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**National Capital Region
Transportation Planning Board**

WORKING PAPER 1

**Measuring the Value Proposition for
Transit Investment in the Washington
Metropolitan Area**

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March 11, 2008

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**Prepared by:
HDR|HLB Decision Economics**

1.0 INTRODUCTION

Unlike highway investment, for which a rigorous and comprehensive economic evaluation framework – namely Cost-Benefit Analysis – has been in place for decades, the appraisal of transit investment proposals in the United States has been less than comprehensive. To be sure, highway decision makers are not habituated to economic counsel, especially in the current era of rampant “earmarking.” Yet there exists a proven methodology¹ for quantitatively evaluating highway investment options in terms of the full range of economic benefits and economic costs they create. A reasoned and quantitative expression of their prospective economic worth can be developed accordingly. In a recent speech before the National Governors Association, Secretary of Transportation Mary E. Peters noted that the economic rate of return on highway projects has declined precipitously since the onset of rampant earmarking. Such an observation could not be made were it not for the ability to assess return on investment.

In fact, practices and procedures of Cost-Benefit Analysis are firmly in place for virtually all types of public infrastructure, including airports, seaports, levees, canals, locks and dams, and water and wastewater facilities. Congress has required the use of Cost-Benefit Analysis by the Corps of Engineers, for example, since the 1930s.

In contrast to highway investment and most other types of public infrastructure, transit projects in the United States are most often assessed and presented to decision makers in terms of cost-per-rider or related indices. It is not the case, however, that the policy objectives and economic benefits of transit are fully reflected in, or proportional to, the level of ridership it serves. While ridership can help identify transit’s effect on the mass movement of people, it is not an index of congestion relief, community economic development, the provision of low-income mobility, the promotion of economic “location efficiency” (high density urban communities), or other prospective objectives and effects of transit investment.

¹ The American Association of State Highway and Transportation Officials published a comprehensive guide on economic evaluation more than three decades ago. See, "AASHTO Red Book" American Association of State Highway and Transportation Officials: *A Manual on User Benefit Analysis of Highway and Bus Transit Improvements*, 1977. The “Red Book” was updated in 2003 under the title User Benefit Analysis for Highways. Note that while some attention was given to the evaluation of bus investments in 1977, this was not the case in 2003.

2.0 THE STOCK APPROACH: THE FEDERAL GOVERNMENT'S NEW STARTS PROCESS

Why then are transit projects evaluated differently from other kinds of infrastructure investment? The practice stems from an analysis procedure established by the Federal Transit Administration called the New Starts process. The New Starts process is the means by which the agency ranks applicant projects for access to a pool of federal funds designated for transit investment. Since applicant projects are not in competition with highway projects for these funds, FTA officials see no need to employ methodologies, such as Cost-Benefit Analysis, that permit like-with-like comparisons of economic rates of return among highway and transit alternatives. As well, FTA officials see ridership as more readily amenable to accurate forecasting than other sources of transit value and focus the procedure for ranking applicant projects accordingly. While the New Starts process does permit the qualitative expression of non-ridership benefits as part of the application process (land use effects, for example), ridership is the driving factor in the ranking procedure.²

Localities must employ the FTA New Starts process in order to apply for federal funding for major transit projects. Although localities are certainly free to employ other methods of measuring the value of transit projects, most do not. One reason is the reality that the FTA process is expensive and time-consuming. A related reason is that findings from other approaches do not help improve a project's FTA ranking for access to federal funds. A more fundamental reason, however, is that the FTA New Starts process has, of its own volition, become the stock means of ascertaining transit value. Transit planners and consulting firms that specialize in the provision of transit planning services invest heavily in its application. Most are not aware that another, more comprehensive approach exists.

Notwithstanding the situation outlined above, internationally the Cost-Benefit Analysis of transit investments lays claim to a long and distinguished track record. In 1965, the government of the United Kingdom commissioned a major Cost-Benefit Analysis to ascertain the merits of building a new underground subway line (the Victoria Line).³ A subsequent analysis was conducted for the Piccadilly Line extension to Heathrow Airport. Today, the Canadian federal government requires all funding applicants to apply the comprehensive Cost-Benefit Analysis framework.

The risks inherent in not using a comprehensive approach are discussed next.

² The FTA employs a cost-effectiveness ratio defined as the "Incremental Cost per Hour of Transportation System User Benefit. Since user benefit is determined by transit ridership and assumed values of transit passenger time for different trip purposes, the ratio is essentially ridership-driven. FTA also examines Incremental Cost per New Rider (for informational purposes only).

