19.0 Capital costs of Interurban/Community rail service

19.1 Exclusions and Contingencies

a) Any rental, lease or track access charges levied by SRY, CN or CP, for running over 3rd party ROW infrastructure.
b) Compulsory building purchase & compensation
c) Land taxes
d) Government legislature costs
e) Local authority/city/township rates, taxation.
f) Federal & Provincial Taxation, including HST
g) Public Consultation costs
h) Public Inquiry costs
i) Operating costs
j) Contingency - Electromagnetic Compatibility [EMC] & Interference [EMI] identification, design, testing & implementation
k) Contingency – disposal of construction waste - environmental landfill charges
l) Contingency -disposal & management of contaminated/hazardous waste
m) Contingency – Installation of pedestrian, stock fencing & noise barriers
n) 3rd party Licences, charges & compensation – BC Highways, BC Hydro, BC Parks, BC Ministry of Environment

19.2 Stage 1.0; Phase 1 Capital budget

Project scope/Work break down structure (WBS):

1. (5.0) Surveys and investigation.
2. (all) Detailed design allowance
3. (11.1) Permanent way (track), renewal & upgrading.
4. (10.0) Civil engineering work, associated with permanent way renewal & upgrading.
    a. Track formation earthworks and embankments.
    b. Highway/road crossings gated grade/level crossings.
    c. Drainage
    d. Bridge strengthening & modifications
5. (7.1) Stations – 10No.
6. (7.2) Tram stops – 8No.
7. (9.0) Depot building and infrastructure
8. (9.0) Depot equipment and fitting out.
9. (12.0 + 13.0) Signalling & communications
10. (18.2) Fare collection.
11. (17.0) Vehicles.

Stage 1, Phase 1 Pricing Schedule:

http://leewoodprojects.co.uk/wp-content/uploads/2010/09/chilliwack-interurban-stage1-phase-1-pricing-schedule_reva.pdf

Stage 1 Phase 1- Chilliwack to Scott Road [Diesel/hybrid option] summary capital cost.

CAD $491,819,424.00 (CAD $5.02 m per km)

19.3 Stage 1.0; Phase 2 Capital budget

Stage 1 Phase 2 - Chilliwack to Scott Road [Electrification] summary capital cost

CAD $114,700,000 (CAD $1.2 m per km)

19.4 Stage 1.0; Total Capital cost per Km

CAD $606,519,424

CAD $ 6.2 million per km

20.0 Stage 2.0 (Further extension proposal)

20.1 Stage 2a proposal: Scott's Road to Richmond – at grade

Stage 2a Scott Road to New Westminster/Richmond 10 km @ CAD $11.7m per km = CAD $ 117 million

20.2 Stage 2b proposal: Richmond to Vancouver Central station – at grade

Stage 2b New Westminster/Richmond to Vancouver Central 18 km @ CAD $13.7 m per km = CAD $246 million

20.3 Stage 3 proposal: Chilliwack station to Rosedale

Chilliwack to Rosedale 12 km @ CAD $ 2.4 m per km = CAD $28 million

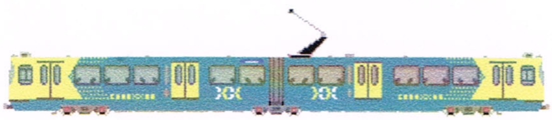
---

For total 138 km route, Vancouver Central to Rosedale
CAD$ 998,519,424

CAD $7.2 million per km

The Stage 2 price summary has been based on;
28 km of double track between Scott Road & Vancouver Central stations, of which no less than 45% will use the existing ROW's; including crossing the Fraser River. The remainder of the alignment will be at-grade street-running on segregated track.

A Temporal separation operation, similar to Stage 1 is envisaged over the shared running section, with at grade Tram stops at no > 3km intervals built to a similar specification as those in Stage 1 for both the shared ROW & street running sections. No major civil Engineering works are envisaged, light & bell protected grade road crossings and signalled highway intersections will be installed on the segregated street-running sections of the designed alignment.
No additional depot facilities are proposed, the number of vehicles priced in the Stage 1estimate are sufficient to maintain, a 20–30 minute peak headway over the entire route length.
Stage 2 will be designed, constructed & implemented in accordance with current European and North American best practise.



21.0 Safety considerations for Interurban/Community rail project

21.2 Certification, design, construction, operation & maintenance of British Columbia commuter railways

The British Columbia Safety Authority is the regulator for provincial railway operations http://www.safetyauthority.ca/regulations/railways

All BC railways must comply with the safety regulations for their railway class.
http://www.safetyauthority.ca/regulations/railways

Commuter Railway Safety Regulation Guidelines
http://www.safetyauthority.ca/regulations/railways/commuter-railway-safety-regulation-guidelines

21.2 Rail vehicle safety assessments

APTA Transit Standards Development Program Partnership
Recommended practices and design guidelines to achieve safety, reliability and efficiency in transit system design and operation.
http://www.aptastandards.com/Portals/0/1GeneralFiles/FTA.pdf

Crashworthiness Standards for the U.S. Light Rail Environment
Steven Kirkpatrick & Martin Schroder American Public Transport Association Transport Research Board http://pubsindex.trb.org/view.aspx?id=804788

US Department of Transport Federal Transit Administration published the paper; Collision Safety Improvements for Light Rail Vehicles Operating in Shared Rights of Way Street Environments in September 2009
http://www.fta.dot.gov/documents/CollisionSafetyImprovementsforLRVs.pdf

21.3 Vehicular/pedestrian rail crossings

Transport Canada www.tc.gc.ca is the agency responsible for regulations, standards and programs work to ensure the safety at grade road crossings.
http://www.tc.gc.ca/eng/railsafety/menu.htm
also;
http://www.tc.gc.ca/innovation/tdc/summary/13800/13819.htm

Transport Canada has published three safety assessments of road/railway grade crossings:-

1. Canadian Road/Railway Grade Crossing Detailed Safety Assessment Field Guide
2. Pedestrian Safety at Grade Crossing Guide (September 2007)
3. Grade Crossing Contraventions and Motor Carrier Safety Assessment – Project summary (TP 13819)

The Government of Canada is investing in cross-Canada rail safety;
IMPROVEMENTS TO ROAD/RAILWAY GRADE CROSSING SAFETY
http://www.tc.gc.ca/eng/mediaroom/releases-2010-h041e-5899.htm

Tri-County Metropolitan Transportation District of Oregon, published:
Safety Criteria for Light Rail Pedestrian Crossings, written by Don Irwin,
http://onlinepubs.trb.org/onlinepubs/circulars/ec058/08_02_Irwin.pdf

22.0 Conclusions and Recommendations

22.1 Conclusions

You need look no further than the Fraser Valley newspapers to gauge the support for re-establishing the Chilliwack to Surrey Interurban.
Courtesy of Rail for the Valley:-

"The most efficient and "green" way to move large numbers of people is via light-rail transit. Given the population growth in the Fraser Valley, this transit option should be a no-brainer." **-The Province**

"If the government is to meet its goal of cutting air contaminants by 4.7 million tonnes in the next 12 years, the revival of the interurban line will be one of many initiatives aimed at getting commuters out of their cars." **-Abbotsford News**

"Now is the time, when our population still allows it, to finally look at light rail. We have the rail ready and the cost of getting it up and running would be a fraction of the cost of building more SkyTrain routes... Not only are we convinced that rail is the best solution for the Fraser Valley, we are convinced that it will be used." **-Abbotsford Times**

"One of the biggest disappointments in Victoria's new transit plan is its failure to include the possibility of light-rail passenger service -- along the old Inter-Urban rail route from Vancouver to Chilliwack. In our view, any transit plan that doesn't include such an environmentally-sound option is deficient to some degree." **-The Province**

"Where is the much-needed light rail for the Fraser Valley?" **-Surrey Leader**

"We can learn from history. Rail-based transit will work in the Fraser Valley." **-Langley Times**

"There's far too much foot-dragging when it comes to the issue of a proper transportation infrastructure for the Lower Mainland and the Fraser Valley. Maybe the politicians need to take a load off and hop on the train." **-Chilliwack Times**

Make no mistake, passenger rail service from Chilliwack to Abbotsford, Langley, Surrey, and even to Vancouver would be a great thing. **-Chilliwack Times**

22.2 Recommendations

This report concludes that the conversion to 21st Century Community Rail/Light Rail of the BCER Lower Fraser Valley Interurban, will bring positive benefits to the communities it will serve in;
Economic & Inward Investment, Tourism, Environment, Health & Social Cohesion.

The early implementation of Phase 1, from Chilliwack to Scott Road in Surrey, will be the beginning of the benefits.

