



LANDSCAPE ARCHITECTURE FOUNDATION

Methodology for Landscape Performance Benefits

Case Study Investigation 2014

The Atlanta BeltLine | Eastside Trail



Figure: 1 & 2 Before and After Images Source: Perkins + Will, Inc.

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Case Study Partners:

Perkins + Will, Inc.

Atlanta BeltLine Inc.

Overview of University of Tennessee, Knoxville's Research Strategy for Atlanta BeltLine | Eastside Trail

Introduction:

The purpose of this research is to investigate the social, economic and environmental performance of the Atlanta BeltLine's Eastside Trail located in Atlanta, Georgia. As part of the 2014 Case Study Investigation (CSI), a program funded by the Landscape Architecture Foundation (LAF), the research is conducted in collaboration with the lead design firm Perkins + Will and Atlanta BeltLine Incorporated. The case studies are pre-outlined by LAF to present the following items: project profile and overview, sustainable features, challenges/solutions, lessons learned, role of landscape architects, cost comparisons, and performance benefits.

Methodology for Landscape Performance Benefits:

(The following bullet points are listed below in their full form. They are formatted to comply with the online portal restrictions. The list below contains more detail)

Environmental Benefits

- **Performance Benefit – 1:** *Sequesters approximately 24.5 tons of carbon annually in 659 new trees.*

Method: Utilizing the construction document’s “Urban Forest Rehabilitation-Planting Plan” developed by Perkins + Will, the research team imported the tree specifications into the National Tree Benefit Calculator to obtain the CO₂ measurement.

Methodology Limitations:

- 1) Carbon sequestration measurements only account for tree vegetation. It does not account for any shrub species existing on site.
- 2) The ‘Planting Summary’ document does not provide the DBH for all the trees listed on the planting plan, and as a result an assumed value of 3-4 is utilized.
- 3) The National Tree Benefit Calculator does not provide the option to calculate the specific cultivars, thus the calculations may include the measurements through the use of an original species or similar tree species.
- 4) The ‘Planting Summary’ list was developed in 2011. The measured values do not include changes in tree size and conditions after 3 years of the initial planting.

The Eastside Trail is the first phase of the Atlanta BeltLine Arboretum, a crucial component of a city-wide urban forest rehabilitation effort led by Trees Atlanta. Trees Atlanta is a non-profit organization established in 1985 by Central Atlanta Progress (the downtown business leaders association), the Atlanta Commissioner of Parks, and the Atlanta Junior League. The primary goals of Trees Atlanta are to replace trees lost to development, conserve existing trees, protect green space areas, and educate the community’s residents and workers regarding the many benefits of trees. Although the Atlanta metropolitan area is recognized by the National Forest Service as “the most heavily forested urban area in the country”, the Atlanta Central Business District was severely lacking in trees compared to other major cities across the country and around the world according to Trees Atlanta (2014). In its first year, Trees Atlanta planted over 40 shade trees in downtown Atlanta and since then, has expanded its focus to the entire metro area. The ambitious efforts resulted in Trees Atlanta becoming one of the most widely known non-profits throughout metro-Atlanta and a highly regarded community steward of Atlanta’s growing urban forest.

In addition to the large and growing list of partnerships with Trees Atlanta, Atlanta BeltLine Inc. became a partner in 2012. The Atlanta Beltline Arboretum was made possible with the efforts of Trees Atlanta full time staff and program volunteers. As a non-profit, Trees Atlanta’s stewardship efforts are highlighted by the large number of volunteers that help to carry out its

mission. Collaboration efforts between Trees Atlanta and the Atlanta BeltLine Inc. is enhanced by their ability to enlist participation from hundreds of community volunteers to carry out the planting of the Eastside Trail. The trail features 17 different varieties of Magnolias and 14 different varieties of Oaks, adding to the already wide range of plant material. There is a larger effort made by Trees Atlanta to preserve Heritage trees and to focus on plantings commonly used in urban parks.

Eastside Trail: Carbon Sequestration				
Tree	Quantity	[DBH]Caliper (in)	CO2 reduction (lbs)	Total CO2 (lbs)
Trident Maple	18	4	56	1008
October Glory Red Maple	11	4	59	649
Palisade American Hornbeam	35	3	56	1960
Pignut Hickory	9	3	52	468
Tokyo Tower Chinese Fringetree	8	2.5	41	328
Emerald Knight Fringetree	3	2.5	41	123
Prodigy Fringetree	5	2.5	41	205
Cherokee Princess Dogwood	7	2.5	29	203
Slender Silhouette Sweetgum	9	3	22	198
Tulip Poplar	6	5	116	696
Arnold Tulip Poplar	9	3	52	468
Cucumbertree Magnolia	3	3	38	114
Ann Magnolia	3	3	38	114
Alta Southern Magnolia	4	4	56	224
Bracken's Brown Beauty Magnolia	2	4	56	112
Claudia Wannamaker Magnolia	1	6	100	100
Hasse Magnolia	6	3.5	47	282
Little Gem Magnolia	1	3.5	47	47
Tree	Quantity	[DBH]Caliper (in)	CO2 reduction (lbs)	Total CO2 (lbs)
Teddy Bear Magnolia	6	3.5	47	282
Leonard Messell Magnolia	3	4.5	65	195
Merill Magnolia	3	2.5	29	87
Dark Alexandrina Saucer Magnolia	3	10	198	594
Centennial Star Magnolia	1	4.5	65	65
Waterlily Star Magnolia	6	2.5	65	390
Green Shadow Sweetbay Magnolia	8	3	38	304
Henry Hicks Weetbay Magnolia	1	4	56	56
Moonglow Sweetbay Magnolia	10	3	38	380
Sweet Thing Magnolia	3	4.5	56	168
Blackgum	22	4	88	1936
Red Rage Blackgum	2	2	25	50