³ C.D. Foster and M.E. Beesley, Estimating the Social Benefit of Constructing an Underground Railway in London, Journal of the Royal Statistical Society, vol. 126 (1965)

3.0 RISKS IN THE CURRENT APPROACH

Exclusive use of the New Starts process for project evaluation poses a number of risks, many of which rest at the local level.

Since the cost-per-rider approach gives quantitative standing to some transit policy objectives (such as ridership and mass movement) and not others (such as congestion management, environmental sustainability, economic development and affordable mobility), there is a risk that localities, in order to obtain federal funds, will not shape projects to serve local policy objectives but rather to satisfy federal criteria. For example, if economic development and location efficiency represents the principal local goal for a transit project, a circuitous bus rapid transit (or streetcar or LRT) alignment linking local suburban clusters might be the benefit-maximizing design. Yet planners seeking to maximize the likelihood of obtaining federal funds might select a more direct or arterial-oriented routing in order to maximize ridership, driving a wedge between project design and local public policy preferences and values.

Even where the design process itself is not distorted, exclusive use of the New Starts evaluation process creates a risk of failure to fully recognize certain value-creation benefits of transit. For example, restricting the analysis of a project's outcomes to its ridership potential means failure to quantify its potential economic development effects. While this would not dampen the project's competitiveness in the New Starts ranking process, it does mean that effects of importance in the search for local public understanding and consensus regarding the project go unnoticed. Indeed, there is the risk that a project which succeeds in satisfying the needs of the FTA New Starts process, and stands a good chance of obtaining federal funds accordingly, would fail to obtain local consensus and approval because either the design has veered from local policy objectives, or the analysis has failed to identify outcomes of local importance.

Design distortions and measurement omissions create an additional risk, that of failure to recognize possible financing opportunities other than federal funding. For example, transit-generated economic development creates the potential for value capture taxation strategies and public-private partnerships. To the extent that ridership-focused alignments and project choices diminish economic development opportunities, such financing methods are diminished accordingly.

Even without design distortion, failure to recognize and measure economic development value itself creates the risk of "leaving money on the table" – that is, overlooking potential non-federal funding opportunities. There is anecdotal evidence of local transit agencies favoring one kind of project over another in order to maximize access to federal funds rather than maximize the achievement of economic value and local objectives which might be financeable in other ways. For example, a transit agency might favor capacity expansion projects (such as new stations) over improvements to existing stations (and the associated development potential) because new stations are ridership-focused and thus stand a greater opportunity of drawing federal funds. It is quite possible,

however, that improving an existing station would (i) generate a stronger economic rate of return (based on the creation of economic development benefits) than would the new station; and (ii) create value-capture of public-private partnering based on financing opportunities.

The point to be drawn from the above is not that one kind of alignment or project is intrinsically better than another. Rather, it is that a ridership-bias in the stock evaluation process inhibits the realization of projects that best serve local objectives; and inhibits the identification of alternative financing arrangements.

Another significant risk inherent in exclusive use of the New Starts evaluation process is that it provides no basis for comparing the economic rate of return of transit projects with highway alternatives, or indeed with non-transportation options for the use of limited capital resources (such as convention centers, stadiums and other infrastructure projects). As in business, “rate of return” in the public sector provides a common measurement yardstick with which to compare the merits of alternative uses of funds. Because the cost-per-rider framework is meaningful in the transit context alone, it provides no information for decision makers about the comparative investment value of their choices.

A further risk inherent in the cost-per-rider methodology ranks among the most serious – that *of mistakenly rejecting good projects*. A recent analysis of a prospective streetcar investment in Cincinnati, for example, finds that whereas ridership-oriented benefits are insufficient to justify the project’s capital and operating costs, economic development benefits would exceed such costs and more than justify the investment. Ignoring economic development benefits and focusing on ridership alone thus creates the risk of rejecting a worthwhile project. This is a risk for both local and federal governments. At the local level, worthwhile projects might be overlooked or mistakenly deemed unworthy. Or design modifications designed to increase ridership might diminish other values, such as economic development benefits, and diminish the overall value of the project in so doing. At the federal level, some analysts suggest that the risk of overlooking good projects helps explain the decline in the number of transit investment applications coming into the FTA New Starts pipeline.⁴ Indeed, the Secretary of Transportation called recently for greater use of comprehensive Cost-Benefit Analysis throughout the nation, both federally and locally.⁵

⁴ See, Statement of Dr. David Lewis, Before the Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit, Implementation of New Starts and Small Starts Program, May 10, 2007. The testimony concludes that in not recognizing the full economic value of transit projects, the federal New Starts process creates a risk of underinvestment in transit and the marginalization of public transportation investment in American urban development.

