Rail and Bus Rapid Transit Considerations for the Thomas Jefferson Planning District

A Literature Review

Presented by the Charlottesville-Albemarle Metropolitan Planning Organization
Advisory Committee on Single Occupant Vehicle Alternatives
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The City of Charlottesville and Albemarle County have committed to making the local transportation system more effective and developing alternatives to road expansion as the primary solution for traffic congestion. The community has expressed an interest in commuter rail*, light rail** and bus rapid transit***. Many variables need to be addressed, however, before the first rail spike is hit or the first articulated bus turns the corner. The intent of this paper is to educate readers quickly, with enough information to ask informed questions so that their involvement in the rail and bus rapid transit planning process is constructive.

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*__Commuter Rail__ - (also called Metropolitan Rail, Regional Rail) – Multiple-car train sets whose motive power is a diesel or electric locomotive. Tracks may be shared with freight services, street integration is rare, and service usually runs from city core to suburbs. Train frequencies are at the half-hour or more. ("Transit")

**__Light Rail Transit (LRT)__ - An electric railway system characterized by its ability to operate single or multiple car trains along exclusive rights-of-way at ground level, on aerial structures, in subways or in streets, and to board and discharge passengers at station platforms or at street, track, or car-floor level. ("Transit")

***__Bus rapid transit (Busways)__ - Buses run on routes dedicated only to buses (referred to as busways), away from car traffic, and are connected to flexible feeder routes to serve areas off main trunk line

I. Planning Issues

An important question when considering rail and rapid bus transit is whether the community has the appropriate population density and land use patterns to support such systems. Much of the popular rail and mass transit print media touts the success of rail and rapid bus transit but glosses over the issues of density, accessibility and the serious land use and transportation planning efforts communities must make in order to have successful systems. The resource "A Toolbox for Alleviating Traffic Congestion," published by the Institute of Transportation Engineers (ITE), supplies some general observations to consider when assessing transit options. It concludes that transit success is improved by higher densities at the origin (defined as home) or the destination (work, shopping, etc.) (ITE 90). But the mix and types of activities and land use are also important: for example, 9-to-5 office workers have different transit needs than a rotating hospital staff (ITE 90). Charlottesville and Albemarle County have this sort of wide variety in transit demand because the dominant employer, the University and its accompanying hospital system, are juxtaposed with a growing number of retail stores and small information service companies located downtown and in suburban research/office parks.

The Transit Cooperative Research Program (TCRP) doesn't work with such absolutes in its transit literature review, though the bottom line on density is similar to that of ITE. In its review of empirical literature, TCRP cautiously offers "working hypotheses" for guidance (Miller et al. 33). It labels specific researchers as "pro density" because they consider density to be the single most important factor in explaining transportation related differences between cities (Miller et al. 33). But TCRP's review combines the density issue with factors such as the variety of transportation choices, socio-economic features of commuters, and the availability of cars.

To simplify the density issue and give some substantive guidance to the transit planning process, the ITE resource offers a possible baseline. ITE suggests several minimum density levels for correspondingly intense transit investments. The minimum level is local bus service (one bus per hour), which should serve residential areas averaging 4 to 5 dwelling units per acre (DUA) or a gross population density of 3,000 to 4,000 people per square mile. At this level, a 5 to 8 million square foot concentration of non-residential floorspace is sufficient support for buses (ITE 90). The next level of service is intermediate service (one bus every half hour), which can serve 7 dwelling units per acre or a gross density of 5,000 to 6,000 people per square mile. Non-residential concentrations needed for this stage of service range from 8 to 20 million square feet (ITE 91). Frequent bus service (a bus every 10 minutes), typically serves 15 dwellings per acre or 10,000 people per square mile. A range of 20 to 50 million square feet of non-residential focused activity is suggested at this service level (ITE 91).

