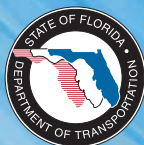


Executive Summary Bus Toll Lane Concept Feasibility Study

May 2013



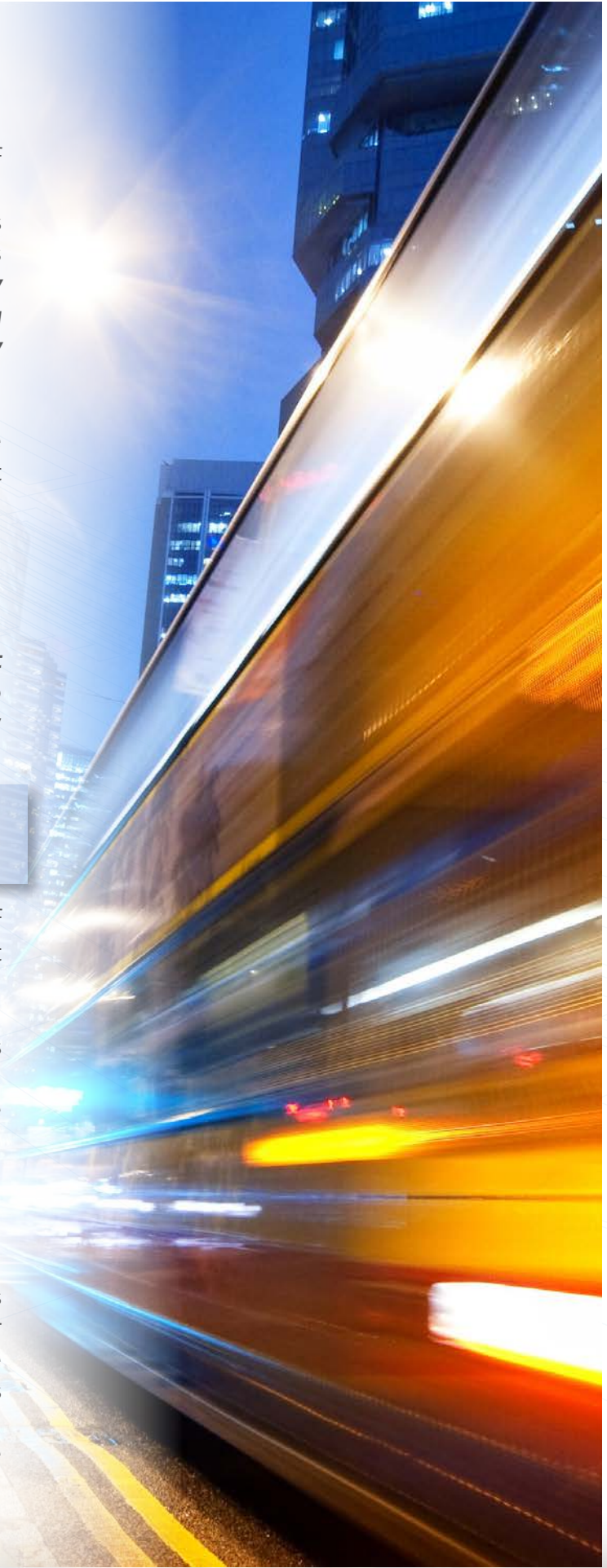
Introduction

The Bus Toll Lane (BTL) concept is a promising new idea to help solve the financial needs of public transportation and the challenges of urban traffic congestion by combining the resources of public transit and toll agencies. The BTL is a transit-based solution **creating financially sustainable transit service with increasing potential to move more people as the facility matures**. The BTL idea brings transit and tolling agencies together as equity partners to fund a multi-modal solution. It is a method to maximize person throughput by employing proven transit and tolling practices. By combining the capital funding resources of transit with the long-term revenue strength of tolls, a more effective and sustainable public transportation system can be developed sooner than either mode could produce on its own. The **Bus Toll Lane Concept Feasibility Study** (BTL Study) was undertaken to determine the operational and financial viability of this new idea.

“The BTL is a transit-based solution creating financially sustainable transit service with increasing potential to move more people as the facility matures.”

If sufficiently patronized, the efficiency of public transit service could provide significant congestion relief. However, the quality of existing public transit needs to improve to make it an attractive/competitive choice. While capital costs for new transit projects can often be funded, traditional fare box revenues from that service only cover a relatively small portion of operating costs. Thus, substantial operating funds from local, state and federal tax sources are needed to subsidize transit service.

For highway facilities, almost all new projects are being constructed with some form of user financing based on tolls. For these facilities, the long term revenue stream is robust. While costs to operate the new facilities are easily covered by the toll revenue, initial capital to build the new lanes is often an issue. This is practically a reverse image of transit funding.



The Study

The Tampa-Hillsborough County Expressway Authority (THEA) in partnership with the Hillsborough Area Regional Transit Authority (HART) conducted the Bus Toll Lanes Proof-of-Concept Study. The study was funded by a grant from the Federal Highway Administration (FHWA) Value Pricing Pilot Program (VPPP). The local match for the study was provided by the Florida Department of Transportation (FDOT) using a “soft match” of toll credits.

The BTL concept imagines a financially self-sustaining public transportation solution to help address urban congestion. The idea proposes a new premium transit service operating on newly built price-managed lanes to function as the “fixed guideway” for bus rapid transit service. Financial sustainability would be achieved through a partnership that combines funding and management practices of a public transit agency and a public toll agency. The study results conclusively confirmed this concept is viable.



Figure 1: Example of BTL Adding New Capacity in the Median of a Limited-Access Highway with All-Electronic Tolls

BTL Elements

The BTL concept provides direct support for public transportation by inviting transit agencies to be equity investors in the construction of new **premium transit service running on new price-managed express lanes** to serve highly congested urban areas. Price-management is a toll application that varies rates by time of day to assure free-flow of traffic at all times in the lanes. This study applied toll rates that varied by time of day to assure traffic flow would be maintained at 50-miles per hour. It is a proven application of the toll industry that transit **can apply to assure sustainable service speeds**. It should be noted that the **BTL concept is not a high occupancy toll (HOT) lane**. No discounts or free passage based on vehicle type or occupancy **assures a sustainable revenue stream and eliminates occupancy enforcement costs**.

