West Side (E & N) Rail Trail Project

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by

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Abstract

The paper reviews the background data on existing "rails with trails" projects, the attributes of the E & N Rail corridor from Johnson Street to Atkins Road (Victoria, BC), and the way in which a multi-use trail could be built within this restricted width (15/30m) right-of-way retaining the existing rail track. Provision for enhanced rail or other transit usage is considered.

The following items will be discussed in detail:

- Existing rail with trails projects are reviewed and appropriate design guidelines identified.
- Design parameters are developed that recognise the corridor constraints as well as the basic safety requirements of a trail adjacent to a rail line.
- Alignment selection is discussed in the context of constraints within the rail right of way, road crossings, and safety issues.
- Environmental issues are identified to the extent that they impact trail alignment.
- Road crossings are discussed and standard details developed. Special details are developed for 3 more difficult crossings.
- Safety at road/trail crossings adjacent to active rail lines is discussed with special reference to one more difficult crossing.
- Opportunities for connections to the trail, other trails, trail user facilities, and signing for trail and road users is discussed.

This paper is based on the report prepared for the project described below. The paper focuses on the Rail/Trail issues and does not discuss the costs or detailed Civil Engineering issues that may arise if the project proceeds.

Biographies

Richard James

Richard James, P. Eng, PTOE, has over 30 years of Transportation Planning and Engineering experience in BC, Alberta and England, including Municipal and Provincial Governments, and Consulting. Richard has been involved in all levels of the planning and design of transportation systems for many years. Throughout this time he has stressed safety and provision of facilities for all road users. Richard's experience includes road network planning, functional and detailed design, neighbourhood transportation management, cycling facility design, traffic operations and development impact reviews. Recent projects with significant pedestrian and cycling content include a review of the Cycling Network Program for the BC Government, functional design of a bicycle route on Saltspring Island, the Tillicum Gorge Neighbourhood Transportation Management Study and the West Side Rail trail (this project).

Richard has provided training to BC Ministry of Transportation staff in Development Access Design and Review for more than 10 years (course completely revised in 2002). Richard also provides beta testing services for the HCS software package, and technical support to the McTrans Center (Univ of Florida) for training in the HCM/HCS procedures to CalTrans staff and at other locations in Western USA and Canada.

Danelle Laidlaw

Danelle Laidlaw has been involved with alternative transportation development for over 20 years as a private alternative transportation consultant working independently and with planning and engineering consulting teams. During that time, Ms. Laidlaw also worked as a staff person for the provincial cycling association, and as a cycling volunteer at the local, provincial, and national levels.

In her consulting role, Danelle has worked on major transportation plans applying her experience to ensure that cyclists and pedestrians needs are anticipated, recognized and incorporated. Recently, Ms. Laidlaw has completed work on the Canadian Institute of Planners revision of their Community Cycling Manual, cycling plans for the City of Prince George and Langley, and the False Creek Cyclist and Pedestrian Crossings Study.

Danelle sat on the TAC Committee on Uniform Traffic Control as the cycling representative from 1996 until 2002. In that role, Danelle was part of the steering committee for the development of the Bikeways Traffic Control Guidelines for Canada, published in December 1998, and the review committee for the Canadian Guide to Neighbourhood Traffic Calming published in December 1998. More recently, Danelle assisted with the editing of the Non-Motorized Transportation Guide with the Victoria Transport Policy Institute.

Client and Project Team

The Study was carried out for the Client Group (City of Victoria, Township of Esquimalt and Town of View Royal) by the Consultants and completed in the summer of 2002.

- Focus Intec - Prime Consultant, Survey and Project Management
- Richard James & Associates - Transportation Planning and Functional Design
- *dpl Consulting* - Bicycle and Pedestrian Specialist
- Ernest Wolski Consulting - Cost Estimating
- NTEC Resource - Environmental Review

Purpose of Study

The Study was performed to address the key issues of:

- Carrying out a survey of the Right of Way to identify relevant features
- *Identifying constraints to implementing a multi-use trail on the E & N Railway Right of Way*
- *Identifying an appropriate trail design standard and alignment concept*
- Identifying an Order of Magnitude cost estimate based on the conceptual design

This paper addresses only the 2nd and 3rd items.

Study Area

The Study Area comprises approximately 8½ kilometres of the E & N Railway Right of Way from the Johnson Street Bridge in Victoria to the Galloping Goose Trail near Atkins Road in View Royal. The study area is identified on Drawing 1 - Key Plan.

Rail corridors can be a community resource for improving conditions for bicycling and walking and an ideal location for a recreational facility. Rail corridors often offer long, unbroken stretches with scenic vistas. Typical railway grades make the corridor suitable for use by a broad range of users. The rail corridor may provide a direct connection between residential and commercial areas when it traverses urban areas. Demand for recreational trails is increasing and placing a trail alongside an active rail corridor is an excellent method of securing land for safe, well-used, and effective trail development.

Background Research

Our background research included review of documents in the Consultant's library, a search for relevant documentation available on the internet, and contact with colleagues in the field. Key resources are listed in the Appendix.

The concept of trails in abandoned rail corridors is fairly well understood. The Galloping Goose Trail is a popular example in the Greater Victoria area. The idea of "Rails with Trails" (RWT), the name given to trails which are located within active rail corridors, is less well-known.

We found that trails located in active rail corridors are becoming more prevalent as the safety and liability concerns of the railway companies and municipalities are addressed. Despite fears that RWT expose users to a greater danger by their proximity to active rail lines, experience with these trails has shown that they are no more risky than other trails. In fact, using a trail in an active rail corridor is likely less risky than walking next to, or cycling on, main roads (Ref: Institute of Transportation Engineers (ITE) Washington, DC, Technical Committee on Rails with Trails). Providing a formal trail may serve to reduce the number of trespassers on the rail line as well as beautify the railway corridor, reduce vandalism, and legitimize the current uses.

Existing Trail Statistics

We found that RWTs are operating successfully under a wide variety of conditions. Some are very close to the rail tracks while others are quite removed; some have fencing or vegetation as barriers between the rail line and the trail while others do not; some share the corridor with high-speed and frequent trains, and some are located next to industrial or tourist railroads with slower trains operating infrequently; and some have at-grade crossings while others use under- or overpasses.

