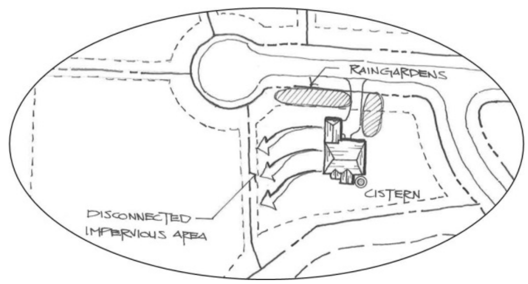
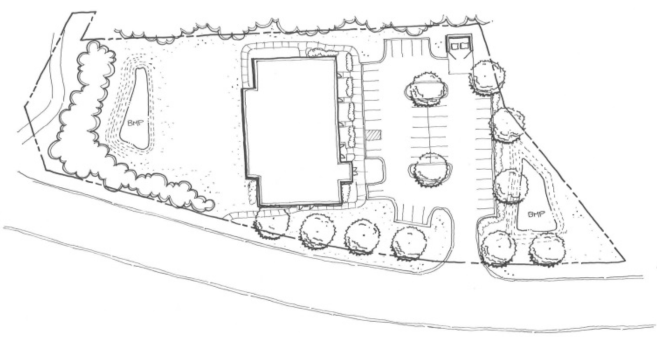
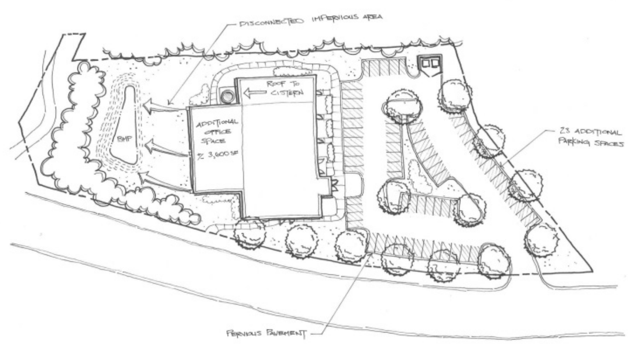
LID: Does It Pay For Itself?

Assessing the Development Costs of Implementing Low Impact Development

LID Cost Study Project







Final Report – September 2015

Report Prepared For:

City of Raleigh
Stormwater Program

Division of Water Resources
205j Grant Program

Prepared By:

Triangle J
Council of Governments

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INTRODUCTION

Why was this project conducted? Low Impact Development (LID) is a stormwater management strategy and set of small-scale, decentralized stormwater management practices to control and treat runoff from developed land. Where LID practices have been implemented on a widespread basis, they have generally proven to be a cost-effective alternative to large conventional stormwater management facilities[1]. In North Carolina, efforts have been made to allow for the use of LID where feasible; however to date the development community has seen only a small number of projects through to completion. In an effort to understand why LID has not been more popular with developers, it became apparent that there was little tangible data on the overall cost of using LID on development projects. The development community has stated that they prefer to have a known budget prior to undertaking any development project, and they identified lack of local implementation costs for LID as a key barrier. That led Triangle J Council of Governments (TJCOG) to undertake this LID cost study project designed to shed light on the costs and overall financial impacts to the developer of using LID techniques.

Who was involved? This project was spearheaded by TJCOG with technical expertise by Withers & Ravenel and input from a Project Advisory Team (PAT). The individuals involved in the PAT are listed below:

- Mike Schlegel, Triangle J Council of Governments (Project Lead/Facilitator)
- Hunter Freeman, Withers & Ravenel (LID Expert/Project Consultant)
- Jonathan Page, North Carolina State University, Biological and Agricultural Engineering
- Jason Hunt, City of Charlotte, Stormwater Services
- Kevin Boyer, City of Raleigh, Stormwater Management Division
- Matt Flynn, Town of Cary, Water Resources Department
- Dave Mayes, Public Services Department, City of Wilmington
- Pete Schneider, City of Greensboro, Department of Water Resources
- Mike Randall, NC Div. of Energy, Mineral and Land Resources, Stormwater Permitting Program

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[1] ***EPA 841-F-07-006***, December 2007***, "Low Impact Development – an Economic Fact Sheet"*** NC Cooperative Extension, ***"Capital Cost Comparisons between Low Impact Development (LID) and Conventional Stormwater Management Systems in Florida"*** Penniman, Daniel C.; Hostetler, Mark; Borisova, Tatiana; and Acomb, Glenn (2013).