⁵ Statement of Mary E. Peters before the National Governors Association, Towards a New Surface Transportation Economic Model, February 25, 2008.

4.0 THE ALTERNATIVE APPROACH: AN OVERVIEW OF THE COST-BENEFIT ANALYSIS FRAMEWORK FOR TRANSIT

FTA officials view ridership as more readily amenable than other sources of transit value to accurate forecasting with traditional transportation planning methods. The agency thus focuses the New Starts evaluation procedure -- which rests exclusively on traditional transportation planning methods -- on ridership. Cost-Benefit Analysis, on the other hand, recognizes all sources of transit value, including those that indeed are not amenable to forecasting with traditional transportation planning methods. Non-ridership sources of value can, however, be ascertained using conventional tools from other related disciplines, including micro-economics and probabilistic risk analysis. While the Cost-Benefit Analysis approach is an internally consistent and disciplined process, it employs a mix of analysis and forecasting methods with which to ascertain the various effects, values and benefits of investment alternatives.

Additionally, the Cost-Benefit Analysis approach can be applied as both a “study” of investment value, and as a deliberative public process that helps bring communities to consensus on the nature of economically and socially appropriate transportation investments. Protocols, such as the Risk Analysis Process (RAP), have been developed through which the Cost-Benefit Analysis process is used to help promote public understanding, engagement and consensus. Facilitated public sessions enable stakeholders to participate in and inform the analysis. Those whose values we seek to quantify, the public, are the very “experts” engaged in the process of scrutinizing and helping shape the evidence. In short, RAP is an operational means by which Cost-Benefit Analysis is recast from a “study” into a procedural framework for reasoned local deliberation and decision by discussion.

Treatment of Costs in the Cost-Benefit Analysis Approach

As in private business, Cost-Benefit Analysis in the public sector examines project costs on a life-cycle basis. The economic costs of transit include one-time capital expenditures on land, vehicles, facilities and equipment; annual outlays for maintenance and repairs; and the opportunity cost of capital employed.

Treatment of Benefits in the Cost-Benefit Analysis Approach

Cost-Benefit Analysis recognizes three sources of transit value:

- Mobility;
- Congestion management; and,
- Economic development.

Although some believe that construction and operating employment should also be included as a benefit, doing so is only legitimate where projects would reduce structural

unemployment or underemployment in the locality's urban labor markets. The reverse is actually possible wherein large-scale construction projects fuel inflation (by bidding up wage rates) during times of economic expansion. In short, construction and operating labor are *costs*, not benefits, unless unemployment in the area would be reduced by virtue of the project.

Mobility Benefits

Mobility benefits arise from:

- Time savings to transit users;
- Cash savings to low income households for reallocation to higher valued effects, such as nutrition, child care and shelter; and,
- Cross-sectoral reductions in the financial burden on social services such as employment support and home-based nutrition and medical services (such as home-based dialysis).

The FTA New Starts process recognizes the first item in the list above, though not the subsequent two.

People benefit from the time savings that attract them to make transit trips. Such time savings have economic value. Additional benefit is occasioned by low income groups. Although the use of transit by people from low income households is typically viewed as an equity benefit rather than an economic one, real resource gains do arise from transit's availability to the poor. Assessments of the demand for transit for low income travelers indicates that the cost of the "next cheapest" modal alternative creates much of their willingness to pay for bus or rail service. The alternative is often taxi, which tends to consume three to four times more of the household budget among poorer households as compared with higher income families.

Congestion Management Benefits

Congestion management benefits arise from:

- Reduced delay and resultant savings in time and vehicle operating costs for auto users and trucks;
- Improved reliability, predictability and productivity for auto users and trucks;
- Reduced environmental emissions and greenhouse gas emissions; and,
- Improved road safety and corresponding reductions in the loss of life, in injuries and in property damage.

Although the cost-per-rider index does not recognize congestion management benefits, time savings and improvements in travel time reliability for autos and trucks resulting

from transit investments carry economic value. The existence of economic value in relation to time savings is widely recognized by transportation economists (and treated as a legitimate benefit by the federal Office of Management and Budget in its guidelines on the conduct of Cost-Benefit Analysis⁶). Improved travel time *reliability* – the degree to which roadway users can count on predictable travel times, is known to convey even greater economic value than improvements in the “average” travel time performance. Shippers of freight, for example, rely on predictable deliveries in order to maintain low inventory costs and obtain value from their investments in just-in-time technologies and business processes. Trucking firms, which incur financial penalties for late deliveries, cushion against the risk of such penalties by leaving earlier than they would under reliable and predictable travel time conditions, thereby reducing their productivity. Workers lose productivity due to unreliable traffic conditions as well. Many place cushions in the time they allow for travel to meetings in order to guard against the risk of being late, time that would otherwise be used for productive work. Householders too are disadvantaged by unreliable travel times. Some leave work earlier in order to ensure timely arrival at day-day care centers. Economists also recognize the economic value of lost family time when people place cushions in the time they allow for the journey to work in order guard against late arrival.⁷

Not included in the FTA cost-per-rider index, environmental, greenhouse gas and safety benefits are known to carry real and quantifiable economic value. Here again the legitimacy of such quantitative estimates is validated by virtue of their recognition by the federal Office of Management and Budget.