The BTL maximizes person throughput by employing proven **bus rapid transit (BRT) service on the newly constructed price-managed lanes**. Price-management of the lanes with all-electronic tolling technology ensures high speed operations at all times. The **new lane capacity is dedicated first to public transit**. All of the remaining capacity above that used by the public transit vehicles is then sold to drivers of personal vehicles who are willing to pay the variable-tolls that assure free-flow service. As shown in Table 1 on the following page, a price-managed lane moves significantly more vehicles and people (165%) than a congested highway lane. Converting auto passengers to public transit passengers substantially increases overall people moving potential. To be conservative, the study assumed bus service running on 10-minute headways. This raised the potential people moving capacity 187% higher than a congested highway lane. The BTL concept provides enhanced transit service at lower passenger costs with equal or better trip times compared to personal vehicle trips. This **provides a competitive advantage in attracting new transit ridership**. As the transit

BTL – MOVE PEOPLE!			
Condition (Vehicle Occupancy Rate = 1.1)	Buses Per Hour	Person Throughput Per Hour	Comparison to General Purpose Lane
General Purpose Lane With Severe Congested	0	1100	100%
Price-Managed Express Lane No Transit	0	1815	165%
BTL 15 Minute Headway	4	1977	180%
BTL 10 Minute Headway	6	2058	187%
BTL 5 Minute Headway	12	2302	209%
BTL 2 Minute Headway	30	3032	276%
BTL 1 Minute Headway	60	4248	386%

Table 1: BTL- Move People
Hypothetical Person Throughput on Bus Toll Lanes in a Limited-Access Free-Flow Environment
(Source: Parsons Brinkerhoff)

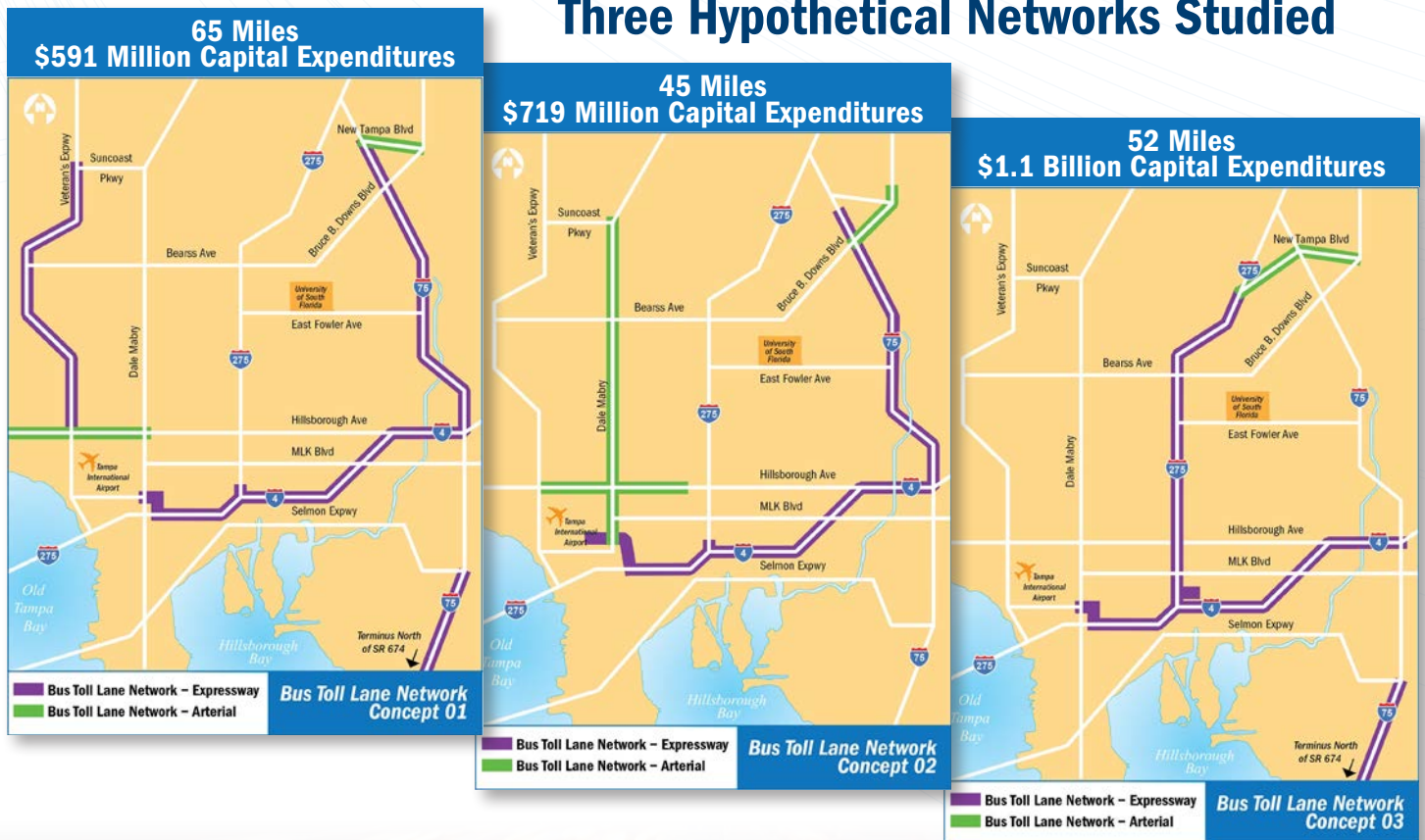
demand increases, the BTL concept provides the financial resources and lane capacity to grow the premium transit service. Even employing one-minute headways (60 buses per hour) uses less than 10% of the price-managed lane capacity

on a limited access facility. The remaining 90% is a revenue opportunity to provide funding in support the transit service. The *revenue opportunity for transit is based on the capital share invested to build the BTL system.*

BTL Networks

The BTL study used Hillsborough County as a test location. The area is representative of mid-sized urban communities within the United States. It has a total population of just over 1.2 million with Tampa being the primary central city. Hillsborough County is very much like other mid-sized American communities that exhibit heavy peak-hour traffic congestion and limited financial capability to develop and operate new premium public transit service. The purpose of this study was to test the BTL concept using real data. It was not intended to recommend a specific transit plan or project for the City of Tampa or Hillsborough County. In fact, to maintain this awareness the study team referred to the city as "Betaville" and the county as "Betaborough County" during the project.