How was this project funded?

Funding was provided from two sources: the NC Department of Environment and Natural Resources (NC DENR) through a 205(j) regional water quality grant, and by the City of Raleigh. Funding from NC DENR was used for organizing and facilitating the advisory team, for developing the LID designs, for analyzing water quality impacts, and for project outreach. Funding from the City of Raleigh was used to evaluate the cost component of the LID and conventional designs.

What was the approach?

As the advisory team met and began discussing the project, one thing was clear – they wanted the designs to be realistic from a developer's perspective. Since the development community was to be the target audience for the results, they wanted to make sure the designs were practical and something a typical developer might implement. The advisory team wanted to ensure that the design approach would not require variances or other features that might add uncertainty to the permitting and approval process. This overarching principle drove much of the design thinking.

LID is defined differently by different stakeholders (LID philosophy vs. LID stormwater practices). Some view LID as a holistic approach to managing stormwater across a development site, incorporating factors such as site design and layout, while others view LID more as an advanced set of best management practices (BMPs) or individual stormwater control measures (SCMs), such as bioretention cells. This project assessed the cost impact of both these views of LID, examining the impact of a holistic approach as well as a simple replacement of stormwater measures.

[NOTE: the terms best management practice (BMP), stormwater control measure (SCM), stormwater controls, stormwater control structure, control structure and LID practices in this report all refer to methods of managing stormwater runoff and are used somewhat interchangeably.]

SITE DESIGNS

What types of development scenarios were used?

Two parent development case study scenarios were used in the analysis, one residential and one commercial. Both were based on current land use regulations and typical development practices currently used in the piedmont of North Carolina. For each parent scenario, three stormwater management alternatives were evaluated: Conventional Development, LID BMPs (LID option), and LID BMPs with adapted land use (enhanced LID option).

How were the site plans developed?

The site plans used in each analysis were determined through input with the advisory team. The discussions resulted in numerous design decisions and compromises. LID approaches and techniques are flexible and numerous, and no two LID designs need to fit the same template. In these case studies, the types of LID measures used were chosen, in large part, because they were viewed as being more mainstream and in line with current development standards and practices. Additional techniques, such as the use of permeable pavement on residential driveways, green roofs, or community-based rainwater harvesting were not used due to additional complexities involved with their design, construction, or long term maintenance and additional uncertainty in the permitting and approval process.

The conventional development alternatives used typical large stormwater control devices such as wet ponds and constructed wetlands to control and treat the runoff in accordance with typical local stormwater regulations. The LID option alternatives did not attempt to revise the site layouts, but merely changed the types of SCMs used from wetlands and wet ponds to permeable pavement, cisterns, rain gardens, bio swales, and disconnected impervious areas. The Enhanced LID option alternatives went a step further by using small-scale SCMs to impact the amount of land available for development, and thereby impact the intensity of development.

Each alternative used City of Raleigh development ordinances to define the stormwater performance standards each design would need to meet in order to be deemed compliant. Furthermore, Raleigh development standards were used to guide site layouts using standard requirements and limitations for setbacks, density, parking ratios, and other standards to ensure that the cost analysis was based on realistic design assumptions.

What factors were included in the residential scenario? The residential scenario was based on a 14.92-acre site developed with 1-acre lots. The roadways were designed as shoulder section roads with roadside swales. No sidewalks were included in the Conventional Development alternative. The layout included public water mains in the roadway. The parcel included an existing jurisdictional pond and an associated 50' riparian stream buffer around the perimeter of the pond. The conventional alternative plan yielded 10 residential lots. The conventional stormwater plan relied on a new pond riser to improve the overall stormwater performance of the pond, thereby meeting the peak flow requirements for the site.