David A. Cockle Kingston upon Thames September 2010

Notes & Acknowledgments

Notes:

1. The story of the BC Electric Railway Company, Ewert Henry
2. Twenty Nine years of Public Service – British Columbia Electric Railway
3. Rail for the Valley
4. Presentations by - Jim Harkins for LRTA/Transport 2000; Scott McIntosh for LRTF; Tony Young for APPLRG.
5. Jim Harkins - Light Rail (UK) Ltd
6. The Railway Association of Canada http://www.railcan.ca/documents/rules/1684/2008_03_19_CROR_TCO_093_en.pdf
7. Mark Cseles http://192.197.62.35/people/mcsele/railroad.htm
8. Railroad Signalling, Carsten Lundsten http://www.lundsten.dk/us_signaling/
9. Vancouver Area Cycling Coalition (VACC)

10a. Track Design Handbook for Light Rail Transit - Parsons Brinckerhoff, Quade & Douglas,
10b. City of Edmonton – LRT Design Guidelines (CA) 2009
10c. Keeping Your Trains on the Track – Strategies for Preventing Derailments, Ensco Inc. | **www.ensco.com** (US) 2009

11. City of Surrey High Level Review of South of Fraser Community Rail Proposal, Final Report – UMA January 2007
12. Calgary light rail transit surface operations and grade-level crossings, D Colquhoun, J. Morrall, J Hubbell Calgary Transit, City of Calgary http://pubsindex.trb.org/view.aspx?id=453018
13. Wikipedia

Acknowledgments:

My wife & co-director, Kate for her belief, unstinting support and encouragement
My daughter Aisling Coward, my reason for coming over to Chilliwack
John Buker, Rail for the Valley
Malcolm Johnston, Rail for the Valley
Mike Chambers, Rail for the Valley
Peter Holt - Buckley Blair & Associates
Roger Nathan, Surrey BC, for his suggestions
Lyndon Henry aka Nawdry, for the US perspective
Scott McIntosh - Mott MacDonald http://www.mottmac.com/markets/transport/rail/ for everything about Light Rail there is to know.
Stuart Hall a colleague on the CTRL King's Cross Project, for his advice on GSM-R
Ken Leach - LUL DSM King's Cross St.Pancras, for his wise words & knowledge
Steve Barber, Nottingham, for his advice & suggestions
Ron Denman - Director Chilliwack Museum
Light Rail Transit Association (LRTA)
Jim Harkins - Light Rail (UK) Ltd, for his encouragement
All Party Parliamentary Light Rail Group APPLRG [Light Rail (UK) Ltd]
http://www.applrguk.co.uk/articles
Tony Young - Transportation Consultant
Light Rapid Transit Forum (LRTF)
Christof Henseler, Eduard de Jong, Ernst Kers & Jos Straathoff, Eurotram E-Group, for their assistance on European Tram-Trains
Simon Smiler http://citytransport.info/Trams02.htm

List of Appendices:

Appendix A

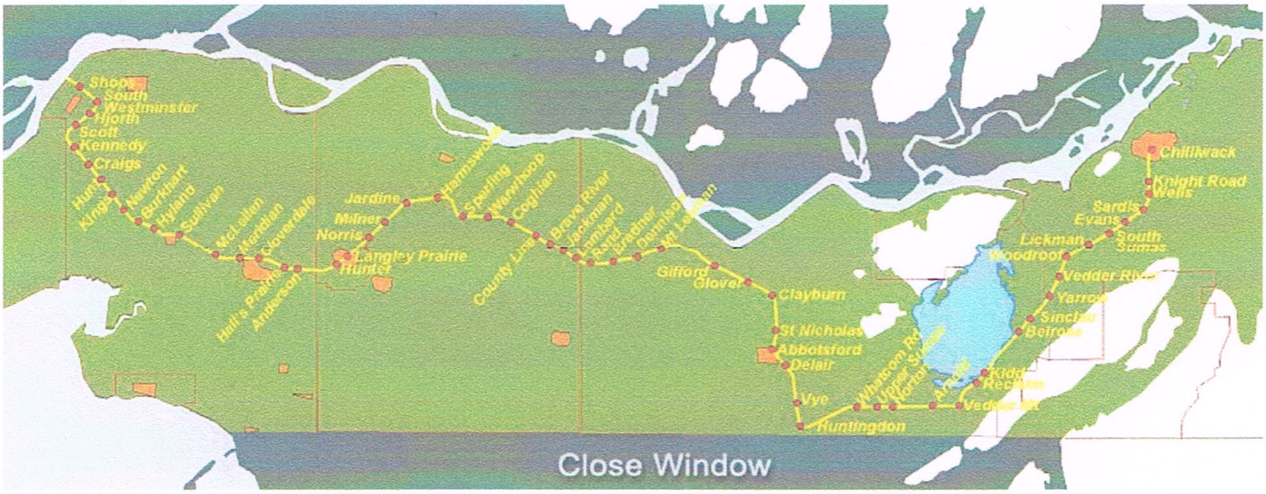
Figure/Photograph references and acknowledgments.

Cover - David Cockle, Stephen Parascandolo – www.croydon-tramlink.co.uk, Stephen Dee – www.nettrams.net , Jos Straathof, http://maninblue1947.wordpress.com/category/public-transport/ , VALTAC, Tourism Chilliwack - Paul Enns, Harald Jahn
Frontispiece – David Cockle & Peter Relf

1. Fraser Valley Heritage Railway Society
2. Neil Roughley http://www.vanc.igs.net/~roughley/whats_new.html
3. Aisling Coward
4. Aisling Coward
5. www.panoramacanada.ca
6. Google Street View
7. Google Street View
8. Google Street View
9. David Cockle
10. Stephen Parascandolo http://www.croydon-tramlink.co.uk/
11. John MacDonald
12. Raymond S. Farand
13. John Means Whatever
14. David Cockle
15. www.tramstore21.eu
16. Blackpool Gazette
17. Stephen Dee http://www.nettrams.net/index.html
18. Churchill-Flickr
19. Churchill-Flickr
20. Jos Straathoff
21. Wikipedia
22. Wikipedia
23. http://www.karlsruher-modell.de/en/index.html
24. http://www.karlsruher-modell.de/en/index.html
25. www.urbanrail.net
26. K. Wunsche www.trambudgie.de
27. www.railway-technology.com
28. Michael Raclin
29. www.dexigner.com
30. Akos Varga aka Hamster http://hampage.hu/trams/e_index.html
31. C. Patriarca
32. Wikipedia
33. www.bahnbilder.de
34. Ikka Siissalo

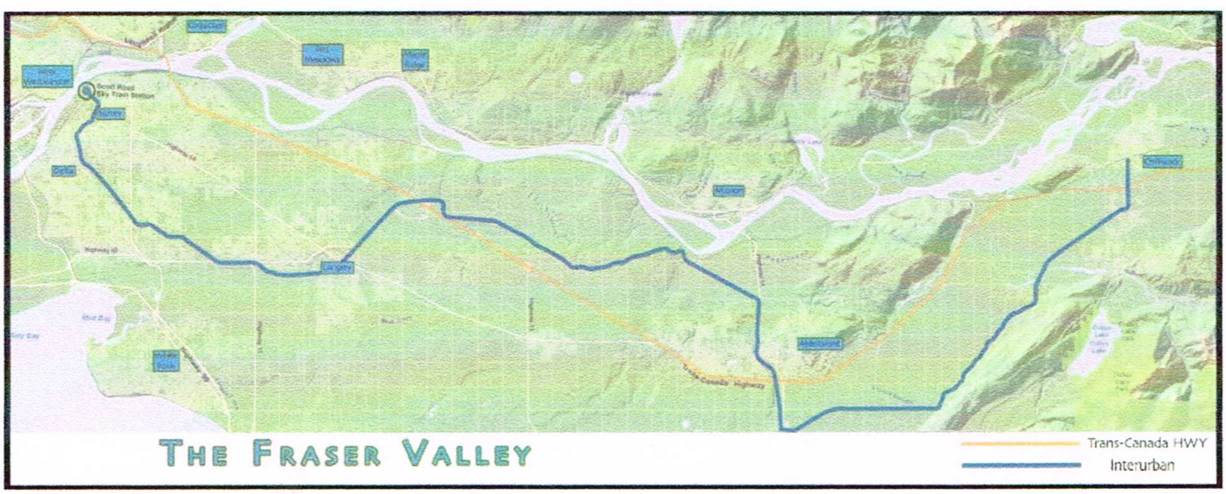
Appendix B

Maps of proposed Interurban



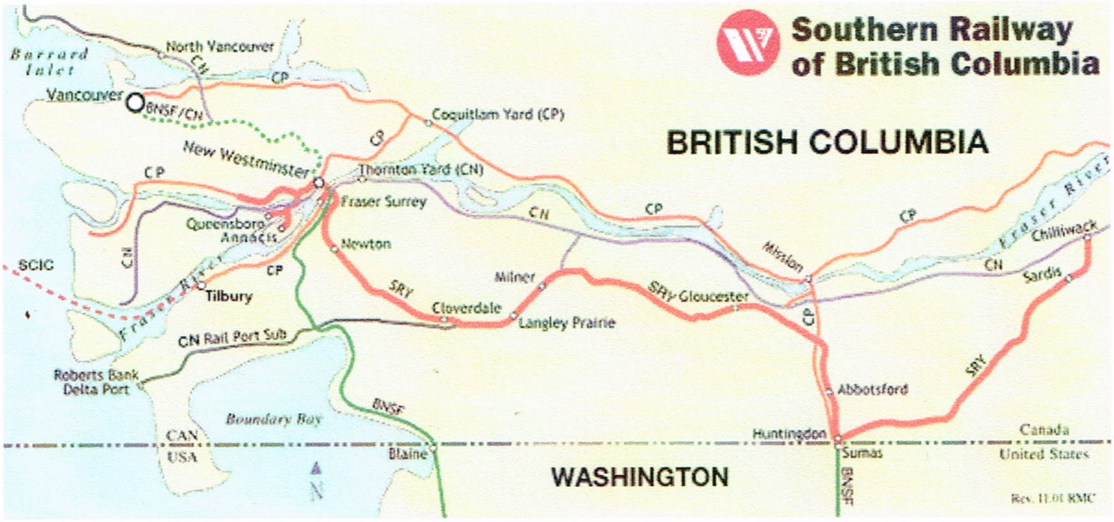
Historical Map of the Fraser Valley Interurban

Courtesy of Valley Transportation Advisory Committee VALTAC
http://www.valtac.org/,



