Excerpts from the 2004 High Speed Transit Planning Study - Final Report

2.2.5 Other HST Modes

Other HST modes were reviewed but were eliminated from consideration because speed, capacity, cost or technical issues render them inappropriate for implementation on a corridor basis in the Edmonton context. Some illustrative photos are presented in Figure 2.18.

Heavy Rail

Heavy Rail generally refers to subway or elevated train operations with very high capacities of >30,000 passengers per hour per direction. This high capacity is achieved by long trainsets, maximizing the number of standees and minimizing the number of seats, headways of two minutes or less, and level platform boarding. The trains are usually powered by a third rail although overhead catenary is sometimes utilized. The service operates exclusively in tunnels or in fully grade separated environment on the surface. The tunnels of the Edmonton LRT have been built to accommodate Heavy Rail should demand ever warrant.

Heavy Rail is one of the most expensive forms of transit to build and the capacity provided is much greater than Edmonton will require for the foreseeable future. The option remains to upgrade the existing LRT if the additional capacity is ever required. In Canada, only Toronto and Montreal currently operate heavy rail systems.

Commuter Rail

Commuter Rail is traditionally used for longer line haul services linking bedroom communities or distant suburbs with city centers. In Canada commuter rail is operated in the Montreal, Toronto and Vancouver regions. Stations are spaced several miles apart and in Canada most services are operated using diesel-electric locomotives and double deck passenger cars. One line in Montreal and numerous lines in the Northeast U.S. utilize electric power from overhead catenary or third rails. Commuter rail services are very popular as they usually offer a superior level of comfort and often are faster than bus or car alternatives. The services are expensive to operate, but as they often operate on lines shared with freight service they can be relatively inexpensive to start up. Alternatives such as using Diesel Multiple Units (DMUs) are now available and may make the service more cost effective for routes with less demand. Unfortunately this mode is not well suited for Edmonton due to the loss of direct rail access to downtown. The abandonment of all of the rail lines leading to downtown Edmonton appears to have precluded the eventual use of commuter rail in the region.

MagLev Trains

MagLev trains are the most recent development in public transit. The first line to go into revenue service is now operating between Shanghai Airport and the city. The technology is very fast, with speeds exceeding 200 kilometres per hour, but extremely expensive. A short demonstration track operated for six months at EXPO 86 in Vancouver, but there are no systems currently in operation or under construction in North America.

Automated Guideway Transit

The SkyTrain in Vancouver is one example of an Automated Guideway Transit system. Automated systems can have capacities that provide up to 15,000 passengers per hour per direction. The systems are characterized by their ability to have very short headways (e.g. 75 seconds) and the need to be fully grade separated. Typically these systems are very expensive to build but enjoy lower operating costs. Each system is proprietary which means that, once implemented, the transit system is captive to a specific manufacturer for the supply of system components. This can also have a negative impact on costs. The capacity of these systems has the potential of ultimately reaching the same levels as attained by heavy rail if the infrastructure is designed to accommodate enough vehicles. However, the systems are usually designed to utilize small vehicles to minimize the cost of overhead track or tunnel dimensions. The capacity and cost of the systems make them undesirable for Edmonton.

Monorail

Monorails are widely used at amusement parks, zoos, world fairs, airports and other tourist destinations. A few cities in Japan, as well as Sydney and Seattle have operating monorail systems in urban environments. Seattle voters have approved a major expansion of the system and a new system is now under construction in Las Vegas. One of the key advantages of monorails is the slim profile of the track and columns. The systems can operate fully automated or with drivers. The profile of trains used in North America is typically quite small which limits their capacity and the ability of passengers to move or stand within the vehicle. Many of the functions critical to the operation of a reliable public transit system are difficult to provide with monorails. For example switches are slow, expensive and unreliable which limits the ability for short turns, and storing of disabled trains. The trains are permanently coupled which means a single fault in one small compartment puts the entire train out of service. Currently there is no monorail system anywhere in the world that operates in winter conditions similar to those found in Edmonton. Freezing, snow and ice may create significant problems for switches and the power and control systems currently used by monorail systems.

Personal Rapid Transit

Personal Rapid Transit (PRT) is used to describe a technology that is similar to a monorail, but uses small 4 - 6 passenger vehicles rather than a longer train. PRT systems were conceived to be horizontal elevators that could be individually programmed by the riders to go to specific stations on a network. The stations would be offline so that boarding and alighting passengers would not delay through travelers. A simple demonstration system was built in Morgantown, West Virginia, in the 1970s but no new systems have been attempted since that time.

