Street and Gordon Drive), a crossing at Ethel Street is not required as Ethel Street does not cross the tracks. If Ellis Street, Richter Street, and Gordon Drive are crossed at the mid-block railway alignment, the warrant indicates that no crossing treatment is required. However, at these three locations, the rail corridor is quite close to an intersection and so it is recommended that the crossing opportunity for the trail be provided at the nearby intersection.

If the southern alignment is used, crossings of all four streets occur. Similar to the northern alignment, street intersections are nearby and so it is recommended that the crossing traffic be directed to the nearby intersection.

Alternatively, trail traffic could be directed to City streets in this area. Sidewalks are generally provided for pedestrians and bicycle routes could be provided on-street. It is expected that at this western terminus of the rail-with-trail, users will be traveling to diverse destinations in the downtown, and so may have less need for a dedicated trail. Bicycle lanes (for example, along Clement Avenue) and trail signs indicating the route could be provided. The alignment options for this section are discussed further in Section 3.5.

High Road

This crossing needs special consideration because the trail approaches High Road at an angle. The trail intersects bike lanes on High Road, so there will be an exchange of cyclists at this location that needs to be taken into account. In addition, an elementary school adjacent to the crossing results in children crossing High Road and the railway track in the same area. It is desirable that the trail cross the roadway and the tracks as close as practical to 90 degrees to improve sight lines. The area is shown in FIGURE 3.2.

FIGURE 3.2 LOCATION OF TRAIL ROAD CROSSING, HIGH ROAD

The warrant indicates that a signed and marked crosswalk is adequate at this location for trail traffic. However, such a crosswalk is now provided for the elementary school children to cross High Road, somewhat west of the railway crossing. If the pedestrian and cycling traffic from the trail and the school could be combined at one location, it is recommended that a Special Crosswalk be considered, although a more detailed review would be required.

A Special Crosswalk involves overhead illuminated crosswalk signs that are activated by a pedestrian, but does not present the driver with a red light. If the City does not wish to use the Special Crosswalk and/or if this treatment is not widely used, consideration can be given to a pedestrian signal for the combined traffic.

At this time, the City is planning to construct a new road, the North End Connector in this area. If built, the rail-with-trail will not need to cross a road. As section of High Road between Gordon Drive and the railway tracks would become a dead end when the North End Connector is built, and the rail-with-trail is located on the south side of the railway, the trail would pass just east of the dead end of High Road. Trail access should be provided at the High Road dead and at the elementary school.

Spall Road

Spall Road has a relatively high vehicle traffic volume on four lanes, resulting in few crossing opportunities for trail users. For this reason, traffic control is necessary to provide for a safe crossing.

The TAC warrant indicates a Special Crosswalk. However, at this location it is recommended that the traffic control be upgraded to a pedestrian signal. A crossing of the Mill Creek path system has been proposed at this location and if both it and the rail-with-trail are built, the two paths would likely share the same crossing point. The additional traffic from the Mill Creek path may escalate the need for a pedestrian signal.

Diversion of trail users to one of the two nearby signalized intersections was considered, but due to the distance it was judged that many trail users would not divert, but instead risk crossing Spall Road unassisted. Spall Road is illustrated in FIGURE 3.3.

Construction of the North End Connector road is currently planned for this area. If built, the new road would require the installation of a full traffic signal at Spall Road, near the railway tracks. In this case, the rail-with-trail crossing should be provided at the signal.

FIGURE 3.3 LOCATION OF TRAIL ROAD CROSSING, SPALL ROAD

In addition, due to the high trail user volumes expected, the trail should be widened to four metres in advance of crossing at Spall Road to allow for two cyclists to stop in tandem.

Dilworth Drive

This crossing location appears somewhat rural, so motorists may not be expecting cyclists and pedestrians. The warrant indicates that a signed and marked crosswalk will be adequate at this location. However, at this location, Dilworth Drive is curved and sight distance may be restricted. For this reason, a Special Crosswalk should be considered.

A crossing point of the proposed Mill Creek path is located nearby, near the bridge on Dilworth Drive. If the Mill Creek path is built, this alternate location may be more desirable for crossing Dilworth Drive because it is at right angles, closer to the urban environment, and further from the horizontal curve on Dilworth Drive.

Sexsmith Road

Sexsmith Road is on a vertical grade near the rail crossing. The slope may restrict visibility for southbound motorists of trail users crossing the roadway. The presence of cyclists and pedestrians may not be expected by motorists because of the industrial character of the location. These factors suggest that a higher level of traffic control may be necessary for crossing safety. Therefore, it is suggested that a marked and signed crosswalk be provided. The installation of overhead crosswalk signs may be required to ensure that adequate sight distance is provided to the motorists.

Other Road Crossings

Crossings at Airport Road, Old Vernon Road, and Beaver Lake Road are not expected to require crossing treatments beyond the provision of marked and signed crosswalks.

The trail will cross a number of other minor access roads and rural crossings as it continues north of Sexsmith Road. The low volumes of trail users and vehicle traffic would not normally require traffic control measures, provided that there are adequate sight lines for motorist and trail users.

3.4 Network Connections

Bicycle and walking trips require a network of facilities so each trip can be made safely and conveniently. Trail connectivity and accessibility is vital to attract users. For the proposed trail, trip generators such as the Downtown, Waterfront Park, Orchard Park shopping centre, Parkinson Recreation Centre, Rutland and the north campus of the University College must have good access to the proposed trail. An adequate number of connection points will also likely reduce unauthorized trespassing through the railway.

The City of Kelowna's Existing and Proposed Bikeway Network (dated September, 2000) and the Kelowna Pedestrian Master Plan (Hamilton Associates, December 2000) were examined in relationship to the proposed linear trail to determine whether this connectivity would be provided. The connections are illustrated on FIGURE 3.1 and a description is provided here.

Western End — If the trail follows Clement Avenue or the southern alignment, it will have good connectivity for both cyclists and pedestrians at the waterfront and with future and proposed bike routes at Ellis Street, Richter Street, Ethel Street, and Gordon Drive. At least one of these planned north-south bike routes should be completed when the rail-with-trail is built to ensure connectivity to and from downtown when the trail opens. If the trail follows the active railroad line along the northern alignment, access to the waterfront west of Ellis Street should be provided.

High Road — Cyclists can access the trail at the High Road rail crossing. Pedestrians and cyclists would have access at the rail crossing to the elementary school.

Spall Road — Spall Road would be a major connection to and from the trail. Spall Road and Glenmore Road have on-street bike lanes. The parking areas at the playing fields in the southwest quadrant would be a good location for trail users to leave their cars.

Hardy Road — Hardy Road is not currently identified as a bike route, but it would provide a good connection to the trail and connect to the Orchard Park shopping area. A partial sidewalk exists on Hardy Road, but a complete sidewalk would be required to provide the pedestrian connection.

Dilworth Drive Dilworth Drive is an existing bicycle route that will provide good access to the proposed trail. A dedicated parking area should be developed near the trail; otherwise trail users will park in the nearby commercial area. A future development of Brendt's Mill nearby may provide an opportunity for shared parking.

Mission Creek It would be desirable to link the Mission Creek Greenway path to the trail along the rail line so that users can interchange between these two major urban trails. There is a bicycle route connection via Dilworth Drive and Springfield Road, but a connection via Leckie Road would be more direct. This latter route will require designating a section of Leckie Road as a bicycle route.

Leathead Road Currently there are no road connections to the rail corridor between Dilworth Drive and Sexsmith Road. A connection to the trail should be made when Leathead Road is extended to join Enterprise Way. This would be a convenient access for the residents of Rutland.

McCurdy Road The McCurdy Road extension will provide another access point to the proposed trail. This location will also provide another connection to the Dilworth Mountain community when McCurdy Road is extended to Dilworth Drive. In the meantime, it is proposed that access be provided to the rail-with-trail at this location, from the east side only.

Hollywood Road Another opportunity exists for a future connection with the proposed trail, when Hollywood Road is extended north to connect with College Way and Quail Ridge Boulevard. Hollywood Road is designated as a bicycle route and can provide future bicycle access to the college.

Highway 97

The Ellison Overpass, where Highway 97 passes over the railway on a bridge, is of particular concern because there is no shoulder on the bridge structure. A trail in the railway corridor provides a superior alternative to Highway 97 for north-south cycling.

The Ministry of Transportation has indicated that it plans to provide a safer cycling connection to the college in the vicinity of the railroad grade separation. Connecting to the rail-with-trail at this point could satisfy the needs of the College and the Ministry of Transportation. A direct connection from College Way to the trail may not be necessary because cyclists can use Hollywood Road to gain access at Airport Road or Old Vernon Road.

Connections to the trail between Old Vernon Road and Commonwealth Road are not required. There would be access to the corridor at Commonwealth Road and at Beaver Lake Road.

The multi-use path from the waterfront of Lake Okanagan to the community of Winfield will have good connections with existing and future bicycle and pedestrian routes. The continued provision of good connection points will help to encourage the use of the rail-with-trail.

3.5 Proposed Conceptual Plan

This section describes the plan proposed to meet the demands identified in the previous discussion. The following design criteria were used to develop the concept for the trail:

- The edge of the trail zone must be 2.5 metres or more from the centerline of the track;

- A fence is required between the railway and the trail, although the option for deterring access through grade separation can be explored;

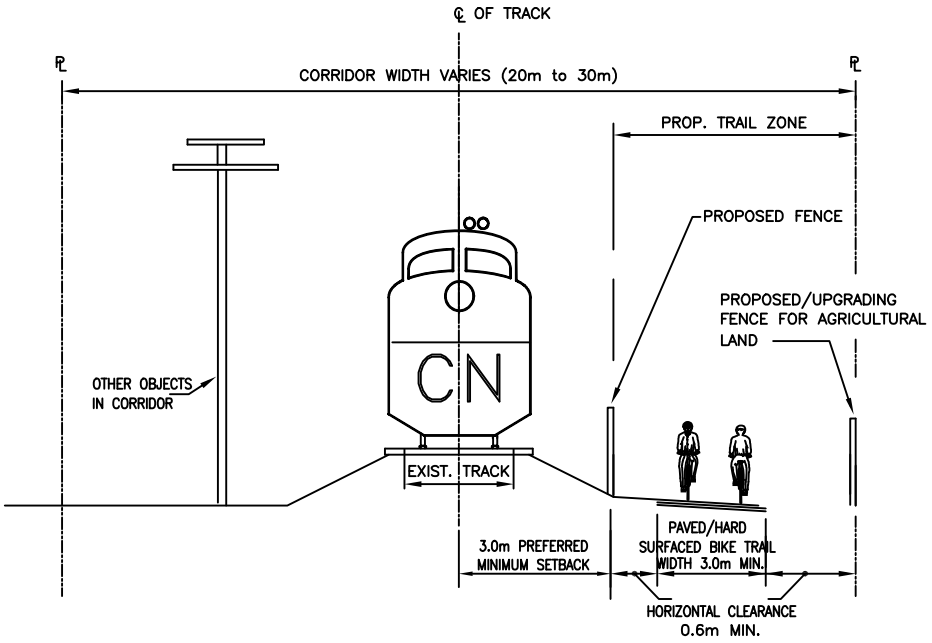
- The trail is to be a minimum of 3.0 metres wide and paved, although an alternate permeable surface may be provided for short sections near Mill Creek; and

- The trail should be visible from adjacent buildings or from busy roads or sidewalks.

