Light Imprint: Integrating Sustainability With New Urbanism

By Thomas E. Low

As the development industry shifts away from the conventional suburban model, the new urban model safeguards the environment while creating compact, connected, mixed-use communities. While sprawl leads to excessive land use and automobile dependency, new urbanist development offers a sustainable alternative.

LIGHT IMPRINT: A NATURAL EVOLUTION OF NEW URBANISM AND THE GREEN MOVEMENT

A natural evolution of new urbanism and the green movement is the Light Imprint (LI) initiative supported by the Congress for the New Urbanism. LI is a culmination of years of on-the-ground experience; it includes over two years of specific research by CNU members.

LI developed out of the need for a new ecological solution. Experiences with the current environmental approaches to new urbanism inadequately address the problem. For example, low impact development is a major enabler of green sprawl; green urbanism compromises community connectivity and quality of life; and conventional gold-plated green engineering tools increase development costs. Shortcomings of these techniques will be further discussed. LI is a planning and development strategy that emphasizes sustainability, pedestrian-oriented design, and increased environmental and infrastructure efficiency. Transect-based environmental metrics established in LI are not found in LEED-ND and form-based codes. LI introduces a framework of tools that addresses stormwater runoff through natural drainage, conventional engineering infrastructure, and innovative infiltration practices. This framework includes a toolbox to be used collectively at the sector, neighborhood, and block scale. A combination of tools can be adjusted according to the appropriateness of their use in each transect zone. This toolbox offers a range of environmental benefits; it can also significantly lower construction and engineering costs.

It can easily be demonstrated that LI differs from conventional approaches when responding to environmental factors. In addition, it is easy to show how LI incorporates the many other quality-of-life benefits of a new urbanist approach to planning and design.

SIGNIFICANT DIFFERENCES FROM OTHER GREEN DEVELOPMENT APPROACHES

The vast majority of current engineering practices continue the conventional "inlet, pipe, and pit" approach to storm water management. The development industry, however, is increasingly considering a range of green approaches. Frequently, green approaches are a requirement. These include green urbanism, low-impact development, best management practices, new urbanist and traditional neighborhood development, and conventional engineering practices. To understand the benefits of LI, it is important to discuss the pros and cons of each of these other approaches.

Green urbanism (GU) is an environmental approach promoted by landscape architects. GU, considered an alternative to new urbanism, emphasizes an increased percentage of open space within a development. Greenway fingers serve as organizing spines for development; stormwater filtration mechanisms are placed outside and around these green spaces. When compared with new urbanist developments, GU developments offer less connectivity. Also, the increased requirement for open space reduces the amount of land available for development. That fact can greatly diminish the economic feasibility of a project.

Low impact development (LID) is another environmental development approach. LID origins are in conventional suburban development adopted by many municipalities. LID manages stormwater quality and quantity with on-site design techniques and best management practices. LID techniques are applied to a wide range of suburban developments. For example, high-density residential development, like suburban apartment complexes, are in the same classification as commercial development, like strip shopping centers. This lack of differentiation between developments of differing characters is a downfall of LID.

When addressing methods for stormwater treatment, best management practices (BMP) focus on engineering rather than planning and design. The EPA proposes using smart growth techniques as a BMP for stormwater although this is not always successful. For example, compact development suffers when the BMPs require stormwater detention areas in front or beside buildings. This approach removes buildings from the public realm of the streetscape, which harms a community's social connectivity. Additionally, detention areas form gaps between buildings that interfere with pedestrian activity, compromising retail merchandizing goals.

Conventional engineering applied to new urbanist and traditional neighborhood development (TND) accommodates the broader range of development standards necessary for community-oriented design. Municipalities reviewing plans for new urbanist and TND communities are often interested in these standards. Their governing bodies, however, may be conservative and opposed to unfamiliar standards. Problems arise when designers overcompensate for differences in standards and design of infrastructure. Called "gold plating," this overcompensation can thwart the successful realization of a new urbanist community. Project delays and additional infrastructure cost can ultimately prevent implementation of a good community development.