Once a city reaches the frequent level of service, the ITE recommends that express buses, or busways, be explored. At the frequent level, the speed of bus service declines as street congestion and the number of passenger pick-up/drop-off points rises

(ITE 91). Bus rapid transit, with exclusive rights-of-way, provides a potentially cost-effective alternative to other transit modes. This approach is explored later in this review.

One of the alternatives to buses, once residential densities reach 9 dwellings per acre in the bus line's catchment area (between ¼ and ½ mile of route) and a non-residential concentration of 35 to 50 million square feet, is light rail transit (ITE 91). If rights-of way can be found at grade, the requisite concentration can be lowered to 20 million non-residential square feet due to lower capital costs. Commuter rail service can accommodate densities as low as 1 to 2 dwelling units per acre (ITE 90). But these commuter rail corridors, with the accumulated volume necessary, lead to non-residential groupings of 100 million square feet or more, which are found only in the nation's largest cities.

Thresholds of Service Types

Type of Service	**Minimum Housing Density** **Dwelling Units per Acre (DUA)**	**Minimum Population Density/ Min. Non-Residential Floorspace**
Local Bus (1 hour service)	4 -5	3,000 - 4,000 people per square mile. 5 - 8 million square feet concentration of non-residential floorspace.
Intermediate Bus (1 bus every half hour)	6 - 7	5,000 - 6,000 people per square mile. 8 - 20 million square feet concentration of non-residential floorspace.
Frequent Level Bus (A bus every 10 minutes)	15	10,000 people per square mile. 15 - 20 million square feet of non-residential floorspace.
Light Rail	9 (between ¼ and ½ mile of route)	35 - 50 million square feet of non-residential floorspace.
Commuter Rail	1 - 2	100 million square feet or more of non-residential floorspace.

Source: ITE "A Toolbox for Alleviating Traffic Congestion."

In examining these figures for the Charlottesville area, it is noted that the densest portions of the urban area typically have 4-5 single family households per acre, and 20 multi-family households per acre, particularly in the University dormitory areas (source: Jefferson Area Eastern Planning Initiative inventory). This indicates some sectors of Charlottesville would be appropriate for hourly bus service, whereas the denser multi-unit areas would support bus service every ten minutes. In fact, this is the type of service available in the City today. Typical suburban areas in our region have about 1-2 households per acre, which would not support hourly bus service according to the ITE guidelines. However, several commercial and mixed use areas in the region have been identified in the Eastern Planning Initiative model as having the potential to become successful centers for rail or rapid bus transit in the future, including the downtown/University of Virginia section of the City as well as several nodes along Route 29 North and Route 250 East.

It is important to note that the density "rules of thumb" are useful, but not the only considerations for transit planning. Other critical issues include accessibility, connectivity and land planning. *Accessibility* describes *how much* of an activity is located *how close* to a location. For example, it is important for transit stations to be centrally located within pedestrian-friendly residential, employment, and shopping centers. *Connectivity* is another key ingredient in the mix: what use is a dense neighborhood that does not have good access to attractive activities? This requires the proper infrastructure, including sidewalks, bike lanes, bike racks at stations, buses and perhaps park-and-ride lots within the communities surrounding rail stations. The *regional land use plan* is also critical; transit systems must support and complement economic development goals in order to be competitive and useful. Volumes of literature fully develop the issues of accessibility, connectivity and land planning, both theoretically and empirically. Communities must address these issues before detailed transit expansion plans can be laid out. The Charlottesville-Albemarle MPO's Real Accessibility Index provides a useful planning tool for easily evaluating accessibility in any given neighborhood. Evaluations of several pilot communities in the urban area were conducted by the MPO in 1999.