A concept that generally meets the design criteria and accommodates the requirements discussed in this Section is illustrated in the map attached as FIGURE 3.1 at the end of this document.

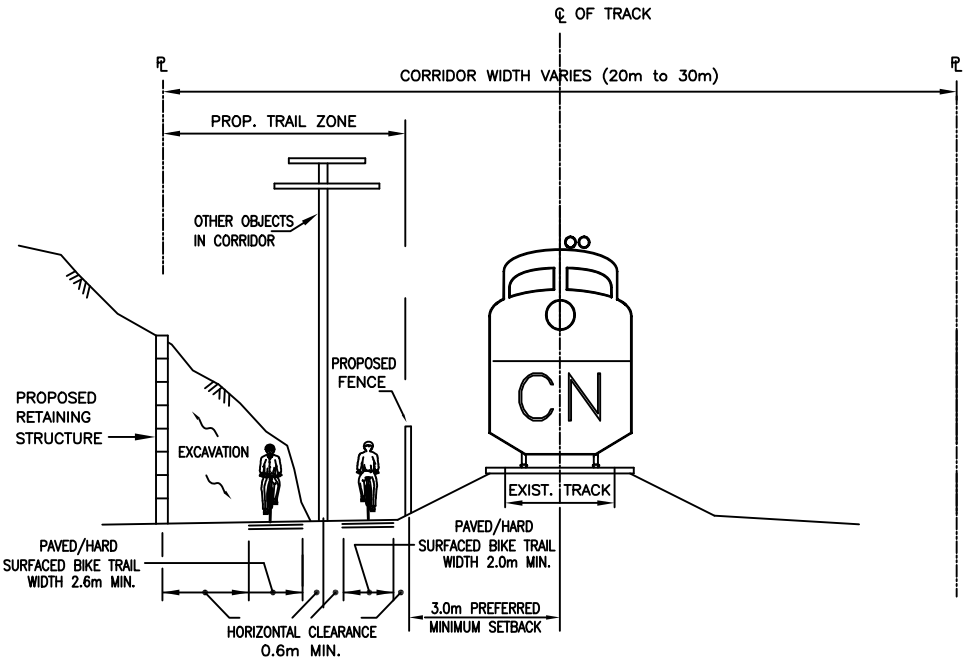
The concept was developed to be able to assess the feasibility of the trail. The concept would involve several crossings of the track, three of which would not be at a roadway. Further design and refinement will be necessary before the trail can be built.

Examples of cross-sections of the proposed trail are shown in FIGURE 3.4. Other typical cross-section diagrams are provided on FIGURE 3.1.



TYPICAL SECTION AT GRADE

N.T.S.



TYPICAL CUT SECTION

N.T.S.

FIGURE 3.4 SAMPLE TRAIL CROSS-SECTIONS

The highlights of the concept proposed for the trail are described here.

Ellis Street to Gordon Drive (Section 1)

On the western-most section of the corridor, three possible alignments were considered during the development of the conceptual plan:

- Northern railway alignment;
- Southern railway alignment; and
- On-street (Clement Avenue).

The original railway formed a loop. The northern portion of the loop remains as an active railway and was considered as one option. The track has been removed from the southern and western portions of the loop and the land sold. However, the alignment of the southern portion appears to be unobstructed and so was considered as a second possible option.

This western section of the corridor is within the downtown of Kelowna, where the origins and destinations of the trail users are expected to be dispersed. A grid street system provides many alternate routes for pedestrians and cyclists. For this reason, the option of providing an on-street option for the proposed trail was considered. It was assumed that this third option would follow Clement Avenue.

The on-street option provides the most direct connection to waterfront paths and possible downtown destinations. Therefore, the on-street option is recommended and the costs for this option were included in the estimate.

The planned North End Connector would involve an upgrade to Clement Avenue, between Gordon Drive and Ellis Street. Bicycle lanes are planned for both sides of the upgraded road. If built, it is recommended that the rail-with-trail route make use of the Clement Avenue bicycle lanes.

Gordon Drive to Spall Road (Section 2)

- Trail would be located on the south side of the track between Gordon Drive and High Road;
- East of High Road, the trail would cross the track at the existing track crossing (near the elementary school);
- The trail would then be located on the north side of the railway track to avoid disruption of Brandt Creek, remaining on the north side until Spall Road; and
- A pedestrian traffic signal is recommended for trail users to cross Spall Road, although this would be a full traffic signal if the North End Connector is built.

Spall Road to Dilworth Drive (Section 3)

- The trail would be located on the south side of the railway track for this entire section;
- Two bridges would be required to cross Mill Creek; and
- At Dilworth Drive, the trail would cross to the north side.

Dilworth Drive to Highway 33 (Section 4)

- The trail would be located on the north side in this section to avoid disruption of Mill Creek; and
- Due to the slope on the northern side, some excavation and a retaining wall will be required to provide sufficient space for the trail.

Highway 33 to Sexsmith Road (Section 5)

- At the southern end of this section, the trail would be located on the north (or west) side, then cross to the south (or east) side south of Leathead Road;

- A bridge would be required to cross Mill Creek near Leathead Drive; and
- The trail would cross the railway track at McCurdy Road, remaining on the west side until Sexsmith Road.

Sexsmith Road to Ellison Overpass (Section 6)

- In the conceptual plan, the trail is located on the west side for the entire section;
- An 800-metre connection would be provided to the Okanagan University College North Campus, and the costs were included in the estimate due to the importance of this link; and
- A boardwalk may be required along the pond near Carney Road to protect the wet area.

Ellison Overpass to Airport Way (Section 7)

- The trail is located on the west side of the tracks for the entire section; and
- A bridge may be required over Mill Creek, just south of Airport Way.

Airport Way to Winfield (Section 8)

- The trail is located on the west side of the tracks for the entire section;
- A boardwalk structure was assumed to be required near Duck Lake to protect the wet area; and
- A bridge would be required over Jim Bailey Creek at the north end of Duck Lake.

Costs were estimated at preliminary level to assess feasibility. Costs for providing a fence between the trail and railway were included, along with some costs for providing or upgrading a fence between the trail and agricultural properties. The cost estimates are shown in TABLE 3.8, with details provided in APPENDIX B.

TABLE 3.8 SUMMARY OF CONSTRUCTION COST ESTIMATE

SECTION		CAPITAL COST	LENGTH (km)	COST/KM
1	Ellis to Gordon (on-street)	$100,000	1.2	$80,000
2	Gordon to Spall	$460,000	1.8	$250,000
3	Spall to Dilworth	$630,000	1.3	$480,000
4	Dilworth to Highway 33	$440,000	0.9	$490,000
5	Highway 33 to Sexsmith	$1,240,000	3.9	$320,000
6	Sexsmith to Ellison OP*	$500,000	2.4	$210,000
7	Ellison OP to Airport	$710,000	2.1	$340,000
8	Airport to Winfield	$2,690,000	8.7	$310,000
TOTAL*		$6,770,000	22.3	$300,000

* Includes the cost of construction of 0.8 km of trail to connect trail to Okanagan University College North Campus of $155,000 due to the importance of this link.

The total estimated capital cost of constructing the trail as shown in the conceptual plan is $6,770,000, which includes a cost contingency of 40 percent. Cost associated with the use of the trail property is not included as it would be negotiated with the railway.

The cost of constructing the trail was estimated to be between $80,000 and $490,000 per kilometre. The average cost was estimated to be approximately $300,000 per kilometre. The estimated cost compares to an average cost of $250,000 per kilometre for a non-obstructed trail, with property costs excluded. The construction costs are therefore considered similar to other trails.

An estimate was also made of the expected cost to maintain the trail. The estimate was prepared based on a combination of typical trail maintenance costs in the City of Kelowna and on average trail maintenance costs elsewhere. On this basis, rails-with-trail maintenance costs are expected to average $3,000 per kilometre annually. If the entire trail is built, annual maintenance costs are estimated to be approximately $67,000.

The average expected costs are summarized in TABLE 3.9 for each segment of the proposed trail. The estimates include the costs of:

- Providing and servicing litter containers;
- Painting centre lines;
- Painting bicycle symbols;
- Snow removal;
- Fence maintenance;
- Sweeping;
- Pavement repair;
- Maintaining signs; and
- Railroad crossing repairs.

TABLE 3.9 ESTIMATE OF MAINTENANCE COSTS

SECTION		LENGTH (km)	ANNUAL MAINTENANCE COST ESTIMATE
1	Ellis to Gordon (on-street)	1.2	$3,500
2	Gordon to Spall	1.8	$5,500
3	Spall to Dilworth	1.3	$3,900
4	Dilworth to Highway 33	0.9	$2,700
5	Highway 33 to Sexsmith	3.9	$11,700
6	Sexsmith to Ellison OP	2.4	$7,300
7	Ellison OP to Airport	2.1	$6,300
8	Airport to Winfield	8.7	$26,000
TOTAL		22.3	$67,000

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4.0 FEASIBILITY ASSESSMENT

In this section, the background information and the proposed concept are reviewed to assess the feasibility of constructing a rail-with-trail. This assessment is conducted on the basis that the primary purpose of the trail is to serve commuter cycling trips. The trips could be current cycling trips that are diverted from other routes or new trips where riders choose to cycle in lieu of another mode of transportation. Based on the analysis discussed in Section 3, it appears reasonable that the proposed trail will be used as envisioned. It can provide a direct and safe route for commuting cyclists.

Feasibility of implementing the proposed trail was further assessed in two parts:

- Overall Feasibility - a summary of whether the trail could reasonably be built in a way that would achieve its goal; and
- Section Prioritization – a ranking of the trail sections to recommend which section(s) could be built first.

4.1 Overall Feasibility

Five general feasibility criteria were developed based on the background research and consultation with the stakeholders. In no particular order, the general criteria, with their associated goals, are:

- Safety – to minimize collision risk;
- Operations – to avoid disruption and delay to trains and trail users;
- Environment – to minimize impact;
- Legal – to achieve agreement among parties; and
- Implementation – to reduce cost and minimize the time required for the trail to be built.

Each criterion was assessed in terms of how difficult it would be to resolve or implement, given the information available to date and the rail-with-trail concept as proposed. The results are illustrated in TABLE 4.1 and are discussed in more detail below.

Safety: to minimize risk

Safety was assessed in terms of the potential conflicts that might occur between:

- Cyclists and pedestrians;
- Trail users and trains; and
- Trail users and road traffic.

It is expected that cyclists and pedestrians can safely co-exist within the proposed three-metre trail. It was forecast that in the busiest section between Spall Road and Dilworth Drive, the highest volumes expected would be approximately 400 bicycles and 160 pedestrians daily, for a total of 560 users. This would likely result in a maximum of 50 to 100 peak hour users on this section. The trail is expected to be adequate for these demand levels. However, if the success of the trail results in user volumes that are double or triple the forecast volumes, the opportunity for conflicts will be increased. At this point, consideration may be given to widening the trail, providing an alternate route, and/or restricting trail use to cyclists.