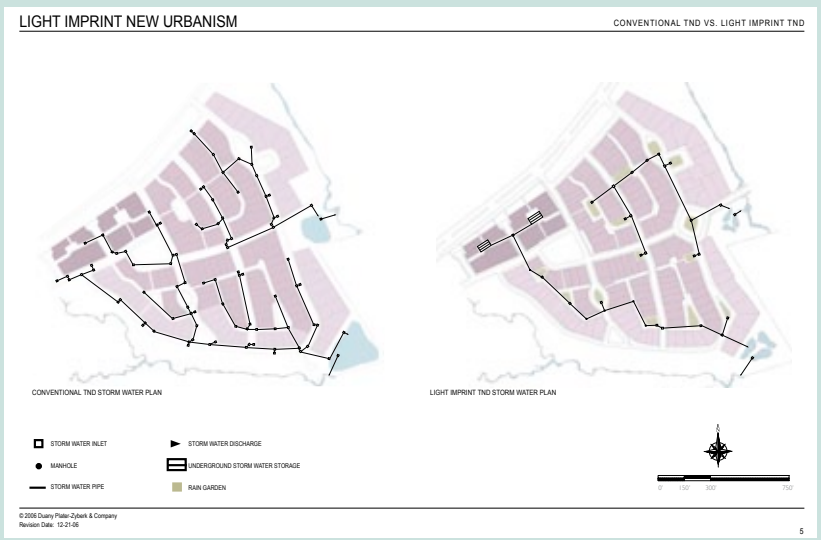
LIGHT IMPRINT NEIGHBORHOOD CASE STUDY: GRIFFIN PARK

Unlike these other development strategies, LI employs different tools in each transect zone (T-zone). It is not limited to one approach for environmentally sensitive development. Rather, LI offers context-sensitive design solutions that work together at the community level.

According to Georgio Tachiev, Ph.D., an environmental engineer at Florida In-

CONVENTIONAL TND MASTER PLAN

LIGHT IMPRINT TND MASTER PLAN

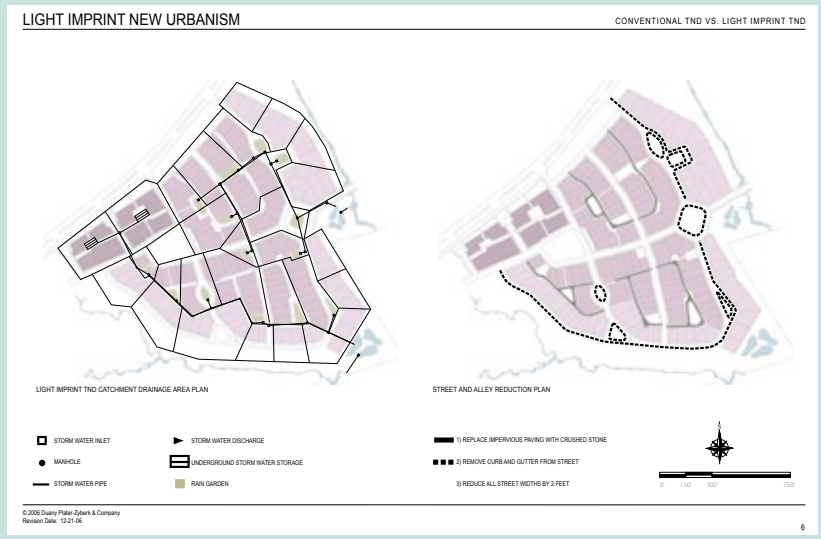


ENGINEERING COMPARISON

Project:	Light Imprint New Urbanism Study								
Date:	6-Dec-06								
Details:	Phase I, 42 Acres, 176 Lots				174 Lots				
Conventional TND Engineering					Light Imprint TND Engineering				
Material	Quantity	Unit	Cost	**Total**	Material	Quantity	Unit	Cost	**Total**
Erosion Control									
Silt Fence	8450	LF	$4.00	$33,800.00	Silt Fence	8450	LF	$4.00	$33,800.00
Rip Rap	200	Tons	$55.00	$11,000.00	Rip Rap	200	Tons	$55.00	$11,000.00
					TPF	4225	LF	$4.00	$16,900.00
Total				**$44,800.00**					**$61,700.00**
Storm Water									
Inlets	101	Ea	$2,500.00	$252,500.00	Inlets	24	Ea	$2,500.00	$60,000.00
Pipes	9434	LF	$30.93	$291,793.62	Pipes	4182	LF	$30.93	$129,349.26
Retention Pond	1	Lump	$48,400.00	$48,400.00	Rain Gardens	20	Ea	$5,120.00	$102,400.00
Total				**$592,693.62**					**$291,749.26**
Pavement									
Curb & Gutter	18910	LF	$7.60	$143,716.00	C & G	13091	LF	$8.00	$104,728.00
Sidewalk	8276	SY	$25.00	$206,900.00	Sidewalk	7000	SY	$25.00	$175,000.00
Paved Road	26705	SY	$18.64	$497,781.20	Paved Road	20515	SY	$18.64	$382,399.60
Paved Alley	6470	SY	$13.36	$86,439.20	Crushed Stone - Alley	5765	SY	$12.00	$69,180.00
Total				**$934,836.40**					**$731,307.60**
Grand Total				**$1,572,330.02**					**$1,084,756.86**
Cost per Lot	176			**$8,933.69**		174			**$6,234.23**