Wildfire Blackgum	14	4	88	1232
Wildfire Blackgum	3	2	25	75
Longleaf Pine	6	3	23	138
Loblolly Pine	3	3	23	69
Swamp White Oak	23	4	81	1863
Swamp White Oak	22	5	116	2552
Scarlet Oak	3	3	52	156
Southern Red Oak	6	3.5	67	402
Southern Red Oak	6	2.5	38	228
Georgia Oak	5	2.5	33	165
Overcup Oak	16	4	88	1408
Highbeam Overcup Oak	38	4	88	3344
Swamp Chestnut Oak	3	2.5	38	114
Highpoint Nuttall Oak	20	6	157	3140
Cherrybark Oak	15	5	87	1305
Hightower Willow Oak	31	5	86	2666
Northern Red Oak	9	3	46	414
Post Oak	1	3	52	52
Smooth Sumac	15	4	56	840
Sassafras	167	4	88	14696
Autumn Gold Bald Cypress	23	4.5	28	644
Princeton American Elm	15	4	81	1215
Bosque American Elm	7	4	81	567
TOTAL	659			49091

Table 1: Plant List Source. Adopted from Perkins + Will (2011)

As illustrated in the Table 1 above, the carbon sequestered is calculated using the National Tree Benefit Calculator.

Sources: (2011) Perkins + Will, Urban Forest Rehabilitation-Planting Plan provided by the firm.

Calculations obtained with the National Tree Benefit Calculator.

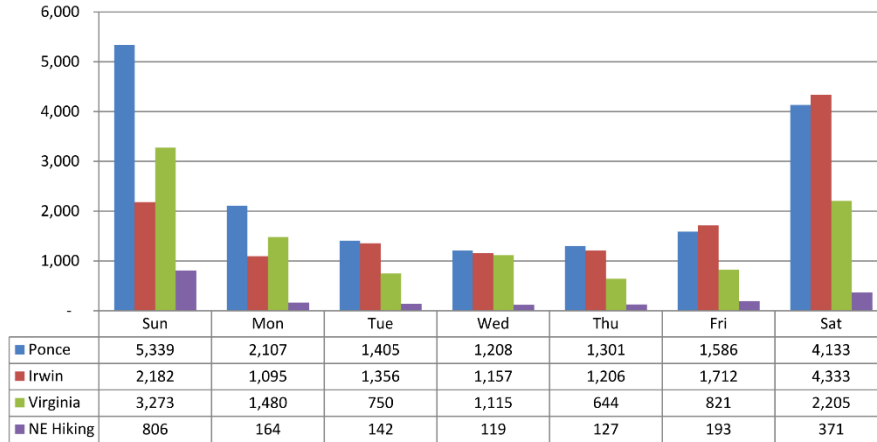
<http://www.treebenefits.com/calculator/>.

Trees Atlanta, <http://treesatlanta.org/who-we-are/history/>

Social Benefits

- Performance Benefit – 2:** *Attracts an average of 3,000 users each weekday and over 10,000 users each weekend day.*

Average Day Counts at Eastside Trail Locations during Q1 2014



The counter model used during this quarterly analysis is an *Eco Counter Pyro post*.

Figure: 3 Average Daily Counts Graph Source: Atlanta BeltLine, Inc.

Method: Information collected from Atlanta BeltLine Inc. traffic counters were set up at four strategic locations on the Eastside Trail during the months of January, February and March of 2014. The counter locations were set along official trail entrances and spanned across 2 miles. (Because the NE Hiking trail goes outside of the Eastside Trail Project Boundaries, the figures collected at the location are not included in the calculations.) The user figures are derived by taking the average totals collected on Monday – Friday for the weekday average and Saturday – Sunday for the weekend average.