The railway operator (KPR) has indicated that a fence will be required between the track and the trail. Typically such fences are between 1.2 and 2.0 metres high and are adequate to discourage access onto the track. On the assumption that the requirement for this fence remains, the risk of a conflict between trail users and trains is expected to be low. The conceptual plan indicates that the trail would cross the tracks at three locations not located at roadways. Additional care will be required to discourage access to the railway at these locations.

TABLE 4.1 CRITERIA TO DETERMINE FEASIBILITY

CRITERIA		EFFORT TO ACHIEVE GOAL			COMMENTS OR CONDITIONS
GENERAL CRITERIA AND GOAL	CONSTITUENT CRITERIA	Low	Medium	High	
Safety: to minimize risk	Cyclist/ Pedestrians				May change if volumes become high.
	Trail Users/ Trains				Assumes fence between rail and trail.
	Trail Users/ Road Traffic				Range of crossing treatments proposed.
	Safety Overall				
Operations: to maximize efficiency	Adequate Setback				2.5 metre setback with fence assumed.
	Siding Crossings				Concept plan minimizes crossings.
	Access				Emergency access improved.
	Operations Overall				
Environment: to minimize impact	Mill Creek				Special treatment required.
	Other Wet Areas				Not fish bearing.
	Environment Overall				
Legal: to achieve agreement	Liability				Indemnification and insurance proposed.
	Negotiations				Requires lease or license; KPR and CN approval
	Legal Overall				
Implementation: to achieve efficiency	Construction				Average costs.
	Consultation				May involve more consultation with property owners.
	Implementation. Overall				
OVERALL					

Trail users will be required to cross several major roads, often at mid-block locations. In each case a reasonable crossing treatment was identified to minimize collision risk. In some cases, special crosswalks or pedestrian traffic signals are recommended.

Of the three types of conflict that could occur, a conflict between trail users and road traffic appears to involve a higher risk, due to the increased exposure. For this reason, more effort is likely required to design and monitor safe road crossings. However, overall, it appears that a relatively safe trail can be achieved with a relatively low effort.

Operations: to maximize efficiency

This criterion was established to assess how the trail might affect the operation of the railway and how the trail itself might be operated and maintained. As the proposed concept provides the required lateral setback between the tracks and the trail, it is expected that the railway operation will be unaffected along the track. Trespassing may be reduced by the provision of the fence. It is therefore likely that the railway operations can be maintained or enhanced with a relatively low effort.

The trail will have to cross spur lines or sidings in only three locations. The concept plan was developed to minimize the number of these crossings.

The trail concept was developed to permit light maintenance vehicles to use it if necessary. This is not expected to affect track maintenance, as this is currently done by on-track vehicles. However, the trail could provide improved access for other maintenance vehicles, such as those for utilities or those required to maintain the trail itself. Emergency access vehicles for the railway and for the trail can also make use of this route. For these reasons, access will likely assist the overall operation and maintenance of the corridor and therefore the effort required to achieve the goal of efficient operations is considered to be relatively low.

Environment: to minimize impact

As Mill Creek is a fish-bearing stream, special consideration is required where the proposed trail comes within 15 metres of the creek. In the concept plan, the proposed trail is within 15 metres of the creek for approximately 700 metres of its length. Further design will be required in these locations, for example to consider sedimentation traps or special drainage designs. For these reasons, the environmental treatments near Mill Creek were assessed as involving more detailed consideration and so a higher effort was assigned.

Areas near Brandt Creek, Duck Lake, and other wet areas would also require some consideration to mitigate drainage effects. However, the effort required to minimize the environmental impact in these areas was considered to be relatively low.

Legal: to achieve agreement

The general legal criterion was assessed on the basis two constituent criteria:

- Liability issues that might concern both the railway operator, the owner, and the City of Kelowna; and
- The process that may be required to reach an agreement.

Based on the review of similar rails-with-trail projects elsewhere, conditions are typically applied to mitigate the risk to the railway operator and railway land owner. The trail operator (in this case assumed to be the City of Kelowna) typically leases or obtains a license to use the land for the trail from the railway. Insurance is usually provided by the trail operator under public umbrella policies. The railway may be indemnified for some trail-related claims, but this would be negotiated.

Difficulty implementing these conditions is therefore not envisioned. In any case, operators of similar rails-with-trails facilities have found that claims have not materialized.

A written agreement will be required to clarify the legal status of the trail area. Kelowna Pacific Railway (a Knighthawk Inc. company) has leased the facility from Canadian National Railway. Based on our understanding of the twenty-year lease between the two, it is expected that the City of Kelowna might sublease the trail property from Kelowna Pacific Railway (or Knighthawk), subject to the approval of Canadian National. Canadian National is expected to be concerned about safety aspects and about the long term use of its land.

The mechanics of the arrangement would remain to be finalized. As three parties are involved and as rails-with-trails are less common in Canada, the time to negotiate and implement such an agreement may be longer than otherwise expected. Nonetheless, hurdles that would prevent such an agreement have not been identified in this study.

Implementation: to optimize cost and time to build

The cost to construct the entire trail was estimated to be $6.8 Million at a conceptual level. The costs are average for a trail of this nature and so were not considered a hindrance. In addition, sections of the trail could be built as funds are available. Obstacles that might require a long construction schedule were not identified during the conceptual planning stage.

Consultation was conducted with adjacent property owners, identified stakeholders, and the public-at-large as part of this feasibility study. Overall, those consulted supported the proposed plan. Some concern was expressed about possible effects related to adjacent agricultural uses, particularly livestock operators.

Where conflicts are expected between some existing property uses and the proposed trail, consideration may need to be given to providing additional protection such as fencing. For this reason, a higher level of effort is anticipated for future consultation before implementation.

4.2 Section Prioritization

Sections of the proposed trail could be built as funds become available. It is therefore necessary to evaluate which of the trail sections should receive the first priority. This review was conducted on the basis of several factors:

- Cost of implementation;
- Expected use of the section;
- Availability of alternate routes; and
- Other factors (such as potential funding sources).

The total capital cost of constructing each section was compared to the annual volumes of expected users. Calculating this ratio permits a comparison of the effectiveness of the trail in attracting users for the dollars spent. The analysis is somewhat restricted as the forecast of use was prepared on the basis that the entire trail was built, but should still provide a reasonable method for relative comparison of the sections. Maintenance costs were excluded from this analysis as they are expected to be similar along the length of the trail and proportional to the section under consideration.

The results of the analysis are shown in TABLE 4.2. For the section from Ellis Street to Gordon Drive, the on-street alignment was used for the analysis as it is the recommended alignment.

The section between Ellis Street and Gordon Drive was found to have the lowest expected cost for each expected user, on a per kilometre basis. However, the costs for this section were prepared on the basis that an on-street bicycle facility would be provided along Clement Avenue. Of the sections that are within the rail right-of-way, the section between Gordon Drive and Spall Road would have the lowest cost per user for each kilometre, followed by the section between Spall Road and Dilworth Drive.

TABLE 4.2 EFFECTIVENESS CALCULATION BY SECTION

SECTION OF TRAIL		TOTAL COST ($1,000)	EXPECTED USERS (annual)	LENGTH (km)	EFFECTIVENESS RATIOS	
					cost/user	cost/user /km
1	Ellis to Gordon (On-street)	$100	59,000	1.2	$1.70	$1.40
2	Gordon to Spall	$460	65,000	1.8	$7.10	$3.90
3	Spall to Dilworth	$630	97,000	1.3	$6.50	$5.00
4	Dilworth to Highway 33	$440	63,000	0.9	$7.00	$7.80
5	Highway 33 to Sexsmith	$1,240	42,000	3.9	$29.50	$7.50
6	Sexsmith to Ellison OP*	$500	29,000	2.4	$17.20	$7.10
7	Ellison OP to Airport	$710	15,000	2.1	$47.30	$22.50
8	Airport to Winfield	$2,690	13,000	8.7	$206.90	$23.80
TOTAL*		$6,770		22.3		

* Includes cost of construction of 0.8 km of trail to Okanagan University College of $155,000

The sections were then assigned a priority ranking based on the effectiveness ratios. Alternate routes were identified where they might provide a temporary route for cyclists and pedestrians until a section of the rail-with-trail is built. The existence of a feasible, nearby alternate route was considered a possible reason for lowering the priority of a segment. It is also possible that the construction of the rail-with-trail could delay the need for one of the alternate planned bicycle or pedestrian routes.

Finally, any other factors that might affect the priority of a segment were reviewed. If appropriate, an adjustment was made to determine the overall priority of the section.

The results are shown in TABLE 4.3.

TABLE 4.3 SUMMARY OF PROPOSED SEGMENT PRIORITY

SECTION OF TRAIL	EFFECTIVE-NESS RANK (1 = best)	ALTERNATE ROUTES		OTHER	OVERALL PRIORITY
	cost/ user/km	Existing	Possible Future		
Ellis to Gordon (On-street)	1	• Downtown	• NEC (soon)	On road	MEDIUM
Gordon to Spall	2		• NEC (soon)		HIGH
Spall to Dilworth	3	• Enterprise Way	• NEC (soon) • Mill Creek		HIGH
Dilworth to Highway 33	6	• Enterprise Way	• NEC (later) • Mill Creek		MEDIUM
Highway 33 to Sexsmith	5		• Mill Creek		MEDIUM
Sexsmith to Ellison Overpass	4		• Hollywood	Funding may be available.	HIGH
Ellison Overpass to Airport	7		• Hollywood		LOW
Airport to Winfield	8				LOW

Notes: Highway 97 was not considered a viable alternative for cyclists and pedestrians in this review due to the current lack of continuous facilities and the relatively high vehicle volumes.
'NEC' is the North End Connector, where the Ellis Street to Spall Road section is planned to be built first.

The priority of the western section between Ellis Street and Gordon Drive was reduced due to the existence of adequate alternate routes in the downtown road system. As a result, the Gordon Drive to Spall Road section and the Spall Road to Dilworth Drive section would be ranked as 'high'. Gordon Drive to Spall Road should have a higher priority of the two, as the Spall Road to Dilworth Drive section constructions costs would be higher and because Enterprise Way could be considered a viable alternative. The Sexsmith Road to Ellison Overpass section was also ranked 'high', as funds may be available for elsewhere for its funding. After these three sections, sections to improve connectivity were considered to have medium priority.

4.3 Implementation

The review found construction of a trail within the rail corridor generally feasible. Most of the desired goals for the trail can be achieved with a relatively low effort. A higher level of effort is expected to finalize the design where the trail crosses the roads and the spur lines and where it would run adjacent to Mill Creek. On this basis, a reasonably safe and efficient trail could be built.

To implement the proposed trail, an early step will be to undertake negotiations with Kelowna Pacific Railway and Canadian National Railway. Features that can be discussed and/or confirmed include:

- The proposed conceptual plan, including the lateral setback required between the track and the trail and the need for fencing between the track and the trail;
- The form that a legal agreement might take, including liability and insurance conditions; and
- Any other conditions or financial considerations that might be involved.