Economic Development Benefits

The economic development value of neighborhoods and communities can be enhanced by certain kinds of transit facilities. Such value arises from several sources, including:

- Increased economic value of existing residential and commercial properties due to peoples’ willingness to pay a premium for access to a wider range of destinations;
- Agglomeration economies (business efficiencies) due to higher density retail and commercial activities; and,
- Reduced requirements for auto-ownership and use due to higher density urban form.

For measurement purposes, economic development benefits can be identified through their influence on the value of land and property. Using sophisticated statistical techniques to separate different sources of land value, one study finds that station facilities yield in the region of \$16.00/square foot more residential equity value for each foot closer the property is to the transit station. Findings in San Francisco indicate that the average home carries \$15,000.00 more value for each 1,000 feet closer it is to a

⁶ Federal Office of Management and Budget, Circular A4

⁷ HDR|HLB Decision Economics Inc., The Value of Travel Time Reliability in Highway User Cost Estimation, National Cooperative Highway Research Program, Report 431, September, 1999

BART station. Similar findings have been reported in relation to the impact of commercial properties.⁸

Increased land values due to transit reflect two distinct effects, (i) the capitalization of transportation benefits (i.e., the reflection of better travel times in the value of land near stations); and, (ii) non-transportation related benefits of transit due to peoples' willingness to pay for improved neighborhood form, agglomeration economies, amenity and general livability. Studies find that transit-induced enhancements in land value can exceed the capitalized value of time savings. This indicates that transportation ridership is not the only source of transit's impact on economic development. That people and firms choose to locate in transit-oriented residential locations without the intention of actually using the transit service is evidence of the non-transportation economic value of transit-oriented development.

In Cost-Benefit Analysis it is wrong to add that portion of increased economic development value arising from the capitalization of time savings to the value associated with mobility value. To do so would be to "double-count" the benefits of a project. For example, mass transportation projects, such as the proposed Dulles corridor Metrorail line, would be expected to create economic development value in the Tysons Corner area, due to both transportation and non-transportation impacts. Only the latter would be additive to mobility and congestion benefits in a Cost-Benefit Analysis. On the other hand, the Corridor Cities Transitway, with its relatively smaller emphasis on mass transportation, might be expected generate a greater share of its economic development value from non-transportation sources (higher densities, agglomeration economies and so on).

It is important to note however that, whatever may be the division of increased economic development value between transportation (ridership) and non-ridership effects, it is always the entire increase in land value that is relevant to quantifying the taxation and other financial leveraging opportunities (such as public-private partnering) that might arise from the transit project's creation of development value.

⁸ David Lewis and Fred Laurence Williams, Policy and Planning as Public Choice: Mass Transit in the United States, Ashgate, 1999

5.0 EXAMPLES OF THE COST-BENEFIT ANALYSIS APPROACH IN APPLICATION

The Cost-Benefit Analysis framework outlined above has been applied in only a handful of urban areas in the United States, but enough to demonstrate its ready applicability and to indicate the value proposition for different kinds of transit investment.

The evidence from such studies indicates that:

1. Projects can generate significant benefits in all three categories of transit value creation, not just those categories relating directly to ridership (*see examples for Austin, Texas in Table 1*);
2. Projects can generate substantially greater economic benefits than the life-cycle costs of construction, operations and maintenance – in other words, projects can be economically well worthwhile (*see examples for Austin and Cincinnati in Tables 1 and 2*);
3. Not all major transit investments generate more benefits than costs (*see the example of the Orange Line in Austin, Texas -- Table 1*);
4. Bus investments can outperform rail alternatives in terms of rate of return, but rail investment can generate significantly greater absolute levels of economic benefit and net benefit (*see example for Cincinnati, Ohio in Table 2*);
5. Transit investment can sharply outperform highway investment alternatives in terms of economic return (*see example for Cincinnati in Table 2*) and
6. Focusing on ridership-related benefits alone can lead to the mistaken conclusion that a project is not economically worthwhile.