Three Hypothetical Networks Studied





The study developed three different hypothetical BTL networks to provide depth and range to the analysis. It included bus rapid transit, express bus and managed lane design concepts on congested limited-access and high-volume arterial highways. The study horizon was projected over a 30-year period (2016-2045). It should be noted that transportation networks of this size are not usually built as one single project, but as a combination of projects over a period of time as resources become available. However, to fully assess the BTL service levels and financial components, the study assumed that all network elements would be constructed simultaneously to be in place in the opening year.

To manage speeds on the BTL and ensure a high level of service for transit using the facilities, toll prices are varied by time of day to control demand. The demand pricing (toll-rate setting) is based on levels of traffic demand in the new managed lane(s). Toll rates are higher in the morning and afternoon peak travel demand periods, and lower during off-peak travel times. The BTL Study included modeling analyses to verify that a high level of service could be maintained in the BTL lanes throughout the study horizon. The toll-rates used to maintain the high-level service (minimum 50 MPH travel speeds) were also used in the revenue analysis.

The BTL Study included traffic and transit ridership modeling along with sketch level engineering and cost estimates. The study used FDOT unit prices, prior HART studies, and actual operating costs from THEA. This information was used as the basis for independent operational performance evaluations.

Modeling

The study team chose to use the latest version (Version 19) of the Tampa Bay Regional Transit Model (TBRTM), which was developed in consultation with the FDOT, FTA, and MPO. Multiple model iterations were performed. The model incorporated projects identified in the MPO's financially feasible long range transportation plan. This base network was then modified to incorporate the BTL improvements. The three BTL networks were then modeled and tested independently.

Modeling iterations of the BTL networks were performed to develop the per mile toll-rates necessary to maintain operating speeds at 50 mph. The final model runs used a low (\$11.60/hour) and a high (\$15.00/hour) customer value of time to forecast use and revenues. The medium model results were an interpolation between those values. This resulted in per mile toll rates on

the BTL networks that ranged from a low of \$0.28 per mile in 2015 to \$1.30 per mile in 2045. These rates compare well with existing tolls needed to maintain freeflow conditions on congested corridors elsewhere in the United States.

The study developed a hypothetical set of transit stop locations for each network. In addition, the University of Florida Urban and Regional Planning GEOPLAN Center team modeled how each BTL network could influence land development patterns in Tampa and Hillsborough County for the years 2025, 2035, and 2045. These revised land-use assumptions were used in the network modeling. This allowed the study to take into account changes in land use that potentially occur with significantly improved transit service.

BTL Transit Equity Investment – The New Fare Box

The primary purpose of tolling in this application is to price-manage service levels in the new lanes. This is a change in the traditional use of tolling as a revenue source to fund construction costs. The BTL concept also proposes a repurposing of the tolls by applying transit funds to the capital financing of the new lanes as a fixed guideway for new premium transit service. The infusion of transit capital would convey ownership rights that entitle transit to an equity share of the toll revenue. A transit agency owning all or part of

the price-managed lane as a fixed guideway for premium transit service will further repurpose the tolls as a component of a new transit fare box.

Traditional transit fare box revenue is described as fares collected directly from transit passengers. In the BTL concept, the transit agency is recognized as an owner of the facility - based on the share of capital funding they provide. In this case the toll paid for the non-transit vehicle to use the transit guideway is a payment to the transit system. Thus the transit fare box would now include BTL toll revenues as well as the fares collected from bus passengers.

Assuming the BTL system was built and funded from traditional transit resources, all **new fare box revenues** would be available to cover the annual costs of operation and maintenance (O&M) for the new bus service, toll systems, and lane systems. For transit, the BTL potential to provide toll revenues as a return on the investment of transit capital funds is a significant benefit.

Table 2 demonstrates that each BTL network produced significant **new fare box revenues** for transit. Based on the results of this study, the BTL fare box provided a sustainable, inflation sensitive revenue stream that would cover 100% of all system O&M costs.

30-Year BTL Revenue and Cost Results					
Using Medium Revenue Scenario for Each BTL Network (\$Millions)					
	New Fare Box	BTL O&M¹		Net Revenue	
Network	Gross Revenue Tolls & Bus Fare	Guideway O&M	New Transit O&M	New Fare Box minus BTL O&M	Present Value @ 5%
BTL #1	3,464	545	535	2,384	807
BTL #2	1,940	371	585	984	316
BTL #3	2,274	361	567	1,346	445

¹ = Annual operations, maintenance and major maintenance

Table 2: 30-Year BTL Revenues and Costs
(Source: Parsons Brinkerhoff, Tindale Oliver, American Engineering & AECOM)



Each network produced significant revenues well above operating costs. The remaining revenues could contribute to subsidize the BTL capital development **as a new source of local funding match to federal transit grant programs**, or it could be used to support other public transportation capital and operating needs.

The financial potential of a BTL to cover 100% of transit O&M costs from fare box revenues is unmatched by any known public transportation system within the United States. According to the American Public Transportation Association (APTA), in 2010, the average US public transit system returned slightly more than 32% of operating expenses from the passenger fare box. The rate of return is typically lower for small-to-midsized transit systems.

The BTL financial analysis offers encouraging results for a new transportation paradigm that marries traditional transit and toll financing to fund operation expenses.

Other Benefits

BTL Assists All Transit Riders Including the Transportation Disadvantaged:

Assuming a transit investment of capital to construct the BTL, the tolls generated by the network may become part of the fare box revenue. That revenue can be used to substantially reduce fares for the dedicated BTL express bus service.

The BTL study reduced the current HART rate of \$2.50 per trip for express service to \$1.00 per trip on the new rapid transit service – thus making BTL transit more attractive and affordable for all transit passengers. There is potential for further subsidies targeted to the transportation disadvantaged.