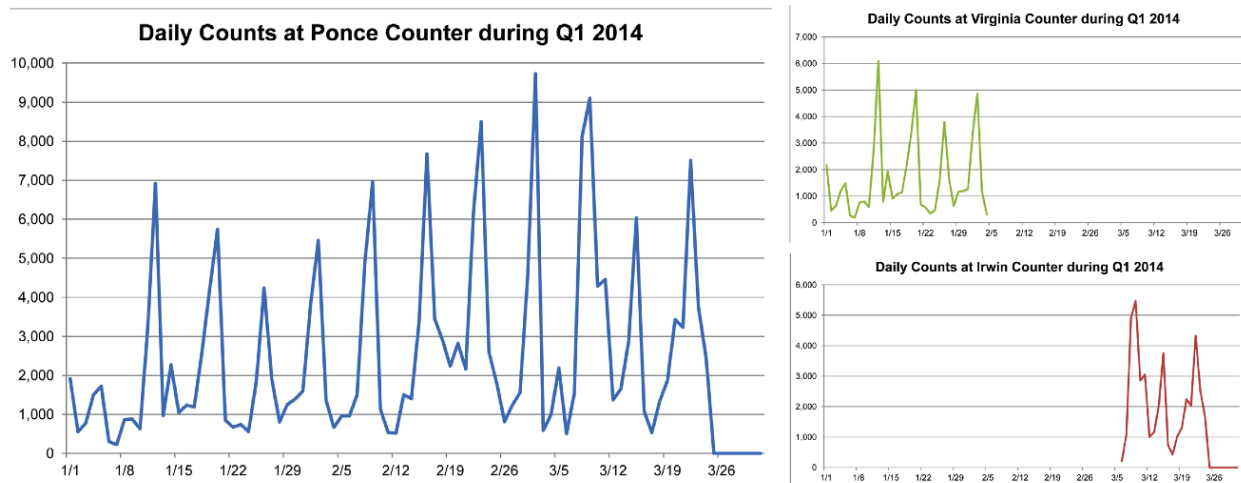
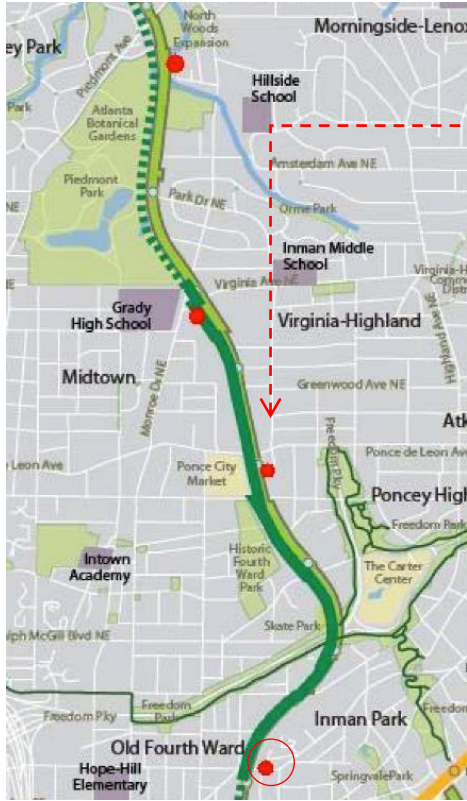


Figure 4: Daily Counts. Source: Atlanta BeltLine, Inc. (2014)



The highest count was recorded at the Ponce de Leon entrance, which rests in the center of the 2.2 mile trail system. It boasts an average 1,400 users per hour and approximately 9,700 total users on Sunday, March 2, 2014.

Highest Daily and Hourly Counts Record at Eastside Trail Counter Locations in Q1 2014

	Daily	Date	Hourly	Date and Hour
Ponce	9,730	3/2/2014	1,419	3/2/2014 at 2 PM
Irwin	5,474	3/9/2014	682	3/9/2014 at 4 PM
Virginia	6,100	1/12/2014	1,024	1/12/2014 at 3 PM
NE Hiking	1,016	3/2/2014	165	3/2/2014 at 4 PM

Table 2: User Count Table, Source: Atlanta BeltLine, Inc. (2014)

Figure 5: Counter Location, Map Provided by Atlanta BeltLine Inc. (2014)

Limitations: Although reliable sources are adopted for this research, the information provided above comes from secondary sources and may have inherent data omissions and errors that cannot be detected or confirmed by the University of Tennessee, Knoxville research team. The provided data only represent Q1 of 2014 and therefore do not include the increased number of users in the warmer spring, summer, and fall months. An additional analysis of multiple quarters over several years would provide a more accurate count of daily users, while accounting for seasonal fluctuations. Traffic counters used by Atlanta BeltLine Inc. to collect this data were not calibrated in a manner commonly used by greenway researchers to adjust for the same user passing a single sensor more than once during a single visit. As such, numbers reported here are likely inflated, the extent to which is not able to be determined, by users who travel multiple “laps” on the Trail or otherwise pass the same sensor twice.

