ITEM 7
MANAGER'S REPORT NO. 62
COUNCIL MEETING 1982 11 08

RE: ALRT DEVELOPMENT IN BURNABY PROGRESS REPORT

MUNICIPAL MANAGER'S RECOMMENDATION:

1. *THAT the recommendations of the Director Planning & Building Inspection be adopted.*

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TO: MUNICIPAL MANAGER — 1982 November 02

FROM: DIRECTOR PLANNING & BUILDING INSPECTION — Our File: 08.230

SUBJECT: A.L.R.T. DEVELOPMENT IN BURNABY - PROGRESS REPORT

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RECOMMENDATION

1. THAT Council request the B.C.T. Rapid Transit Project representatives to meet with them regarding the A.L.R.T. system.

2. THAT Council request that B.C. Transit officials' presentation include consideration of the status of system development in Burnaby as well as financing and ridership.

3. THAT a copy of this report be sent to the B.C.T. Rapid Transit Project's Chief Administrator.

1.0 SUMMARY/INTRODUCTION

At its meeting of 1982 October 18 members of Council expressed some concerns regarding the financing of the A.L.R.T. project. In response we asked B.C. Transit to supply us with data addressing financing, and related issues. This material has been received and is annexed to this report but it may not alleviate particular concerns of Council.

B.C.T. Rapid Transit Project staff also indicated a willingness to appear before Council; to brief it with regard to progress on the development of the system as a whole; to discuss financing issues; and/or particular aspects of the system in Burnaby. We understand that B.C.T. would require a lead time of at least two weeks in order to schedule a meeting and organize a presentation should Council elect to meet with them. B.C.T. staff would also appreciate some advance indication of particular concerns of Council so that they would be prepared to address those topics.
To assist Council in its decision as to whether a meeting with B.C. Transit Rapid Transit Project staff would be useful this report includes a summary of the current status of the A.L.R.T. development in Burnaby. The report also serves to encapsulate the results of previous reports to Council on individual issues regarding alignment, station locations and the A.L.R.T. yard site.

As shown on the attached plan and as discussed below the broad principles relative to the A.L.R.T. development are now fixed and detailed design of the system in Burnaby has commenced. Municipal staff have had the opportunity to review the preliminary versions of the design detail for the stations, the guideway and the yard site to ensure that they accord with basic policy and technical requirements. This review process will be continuing and is essentially not dissimilar, particularly with regard to stations, to the approach taken with major new private development in the Municipality. It is assumed that issues of technical concern will be addressed through this proces and resolved at a staff level.

We anticipate that construction of the A.L.R.T. guideways in Burnaby will commence as scheduled in 1983 and that the system will be operating in revenue service by 1986. Prior to that time the Municipality will have to ensure that requisite road improvements are in place in order to meet basic A.L.R.T. accessibility requirements. The improvements contemplated are by and large those that were considered by the Transportation Committee in the development of the Comprehensive Transportation Plan Implementation Strategy.

R E P O R T

A. A.L.R.T. Financing

The appended material has been provided by B.C.T. and is their response to concerns that have been generally raised regarding the financing and economic viability of the A.L.R.T. system.

In summary the A.L.R.T. Capital Cost is estimated to be $718 million as at the 1986 opening. Of this sum $120 million will be funded through grants from the federal government ($60 million) and a matching grant from the province. It is our understanding that the remaining capital amount will be amortized through cost sharing arrangements for funding transit that are now in place. If amortized over 30 years at a nominal interest rate of 10-1/2% then the annual 'mortgage' payment for A.L.R.T. will be approximately $66 million. Additionally there will be an annual cost from operating A.L.R.T. (energy maintenance etc.)

We presume that the A.L.R.T. system will be funded in the context of and as a part of the Lower Mainland transit system. Under this formulation 35% of costs have to be met through the fare box and the deficit would be financed two-thirds by the province and one-third by the G.V.R.D. (through their respective taxing mechanisms). It should be noted that A.L.R.T. system costs will to some extent be offset by savings with respect to operating buses. Council will recall that the G.V.R.D. Rapid Transit Project's recommendation for implementing L.R.T. was based on the conclusion that ultimately a transit system that included rapid transit would be cheaper than one that was based solely on the use of buses.