Notes:
TPF - Tree Protection Fence
LF - Linear Feet
SY - Square Yard
Ea - Each

Overall 31% Saving
Per Lot 30% Saving



LIGHT IMPRINT OVERLAY STUDY

Griffin Park, Greenville County, S.C.

The study, prepared by Duany Plater-Zyberk & Company, contains six plates of plan diagrams and one chart. The first two plates compare the master plan before and after the application of LI engineering. The second two plates show the engineering infrastructure for each of these plans. The fifth plate shows the LI TND catchment drainage area plan. The sixth plate shows the master plan with proposed reductions of pavement and curb and gutter.

The table demonstrates the substantial cost savings achieved by applying the LI engineering techniques. It shows the comparison between the two engineering methods for the first phase of the development of 42 acres and 174 lots. The table compares the costs of the two methods based on erosion control measures, stormwater infrastructure, and pavement width and materials. Finally, it summarizes the cost of each showing a 31 percent cost savings of approximately $500,000 for the first phase.

ternational University, LI reduces infrastructure on the neighborhood scale in terms of roads, public works, and facilities. On the block scale, the implementation of LI methods results in reduced building footprint and stormwater runoff. The application of additional LI techniques at the individual lot and building scale add to the increased level of sustainability.

Griffin Park, a DPZ-designed community in Greenville County, S.C., offers one example of LI development. While numerous studies compare conventional suburban developments with TNDs, few compare standard TNDs to Light Imprint TNDs. The DPZ Charlotte office uses Griffin Park as such a case study.

Landscape architect Guy Pearlman and designer Patrick Kelly, both of DPZ, have developed the LI overlay of techniques for Griffin Park. The goal is to create an environmentally sensitive community while lowering construction costs during the first development phase. Pearlman explains, "The conventional TND engineering plan is for both county review and bidding purposes; it reaches an extensive level of detail. The LI engineering plan is based on many variables developed in the conventional plan. Added consideration is given to environmental and preservation factors. Those factors enhance the value of the community and lower the cost of construction."

LI overlay strategies for Griffin Park include the introduction of tools for stormwater storage, channelization, filtration, and paving options. Additional protection for natural areas is provided during the construction phase. Through the use of different tools within different T-zones, the need for infrastructure is reduced while lessening the environmental impact of development.

To achieve LI goals within the TND plan, tree protection fences used in the erosion control phase protect existing natural areas including mature trees. That strategy results in a 27 percent cost increase compared to the conventional method. Yet, using LI, there is a 50 percent cost saving in the stormwater management phase. The introduction of bioretention swales, rain gardens, and vegetative surface filtration areas add aesthetically pleasing natural areas and neighborhood recreation areas. Rain gardens filter runoff to remove pollutants before they reach the adjacent creeks and river.

Two road pavement techniques reduce costs. First, building roads that are 24 feet wide instead of 26 feet wide results in a significant reduction of paving costs. Second, substituting crushed stone for asphalt for rear lane surfacing saves over 20 percent of this development cost.

The following summary outlines the application of various tools by T-zones in Griffin Park:

- T4 Neighborhood Center Zone: 1) Introduction of an underground stormwater storage system; 2) reduction of the amount of pipe required as well as reduction in their lengths; and 3) reduction in the number of stormwater inlets.

- T3 Neighborhood General Zone: 1) Use of pervious pavement in rear lanes;

2) reduction of the street widths; 3) reduction of the amount of pipe required and reduction in their lengths and size; 4) reduction in the number of stormwater inlets; and 5) introduction of small-scale, multiple-lot, communal bioretention swales.