Sources: Atlanta BeltLine Inc. www.BeltLine.org, Secondary report provided by Atlanta BeltLine Inc. Q-1 2014_Eastside Trail Counter Report. PDF

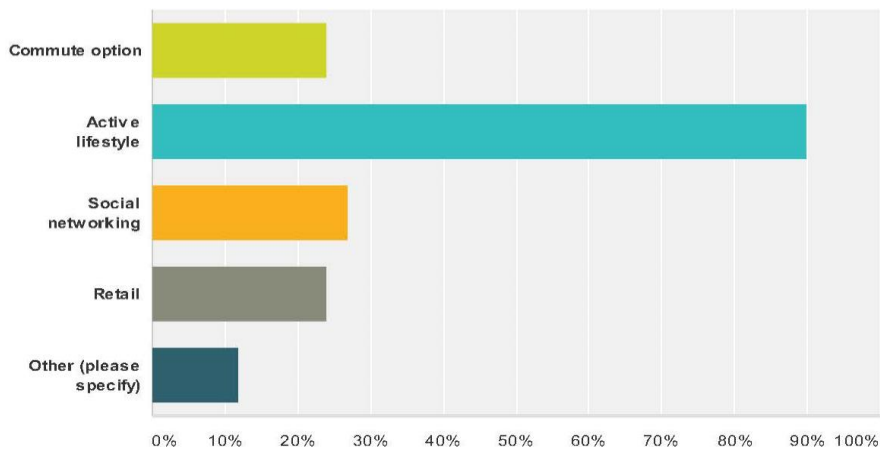
- Performance Benefit – 3:** *Promotes physical activity. 90% of 100 trail users surveyed said that the trail provides them with an active lifestyle benefit. 70% said that they exercise more since the opening of the Eastside Trail.*

Method: The University of Tennessee, Knoxville research associates solicited trail users to participate in the Atlanta BeltLine | Eastside Trail User Survey during site visits on a Sunday and Monday in early June, 2014. Willing participants completed hard copies of the survey that were subsequently entered into Survey Monkey by research associates for data analysis. Figure 9 represents the respondents’ impression of the Eastside Trail, while Figure 10 shows their response to an increase in physical activity.

Atlanta Beltline Eastside Trail User Survey (On Site Responses)

Q25 How do you benefit from the Eastside Trail (check all that apply)?

Answered: 100 Skipped: 6



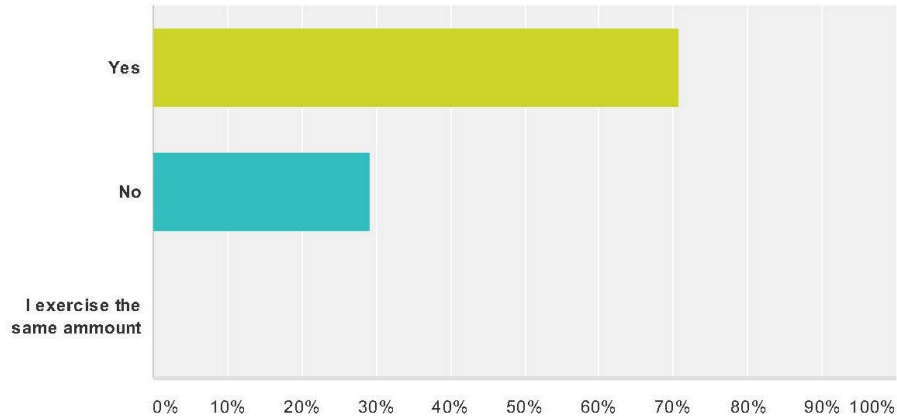
Answer Choices	Responses
Commute option	24.00% 24
Active lifestyle	90.00% 90
Social networking	27.00% 27
Retail	24.00% 24
Other (please specify)	12.00% 12
Total Respondents: 100	

Figure 9: On site survey analytics. Adapted from the University of Tennessee, Knoxville’s survey using Survey Monkey. (2014)

Atlanta Beltline Eastside Trail User Survey (On Site Responses)

Q37 Do you exercise more since the Eastside Trail has opened?

Answered: 99 Skipped: 7



Answer Choices	Responses
Yes	70.71% 70
No	29.29% 29
I exercise the same amount	0.00% 0
Total	99

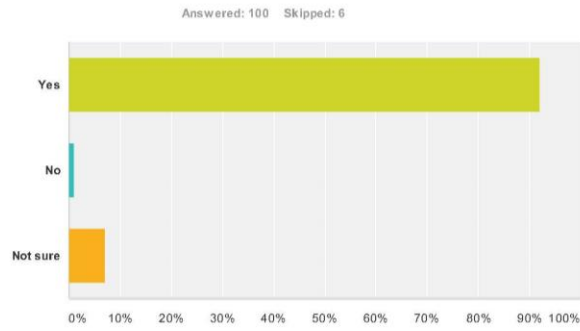
Figure 10: On site survey analytics. Adapted from University of Tennessee-Knoxville’s survey using Survey Monkey. (2014)

Sources: Survey conducted by University of Tennessee, Knoxville

- Performance Benefit - 4:** *Creates a better sense of community for 94% of the 102 surveyed trail users.*

Method: According to the Atlanta BeltLine | Eastside Trail User Survey conducted on-site by the University of Tennessee, Knoxville research team. Research associates solicited trail users to participate in the survey during site visits on a Sunday and Monday. Willing participants completed hard copies of the survey that were subsequently entered into Survey Monkey by research associates for data analysis. Figure 6 shows the respondents’ impression on how the Eastside Trail creates a sense of community.