BTL is a Transit Oriented Development Solution:

In addition to the BTL being an effective and financially feasible transportation solution, land-use research by the University of Florida Urban and Regional Planning GEOPLAN Center demonstrated positive impacts on projected changes to community land-use through the BTL support of transit oriented development (TOD). **BTL networks encourage more compact, mixed-use land development which results in the reduction of trips and more efficient use of the existing transportation system.**

US Public Transportation Sources of Operating Funds									
	Agency Funds			Government Tax-Based Sources					
YEAR	Passenger Fares	Other (advertising, concessions, leases, etc.)	Total Agency Funds	Local Taxes	State Taxes	Federal Taxes	Other (public taxing organization sources)	Total Government Tax-Based Funds	TOTAL FUNDS
2010	32.1%	5.4%	37.5%	21.6%	25.0%	9.4%	6.5%	62.5%	100%

2012 Public Transportation Fact Book, Appendix A: Historical Tables - Table 63, Page 89

Table 3: Source of Public Transit Operating Funds (Source: American Public Transportation Association)

Study Findings: BTL#1 Network Overview

A BTL partnership builds on the financial and institutional strengths of transit and toll practices. Analysis indicates that BTL #1 is a strong transit project from both a ridership and financial perspective. This conclusion is based on the amount of new transit riders generated by BTL #1, the total capital cost of the project, and the resulting net cash flows.

Growth in New Transit Ridership

Premium express bus routes were developed specifically for each of the BTL networks. Existing express bus routes were also identified that would likely use the BTL network to enhance the performance of public transit systems in the vicinity of the BTL corridors. Based on the very attractive travel times created through the application of value pricing in the lanes and reduced fare costs of the BTL express bus service, a significant growth of transit ridership is forecast for all three networks as shown in table 4.

Financial Feasibility

Finding capital funds for new public transportation projects is always a challenge. Public transit

typically looks to fund major capital projects through Federal Transit Administration (FTA) New Starts and Small Starts grant programs. Matching funds for the FTA grant are usually from local and state levies of transportation fuel taxes or general tax sources. The “greater” financial challenge of transit is finding sustainable revenue sources to cover ongoing operations and maintenance costs.

As mentioned earlier, transit fare box revenues typically cover 20% to 30% of operations. Over a thirty-year period, the transit operation and maintenance costs far exceed the initial development costs. This places a financial burden on federal, state, and local governments.

The ability of toll projects to cover O&M costs is very much the opposite of transit. Toll projects have a strong potential to fully fund operations and maintenance from a very early point of being open-to-service. On the other hand, “greenfield” toll projects (new roads in new corridors) typically face a financial challenge in raising the up-front capital for construction. Such projects often need capital subsidies to supplement the revenue bonds issued for construction. Once

Transit Ridership Forecasts - Opening Year (2015)					
Network	Weekday Boardings			Annual Riders	
	Existing Express Routes	New BTL Express Routes	Total New BTL Express and BRT Routes	Ridership	Transit Use Growth within BTL Corridor
BTL 1	3,325	12,381	15,706	4,005,030	472%
BTL 2	5,176	14,238	19,414	4,950,570	375%
BTL 3	1,280	22,094	23,374	5,960,370	1826%

Table 4: BTL #1 Transit Ridership Forecasts for 2015 (Source: AECOM)

built, however, a well-planned and operated toll road has the potential to produce significant revenues in excess of O&M and debt service costs as customers are attracted to the premium service provided by the facilities.

The option to use transit capital funds provides transit a return on investment opportunity by gaining access to the toll revenue to cover transit operating costs. The infusion of transit funds for the capital development of the new lanes advances the ability to add new capacity sooner than would be possible if left to toll agency resources. The combination creates a premium transit service that moves people and provides a sustainable choice for drivers of personal vehicles. This is a strong solution to address urban transportation needs.

Utilizing data derived from the BTL #1 network, the following analysis results demonstrate:

- Stand-alone challenges for transit to develop BRT service
- Stand alone challenges for a toll agency to develop price-managed express lanes – with and without issuing construction bonds.
- Combined funding efforts to show the strength and benefits of the BTL concept.

Price-Managed Fixed Guideway Facility

Figure 4 provides cost and revenue data for the new price-managed lanes that would be built for premium bus service on BTL #1. The capital cost to build 65-centerline miles of new fixed guideway, and the tolling elements essential to price-manage the lane operation of BTL #1 is \$560 million (grey bars). This element of the

BTL 1 – Fixed Guideway Price Managed Lane

Dollars in Millions	Fixed Guideway
Guideway Capital Cost	\$560
Toll Revenue	\$3,406
Guideway O&M Cost	\$545
Net Revenue	\$2,861