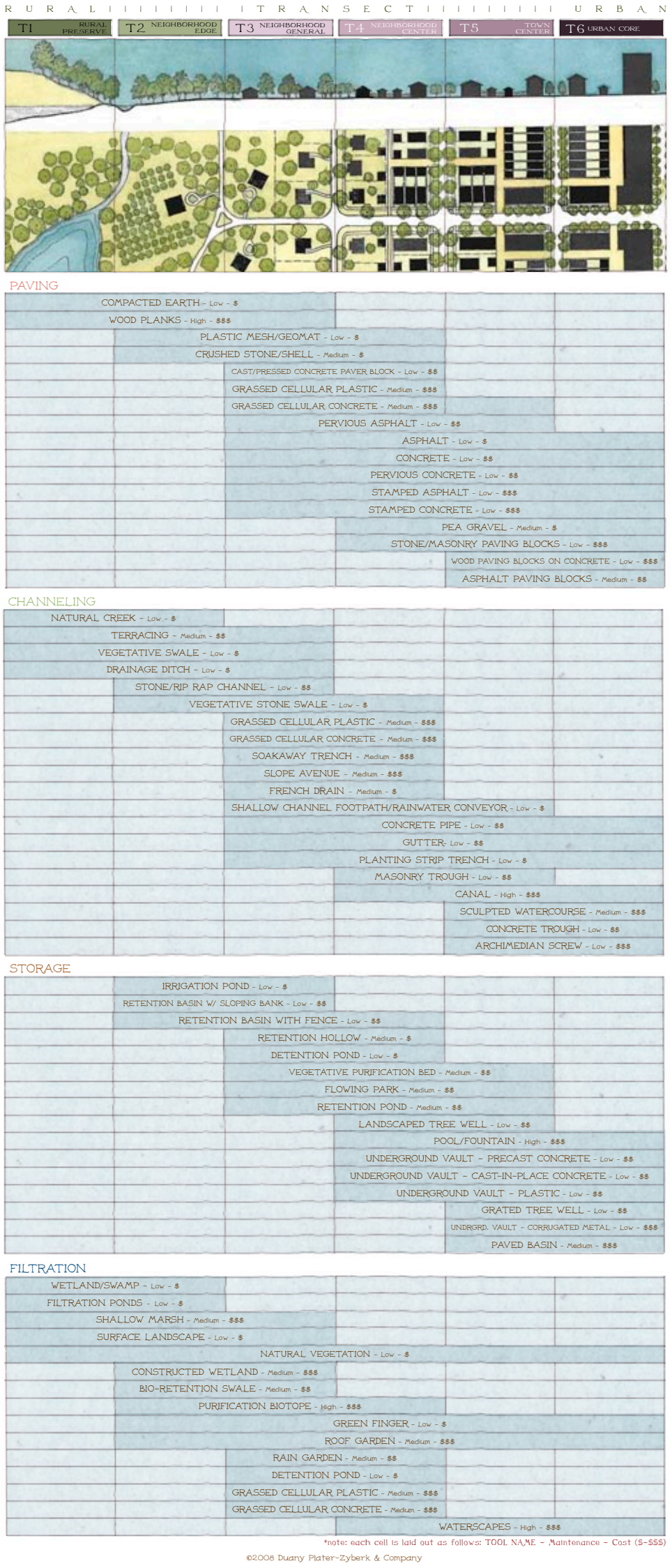
- T2 Neighborhood Edge Zone: 1) Elimination of curb and gutter in strategic edge areas; 2) replacement of the proposed large retention ponds with smaller-scale natural filtration ponds; and 3) introduction of vegetative surface filtration areas along the perimeter; and 4) elimination of stormwater inlets and pipe.

Pearlman summarizes, "Implementing the LI overlay results in over 30 percent engineering cost savings in actual construction dollars for the first phase. That savings is in addition to the added community value of preserved mature trees and communal rain gardens.

LIGHT IMPRINT REQUIRES A COMPREHENSIVE STRATEGY

Stephen L. Davis, P.E., of Davis & Floyd Engineers, is also active in the development of Griffin Park. He supports the LI approach to new urbanism but tempers it with reality from a long-range standpoint. Davis uses the term "ground truthing" to determine how practical it is to get LI communities approved by municipalities and then actually built. Ultimately, success will be measured over the lifetime of the community.