2 **Q22 Has the Eastside Trail helped create a better sense of community?**

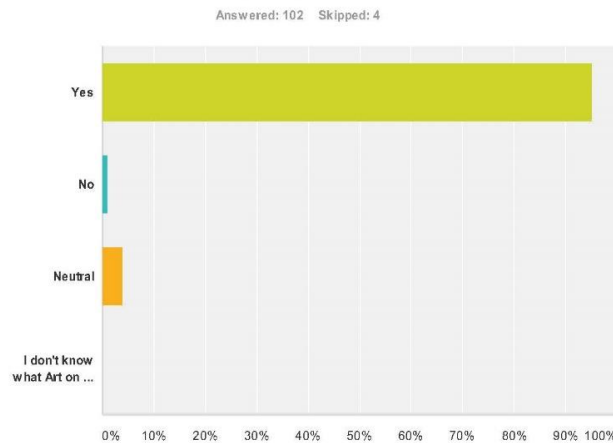


Answer Choices	Responses	Count
Yes	92.00%	92
No	1.00%	1
Not sure	7.00%	7
Total		100

Figure 6: On site survey analytics. Adapted from the University of Tennessee, Knoxville’s survey using Survey Monkey (2014)

In addition to serving as a venue for social engagement amongst daily users and event attendees, the popularity of the Atlanta BeltLine’s various social media outlets are further demonstration of how the project connects people with more than 28,000 Facebook ‘friends’ and 22,000 Twitter followers. As seen in Figure 8, the overwhelming majority of these followers are from the Atlanta region, though a respectable following has developed around the country and the world. These individuals and organizations are privy to news and events about the BeltLine, many of which are related to the Eastside Trail. Special interest social networks have also manifest for Art on the Atlanta BeltLine (3,700 likes), which 95% of survey respondents feel enhances the visual quality of the trail (Figure 7), and the Atlanta BeltLine Running Series (2,400 likes).

Q26 Does Art on the Beltline enhance the visual quality of the trail?



Answer Choices	Responses	Count
Yes	95.10%	97
No	0.98%	1
Neutral	3.92%	4
I don't know what Art on the Beltline is	0.00%	0
Total		102

Figure 7: On site survey analytics. Adapted from the University of Tennessee, Knoxville’s survey using Survey Monkey. (2014)



Sources: Survey conducted by University of Tennessee, Knoxville

- Performance Benefit – 5:** Generates funding to support 52 affordable housing units located directly on the Eastside Trail. 15% of net Tax Allocation District bonds are reserved for the BeltLine Affordable Housing Trust Fund.

Method: The City Council established the BeltLine Affordable Housing Advisory Board (BAHTF) to ensure proper handling and reporting of affordable housing TAD principles. The BAHTF proposed a multifamily project: City Hall East came to fruition through Ponce City Market developers in 2013. This multifamily project, directly located on the Eastside Trail, provides units for renters and owners by providing dollars to homebuyers through down payment assistance and incentives to developers. The Flats at Ponce City Market have reserved the following for affordable housing:

Family Size	1	2	3	4
Rental Apartments (80% AMI)	\$40,250	\$46,000	\$51,750	\$57,450

For Sale Condos (100% AMI)	\$71,700	\$71,700	\$82,455	\$82,455
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- **Residential rental units**
 - 20% of units reserved for affordable households.
- **For-sale condos**
 - 10% of units reserved for affordable households.

The first bond issued at \$8.8 million is now fully committed. Due to this 100% commitment, the BAHTF is in the process of updating the business plan and revising policies to meet additional future growth. Table 3 shows the breakdown of the additional resources.