In the LID option, a portion of the necessary stormwater management needs were met using enhanced roadside swales and on-lot cisterns, rain gardens, and disconnected downspouts. The net impact of the swales and on-lot devices resulted in fewer necessary improvements to the existing dam and pond outlet structure.

In the enhanced LID option, the cul-de-sacs were shortened and the reduction in total land dedicated as right of way (and reconfiguration of the lot lines) yielded one additional lot. The stormwater management strategy was identical to the LID option described above, and the reduction in impervious surfaces from the shortened roadways was re-allocated to the new residential lot to ensure that there was no impact to the type of residence that could be constructed.

What factors were included in the commercial scenario? The commercial analysis was based on a 1.85-acre parcel being developed as commercial office space with an 11,000 sf building and associated parking. A ridgeline through the center of the site dictated that two stormwater controls be used, which were both designed as bioretention cells in the conventional development alternative. The bioretention cells satisfied flood control, diffuse flow, and nutrient loading requirements per typical local watershed regulations.

In the LID option, the conventional parking lot asphalt was replaced with a permeable pavement system in the parking stalls. The travel aisles remained as conventional asphalt paving. On the west side of the building, available open space was leveraged to disconnect the roof leaders from the storm drainage system, and a cistern was added to collect rooftop runoff. In this option, the use of permeable pavement resulted in the elimination of the eastern bioretention cell entirely, and the cistern and disconnection reduced the required size of the western BMP, which was also modified to add an internal water storage area for additional stormwater credits.

In the Enhanced LID option, the land gained from elimination of the eastern BMP was used to increase the parking lot area, still using permeable pavement in the parking stalls. By increasing the number of parking spaces, the total building area could be increased and remain in compliance with typical local parking requirements. The additional building area resulted in a slight increase in the size of the western bioretention cell when compared to the LID option.

WATER QUALITY

How was water quality evaluated? The Storm-EZ permitting tool was used to quantify the water quality characteristics of each scenario in the case study. Storm-EZ is a new spreadsheet-based tool used for stormwater permitting in North Carolina.

Storm-EZ examines the change in runoff volume between pre-development and post-development land use scenarios for identical land boundaries. The Excel-based program uses the discreet curve number method to derive runoff volume based on a combination of soil type and ground cover. The program also includes a stormwater control structure input section, which quantifies the impact that structural stormwater controls have on the total post-development runoff volume.

The analysis is completed for various rainfall depths as entered by the user. This analysis is based on the minimum required regulatory design storm, which is the 90th percentile rainfall event for the Raleigh area. Storm-EZ reports findings based on the "fate of rainfall," where the total rainfall volume that falls over a given area is divide into 3 primary rainfall fates – infiltration, treated runoff, and untreated runoff.

Infiltration includes the initial abstraction as computed by the curve number method as well as the anticipated amount of runoff which can be infiltrated, evapotranspired, or reused through various types of structural stormwater controls. Values for the infiltration capabilities of each type of BMP vary by soil type, the available storage volume in the control structure, and the inflow volume expected to reach the structure during the design storm. Infiltration also includes a portion of the outflow from controls that include a filtration component that closely mimics natural shallow infiltration.

Treated runoff is outflow that is deemed to have been treated to remove 85% of the total suspended solid loads of the inflow. Treated outflow includes the drawdown volume from most wet ponds and constructed wetlands, as well as filtered outflow from sand filters and similar filtration devices. The remaining runoff from the site is deemed to be untreated.

Values for the performance characteristics of each type of stormwater control were developed in conjunction with NC State University and NC DENR during the development of Storm-EZ. The project advisory team was trained in the use of Storm-EZ and provided beta testing. Feedback was incorporated into the official version of the tool, which is available from the NC DENR website at http://portal.ncdenr.org/web/lr/low-impact-development.