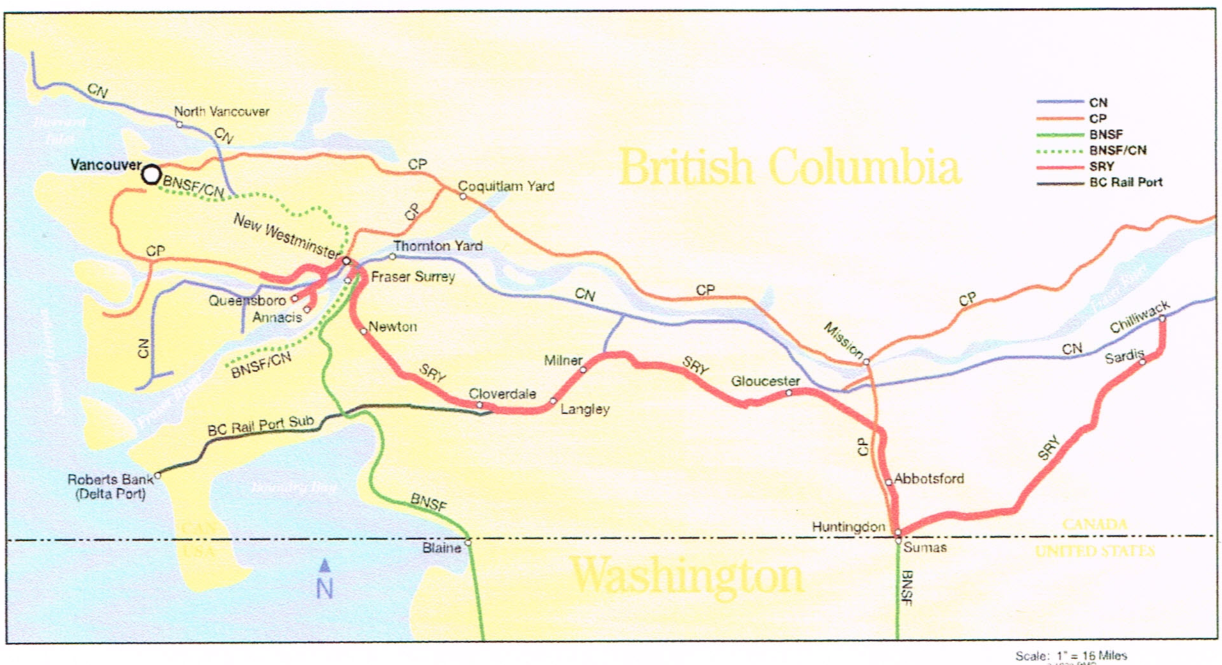
Proposed route of the Fraser Valley Interurban

Courtesy of Rail for the Valley RftV http://rftv.wordpress.com/



Southern Railway of British Columbia (SRY)

Courtesy of SRY http://www.sryraillink.com/



Fraser Valley railway lines

Courtesy of Canadian National Railway Company
http://cnplus.cn.ca/it/Shortlines/SL_Static.nsf/shortlines/150ECBF0AA9EC32F86256826006DCA8F?opendocument

Appendix C

The Case for Light Rail

Liveable Cities – The Role of Tramways and Light Rail

Jim Harkins – Light Rail (UK) Ltd for All Party Parliamentary Light Rail Group [APPLRG]

http://www.applrguk.co.uk/files/lruk%20v.1%20role%20of%20light%20rail%20&%20tramways%20v.%20150610.pdf

Controlling Costs – Affordable New Starts

Scott McIntosh – Light Rapid Transit Forum [LRTF]

http://www.lightrailuk.com/applrg/pdf/applrg-04-11-2008.pdf

Widening the Potential Benefits of Light Rail to Combat Congestion

Tony Young – All Party Parliamentary Light Rail Group [APPLRG]

http://www.lightrailuk.com/applrg/pdf/applrg-undated.pdf

Light Rail & Trams, a Low Cost, Affordable & Sustainable Mode

Tony Young – All Party Parliamentary Light Rail Group [APPLRG]

http://www.applrguk.co.uk/files/lr%20applrg%20tony%20young%2004%2011%2008.pdf

Employment in Sustainable Transport

A Report for Passenger Transport Executive Group (pteg), the Campaign for Better Transport, Sustrans, 2010

http://www.pteg.net/NR/rdonlyres/D09F59E8-72C6-438C-8964-60A1993A8F48/0/EmploymentintheSustainableTransportSectorpdf.pdf

Appendix D

Proposed Interurban/Community vehicle references

2nd hand/used electric & diesel LRV/Interurban vehicles

References:

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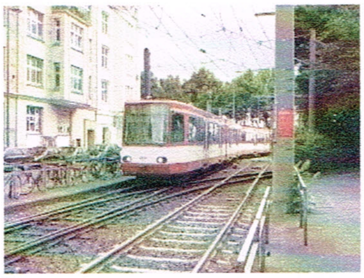
2. Bombardier Talent http://en.wikipedia.org/wiki/Talent_(train) also as per Ottawa 0-Train http://www.octranspo.com/train_menue.htm
3. Stadler GTW http://en.wikipedia.org/wiki/Stadler_GTW in use on New Jersey transit River Line, between Trenton & Camden. http://www.njtransit.com/sf/sf_servlet.srv?hdnPageAction=LightRailTo
4. Siemens Desiro http://en.wikipedia.org/wiki/Siemens_Desiro and http://www.mobility.siemens.com/mobility/en/pub/urban_mobility/rail_solutions/commuter_and_intercity.htm and San Diego Sprinter http://en.wikipedia.org/wiki/Sprinter_(passenger_rail)
5. Possible Colorado Railcar http://en.wikipedia.org/wiki/Colorado_Railcar#Mass_transit_DMUs
6. Possible second hand option; Duewag/Scandia MR http://www.railwaygazette.com/news/single-view/view/10/dsb-agrees-desiro-dmu-framework-contract.html ex-Danish railways

Duwag TW6000's ex-Hannover
http://villamosok.hu/tipus/tw6000_a.html

German Stadtbahn B80 or 100 cars



Bonn. Akos Varga.

Dortmund. Jos Straathof.

Bombardier K5000 ex-Bonn

Jos Straathof

Bombardier A32 Tram Trains from the Gouda to Alphen line (Netherlands) may now be out of use, since a contract has or will be placed for the complete Rijn-Gouwe rolling stock, which may or may not match the A32 specification.
http://en.wikipedia.org/wiki/RijnGouweLijn

Surplus RandstadRail LRV's available http://en.wikipedia.org/wiki/RandstadRail

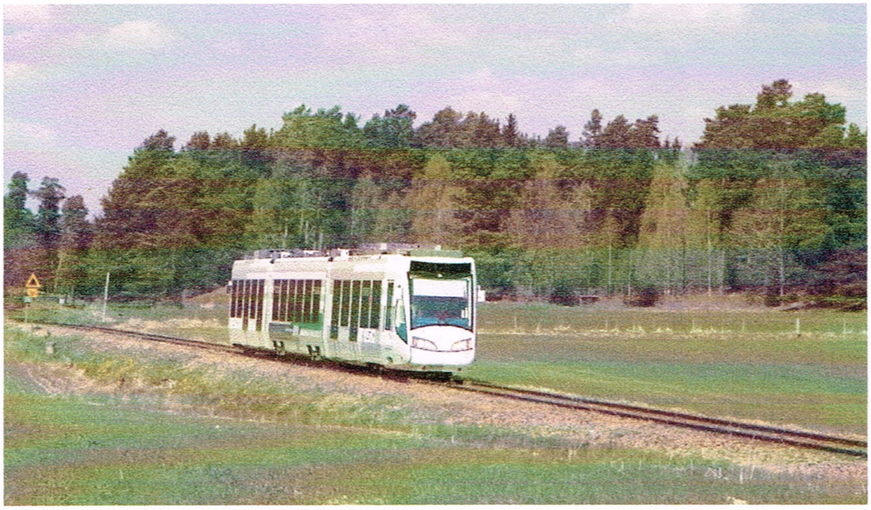
Also http://www.lightrail.nl/NL/nl-tour.htm and http://www.xs4all.nl/~rajvdb/lra/index.html

Both these lines are dual voltage 750/1500 v DC
http://www.lightrail.nl/TramTrain/tramtrain.htm

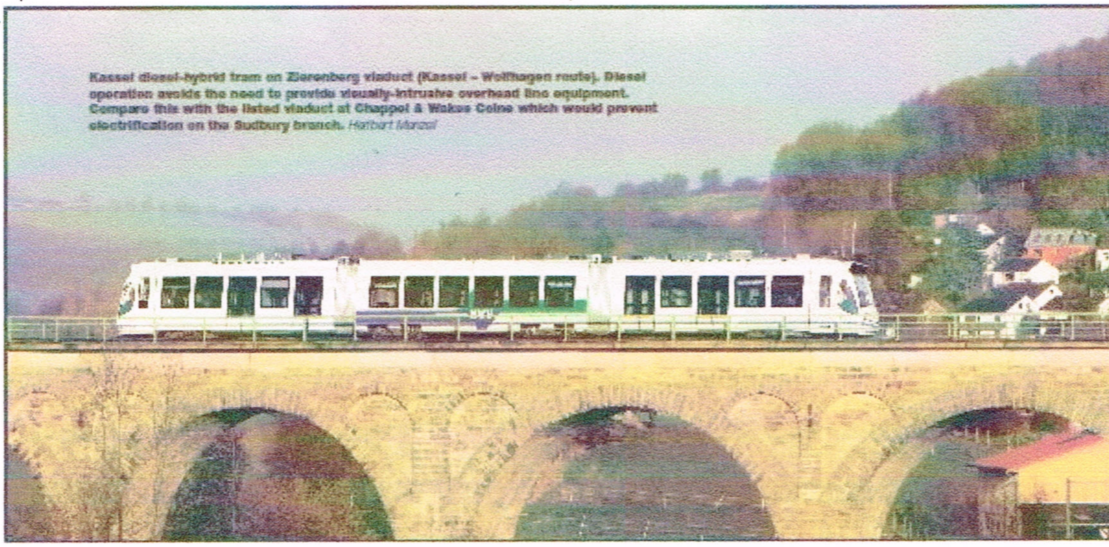
NCTD Sprinter/Siemens Desiro
http://www.gonctd.com/pdf_fact_sheets/Sprinter_FactSheet.pdf

Dutch site:
http://www.railfaneurope.net/list/netherlands/netherlands_nsr_del.html
Listing both Dutch heavy rail, light rail & interurban stock, which is withdrawn & possibly available for sale, including the Rijn-Gouwe A32's

Ferrostaal, a German company specialising in reconditioning and sale of 2nd use railway vehicles
http://www.ferrostaal.com/index.php?id=411&no_cache=1&tx_editfiltersystem_pi1[cmd]=detail&tx_editfiltersystem_industry_pi1[uid]=92&cHash=cbf5503fbdac8b188c702f43e1bb7d57



Regio Citadis Tram Train



Kassel diesel-hybrid tram on Zierenberg viaduct (Kassel – Wolfhagen route). Diesel operation avoids the need to provide visually-intrusive overhead line equipment. Compare this with the listed viaduct at Chappel & Wakes Colne which would prevent electrification on the Sudbury branch. *Herbert Menzel*

Diesel trams: a new way forward?