It is recommended that the major points requiring agreement be summarized in a Memorandum of Understanding (MOU). The Memorandum would then be reviewed by the legal representatives of the City, the KPR, and CN. If possible, an example of an existing lease or license agreement for a rail-with-trail in British Columbia should be reviewed simultaneously.

Ongoing consultation is also recommended with the other stakeholders identified, including the government agencies and property owners.

Other implementation steps that would follow after the completion of this feasibility assessment were identified during the study:

- A review of the timing of the proposed rail-with-trail, the North End Connector, and the Mill Creek path for each segment to determine whether one, two, or three of these routes are required and when;

- An environmental review, as a best practice recommended based on American experience; and
- Design and more detailed cost estimate of the first section (or sections) of the trail.

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APPENDIX A

DETAILS OF BACKGROUND MATERIAL REVIEW AND CONSULTATION

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APPENDIX A
DETAILS OF BACKGROUND INFORMATION REVIEW AND CONSULTATION

A.1 Official Community Plan

The Kelowna Official Community Plan (OCP) estimated that cycling represented 1 to 2 percent of the afternoon peak period trips in 1993, while walking represented approximately 4 percent. At that time, the lack of facilities was considered a possible limitation to the number of people selecting these mode choices.

The need for an alternate cycling route to Highway 97 and the need for a bicycle connection to the Okanagan University College North Campus were both recognized in the Official Community Plan. The Plan specifically identifies the (then) Canadian National Railway right-of-way as a potential bike route should it be no longer required for railway use. No mention is made in the OCP of using of the railway corridor for pedestrians.

The OCP also illustrates the future land use adjacent to the study corridor. Future land uses adjacent to the corridor are summarized in TABLE A.1. Each land use type is expected to generate specific needs with respect to the provision of an adjacent trail.

Finally, Section 2.7 of the OCP identifies Stream Protection Corridors to “maintain the ecological, recreational, aesthetic, and economic values” of the corridors. Both Brandt Creek and Mill Creek , which flow adjacent to the rail corridor, are included in this designation. Mill Creek is also subject to the policies for Public Routes of Access as described in Section 2.8.

A.2 Transportation Plan, 1995

The Transportation Plan suggests numerous policies and physical improvements to encourage cycling and walking over a twenty-year period. Bicycle routes were recommended, particularly those that would connect urban areas and be located on the roads. Provision of a bicycle route within the rail corridor was specifically included in the plan. Using the route for pedestrians was not identified in the plan.

The plan also identified a new road to be built north of the railway corridor. The North End Connector was to follow the railway corridor along Clement Avenue in the west to McCurdy Road in the east, providing an alternate to Highway 97. The plan suggested that a roadside bicycle trail be built along the alignment of the new road.

TABLE A.1 SUMMARY OF ADJACENT LAND USE

Segment			General Land Use Type							
No	Western or Southern Cross Street	Eastern or Northern Cross Street	Residential	Educational	Commercial	Industrial	Park/ Open Space/ Recreation	Institutional/Airport	Rural/ Agricultural	First Nations
1	Ellis Street	Gordon Drive	✔			✔	✔			
2	Gordon Drive	Spall Road	✔	✔		✔	✔			
3	Spall Road	Dilworth Drive			✔		✔	✔		
4	Dilworth Drive	McCurdy Road			✔	✔	✔		✔	
5	McCurdy Road	Sexsmith Road				✔			✔	
6	Sexsmith Road	Airport Road	✔	✔		✔		✔	✔	
7	Airport Road	Northern City Limit	✔					✔	✔	✔

Several bicycle, pedestrian, and/or transportation demand management policies were also put forward in the Transportation Plan that may relate to the proposed rail-with-trail. In addition to the statements supporting cycling and walking as alternate modes, some of the relevant policies are listed below.

- A network of walkways will be implemented within the City as part of planned linear parks. This multi-use pedestrian/cyclist network will primarily serve slower recreational cycling movements to ensure user compatibility and safety.
- Cycling planning in Kelowna is based on the existence of a potentially large “latent” demand, meaning people would use bicycles rather than cars if better facilities were provided.
- As funding becomes available, the City will implement a staged network of bicycle trails… for purely off-road bicycle trail use.
- The City will endeavor to acquire additional bike routes through the use of the CNR rail right-of-way should it no longer be required for railway use.
- The highest priority improvements would connect all Town (urban) Centres with each other and the Okanagan University North campus.
- Any designated commuter bicycle routes within the City will favour on-road bikeways as opposed to mixed-use trails to reduce potential bicyclist/pedestrian conflicts.

- The City will also work in cooperation with neighbouring jurisdictions in the Okanagan Valley, and with the Ministry of Transportation and Highways in order to establish connections with bikeways in these adjoining areas.

In general, the Transportation Plan envisioned use of the rail corridor as a bicycle route, although the intended use was not specified. Commuter routes were to be generally on-road, with off-road facilities for slower cycling and pedestrians. The document included a proposed bicycle network map.

A.3 Mill Creek Linear Park Master Plan, 2000

The Mill Creek Linear Park Master Plan was prepared for the City of Kelowna in part to develop a trail system along Mill Creek. Mill Creek flows adjacent to the rail corridor generally between Spall Road and Bulman Road, near the Elliston Overpass with Highway 97. Therefore, the proposed Mill Creek trail may provide a parallel or alternative trail to the proposed railway trail. The plan also provides for connections from the Mill Creek Linear Park to local and regional bicycle routes.

As part of the planning work, relevant corridor features were identified, including:

- Historical and cultural features;
- Land use and views;
- Topography and geology;
- Hydrology and water quality features; and
- Vegetation and wildlife.

A.4 Sidewalk Master Plan, 2000

In December of 2000, work was completed on the Kelowna Sidewalk Master Plan (titled then as the Pedestrian Master Plan). The purpose of the plan was to develop a priority list of sidewalk projects on collector and arterial roads that would best encourage walking. As the plan for the proposed railway trail is developed, links should be considered to the existing sidewalks and to the higher priority future sidewalk projects identified in the plan.

A.5 Consolidated Zoning Bylaw No. 8000

This bylaw provides the regulations for development and redevelopment within each land use designation. The provisions most likely to affect development of the trail would be those related to landscaping and screening (Section 7).

The bylaw includes the municipal zoning of the railway corridor property. However, the bylaw does not apply directly to the railway lands, as described in Section 1.4.3 (h), although private rail sidings are covered. The zoning map (Schedule A, also available on the City's web site at *www.city.kelowna.bc.ca*) indicates the zoning of the adjacent properties.

A.6 Subdivision, Development and Servicing Bylaw No. 7900

This bylaw sets the standards and specifications for works and services in connection with the subdivision and development of land. It is expected that any design or construction work related to the provision of a trail within the rail right-of-way would adhere to this bylaw.

The design and construction standards expected to relate to the proposed trail related to drainage, highways at the road crossings, and electrical services. The bylaw specifically adopts the highway or road design elements of the Transportation Association of Canada (TAC). Although reference is made to the 1986 TAC manual, which has since been replaced by the 1999 TAC publication Geometric Design Guide for Canadian Roads.

Detail drawings related to bicycle and/or pedestrian trails are not provided in the bylaw document. However, a detail design for a walkway gate is shown (reference SS-R28).

A.7 Utility Location Maps

Several utilities are located within the railway right-of-way. Some information is contained on City records. The known utilities include:

- Watermains;
- Storm sewer; and,
- Sanitary Sewer.

Other utilities are also believed to be located within the corridor. Engineering services are provided to the railway by an engineering consultant (UMA). Additional utility information may be available from this source and will be compiled if and when received.

A.8 Crime Prevention through Environmental Design, 1999

The document provides guidelines and suggestions for improving safety through environmental design. The general principles to reduce crime are provided as they might relate to the trail design.

- Natural surveillance from visibility from buildings, through unobstructed sight lines, and through adequate night lighting can reduce the need for formal surveillance. Having the trail visible from adjacent buildings or from busy road or sidewalks would therefore be desirable.
- Features should define public and private property to develop a sense of territorial control. This enhances the pride of ownership and discourages offenders. A clear delineation between the trail, the railroad, and adjacent private property would therefore be desirable.
- Access to private areas should be discouraged and public routes clearly indicated.
- Dark or blind spots should be avoided but not all areas need to be lit at night.

A.9 Environmental Agency Consultation

As part of the consultation for this feasibility study, a meeting was held on July 10, 2001 with representatives of:

- Fisheries and Oceans, Canada;
- Ministry of Sustainable Resource Management; and
- Ministry of Water, Land and Air Protection.

The Federal and Provincial Ministries will need to be involved on this project particularly because Mill Creek supports a variety of game fish. Any disturbance of fish habitat will require approvals.

Impervious trail surfaces are discouraged within 15 metres of Mill Creek. At some locations, the construction of the trail may be within the 15 metres zone. Encroachments within 15 metres may trigger compensation and/or mitigation measures. The gravel path along the Mill Creek Linear Park is proposed for recreational purposes only and is not suitable for commuting cyclists. The trail along the rail line may relieve the need for the recreational trail along very difficult sections adjacent to Mill Creek, for example north of Spall Road.

Brandt Creek is not considered to be major issue because it does not have important fish species, but the waterway must be kept open and not disturbed. The environmental representatives emphasized that care should be taken at the section near High Road.

The Federal and Provincial representatives need more information and the opportunity for review before stating whether the trail in the railway corridor is feasible from an environmental aspect.

A.10 Ministry of Transportation

The Ministry of Transportation wants to improve cycling safety and utility along the Highway 97 corridor. The Ellison Overpass is of particular concern, especially for northbound cyclists, because there is no shoulder on the bridge structure. A trail in the railway corridor could provide a superior alternative for north-south cycling. The Ministry is a key stakeholder on this project.

A.11 Railway Operator, Owner, and Regulator

Kelowna Pacific Railway

A meeting was held on July 18, 2001 with two representatives from Kelowna Pacific Railway (KPR), the current operator of the railway. The representatives provided the following information about KPR operations:

- KPR belongs to a larger group of short line railroads such as the New York and Lake Erie Railroad, and are part of the Knighthawk organization.

- Legal and engineering services are contracted out. UMA handles the engineering and technical issues from their Edmonton Office.

- In 1999, the KPR obtained a 20-year lease from the CNR between Kelowna and Vernon. KPR has joint operating agreements with the Okanagan Valley Railroad (OVR) north of Vernon and connect to the CPR to get to their terminus in Kamloops. The OVR also operates into Kelowna. KPR subleases to the Wine Excursion Train.

- KPR's main customers are Riverside Lumber Mill, Sun Rype, OK Builders Cement, Knox Mountain Metals, and Crown Packaging. There are many smaller customers.

- Products moved are mainly wood chips, plywood, metal and salt. There is a very low volume of dangerous goods moved by the KPR.

- There is daily service of one train in and out by the KPR and one by the OVR. The Wine Train operates May to September.

- The right-of-way is typically 100 feet wide (30 metres) but can be as narrow as 60 feet (20 metres) at some locations.