II. Marketing and Political Considerations

With these density guidelines and accessibility, connectivity and planning points in mind, the next challenge is to incorporate other real world variables that impact a decision for transit. The importance of the public planning process for studying rail and rapid bus transit's applicability to an area can be gleaned from the success and failure of various rail and rapid bus transit ventures. In the limited scope of this introduction to pursue these transit options, no one clear source provided either a simple step by step process needed to guide a project to reality or the direct costs involved in this venture. Concerning light rail, Rick Thorpe, a former project manager of Salt Lake City's $300 million, 16 mile light rail system commented, "As more systems have been constructed and been successful, you'd think more people would accept the idea. After 24 years of struggle, I still haven't found the secret" (qtd. in Cho et al. 5). But there are some established ways to avoid pitfalls, gain the confidence of the public and private sectors, and successfully build a strong transit system.

William Middleton, a contributing editor at Railway Age, consolidated input from several transit planners and wrote "Selling Rail Transit: Why Some Voters Say Yes; Why Some Say No." This article developed eight themes that seem to be echoed in many of the success stories in the transit literature. These eight themes propose that planners: 1) listen to the public, 2) pitch the whole transportation issue, not just transit, 3) include benefits for all of the public, 4) maintain fiscal accountability, 5) present issues in careful and realistic terms, 6) insure strong political support, 7) generate strong public support, and 8) be careful in timing the proposal's release.

First Middleton suggests that planners involve the public, one of the large funding and support sources, by seeking their ideas and needs as early as possible. The article

describes a strategy of San Francisco's Metro Transportation Commission executive director Lawrence Dahms, which began with focus group interviews and polls that assess the public's attitudes before addressing the project details. Issues surveyed included the size of any tax, the duration of the tax, the actual projects funded and the limits on spending to insure funds were not wasted. Dahms found that really listening to the public's answers and showing them that planners are listening by using their input, was as important as asking. Bob White, executive director of the Central Puget Sound Regional Transit Authority, also believes his program's success rode on the public's perception that project planners really took their opinions into account. Toni Bates, the senior transportation planner to San Diego's transit development board, observed "If the public is not fully informed and consulted during the planning stage, public concerns and objections might be raised late in the process. That can derail the project schedule and budget. We wanted the community on board from the beginning" (qtd. in Schurr 27). Placement of the transit system is also stressed by Rolf Meissner, of rail car supplier Siemens Transport Systems, who notes the public is most supportive of light rail proposals that link downtowns, airports, major civic centers and schools (Cho et al. 3).

The second consideration is making sure the public understands transit improvements affect users and non-users (Middleton G6). Drivers, for example, benefit from less congestion on the highway. Approach the transit issue as "pro-flow" not "anti-highway" advises John Inglish, general manager of the Utah Transit Authority.

The third point suggests including other transit modes when gaining financing for projects. This ties into the previous point of including the non-users as another source of support. Middleton cites the example of California, which established county-level transportation sales taxes that go to roads and transit. San Diego divides the tax into thirds, dedicating one-third to freeway construction, one-third to local roads and one-third to transit. This way, each advocate group can lend its support to the tax while maintaining its own agenda. It is important to note that the Thomas Jefferson Planning region does not currently have a governmental entity with taxing authority for transportation, and the creation of such an entity would require state enabling legislation.

Middleton's fourth concern is accountability to the public when dealing with their transit dollars. This accountability is critical for project support. From Los Angeles, CA to Yakima, WA, cities are learning to be more attentive to how and where transit money is going. Middleton lists practices like the establishment of publicly influenced performance standards and objectives accompanied by measuring and reporting back to the public as means of assuring the community that transit money is well spent .

Project clarity and the thorough explanation of goals, length of project and cost, comprise Middleton's fifth key. San Diego used voter information packets, which covered all projects and their costs, along with a visual map to lay out the uses for all money. This modest approach built support for San Diego and is definitely a "Do" on transit writer Cliff Henke's "5 New Start Do's, 5 Don'ts list" (4). The converse makes the "Don't" list: promising too much to voters and then failing to meet self-imposed high expectations (Henke 4). Los Angeles, for example, initially issued high ridership

numbers to get government funding, released lower numbers prior to opening, then took credit for surpassing ridership estimates (Pearlman 2). This behavior undermined support from many would-be backers and gave more credence to transit foes.