Charles King suggests a novel approach for secondary routes

Light rail technologies have received closer attention in recent times as potential solutions to transport problems as well as providing alternatives to 'traditional' railway operation. In light of this, a trip run by ACoRP (Association of Community Rail Partnerships), and organised by Faber Maunsell, took eight delegates from Network Rail, the Department for Transport and Transport Scotland in December last year to Switzerland and Germany. The aim of this was to study developments in light rail and their applicability to the UK.

A major focus of this trip was 'tram-train'. For many people, this concept is most closely associated with the city of Karlsruhe in south-west Germany, which pioneered the technology in the 1990s. Essentially it involves the 'joining-up' of a tram network with heavy rail so that local services sharing paths with conventional trains on the main line can travel over both systems, enabling seamless through journeys. The need to change modes is thereby eliminated: accessibility is improved and end-to-end journey times drop. In Karlsruhe's case, the city centre, about two km from the main station, was the main attraction, and a through journey from the suburbs with dual-voltage electric trams was made possible.

Factors for success

Karlsruhe's success has led to numerous developments and extensions, most recently conversion of the 30-km long Murgtalbahn to tram-train operation, which took only seven years from conception to completion at a cost of Euro75million (£50million). The longest possible journey on the system now takes in tramways in both Karlsruhe and Heilbronn as well as main-line railway over its 150-km route from Achern to Öhringen.

But it is perhaps surprising that not more schemes modelled on this apparently thriving example have come to fruition, even in continental Europe. Those that are operational include Saarbrücken in Germany and the Rijn-Gouwe-Lijn through Leiden and Gouda in the Netherlands, with the French city of Mulhouse at the initial stages. An overview of these projects reveals that a certain number of factors typically have to come together for a scheme to work:

- a common tram and heavy rail track gauge and a suitable interface point between heavy rail and tramway;
- a relatively large but dispersed population, ideally with a strong commuting market – Karlsruhe, for instance, serves 120 communities with a total population of 1.3million people;
- favourable urban planning and public transport characteristics – the two must be considered together;
- existing heavy rail stations some distance from the main centres they seek to serve;
- an ability to overcome the technological challenges such as providing trams with two sorts of traction equipment, signalling compatibility, and meeting the relevant safety standards;
- perhaps most importantly, the political will and funding to see the project through.

Latest developments

One city where the balance of factors has been positive, however, is the city of Kassel in central Germany, which is currently developing its own 'RegioTram' system, due to open in June this year. A total network of 122km is provided with only 10km of new track, serving an urban population of 220,000 with a further 400,000 in the surrounding area. Although the system is based on the 'classic' tram-train principle with dual-voltage trams running on the mainline at 15kV AC and on the city tramway at 600V DC, one very significant innovation is the introduction of diesel trams for operation over non-electrified sections of line. This extends their reach beyond conventional electrified routes to rural single-track branches and diesel freight-only lines. Specifically, these vehicles are diesel hybrids: equipped with a diesel-electric engine, they are also able to work on the city tram network at 600V DC.

Each branch will operate to a regular interval 30-minute frequency, with connecting buses at stations along the route in line with the Taktfahrplan principle of bus and rail integration. Coupled with the enhanced journey opportunities, passenger demand on the network is predicted to grow by up to 50%.

Value for money

The total cost of the whole scheme is Euro 180million (£120million), made up of Euro 100million (£67million) for infrastructure and Euro 80million (£53milion) for new vehicles.

Appendix E

Train-Trams, Zwickau, Riverline & Seetalbahn

LRTA June 2006 via Light Rail (UK)

http://www.lightrailuk.com/pdf/axel_kuehn.pdf

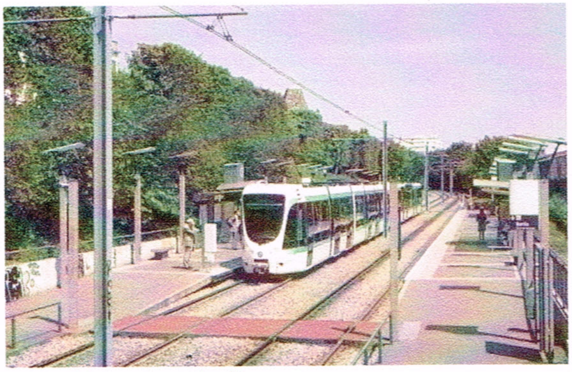
Tram-Train in the UK?

Network Rail (INCOSE) February 2009

http://www.incoseonline.org.uk/Documents/Groups/Railway/RIG_090225_tram_train_in_the_UK.pdf

Tram Train: The 2nd Generation; New Criteria for the `Ideal Tram Train City'

http://www.lightrail.nl/TramTrain/tramtrain.htm



Paris T4, Jos Strathoff

Alicante, Andrew Moglestue

Appendix F

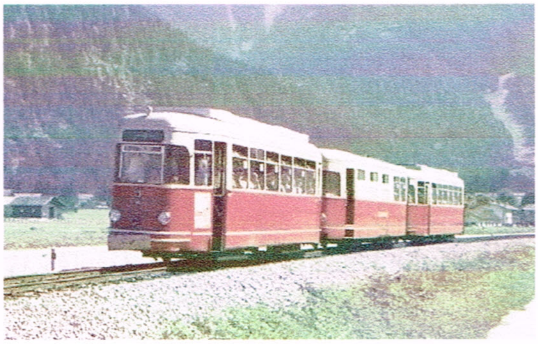
Electric Traction beyond the Wires

Scott McIntosh April 2009

We discussed at our recent Abbey Line meeting potential ways of using recycled tramway equipment for use on Community Railways. I pointed out that electrification at 600-750V dc can be undertaken at lower cost than is initially thought. Nevertheless, we agreed that there are lines where even low-cost electrification would not be economic and I pointed out that this did not necessarily preclude the use of recycled tramway equipment.

The photograph above shows a train on the ***Rotterdamsche Tramweg Mij***. (RTM) a series of interurban light railways to the south west of the city of Rotterdam. The system was an early user of diesel-mechanical railcars in the 1930s. Damage during the Second World War meant that the company had to buy, rebuild and operate new vehicles from a number of sources. Their most ambitions effort was railcar set M1700, created in 1963; this consisted of two electric trams, previously operated by ***Deutsche Bundesbahn*** (DB) on a light rail line in west Germany, sandwiching a home built generator trailer. This trailer contained a diesel electric generator, a small supplementary passenger/luggage saloon and two end vestibules and was styled to match the two tramcars; it fed current through the tramcar controllers to the existing traction motors on the trams. When the railway was run down and closed in the mid-late 1960s M1700 was acquired by the ***Zillertalbahn*** in Austria in 1966. It was used in regular service until new railcars arrived in 1984, since then it has formed part of the reserve fleet, although there have been attempts to return the unit to the Netherlands for use on a preserved railway.

M1700 at Spijkenisse, RTM in 1965



M1700 in use on the ZB Austria

The photograph above shows the general arrangement of the set in use on the Zillertalbahn. The two ex DB trams are little modified apart from the provision of a power bus line in replacement for the pantograph. The home-built generator trailer is a remarkably good visual match; it runs on bogies recovered from a scrapped carriage. The leading vestibule of the trailer had provision for the fitting of a controller so the set could be run as a two car set if required – I have no evidence that this was ever done - there is then an entrance vestibule and a 2-bay seating area, the 3 bays with toplights only, is the motor-generator space.

The advantages of this arrangement are:

- the passengers are well insulated from the noise and vibration of the motor-generator
- the weight is distributed across a larger number of axles
- the tramcars need minimal alteration
- the maintenance facility can be a short shed only covering a single car.

A little history

These ideas are not new. Heilmann's experiments in France in the 1890s explored a variety of electric traction systems, including locomotives and trains where each vehicle was powered by a through train busbar, fed from a conductor rail or a power station on wheels.

During the prosperous 1920s in Argentina the ***Buenos Aires Great Southern Railway*** (BAGSR) was interested in electrifying their suburban lines around the capital and ordered two electric multiple units from the UK. The CME of BAGSR was reluctant to initiate full electrification of the lines around Buenos Aires due to its cost, but believed in the idea of powered coaching stock, in this case drawing power from a diesel electric generator set installed in a 'mobile power house'. Accordingly, two 1,200hp mobile power houses, numbered UE 1 & 2, were delivered in late 1930; each was powered by two Sulzer 8LV28 cylinder engines developing 600hp at 700rpm, powering an Oerlikon main generator. Traction motors under the coaches were powered by the mobile power houses. They remained in service at least until 1948.

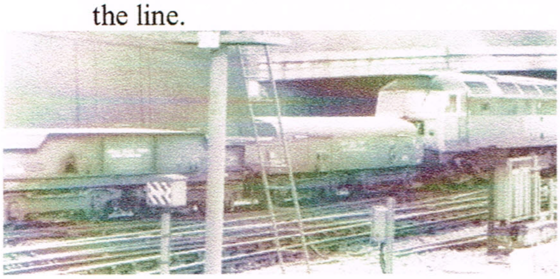
The success of this experiment led BAGSR to order three 1700hp mobile power houses in 1933. Numbered UE 3, 4 &5 they were used to haul eight coaches. As with UE 1 & 2 the performance of these three trainsets was impressive, particularly in light of their quick turnround times at the termini, however for most of their lives they slotted in to steam diagrams. These mobile power houses remained in service at least until 1959.