How was the residential site modeled in Storm-EZ? Pre- and post-development land use, total site area, and underlying soils were first determined for the residential site. Stormwater controls in the conventional alternative included road-side grassed swales and disconnected impervious area on each residence.

In the LID Option, the grass swales were redesigned to be infiltration areas, and cisterns and rain gardens were added to the residential lots. The rain gardens were entered into Storm-EZ as infiltration areas. In the enhanced LID option, there was a minor revision to the drainage areas to each BMP as a portion of the roadway impervious area was reallocated to the additional residential lot. The existing lake was not entered into any of the models since it does not meet the NC DENR requirements for a stormwater BMP.

How was the commercial site modeled in Storm-EZ? Analysis of the commercial site began by documenting the total site area, pre-development land cover, and underlying soils. Land cover was determined from recent aerial photos and soil types were found in the Wake County Soil Survey. The post-development land uses were determined using the proposed site plan and a CAD analysis to quantify the total impervious area, open space, and forest. Post-development BMPs required a similar analysis of land cover for the drainage area to each BMP, determined using a post-development grading plan. Water quality storage volume for each BMP was determined from the stage storage curve and proposed grading and verified to meet minimum regulatory requirements.

In the LID option, the land uses remain unchanged. Parking lot and building sizes were unchanged from the original post-development scenario. On the east side of the site, the parking lot was re-entered into Storm-EZ as a permeable pavement system with sufficient gravel depth to meet regulatory requirements. The conventional asphalt travel lanes were entered as additional built upon area (BUA) draining onto the permeable surface. The infiltration through the pavement allowed for the removal of the BMP on the east side of the site, since it was no longer needed to meet the minimum water quality standards. On the west side of the site, a portion of the roof area was directed to a cistern and entered into Storm-EZ as rainwater harvesting. A portion of the roof was also disconnected from the storm system and allowed to sheet flow over the open space. Since the stormwater treatment was occurring in series (i.e., the sheet flow drains to the bioretention cell), the data was entered as such, creating a treatment train. The benefit of the cistern and the disconnected impervious surface were reflected by a reduction of inflow volume to the bioretention cell, which then reduced the required volume for the BMP, effectively reducing its footprint.

In the enhanced LID option, the area of permeable parking was increased for the additional parking stalls. The system still has sufficient infiltration to serve the entire parking area without the need for additional controls on the east side of the site. The additional building area was divided between the drainage area to the cistern and the disconnected impervious area. The additional impervious area was still treated by both the cistern and the disconnected sheet flow; however the inflow volume to the bioretention cell increased relative to the LID option described above, and therefore, the volume of the BMP was increased accordingly to ensure that sufficient treatment was still provided.

What were the water quality results from the Storm-EZ analysis? The results of the Storm-EZ analysis were evaluated based on changes to the "fate of rainfall" in each alternative. The conventional design alternative was the baseline. The evaluation is based on the premise that infiltration, evapotranspiration, reuse, and post-filtration discharge are all more environmentally preferable options than treated or untreated outflow since they reduce runoff leaving the site. The analysis assumes that there are no outside factors such as contaminated soils, groundwater contamination, basement flooding, or soil concerns which would be exacerbated by the additional infiltration.

The table below includes the summary of rainfall fates for the water quality design storm in each alternative. Also included is the total built upon area (BUA) footprint (i.e., roof, permeable pavement, asphalt, sidewalk, concrete, etc.,) which is a measure of overall site intensity and can be an indicator of the total land disturbance needed for construction.

Residential	Total BUA Footprint	Infiltration & ET	Treated Outflow	Untreated Runoff	Total Runoff	Runoff Reduction (from Conventional Design)
	sf	cf	cf	cf	cf	
Pre-Development	0	72,168	0	0	0	N/A
Conventional*	161,898	63,485	562	8,121	8,683	
LID Option**	161,898	72,098	0	70	70	99%
Enhanced LID Option**	161,898	72,098	0	70	70	99%

All results based on the 90th percentile rainfall event for the Raleigh Area (1.41in)
** Note - Project met low density standards, no additional SW controls required*
*** Note untreated runoff generated is coming from lawn area*

The results of the residential alternatives show that the conventional design increased runoff compared to the pre-development condition. It should be noted that the lot plans may include some disconnected impervious area, but no credit was taken because it was not a required element in the design.