Insuring a firm political base is the sixth point and is crucial for transit because the positions of just a few political opponents can defeat a measure. The defeat of Denver's transit funding measure had much to do with the opposition of eight of the elected Regional Transportation District board members. The Denver *Post* credited this opposition with giving the anti-rapid transit foes a wedge to widen public mistrust. Regional cooperation and involvement is necessary for the success of a truly regional transit line. One disenchanted community in the project area could doom a project to the bookshelf.

The seventh point again plays the public support card, suggesting that an independent group should push the issue, separate from the actual transit project. In Seattle, the Chamber of Commerce organized the pro-transit campaign with Microsoft and Boeing as major contributors. This backs Henke's advice to, "Secure dedicated, stable funding sources" in his list of new start "Dos" list (4). With a lot of media coverage, support rallies, displays of signs, and focus groups, Seattle's plan gained public support.

Finally, timing is credited for contributing to the success or failure of a project. Middleton acknowledges that many factors, like economic uncertainty or voter turn-out, are beyond the scope of the transit proponent's control. Considering external variables to the planning process, however, may affect a project's release to public scrutiny and comment.

III. Successes and Shortcomings

Successful city models also suggest ideas to emulate when cultivating transit support and ultimately building a system. San Diego's system has a reputation as a low-cost, high-quality mass transportation system. The city's light rail trains cover sixty-seven percent of costs from fares, a high percentage for transit systems (Perlman 1). Its approach was deemed cost-effective by Matt Welbes, a special assistant at the Federal Transit Administration, because San Diego didn't follow the fallacy of over-engineering a system (Perlman 1). For example, costs for their system's stations were kept at a minimum by using stairways rather than escalators. San Diego has also shown success in pursuing and keeping public support for its projects. The transit development board organized a Project Review Committee (PRC) consisting of nineteen "stakeholders" which included area residents, students, business owners, local university representatives, transit users, transit and city representatives (Schurr 28). This foresight avoided surprises later on in the process because the board resolved problems in the early stages of planning.

On the other extreme is Los Angeles. Many of the "Don'ts" in Cliff Henke's list were derived from this city. Los Angles opened two light rail lines, a subway and six

commuter rail lines with a $5 billion dollar price tag. The subway alone cost $300 million a mile. Instead of an integrated network of train, commuter rail and buses, Los Angeles Metropolitan Transit Authority faces a $3.5 billion dollar debt with extension cancellations becoming the rule. The public relations scar of an extravagant station in Hollywood, complete with a yellow brick road and film reels in the ceiling, does not help the troubled transit system. Planners can learn lessons of economy, network integration, and scale from the Los Angles experience.

Other areas of the country are in the process of investigating rail transit. The city most similar in size and character to Charlottesville is Burlington VT (pop. 38,453), which is creating a commuter rail line using existing track. The project was developed by the Vermont Agency of Transportation to ease traffic burdens using surplus traincars obtained from the Virginia Railway Express (VRE). This rail service finally began on 05 December, 2000 and is currently free with two round trips a day. Currently, the 20-mile commuter rail is running between Burlington, VT and Charlotte, VT with a single stop in Shelburne. Future expansions are planned to South Burlington, east of Burlington and for 10 trains a day in each direction. But an e-mail from David Roberts, a transportation planner at the MPO in South Burlington VT, relates that the controversial project is currently almost two years off before train movement in his area. According to Mr. Roberts, difficulties still lie with MPO member jurisdictions viewing the project as a waste of money. Mr. Roberts predicts that the system will be reaching South Burlington in a couple of years with its future hanging on successful ridership.

IV. Status of Selected Rail Transit Projects

Other suggested areas for transit research in the United States give a cross-section of the realities in attempting to forge a rail transit system:

- Orlando, FL – A proposed tourist light rail line from downtown to Disney was planned and very nearly funded by FTA but died at the last minute due to a change of heart by a major financial backer. A light rail line for commuters from north Orlando to downtown also went through extensive planning and was nearly funded, but was quashed due to opposition from local communities through which the service would pass. The city is now studying a commuter rail proposal (information from LYNX website www.golynx.com, and local transit planner Chris Sinclair of Renaissance Planning Group, Orlando FL).