London Transport studied these units and one of the options for modernising the Metropolitan Line under the 1935-40 'New Works Programme' was to introduce electric multiple units, with mobile power houses being coupled on at Rickmansworth to take the train beyond the end of the conductor rails to the end of the line. The war and post war spending restrictions killed the idea and when modernisation was finally approved it was the far les innovative scheme of taking the conductor rails to Amersham and giving up the rest.

I looked at the concept when examining the possibility of an early tram-train operation in **Blackpool** in the early 1990s. The concept was that trams would run 'on the wire' to Starr Gate and then use a diesel generator to run over the Blackpool South – Preston line as far as Lytham. I looked at two ways of doing this;

- Taking one saloon in a Progress Twin-car set out of passenger use and inserting a diesel generator in its place. The trailers were robustly built in the 1960s and preliminary discussions with the rolling stock team at Blackpool indicated that the car could carry a generator set – Blackpool already had some experience of fitting such a set in the former passenger saloon of a works car. The problem with this approach was that it would reduce passenger capacity by 25%, the noise and vibration would be closer to the passengers and the dead weight of the generator set would have to be carried under the wire from Starr Gate to Fleetwood. (You may care to share these thoughts with tour Departmental colleagues specifying the IEP)

- Providing a small fleet of generator trailers. These adopted the concept of the BR Brake Tender of the 1960's, in that they would be low enough for the driver of a tram to look over the tender to see the line ahead. A generator tender would be waiting at Starr Gate, the tram would couple up to it and it would then be pushed to Lytham as it provided the traction current. The unit would be towed in the reverse direction and then dropped off at Starr Gate to await the next tram. The advantage of this system is that it insulates the passengers from the noise and vibration; there would be no dead weight to haul 'under the wires' and only a limited number of trailers would be required. This seemed to offer an inexpensive option for extending tram services over the line.



When diesel locomotive haulage of unfitted goods trains was first introduced, it was considered that the locomotives would have insufficient brake power to control their trains, so some special "diesel brake tenders" were introduced. These were heavy wagons (35½ - 37½ tons) fitted with automatic vacuum brakes. On some BR Regions they were usually pushed by the loco, but on the Southern Region it was normal practice to pull them.

Experimental operation of a standard Stadtbahn car in Essen coupled to a natural gas – powered generator trailer. The unit was used to provide demonstration runs in 1999 as part of plans to bring a non-electrified industrial railway back into service as a light railway

Applicability today

The RTM concept could be applied to the provision of a lightweight tram-train for non electrified lines in the UK. The ex-Berlin Tatra T6 cars were examined for possible use on the Abbey Line and a description of the car is included in the Phase1 Report. Briefly the car is a single ended, single sided car, some 15m long. Coupling a pair of these cars back to back would produce a double-ended set. The front doors could be left in their existing location to provide driver's access and emergency detrainment, the rear doors would be plated over and the redundant equipment used to provide an off-side door. The two centre doors would then be raised to provide UK platform-level access.

Interior and exterior views of Berlin rebuilt T6 cars

If a pair of these T6 cars was used to sandwich a central generator trailer then a modern version of the RTM M1700 set would be achieved.

Tatra bogies identical to those in use under the T6 are readily available on the second hand market at scrap metal prices. The majority of these bogies are motorised, but it is a simple matter to remove the traction motors, retaining the drive train and cardan shaft friction brakes. One motor could be left on one truck, thus permitting the motor trailer some limited manoeuvring capacity, independent of the rest of the train, whilst under limited local control. An alternative would be to obtain some of the trailer trucks provided under the Tatra *beiwagen* trailers supplied to East Germany and Russia. All of these bogies could be controlled from the motor cars, thus providing a fully-braked train.

The chassis of the generator trailer would be easy to fabricate and the body would only need to be a lightweight cover for the motor generator unit – unless it is desired to provide some limited passenger and luggage capacity on the trailer. The motor generator set could be a normal commercial unit, since many of these are designed to be housed within a normal sea container there should be few problems in fitting them within the confines of a normal rail vehicle. It is recommended that thought is given to improving the environmental performance of the set by introducing a form of 'hybrid drive'; this could be achieved by 'floating' the output of the generator, using a battery, flywheel accumulator or a bank of super-capacitors. Such an arrangement would allow the unit to accelerate by drawing on the energy store and to decelerate using the regenerative capacity of the tram – feeding the current into the energy store. Similar arrangements are used on 'hybrid drive' road vehicles, in the Bombardier super-capacitor tram and in the Parry People Mover.

A 3 car set of T6+GT+T6 would be around 45m long and provide a capacity of over 150 passengers (72 seated and 80 standing in the two T6s, plus whatever is proposed for the generator trailer. The train would have a top speed of around 65kmh and an acceleration of around 1m/s/s. This performance may not make such a set suitable for longer-distance interurban work, such as the Penistone Line, but it would certainly be an attractive substitute for a Pacer on shorter lines (St Ives branch, Stourbridge, Severn Beach, rebuilt Alnwick, etc.) where there is no need for physical inter-running with main line trains.

Experiment

An experimental set could be built very cheaply; the T6 cars are currently available at low prices from Germany, spare parts are readily available at scrap metal prices and the diesel generator set would be a standard commercial product. All that is required is the fabrication of the diesel generator car body and the modifications to the two T6 cars. If the experiment is not a success then the diesel generator set can be recovered and sold on, reducing the overall cost of the experiment.

This experimental set could then be compared with the cost and performance of existing diesel railcars in the 14X, 15X series – and the Parry cars at Stourbridge.

Whilst the current proposal is for a relatively small train, there is no reason why the concept could not be enlarged to allow larger articulated trams to be used and the decouplable generator trailer concept could be used to allow through operation of trams in places such as Manchester (Manchester – Marple line) or Sheffield (Penistone Line), the concept could also be expanded to allow the extension of Merseyrail services over the Bidston-Wrexham line – without the cost of electrification. It is important to note that in the Manchester, Sheffield and Mersey cases this type of operation could be considered as an intermediate stage in the development of a full electric network; hybrids could prove the business case and then the generators redeployed elsewhere once the funds for electrification are available.

SMcl v2 20 April 2009.

Annex A.

Mobile Power Houses in Argentina

In 1929 the Buenos Aires Great Southern Railway (BAGSR) obtained from Armstrong Whitworth in the UK, two 1,200hp mobile power houses (MPH), numbered UE 1 & 2, used to power five coaches, three 1st & two 2nd class. Traction motors under the coaches were powered by the MPH's. One was loaned to the FC Buenos Aires Pacifico. The CME of BAGSR was reluctant to initiate full electrification of the lines around Buenos Aires due to its cost, but believed in the idea of powered coaching stock, in this case drawing power from a diesel electric generator set installed in a 'mobile power house'. These units were semi-permanently coupled to five coach sets, the end coach being equipped with driving compartments, avoiding reversals at the busy Buenos Aires terminals. These two locomotives were ordered just after an order to Beardmore, the first diesel locomotives to work anywhere in South America.

Delivered in late 1930, each was powered by two Sulzer 8LV28 cylinder engines developing 600hp at 700rpm, powering an Oerlikon main generator & two 136hp Metropolitan Vickers traction motors - each coach carried two 100hp motors. The rigid frame supported four fixed axles, two of which were powered with a pony truck at each end (1-A-2-A-1 arrangement). The components were all received separately in Argentina, being shipped to the BAGS workshops, where the locomotives were put together; because they were semi-permanently coupled to the coaching stock, the MPH's carried only one driving cab. Locomotive weight was 92 tons; total train weight was 314 tons.

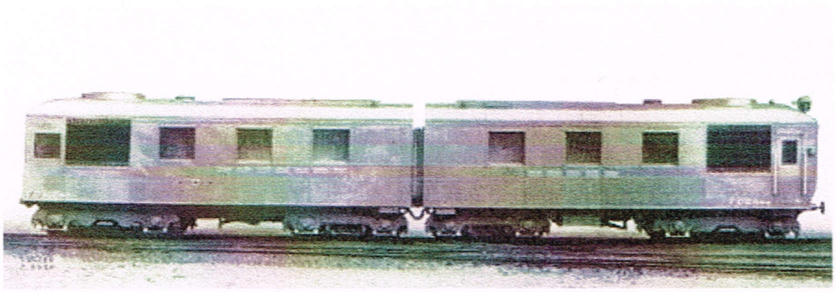
They were most regularly operated out of the Plaza Constitucion terminal to Quilmes, their acceleration was superior to the regular steam fleet, but the MPU powered trains generally ran under the steam timings. Occasionally the two sets were combined. In the early years it was the practice to stop the engines at each station stop, leading to the engines going through the stop/start cycle over two hundred times a day! They remained in service at least until 1948.

In 1933 Buenos Aires Great Southern obtained three further 1700hp mobile power houses, 2 x 850hp 8LV34 550rpm, cylinder dimensions 340mm x 400mm, with 8 x 134 hp traction motors, tractive effort 38,000lb, weight in working order 148.50tons. Numbered UE 3, 4 &5 they were used to haul eight coaches, five 1st & three 2nd class. They had an increased top speed of 70mph but had the same traction motors and reduction gearing as the first two power houses. The newer machines were also lighter, 132 tons compared to 145 tons. The cost of the two engine-generator sets and ancillary equipment was GBP16,400.

These three MPH's were direct descendants of the 1930 built UE 1 & 2. Improvements included the use of two four axle trucks rather than the earlier rigid wheelbase. Each MPH was comprised of two half units, each containing an engine generator set, though only one unit had a driving compartment (an A-B unit in American diesel nomenclature). A third innovation was the use of Messrs J Stone & Co's 'Skefco' roller bearings on all axles, a welcome fitting in the dry dusty conditions of Argentina.