A study completed by the Rails-to-Trails Conservancy (Ref: Rails with Trails: Design, Management, and Operating Characteristics of 61 Trails along Active Rail Lines, November 2000), indicates some of the design highlights of successful rails-with trails:

- Longest trail 92 km - shortest trail 0.6 km
- Longest length of rail next to a trail 35.5 km - shortest length of rail next to a trail 0.3 km
- Fastest trains 240 kph - slowest trains 5 kph
- Widest corridor (Railway Right of Way) 457 m - narrowest corridor 5.5 m
- Furthest trails from the edge of the tracks 30.5 m - closest to tracks 0.6 m
- Most crossings 17 - least crossings 0
- Most at-grade crossings 13 - least at-grade crossings 0

The research for this project produced the following general findings:

- The average length of a trail is 13.8 km of which 6.1 km is alongside the active rail line
- Of all Rails with Trails projects, 64% have adjacent active rail lines over more than 50% of their length
- Trail widths on active rail lines range from 1.22 m to 6.1 m with the average being 3m
- The average distance between the active rail and the trail (centreline of the track to the near edge of the trail) is 10m

- Approximately ¾ of the trails have a barrier separating them from the rail line (types of barriers are vegetation, grade separation, ditch, fencing or a wall)
- More than ½ of the trails cross the tracks with the average number of crossings being 3
- Average train speed is 51.5 km/hr
- More than ½ of the rails with trails are located in Class 1 rail lines (gross operating revenue greater than $250 M US)

Safety

The biggest concern when developing a Rail with Trail project is safety. According to the Rails-to-Trails Conservancy (Ref: Rails with Trails) and the ITE Technical Committee on Rails with Trails (Ref: Rails with Trails: A Best Practices Informational Report, January 1999), existing Rails with trails appear to be operating without major problems. Safety can be greatly enhanced by providing:

- Adequate distance between the track and the trail
- Adequate grade separation, barrier or fencing between the track and the trail where necessary
- Well-designed rail crossings
- Adequate signage for trail users

Legal Liability

Another important concern is the legal liability of the railway company and the municipalities. Building a trail along an active rail corridor does not, in itself, create an unacceptable element of risk. It is not inherently dangerous to construct a trail alongside a rail line. By using accepted design guidelines and standards, installing standard signs, traffic signals and warning devices, performing regular maintenance, and by monitoring the trail, liability and risk can be greatly reduced. These are simply good practices for any trail or rail line.

Barriers

There are strong arguments around the use of barriers to separate the trail users from the active rail line. A typical barrier would be a ditch, grade separation, vegetation, fence (chain link, wire, rail, wrought iron, vinyl or steel), or wall (retaining wall, cement blocks). The main arguments against providing a barrier on a RWT are:

- Cost
- Visual impact
- Lack of effectiveness
- Environmental impact
- Fear of individuals being trapped between the train and the barrier

The main arguments for using a barrier are:

- To keep trail users away from the tracks and adjacent properties
- To protect trail users from being hit or affected by objects falling from trains, from dust and dirt being blown out from moving wheels
- To prevent trails users from throwing things onto the tracks or at the trains
- To discourage the public from getting close to trains

The ITE report states "there is no logical reason to require an expensive fence along the entire length of a proposed “Rail-with-Trail”, especially where there has been no history of trespassing in the area". The same report suggests that fencing is an effective tool to channel trail users towards legal crossings. Extending this fencing either side of the crossing reduces short-cutting. Fences are most often used when the trail runs particularly close to the rail line.

The profile of a trespasser is varied – they can be local residents, youths, homeless, and recreational users. Research and accident data has found that most injuries to railroad trespassers involved males, aged 20-49, many of whom were intoxicated. Most trespassers were walking or socializing near the tracks and did not hear the train or misjudged the speed and location of the train.

Canadian Trails

In the report, Rails with Trails: Lessons Learned, December 2001, the following reference is made to rails with trails in Canada – "No formal tally of Canadian RWTs currently exists, although Transport Canada reports that hundreds of RWT kilometres probably exist. In response to a growing number of requests for RWTs, the Canadian Pacific Railway (CPR) Police Service Community Services Unit is undergoing an internal discussion about their policies and practices.

The CPR has collected data about such issues as trespassing, accidents, vandalism, and liability through a survey of various field offices, many of which have experience with RWTs." The consultants were unable to obtain copies of any reports produced by CPR, however CPR concerns will be addressed before a decision to proceed with the project is made.

Standards or Guidelines

The research conducted for the project indicates that there are no existing national standards or guidelines for rail-with-trail facility design, but there are many examples to follow. It is essential that the trail be designed to meet the needs of both the railway and the trail users. The recommendations and standards listed in this report have been assembled from various standards relating to shared use paths, railroad facilities, pedestrian facilities, cycling facilities, roadway crossing of railway rights of way, and from the experience of existing rails with trails projects.

Trail Design Issues

This section of the report discusses the general features of the plan presented and covers four areas of the project design:

- Trail Design
- Trail Signing and Access Control
- Future Rail/Bus Use
- Fire/Emergency Vehicle Access

Trail Design

The selection of the alignment, intersection and crossing design is discussed later in this report. In this report left/right refers to the left or right side of the trail or rail line as viewed when moving from the east (Victoria) to west (Atkins Road). When referring to roads or directions off of the trail north/south are taken as perpendicular to the trail (north to right, south to left).

Definition and Description of Terms:

Setback: the term refers to the distance between the centre line of the active railroad track to the nearest paved edge of the trail (includes Structural Clearance and "Comfort Zone" as discussed below, (see Drawing 3).

Separation: is the treatment of the space between the railroad track and the trail, (see Drawing 3)

Dynamic Envelope: is the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (no standards exist for this, it is part of "Structural Clearance", which also includes a "margin of safety")

Flangeway: is the space between the rail and the adjacent pavement edge in a paved rail crossing

Stopping Sight Distance: is the distance, clear of visual obstructions, that is required to observe a situation and stop (see Drawing 11 and Table 1).

Bicycle Stopping Distance: is the distance required to bring the bicycle to a full stop (see Table 1)

Setback

Our research shows that the range of setback on existing rails with trails is:

- 13% have a setback of less than 2.1 metres (this is within the "Structural Clearance"),
- 13% have a setback of 2.4 - 3.7 metres,
- 23% have as setback of 3.7 – 6.1 metres (51% are < 6.1m),
- 27% have a setback of 6.4 – 15 metres,
- 12% have a setback of 15 - 27 metres,
- 10% have a setback of 27 – 30.5 metres

The average is approximately 10 metres. The minimum setback distance based on available railway standards is 2.6 m on tangent and 2.9 on curved track (US Federal Railroad Administration) This approximates the "Structural Clearance" referred to later. In a rails with trails situation, the speed and frequency of the trains, maintenance requirements, separation techniques, a review of any problems in the area, and engineering judgment must also be taken into consideration. If any physical constraints exist on or adjacent to the railroad corridors, then further consideration must be given to the setback distance. The guidelines followed by the Rails to Trails conservancy for low density/low speed trains are a recommended setback of 6 metres with a minimum of 3 metres. In constrained areas, the minimum is 3 metres with a fence or other physical separation. For the purposes of this project, the consultants recommend a minimum setback of 4.1 metres and the use of grade separation where possible (see Drawing 3).

Trail Widths

The minimum design width for a one-way bicycle lane is 1.5 metres (Transportation Association of Canada, (TAC), Ottawa, Geom. Design Guide for Canadian Roads, 1999). An offroad trail should also provide additional width for clearance and bicycle handling and therefore should be 1.8 metres. The minimum design width for a bi-directional secondary bicycle path with low volumes is 3.0 metres and 3.4 metres on higher volume paths. Most paths are bi-directional and multi-use. The minimum design width for this type of facility is 4.0 metres with an extra 0.6 metres on sharp turns. Ideally, there should also be a 1.0 metre clearance on either side of the path with special care to avoid encroachment on to the path by vegetation (Canadian Institute of Planners (CIP), Community Cycling Manual (CCM) Guidelines). However, this is not achievable on the 15m right of way sections where we have allowed 0.5m including the fence. In determining trail widths, users considered include: recreational, utility and commuter cyclists, bikes with trailers, pedestrians, roller bladers, etc.