B. Status of A.L.R.T. Development in Burnaby

1. Introduction:

Since the beginning of this year Council has received a number of reports regarding A.L.R.T. alignments and station locations in Burnaby. The major issues addressed in those reports have been resolved and the broad parameters of the system are now fixed. The detailed design of system elements is proceeding on an incremental basis as discussed below. Municipal staff have been involved in reviewing preliminary design submissions to ensure that they conform with Municipal technical/policy requirements.

2. Alignment:

The A.L.R.T. system design in Burnaby has been broken down into four alignment sections. Staff have met with the section designers and reviewed their '25%' design of the guideway. Our primary concern was that piers and footings do not conflict or preclude options for present and future road crossing requirements and we anticipate that subsequent design submissions will reflect our comments.

As the structural design moves towards completion we will also need to address the treatment of the A.L.R.T. right-of-way. B.C. Transit staff have already, albeit informally, indicated some willingness and flexibility with respect to provision of pedestrian cycle ways landscaping and the like under the A.L.R.T. guideway. These features will be especially critical in the Metrotown area.

3. A.L.R.T. Stations:

The design of the A.L.R.T. stations in Burnaby is being progressed in the context of the procedure normally applied to a new development carried out through rezoning. The stations are expected to be constructed to a high standard in terms of both their appearance, function, and landscaped setting. Current Planning staff are pursuing these aspects with B.C. Transit. Staff have reviewed 'functional plans' for all of the stations in the Municipality (except for Kingsway which is to be built at a later date as discussed below) and provided both B.C. Transit and the station architects with a comprehensive list of requirements and comments.

We have also received more detailed concept design submissions for the Patterson, Metrotown and Royal Oak stations. However not all of our concerns were addressed by these latter submissions. B.C. Transit has not yet replied in detail to the Municipal requirements and concerns expressed by Burnaby staff. We expect that the majority of these issues will be resolved through further discussion. The major design parameters of the major stations in Burnaby are discussed below.

a) Kingsway:

The A.L.R.T. guideway crosses Kingsway in a single span that is aligned to allow for the future development of a station (which would also span Kingsway). Because the A.L.R.T. crosses Kingsway at a skewed angle the clear span required is at the limit of what is considered technically feasible. We are awaiting the results of a study commissioned by B.C. Transit which is to examine the station's structural requirements relative to this long span.

b) Patterson:

The Patterson station is elevated and straddles the Patterson road right-of-way. The station guideways are split to accommodate a centre load platform with a primary access from the east side of Patterson and a secondary access from the west side of Patterson. There will be a lay-by for buses and 'handy dart' vehicles. It is anticipated that short term 'kiss-and-ride' waiting by vehicles would take place curbside along Beresford (South). The undergrounding of existing overhead wiring which intersects with this elevated station would be desirable.

c) Metrotown:

The Metrotown station (which is to be located behind the Kelly Douglas site) is considered one of the most important stations along the line. This station has a centre platform which is to be connected by an overhead enclosed walkway to a major bus interchange. It is envisaged that this passarelle will be incorporated into any redevelopment of the Kelly Douglas site. The achievement of required dedicated rights-of-way to access this A.L.R.T. and bus station is necessary and is being pursued. Public pedestrian linkages to this facility are important to the proper functioning of the A.L.R.T. station.

d) Royal Oak:

The Royal Oak station will be similar to the one at Patterson except that it is expected to have a lower level of patronage. There are no bus connections at Royal Oak planned at this time but we envisage that it will be the focus for those rapid transit users arriving or leaving the station as 'kiss-and-ride' passengers. It is proposed that a short term waiting area be developed by B.C. Transit adjacent to the station along south Beresford east of Royal Oak to accommodate this use. The undergrounding of existing overhead wiring which intersects with this elevated station would be desirable.

e) Edmonds:

The Edmonds station is to be developed as a side loaded platform facility on an at grade alignment south of the Byrne Creek ravine. It would be primarily accessed from 19th Street via 18th Avenue which at present consists of a narrow roadway within a 33 foot right-of-way. Accordingly B.C. Transit will have to reconstruct this access link to a 46 ft. wide pavement standard within an augmented right-of-way (66 ft). Adjacent to the station there is to be a waiting area for 'kiss-and-ride' users as well as a bus interchange. It is presumed that this interchange will take over the function of the existing Edmonds loop.