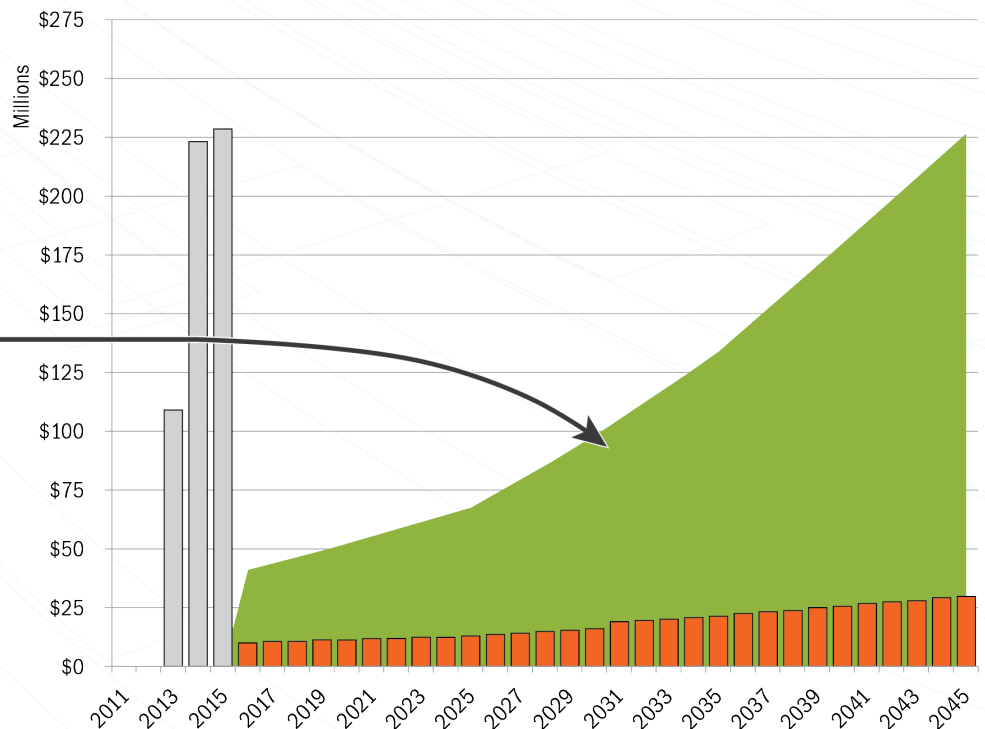


Figure 4: Fixed Guideway Facility
 (Source: Parsons Brinkerhoff, American Engineering, AECOM & HNTB)

BTL system would generate about \$3.4 billion in toll revenue over 30-years (green area of the chart from opening year 2015 through 2045). Those funds would be sufficient to cover 100% of the \$545 million cost for the fixed guideway operations, and maintenance over that 30-year period (shown as the orange bars). This leaves about \$2.9 billion in net revenue.

While this net revenue is significant, the relatively small amount of revenue available in the first 10-years of operation constrains the ability to finance the capital costs from tolls alone. This is demonstrated on Figure 5.

Figure 5 adds a relatively basic bond (construction costs) issue to the prior chart. The revenue in excess of the toll O&M for the BTL could provide \$268 million, or 48% of the \$560 million capital funds

needed for construction of the fixed guideway network. The 30-year principle and interest for that financing is \$875 million. The dark-blue and light-blue bars show interest and principle payments respectively. The debt service of this bond issue was structured to reflect the stronger revenue potential in the later-half of the 30-year period. It assumed a 30-year bond interest rate of 5.46% with an annual debt service coverage ratio of 1.5 times the annual debt service cost.

This financing approach leaves \$292 million as the unfunded capital cost to build and implement managed lanes. That would be the un-funded capital cost if the lanes were built as a stand-alone toll facility. It would require additional funds from some other source to fund construction. The source of that match determines ownership of the revenue stream.

BTL 1 – Fixed Guideway Price Managed Lane

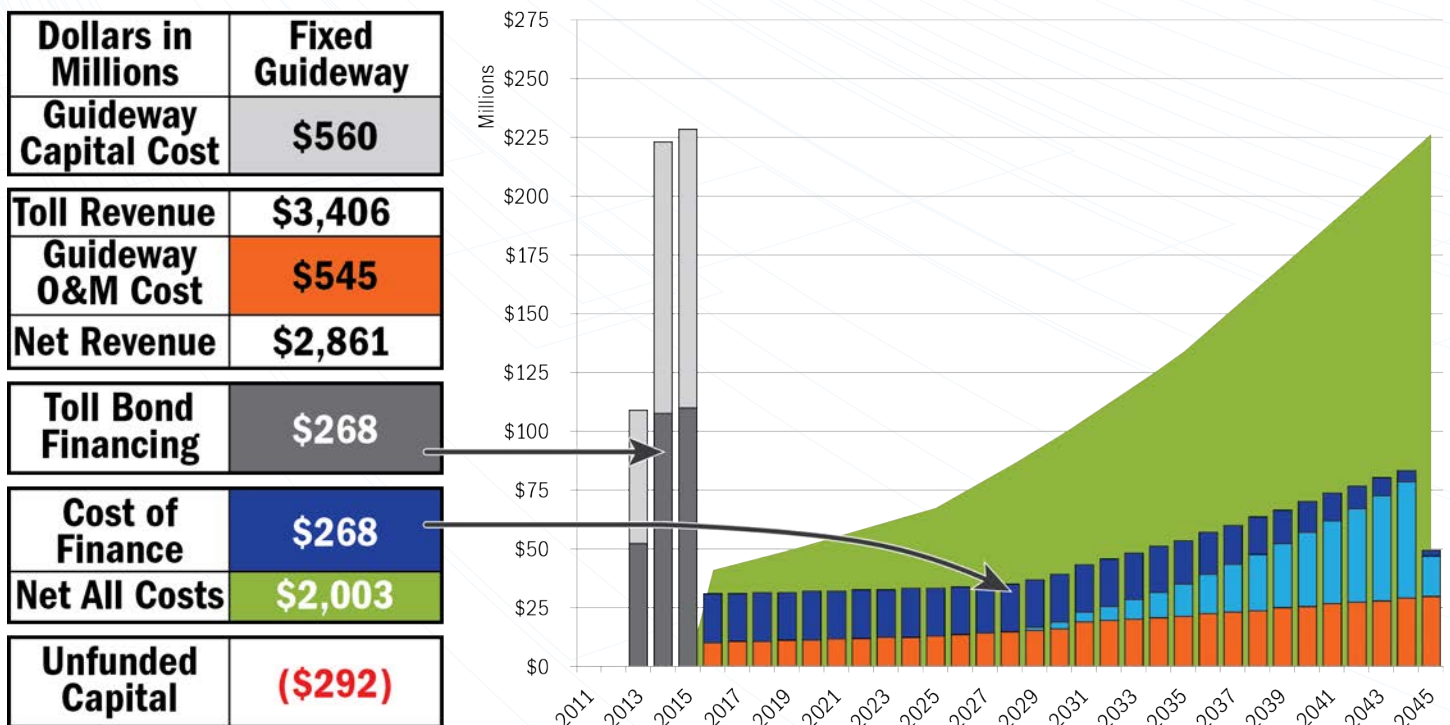


Figure 5: Fixed Guideway Facility
 (Source: Parsons Brinkerhoff, American Engineering, AECOM & HNTB)

An optimized financing structured could utilize additional debt products such as Capital Appreciation Bonds (CABs) or a federal TIFIA loan to aggressively tailor project financing and produce additional upfront proceeds. Public-Private Partnerships could also explore the use of additional debt products. In each case, there will be trade-offs of increased upfront capital proceeds for construction in exchange for less, perhaps significantly less, net revenue over the life of the project.