User conflicts are a primary design criteria governing the selection of trail width. Conflicts are a function of the mix of user types (cyclists, pedestrian, roller bladers, etc.), the total volume and directional split, and user attitudes. No specific measures to reduce user conflicts other than a width that reflects current practice are proposed, and, a painted centre line and signage to “share the facility”.

If user volumes increase and rail use of the corridor is eliminated then the trail can be widened to minimize conflicts. The trail width is constrained by the available right of way east of Hallowell Road. No estimate of potential trail use is available.

For the purposes of this project, based on the experience of the Rails to Trails Conservancy’s research data, and the available railway right of way, the consultants recommend a minimum trail width of 3 metres (15m right of way) and 4m where possible west of Sta 5+500 (30m right of way).

Grades

According to the CCM guidelines, grades should not be over 5%. When a 5% or higher grade is unavoidable, it should be limited to 100 metres. For each 100 metres of grade a flat plateau should be built into the design as a rest area.

Cross-Slope

The trail should be designed with a 2% cross-slope for runoff and super-elevated toward the inside of curves for greater cornering safety. Where the trail is on a hillside, an upper slope drainage ditch may be needed. Runoff debris could otherwise be deposited on the pathway and pose a safety hazard.

Sight Distances

Adequate sight distances are important to ensure the safety of trail users. Trail users such as bicyclists, and pedestrians need sufficient time to detect the presence of an approaching train and time either to stop or clear the intersection before the train arrives. The detailed information below is taken from Chapter 9 of the AASHTO (Am. Assn. of State Highway and Transportation Officials) Bike Guide on how to calculate sight distances at highway-rail grade intersections.

To determine appropriate sight distances at trail-track intersections, the following criteria must be met:

- the trail user must be able to observe the approaching train in a sight line that enables them to pass through the crossing prior to the train's arrival. In this case, intersection crossing measures should be designed to enable a pedestrian (the slowest user) to safely clear the intersection from a stopped position at a walking speed of 1m/sec.

- the trail user must be able to observe the approaching train in a sight line that enables them to stop prior to encroaching on the crossing area. In this case, sight distances should be designed to enable a bicyclist (the fastest user) to anticipate the approaching train and either clear the intersection or stop prior to the crossing.

Stopping sight distances depend on speed, grade, reaction time, mass, and braking friction. Cyclists speed can easily exceed the trail's design speed on a steep downhill section. On rail grades it is unlikely that cyclists will exceed the trail design speed. Stopping sight distances for cyclists are approximately 15 metres at 20 km/hr, 38 metres at 30 km/hr, 53 metres at 40 km/hr, and 75 metres at 50 km/hr. (Ref: Figure 18 – Canadian Institute of Planners – Community Cycling Manual)

For the purposes of this study, the consultants recommend using a stopping sight distance of 38 metres for a design speed of 30 kph where possible.

Track Crossing Angles

When cyclists are required to cross railway tracks, the ideal crossing angle is 90 degrees (AASHTO Bike Guide). The minimum crossing angle should be 70 degrees and if the crossing angle is less than 70 degrees, an additional shoulder of sufficient width should be added to permit cyclists to cross the tracks at a safer angle.

In addition to alignment, and where train speeds are low, it is recommended to treat the rails with a flangeway filler. The standard flangeway width is 63.5 mm which can easily trap a wheelchair or bicycle wheel. These flangeways can be filled with compressible slip-resistant materials to reduce the risk.

Lighting

It should be assumed that the trail will be used at night and at times of low lighting. It is likely cost-prohibitive to provide standard lighting along the entire length of a trail. All roadway rail grade crossings should be illuminated in accordance with standard roadway lighting, with the lighting fixtures at the appropriate locations and levels.

All intersections should be visible at night far enough back from the intersection in order to allow the cyclist enough time to see the intersection and act appropriately.

The other lighting consideration is headlight glare which occurs when the path parallels a road. There are very few spots on this trail where this will cause a problem. One location is between Burnside and the Colwood interchange, where glare fencing could be installed if necessary. It can be addressed as a remedial measure if the problem arises.

Vertical Clearances

The minimum vertical clearance for tunnels and underpasses is 3.6 metres. This allows clearance for service vehicles. Vertical clearance for railway signals should be a minimum of 2.5 metres above the trail surface.

Horizontal Curve Radii

The width of the path should be modified as design speed increases. Horizontal curve radii will also increase as design speeds are increased. Standard highway design criteria should be used to calculate the horizontal curve radii. Turns at intersections (to/from other trails or bike lanes) must be wide enough to accommodate bikes with trailers.

Crest Vertical Curves

The longer the vertical curve, the farther the cyclist can see from crest to crest or from crest to obstruction on the path. Standard highway design criteria should be used from which the minimum lengths of crest vertical curves can be calculated for the appropriate cyclist eye height.

Railway Clearance

There has to be an "acceptable" clearance between the trail and railway. Over much of the project the rail right of way is 15m (50ft) with the track centered on the Right of Way. From Hallowell to the Colwood Interchange the Right of Way is 30m, and one small section at Kislingbury Road is 17m (with the track offset 15m from the right property line). The key design criteria are shown on Drawing 3.

Railway "Structural" Clearance

This is the distance from the rail track centreline within which no obstructions can be placed above the rail tie level and comprises the physical width of rail vehicles plus allowances for curvature, railcar sway and a safety clearance. The railway company defines this clearance. We have assumed it is 2.5m (general CP Rail/CNR requirement in Canada). This issue will be resolved with CPR before proceeding with the project.

Comfort Zone

This is additional clearance between rail cars and trail users that is required for user comfort, typically, this is 3.5m to 7.5m. For this project we are constrained by the right of way and can only obtain 1.6+/- m of clearance in the 15m right of way sections or where track location is constrained. This does not represent “ideal design”, but reflects all that is achievable within the project constraints and the lower levels of common practice.

From Sta 6+590 (Hallowell Road) to the end of project, the right of way is generally 30m (except at Kislingbury). In this area the trail can be located up to approx 8m from the track giving a much better "Comfort Zone". From 7+650 to 8+150 there is a "High Fill " section which constrains trail location. This issue will be resolved with CPR before proceeding with the project.

Property Line Clearance

This is required for construction, surface water drainage and to provide a "shy distance" between the trail and objects outside the right of way. This clearance also includes a fence on the top of all retaining walls that will generally replace the existing fence on the property line.

Horizontal/Vertical Separation

To minimize the risk of a person on the rail right of way becoming “trapped” by an oncoming train, a minimum clearance between the track and a fence-line is normally required where it is likely that people may be on the right of way. A figure of 6m has been quoted (BC Ministry of Transportation) as required to minimize this risk. Clearly we can not provide this with a fence between the track and trail due to the restricted right of way width.