BELTLINE AFFORDABLE HOUSING TRUST FUND

TRUST FUND POLICIES		10/28 BUDGET
PROGRAM COMPONENT		
1 Multifamily Rental Developer Incentives	Grants to developers of rental housing enforced by a Land Use Restriction Agreement <ul style="list-style-type: none"> ➢ 60% of area median income ("AMI") eligibility cap for affordable units funded by Trust Fund ➢ A minimum of 15% of all units in each development must be affordable ➢ Require a minimum 15 year affordability period 	\$2,868,659
2 Single Family Developer Incentives	The Trust Fund will allocate subsidies to developers that commit to building affordable for sale units. <ul style="list-style-type: none"> ➢ The subsidy will be passed on to eligible homebuyers in the form of a deferred second mortgage. ➢ 100% of AMI eligibility cap for one or two person households; 115% of AMI cap for three or more persons ➢ A minimum of 15% of all units in each development must be affordable ➢ 2nd mortgage forgiven after 15 yrs; principal + share of gain due during years 1-9; prin. only yrs 10-15 ➢ HUD 203(B) purchase price limit 	\$ 988,358
3 Community Housing Development Organization ("CHDO") Set Aside: Multifamily Rental	Grants to CHDOs enforced by a Land Use Restriction Agreement <ul style="list-style-type: none"> ➢ 60% of AMI eligibility cap for affordable units funded by Trust Fund ➢ A minimum of 15% of all units in each development must be affordable ➢ Require a minimum 15 year affordability period 	\$ 829,596
4 Community Housing Development Organization ("CHDO") Set Aside: Single Family Homeownership	The Trust Fund will allocate subsidies to CHDOs that commit to building affordable for sale units. <ul style="list-style-type: none"> ➢ The subsidy will be passed on to eligible homebuyers in the form of a deferred second mortgage ➢ 100% of AMI eligibility cap for one or two person households; 115% of AMI cap for three or more persons ➢ A minimum of 15% of all units in each development must be affordable ➢ 2nd mortgage forgiven after 15 yrs; principal + share of gain due during years 1-9; prin. only yrs 10-15 ➢ HUD 203(B) purchase price limit 	\$ 829,596
5 Downpayment Assistance	Assistance will be provided in the form of a deferred second mortgage loan. <ul style="list-style-type: none"> ➢ 0% interest ➢ 100% of AMI eligibility cap for one or two person households; 115% of AMI cap for three or more persons ➢ 2nd mortgage forgiven after 15 yrs; principal + share of gain due during years 1-9; prin. only yrs 10-15 ➢ Best efforts will be made for six months to target households between 60 - 80% of AMI ➢ Provide exclusive marketing to City of Atlanta, Fulton County, Atlanta Public School employees and BeltLine neighborhood residents for first three months of the program. ➢ HUD 203(B) purchase price limit 	\$1,544,309
6 Property Acquisition Rental Affordable Housing	Funds available for property acquisition for rental affordable housing development within the Beltline TAD <ul style="list-style-type: none"> ➢ Developers will execute a Land Use Restriction Agreement which outlines affordability restrictions. 	\$ 617,723
7 Property Acquisition Owner-Occupied Housing	Funds available for property acquisition for single family affordable housing development. Developers to execute a Development Agreement and will transfer this grant to homebuyers in the form of a deferred second mortgage.	\$ 617,723
	SUBTOTAL	\$8,295,965
	Program Administration	\$ 555,951
	TOTAL	\$8,851,916

OTHER GENERAL POLICIES:

- 20% of Trust Fund Program dollars will be reserved for CHDO's.
- Program funds not expended within 12 months may be reallocated to other components to insure that 100% of bonds proceeds meet spend down requirements.
- Approved projects must balance cost and quality; meet or exceed local building standards; be comparable in size and quality to similar market rate units within the same development; be mixed income; and contain units affordable to the City's lower income citizens.
- Developments must meet "Barrier Free" requirements as defined by City of Atlanta ordinance.
- Developments must have environmentally sustainable components.

10/28/08

Figure 12: Affordable Housing Trust Fund Policies and Programs. BAHTF (2008)

The BeltLine has received support from the City and developers alike. To date, the Affordable Housing Trust Fund has committed funding for the following:

- Over 75 affordable owner occupied units
- Over 40 affordable rental units
- Lofts at Reynoldstown Crossing

Over the next 25 years, the Atlanta BeltLine AHTF aims to make city living financially attainable for renters and homeowners by creating 5,600 units of affordable housing, retaining 15% of net bond proceeds for an affordable housing trust fund, providing down payment assistance to homebuyers and finally, providing incentives to developers.

Sources: Atlanta BeltLine Inc. Affordable Housing; reports and documents <http://BeltLine.org/programs/affordable-housing/>,

BeltLine Affordable Housing Advisory Board 2012 Annual Briefing Presentation PDF

The Flats at Ponce City Market <http://www.flatsatpcm.com/>

Economic Benefits

- **Performance Benefit – 6:** *Helps catalyze economic development with more than \$638 million in new private real estate investment planned or underway within the portion of the Atlanta BeltLine Tax Allocation District (TAD) that surrounds the Eastside Trail.*