- Charlotte, NC – Voters approved a sales tax in November of 1998 to fund five Charlotte area corridors for transit development. Three of the corridors will get bus rapid transit, one will get light rail and one will get DMU service (Middleton and Wolinsky G8).

- Birmingham, AL – As of November, 1999, the MPO voted to continue light rail study. The MPO is also considering park-and-ride lots, High Occupant Vehicle (HOV) lanes, rapid buses and a combination of the four modes. (MacDonald, Ginny. "MPO Votes to Continue Light Rail System Study." The Birmingham News 11

Nov. 1999.) As of this point, according to Renaissance Planning Group Director Chris Sinclair who worked on the study, the proposal is delayed due to unrelated political problems on City Council.

- Hampton Roads, VA – May 02, 2000, residents of Chesapeake, VA voted to allow zoning changes and planning to allow for possible light rail development. [Hampton Roads Transit- Light Rail (visited Jul. 12, 2000) http://www.geocities.com/light_rail/index.html.] Virginia Beach residents had earlier voted against the regional proposal, while Norfolk is currently in the early stages of considering a smaller internal system.

- Yakima, WA – A heritage trolley line was planned to serve the town. But state officials want to cut ties with the local trolley company, Yakima Interurban Lines Association, and its president because of $200,000 in question by a State of Washington DOT audit. The DOT handed the case to the State Attorney General's office for further action against the company. (Nelson, Wes. "Are George Inness, Yakima Interurban at End of Rail Line?" Yakima Herald-Republic July 13, 2000.)

- Memphis, TN – In October of 1997, the Memphis Area Transit Authority linked an $8 million, 2.5 mile trolley route with an existing 2.5 mile trolley system in the city's business district. The system uses heritage trolley equipment and plans an additional three-mile extension. (Middleton, William. "Urban Rail Continues to Grow." Railway Age Feb. 1998: G14.)

- New Orleans, LA – The St. Charles trolley line remains in operation after the city refused to scrap the system in the mid-sixties. The city added an additional eight blocks of track in 1998 and will complete an additional four miles of trolley line by 2001. (Wilkins, Van. "Return of the Trolley" Mass Transit Nov./Dec. 1998: 18-20.)

V. Costs for Rail Transit

Another consideration that needs to be addressed is the potential cost of constructing a rail transit system. An overview of light rail costs can be found at Light Rail Central's website, http://www.lightrail.com, which surveys the cost of approximately thirty community attempts to complete light rail projects. The average cost in Light Rail Central's compilation of transit lines is $35 million per mile. It is important to keep in mind that costs vary widely between localities when securing rights-of-way, adding to existing lines and undertaking underground construction.

Light rail system costs can run from Camden, NJ's system at $18 million per mile to Los Angles, CA's $49 million per mile. Much of the differential can be accounted for by the expense of acquiring right of way in urban areas; construction costs by themselves average about $2 to $5 million per track mile. An interesting comparison for Charlottesville is the heritage trolley system of Kenosha, WI, with a population estimate of 87,849, which registers at just over $2 million per mile. Also for comparison, the Burlington, VT commuter rail project, using an existing twenty-mile corridor owned by

Vermont Railway, is costing just under $1 million per mile. By using existing infrastructure, Burlington limits its start-up cost.

For a variety of reasons, it is likely that a third track would have to be built in the Charlottesville area should the region want to pursue rail transit. Planning for right of way acquisition and planning will need to be considered early in the planning process.

There are also costs associated with the planning steps for transit expansion, which are explored further in the following sections.