As an alternative, vertical separation is often used to provide clearer guidance to people that they should not approach the track too closely. Although fill sections on this project are generally of low height, we intend to locate the trail to minimize retaining wall requirements with the result that in most locations there will be a vertical separation between the track grade and trail surface. This may be a grassed fill slope or, exceptionally, a retaining wall. Some short sections where the rail is in cut may require the trail to be on fill (or natural ground above rail level). In this case the retaining wall may be between the trail and rail track. In the rock cut area between 7+450 and 7+600 the trail will be above rail level on a bench blasted into the rock face.

Drainage

Between the trail and railway we require a swale to catch surface water and prevent soil and small debris being washed onto the trail. This is accommodated within the rail to trail offset. Surface water will be directed to appropriate watercourses or storm water drain systems. Surface water from adjacent property also needs to be intercepted and directed to appropriate discharge points. This may have to be dealt with outside of the railway right of way. The proposed typical cross section is shown on Drawing 3. The rail right of way width limits the trail width and "Comfort Zone", both of which are less than the desirable distances.

Trail Signing and Access Control

All references to signs and specifications in this section refer to the Manual of Uniform Traffic Control Devices for Canada (MUTCDC) and all signs used must comply with that manual and the BC Traffic Signs Manual and Motor Vehicle Act Regulations. Sign sizes are those recommended for bicycle and pedestrian facilities unless they are signs for road traffic in which case they are standard roadway sign sizes. The TAC Bicycle Signs Manual also provides guidance.

Regulatory Signing

Regulatory signs indicate a traffic regulation that applies on a specific time or place. These signs indicate the applicability of a legal requirement. Regulatory signs apply to bike routes/paths as well as to the roadway. Regulatory signs are installed at the location where the regulations apply and in positions where the signs can be easily seen. All regulations indicated by the signs should be enforced. Applicable regulations and policies differ from one jurisdiction to another, depending on traffic requirements, road conditions, and local regulations.

Regulatory signs are designed in accordance with the general specifications in Section A1.6. of the MUTCDC. Typical sizes of regulatory signs are 450 mm x 450 mm for use on pedestrian and bicycle trails. Regulatory signs (MUTCDC designations) that are recommended for use on this trail are RA-1 (Stop Sign), RA-2 (Yield Sign), RA-8 (Yield to Pedestrian Sign), and RB-93 (Shared Pathway Sign). Stop Signs (RA-1) are used at all unsignalized road-trail crossings because of poor sightlines, and/or high traffic volumes except where noted on the plans.

Regulatory signs that are recommended on the roadway at trail crossings are the Pedestrian Crosswalk Sign (RA-4). The Yield to Pedestrians and "Shared Pathway" signs should be used at the locations where the trail is not distinctly separated from the sidewalk. Examples are at the Esquimalt Road crossing where cyclists are using the sidewalk to allow access to the crosswalk to cross the tracks at a suitable angle, and, between Burnside and the Colwood Interchange where the trail is along side the road.

Warning Signs

Warning Signs indicate in advance conditions on or adjacent to a road or bikeway that will normally require caution and may require a reduction in speed. Warning signs offer a higher level of safety and more efficient traffic flow.

Warning Signs are designed in accordance with the MUTCDC. Typical sizes for warning signs are 450 mm x 450 mm. On this trail, the recommended warning signs are: WA-18R (Railway Crossing Ahead Signs) at Esquimalt, Admirals and the “Old” Island Highway/1A link trail; and WB-1 (Stop Ahead). Stop Ahead signs at the Hereward and “Old” Island Highway/1A links, and at Helmcken (eastbound) and Burnside (westbound) are required due to grades.

On the roadway, warning signs are only used in exceptional circumstances. Where required, the recommended warning signs are WC-46 (Pedestrian and Bicycle Crossing Ahead Signs) with WC-7S (Crossing) tab.

Railway Crossing Ahead Signs should be installed at the locations where the trail crosses the tracks. At locations where the intersection (or signs) are obscured, Stop Ahead Signs are required.

Guide And Information Signs

Guide and Information Signs for cyclists indicate information for route selection and the location of off-road facilities. These signs are typically 450 mm x 450 mm and conform to the standards of the MUTCDC.

On the trail, the following signs should be used to provide information to cyclists and pedestrians ID-20R (Signalized Intersection Crossing Sign), and on the roadway, IB-23 (Bicycle Route Marker Signs) with IS5R, 6R, 7, 8R, 9R (Arrow Tab Signs) should be used. Signalized Intersection Crossing Signs should be used where the trail users will be required to activate a signal crossing and the Bicycle Route Marker Signs should be used at each of the access points for the trail to direct users onto the trail.

There are several opportunities to provide signs that provide directions to another trail or significant off-trail location (Parks, Schools etc.). Standard text directional signs with appropriate pedestrian and/or bicycle symbols should be used with a directional tab indicating the link with another trail. At the Esquimalt Road Crossing (Russell Street) which links to the waterfront trail, bicycles are not allowed on the waterfront trail, so the Bicycle Route Marker Sign is not appropriate.

Temporary Condition Signs

Temporary Condition Signs regulate, warn and guide cyclists and pedestrians when work zones, construction, maintenance, utility activities or temporary and unusual conditions obstruct the trail. All of these signs conform with the MUTCDC and are generally 450 mm x 450 mm.

Signs which may be used from time to time on this trail or at access points for the trail are TC-70, TC-70R1, TC-70R2 and TC-71 which are all detour signs.

User Features

Local Access/Bollards, Gates, And Curb Cuts

Bollards, gates, and barriers control access to the trail and are not meant to be used as speed control devices. 1.2 metre high flexible bollards should be installed to control vehicle access. Flexible bollards are safer for cyclists and are generally adequate to prevent vehicle access. All bollards should be fully coated with a reflective material to make them visible at night. All bollards should be removable to allow service vehicles access to the trail. Wherever possible, a single central bollard should be used to channel pedestrians and cyclists and reduce the chance of collisions. Where two bollards must be used, it is recommended that they be 1.5 metres apart to accommodate bikes with trailers. At intersections where turns are required, bollard location must accommodate bikes with trailers.

Where the trail meets a roadway, the trail, sidewalk and roadway must meet at the same level. At the curb, the curb should be cut and a ramp extended from the trail to the road. The ramp should extend across the entire width of the trail to accommodate both cyclists and pedestrians with strollers or in wheelchairs.

Bicycle Parking

Bicycle parking may be necessary along the trail at points where trail users may want to temporarily stop and stray away from the trail. Possible locations for this would be at locations where there are toilets, or at the access to Portage Park. The bicycle racks provided must allow the bicycle to be securely locked and must support the bicycle frame and wheel above the wheel axle.

Rest Facilities

Any long pathway needs rest stops. Typically rest points will occur at scenic lookouts or at spots where amenities or access to the trail is feasible. Any rest stop should be away from the path so cyclists can pull off the path and not block through traffic on the trail. A typical rest stop should have a bench, and could also have a water fountain, toilets, and a parking rack for bicycles.