Because the station location is somewhat remote from the higher densities of the Middlegate area staff have been particularly concerned that the station design maximize "visibility" and the opportunities for pedestrian access. Accordingly we have proposed changes to the functional plan that was submitted to us for review. In particular we have proposed placing the station "pod" at the end of the vista down 10th Avenue. We understand that G.V.R.D. Transit Planning staff have also suggested major restructuring of the transit interchange facility proposed. We have not yet had any written indication of how these concerns are to be addressed by B.C. Transit.

It is noted that public washrooms have been requested of B.C. Transit at this Edmonds and the Metrotown A.L.R.T. station and indicated as desirable at the other A.L.R.T. stations in Burnaby.

4. A.L.R.T. Yard Site:

The A.L.R.T. yard site development and design are proceeding in parallel. The yard is to be developed in the gravel pit area north of 10th Avenue which is owned by the Municipality and B.C. Hydro and the treatment/reclamation of the gravel pit(s) has commenced. The ultimate development is to be progressed through a normal rezoning process which in this case also includes the consolidation and sale of Municipal holdings.

Staff have had sight of preliminary drawings for the yard development and are working with B.C. Transit staff and consultants to ensure that the yard site improvements conform to the high standard of design for landscaping and architecture that is expected of the rest of the system. Considerable effort has also been focussed on the basic requirement that the A.L.R.T. system accommodate and not obstruct the development of the Marine Way-Tenth Connector.

C. DISCUSSION & CONCLUSIONS

The design of the A.L.R.T. system in the Municipality is moving forward at the rapid pace required for construction to commence in 1983. As the design progresses it becomes more fixed and the opportunities for change become limited. Additionally with the advancement of design, the focus shifts to the more detailed design elements and refinements. Municipal staff, conscious of this process, are ensuring that basic Municipal requirements are adequately addressed.