Table 1: Cost-Benefit Analysis of Two Prospective Light Rail Lines in Austin, Texas (in present value of millions of year-2000 dollars, over 30 years)

Category of Benefits	Green Line	Orange Line
Total Benefits (Million U.S. dollars)	\$1,369.9	\$233.6
Congestion Management	\$852.5	\$106.5
Affordable Mobility	\$224.0	\$32.5
Community Economic Development	\$293.5	\$94.6
Total Cost (Million U.S. dollars)	\$1,035.4	\$410.0
Net Present Value (Million U.S. dollars)	\$334.5	(\$176.4)

Source, HLB Decision Economics, *Light Rail Transit in the Austin Urbanized Area: A Cost-Benefit Analysis*, prepared for Austin Transit Authority, March, 2000.

Table 2: Cost-Benefit Analysis of Bus, Light Rail and Highway Capacity Investments in Cincinnati, Ohio (in present value of millions of year-2000 dollars, over 30 years)

	Bus Improvement, Region-wide	Light Rail Region-wide	New Highway Capacity
Total Cost	\$522	\$6,218	\$1,209.1
Total Benefits	\$1,141	\$10,784	\$1,365.2
Net Benefits	\$619	\$4,566	\$156.1
Internal Rate of Return	27.1%	8.7%	4.9%

Source: HLB Decision Economics, *The Economic and Community Benefits of Transportation Options for Greater Cincinnati*, February, 2001, prepared for Ohio-Kentucky-Indiana Metropolitan Planning Organization.

Conclusion 6 above is evident in the Cost-Benefit Analysis of a prospective streetcar project in Cincinnati. As shown in Table 3, all benefits other than those associated with local economic development (namely mobility and congestion benefits, which sum to \$52.7 million) are found to be insufficient to cover the estimated total life cycle costs of \$115.8 million. Non-ridership related economic development benefits, on the other hand are estimated to total \$378.9 million, more than enough to justify total costs. And even though the project is economically worthwhile, there is a risk that it would not rank

highly under the cost-per-rider index which reflects largely the mobility category of benefit.

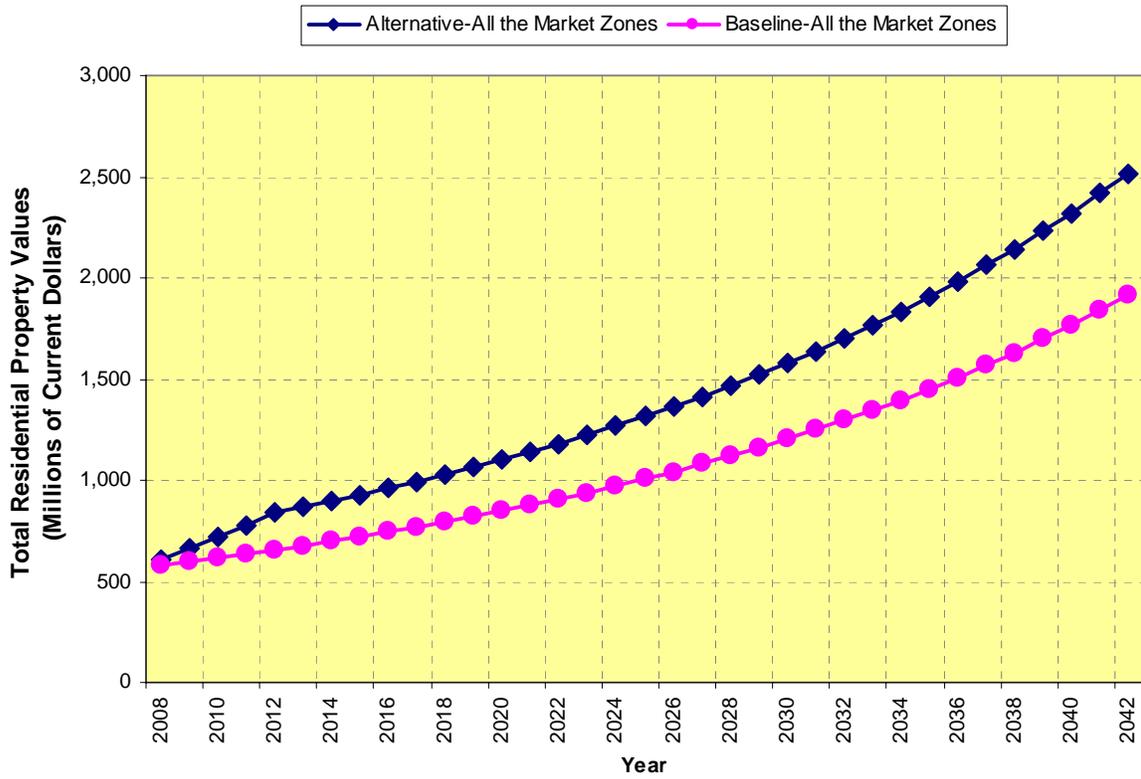
The Cincinnati streetcar study found that the proposed system could generate substantial economic development benefits for both the residential and commercial sectors in downtown Cincinnati. Figure 1 depicts the projected incremental growth in property values in the Base Case (without a Streetcar System) and Alternative (with a Streetcar System) over the period 2008-2042. The Alternative case accounts for growth in economic value resulting from the streetcar investment only and not from other additional or complementary policy initiatives.