Appropriate places along the trail to provide rest stops would be Hereward Park, Admirals Road, Portage Park and Atkins Road (existing Galloping Goose facilities). These are identified on Drawing 4. No design is provided

for rest facilities or bike racks. Cyclists are likely to use an inter- and intra-city trail like this one at all hours of the day and night and every day of the week. Lighting becomes a factor that should be considered at rest facilities where additional security lighting may be required.

Future Rail/Bus Use

At the Client's request we considered the implications of a change in the rail line's status. Four situations exist for future rail use that impact the trail location. No judgement is made on which of these situations is more likely, and no decision has been made on any future use of the line. Comments are provided on Trail issues as a "What if" scenario.

Rail Abandonment

If rail use ceases and the track is removed then the trail can best be constructed on top of the existing fill with minimal widening (obtained by lowering the trail surface below the current “top of fill” level). Consideration should be given to installing safety rails on high fill sections. In this case a 4m effective trail width plus shoulders/rounding and fencing clearance should be used.

Continued Minimal Usage

This is the current situation. We have designed the "best fit" trail into the available right of way.

Increased Usage - Single Track

Under this scenario rail traffic would increase from the present one (passenger) train each way each day to some higher level. The principal impacts would be increased "friction" due to more frequent train traffic (noise etc.), and the potential need to upgrade track/road crossings due to safety requirements with higher rail traffic (exposure to risk). It is possible that additional passing tracks may be required (see below - twin tracking)

Increased Usage - Twin Track

Under this scenario rail traffic would increase from the present one (passenger) train each way each day to some much higher level that would require twin tracking for rail level of service considerations.

Due to the restricted right of way, twin tracking retaining the existing track location is problematic. Minimum clearances to fixed objects require a distance of 2.5m. At a minimum clearance of 5m between track centrelines, there is no "Refuge Area" for track workers etc. between opposing trains.

Minor variations in the placement of the existing track would require relocation of the track to accommodate a parallel track (see Drawing 5) within the present right of way. In addition, substantial retaining walls would be required to support the required fill with rail live loading superimposed for much of the length of the route.

Other considerations include:

- The hydro pole line from Hereward to Admirals Road
- The CRD Sewer Line west of “Old” Island Hwy/Hwy 1A
- Rock cut sections requiring blasting

At this stage it appears to be unreasonable to assume that the rail line could be twinned with the existing track remaining in place on the 15m right of way section from Johnson Street to Hallowell Road. Under that scenario it is clear that there would be insufficient clearance remaining to accommodate the proposed bike/pedestrian trail within the present railway right of way. West of Hallowell Road the possibility of twin tracking within the right of way is more reasonable except for the "high fill" section were additional right of way would be required to contain the additional fill material.

Future Bus Use

Future bus use (as a busway - bus only roadway) would require a minimum 7.2m two way paved roadway plus offsets to the property line and an adjacent trail. This would have a similar impact to Twin Tracking as discussed above. The existing rail roadbed could be lowered and widened to provide this width but retaining walls would

likely be required at some locations. On the 15m Right of Way sections a 4m trail could be accommodated with 1m setback of the busway and trail from the property line and a 1.8m clearance between the busway and trail. This would assume essentially a level cross section between the property lines. On the high fill sections ("Old" Island Hwy/Hwy 1A to Helmcken Road) construction of this cross section would require extensive lowering of the fill to achieve a 15 top width.

Fire / Emergency Vehicle Access

The desirability of improving emergency service access to the trail is acknowledged. All sections are accessible at both ends except Johnson Street-Kitma, Wilson-Hereward, Hereward-Devonshire, Hallowell-"Old" Island Hwy/1A, and "Old" Island Hwy./1A-Helmcken where access is only from one end.

The paved trail width of 3m (4m clear width) is adequate for all vehicles to reach an incident location. Vehicles will be required to back up to exit an incident location on the sections noted above. Turning cannot be provided on this trail.

Trail Alignment Selection

The trail alignment is selected based on the following criteria:

- Obstructions within the rail right of way
- Design controls
- Trail/rail crossings
- Indian Reserve Right of Way

The general alignment of the trail is shown on Drawing 2.

Obstructions on Right of Way

- The location of the power line running from Hereward Road to Admirals Road along the left side of the track puts it within the trail cross section with no flexibility to detour the trail round individual poles or move the trail to avoid the poles.
- Rail crossing signals and control cabinets.
- The section between Esquimalt and Wilson Roads has adjacent property owners using the right of way for access, and, in the case of one building, an air extraction and filtration unit is constructed on the right of way.
- Between a point west of Helmcken Road to "Old" Island Hwy/Hwy 1A a CRD sewer line follows the right side of the track.

Design Controls

Topography

- Grades are minimal and are not a design consideration.
- Topography was a primary consideration in selection of the alignment between Hallowell Road and "Old" Island Hwy/Hwy 1A. There are rock faces adjacent to both sides of the rail line through this section.
- West of the "Old" Island Hwy/Hwy 1A, environmental issues indicate that it is preferable to remove the rock in 2 short sections on the left side to avoid working adjacent to Craigflower Creek

Right of Way Issues

Known right of way issues are:

- Catherine Street: sliver required in SW corner Lot
- Esquimalt Road: Access and encroachment
- Hereward Park: existing access trail upgraded
- Esquimalt Indian Reserve: Rail status is easement on Indian Reserve "for Rail Purposes".
- Portage Park: municipal park, assumed acceptable at no cost

Fills/Cut

Generally cuts and fills on the route are low, however, due to the restricted right of way width almost all sections include low cuts or fills to accommodate the trail. These are addressed in the standard Cross Sections and will generally be reinforced earth or "Lock Block" type construction.

High Fill Sections are required in two locations. There are 3 options to locate the trail:

- At the top of the fill using a retaining wall
  We see no practical means of constructing a retaining wall on the existing fill slope with the rail line in operation. Construction would require undercutting the rail track for wall footings and/or reinforced earth tie-backs.

- At the top of the fill using additional fill material.
  This requires fill down the slope to the toe of the existing fill and an additional width of approximately 3-4m. This requires minimal construction, but requires a low retaining wall to retain construction within the property line or minimize encroachment.

- The base of the fill
  This requires minimal construction, but requires a low retaining wall to retain construction within the property line or minimize encroachment.

Wherever possible, the trail is placed at the bottom of the fill slope. In addition to minimizing construction cost, this also provides a very desirable vertical separation between the trail and rail

Environmental Issues

The rail right of way appears to be severely modified from its natural vegetation etc.. In our initial review we identified three areas (see Drawing 7) where we felt a more detailed environmental examination was necessary.

Three areas are identified as:

- In Portage Park some mature Douglas Fir trees may be impacted by trail construction.
- In the Rock areas west of "Old" Island Hwy/Hwy 1A a number of Garry Oak Trees may be impacted by rock blasting or fill in this area. This area is not identified as prime habitat. Mitigation may be achieved by replanting in a more appropriate location as compensation for removal.
- The primary environmental issue that has been identified is the section between "Old" Island Hwy/Hwy 1A and Helmcken Road where a significant length of the alignment is adjacent to Craigflower Creek. This is a fisheries resource that should be avoided.