The Sulzer engines were coupled to Brown Boveri main generators and two English Electric traction motors on the outer bogie of each half unit. The weight of each double unit was 133 tons, with eight coaches in tow the total train weight was 470 tons. As with UE 1 & 2 the performance of these three train sets was impressive, particularly in light of their quick turnround times at the termini, however for most of their lives they slotted in to steam diagrams.

These MPH's remained in service at least until 1959, although one power-house was re-engined with two Paxman 1,500rpm engines and Metropolitan Vickers generators.



A side view of one of the double unit mobile power houses.

A view from a 1933 issue of Diesel Railway Traction advertising Sulzer diesel engines shows the two 1,700hp mobile power houses with a lengthy train.

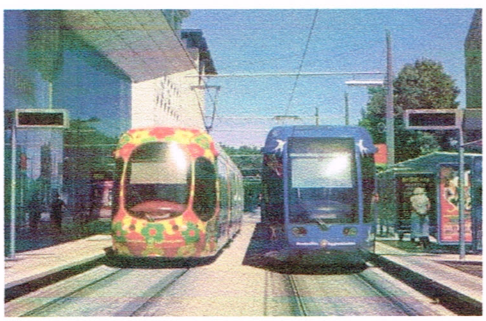
On November 8th 1933 the chairman of the BAGS included this statement about the early diesel experiments on the BAGS in Argentina:

"*....experiments with diesel engines were started by us some five years ago. Trials have convinced us that this form of traction for branch lines and similar light service has outstanding potentialities. We sent out two mobile power houses, each of 1,200bhp. Encouraged by the results obtained from these original power houses the company acquired three more powerful units, each of 1,700bhp. These were put into service in June this year and up to the present have run some 45,000 miles. Each of these 1,700bhp power houses operates an eight coach train, weight of which is 526 tons. Seating capacity is provided for 916 passengers. In addition to these units a diesel-electric locomotive of 1,700hp was sent out. Trials of this locomotive were satisfactory. These pioneer developments in diesel traction are being watched with great interest in railway circles and each step we have taken so far has been attended with complete success.....*"

Appendix G

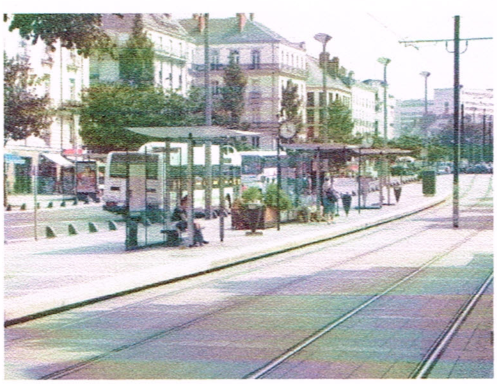
Proposed Interurban/Community Rail Station layouts

Mulhouse, Harald Jahn



Montpellier, Malc McDonald

Dublin LUAS, David Cockle



Nantes, David Cockle

Nottingham, Stephen Dee

Appendix H

Chilliwack Interurban Stage1 Phase1 Pricing Schedule

Report Item #	Work Scope	Unit	Size	Unit cost	Qty	Extension	Sub Total		Total			
				CAD$		CAD$	CAD$		CAD$			
5.0	**Surveys, Site Investigation & Bore holes.**											
	Permanent way	Item		$ 450,000.00	4	$ 1,800,000.00						
	Bridges & Structures	Item		$ 490,000.00	5	$ 2,450,000.00						
	Grade crossings	Item		$ 420,000.00	4	$ 1,680,000.00						
	Embankments, Earthworks & Drainage	Item		$ 465,000.00	4	$ 1,860,000.00						
	Utilities	Item		$ 250,000.00	5	$ 1,250,000.00	$ 9,040,000.00		$ 9,040,000.00			
all	**Detailed Design Fees**	Item		$ 4,950,000.00	1	$ 4,950,000.00	$ 4,950,000.00		$ 4,950,000.00			
11.1	**Permanent way (track), renewal & upgrading.**											
	30% spot renewal	km		$ 38,500.00	29	$ 1,116,500.00						
	30% heavy renewal	km		$ 48,500.00	29	$ 1,406,500.00						
	40% heavy renewal	km		$ 65,000.00	40	$ 2,600,000.00	$ 5,123,000.00		$ 5,123,000.00			
11.3	**Passing loops**											
	Stations & tram stops	No		$ 3,950,000.00	18	$71,100,000.00						
	Existing upgrades + capacity provisions	No		$ 3,350,000.00	9	$30,150,000.00	$ 101,250,000.00		$ 101,250,000.00			
10.0	**Civil engineering work, associated with permanent way renewal & upgrading.**											
	Drainage & Culverts	allowance					$ 4,250,000.00		$ 4,250,000.00			
	Track formation earthworks and embankments.	allowance					$ 5,200,000.00		$ 5,200,000.00			
16.2	**Highway/road crossings gated grade/level crossings.**											
	Upgrade to Stop Sign protected	No		$ 45,100.00	1	$ 45,100.00						
	Upgrade to light & bell protected	No		$ 102,000.00	6	$ 612,000.00						
	Upgrade to gate & light protected	No		$ 195,000.00	7	$ 1,365,000.00						
	New gate & light protected crossing	No		$ 245,000.00	1	$ 245,000.00	$ 2,222,000.00		$ 2,222,000.00			
5.0	**Rail-Over Bridge strengthening & modifications**	No		$ 485,000.00	12	$ 5,820,000.00	$ 5,820,000.00		$ 5,820,000.00			
7.1	**Stations**											
	Building	m2	500	$ 1,786.00	10	$ 8,930,000.00						
	Station, building finishes, E & M services & Equipment	m2	500	$ 2,215.00	10	$11,075,000.00						
	Platforms	No		$ 78,000.00	20	$ 1,560,000.00						
	Shelters	No		$ 740,000.00	10	$ 7,400,000.00						
	Services	No		$ 885,000.00	10	$ 8,850,000.00	$ 37,815,000.00		$ 37,815,000.00			
7.2	**Tram stops**											
	Platforms	No		$ 78,000.00	16	$ 1,248,000.00						
	Shelters	No		$ 740,000.00	16	$11,840,000.00						
	Services	No		$ 480,000.00	8	$ 3,840,000.00	$ 16,928,000.00		$ 16,928,000.00			
9.0	**Depot building and infrastructure**											
	Depot, workshops, control room & offices	m2	1,600	$ 3,725.00	1	$ 5,960,000.00						
	Stabling area, trackwork, fencing & security	m2	16,000	$ 1,850.00	1	$29,600,000.00						
9.0	**Depot equipment and fitting out.**											
	Depot, building finishes, E & M services & Equipment	m2	1,600	$ 17,500.00	1	$28,000,000.00						
	Fuelling facilities, vehicle washer, sand silo & dispenser	Item		$ 11,250,000.00	1	$11,250,000.00						
	Stabling area, trackwork, fencing, facilities & security @ Chilliwack & Scott Road	No		$ 9,500,000.00	2	$19,000,000.00						
							$ 93,810,000.00		$ 93,810,000.00			
12.0, 13.0	**Signalling & communications**	Item					$ 75,000,000.00		$ 75,000,000.00			
18.2	**Fare collection.**	Item					$ 21,000,000.00		$ 21,000,000.00			
17.0	**Vehicles.**	No		$ 3,850,000.00	12	$46,200,000.00	$ 46,200,000.00		$ 46,200,000.00			
									Net Total	$428,608,000.00		
	Provisional Sums											
15.0	Utility Diversions	Prime Cost				$ 4,300,000.00						
16.0	Highway modifications	Prime Cost				$ 3,850,000.00						
7.0, 9.0	Land Purchase	Acre	16	$ 230,000.00	1	$ 3,680,000.00						
21.0	Approvals & Assurances - BCSA, CRSA, TC	Prime Cost				$ 4,950,000.00						
21.0	Compliances & Licences - BCSA, CRSA, RAC	Prime Cost				$ 4,800,000.00						
21.0	Quality [ISO 9001, CSA 299.1]	Prime Cost				$ 2,500,000.00						
6.0	Environmental Impact Report	Prime Cost				$ 2,250,000.00	$ 26,330,000.00			$ 26,330,000.00		
	Preliminary Sums											
21.0	Safety Cases - BCSA, CRSA, TC	Allowance				$ 3,450,000.00						
all	Planning & Legal	Allowance	%	Net Contract	2.50%	$10,715,200.00						
all	Contract Insurance	Allowance	%	Net Contract	0.80%	$ 3,428,864.00						
all	Contract Project Management	Allowance	%	Net Contract	4.50%	$19,287,360.00	$ 36,881,424.00			$ 36,881,424.00		
									Total	**$491,819,424.00**	**$ 5,018,565.55**	per Km

Appendix J

Interurban Cost Summary

Stage	Phase		Total Cost		Length Km		Cost per Km	
1	1		$491,819,424.00		98.00		$5,018,565.55	Chilliwack to Scott Road [Diesel/hybrid]
	2		$114,700,000.00		98.00		$1,170,408.16	Chilliwack to Scott Road [Electrification]
Stage 1		Total	$606,519,424.00		98.00		$6,188,973.71	
2	2a		$117,000,000.00		10.00		$11,700,000.00	Scott's Road to Richmond – at grade
	2b		$246,500,000.00		18.00		$13,694,444.44	Richmond to Vancouver Central station – at grade
Stage 2		Total	$363,500,000.00		28.00		$12,982,142.86	
3			$28,500,000.00		12.00		$2,375,000.00	Chilliwack station to Rosedale
Stage 3		Total	$28,500,000.00		12.00		$2,375,000.00	
	Project	Total	$998,519,424.00		138.00		$7,235,648.00	