VI. Assessing Transit Alternatives to the New Starts Program: FTA New Start Steps

A method for assessing the feasibility of rail and bus rapid transit for the city of Charlottesville and Albemarle County may lie with the **FTA's New Starts** system funding program. This method of evaluation would allow the plan to be sent directly to the FTA for funding consideration, resulting in a possible time and cost advantage over alternate approaches. In recent years, many new transit systems have secured funding through Congressional earmarks rather than going through the New Starts grant process. However, the steps involved in the New Starts program would be required of any new federal project regardless of the funding package, and are a good summary of how to plan for this type of major transit investment.

The New Starts funding program was created under the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 and modified by the Transportation Equity Act for the 21st Century (TEA-21) in 1998. The New Starts program permits federal financial backing of new rail and rapid busway projects, or improvement and maintenance of current rail and rapid bus systems. The New Starts program process consists of four major steps: **1) Alternatives analysis, 2) Preliminary engineering, 3) Final design** and **4) Construction**. An abbreviated review of these four steps follows for consideration.

1) Alternatives analysis: This analysis provides information on the benefits, costs, and impacts of alternative transportation strategies which leads to the selection of a locally-preferred solution to the community's mobility needs. Local officials provide a general corridor-level analysis on the mode and possible alignment alternatives. Proposed projects must come from the Metropolitan Planning Organization (MPO) and statewide long range plans. Alternatives Analyses can cost anywhere from $250,000 to $5 million depending on the complexity of the proposed system and previous work developing consensus on land use plans. In the Thomas Jefferson Planning District, the Eastern Planning Initiative (a $500,000 study funded entirely by a special grant from FHWA) can fulfill part of the Alternatives Analysis requirement by building consensus on regional land use development plans and proposed corridors for transit. Assuming transit options are selected in this study and are approved in the MPO's long range plan, the community could apply for state and federal funds to conduct preliminary engineering studies on specific alignments, financial feasibility, and environmental impact analyses.

Each of the following steps, 2) – 4), would be approved and listed in VDOT's Six Year Program and the MPO's Transportation Improvement Program (TIP). Possible funding sources for the next three steps include New Starts funds or Congressionally earmarked funds, as well as federal highway funds and local and/or state funds.

2) Preliminary engineering: If the MPO wants to move on to this phase, it may submit a request to FTA regional office for funds to conduct the necessary studies. It is important to note that FTA approval to initiate this phase is not a commitment to funding. Requests must:

- Identify project;
- Note the adoption of the project into the metropolitan transportation plan;
- Indicate endorsement of preliminary engineering funds in the Transportation Improvement Plan (TIP);
- Address the project justification and local financial commitment criteria.

The preliminary engineering phase entails local and/or project sponsors refining the design of the proposal and considering all reasonable design alternatives. The results of the process include:

- Specific alignments for a new facility such as railways or dedicated rapid busways
- Estimates of project design costs;
- Benefits of design projects;
- Impacts of design projects;
- Environmental Impact Statement (EIS) analyses and other considerations under National Environmental Policy Act (NEPA) requirements
- Project management concepts;
- Identified local funding sources.
- Identified local land use policies to support ridership.

In the Thomas Jefferson Planning District, the results of the Eastern Planning Initiative can supply the project justification and local commitment information, as well as planning level PE information. Because some information will have been developed through the Eastern Planning Initiative, the cost for the preliminary engineering phase may be at the lower end of the typical range of $1 million to $5 million.

3) Final design: This is the last phase of project development which may include the following items. Costs vary greatly depending on the amount of right of way required.

- Right-of-way acquisition
- Utility relocation
- Preparation of final construction plans, including construction management plans

- Detailed specifications
- Construction costs estimates
- Bid documents

4) Construction of the proposed project. As noted earlier in this report, the average cost nationwide for light rail range from $18 million to $49 million per mile, with an average of $35 million. The cost depends greatly on the complexity of the system. Bus rapid transit systems, or busways, are becoming increasingly popular alternatives to rail because they generally cost less to build (such as the Orlando, FL system which cost $7 million per mile) and can sometimes take advantage of existing pavement.