All work on the project should be undertaken with appropriate environmental concern including provision for minimizing spills of contaminants (hydraulic fluids etc.) during construction.

Rail Trail Crossings

A primary objective is to minimize the number of times the trail crosses the rail line. Wherever possible these crossings should be at locations where they are protected by crossing signals. If they are not protected by signals adequate sight distance must be provided along the track and approaching the crossing.

Table 1 Rail Crossing Sight Distances

Trail Design Speed	Sight Distance on Road	Rail Design Speed	Sight Distance on Rail
	Desirable/Minimum Distance at 0% grade		
30 kph	40/32m	20 mph	75m
50 kph	85/70 m	30mph	116m
-	-	35mph	136m

Note: adapted from BC MoT Design Guide, Tables 1110.12 A and C, 50% reduction for Pedestrian/Cyclists

Trail crossings of the rail tracks should be made at an angle as close to 90 degrees as possible, with a minimum of 70 degrees to minimize the risk of bicycle tires slipping on the rail surface or becoming trapped in the flangeway. Drawing 8 shows typical crossing details. There are 2 crossings for the main trail, Esquimalt Road and Admirals Road. Access links cross the rail line at street intersections and at "Old" Island Hwy/Hwy 1A Road.

Table 2 Trail Alignment

From	To	Side	Comments
Johnson Street Bridge	Songhees Road	Left	Existing Trail
Songhees Road	Catherine Street	Left	Use Kitma Road/Catherine Street (Bike Lanes/Shared Lanes)
Catherine Street	Esquimalt Road	Left	Protected crossing
Esquimalt Road	Admirals Road	Right	
Admirals Road	Burnside Road	Left	Protected crossing
Burnside Road	Colwood Interchange	Left	Trail alongside Old Island Highway

A number of unofficial access points to the present informal "trail" along or across the rail right of way were noted. Access is provided to the trail at all road crossings as well as to Portage Park. These locations provide adequate access to desirable user destinations (see Drawing 4). Additional informal access points should not be encouraged as they result in rail crossings at locations that may not have adequate sight distance.

Indian Reserve Right of Way

As noted in the right of way section, the Rail line is on an easement "for Rail purposes". This is an issue to be resolved. The rail trail through this area is expected to follow our typical design section (based upon field observations). There are opportunities for partnerships on this section of the proposed trail.

Intersection Design and Engineering Issues

This section covers three areas:

- Intersection concepts
- Specific intersections
- Engineering issues

Intersection Concepts

Three road/trail intersection types are identified for this project:

- Uncontrolled Intersections - Low volume street crossings with acceptable sight distance will generally be of this type. Typical details are shown in Drawing 9. Sight distance requirements are shown on Drawing 11.
- Pedestrian or Traffic Signal Controlled Intersections - Higher volume street crossings, or existing signalized intersections will be of this type. Typical details are shown in Drawing 10. Sight distance requirements are shown on Drawing 11.
- Special Intersections - Intersections with specific design issues will be of this type, Esquimalt Road, Admirals Road and the Highway 1A/14 crossing at the Colwood Interchange are in this category. Specific design details are discussed below. Sight distance requirements are shown on Drawing 11.

Uncontrolled Intersections

Pedestrians and cyclists are treated similarly as both are required to stop at crosswalks. While cyclists may be able to move away more quickly (in the absence of pedestrians), the design criterion is governed by pedestrian characteristics. There are three key criteria involved, Stopping/Decision Sight Distance for approaching cyclists and vehicles, and, crossing time for pedestrians. This is a critical safety requirement. The appropriate sight distances are summarized in Table 3. Sight distance requirements for all intersections are shown on Drawing 11.

Vehicle Stopping Distance (SSD) and Decision Sight Distances (DSD) are documented in the TAC Design Guidelines. Bicycle Stopping Sight distances are documented in the Community Cycling Manual. Cyclist Decision Sight distance is taken as SSD + 2.5 seconds travel distance at the design speed (same as for cars).

Pedestrian crossing time is based on 4fps (1.2m/s). Two conditions exist, the time required for a pedestrian to clear the approach travel lanes, and time to clear the entire roadway.

Sight distance for pedestrians crossing (both for the pedestrian to see, and the driver to see) is impacted by parked vehicles. There should be no parked vehicles within the area of the triangle formed by the curb and sightline.

Decision Sight Distance (DSD) is the preferred criterion as it provides a better margin of safety. Stopping Sight Distance (SSD), is the absolute minimum, it provides only for a "sudden stop" with consequential increased risk of collisions (late brake application resulting in pedestrian/bike impact, or, the following vehicle fails to react in time and rear end collisions occur).

Two "Safety" conditions arise:

- Vehicle stops for pedestrians
- Pedestrians cross ahead of approaching vehicle

In condition 1 the requirement is for at least the vehicle stopping sight distance (SSD) to be unobstructed (including parked cars - no parking for 33+m from Crosswalk (see Table 3), applies to both 2 and 4 lane roads).

In condition 2 the requirement is for the pedestrian to be able to clear the crossing (approach lanes or entire crosswalk) without the approaching vehicle slowing. This condition is more restrictive and requires 41-167m depending on road width, approach lane or entire crosswalk, and crossing direction.

Maximum grades are also given in Table 3 for the trail as they affect design speed and thus stopping distances. Roadway grades are fixed and will not be changed in this project.

Table 3 Sightlines and Grades

Criterion	Minimum	Desirable	Comments
Sight Distance	SSD = 38m (flat), 40m on 5% downgrade @ 30kph or 73m (82m) @ 50kph	DSD = 57m (61m) @ 30kph 108m (117m) @ 50kph	Assume Design Speed = 30kph DSD = SSD + 2.5 sec travel (21m @30kph, 35m @ 50kph)
Grade	+/-5%, plus -2% for 100 m if length <100m	+/-2%	Grades over 5% design speed is 60kph, otherwise 30 kph
Curvature	Road standards	Road standards	
Sight Distance	SSD = 65m	DSD = 160m	Assume Design = Posted = 50kph
Grade	Existing	+/- 2%	
Crossing Sight Distance	Clear approach direction only 2 lane = 3 sec - 41m 4 lane = 6 sec - 83m	Clear all Lanes 2 lane = 6 sec - 83m 4 lane = 12 sec - 167m	Assume Approach Speed = 50kph Ped Speed = 4fps (1.3m/s) Note: for 4 lane roads, this is critical, not driver sight triangle with parked car.

Pedestrian or Traffic Signal Controlled Intersections

These intersections have either the "BC Pedestrian Signal" or conventional traffic signals. The key requirement for any signal at a rail crossing is that the signal controller has to be linked to the rail crossing signal to provide appropriate signal timing when a train is approaching so that vehicles are not trapped on the tracks or given conflicting signal indications.

Acceptable primary and secondary signal head, and crosswalk locations, have to be available. Crosswalks should be located immediately adjacent to side streets, or be clearly "mid Block" locations. In either case both the railway crossing and the trail crossing of the road must be controlled by the same signals. The creation of "trap" situations or driver confusion by excessive crossing width should be avoided.