The inclusion of LID practices within the site plan results in significant water quality benefit. Both LID options mitigate the hydrologic impact of the proposed impervious surfaces on the site. The slight increase in total site runoff (compared to the pre-development condition) is attributed to clearing of the residential lots to provide lawns. The change in land use from woods to lawns is measurable and runoff from lawns is not required to be managed.

Commercial	Total BUA Footprint sf	Infiltration & ET cf	Treated Outflow cf	Untreated Runoff cf	Total Runoff cf	Runoff Reduction (from Conventional Design)
Pre-Development	0	9,203	0	432	432	N/A
Conventional	35,500	9,127	358	150	508	
LID Option	35,500	9,223	0	412	412	19%
Enhanced LID Option	42,091	9,288	0	347	347	32%

All results based on the 90th percentile rainfall event for the Raleigh Area (1.41in)

Inclusion of LID practices on the commercial site results in improved water quality. Compared to the conventional design, replacement of traditional stormwater controls with LID practices resulted in a 19% reduction in surface runoff. Additionally, the enhanced LID option, which increases the BUA, actually reduces runoff even further (32% reduction compared to the conventional design).

COST ANALYSIS

How were costs calculated?

The cost analysis was conducted using a *unit cost approach*. The unit cost approach quantified the number of *units* needed for each component of the site design options (e.g., square feet of asphalt paving) and the cost per unit (e.g., $3.00 per square foot). Unit costs were estimated from recent contractor bid prices, feedback from commercial and residential developers, and RS Means Heavy Construction Cost Data, 2013 edition. The costs reported do not represent the total cost of construction to complete each alternative; rather they are used as a basis of comparison to evaluate the difference in costs among alternatives. That is, the *difference* in the number of units among site designs was multiplied by the unit cost to determine the *cost difference* among alternatives.

The unit cost approach required an itemized list of project elements, a unit of measurement for each element, a price or cost for one unit of each element, and a total quantity of units needed. The unit costs remained constant in each scenario, and the only variable between site design options was the number of units needed. Elements of the designs that were common among each site design option (i.e., same type of product, method of construction, AND total quantity) were not included in the cost analysis because there was no cost difference in that element between the options.

The itemized cost spreadsheets are available at this link.

What were the cost implications for the residential site designs?

For the residential site designs using the LID option, implementation of the LID elements (i.e., additional design cost plus rain gardens, enhanced landscaping in the roadside swale, and cisterns on each residential lot) was expected to increase the overall construction costs by approximately $72,000 compared to the conventional stormwater design. The conventional design relied on the existing pond for stormwater controls, and while the size of the pond was not changed between the conventional design and the LID option, a small outlet structure was required in the LID option because of the on-site practices.

However, the reduction in the cost of the outlet structure was not enough to offset the cost increases incurred through the addition of rain gardens, enhanced landscaping in the roadside swale, and cisterns on each residential lot.

In the enhanced LID option, an additional residential lot was added, which increased the costs of the on-site LID practices, but the roadways and water and sewer mains were shortened, reducing their costs. The net result was an increase in the overall construction costs by approximately $55,000 compared to the conventional stormwater design. It should be noted that the revised layout (i.e., shorter roads with an additional lot) would also have been be possible using conventional stormwater techniques, because the existing pond would have been sufficient to control the additional runoff, but this project did not investigate the cost implications of using conventional stormwater strategies on the revised layout.

The residential analysis resulted in an increase in costs in both the LID option and enhanced LID option. Depending on the whether the LID-outfitted lots would drive a higher market price (currently available data is insufficient to predict any increase or decrease in sales price of a single residential lot), or whether the additional lot could be sold for more than the $55,000 increase in costs would ultimately determine the overall profitability of using this approach in this residential development setting.