Table 3: Cost-Benefit Analysis of Prospective Streetcar System, Cincinnati (in present value, millions of 2007 dollars over the period 2008-2042)

	Mean	90% Probability of Exceeding	10% Probability of Exceeding
Congestion Management Benefits			
Time and Vehicle Operating Cost Savings	\$13.0	\$10.4	\$16.5
Emission Savings	\$0.4	\$0.1	\$0.6
Accident Cost Savings	\$3.0	\$0.8	\$5.8
Total Congestion Management Benefits	\$16.4	\$12.3	\$21.0
Mobility Benefits			
Trip Cost Savings	\$35.2	\$23.9	\$47.4
Cross Sector Benefits			
Welfare Cost Savings	\$0.7	\$0.5	\$1.0
Home Care Cost Savings	\$0.3	\$0.2	\$0.4
Total Cross Sector Benefits	\$1.1	\$0.7	\$1.4
Economic Development Benefits			
Residential	\$106.9	\$70.8	\$143.0
Commercial	\$272.0	\$148.5	\$398.3
Total Economic Development Benefits	\$378.9	\$249.5	\$509.1
Grand Total Benefits	\$431.6	\$303.0	\$565.7
Project Costs			
Capital Expenditures	\$75.7	\$73.7	\$77.7
Incremental O&M + Disruption Costs	\$40.1	\$39.7	\$40.5
Total Costs	\$115.8	\$113.8	\$117.9
Net Present Value	\$315.8	\$186.8	\$450.4
Benefit-Cost Ratio	2.7	1.6	3.9

Source: HDR Corporation, 2007

Figure 1: Projected Total Property Values (2008-2042): Cincinnati Streetcar



6.0 A PRELIMINARY LOOK AT THE WASHINGTON METROPOLITAN AREA

What implications can be drawn from the previous sections in relation to transit project proposals for the Washington D.C. metropolitan area? Without undertaking the Cost-Benefit Analysis itself, we cannot estimate the likely net economic value and rate of return on such projects. However, a high-level qualitative assessment does allow us to explore three questions:

- What is the nature of the economic benefits that these projects would likely generate? Into which of the various categories outlined earlier would these benefits fall?
- What does evidence from the application of Cost-Benefit Analysis to similar projects in other jurisdictions indicate about the possible net benefits and rates of return on projects planned in the Washington area?
- Is it likely that the FTA cost-per-rider approach, on its own, would recognize the kind of benefits associated with these projects? Is there any risk associated with relying solely on the cost-per-rider approach?

Presented in Table 4, a preliminary qualitative assessment has been conducted in relation to the following projects in the Transportation Planning Board's Constrained Long Range Plan:

1. Corridor Cities Transitway, Phases I and II;
2. Purple Line;
3. Dulles Corridor Metrorail;
4. Potomac Yards Metro Station;
5. Columbia Pike Streetcar;
6. New York Avenue Station; and
7. Anacostia Area Streetcar

Taken together, the total estimated capital cost of these projects exceeds \$6.5 billion. Excluding the Dulles Corridor Metrorail project, their total estimated capital cost exceeds \$1.5 billion.

Question 1: What is the nature of the economic benefits that the seven projects would likely generate? Into which of the various categories outlined earlier would these benefits fall?

Each of the projects would create economic benefits in all three categories, mobility, congestion management and economic development. While the relative size of the benefits in each category would differ among projects, there is a strong likelihood of value creation across the span of all areas of potential benefit.

Question 2: What does evidence from the application of Cost-Benefit Analysis to similar projects in other jurisdictions indicate about the possible net benefits and rates of return on the seven projects?

Evidence cited in Section 5 above indicates that light rail, bus and streetcar investments, such as projects 1, 2, 5 and 7 listed above, can generate strong net benefits and economic rates of return that exceed the opportunity cost of capital employed. While such a result is by no means guaranteed, the evidence thus bodes well for similar local projects.