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List of Tables

Table 1: Proposed Interurban/Community Rail – distance matrix

Distance Matrix - Km

	Scott Road	Delta-Nordel Way	Newton-King George	South Surrey-152nd Street	Cloverdale-180th Street	Langley-200th Street	Langley-#10 Road	TWU-Glover Road	Gloucester Estates /Aldergrove	Abbotsford-McCallum Road	Abbotsford-Essendene Avenue	Abbotsford-Marshall Road UFV	McConnell Road/Abbotsford International Airport	Huntingdon / Sumas USA	Yarrow / Cultus Lake	Sardis-Knight Road	Chilliwack-Airport Road UFV	Chilliwack Station Yale W & Young Roads
Scott Road		2	7	11	16	23	26	30	39	56	58	60	62	64	84	94	96	98
Delta-Nordel Way	2		5	9	14	21	24	28	37	54	56	58	60	62	82	92	94	96
Newton-King George	7	5		4	9	16	19	23	32	49	51	53	55	57	77	87	89	91
South Surrey-152nd Street	11	9	4		5	12	15	19	28	45	47	49	51	53	73	83	85	87
Cloverdale-180th Street	16	14	9	5		7	10	14	23	40	42	44	46	48	68	78	80	82
Langley-200th Street	23	21	16	12	7		3	7	16	33	35	37	39	41	61	71	73	75
Langley-#10 Road	26	24	19	15	10	3		4	13	30	32	34	36	38	58	68	70	72
TWU-Glover Road	30	28	23	19	14	7	4		9	26	28	30	32	34	54	64	66	68
Gloucester Estates /Aldergrove	39	37	32	28	23	16	13	9		17	19	21	23	25	45	55	57	59
Abbotsford-McCallum Road	56	54	49	45	40	33	30	26	17		2	4	6	8	28	38	40	42
Abbotsford-Essendene Avenue	58	56	51	47	42	35	32	28	19	2		2	4	6	26	36	38	40
Abbotsford-Marshall Road UFV	60	58	53	49	44	37	34	30	21	4	2		2	4	24	34	36	38
McConnell Road/Abbotsford International Airport	62	60	55	51	46	39	36	32	23	6	4	2		2	22	32	34	36
Huntingdon / Sumas USA	64	62	57	53	48	41	38	34	25	8	6	4	2		20	30	32	34
Yarrow / Cultus Lake	84	82	77	73	68	61	58	54	45	28	26	24	22	20		10	12	14
Sardis-Knight Road	94	92	87	83	78	71	68	64	55	38	36	34	32	30	10		2	4
Chilliwack-Airport Road UFV	96	94	89	85	80	73	70	66	57	40	38	36	34	32	12	2		2
Chilliwack Station Yale W & Young Roads	98	96	91	87	82	75	72	68	59	42	40	38	36	34	14	4	2	

Table 2: Proposed Interurban/Community Rail – journey time matrix

Journey Time Matrix - Minutes

	Scott Road	Delta-Nordel Way	Newton-King George	South Surrey-152nd Street	Cloverdale-180th Street	Langley-200th Street	Langley-#10 Road	TWU-Glover Road	Gloucester Estates /Aldergrove	Abbotsford-McCallum Road	Abbotsford-Essendene Avenue	Abbotsford-Marshall Road UFV	McConnell Road/Abbotsford International Airport	Huntingdon / Sumas USA	Yarrow / Cultus Lake	Sardis-Knight Road	Chilliwack-Airport Road UFV	Chilliwack Station Yale W & Young Roads
Scott Road		2.5	7.25	11.25	16	22.5	25.5	29.5	37.25	51	53.5	56	58.5	61	77	85.5	88	90.5
Delta-Nordel Way	2.5		4.75	8.75	13.5	19.75	23	27	34.75	48.5	51	53.5	56	58.5	74.5	83	85.5	88
Newton-King George	7.25	4.75		4	8.75	15	18.25	22.25	30	44.75	46.25	48.75	51.25	53.75	69.75	78.25	80.75	83.25
South Surrey-152nd Street	11.25	8.75	4		4.75	11	14.25	18.25	26	39.75	42.25	44.75	47.25	49.75	65.75	74.25	76.75	79.25
Cloverdale-180th Street	16	13.5	8.75	4.75		6.25	9.5	13.5	21.25	35	37.5	40	42.5	45	61	69.5	72	74.5
Langley-200th Street	22.5	19.75	15	11	6.25		3.25	7.25	15	28.75	31.25	33.75	36.25	38.75	54.75	63.25	65.75	68.25
Langley-#10 Road	25.5	23	18.25	14.25	9.5	3.25		4	11.75	25.5	28	30.5	33	35.5	51.5	60	62.5	65
TWU-Glover Road	29.5	27	22.25	18.25	13.5	7.25	4		7.75	21.5	24	26.5	29	31.5	47.5	56	58.5	61
Gloucester Estates /Aldergrove	37.25	34.75	30	26	21.25	15	11.75	7.75		13.75	16.25	18.75	21.25	23.75	39.75	48.75	50.75	53.25
Abbotsford-McCallum Road	51	48.5	44.75	39.75	35	28.75	25.5	21.5	13.75		2.5	5	7.5	10	26	34.5	37	39.5
Abbotsford-Essendene Avenue	53.5	51	46.25	42.25	37.5	31.25	28	24	16.25	2.5		2.5	5	7.5	23.5	32	34.5	37
Abbotsford-Marshall Road UFV	56	53.5	48.75	44.75	40	33.75	30.5	26.5	18.75	5	2.5		2.5	5	21	29.5	32	34.5
McConnell Road/Abbotsford International Airport	58.5	56	51.25	47.25	42.5	36.25	33	29	21.25	7.5	5	2.5		2.5	18.5	27	29.5	32
Huntingdon / Sumas USA	61	58.5	53.75	49.75	45	38.75	35.5	31.5	23.75	10	7.5	5	2.5		16	24.5	27	29.5
Yarrow / Cultus Lake	77	74.5	69.75	65.75	61	54.75	51.5	47.5	39.75	26	23.5	21	18.5	16		8.5	11	13.5
Sardis-Knight Road	85.5	83	78.25	74.25	69.5	63.25	60	56	48.75	34.5	32	29.5	27	24.5	8.5		2.5	5
Chilliwack-Airport Road UFV	88	85.5	80.75	76.75	72	65.75	62.5	58.5	50.75	37	34.5	32	29.5	27	11	2.5		2.5
Chilliwack Station Yale W & Young Roads	90.5	88	83.25	79.25	74.5	68.25	65	61	53.25	39.5	37	34.5	32	29.5	13.5	5	2.5	

Overall journey Time 90.5 minutes

Table 3: Schedule of bridge structures

Proposal Ref No	Location	CTA/ Hwy Agency Designation	Type	Construction	Crossing			Comments
					Highway /Road	River/ stream	Railway	
B10-01	Airport Rd Chilliwack	–	Rail Over	Steel box girder	–	Vedder	–	Single span
B10-02	Chilliwack	Highway 1	Rail Over	Steel box girder	TCH & Luckakuck Way	–	–	3-span
B10-03	Yarrow	–	Rail Over	Steel bowstring	–	Vedder	–	2-span
B10-04	Arnold	–	Rail Over	Timber deck & beam & pier	Marion Road	–	–	Single span
B10-05	Arnold	–	Rail Over	Timber deck & beam & pier	Arnold Road	–	–	Single span
B10-06	Upper Sumas	–	Rail Over	Timber deck & beam & pier	Bowman Road	–	–	Single span
B10-07	Upper Sumas	–	Rail Over	Timber deck & beam & pier	Un-classified	Un-named	–	Single span
B10-08	Upper Sumas	–	Rail Over	Timber deck & beam & pier	Lamson Road	–	–	3-span
B10-09	Upper Sumas	–	Rail Over	Timber deck & beam & pier	Maher Rd	–	–	Single span
B10-10	Abbotsford	Highway 1	Rail Under	PCC beam & Insitu RC deck	Trans-Canada Hwy	–	–	Single span
B10-11	Abbotsford	Highway 11	Rail Under	PCC beam & Insitu-RC piers & deck	South Fraser Hwy	–	–	4- span
B10-12	Abbotsford	–	Rail Under	PCC beam & Insitu RC deck	Maclure Road	–	–	Single span
B10-13	Abbotsford	–	grade	Diamond crossing	–	–	Clayburn Rd	CPR
B10-14	Gifford [Glenmore Road]	–	Rail Over	Steel box girder	–	Un-named	–	Single span
B10-15	Sperling	264th street	Rail Under	Timber trestle, steel beams Insitu RC deck	County Line Road	–	–	Single span
B10-16	Livingstone /Trinity Western Uni	Highway 1	Rail Over	Insitu RC walls & deck	Trans-Canada Hwy	–	–	Twin Single span
B10-17	Langley	204a St	Rail Under	PCC beam & Insitu RC piers & deck	Duncan Way	–	–	Multi span viaduct
B10-18	Cloverdale	Pacific Highway 15	Rail Under	PCC beam & Insitu RC piers & deck	176th Street Cloverdale Bypass			
B10-19	Surrey 56th Ave	10	Rail Over	Steel trestle	–	Pit	–	Single span