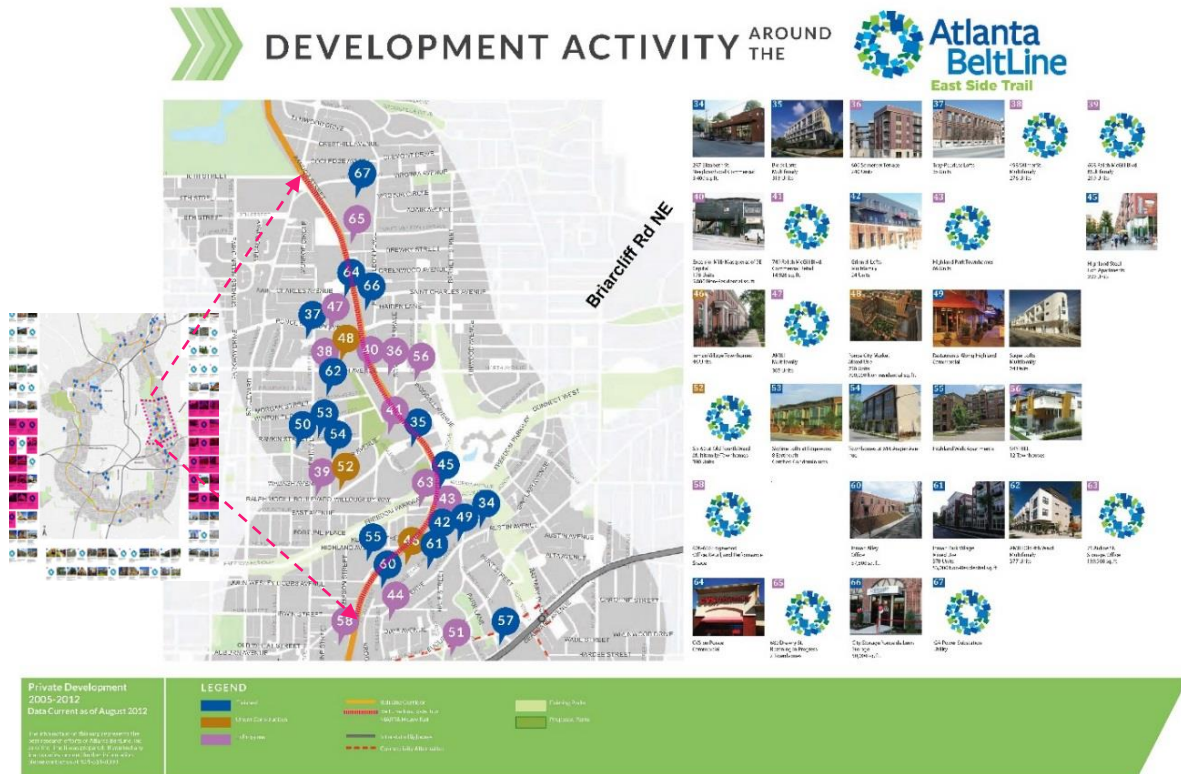


Figure 11: Development Activity. Adapted from Atlanta BeltLine, Inc. (2012)

Methods: New private real estate development figures are reported as a result of systematic review of literature, archival, and secondary data provided by Atlanta BeltLine, Inc. Additional figures, presented in Table 3, have been provided by the City of Atlanta for private development as of the year 2012. These numbers do not include the additional redevelopment and private investment in the Eastside Trail TAD Corridor that has occurred since 2012, explaining why this number is lower than the \$775 million investment value that is presently promoted by Atlanta BeltLine Inc.

Eastside Trail and Historic Fourth Ward Park Area Private Development (Recent and Underway)

Recently Completed	Estimated Construction Value
Block Lofts	50,000,000
Ford Factory Lofts	9,700,000
Freedom Lofts/Freedom Heights	42,900,000
North Highland Steel	39,500,000
Nu-Grape Lofts	5,800,000
Ponce Springs	27,000,000
Sager Lofts	7,400,000
Southern Dairies	4,100,000
Telephone Factory	10,400,000
The Fourth (owned by ALTA)	30,800,000
Troy Peerless Laundry/ Glen Iris Lofts	36,000,000
Woodall Place	2,600,000
Subtotal	266,200,000
Under Construction	Estimated Construction Value
768 Highland Townhomes	17,000,000
North American Apartments	25,000,000
Ponce City Market (Old Sears Building)	180,000,000
Subtotal	222,000,000
Pre-Development	Estimated Construction Value
608 Ralph McGill	20,000,000
AMLI Apartments on North Ave	51,200,000
Excelsior Lofts	38,200,000
Perennial Apartments	35,000,000
Skyline Townhomes	6,000,000
Subtotal	150,400,000
TOTAL	638,600,000

Table 3: Eastside Trail Private Development. Adapted from City of Atlanta (2012)

This is part of the \$1 billion of investment already on the ground within the entire Atlanta BeltLine TAD.

Limitations: Although reliable sources are adopted for this research, the information provided above comes from secondary sources and may have inherent data omissions and errors that cannot be detected or confirmed by the University of Tennessee, Knoxville research team.

Sources: Atlanta BeltLine Inc. & GADOT Presentation Reports_2013-PDF.
<http://BeltLine.org/progress/progress/economic-development-progress/>

- Performance Benefit – 7:** *Helped stimulate the creation of public open spaces adjacent to the Eastside Trail, such as the 17.5 acre Historic Fourth Ward Park and the Historic Fourth Ward Skate Park.*



Figure 13: Map of Eastside Trail with access points and surrounding parks. Adopted from Atlanta BeltLine, Inc. (2012)

Information: Alex Garvin and Associates prepared a study for The Trust for Public Land, Georgia Staff detailing the need for park space and preservation of public areas in Atlanta. The

study was published in 2004 and was in support of the proposed Atlanta BeltLine corridor. The study, titled “The BeltLine Emerald Necklace: Atlanta’s New Public Realm” was also aimed at identifying area “jewels” that could be preserved for park space. With the anticipation of the Atlanta BeltLine corridor, The Trust for Public Land secured ten acres of land and later began work to secure the remaining 7 acres. The purchases were the first acquisitions made for the Atlanta BeltLine project. Mayor Shirley Franklin established the BeltLine TAD and Coalition to support funding of the project (Historic Fourth Ward Park Conservancy 2014). In addition, the Eastside Trail of the BeltLine connects two of Atlanta’s largest parks, the 185 acre Piedmont Park and the 207 acre Freedom Park.