- The track is designated as a class 2 standard, which has a maximum speed of 40 kilometres per hour (25 miles per hour) for freight and 50 kilometres per hour (30 miles per hour) for passenger service. This may be upgraded in the future to a class 3 line with a maximum speed of 65 kilometres per hour (40 miles per hour) for freight and 95 kilometres per hour (60 miles per hour) for passenger rail.

- There have been some minor derailments on customer sidings but none on the main line.

- There was a fatality in February at a railroad crossing near Riverside. Transport Canada reviewed the KPR operations and various safety measures have been implemented.

- Spur lines and sidings are used but if a trail is built it is unlikely that railcars would block the trail.

- KPR is aggressively and successfully marketing their services and more future growth is expected.

- Utilities in the right-of-way are there under licensing agreements. KPR can allow additional utilities. UMA has some information about their location. A paved trail over the underground utilities is not a major concern, however, care needs to be taken during construction and excavating.

The KPR officials raised a number of concerns and issues related to a trail along their active rail line:

- Existing trespassing is felt to be a problem at some locations. While a trail can reduce some incidents, it may create additional opportunities for unauthorized access and higher risk situations, especially in the more populated section south of the Airport.

- A physical barrier (fence) between the trail and the rail line is paramount to discourage trespassing, improve safety and reduce liability.

- The rail operator's minimum lateral clearance requirement is 2.5 metres (8 feet). Therefore, any fence should be no less than 2.5 metres and preferably 3.0 metres (10 feet) from the centre of the tracks. KPR would like to see as much setback as possible in case of future speed increases.

- The operator feels that the low frequency and speeds of KPR trains create a false sense of security resulting in a public lack of respect for the train operations and the potential dangers.

- Encroachments into the rail corridor by adjacent property owners are being experienced. Other encroachments include the parking of cars near the city-operated baseball diamond parks west of Spall Road.

- The KPR would prefer not to have the trail crossing the tracks. Where possible, the trail should change sides at existing roadway crossings. If a rail crossing is required, it should be at right angles to the track where there are good sight lines. A culvert underpass could be considered where feasible.

- The rails are maintained by equipment on the track so a paved trail would not provide a major advantage in terms of track maintenance operations.

- The trail can be an asset for fire fighting and other emergency access.

- The trail must be designed to prevent unauthorized motor vehicles from entering and using the trail.

- KPR suggested that a Long Term License to Use agreement might be the best option for using a portion of the rail corridor as a public trail. KPR would like to discuss some property tax relief as part of the agreement.

CN Rail

A discussion was held with L. Yurkiw, a representative of Canadian National's real estate section on October 3, 2001. The following points were discussed.

- CN's experience with rails-with-trails proposals tends to be contrary to CN's policies regarding safe operations, especially as it relates to maintaining adequate setbacks from the active tracks. CN will oppose schemes that are not consistent with CN safety policies.

- CN should be involved in any land agreement
- The operator cannot grant a permanent land use to a third party.
- CN can cancel any land agreement entered into by KPR in 30 days.
- CN would consider the future development of the property, particularly as it is in an urban area. They currently do not have long term plans for the property.
- CN has granted a lease for a rail-with-trail that is part of the 'Fort to Fort' trail in Fort Langley, B.C.
- CN's Regulatory Affairs Department would have to be consulted on any proposed trail, particularly with respect to operational safety.
- In the Okanagan, the railway was built after the land was subdivided. This is why there are numerous properties within the rail right-of-way.
- On CN railways, the property titles usually do not have use restrictions (they are 'clean'). The case where a clause is registered on the title where the railway would revert to the Crown if the land is not used for railway purposes is not common on CN property.
- Canada Lands (formerly CN's real estate division) now own the de-commissioned western portion of the rail corridor.
- CN would like to see a sketch of the proposed trail. We discussed providing CN copies of the two Technical Memoranda and the Draft Report for this project.
- CN will look for any alignment drawings they may have, particularly those that locate the track within the right-of-way. Often these drawings do not exist.
- UMA has an alliance with CN to provide engineering services. The contact would be Teresa Doolittle in Edmonton.

Transport Canada

The issues that may relate to government regulations related to the rail corridor were discussed with I. Mann of the Railway Safety section of Transport Canada on June 28, 1001. The points discussed are listed below.

- Knighthawk/ Kelowna Pacific lease the track and right-of-way from CN to maintain and operate the line. They applied for and got a Certificate of Operations.

- Transport Canada inspects railways for safety (trains, tracks, et cetera).

- Transport Canada would be interested in seeing the plans for the trail, although we do not need their approval. However, if something is unsafe, it could be removed after it is built. He thinks it would be better to advise them early in the process, but it is not required.

- If there are to be crossings of the track, Transport Canada is more involved.

- The railway will likely be most interested in safety and will require a fence. He suggests a clearance of 14 feet (4.3 metres) from the track centreline to any obstacle.

- He thinks that CN may need to approve any deal for a trail. His suggested contact at CN is Hal Erikson in Edmonton (780) 421-6430.

- If a new track crossing is required, the municipality and the railway must reach agreement (does not technically have to be written but most are).

- The agreement "may be filed" with the Canadian Transportation Agency (CTA). CTA looks after disputes and public convenience, but nor safety (Transport Canada does that). If the municipality and the railway cannot agree, CTA will rule.

- New track crossings may need a 60-day notice to all adjacent property owners. Transport Canada may also assess the safety of the crossing and could take it out if unsafe.

- Information is on Transport Canada's web site related to the Railway Safety Act – particularly 8 pages of Section 11 that requires crossings to be certified by a P.Eng.. Rules for new track crossings are also on the web site.

A.12 Rails-with-trails, 2000

The document was produced by the Rails-to-Trails Conservancy, a non-profit organization, to document the design, management, and operating characteristics of 61 trails along active rail lines. It included an extensive survey of U.S. trail managers to provide their experience to trail planners, advocates and managers. The general findings of the report are listed here.

- In the year 2000, 61 rails-with-trails were identified in the United States, up from 37 in the year 1996 (an average increase of 14 percent each year).
- Constructing a trail along an active railroad provides a community benefit through additional transportation choice.

- Rails-with-trails appear to be as safe as other off-road trails, despite fears of the opposite. Only one accident between a trail user and a train was found in the survey.
- A rail-with-trail may be significantly safer than walking or cycling next to a busy road due to the lower exposure to vehicles.
- The formal trail may serve to keep people from walking on active rail tracks.
- Rails-with-trail benefits for railroads can include corridor beautification, reduction of trespassing on tracks, improved community relations, improved maintenance, and reduced vandalism.
- Most trail managers (59 percent) described the attitude of the railroad to the trail as 'neither opposed nor supportive', followed by 33 percent who described the railroad as supportive.
- The majority of rails-with-trails are insured with coverage similar to that for other trails. An increasing number of railroad companies require trail managers to indemnify them against some liability. The survey found only three claims made against trail managing agencies and no claims made against railroad companies.
- Safety can be enhanced by providing adequate distance between track and trail, providing a barrier or grade separation where necessary, using licensed professionals to design the trail, designing safe rail crossings, and installing adequate warning signs.

A.13 Rails-Trails and Liability, 2000

The Rails-to-Trails Conservancy prepared this report as a primer on trail-related liability issues and risk management techniques. It outlines the general legal issues associated with all trails, not just rails-with-trails, with a focus on the American legal system. Concerns and solutions are discussed along with the results of a trail manager survey.

The report found that railway trails have not posed significant legal liability problems. This was attributed to appropriate management that accounts for safety, including trail design, construction, and maintenance. Laws that protect adjacent landowners and trail managers should provide adequate protection.

The risks for bicyclists and pedestrians using trails were found to be less than those associated with similar use of streets and highways. The relative safety of trails is one of the major reasons they are so popular.

A.14 Rails-with-Trails: Best Practices Report - Phase 1, 2001: State of the Practice

The U.S. Department of Transportation sponsored this report prepared by Alta Transportation Consulting. The work is a follow-up to a draft paper prepared by an Institute of Transportation Engineers Technical Committee in 1998, where the need for a more in-depth study was identified.

The Phase 1 report examines safety, design, and liability issues associated with the development of multi-use trails within active railroad rights-of-way. A literature review was conducted and 21 case studies were analyzed. The Phase 1 report is a preliminary document that was later combined with the Phase 2 report in the fall of 2001.

In its summary of Canadian experience, the review found that the Canadian Pacific Railway (CPR) Police Service, Community Services Unit is undergoing an internal discussion about rails-with-trails. A series of issues are discussed in a report produced by CPR in 2000.

A.15 Rails-with-Trails: Lessons Learned - Phase 2, November 2001 Draft

An early draft of Phase 2 of the U.S. Department of Transportation study was provided by Alta Transportation Consulting. When complete, it will present the practices that appear to be working elsewhere in terms of legislation, policy, design, operations and management, liability and other areas related to rails-with-trails. The preliminary study recommendations are summarized here.

- *Planning* - Trail plans should include viable alternatives to any trail that is proposed within an active railroad corridor.

- *Feasibility Process* - Form a Technical Advisory Committee consisting of the trail manager, affected local agencies, and [City] departments. Representatives of the railroad company or agency should be on the technical committee. Members of the public or special interest groups may be included in an affiliated Advisory Committee.

- *Public Input* - The feasibility study and environmental review should incorporate extensive public review. The typical process starts with an initial public workshop. This is followed by a second round of workshops where the results of the feasibility study and environmental analysis are presented, a preferred alignment and two alternatives are presented, and comments are received.

- *Railroad Involvement* – The railroad should be contacted as an initial step and informed that the public agency is interested in acquiring property for the purpose of a trail, stating that a full feasibility is to be conducted that will include the railroad. It is unlikely the railroad can make a final determination to grant access at this point in the process.

  If serious, the public agency should commit to developing the project into enough detail so the true impacts, benefits, costs and feasibility are known. However, if the railroad company has absolutely no interest in allowing access, they should express this in clear terms.

- *Railroad Policy* – A railroad company may wish to develop an internal policy on rails-with-trails and provide a consistent response to all such proponents. The railroad's policy may involve requesting involvement in the review process, a detailed project description and a feasibility report.

- *Environmental Review* – As part of or concurrent with a feasibility study, a preliminary environmental analysis should be conducted. This would include biological, cultural, hydrological, geological, noise, light, traffic safety, and other impacts. This allows planners and engineers to pre-mitigate a trail project or eliminate an alignment entirely early in the process.

- *Warn Trail Users at Trailheads* – Trail developers should provide signs at trailheads and other entrances warning users to stay off the railroad tracks, and that trespassing is a crime.

- *Adhere to Best Available Design Guidelines* – Trail designers, railroad officials, and other officials should work together so that the trail design follows best available practices as identified in this report, the AASHTO Guide for the Development of Bicycles Facilities and MUTCD and State bikeway and trail guidelines, when they exist.

- *Ensure Laws Cover Use*– (American) Recreational Use Statutes should be specifically revised to be applicable to rails-with-trails.

- *Reduce Railroad Liability Exposure* – To the extent practicable and reasonable, trail management organizations should enter into indemnification agreements that absolve railroad companies of liability responsibility for injuries related to railroad activities on railroad property. Trail management organizations should also pay the cost for railroad company insurance for defense of claims.