Aerial Tramway

Aerial tramways are typically found in ski areas, and rarely are used for public transportation (e.g. across obstacles such as rivers or narrow canyons). Two examples in urban settings are an aerial tram connecting New Jersey and Manhattan, and a funicular on an escarpment in Pittsburgh.

Table 2.2 summarizes the main issues leading to each of the “other” HST modes being deemed inappropriate for corridor-level implementation in Edmonton (using “X” to indicate issues associated with each mode).

Table 2.2
Critical Issues Of “Other” Modes Making Them Unsuitable For Edmonton Application

HST Mode	Cost Issues	Capacity / Speed Issues	Other Technical Issues
Heavy Rail	X	X	X
Commuter Rail	X		X
MagLev Trains	X		X
Automated Guideway Transit	X	X	X
Monorail			X
Personal Rapid Transit		X	X
Aerial Tramway		X	X

2.3 SUMMARY

Some key features of the shortlisted HST modes are summarized in Table 2.3.

Table 2.3
Summary of Key HST Features

	Example Capital Costs (per km)	**Typical Person Capacity (peak direction passengers/h)**	**Typical Travel Speed (km/h)**
BRT On Exclusive R/W	\$5 M - \$50 M	10,000	30 - 60
BRT On Street	\$0.5 M - \$6.5 M	5,000	20 - 50
LRT On Exclusive R/W	\$10 M - \$70 M	20,000	30 - 60
LRT On Street	\$8 M - \$25 M	10,000	25 - 50
Enhanced Bus Priority	≤ \$0.5 M	5,000	20 - 50

The capital construction costs are based on recent experience in the United States and Canada. The figures can vary dramatically based on local conditions such as the availability of rights of way, grade crossing treatments, bridges or tunnels and utility relocations. LRT vehicles are much more expensive to purchase than articulated buses, however the difference is less significant when the price is adjusted for the longer life cycle and higher capacity of a rail vehicle. When evaluated on the same capacity over the same time period there is relatively little cost difference between LRT and dedicated BRT vehicles.

All of the modes can achieve significant travel time decreases with improvements ranging from 25% to 40% compared with baseline bus services. On street services (LRT, Enhanced Bus Priority and BRT) will result in only moderate improvement in areas with significant traffic congestion.

All of the technologies under consideration will support passenger volumes that are greater than currently needed today or in the foreseeable future based on recent trends and actual ridership by corridor. At a recent Transportation Research Board meeting it was reported that there is no practical difference between the passenger carrying capacity of BRT and LRT in similar rights of way.

In exclusive rights of way BRT and LRT reliability will be similar. BRT may suffer slightly during winter conditions if the garage facilities are located some distance from the busway and depending on the level of winter maintenance. LRT is widely acknowledged as offering a superior level of comfort over traditional diesel bus service. The quality of BRT service can be improved with specialized vehicles and fully or partially dedicated rights of way. Buses with electric, hybrid, clean diesel or natural gas propulsion systems have smoother, quieter and environmentally more friendly operations. A high quality BRT roadbed can deliver smoother travel, however this may be difficult to achieve with Edmonton's climatic extremes.

Local zoning, current economic development and community preferences affect collateral economic and community benefits. BRT is an unknown in terms of station economic development although a fully developed BRT is expected to have the same potential as LRT. The community and quality of life benefits resulting from high-speed transit result from lower noise, increased personal mobility and pedestrian activity, improved air quality and reduced dependence on personal vehicles. These benefits are generally highest for electric powered rail systems and lowest for conventional diesel buses.

Access impacts, land use impacts, and community impacts vary by type of HST and by on-street versus exclusive right-of-way operation. Generally, rail-based HST on an exclusive right-of-way will have the greatest negative impacts, although light rail transit does have the flexibility to run in mixed-traffic operations if necessary to mitigate or eliminate unacceptable impacts. Bus-based HST may have lesser negative impacts: Enhanced Bus Priority has similar impacts to conventional bus; and BRT has significant flexibility to be customized to mitigate or eliminate unacceptable impacts.

Overall BRT competes well with other rapid transit modes. BRT meets the performance standards of high-speed transit and is considered by potential riders as a completely separate brand when designed and marketed as something different. Enhanced Bus Priority or BRT are easier than LRT to incrementally upgrade as needs change.