A.L. Parr
DIRECTOR PLANNING &
BUILDING INSPECTION

PL/mcb

cc: Director Engineering

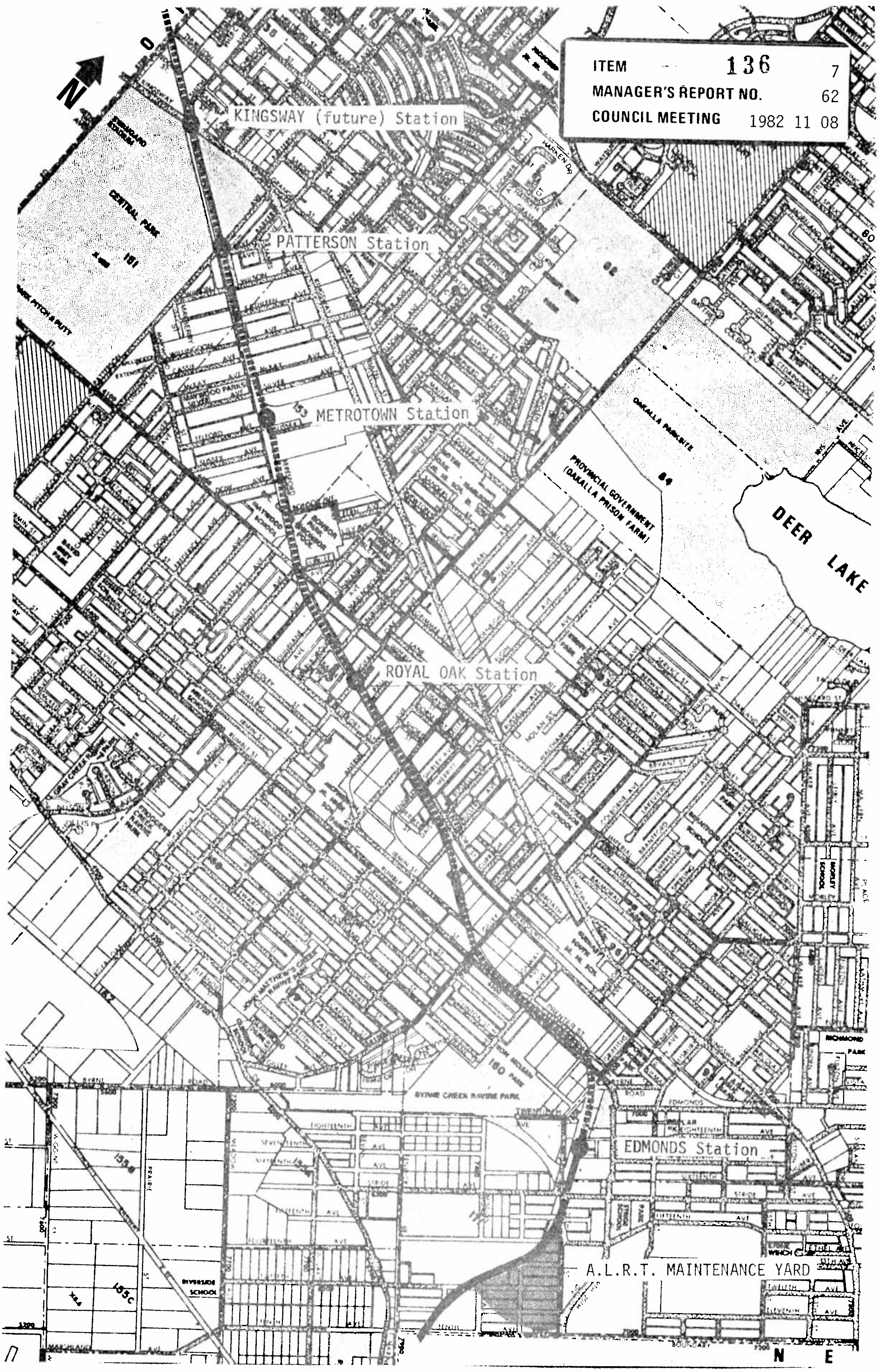

FIG.1 A.L.R.T. DEVELOPMENT IN BURNABY

APPENDIX 'A'

ITEM	7
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News Release

RAPID TRANSIT PROJECT

BC Transit

82/13

RELEASE: Immediate

DATE: November 2, 1982

CONTACT: Bob Egby 683-8401
(Res.) 687-1178

HIGH CAPACITY IS KEY TO ECONOMIC RAPID TRANSIT

The Hon. Jack Davis, Chairman of the Rapid Transit (1986) Committee said that a B.C. Transit survey* clearly shows that, in per passenger cost terms, Vancouver's ALRT will be less expensive than those in Calgary, Edmonton, Portland, San Diego and Buffalo.

The survey puts the capital cost for each kilometre of line per thousand passengers carried in Vancouver at $3.3 million; Calgary $3.7 million; San Diego $4.5 million; Edmonton $5.4 million; Pittsburgh $6.3 million, Portland $3.4 million and Buffalo at $12.2 million.

"Our Rapid Transit system in Vancouver will be less expensive because of its high capacity grade separated line," Mr. Davis said.

The survey shows that peak hour passenger capacity in the early years will be: Vancouver 10,060; Calgary 5,830; San Diego 1,800; Edmonton 5,376; Pittsburgh 6,250; Portland 4,000 and Buffalo at 6,600.

"Ours is clearly a high capacity system. Fully developed, it can carry more people than the other intermediate systems now built or under construction in North America," he said.

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Suite 874, Four Bentall Centre, P.O. Box 49297, 1055 Dunsmuir Street, Vancouver, B.C. V7X 1P6 (604) 683-8401

* attached, following

Design passenger capacity in the peak hour is Vancouver 20,160; Calgary 9,000; San Diego 9,000; Edmonton 9,000; Pittsburgh 9,800; Portland 6,600 and Buffalo 8,000. Higher passenger carrying capabilities are possible in Vancouver by adding cars and reducing headways. In all other cities, major capital expenses to eliminate grade crossings and add train control will be needed.

The survey statistics on the six other cities were provided by official sources. Mr. Davis said it is difficult, if not impossible to compare one city's transit system with another because there are many unknown factors such as subsidies, free use of highways for CLRT routes, plus use of existing facilities.

"Critics of ALRT are tossing figures around with abandon. Some are trying to show that conventional LRT will be less expensive. It would only be marginally less expensive if it ran down the street and had gates coming down at intersections. But this is the old-fashioned arrangement which was abandoned here in the 1950s," he said. "Our new system is 'grade-separated'. It doesn't march with the other traffic and any LRT system which was independent of the traffic would be at least as expensive as ALRT," Mr. Davis said.

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COMPARISON OF ALL INTERMEDIATE CAPACITY RAPID TRANSIT SYSTEMS IN NORTH AMERICA BUILT IN LAST 10 YEARS OR UNDER CONSTRUCTION.