While Section 5 does not provide evidence in relation to subway investment like that of project 3 (the Dulles Metrorail extension) evidence that can be brought to bear is suggestive of positive results for the Metrorail extension. A recent, unpublished⁹ Cost-Benefit Analysis of Toronto's \$2 billion "Spadina Extension" indicates a positive economic real rate of return of about 7 percent, well above the opportunity cost of capital. Projected net benefits (benefits minus costs) approached half a billion dollars.

Evidence is also available from major subway extensions abroad. Opened in 1986, the Hounslow branch of London's Piccadilly subway line was extended to Heathrow Airport in a loop to serve the (then) new Terminal 4. Prior to construction, Cost-Benefit Analysis lead to the conclusion that these investments would generate positive net economic benefits. Going back to the 1960s, a Cost-Benefit Analysis of London's then prospective Victoria Line by Professors Michael Beesley and Christopher Foster¹⁰ found the investment's economic benefits to exceed its total life-cycle costs. The Victoria Line was opened in 1968.

Evidence of Cost-Benefit Analysis results for station development is not available for this Working Paper. Outcomes associated with Metrorail's successful redevelopment of the New York Avenue station, however, indicate that economic development benefits can certainly justify redevelopment costs and provide leverage for local financing.¹¹

⁹ HDR|HLB Decision Economics, 2007 (unpublished)

¹⁰ C.D. Foster and M.E. Beesley, Estimating the Social Benefit of Constructing an Underground Railway in London, *Journal of the Royal Statistical Society*, vol. 126 (1965)

¹¹ From discussions with Transportation Planning Board staff.

Question 3: Is it likely that the FTA cost-per-rider approach, on its own, would recognize the kind of benefits associated with these projects? Is there any risk associated with relying solely on the cost-per-rider approach?

As indicated in Table 4, there exists a material risk that the cost-per-rider approach alone (that is, without complementary Cost-Benefit Analysis) would fail to reveal the full value-proposition of each of the seven local projects. On the other hand, each of the projects is amenable to evaluation using the Cost-Benefit Analysis approach, and there is nothing in the FTA regulations prohibiting its use.

Table 4: Qualitative Assessment of Benefits Associated with Prospective Transit Projects in the Constrained Long Range Plan

PROJECT	<u>QUALITATIVE ASSESSMENT</u>		
	MOBILITY	CONGESTION MANAGEMENT	ECONOMIC DEVELOPMENT
<p>Corridor Cities Transitway: Shady Grove to Metropolitan Grove; and Metropolitan Grove to COMSAT.</p> <p>Either light rail transit or bus rapid transit along the corridor from Rockville through Quince Orchard and Germantown to Clarksburg. Another option is premium bus service along proposed I-270 HOV managed lanes.</p>	<p><i>Improvements in general mobility and low income mobility can be expected due to the increase in accessibility between communities</i></p>	<p><i>A degree of diversion from auto to transit can be expected to the extent that transit travel times are competitive and to the extent that higher density development diminishes auto ownership</i></p>	<p><i>An alignment through smaller cities and communities to the north of the metropolitan area could be expected to diminish the risk of sprawl and create economic value and financing potential.</i></p>
<p>Comments: <i>Benefits in all three categories can be expected. Economic development benefits could be relatively high compared with ridership-based benefits. Exclusive use of the cost-per-rider evaluation methodology creates risk of understating project value.</i></p>			

Table 4: Qualitative Assessment of Benefits Associated with Prospective Transit Projects in the Constrained Long Range Plan (Cont'd)

PROJECT	QUALITATIVE ASSESSMENT		
	MOBILITY	CONGESTION MANAGEMENT	ECONOMIC DEVELOPMENT
<p>Purple Line: Bethesda to New Carrollton</p> <p>High capacity transit along 14-mile corridor from western limit of Red Line in Bethesda to New Carrollton Metro Station in Prince George's County.</p>	<p><i>High trip generation communities along this east-west alignment could generate substantial improvements in general mobility and low income mobility.</i></p>	<p><i>Growth in east-west commuting patterns create a significant likelihood of diversion from auto to transit, the rate of such diversion dependent upon the extent to which purple line travel time performance is competitive with auto and to the extent to which higher density development diminishes auto ownership</i></p>	<p><i>Alignment through major centers could be expected to diminish the risk of east-west sprawl and create economic value and financing potential.</i></p>
<p>Comments: <i>Benefits in all three categories can be expected. Economic development benefits could be relatively high compared with ridership-based benefits. Exclusive use of the cost-per-rider evaluation methodology creates risk of understating project value.</i></p>			
<p>Dulles Corridor Metrorail Project: East Falls Church to VA 772 (Loudoun County)</p> <p>23.1 mile extension of the existing Metrorail system from the Orange Line in Fairfax County through Tysons Corner to Washington Dulles International Airport and Route 772 in Loudoun County. Would include 11 new Metro stations and rail yard facilities. Four new stations would be located within Tysons Corner.</p>	<p><i>Ridership and mobility potential arises from station locations in major trip generation locations, including major retail locations and one of the nation's busiest international airports.</i></p>	<p><i>Diversion of airport traffic from auto and taxi could yield congestion management benefits in the corridor.</i></p>	<p><i>Siting of four stations in Tyson's corner might be expected to create significant increases in densification and land values</i></p>
<p>Comments: <i>Benefits can be expected to arise in all three categories. Focus on ridership-oriented benefits alone, to the exclusion of congestion management and economic development values, creates a risk of substantially undervaluing the economic worth of the project.</i></p>			