New Start Project Evaluation by FTA*:* The following three criteria categories are utilized by FTA to evaluate the planning and project development process and decide if the project(s) will qualify for funding. The project's ratings are updated by the FTA throughout the preliminary engineering and final design processes as cost, benefit and impact information is honed. At each stage, the proposed New Starts project is compared then to a no-build alternative and a Transportation System Management (TSM) alternative. The TSM alternative would make improvements to the efficiency of an existing transportation system.

1) Project justification: FTA rates the following as either "high", "medium-high", "medium", "low-medium", or "low".

- Mobility improvements,
- Environmental benefits,
- Operating efficiencies,
- Cost effectiveness,
- Transit-supportive existing land use policies and future patterns

2) Other Factors: FTA rates the following as either "high", "medium-high", "medium", "low-medium", or "low".

- Degree to which the policies and programs (local transportation planning, programming, parking policies, etc.) are in place as assumed in the forecasts;
- The project management capability;
- Additional factors relevant to local and national priorities.

3) Local and state financial commitment: FTA rates the following as either "high", "medium-high", "medium", "low-medium", or "low".

- Consideration of local funding beyond the local match required by Federal law
- Strength of proposed capital financing plan
- Ability of sponsoring agency to fund operation and maintenance for the entire system as planned, once the project is built.

For a full explanation of this entire New Starts process by the actual FTA source, consult http://www.fta.dot.gov/library/policy/ns/ns2000/2000nsr.htm.

VII. Bus Rapid Transit

Busways may often provide the same benefits as rail transit at a fraction of the cost. To quickly illustrate, the "Lymmo" busway service in Orlando, FL, cost less than $7 million per mile to put into service, compared to the figures presented above. Three elements distinguish busways from conventional bus service. The first is a dedicated lane where traffic does not impede the buses. A ticketing system similar to subway stations, comprises the second element and allows passengers to pre-pay prior to boarding a bus. The third element integrates feeder routes into a central route so that riders are brought out of neighborhoods and onto the major arteries.

Curritiba, Brazil (1999 population est. 1,584,232) is often presented as the model city for rapid bus transport. With a 2,000-bus system that moves 1.3 million riders daily, handles 75 percent of all weekday trips into the city, and features a maximum of ninety second wait times on the most heavily traveled routes, Curitiba is a strong argument for bus rapid transit (Detroit Speed Link Collaborative, Feb. 2000). But Martin Hull points out, in his article "Rapid Bus Cities", that some real differences exist between Curritiba and cities in North America (32). Curritiba has very high adjacent development density, full length busways and extraordinary ridership levels that may not be practically applied in an area that doesn't have the excess street capacity and political backing to dedicate full lanes to buses (Hull 32). Few North American cities have the density to support this scale of bus rapid transit. But there are examples of more attainable rapid busway systems in North America that can guide a community towards this transit mode.

While Orlando, Florida has trouble getting light rail accepted, its rapid busway system appears to be successful in its downtown district. The Lymmo system, provided by Orlando's "Lynx" transit system, provides links to various downtown sites through a stand-alone three-mile service (Hull 34). This free service takes a fun approach by mixing brightly decorated buses with open, well designed stations (Hull 35). Ridership averages 3,500 people a day on the full length exclusive bus lanes, which stand out physically through different texture and color (Hull 35). The operating schedule has buses arriving at five minute intervals during the week with longer periods on weekends and holidays. The buses run on CNG and incorporate a low floor design with a raised station boarding platform that eases entry onto the bus. These attributes make the service more approachable for riders by making the experience aesthetically and ergonomically pleasing. Downtown business concerns were hurdled with the support of the downtown business association, whose members are now linked to the buses by promotional literature and marketing. The Lynx system is hoping that Lymmo's positive transit image will extend to other routes and improve ridership on other bus routes (Hull 36).