Table DOES NOT stand alone, please use only in conjunction with text and footnotes.
US dollars converted at 1.23

	Notes	Units	Vancouver	Calgary	San Diego	Edmonton	Pittsburgh	Portland	Buffalo	Units
Type of Transit:	(1)	-	RT	LRT	LRT	LRT	LRT	LRT	LRRT	-
Year Open:	(2)	-	1986	1981	1981	1979	1984	1985	1984	-
Length of Line:	(3)	km	21.4	12.5	25.4	10.2	16.8	24.2	9.3	km
Level (Grade crossings):	(4)	#	0	19	52	10	(20)	65	6	#
Travel Time:	(5)	mins	28	22	42	18	35	40	18	mins
Schedule Speed:	(6)	km/h	46	34	36	34	29	36	32	km/h
Maximum Vehicle Speed:	(7)	km/h	80	80	80	80	90	88	90	km/h
Number of Vehicles: 2 Vanc. cars are equivalent to 1 car of others.	-	#	114	27	24	14	55	26	33	#
Sound Level (at 15 metres from track):	(8)	dB(A)	67	78	75	74	74	72	75	dB(A)
Handicap (wheelchair) Access:	-		Yes	No	Not used	Yes	Yes	Yes	Yes	
Passenger Capacity Initial Year:	(10)	ppphd	10,060	5,830	1,800	5,376	6,250	4,000	6,600	ppphd
Passenger Capacity at design capac.:	(11)	ppphd	21,600	9,000	9,000	9,000	9,800	6,600	8,000	ppphd
Passenger Capacity Ultimately:	(12)	ppphd	33,000	18,000	18,000	18,000	19,600	13,000	16,000	ppphd
Peak Hour Headway in initial year:	(13)	mins	1.75	5	20	5	4	5	4	mins
Total Cost ($CDN) as spent.	(14)	$	$710m	$176m	$150m	$213m	$590m	$318m	$603m	
Adjusted Total Cost ($CDN millions) inflated to same time period as ALRT	(15)	$	718 m	272m	207m	298m	661m	325m	750m	$
Cost per km:	(16)	$/km	33.5 m	21.8m	8.1m	29.2m	39.3m	13.4m	80.7m	$/km
Cost per km/1000 ppphd (initial):	(17)	$/km	3.3 m	3.7m	4.5m	5.4m	6.3m	3.4m	12.2m	
Cost per km per 1000 ppphd at design capacity.	(18)	/1000 ppphd	1.55 m	2.4m	0.9m	3.3m	4.0m	2.0m	10.1m	$/km /1000 ppphd

Rapid Transit: A widely used term introduced in the last century to denote faster transit-usually with the introduction of electric streetcars. Now used for higher speed transit using a fixed guideway (i.e. rails) in part or in whole separated from other traffic.

Conventional rapid transit such as the New York or Toronto subways and the Montreal Metro are often designated as "Heavy Rapid Transit" (HRT) or "Conventional Rapid Transit" (CRT) to distinguish them from recent alternates.

Intermediate Capacity Rapid Transit:(ICTS) Conventional Rapid Transit is always fully grade separated and usually involves extensive sections of underground construction. The resulting high cost can only be justified in the very largest cities with high densities or corridors with high transit demand. Most such cities in North America now have or are building CRT.

Many medium sized cities such as Vancouver have major transit corridors where demand is growing to beyond the economic capabilities of buses (4000-6000 passengers per peak hour direction (ppphd)) but will never reach levels where CRT is economically justified. (30,000 - 60,000 ppphd.) Rapid Transit systems designed to economically fill this gap between buses and CRT are designated ICTS. By far the most common type of ICTS is Light Rapid Transit (LRT), called Light Rail Transit in the US.

Light Rapid Transit (LRT): LRT is defined as a transit mode using electrically propelled rail vehicles, singly or in trains on a predominantly reserved, but not necessarily grade separated right of way.

The most appropriate comparison uses cost per kilometer per unit of capacity. Based on the anticipated passenger volumes in the first year, Vancouver is the lowest cost system followed closely by Calgary and Portland. San Diego,with its low patronage, and Pittsburgh are almost double the unit cost with Buffalo and its long underground sections coming in at four times the cost. Adding vehicles until a line reaches its design capacity produces a tabulation of cost per kilometer per 1000 passengers in which Vancouver is the second lowest cost behind San Diego. In all these comparisons Vancouver has a significantly higher schedule speed and much greater growth capacity, both attributed to the elimination of grade crossings.