Table 4: Qualitative Assessment of Benefits Associated with Prospective Transit Projects in the Constrained Long Range Plan (Cont'd)

PROJECT	QUALITATIVE ASSESSMENT		
	MOBILITY	CONGESTION MANAGEMENT	ECONOMIC DEVELOPMENT
<p>Potomac Yards Metro Station</p> <p>Construction of a Metro station on an existing rail line to provide access to the Potomac Yard development (a variety of housing types, retail stores, offices and parks).</p>	<p><i>Ridership and related mobility benefits arise from residential and commercial development at Potomac Yards.</i></p>	<p><i>Against a base case of development at Potomac Yards <u>without</u> the station, a station is likely to diminish the impact of added automobile volumes in the surrounding area</i></p>	<p><i>Against a base case of development at Potomac Yards <u>without</u> the station, a station is likely to foster higher density development and related economic benefits from agglomeration and a diminished rate of auto ownership.</i></p>
<p>Comments: <i>Economic development benefits could be relatively high compared with ridership-based mobility benefits and benefits from congestion management. Reliance on the cost-per-rider methodology alone creates risk of understating project value.</i></p>			
<p>New York Avenue Station</p> <p>New infill station on the Red Line between Union Station and Rhode Island Avenue Stations in the District of Columbia</p>	<p><i>Likely to generate additional ridership and mobility, including low income mobility due to infill location</i></p>	<p><i>Could reduce auto use in infill neighborhood and thereby help ease local traffic delay</i></p>	<p><i>Could increase the extent and density of residential and commercial development, improving neighborhood livability and increasing land values accordingly</i></p>
<p>Comments: <i>Economic development benefits could be relatively high compared with ridership-based mobility benefits and benefits from congestion management. Reliance on the cost-per-rider methodology alone creates risk of understating project value.</i></p>			

Table 4: Qualitative Assessment of Benefits Associated with Prospective Transit Projects in the Constrained Long Range Plan (Cont'd)

PROJECT	QUALITATIVE ASSESSMENT		
	MOBILITY	CONGESTION MANAGEMENT	ECONOMIC DEVELOPMENT
<p>Streetcar Project Phases I-V Anacostia Area/H Street; Benning Road; and over 11th Street Bridge</p>	<p><i>High trip generation communities along this alignment could generate substantial improvements in general mobility and low income mobility.</i></p>	<p><i>Likelihood of diversion from auto to transit, the rate of such diversion dependent upon the extent to which travel time performance is competitive with auto and the extent to which higher density development diminishes auto ownership</i></p>	<p><i>Could increase the extent and density of residential and commercial development, improving neighborhood livability and increasing land values accordingly</i></p>
<p>Comments: <i>Economic development benefits could be relatively high compared with ridership-based mobility benefits and benefits from congestion management. Reliance on the cost-per-rider methodology alone creates risk of understating project value.</i></p>			
<p>Columbia Pike Streetcar from Skyline (Fairfax County) to Pentagon City</p> <p>Streetcar running approximately 4.7 miles between Pentagon City in Arlington County and Skyline in Fairfax County. Project selected by Board in each County to provide enhanced transit and promote revitalization and redevelopment in the corridor.</p>	<p><i>Improvements in general mobility and low income mobility can be expected</i></p>	<p><i>A degree of diversion from auto to transit can be expected to the extent that transit travel times are competitive and to the extent that higher density development diminishes auto ownership</i></p>	<p><i>Could increase the extent and density of residential and commercial development, improving neighborhood livability and increasing land values accordingly</i></p>
<p>Comments: <i>Benefits in all three categories can be expected. Economic development and low income mobility benefits could be relatively high compared with general ridership-based benefits. Exclusive use of the cost-per-rider evaluation methodology creates risk of understating project value.</i></p>			