Table 4: Schedule of grade highway crossings

Proposal Ref No	Location	Hwy/Avenue /Street Ref	Hwy/Avenue/St Name	Existing Grade Crossing Type			Interurban Up-grade	Comment
				Gate & Light Protected	Light & Bell Protected	Stop Sign Protected	SSP ¦ GLP ¦ LBP	
G10-01	Chilliwack	–	8898 Young Rd	√	–	–	–	
G10-02	Chilliwack	–	45822 Hocking Ave	–	–	√	LBP	
G10-03	Chilliwack	–	45722 Airport Rd	–	–	√	LBP	
G10-04	Chilliwack	–	45786 Knight Rd	–	–	√	LBP	
G10-05	Chilliwack	–	45786 Web Ave	√	–	–	–	
G10-06	Chilliwack	–	7140 Vedder Rd	–	√	–	GLP	
G10-07	Chilliwack	_	Spruce Drive	-	-	√	LBP	
G10-08	Chilliwack	–	6974 Evans Rd	–	√	–	GLP	
G10-09	Chilliwack		6520 Unsworth Rd	–	–	√	–	
G10-10	Chilliwack	–	44440 S. Sumas Rd	–	–	√	LBP	
G10-11	Chilliwack	_	Lickman Rd	-	-	√	-	
G10-12	Chilliwack	–	Keith Wilson Rd	–	–	√	–	
G10-13	Chilliwack	–	Vedder North Dyke Road	–	–	√	–	
G10-14	Chilliwack	–	Lumsden Road	–	–	–	SSP	No existing protection
G10-15	Chilliwack	–	42762 Yarrow Central Rd	–	–	√	LBP	
G10-16	Chilliwack	_	Wilson Road	-	-	√	-	
G10-17	Chilliwack	_	Belrose Road	-	-	√	-	
G10-18	Abbotsford	_	Old Yale Rd	-	-	√	-	
G10-19	Abbotsford	–	680 Whatcom Rd	–	–	√	–	
G10-20	Abbotsford	–	Kenny Rd	–	–	√	–	
G10-21	Abbotsford	–	Angus Campbell Rd	–	–	√	–	
G10-22	Abbotsford	–	34888 Boundary Rd	–	–	√	–	
G10-23	Abbotsford	9	Cherry St	√	–	–	–	
G10-24	Abbotsford	11	Sumas Way	√	–	–	–	
G10-25	Abbotsford	4th Avenue	–	–	√	–	–	

Proposal Ref No	Location	Hwy/Avenue /Street Ref	Hwy/Avenue/St Name	Existing Grade Crossing Type			Interurban Up-grade	Comment
				Gate & Light Protected	Light & Bell Protected	Stop Sign Protected	SSP ¦ GLP ¦ LBP	
G10-26	Abbotsford	–	34540 Vye Rd	–	√	–	–	
G10-27	Abbotsford	–	Marshall Rd	√	–	–	–	
G10-28	Abbotsford	–	33842 Essendene Ave	√	–	–	–	
G10-29	Abbotsford	–	33813 George Ferguson Way	√	–	–	–	
G10-30	Abbotsford	–	2931 McCallum Rd	–	√	–	–	
G10-31	Abbotsford	–	Maclure Rd	√	–	–	–	
G10-32	Abbotsford	–	33618 Valley Rd	–	–	√	–	
G10-33	Abbotsford	–	33880 Clayburn Rd	–	–	√	–	
G10-34	Abbotsford	–	33140 Townshipline Rd	–	–	√	–	
G10-35	Abbotsford	–	5142 Gladwin Rd	–	–	√	–	
G10-36	Abbotsford	–	5336 Glenmore Rd	–	–	√	–	
G10-37	Abbotsford	–	31421 Harris Rd	–	–	√	–	
G10-38	Abbotsford	–	30974 N Burges Ave	–	–	√	–	
G10-39	Abbotsford	–	5895 Mt Lehman Rd	–	–	√	–	
G10-40	Abbotsford	–	5658 Ross Rd	–	–	√	–	
G10-41	Abbotsford	–	Bradner Rd	–	–	√	–	
G10-42	Abbotsford	–	5490 Rand St	–	–	√	–	
G10-43	Abbotsford	–	56th Avenue	–	–	√	–	
G10-44	Abbotsford	272 St	5948 Jackman Rd	–	–	√	–	
G10-45	Abbotsford	26700 62nd Ave	–	–	–	√	–	
G10-46	Abbotsford	26306 64th Ave	–	---	---	√	---	

Proposal Ref No	Location	Hwy/Avenue /Street Ref	Hwy/Avenue/St Name	Existing Grade Crossing Type			Interurban Up-grade	Comment
				Gate & Light Protected	Light & Bell Protected	Stop Sign Protected	SSP ¦ GLP ¦ LBP	
G10-47	Abbotsford	258th St	–	–	–	√	–	
G10-48	Abbotsford	6900 256th St	–	–	–	√	–	
G10-49	Langley	6762 248th St	–	–	–	√	–	
G10-50	Langley	7060 240th St	–	–	–	√	–	
G10-51	Langley	23702 72nd Ave	–	–	–	√	–	
G10-52	Langley	7588 232nd St	–	√	–	–	–	
G10-53	Langley	–	7600 Glover Rd	√	–	–	–	
G10-54	Langley	216th St	–	√	–	–	–	
G10-55	Langley	–	21482 Smith Crescent	–	–	√	–	
G10-56	Langley	–	Crush Crescent	√	–	–	–	
G10-57	Langley	–	21150 Worrell Crescent	√	–	–	–	
G10-58	Langley	–	20780 Mufford Crescent	√	–	–	–	
G10-59	Langley	10	20698 Langley Bypass	√	–	–	–	
G10-60	Langley	5981 200th St	–	√	–	–	–	
G10-61	Langley	1A	19879 Fraser Highway	√	–	–	–	
G10-62	Langley	56th Ave	19462 Langley Bypass	√	–	–	–	
G10-63	Langley	192nd St	–	√	–	–	–	
G10-64	Langley	188th St	–	–	–	√	–	
G10-65	Langley	184th St	–	–	–	√	–	
G10-66	Surrey	5566 168th St	–	√	–	–	–	
G10-67	Surrey	10	56th Ave/164th St	√	–	–	–	Old McLellan Rd
G10-68	Surrey	6010 156th St	–	–	–	√	–	
G10-69	Surrey	152nd St	–	√	–	–	–	
G10-70	Surrey	14851 64th Ave	–	√	–	–	–	

Proposal Ref No	Location	Hwy/Avenue /Street Ref	Hwy/Avenue/St Name	Existing Grade Crossing Type			Interurban Up-grade	Comment
				Gate & Light Protected	Light & Bell Protected	Stop Sign Protected	SSP ¦ GLP ¦ LBP	
G10-71	Surrey	6442 148th St	–	√	–	–	–	
G10-72	Surrey	6692 144th St	–	√	–	–	–	
G10-73	Surrey	138th St	–	–	√	–	GLP	
G10-74	Surrey	99A	7046 King George Hwy	–	√	–	GLP	
G10-75	Surrey	13530 72nd Ave	–	–	√	–	GLP	
G10-76	Surrey	13236 76th Ave	–	–	√	–	GLP	
G10-77	Surrey	7560 132nd St	–	–	√	–	–	
G10-78	Surrey	12898 80th Ave	–	–	√	–	–	
G10-79	Surrey	8116 128th St	128th/82nd Ave intersection	√	–	–	–	
G10-80	Surrey	–	12090 Nordel Way	√	–	–	–	
G10-81	Surrey	12066 88th Ave	–	√	–	–	–	
G10-82	Surrey	120th St	Scott Road	–	√	–	GLP	
G10-83	Surrey	11944 92nd Ave	–	–	√	–	–	
G10-84	Surrey	11884 96th Ave	–	–	–	√	–	
G10-85	Surrey	9880 120th St	–	√	–	–	–	
G10-86	Surrey	12422 104th Ave	–	–	√	–	–	
G10-87	Surrey	106th Ave & 125a St	–	–	–	√	–	
G10-88	Surrey	-	12538 Old Yale Road	–	√	–	–	
G10-89	Surrey	12566 110th St	–	–	–	–	GLP	New Grade Crossing

Tuesday, July 23: All aboard! Bring back the Interurban

VANCOUVER SUN 07.22.2013 |

Terry Nichols of the Fraser Valley Heritage Railway Society operates the society's recently restored BC Elecrtric Railway 1 railcar at the Cloverdale Station in Surrey on Wednesday, July 17, 2013. *RIC ERNST / VANCOUVER SUN*

Re: The return of the Interurban (http://www.vancouversun.com/return+interurban/8675428/story.html) , Pete McMartin column, July 18

The Rail for the Valley group engaged Leewood Projects of the UK to do a viability study of the return of the interurban service for the Fraser Valley in 2010. The Leewood RftV study, not only showed that a new interurban service was viable, it would be quite cheap compared to recent rapid transit projects in the region.

A basic diesel light Rail service from Scott Road Station to Chilliwack could be had for around $500 million and a deluxe, full-build Vancouver/Richmond to Chilliwack, electric interurban/tram train service could be built for just under $1 billion dollars. Not bad, if one compares the cost of the Leewood/RftV interurban with the $1.4 billion,11-kilometre Evergreen Line, now under construction.

Rail for the Valley, at no expense to the taxpayer has a 'shovel ready' plan to provide much needed 'rail' transit for the Fraser Valley, which to date has been ignored by most provincial and civic politicians.

The Leewood/RftV study can be seen on the Rail for the Valley web site http://www.railforthevalley.com/ under the heading "Need for Passenger Rail", then "Important Studies.

The return of the interurban, providing rail transit from Vancouver to Chilliwack is within our grasp, if only we had the political will to make it happen.

D. Malcolm Johnston, Rail for the Valley, Delta

Peter McMartin's excellent Thursday article on the resurrection of the Interurban rail line from Chilliwack serving many Fraser South shore towns indicates to me (and many others) that all local and provincial politicians in the Lower Mainland must accept the potential role of the Interurban system for the Fraser Valley, using present infrastructure already in place -- thus saving the substantial capital costs of yet another horrendously expensive skytrain system (ie to South Surrey and Langley). Much of the original track is still in place and Victoria (Translink) can always arrange for the capital funds for stations to be provided for by property developers, using park-and-pay and stations, with connecting bus loops, incorporated into major retail mini-malls.

Politicians in the Lower Mainland and Victoria no longer have any choice over setting up major public transit routes as the taxpayer will not countenance more multi-billion-dollar systems like Skytrain, when more common sense alternatives such as the South Urban line and the Broadway tram routes are available. Why do we have to build more $2-billion tunnels under Broadway when the original Broadway tram system serviced five routes to and from Commercial Drive to UBC right upto the 1950s. Major European cities have tram systems to provide fast efficient public transit with regional rail connections to outlying towns. What is our problem that the provincial government is totally incapable of providing tram and regional