Residential Scenario - LID Option
(Same Site Plan and Lot Layout)

Description	*Conv. Quant.*	*LID Quant.*	*Unit*	*Unit Cost*	*LID Cost Impact*
Rain Garden	-	11	ea	$ 1,500	$ 16,500
Roadside Swale Landscaping	-	18,000	sf	$ 2	$ 36,000
Connected Roof Leaders	60	33	ea	$ 50	$ (1,350)
Cistern	-	5,500	gal	$ 2	$ 11,000
LID Design	-	1	ls	$ 15,000	$ 15,000
Driveways	8,000	8,000	sf	$ 5	$ -
Sewer Service	600	600	lf	$ 6	$ -
Water Service	600	600	lf	$ 2	$ -
Roadway Paving	27,800	27,800	sf	$ 3	$ -
36" Pond Outlet Pipe	80	-	lf	$ 140	$ (11,200)
24" Pond Outlet Pipe	-	80	lf	$ 75	$ 6,000
Water Main	1,020	1,020	lf	$ 40	$ -
Sewer Main	1,020	1,020	lf	$ 10	$ -
Total LID Cost Impact:					**$ 71,950**

Residential Scenario - Enhanced LID Option
(w/ Extra Lot)

Description	*Conv. Quant.*	*LID Quant.*	*Unit*	*Unit Cost*	*LID Cost Impact*
Rain Garden	-	11	ea	$ 1,500	$ 16,500
Roadside Swale Landscaping	-	15,000	sf	$ 2	$ 30,000
Connected Roof Leaders	60	33	ea	$ 50	$ (1,350)
Cistern	-	5,500	gal	$ 2	$ 11,000
LID Design	-	1	ls	$ 15,000	$ 15,000
Driveways	8,000	9,050	sf	$ 5	$ 5,250
Sewer Service	600	750	lf	$ 6	$ 900
Water Service	600	750	lf	$ 2	$ 300
Roadway Paving	27,800	24,850	sf	$ 3	$ (8,850)
36" Pond Outlet Pipe	80	-	lf	$ 140	$ (11,200)
24" Pond Outlet Pipe	-	80	lf	$ 75	$ 6,000
Water Main	1,020	855	lf	$ 40	$ (6,600)
Sewer Main	1,020	855	lf	$ 10	$ (1,650)
Total LID Cost Impact:					**$ 55,300**

What were the cost implications for the commercial site designs? Analysis of the costs of the commercial alternatives showed a cost savings for the LID option. In the LID option, using the same site layout, but replacing the two bioretention cells with LID techniques resulted in a reduction of total construction costs by $12,000. While the permeable parking lot increased the cost of parking lot, the elimination of some of the conventional stormwater infrastructure required to direct flow to the eastern bioretention cell and the elimination of the eastern bioretention cell itself helped offset those costs. Additionally, the western bioretention cell was smaller because of the cistern and disconnected impervious surface, and that was a key aspect of the overall cost reduction. The disconnected downspouts were shown to be an extremely cost effective practice, which was further bolstered by the resulting reduction in the size of the western bioretention cell.

The enhanced LID option showed a significant increase in upfront construction costs due to the addition of 3,600 sf of office space compared to the original site layout. The cost to construct this site with the additional office space was expected to increase by approximately $375,000 compared to the conventional design. The parking lot construction costs increased due to the addition of 20 new parking spaces, and the larger building footprint resulted in a larger bioretention cell in the western part of the site, even with the continued inclusion of the cistern and downspout disconnections.

The scope of this cost analysis focused on initial construction costs, and additional real estate market studies would be needed to fully assess the long term financial implications and profitability of the additional parking and office space.