The "Cityxpress" of Brisbane, Australia is a much more extensive example of a bus rapid transit program that would have application in North America. The goals of serving suburbs and mimicking the commuter rail system, in areas it didn't reach, led

Brisbane to rapid busways (Hull 34). The transit service placed the Cityxpress busway network over its local bus service routes. When Cityxpress is introduced to an area, the local bus service is not altered so that busway ridership reaches a natural level in its own right (Hull 34). If rapid busway ridership numbers are strong and local service numbers are down, then local service is cut back (Hull 34).

Cityxpress designers linked suburbs, chose non-rail routes and insured service to major activity centers. In creating a system that parallels commuter rail in atmosphere, bus stations have architecture, bike racks and landscaping similar to rail stations (Hull 34). Buses have a special paint scheme to set them apart and the service has an easily recognized graphic applied to buses, stations and literature (Hull 34). The numbers that support the service include a forty percent ridership that is new to public transit and fares that recover seventy percent of operating costs (Hull 34).

Hull concludes his article with four lessons that echo the advice given to communities considering light rail systems. The first lesson is to conduct background market research and concept development prior to a full public presentation (Hull 40). At the public presentation, citizens need to grasp the goals of the service and how it will affect streets and neighborhoods (Hull 40). The second point is to borrow from the experiences of localities with busways and use the lessons that apply to your area based on market research (Hull 40). Third, Hull suggests that leaders plan comprehensive public outreach programs that offer full explanations to the public and not to be afraid to modify the initial concept to work better with the community (40). Finally, Hull advises that important stakeholders be involved early in the planning process (40). The strong points of bus rapid transit, including ease of implementation and a palatable cost, make a powerful argument for this alternative to light rail.

Bolstered by the success of busways, the FTA sponsered a federal Bus Rapid Transit (BRT) demonstration program in 1999. The intent was to show that with proper planning and technological devices, buses could operate with the speed, reliability and efficiency of light rail at a much lower cost ["FTA Announces Project Selected for Bus Rapid Transit Demonstration Program" (visited Jul. 26, 2000) http://www.dot.gov/affairs/1999/fta0699.htm.] The FTA selected ten cities, on a competitive basis, to participate in this program. The selected cities include: Boston MA, Charlotte NC, Cleveland OH, Dulles Corridor VA, Eugene-Springfield OR, Hartford-New Britain CT, Honolulu HI, Miami FL. San Juan PR, Santa Clara County CA. The majority of these projects are currently under construction.

IX. Definitions

Commuter Rail – (also called Metropolitan Rail, Regional Rail) – Multiple-car train sets whose motive power is diesel and electric locomotives. Tracks may be shared with freight services, street integration is rare, and service usually runs from city core to suburbs. Train frequencies are at the half-hour or more. ("Transit")

DMU (Diesel Multiple Unit) - A hybrid between locomotive-hauled coaches and light rail transit (LRT) vehicles. Sometimes called "cordless light rail," individual DMU cars are powered by on-board diesel engines. http://www.lightrail.com.

Heavy Rail – (also known as Subway, Rapid Transit, Metro) – Multiple-unit electric powered trains on exclusive rights-of-way where level crossings with vehicle traffic are rare. Service is intra-urban and frequencies are as common as sixty seconds at peak times. ("Transit")

Heritage Trolley – (referred to as Historic or Antique trolley) – Antique streetcars, reconditioned or new, on restored or new track in an urban environment. Can serve a local transportation function though many are focused on tourists. ("Transit")

Light Rail Transit (LRT) - An electric railway system characterized by its ability to operate single or multiple car consists (trains) along exclusive rights-of-way at ground level, on aerial structures, in subways or in streets, and to board and discharge passengers at station platforms or at street, track, or car-floor level. http://www.lightrail.com.

Bus rapid transit (Busways) – Buses run on routes dedicated only to buses (referred to as busways), away from car traffic, and are connected to flexible feeder routes to serve areas off main trunk lines.

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