- *Setback from Tracks* – Maximize the setback between any trial-with-trail and active railroad track to the extent feasible. The recommended setback between track centreline and closest edge of the trail is 7.6 metres for most higher speed and higher frequency trains.

- *Exceptions to Recommended Setback* – Subject to railroad, state, and federal guidelines and the advice of engineering and safety experts, exceptions to the recommended setback include constrained areas, low traffic and speed branch lines, and areas where there is a history of extensive trespassing.

- *Track Crossings* – Trail planners should minimize the number of at-grade crossings as much as possible, and seek all reasonable alternatives to new at-grade track crossings.

- *At-Grade Crossing Designs* – (American) Adhere to the standards set forth in the AASHTO Guide for the Development of Bicycle Facilities and any federal railroad crossing guidelines. [Note: The AASHTO guide is used as a reference for the Transportation Association of Canada's bikeway guidelines described in this report.]

- *Bridges and Trestles* – The cost and environmental impact of having to construct new bridges and trestles should be clearly understood as part of the feasibility process, as should the opinion of the railroad company and any public agency that must approve or issue permits for the crossing.

- *Cut and Fill Sections* – The presence of extensive cut and fill sections on a proposed trail corridor should alert the trail planners and designers to focus on this obstacle first to determine if it is a fatal flaw. The costs, environmental impact, and impact on access for disabled persons should be clearly understood. As a rule, any trail on higher speed and frequency lines that is proposed to be closer than 7.6 metres for more than 50 percent of its length should be considered to have a fatal flaw. Medium and low volume and speed train operations allow for lower setbacks.

- *Continuity* – The rails-with-trails project should only be considered where it is a rational part of a longer trail network, serves a real connecting purpose, and does not duplicate existing resources.

- *Trailheads* – Identify future parking and trailhead needs, and include them as appropriate in the feasibility study and as part of the overall project cost estimate.

- *Landscaping* – Include landscaping as an optional cost element in the feasibility study, especially if it will address wind or sun problems with the corridor. Keep all higher landscaping (greater than one metre) back at least 61 metres [sic] from every active railroad/road crossing.

- *Drainage* – The feasibility study should include a section on drainage, and especially how the existing railroad drainage system will be maintained.

- *Lighting* – Consider lighting needs for commuting and safety purposes, especially at crossings, as part of the basic feasibility study.

- *Signs and Markings* – (American) Follow MUTCD, state, and local standards for signing and marking of rails-with-trails.

- *Utilities* – Include a full review of existing and potential utilities in the railroad corridor.

- *Tracks and Sidings* – Include discussions with the railroad operator about all existing and future tracks and sidings in the proposed corridor. Design and locate the trail so as not to preclude potential future sidings and tracks and locate the trail to avoid all existing sidings.

- *Operations Personnel Involvement* – Train operators, engineers, and signalmen should be invited for technical discussions and advice in the feasibility analysis phase.

- *Maintenance and Access* – Include the maintenance and access needs of the railroad operator in the alignment and design of the trail. Provide adequate room for railroad access and operations outside the trail and fenced area wherever possible. In areas with less than 7.6 metre setback, address the railroad's need for routine and emergency access to the trail as a shared maintenance road. Improvements that would become the responsibility of the trail management agency should be identified.

- *Construction Management* – Include a construction phasing and management section in the feasibility study. Consult with the railroad to determine the steps, approvals, permits, designs and other requirements.

A.16 Transportation Association of Canada

The Geometric Design Guide for Canadian Roads, 1999 is published by the Transportation Association of Canada. The recommended practices in the guide will be used throughout this project, as specified in the City's Subdivision, Development and Servicing Bylaw. The material most relevant to the rails-with-trails project is contained in Chapter 3.4, which describes bikeways. The major relevant points from the TAC guide related to route planning and design are listed here.

- Bike routes must have adequate space, a smooth surface, the ability to maintain bike speed, and connectivity.
- Bicycle trails intended for use by commuters should follow a direct route to popular destinations. Rail corridors can offer an opportunity to provide a high quality commuter trail.
- While trails shared between cyclists and pedestrians offer benefits, conflicts between users can occur. A segregated trail, separate facilities, and/or provision of a centreline should be considered.
- The recommended widths for bicycle lane widths are provided in TABLE A.2. The minimum recommended width for a two-way trail shared with pedestrians is 3.0 metres.
- A horizontal clearance of 600 millimeters is generally maintained between a bikeway and any lateral obstruction.

TABLE A.2 BIKE TRAIL LANE WIDTH

CLASSIFICATON		LANE WIDTH (m)
DIRECTION	USE	Design Domain
Two-Way	Cycling Only	2.5 to 3.5
	Shared With Pedestrians	3.0 to 4.0
One-Way	Cycling Only	1.5 to 2.0
	Shared With Pedestrians	2.0 to 3.0

Source: Geometric Design Guide for Canadian Roads, Table 3.4.6.1.

The relevant points related to treatment at road intersections and track crossings are listed here.

- Mid-block crossing should be avoided because drivers are not expecting cyclists between intersections.
- If unavoidable, mid-block crossings should be at right angles to the street and be designed to encourage the cyclist to reduce speed and stop if necessary. Other measures such as signing, textured surfaces and bollards can be used to warn cyclists and drivers of the crossing and to advise which vehicle has the right-of-way. Adequate sight distance should be provided as calculated from the road design speed and width.
- At signalized intersections, the cyclist is to obey traffic signals. The STOP bar and the bike trail can be set back from the standard crosswalk to improve sight distance. Bicycle signs are normally installed.
- Tracks can be especially hazardous to cyclists. If possible, tracks should be flush with the trail or road surface and the cyclist should cross at right angles. STOP bars on the trail and railway crossing signs are also recommended.

A. 17 Examples of Rails-with-trails

Staff from the City of Kelowna also conducted interviews with the managers of several Canadian and American rails-with-trails. The interviews were summarized by the City as below.

The American candidates were selected from those surveyed as part of the Rails with Trails report by the Rails-to-Trails Conservancy based on their similarity with the Kelowna situation.

- Two of the case studies have gate-controlled crossings with signals (one on a road, one just for the trail). Another trail will be required to install gates when it is extended in the future.
- Two trails have crossings with signals/flashing lights.
- All other examples use signage (railroad approved signage, stop signs, warning signs) when the trail crosses tracks (on its own or on road).
- All but one case study use signage (stop signs and warning signs) in situations where trail crosses roads. One respondent mentioned the use of a crosswalk. In all but one case, trail users are expected to stop before crossing road.
- In all cases, the respective railroad company maintains the tracks and land abutting the tracks.
- All trails are maintained by the City or County. Some cases have volunteer organizations that are taking care of some of the maintenance.

Information collected concerning the four Canadian trails is summarized in TABLE A.3.

TABLE A.3 SUMMARY OF CANADIAN TRAIL EXAMPLES

TRAIL FEATURE	TRAIL			
	Kent Avenue, Vancouver	Sentier du Curé Labelle, Ste-Therèse, Quebec	E&N, Nanaimo	CASO – St. Thomas, Ontario (not built yet)
Corridor Width (metres)	20	*	30	*
Length of Trail Along Railway (km)	1.1	35	4	5
Maximum Speed (kilometres per hour)	25	110	80	*
Trains per Day	6	26	5	3
Physical Barrier between Rail and Trail	fence	fence	grade separation, trenches	fence
Surface	gravel	gravel	asphalt	asphalt

* Not Specified.

The specific points of interested gained from the interviews that may be relevant to the Kelowna trail are:

- Negotiations can be difficult and may involve adjacent land developers, provincial Ministries, Mayors, and non-profit groups (Kent Avenue, Vancouver and Ste-Therèse, Quebec);
- Snowmobile use was rejected by CP Rail (Ste-Therèse, Quebec);
- The existence of the rail-with-trail significantly reduced pedestrian use of the tracks (Nanaimo); and
- The railway was excused from property taxes in return for a lease of the trail land (St. Thomas, Ontario).

APPENDIX B
DETAILED COST ESTIMATES

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Rails With Trails Feasibility Study
Sections 1 to 8 (22.39km)*
Preliminary Construction Cost Summary

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**
Revised Date: December 18, 2001

	Trail Construction	Miscellaneous	40% Contingency	Extension
Section 1 (1.18 km)	$73,400	$1,500	$29,960	$104,860
Section 2 (1.83 km)	$177,000	$151,975	$131,590	$460,565
Section 3 (1.31 km)	$303,000	$148,575	$180,630	$632,205
Section 4 (0.96 km)	$177,600	$139,250	$126,740	$443,590
Section 5 (3.91 km)	$533,710	$353,650	$354,944	$1,242,304
Section 6 (2.42 km)*	$302,000	$58,650	$144,260	$504,910
Section 7 (2.1 Km)	$329,700	$178,500	$203,280	$711,480
Section 8 (8.68 km)	$1,556,500	$368,350	$769,940	$2,694,790
Total Preliminary Construction Cost	**$3,452,910**	**$1,400,450**	**$1,941,344**	**$6,794,704**

*** Includes the construction of 0.8 km of trail to connect trail to Okanagan University College North Campus**

Rails With Trails Feasibility Study
Section 1 - Clement Avenue Alignment
Ellis Street to Gordon Drive - 1.18 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 9, 2001**

Description	Unit	Quantity	Unit Price	Amount
Section 1 - Ellis Street to Gordon Drive - 1.18km				
Trail Construction - 3 m wide along existing road shoulder				
Waste Excavation (0.25m deep)	cu.m.	900	$10	$9,000
Asphaltic Concrete Cement C/W Base	sq.m.	3,550	$18	$63,900
Centre-Line Painting	l.s.	1	$500	$500
Sub-Total Trail Construction Cost				$73,400
Railroad/Culvert Crossings & Miscellaneous				
Gordon Drive Crossing	each	1	$1,500	$1,500
Sub-Total Miscellaneous				$1,500
Sub-Total Section 1 Preliminary Construction Cost				**$74,900**
Add 40% Contingency Fee				**$29,960**
Total Section 1 Preliminary Construction Cost Estimates (Rounded)				**$100,000**

Rails With Trails Feasibility Study
Section 2 - Southern & Northern Alignment
Gordon Drive to Spall Road - 1.83 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 9, 2001**
Revised Date: December 18, 2001