Planning groups, including the City of Atlanta and Atlanta Development Authority (ADA), continued to support the development of park space and the preservation of public areas by helping establish the Park Area Coalition (PAC). Today, PAC and the Atlanta BeltLine Inc. work closely together with the city, the adjacent neighborhoods, architects, and city planners to continue planning for the parks. The Historic Fourth Ward Park is made possible through the Woodruff Foundation’s pledge of \$8 million for land acquisition.

“Atlanta’s Department of Watershed Maintenance intended to address sanitary sewer overflow problems in the Old Fourth Ward area of the Clear Creek Combined Sewer Basin by building an extension to a nearby CSO tunnel. However, by constructing the detention lake, the City reclaimed what was once the original “Clear Creek” and also created a functional, creative and sustainable feature for the park. More importantly, by detaining storm water flows for a 100- year storm event, the lake addresses capacity relief problems in the overall 800- acre drainage basin and reduces the peak flow of the Highland Avenue Combined Sewer Trunk to which it discharges” (Historic Fourth Ward Park Conservancy 2014).

Sources: (2005) “The BeltLine Emerald Necklace: Atlanta’s New Public Realm” report prepared for

The Trust of Public Land by Alex Garvin and Associates. <http://BeltLineorg.wpengine.netdna-cdn.com/wp-content/uploads/2012/04/Emerald-Necklace-Study1.pdf>;

The Historic Fourth Ward Conservancy www.h4wpc.org

- **Cost Comparison**

Method: Investments were made to ensure that high quality and durable materials are a standard throughout all phases of the Atlanta BeltLine construction. For the Eastside Trail, an important cost decision was made in relation to the stone cladding implemented to protect and provide an aesthetic appeal to the path’s retaining walls. The initial bidding documents called for 1.25 in. stone cladding for vertical surfaces with 4 in. capstones at an approximate cost of \$833,535. The final decision included the use of 3 in. stone cladding for vertical surfaces and 4 in. capstones at

an approximate total cost of \$945,650. Despite the cost increase of approximately \$112,115, the investment is important given the size and nature of the project. Higher quality materials reduce the need and expense for maintenance, while increasing the lifespan of the materials used on and along the trail. The stone cladding selected requires little to no maintenance for 20-25 years.

Initial Bidding

Quantity*	Unit	Depth of Stone	Total Cost	
			Low	High
22,423	SF	1.25"	\$695,113.00	\$739,959.00
2,228	SF	4"	\$ 89,120.00	\$ 93,576.00

Table 4: Cost of first option 1.25 in. stone cladding. Source: Perkins + Will (11/18/2010)

Option C

Quantity*	Unit	Depth of Stone	Total Cost	
			Low	High
22,423	SF	3"	\$ 807,228.00	\$ 852,074.00
2,228	SF	4"	\$ 89,120.00	\$ 93,576.00

Table 5: Cost of stone cladding. Source: Perkins + Will (11/18/2010)

Method: Secondary data and information received by Perkins + Will details the cost comparison associated with the materials bid. The designer's main concern was to maintain a consistent aesthetic for the trail while performing the dual action of being a high quality material aimed at lower maintenance costs over time.

Comparative Costs for Stone Cladding Options

Quantity*	Unit	Depth of Stone	Material Cost**	Installation Method	Installation Cost***		Installed Unit Cost		Total Cost		Notes
					Low	High	Low	High	Low	High	

22,423	SF	1.25"	\$13.00	Veneer anchors	\$18.00	\$20.00	\$31.00	\$33.00	\$695,113.00	\$739,959.00	Included in Bid Documents
22,423	SF	1.5"	\$17.50	Veneer anchors	\$18.00	\$20.00	\$35.50	\$37.50	\$796,016.50	\$840,862.50	Option for 1.25" depth stone
22,423	SF	2"	\$19.00	Veneer anchors	\$18.00	\$20.00	\$37.00	\$39.00	\$829,651.00	\$874,497.00	Option for 1.25" depth stone
22,423	SF	3"	\$26.00	Masonry anchors	\$10.00	\$12.00	\$36.00	\$38.00	\$807,228.00	\$852,074.00	Option for 1.25" depth stone
2,228	SF	4"	\$30.00	Masonry anchors	\$10.00	\$12.00	\$40.00	\$42.00	\$89,120.00	\$93,576.00	Included in Bid Documents

Table 7: Overall cost spreadsheet for stone cladding Source: Perkins + Will (11/18/2010)

Sources: Information provided by Perkins + Will (2010)