Davis explains, "Standard engineering methods are quicker to complete submittals for permits. For the Light Imprint approach to be embraced by advocates of new urbanism within municipalities and the development and building industry, it is important to have the LI model presented as a comprehensive strategy." He also advises that this strategy should not substantially modify the new urbanist design of street and lot layout, nor should it alter other standard practices for common infrastructure elements. Additionally, when practicing LI, he states, "Engineering hydrology becomes critical." For example, soil analysis must verify rain garden absorption requirements and sufficiency of smaller pipe sizes within the system.



Even though a comprehensive approach works best when applying the LI model, it is critical that technical issues work within the framework of good engineering practices. Davis recognizes that the LI strategy allows stormwater surface sheet-flow across pervious surfaces. That encourages onsite absorption and reduces the typical number of drain inlets. Although this technique works, the rule-of-thumb of the curb and gutter system should still apply — 400 linear feet as the maximum distance between drain inlets. Davis also suggests that LI can reduce infrastructure even further if the lots and streets on the neighborhood's perimeter allow sheet flow of stormwater through landscaping into existing natural drainage systems.

Field supervision and maintenance issues are also factors to consider during design and construction. For example, correct design of a rain garden assures that water does not bypass the drainage area. Perforated drainpipes must be also installed properly. Davis voices concerns that rain gardens could become dysfunctional over time. This issue can be mitigated if the rain garden plant material is indigenous, water tolerant, and properly maintained. If pervious road surfaces are being considered for alleys, lanes, and streets without curbs and gutters, then measures are required to stabilize the road's shoulders to prevent erosion and tire rutting. Developers point out, however, that maintenance requirements for most LI tools do not necessarily exceed those already in practice for well-maintained conventional suburban development. LI offers a tangible green alternative to the superficial perfection of suburbia.

Finally, Davis advises that time is necessary for LI to become the norm. Designers and developers may not be able to employ all LI techniques immediately, but they could be implemented incrementally. The pace of development and the need for a project to succeed may dictate incremental implementation.

BOTTOM LINE VALUE TO DEVELOPERS

Joe W. Jelks, III, developer and founder of Griffin Park, S.C., sees value in applying LI. He explains, "For Griffin Park, the LI overlay case study for the first phase was compelling enough to lead our development team to apply the LI overlay techniques after construction had started. The case study also convinced us to work with stakeholders and approval agencies to holistically apply LI for the next phases."

THE *LIGHT IMPRINT HANDBOOK*

Elaborating on this approach, the authors are publishing the *Light Imprint Handbook*. The handbook provides an overview of the initiative supported by CNU. In the *Light Imprint Handbook*, the transect-based matrix organizes over sixty tools and resources in a simple, useful form. Readers can easily gain an understanding of the LI overlay strategy and methods to apply the LI approach on their next land development project. It features four LI case studies, including Griffin Park. This handbook, part of a user-friendly website, is available at www.lightimprint.org.

The web version of the *Light Imprint Handbook* includes a user-friendly interactive database that allows individual property owners, environmentalists, development teams, municipal staff, engineers, land planners, and land conservationists to select different variables. These variables may include soil hydrology, slope condition, climate, urban-to-rural T-zones, initial costs, and long-term maintenance factors. Once variables are submitted to the database, a customized palette of tools specific to the project's needs appears instantaneously. This valuable database provides a simple solution to those overwhelmed by the massive surge of green information in professional practice today. LI will benefit from application on real projects. As experts add content, this toolbox will grow and expand. The authors welcome peer review, comments, suggestions, or questions.

Lead author Thomas E. Low, AIA LEED CNU, gratefully acknowledges contributors to this article: Stephen L. Davis, P.E. CNU; Andres Duany, FAIA AICP CNU; Joe W. Jelks, III; Patrick Kelly, LEED CNU; Guy Pearlman, RLA CNU; Georgio Tachiev, Ph. D. CNU; Nora M. Black, Associate AIA CNU; Katharine Burgess, CNU; Monica Carney, CNU; Kathy Crowe; Xavier Iglesias, CNU; Lauren Koutrelakos, CNU and Elizabeth Plater-Zyberk, FAIA CNU.