Description	Unit	Quantity	Unit Price	Amount
Section 2 - Gordon Drive to Spall Road - 1.83 km				
A. Gordon Drive to High Road - Trail along Southside - 3 m wide (450m)				
Clearing	ha.	0.20	$12,000	$2,400
Waste Excavation (0.35m deep)	cu.m.	550	$10	$5,500
Subgrade Granular Fill	cu.m.	250	$15	$3,750
Asphaltic Concrete Cement C/W Base	sq.m.	1,350	$23	$31,050
Centre-Line Painting	l.s.	1	$400	$400
C. High Road to Spall Road - Trail along Northside - 3 m wide (1380m)				
Clearing	ha.	0.55	$12,000	$6,600
Waste Excavation (0.35m deep)	cu.m.	1,700	$10	$17,000
Subgrade/Embankment Granular Fill	cu.m.	1,000	$15	$15,000
Asphaltic Concrete Cement C/W Base	sq.m.	4,100	$23	$94,300
Centre-Line Painting	l.s.	1	$1,000	$1,000
Sub-Total Trail Construction Cost				$177,000
Railroad/Culvert Crossings & Miscellaneous				
Culvert Crossing at School	each	1	$1,500	$1,500
Upgrade Railroad Crossing @ High Road	each	1	$8,000	$8,000
Fencing along Railroad Side	lm	1,830	$33	$59,475
Spall Road Crossing - Pedestrian Signal	ls	1	$75,000	$75,000
Gravel Parking at Trail Head	ls	1	$8,000	$8,000
Sub-Total Miscellaneous				$151,975
Sub-Total Section 2 Preliminary Construction Cost				**$328,975**
Add 40% Contingency Fee				**$131,590**
Total Section 2 Preliminary Construction Cost Estimates (Rounded)				**$460,000**

Rails With Trails Feasibility Study
Section 3 - Southern Alignment
Spall Road to Dilworth Drive - 1.31 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 10, 2001**

Description	Unit	Quantity	Unit Price	Amount
Section 3 - Spall Road to Dilworth Drive - 1.31 km				
Trail along Southside - 3 m wide				
Clearing	ha.	0.60	$12,000	$7,200
Waste Excavation (0.4m deep)	cu.m.	2,620	$10	$26,200
Embankment Granular Fill	cu.m.	12,000	$15	$180,000
Asphaltic Concrete Cement C/W Base	sq.m.	3,930	$20	$78,600
Drainage	l.s.	1	$10,000	$10,000
Centre-Line Painting	l.s.	1	$1,000	$1,000
Sub-Total Trail Construction Cost				$303,000
Railroad/Culvert Crossings & Miscellaneous				
Bridge Crossing @ Mill Creek (West of Hardy St.)	each	1	$30,000	$30,000
Bridge Crossing @ Mill Creek (East of Hardy St.)	each	1	$50,000	$50,000
Spur Line Crossing (West of Hardy Street)	each	1	$8,000	$8,000
Spur Line Crossing (East of Hardy Street)	each	1	$8,000	$8,000
Hardy Street Crossing	ls	1	$5,000	$5,000
Dilworth Drive Crossing	ls	1	$5,000	$5,000
Fencing along Railroad Side	lm	1,310	$33	$42,575
Sub-Total Miscellaneous				$148,575
Sub-Total Section 3 Preliminary Construction Cost				**$451,575**
Add 40% Contingency Fee				**$180,630**
Total Section 3 Preliminary Construction Cost Estimates (Rounded)				**$630,000**

Rails With Trails Feasibility Study
Section 4 - Northern Alignment
Dilworth Drive to Highway 33 - 0.96 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**

Description	Unit	Quantity	Unit Price	Amount
Section 4 - Dilworth Drive to Highway 33 - 0.96 km				
Trail along Northside - 3 m wide				
Clearing	ha.	0.4	$12,000	$4,800
Waste Excavation (0.3m deep)	cu.m.	600	$10	$6,000
Rock Excavation	cu.m.	2,400	$35	$84,000
Embankment Granular Fill	cu.m.	2,000	$8	$16,000
Asphaltic Concrete Cement C/W Base	sq.m.	2,900	$20	$58,000
Drainage	l.s.	1	$8,000	$8,000
Centre-Line Painting	l.s.	1	$800	$800
Sub-Total Trail Construction Cost				$177,600
Railroad/Culvert Crossings & Miscellaneous				
Railroad crossing East of Dilworth Drive	each	1	$8,000	$10,000
Retaining Wall (Lock Block Wall)	l.m.	200	$500	$100,000
Fencing along Railroad Side	lm	900	$33	$29,250
Sub-Total Miscellaneous				$139,250
Sub-Total Section 4 Preliminary Construction Cost				**$316,850**
Add 40% Contingency Fee				**$126,740**
Total Section 4 Preliminary Construction Cost Estimates (Rounded)				**$440,000**

Rails With Trails Feasibility Study
Section 5 - Northern & Southern Alignment
Highway 33 to Sexsmith - 3.91 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**

Description	Unit	Quantity	Unit Price	Amount
A. Highway 33 to South of Leathead Rd. - Trail along Northside - 3 m wide (380 m)				
Clearing	ha.	0.12	$12,000	$1,440
Waste Excavation (0.35m deep)	cu.m.	400	$10	$4,000
Rock Excavation	cu.m.	500	$35	$17,500
Embankment Granular Fill	cu.m.	2,100	$8	$16,800
Asphaltic Concrete Cement C/W Base	sq.m.	1,220	$23	$28,060
Drainage	l.s.	1	$2,500	$2,500
Centre-Line Painting	l.s.	1	$500	$500
B. South of Leathead Rd. to South of McCurdy Rd. - Trail along Sorthside 3 m wide (1040 m)				
Clearing	ha.	0.40	$12,000	$4,800
Waste Excavation (0.35m deep)	cu.m.	850	$10	$8,500
Embankment Granular Fill	cu.m.	4,800	$8	$38,400
Asphaltic Concrete Cement C/W Base	sq.m.	3,200	$23	$73,600
Drainage	l.s.	1	$5,000	$5,000
Centre-Line Painting	l.s.	1	$800	$800
C. South of McCurdy Rd. to Sexsmith Rd. - Trail along Northside - 3 m wide (2490m)				
Clearing	ha.	1.00	$12,000	$12,000
Waste Excavation (0.35m deep)	cu.m.	3,500	$10	$35,000
Embankment Granular Fill	cu.m.	12,000	$8	$96,000
Asphaltic Concrete Cement C/W Base	sq.m.	7,470	$23	$171,810
Drainage	l.s.	1	$15,000	$15,000
Centre-Line Painting	l.s.	1	$2,000	$2,000
Sub-Total Trail Construction Cost				$533,710
Railroad/Culvert Crossings & Miscellaneous				
Bridge Crossing @ Mill Creek (Near Leathead Rd.)	each	1	$30,000	$30,000
Railroad Crossing South of Leathead Rd.	each	1	$8,000	$8,000
Drive Way Crossing @ Cattle Range	each	1	$2,500	$2,500
Road Crossing South of McCurdy Drive	each	1	$8,000	$8,000
Railroad Spur Line Crossing @ McCurdy Rd.	each	1	$16,000	$16,000
Bridge Crossing @ Mill Creek (Near Stremel Rd.)	each	1	$30,000	$30,000
Sexsmith Road Crossing	ls	1	$5,000	$5,000
Fencing along Railroad Side	lm	3,910	$33	$127,075
Fencing along ALR properties	lm	3,910	$33	$127,075
Sub-Total Miscellaneous				$353,650
Sub-Total Section 5 Preliminary Construction Cost				**$887,360**
Add 40% Contingency Fee				**$354,944**
Total Section 5 Preliminary Construction Cost Estimates (Rounded)				**$1,240,000**

Rails With Trails Feasibility Study
Section 6 - Western Alignment
Sexsmith Road to Ellison Overpass - 2.42 km *

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**

Description	Unit	Quantity	Unit Price	Amount
Section 6 - Sexsmith Road to Ellison Overpass - 1.62 km				
Trail along Westside - 3 m wide				
Clearing	ha.	0.70	$12,000	$8,400
Waste Excavation (0.35m deep)	cu.m.	2,000	$10	$20,000
Embankment Granular Fill	cu.m.	2,600	$15	$39,000
Asphaltic Concrete Cement C/W Base	sq.m.	4,900	$23	$112,700
Drainage	l.s.	1	$10,000	$10,000
Centre-Line Painting	l.s.	1	$1,000	$1,000
Sub-Total Trail Construction Cost				$191,100
Trail to Okanagan University, West of Highway 97 - 3 m wide (800m)				
Clearing	ha.	0.30	$12,000	$3,600
Waste Excavation (0.35m deep)	cu.m.	900	$10	$9,000
Embankment Granular Fill	cu.m.	2,500	$15	$37,500
Asphaltic Concrete Cement C/W Base	sq.m.	2,400	$23	$55,200
Drainage	l.s.	1	$5,000	$5,000
Centre-Line Painting	l.s.	1	$600	$600
Sub-Total Trail Connection to University				$110,900
Sub-Total Trail Construction Cost (Including Trail to the University)				**$302,000**
Railroad/Culvert Crossings & Miscellaneous				
Lougheed Road Crossing	ls	1	$6,000	$6,000
Fencing along Railroad Side	lm	1,620	$33	$52,650
Sub-Total Miscellaneous				$58,650
Sub-Total Section 6 Preliminary Construction Cost				**$360,650**
Add 40% Contingency Fee				**$144,260**
Total Section 6 Preliminary Construction Cost Estimates (Rounded)				**$500,000**

*** Includes the construction of 0.8 km of trail to connect trail to Okanagan University College North Campus**

Rails With Trails Feasibility Study
Section 7 - Western Alignment
Ellison Overpass to Airport Road - 2.1 Km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**

Description	Unit	Quantity	Unit Price	Amount
Section 7 - Ellison Overpass to Airport Road - 2.10 km				
Trail along Westside - 3 m wide				
Clearing	ha.	0.90	$12,000	$10,800
Waste Excavation (0.35m deep)	cu.m.	2,600	$10	$26,000
Embankment Granular Fill	cu.m.	9,100	$15	$136,500
Asphaltic Concrete Cement C/W Base	sq.m.	6,300	$23	$144,900
Drainage	l.s.	1	$10,000	$10,000
Centre-Line Painting	l.s.	1	$1,500	$1,500
Sub-Total Trail Construction Cost				$329,700
Railroad/Culvert Crossings & Miscellaneous				
Local Road Crossing North of Ellison Overpass	ls	1	$3,000	$3,000
Bridge Crossing @ Mill Creek (South of Airport Rd.)	each	1	$30,000	$30,000
Local Road Crossing South of Airport Road	ls	1	$3,000	$3,000
Airport Road Crossing	ls	1	$6,000	$6,000
Fencing along Railroad Side	lm	2,100	$33	$68,250
Fencing along ALR properties	lm	2,100	$33	$68,250
Sub-Total Miscellaneous				$178,500
Sub-Total Section 7 Preliminary Construction Cost				**$508,200**
Add 40% Contingency Fee				**$203,280**
Total Section 6 Preliminary Construction Cost Estimates (Rounded)				**$710,000**

Rails With Trails Feasibility Study
Section 8 - Western Alignment
Airport Road to Winfield - 8.68 km

Preliminary Class "D" Trail Construction Cost Estimate.
Construction Cost Estimates shall be verified at the preliminary design stage.

Prepared by: Thomas Ho P.Eng. **File No.: 7555**
Checked by: Erica Geddes, M.A.Sc., P.Eng., PTOE **Date: October 11, 2001**

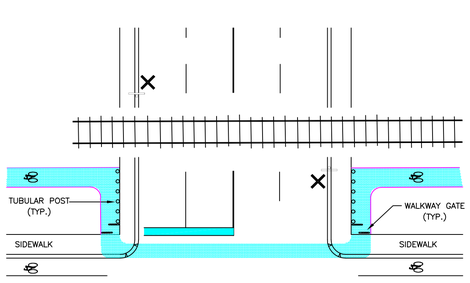
Description	Unit	Quantity	Unit Price	Amount
Section 8 - Airport Road to Winfield - 8.68 km				
Trail along Westside - 3 m wide				
Clearing	ha.	4.00	$12,000	$48,000
Waste Excavation (0.35m deep)	cu.m.	12,500	$10	$125,000
Embankment Granular Fill	cu.m.	45,500	$15	$682,500
Asphaltic Concrete Cement C/W Base	sq.m.	25,000	$23	$575,000
Broadwalk along Duck Lake	lm	500	$150	$75,000
Drainage	l.s.	1	$45,000	$45,000
Centre-Line Painting	l.s.	1	$6,000	$6,000
Sub-Total Trail Construction Cost				$1,556,500
Railroad/Culvert Crossings & Miscellaneous				
Local Road Crossing North of Airport Road	ls	1	$3,000	$3,000
Old Vernon Road Crossing	ls	1	$8,000	$8,000
Bridge Crossing @ Jim Bailey Creed	each	1	$30,000	$30,000
Local Road Crossing South of Airport Road	ls	1	$3,000	$3,000
Fencing along Railroad Side	lm	8,680	$33	$282,100
Fencing along ALR properties	lm	1,300	$33	$42,250
Sub-Total Miscellaneous				$368,350
Sub-Total Section 7 Preliminary Construction Cost				**$1,924,850**
Add 40% Contingency Fee				**$769,940**
Total Section 6 Preliminary Construction Cost Estimates (Rounded)				**$2,690,000**

LEGEND

- Proposed Trail on North/West Side of Railway Track
- Proposed Trail on South/East Side of Railway Track
- Proposed Bridge or Culvert for Trail
- Location where trail crosses the track
- Location where trail crosses spur line or siding

Routes Proposed by Other Studies

- Proposed Roadway
- Existing Bike Route
- Proposed Bike Route
- Proposed Mill Creek Path
- Proposed Sidewalk Linked to Mill Creek Path

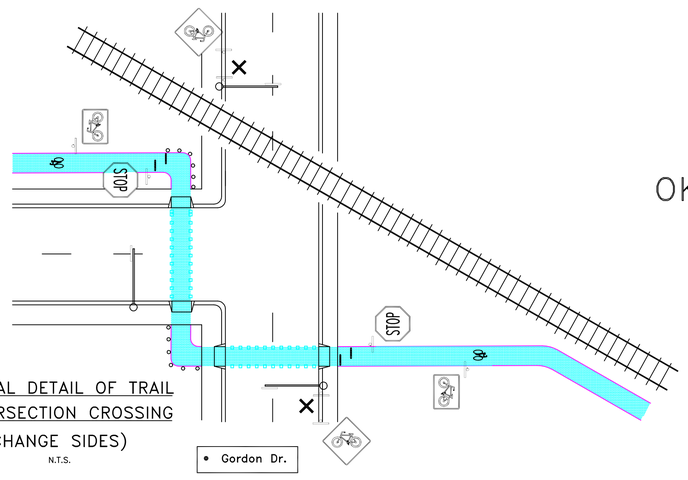


TYPICAL DETAIL OF TRAIL DIRECTED TO NEAREST INTERSECTION

N.T.S.

NOTE:
DIRECTIONAL SIGNS PROVIDED AS REQUIRED. (TYPICAL)

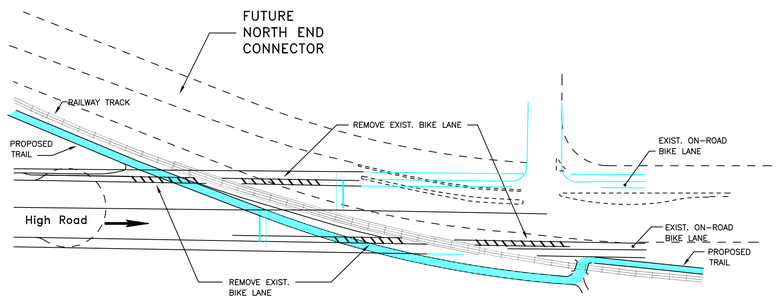
- Ellis Street
- Richter Street
- Ethel Street



TYPICAL DETAIL OF TRAIL INTERSECTION CROSSING (CHANGE SIDES)

N.T.S.

- Gordon Dr.

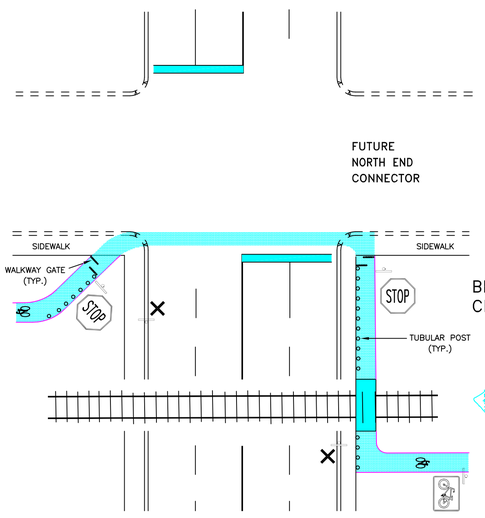


TYPICAL DETAIL OF TRAIL CROSSING WITH ANGLED RAILWAY TRACK

N.T.S.

- High Road

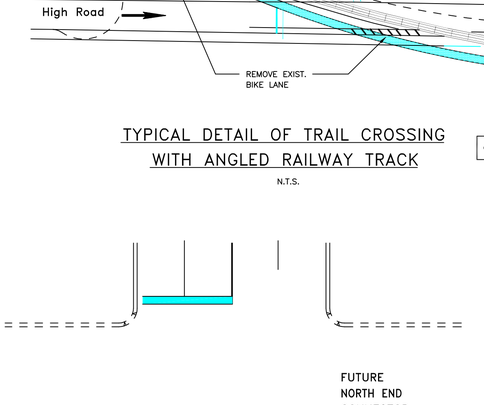
ELEMENTARY SCHOOL



TYPICAL DETAIL OF TRAIL INTERSECTION CROSSING (SAME SIDE)

N.T.S.

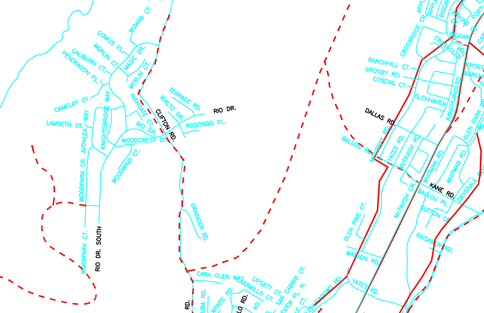
- Spall Road



TYPICAL DETAIL OF TRAIL MID-BLOCK CROSSING (CHANGE SIDES)

N.T.S.

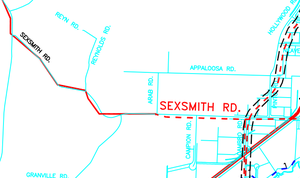
- Dilworth Road



TYPICAL DETAIL OF TRAIL MID-BLOCK CROSSING (SAME SIDE)

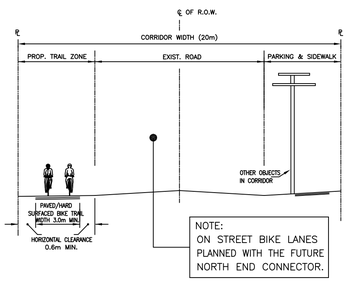
N.T.S.

- Sexsmith Road



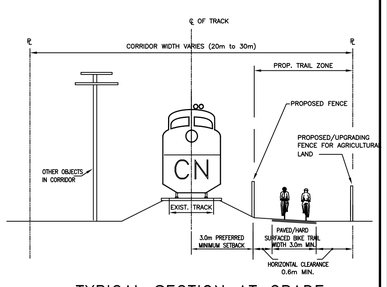
TYPICAL DETAIL OF TRAIL CROSSING RAILWAY

N.T.S.



TYPICAL SECTION OF CLEMENT AVENUE

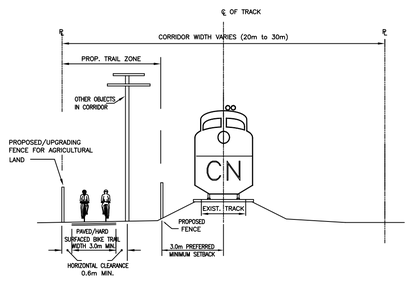
N.T.S.



TYPICAL SECTION AT GRADE

N.T.S.

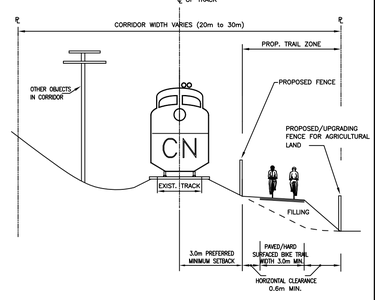
- Trail Between Ellis St. & High Rd.
- Trail between Leathead & McCurdy Rd. (Portion – 200m)



TYPICAL SECTION AT GRADE

N.T.S.

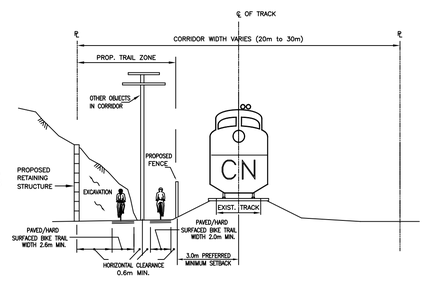
- Trail Between High Rd. & Spall Rd.



TYPICAL FILL SECTION

N.T.S.

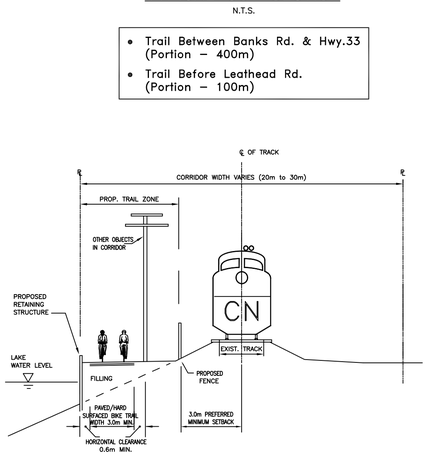
- Spall Road to Winfield (Except As Shown Otherwise)



TYPICAL CUT SECTION

N.T.S.

- Trail Between Banks Rd. & Hwy.33 (Portion – 400m)
- Trail Before Leathead Rd. (Portion – 100m)



TYPICAL SECTION ALONG LAKE SIDE

N.T.S.

- Trail Along Duck Lake
- Trail (Portion – 400m) before Carney Rd.

FIGURE 3.1

RAIL-WITH-TRAIL CONCEPT PLAN

SCALE 1:20,000

DATE 2001/12/17

HAMILTON ASSOCIATES

FILE: 7555\7555-P60C