Premium Bus Service

Figure 6 demonstrates the new premium bus service on BTL #1 running on 10-minute headways. Purchase of the rolling stock and infrastructure to support operations would cost

\$31 million (grey bar on the chart). Operations, routine maintenance and major-maintenance over 30-years would cost about \$559 million (yellow bars on the chart). The sharp changes in operating costs are from 12-year sinking funds that support the purchase of new/replacement buses in 2027 and 2039. Revenue from bus-fares would generate \$58 million over that period (green area on chart). The chart clearly demonstrates the inability of the traditional transit fare box to cover operating costs. Net revenue after operations is a negative \$501 million. This relationship of relatively low capital costs to large operation and maintenance costs over time demonstrates the ongoing financial challenge for transit.

BTL 1 – Premium Bus Service

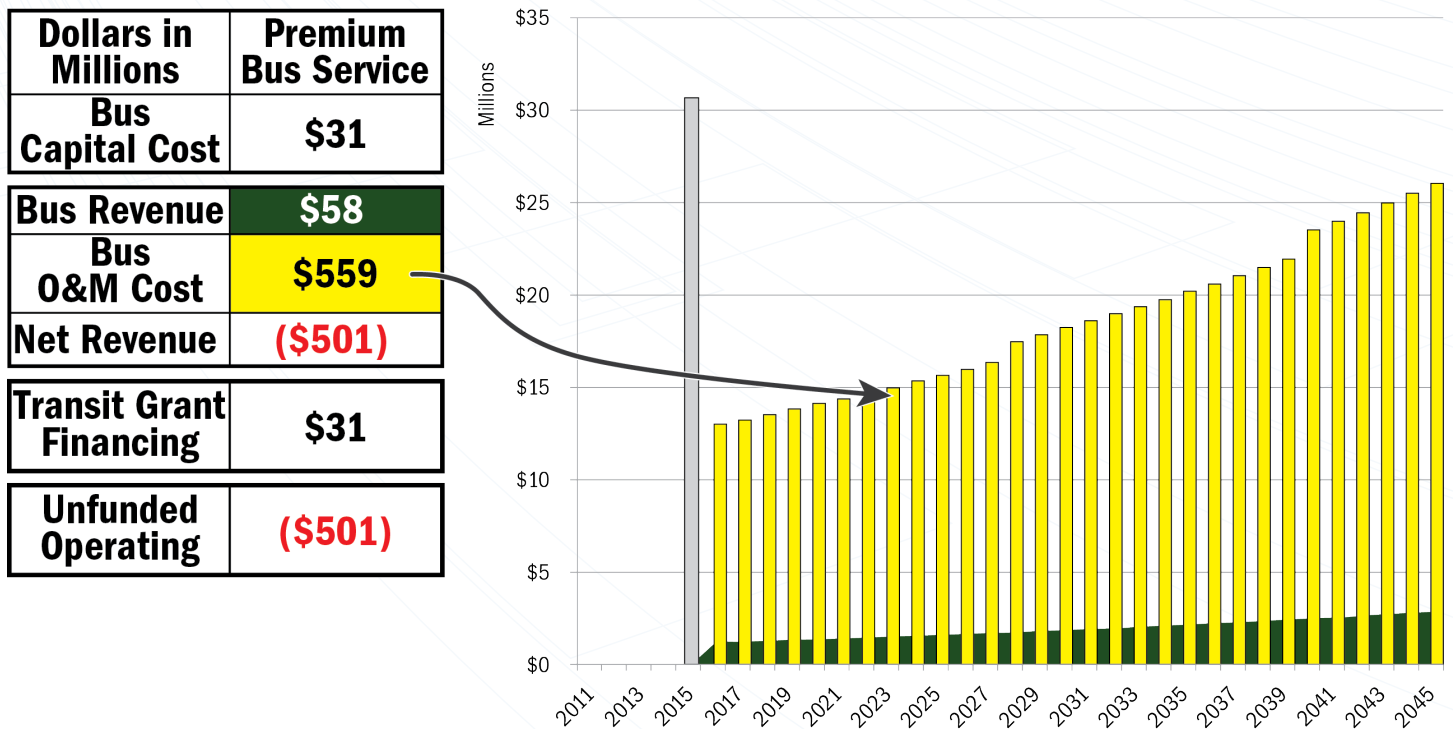


Figure 6: Premium Bus Service
(Source: Parsons Brinkerhoff, Tindale Oliver, AECOM & HNTB)

The BTL Concept

Figure 7 presents the previous elements as the unified financial concept for a BTL. By optimizing the strengths of toll financing and transit financing, the project is much more likely to be financially feasible. While toll bond financing can cover a significant portion of the overall capital costs, funding from traditional transit capital grant sources is applied to cover the combined \$591 million in capital costs. Rather than relying only on traditional sources to provide the required local matching funds for a federal transit grant, this toll bond financing is used as a new source of local matching funds.