NOTES TO COMPARISON TABLE:

(1) All systems are ICTS and fit into the LRT definition. Vancouver has a fully grade separated system (the only one) and an ultimate passenger capacity that reaches into the lower end of the CRT range, at least 50% higher than any of the other systems. It would be more correctly designated as CRT. Buffalo NY has designated its system as Light Rail Rapid Transit. (LRRT).
(2) Year Open is the year that passengers were carried on the first section of a line. Edmonton has subsequently opened or is building extensions which are included in this comparison.
(3) Length of line reflects extensions under construction.
(4) Grade crossings include both protected (automatic barrier) crossings and unprotected crossings (usually in the downtown areas.) Street closures are not included.
(5) Travel times provided by each agency. San Diego is intending to accelerate service by 3 or 4 minutes in the future. The Pittsburgh time appears long and is subject to verification.
(6) Schedule speed calculated from travel times or as provided by each agency.
(7) Maximum vehicle speed as provided by the agency or vehicle manufacturer. This relates to the sustainable speed on straight level track with an average passenger load at full supply voltage. Trains are usually scheduled to run 8-10% below this speed to allow for system variables and permit schedule correction (time make-up,also known as Speed Margin).
(8) Sound levels are not directly comparable.Agencies have not quoted all variables. In addition to distance from track, the height from the ground, the speed of the train, the number of cars in a train, the type of track (concrete or ballast base) and whether at-grade or elevated must be known. The Vancouver figure relates to a 4 car train at 80km/h on concrete elevated track. All other figures are believed to refer to at-grade ballasted track and would be higher for elevated concrete track. 10dB represents a doubling in sound level. Differences of less than 5dB are not significant.
(10) Initial passenger capacity as provided by each agency or determined from the travel time and number of cars,allowing 10% maintenance spares. Passenger capacity of cars as stated by agencies. In all cases this is very comparable at about 6 passenger spaces per metre of car length. All cars are in the width range of 2.4m to 2.85m.

Passenger capacities here and in lines (11) and (12) are expressed as the number of passenger spaces provided at the peak point on the line in the peak hour in a single direction, i.e. passengers per peak hour per direction(ppphd). No allowance is made for diversity (the uneven loading of cars in a train) or short term peaks within the peak hour. In practise, and varying from city to city, the actual practical passenger loadings will be 10-20% below the number of spaces provided.

Note that the stated peak point capacity may not be provided over the full length of the line. Certain cities, including Vancouver, match supply to demand by turning back trains

SUMMARY:

ICTS represents an approach to provide economic rapid transit in medium sized cities. The capital invested, as with the conventional subways in Toronto , New York et al, buys faster travel times and lower operating costs per passenger kilometer than buses. LRT is the predominant ICTS mode and is in operation or under construction in seven North American cities. The 'light' does not refer to the vehicles which are as heavy or heavier per passenger space as the conventional Toronto subway, rather it refers to the 'light' construction costs, obtained by making use of existing right of way opportunities, be they railways, highways or hydro rights of way, often this involves design compromises with many grade crossings. These in turn limit speed and future passenger capacity.

Each of the seven ICTS lines represents a specific design taking advantage of right of way opportunities in each city. Comparing one with the other can never be entirely exact. San Diego purchased an existing railway line, renovated the track and operated a limited volume service on single track. At the other extreme Buffalo had no right of way available in the desired corridor and had to build the entire outer end of the line underground at considerable expense. Savings came in by running on street in the downtown area,creating a new transit mall. Other systems fall between these extremes. Vancouver is unique in using excellent right of way opportunities in a heavily travelled corridor but using elevated construction to eliminate all grade crossings and permit an automated system. This permits lower operating costs, shorter waits for trains and much higher passenger capacities. In effect buying future growth capabilities from year one.

The comparison analysis attempts to place the 'apples and oranges' of these different systems on an even basis. It does not and cannot suggest than any one design is best for any particular city. In the final cost tabulations, the cost per kilometer ranges from $8.1m(San Diego) to $80.7m (Buffalo). Vancouver falls in the very middle of the range with a value close to that of Edmonton.

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(11) The design capacity of a system is the maximum capacity obtained by adding additional cars to the system but without additional civil works such as grade separating road crossings or lengthening stations. The design capacity is a direct function of the maximum train length and the minimum headway. Train length is limited by either the length of station platforms or the distance between two adjacent grade crossings at a station. This latter factor is applicable in San Diego Portland, Calgary and Buffalo where trains run on-street in the downtown and at a stop may not block a cross street. In Portland the short downtown blocks are a severe constraint limiting trains to only two cars.

The minimum train headway is set either by the minimum safe train separation time permitted by the signal system plus the maximum dwell time a train spends in a station, or by the limitation of closure times at grade crossings. This latter is the ruling criteria for all systems except Vancouver and hence is outlined in full.

At grade crossings outside the downtown all systems use automatic barriers or traffic signals controlled by the trains. Depending on the speed of the train and requiremets of regulating authorities this requires a street closure of 17 to 28 seconds which can be accommodated within the normal 'red windows' of typical signallised urban streets without restricting traffic flows. Ideally this would allow one train per minute without impacting traffic flow, or allowing for trains in the opposite direction a headway of two minutes. In practise it is impossible to syncronise numerous grade crossings with adjacent traffic signals and trains in both directions without significantly impeding trains or traffic at headways below 4 minutes. As some transit engineers believe that acceptable delays can be achieved with 3 minute headways, this latter time is used.

The resultant calculations are straightforward. Systems with series of grade crossings and trains of 3 articulated cars (150 passengers each) have a design capacity of 150x3x20 trains per hour or 9,000ppphd. In Vancouver the equivalent capacity is computed with the maximum train length of 6 cars (75 passengers each) at the minimum contracted headway of 75 seconds for a total of 6x75x48 = 21,600ppphd.

(12) The ultimate system capacity on all systems except Vancouver will require major capital expenditure to grade separate crossings and to install automatic train control. This will allow the minimum headway achievable on adhesion propelled rail transit of 90 seconds, an effective ultimate doubling of capacity. Further expansion would require longer trains and station platforms. In Vancouver the addition of a seventh car within existing platform length plus a 10 second headway reduction by managing station dwells (and introducing some minor schedule irregularities) will permit passenger capacities above 30,000ppphd and into the range of CRT. This will involve little capital expense beyond additional cars.

(13) Initial peak hour headway as operated or proposed by each city.

(14) Total cost in dollars spent to the completion of the project, or segments of the project, converted into Canadian dollars, as appropriate, at the October 1982 rate of 1.23. Costs are as published by each city with these amendments: In Portland costs directly associated with the adjacent freeway have been subtracted, costs associated with accommodating the LRT within the freeway right of way (retaining walls and overpasses) are included. In Edmonton the extensions to each end of the first line are included. In San Diego the current construction to add a second track and 10 more cars is included. In Buffalo recent upward adjustments in project cost estimates are included.

While total project costs are as comparable as possible note that certain cities do not include all land costs, specifically where rights of way are leased from private railways, nor are all costs associated with the provision of services by other municipal, state or provincial agencies included. All such costs are included in the Vancouver estimate. Reduction in project cost by resale of land or air rights is not included.

(15) Total costs are adjusted to make them comparable to those of Vancouver by a straightforward if lengthy process. Each project is broken down into expenditures on a year by year basis assuming the same expenditure distribution as Vancouver but on the specific project's time frame. Costs in each year are inflated to the equivalent year, were the project on the same time frame as Vancouver. These dollars are then accumulated as 'spent' dollars, that is, there is no further inflation.

Inflation rates used are a composite based on wages, various materials and non-residential construction as published by Statistics Canada for prior years or as estimated by the B.C. Government Central Statistics Bureau for future years. The figures used are: 1977-7.5%; 1978-7.3%; 1979-14.5%; 1980-14.2%; 1981-9.5%; 1982-12.5%; 1983-10.0%; 1984-9.5%; 1985-9.0%; and 1986-8.5%.
While these rates are applicable in Vancouver they are not necessarily identical to those of other cities. They do, however give an indication of what a particular city's project would cost if built in Vancouver except for the inevitable significant underestimate of the higher labour and material costs in Vancouver. This results in the Vancouver costs being unfavourable compared with all others, except possible Calgary.
Minor adjustments have also been made to allow for differing year ends. The fiscal year being to the end of March, inflation statistics to the middle of the year and certain project costs to the end of the calendar year. A final calibration was made by applying this process to the Vancouver project. The resultant figure was 2.366% high, and all projects except Vancouver were reduced by this amount.

(16) Cost per kilometer is the adjusted total cost divided by length

(17) Further division by the initial passenger capacity. Note (10)

(18) Division by the design passenger capacity. See note (11).