Commercial Scenario - LID Option
(Same Layout, Same Building)

Description	*Conv. Quant.*	*LID Quant.*	*Unit*	*Unit Cost*	*LID Cost Impact*
Cistern & Pump System	-	2,000	gal	$ 3	$ 6,000
Permeable Pavement	-	8,200	sf	$ 10	$ 82,000
Gravel Subgrade (storage)	-	177	cy	$ 40	$ 7,080
Pavement Underdrains	-	350	lf	$ 12	$ 4,200
Striping	738	738	lf	$ 1	$ -
Building Construction	11,686	11,686	sf	$ 95	$ -
Sidewalk	2,701	2,701	sf	$ 5	$ -
Roof Leaders	8	25	ea	$ 200	$ 3,400
Parking Lot Landscaping	600	600	sf	$ 8	$ -
Curb & Gutter	819	819	lf	$ 9	$ -
Asphalt Paving	16,149	7,949	sf	$ 3	$ (24,600)
Bioretention Cell	3,800	1,300	sf	$ 30	$ (75,000)
Catch Basins / BMP Outlet	7	5	ea	$ 4,000	$ (8,000)
18" RCP	100	100	lf	$ 37	$ -
15" RCP	310	150	lf	$ 45	$ (7,200)
Total LID Cost Impact:					**$ (12,120)**

Commercial Scenario - Enhanced LID Option
(23 additional parking spaces and 3,600 additional SF office space)

Description	*Conv. Quant.*	*LID Quant.*	*Unit*	*Unit Cost*	*LID Cost Impact*
Cistern & Pump System	-	2,000	gal	$ 3	$ 6,000
Permeable Pavement	-	11,656	sf	$ 10	$ 116,560
Gravel Subgrade (storage)	-	260	cy	$ 40	$ 10,400
Pavement Underdrains	-	400	lf	$ 12	$ 4,800
Striping	738	1,200	lf	$ 1	$ 462
Building Construction	11,686	15,286	sf	$ 95	$ 342,000
Sidewalk	2,701	2,738	sf	$ 5	$ 167
Roof Leaders	8	21	ea	$ 200	$ 2,600
Parking Lot Landscaping	600	2,300	sf	$ 8	$ 13,600
Curb & Gutter	819	1,188	lf	$ 9	$ 3,321
Asphalt Paving	16,149	10,050	sf	$ 3	$ (18,297)
Bioretention Cell	3,800	1,200	sf	$ 30	$ (78,000)
Catch Basins / BMP Outlet	7	3	ea	$ 4,000	$ (16,000)
18" RCP	100	-	lf	$ 37	$ (3,700)
15" RCP	310	150	lf	$ 45	$ (7,200)
Total LID Cost Impact:					**$ 376,713**

OUTREACH

How were the results of this study shared?

The results of this study are being shared through presentations and email listserves. The preliminary cost analysis was presented at the 2015 North Carolina Water Resources Conference in March 2015 to a diverse audience of water professionals, local government staff, environmental consultants and students. In August 2015, a presentation was made to local government staff leaders in the Triangle area at a regional meeting of City and County Managers. In September 2015, a presentation was made to local government elected officials in the seven-county Region J at Triangle J Council of Governments. Additionally, a presentation was made to the City of Raleigh Planning Commission at their September 22, 2015 meeting. An email announcement of this final report was also made was through the several statewide email listserves, include the NC Water Resources Association and Water Resources Research Institute.

NEXT STEPS

Are there any next steps after this project? There are several efforts that would serve to enhance and extend the understanding from this project. The first is to share the results of this study with the development community. This can be accomplished through existing associations (e.g., Home Builders Association) or organizations that work with the development community like the Chamber of Commerce. A targeted outreach effort could include presentations at trade shows and regional meetings as well as email dissemination of this report or a separate summary document made for that purpose.

There are several other research efforts which could further the understanding of LID costs and value, looking at cost implications to local governments for the plan review and approval process or inspections and permitting for LID. Finally, an analysis of the long-term operation, inspection and maintenance costs and implications of traditional stormwater management vs. LID, especially for a residential setting is an area of research that is needed to further the understanding of the costs and market value of low impact development.

MORE INFORMATION

Where can I get more information about this project? More information is available at the following links:

- Project Summary
- Cost Tables
- Detailed Site Plans
- Storm-EZ Results

Who can I contact with questions? You can contact Mike Schlegel or Hunter Freeman with any questions.

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