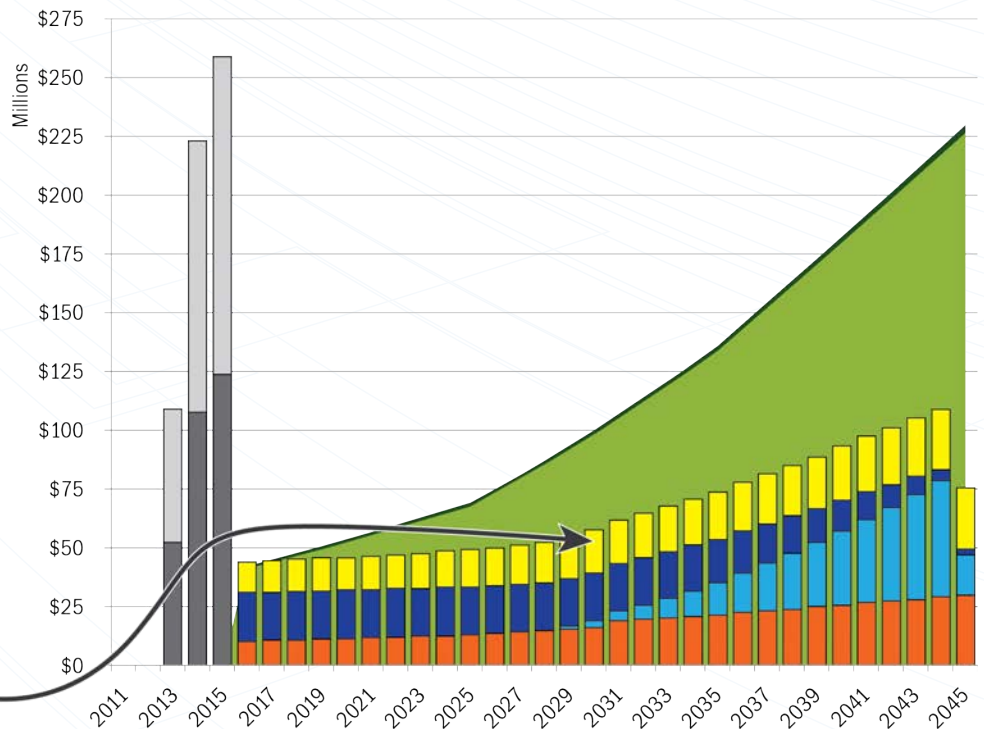
Using the bond structure discussed earlier, the revenue in excess of the toll O&M for the BTL could provide \$268 million, or 45% of the capital

funds for construction of the fixed guideway network. This would serve as an element of the required local match. The total 30-year principle repayment and interest cost for that financing is \$875 million, as represented the dark and light blue portion of the bars in the graph.

This financing approach leaves \$323 million as the unfunded capital cost to build and implement the BTL as a premium transit service. The analysis assumed that remaining capital cost would come from traditional transit grant financing sources (federal, state and local). That \$323 million capital cost is an equity investment that would make the transit agency the owner of the revenue stream – creating the new transit fare box.

BTL 1 Concept

Dollars in Millions	BTL Concept
Total Capital Cost	\$591
Revenue	\$3,464
Guideway O&M Cost	\$545
Net Revenue	\$2,919
Transit Grant Financing	\$323
Toll Bond Financing	\$268
Cost of Finance	\$875
Bus O&M Cost	\$559
Net All Costs	\$1,485



Assumes a 30-year bond at 5.46% interest rate with a debt service coverage ratio of 1.5X. The debt service was structured to reflect the stronger revenue potential in the later-half of the 30-year period.

Figure 7: Bus Toll Lane #1 – Combining the Strengths of Transit and Tolls
 (Source: Parsons Brinkerhoff, Tindale Oliver, American Engineering, AECOM & HNTB)

The yellow bars on top of the blue debt service bars show the annual O&M cost for transit. As can be seen on the graph, the majority of bus service and maintenance costs are covered in the first year and fully funded thereafter. As previously described in Figure 6, there was an anticipated \$501 million operating deficit to provide the transit service over the 30-year period. The \$323 million transit capital investment gained access to the toll revenue stream that now covers 100% of that cost.

Finally, there is the net revenue of \$1,485 million. Again, because the \$323 million transit capital investment gained access to the toll revenue

stream, this revenue would also be available to the transit agency to supplement existing service or add new transit service.

Table 5 illustrates that a transit capital investment in the construction of the BTL guideway provides a significant revenue stream during the life of the project. For BTL 1, the revenue stream produces more than 600% of the original investment. While BTL 1 produces the most return, BTL 2 and BTL 3 also return significantly more revenue than the original capital investment. In short, **all networks cover the transit operating shortfall while producing significant amounts of additional revenue for the transit agency.**

BTL 1 – Return on Transit Grant Investment			
Transit Grant (Local, State, Federal)		\$323	
Bus Operating Subsidy	\$501		
+ Net System Revenue	\$1,485		
	$\$1,986 / \$323 =$		617%

BTL 2 – Return on Transit Grant Investment			
Transit Grant (Local, State, Federal)		\$568	
Bus Operating Subsidy	\$545		
+ Net System Revenue	\$467		
	$\$1,012 / \$568 =$		178%

BTL 3 – Return on Transit Grant Investment			
Transit Grant (Local, State, Federal)		\$838	
Bus Operating Subsidy	\$510		
+ Net System Revenue	\$759		
	$\$1,269 / \$838 =$		151%

Table 5 - Return on Original Transit Investment

Moving Forward

While the BTL concept is different than what is normally thought of as a transit facility, it nonetheless provides the operational benefits of an exclusive fixed guideway transit system. In addition, it provides a self-generating revenue source for transit O&M that is lacking in traditional transit funding.

While it can be reasonably interpreted that BTLs qualify under Small Starts. Under New Starts, it is less clear. That eligibility could be confirmed on premise that BTLs are a Transit Fixed Guideway Asset.

The reasoning for this is straightforward. BTLs dedicate available guideway capacity first to transit vehicles. BTLs maintain a high level of service on the guideway through value pricing. All vehicles using the BTL guideway specifically benefit public transportation by moving people and providing the necessary revenue stream for transit operations.