Pedestrian push buttons and bicycle detection loops will be provided at all signalized crossings.

Special Intersections

These 4 intersections have skew rail crossings and a rail/trail crossing, or in the case of the Colwood Interchange crossing, multiple signalized legs to cross.

Standard Details

All road crossings have standard details as shown in Drawing 9 (unsignalized) and 10 (signalized) These include regulatory signage, directional signage (message varies), access control bollards, pedestrian push buttons and bicycle loops, standard crosswalk markings and stop lines, and, rail and traffic signal head locations. Special details are noted for each intersection below.

Specific Intersections

In this section each intersection is described with any specific features noted.

Table 4 Crossing Types

Location	Crossing Type	Comment
Songhees	Rail Crossing Signal	Crosswalk, signal not justified
Catherine	Rail Crossing/Signal	Signal: Ped Buttons/loops in trail
Mary	Uncontrolled	
Russell	Uncontrolled	
Esquimalt	Rail Crossing Signal	Ped Activated Signal
Wilson	Rail Crossing Signal	
Hereward	Overpass	Access through Park
Devonshire	Uncontrolled	
Lampson	Rail Crossing Signal	Relocate Ped Signal from Devonshire
Hutchinson	Uncontrolled	
Intervale	Uncontrolled	
Admirals	Rail Crossing Signal	Uncontrolled, see discussion
Maplebank	Uncontrolled	
Thomas	Uncontrolled	
Hallowell	Private Crossing	
"Old" Island Hwy/Hwy 1A	Overpass	Ramp(s) to road, use Ped Bridge
Helmcken	Trail at Grade	Relocate present mid-block crosswalk
Burnett	Uncontrolled	
Kislingbury	Private Crossing	View Royal Sewer Lift Stn access only
Burnside	At Grade	
Colwood Interchange	Signal	Use ped phase, buttons/loops in trail

Crossings with specific features are listed below (crossings with only "standard" features are not described below, see Drawings 9 and 10 for details):

Songhees: end of existing trail adjacent to rail line (from Johnson Street Bridge). Trail runs along Kitma Road as a shared traffic lane (with parking) or bike lanes (no parking). (Drawing 9).

Catherine: pedestrian crosswalk, rail crossing signal and stop bar relocated. Pedestrian Activated signal phase using the existing traffic signal hardware, in trail loops and push buttons added (Drawing 10).

Esquimalt: skew crossing, (70 degrees+) with BC Pedestrian Signals, rail interlock, loops in trail and push buttons. Short section of existing sidewalk included in trail. (Drawing 9).

Lampson: West (southbound) bus stop relocated to far side of Wurtle Avenue to provide sight distance. Existing Pedestrian Activated signal at Devonshire/Rock Heights relocated (Drawing 13).

Admirals: this is a complex crossing with a 5 legged intersection adjacent to a 70 degree skew rail crossing. Multiple entrances to HMCS Naden also complicate the layout. Although traffic volumes on Admirals Road may indicate that with high trail usage a pedestrian activated signal (BC Pedestrian Signal) is desirable, installing the signal safely at this location is problematic due to the excessive distance between stop bars, poor locations for traffic signal heads and the risk of a vehicle becoming "trapped" in the crossing. Several alternatives have been examined:

- Relocate the existing east crosswalk to east of the rail tracks – this places the crosswalk in an "unconventional" location away from the "intersection". It carries a higher safety risk of vehicle drivers failing to recognize it. This location gives the least direct trail routing and requires extensive modifications to the islands (and traffic patterns) in the HMCS Naden entrance.
- Use the existing east crosswalk – this is correctly located adjacent to the intersection and gives the most direct trail routing.
- Use the existing west crosswalk - this makes trail users cross both Colville Road and Naden Street before crossing Admirals Road. It thus gives a very indirect routing for trail users.

Using the existing uncontrolled pedestrian crosswalk on the east side of Colville Road is recommended. The rail crossing is protected by rail crossing signals. (Drawing 14).

If at some time in the future trail usage grows to a level that an improved crossing is required, then an "Enhanced Crossing" with additional lighting and overhead signing with flashing amber lights (push button activated) should be considered. The practicality of signalization could also be reviewed, or an overpass considered. No evaluation of an overpass has been carried out due to the uncertainty of future use of the rail line. If rail service is abandoned either a BC Pedestrian Signal or a full traffic signal can be installed at the Colville intersection with the recommended trail crossing location

"Old" Island Hwy/Hwy 1A: The trail uses the overpass. There is no safe crossing location in this section of "Old" Island Hwy/Hwy 1A unless it is signalized, due to deficient sight distances. We propose to provide a single connection from the trail to "Old" Island Hwy/Hwy 1A and direct users to use the existing pedestrian overpass, east of the rail crossing, to cross "Old" Island Hwy/Hwy 1A. This is not a good solution in that it is an excessive detour from the trail for users travelling to the west on "Old" Island Hwy/Hwy 1A.

View Royal staff are investigating the feasibility of constructing a sidewalk on this section of "Old" Island Hwy/Hwy 1A. One option to provide an adequate width is to construct a pedestrian underpass through the fill behind the bridge abutment. This does not impact the choice of connection if the sidewalk is constructed on the south (Portage Park) side of "Old" Island Hwy/Hwy 1A.

The proposed rail crossing for the access trail is located approximately in the middle of the tangent section of rail line thus maximizing sight distance (125/145m) (Drawing 8).

Helmcken: we have bought the trail to grade on both sides of Helmcken Road. Sight Distance is adequate for the road crossing. Relocating the existing mid-block pedestrian crosswalk to the trail crossing location is proposed. This should not impact school use of the crosswalk (Drawing 9).

Colwood Interchange: the proposed trail leaves the rail right of way west of Kislingbury and descends to the "Old" Island Highway/Hwy 1A grade at Burnside Road. Overpasses of Burnside and the Colwood Interchange Ramps were considered but deemed to be impractical primarily due to the length of bridge span required at the Ramps. The trail will use the existing pedestrian crosswalks. Some modification to pedestrian crosswalk signal timing may be required if trail volumes become substantial. (Drawing 15).

Engineering Issues

Retaining Walls

As noted in the discussion of trail cross section, much of the trail length requires the use of low retaining walls to permit construction within the right of way. A detailed review of each wall location has not been undertaken. As most walls will be low and supporting only the trail the use of simple walls, typically of lock block or reinforced earth construction, is proposed. No geotechnical investigation or design has been carried out. Exceptions to this are:

- Kislingbury - the wall retains the existing roadway. A concrete wall is required
- Colwood Interchange - a short section of railway fill requires a toe wall. A concrete wall is assumed.

Structures

Two structures have been identified as desirable upon initial construction: at Hereward Road and "Old" Island Hwy/Hwy 1A.

An initial strategy of the conceptual analysis was to consider the practicality of cantilevering additional trail structures off of the existing rail bridges where possible. Upon review however, the following concerns for this approach were identified:

- There would be considerable risk of liability for construction of additions to the existing rail bridges. Torsion on the existing structure would have to be carefully assessed and monitored.
- In order to match the rail profile, approach grades on the trail would be somewhat longer.
- A cantilevered crossing would result in localized reductions in the desired separation between the path and rail.
- The existing concrete bridge abutments would have to be modified. Impacting existing structural components is not desirable unless unavoidable.

We are therefore recommending that the structures be constructed separate from the existing rail bridges. Additional advantages to this approach include:

- Construction can be achieved with less impact to existing rail operations.
- A wider range of cost effective construction options may be considered.

Drainage

No detailed drainage review has been carried out. Generally the existing cross-track culverts will be extended under the trail. These may be sufficient to collect surface water runoff from adjacent properties. However, as the proposal is to construct retaining walls on the property line (in the 15m Right of Way sections) there may be locations where additional drainage is required, or, existing ditches on the rail right of way that have to be replicated in some form. These will have to be identified and designed during detailed design. In some instances easements may be required to construct ditches on the adjacent property to collect water flowing from that property (and adjacent lots) and pass it to culverts. These requirements have not been identified or costed at this stage. All drainage design will be to Municipal standards and recognize impacts on existing systems.

Between Sta and 7+700 and 8+125 approx. there is a significant existing ditch that will be rebuilt within the right of way (30m right of way section).

Conclusions and Recommendations

The body of the report details our review and recommendations.

The principal conclusions and recommendations from our review are:.

- The concept of a multi-use trail within the rail right of way is generally feasible, with the following considerations:

- The trail width is limited to 3m for approximately the first $5^{1}/_{2}$ km due to inadequate right of way width for the preferred 4m trail width (See Drawing 3 - Typical Cross Section ─ 15m Right of Way, and Drawing 6 - Typical Cross Section - 30m Right of Way).

- The "Comfort Zone" between the railway and trail is limited to 1.6m for approximately the first $5^{1}/_{2}$ km due to limited right of way width.

- CP Rail/Rail America approval of all cross sections is required.

- There are no traffic operations constraints to trail/road crossings in terms of roadway capacity.. All bicycle and pedestrian design and operation issues can be adequately addressed.

- In one area some Garry Oak trees may be impacted by trail construction. There are no other significant environmental issues identified on the trail or issues that can not be addressed by appropriate design or construction practices. Identified issues are shown on Drawing 7.

- Access to the trail is provided at all road crossings and at Portage Park. This provides access to a number of desirable destinations along the trail (See Drawing 4).

- There are four locations where the recommended trail alignment leaves the rail right of way:

    - Kitma Road
      There is inadequate right of way to pass the CP Rail yard operations. The recommended alignment uses on-road bike lanes or shared lanes between Songhees Road and Catherine Street.
    - Portage Park
      There is inadequate right of way between the twin rail tracks and the property line. View Royal staff have indicated they prefer a separate trail adjacent to the rail line rather than incorporation of the rail trail in the existing park pedestrian trail.
    - Kislingbury
      A short length of the recommended alignment straddles the rail/road right of way.
    - Burnside Road to Colwood Interchange Ramps
      There is inadequate right of way at the base of the fill. The recommended trail alignment is a separate 2-way trail straddling the rail/road rights of way.

- There are concerns with the Admirals Road crossing should trail use develop to the stage where some form of signal control is desirable. Due to the skew of the rail crossing, and adjacent complex intersections, there is no effective way of providing traffic signals with the rail line in use. Due to the uncertain future of the E & N Rail line as an operating railway, no evaluation of overpass construction cost has been made. Crossing options are discussed in our report. If rail use is abandoned (or the route is converted to a busway), these crossing issues can be addressed by signal control (Pedestrian Signal or full traffic signal).

- Two structures are required at Hereward Road and "Old" Island Hwy/Hwy 1A. The trail will cross Helmcken Road and the Colwood Interchange Ramps/Old Island Highway at grade due to the need to access Helmcken Road, and the requirement to place the trail at the base of high fills rather than at the top (this applies to both locations). The review of structural options indicates that construction of separate parallel structures is preferable to cantilevering the trail structure off of the existing bridges. No staging strategy is identified as appropriate for these two bridge crossings, therefore grade separations are recommended for initial construction.

- The BC Hydro line on the left side of the rail track from the Hereward substation to Admirals Road determined our choice of alignment through this section.

- There is apparently a fibre optic cable along the right of way. We have not confirmed this or located the cable in the field. We have assumed that appropriate measures to protect it can be specified at the design stage.. No other significant utility conflicts with the selected trail alignment have been identified based on our survey. Hidden utilities such as water, sewer, natural gas, or telephone cables have only been identified where they are visible or marked on the ground. Utility companies and CP Rail have not been contacted to verify utility locations.

- No major right of way requirements have been identified. Requirements that have been identified are:

    - Catherine Street: sliver required in SW corner Lot 1 Plan 6815 (approx 36m2)
    - Esquimalt Road: Access and encroachment (no area - access "rights" and relocation of equipment, Legal status of encroachment unknown)
    - Hereward Park: existing access trail upgraded, Right of Way Status not checked, assumed BC Hydro or Municipal, assumed acceptable at no cost
    - Esquimalt Indian Reserve: Rail status is easement on Indian Reserve "for Rail Purposes". Status not investigated for trail use.
    - Portage Park: municipal park, assumed acceptable at no cost

- Due to the need to place a retaining wall on the property line for much of the trail east of Sta 6+590 (Drawing 3) there may be some surface drainage problems that can best be resolved by easements on adjacent lots. Surface drainage will generally be taken to existing culverts under the rail line. No specific drainage review has been undertaken. West of Sta 6+590 additional right of way is generally available (Drawing 6) and surface drainage should be dealt with within the right of way.

- Following instructions from the Client, no contact has been made with CPRail/Rail America other than that for permission to access the right of way for survey. Critical decisions on trail location relative to the rail track and crossing interlock provisions at all signalized crossings require rail company agreement. The assumption is made that this will be obtained as part of detailed design.

- If rail use increases such that twin tracking is desirable, there appears to be inadequate right of way to accommodate both twin tracking and a trail without major reconstruction of the rail line. With reconfiguration as a twin track system, the available clearance between the rail line and trail is likely to be further reduced. Trail use in this scenario appears to be problematic. If, however, the rail route is converted to a busway then the trail can be accommodated. This conversion would require significant reconstruction of the roadbed.

Appendix

Major References used in this study included:

- Canadian Institute of Planners Community Cycling Manual - A Planning and Design Guide, March 1990
- Rails with Trails: A Best Practices Informational Report, January 1999, Institute of Transportation Engineers (ITE) Washington, DC, Technical Committee Report
- Rails with Trails: Design, Management, and Operating Characteristics of 61 Trails along Active Rail Lines, November 2000, Rails-to-Trails Conservancy, Washington DC.
- Rails with Trails: Lessons Learned, Literature Review, Current Practices, Conclusions - Alta Transportation Consulting, Draft, December 2001
- Geometric Design Guidelines for Canadian Roads, Transportation Association of Canada, Ottawa, ON, 1999
- BC Supplement to the TAC Geometric Design Guide, BC Ministry of Transportation, Victoria, BC, 2000
- Bikeway Traffic Control Guidelines for Canada - December 1998