Recommendations

The acceptance of the BTL toll revenue as a contribution to the “local financial commitment” is an important element of the acceptability of the BTL concept. This provision, along with the favorable treatment of bond proceeds as local match and debt service reserve reimbursement potential, all seem favorable to a BTL or BTL network as envisioned within the Proof-of-Concept Study. The following recommendations are presented to assist in BTL implementation within urban areas:

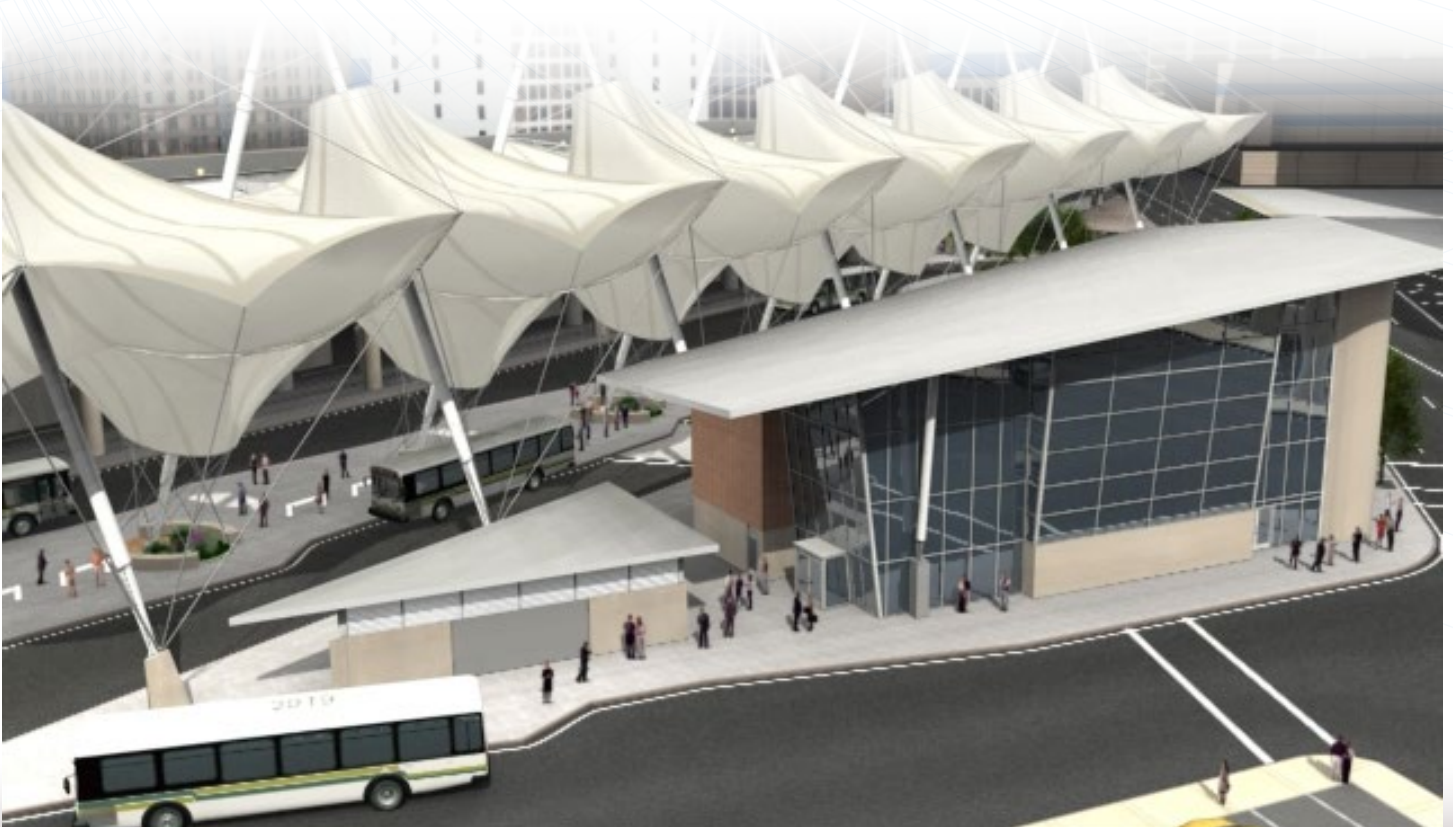
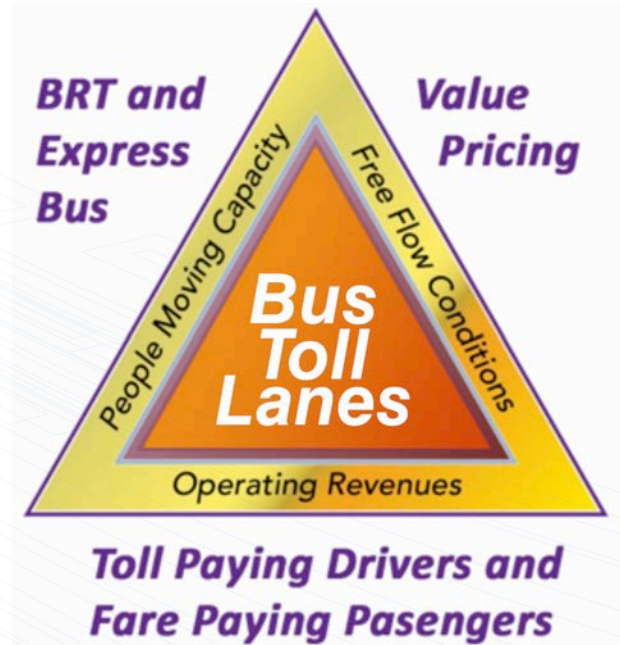
- To ensure that BTL projects are eligible for FTA capital, the next surface transportation authorization should specifically clarify that the definition of “fixed guideway” allows Federal funding for transit agencies who wish to be equity partners in the construction and operation of BTL projects and networks.
- The establishment of a pilot program would support the development and operation of BTL networks within urbanized communities.



Summary– The Bus Toll Lanes Transit-Tolls Partnership Delivers Excellent Financial, Transportation and Community Benefits

- The BTL transit-tolls partnership is a financially feasible and sustainable public transportation solution to fund the construction and operation of a robust, competitive public transit system.
- Value Pricing on the BTL is an effective tool to add significant and sustainable new capacity to existing travel routes and substantially reduce urban traffic congestion.
- The BTL uses Premium BRT and Express Bus service to substantially increase the “people-moving” capacity within high-demand urban corridors.
- Application of proven toll practices on the BTL will create a new transit fare box as a revenue source to support expansion of public transportation systems and reduce requirements for local transit tax subsidies.
- BTL “transit first” practices address the needs of the transportation disadvantaged by funding more frequent transit service and reducing public transit fares.

- BTL networks support transit oriented development resulting in more compact, efficient urban land-use.
- Policy guidance from FTA can optimize Federal funding for transit agencies who wish to be equity partners in the construction and operation of BTL networks.



Thanks to Our Consultants:

