LIGHT IMPRINT NEW URBANISM

A CASE STUDY COMPARISON

DUANY PLATER-ZYBERK & COMPANY

ARCHITECTS AND TOWN PLANNERS

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In recent years, the development industry has begun to shift from the conventional suburban model towards the New Urban model, which advocates the development of compact, mixed-use, pedestrian-friendly communities. Much of this shift has emerged from the need to better address environmental and community goals; it also addresses the need to reconcile the needs of the development industry with land conservation organizations. While sprawl leads to excessive land use and automobile dependency, New Urbanist development offers a far more sustainable alternative.

Mixed-use, pedestrian-friendly developments, which allow residents to greatly decrease use of their cars, clearly yield environmental benefits, but such developments also have a great number of other environmental strengths. The U. S. Green Building Council (USGBC), which developed the LEED (Leadership in Energy and Environmental Design) Green Building Rating System, has recently recognized this fact. In partnership with the Congress of New Urbanism (CNU) and the Natural Resources Defense Council, the USGBC used the principles of New Urbanism to develop a new rating system, LEED for Neighborhood Development. The new system integrates the principles of smart growth, urbanism, and green building into the first national standard for neighborhood design.

Georgio Tachiev, an environmental engineer at Florida International University, also confirms the high level of environmental benefits. According to Tachiev, New Urbanist developments perform well on the regional scale for two important reasons. First, compact communities reduce the stress on the watersheds caused by runoff from roads; second, they require reduced regional infrastructure. Conversely, the excessive land use encouraged by sprawl leads to fragmentation of watersheds by roads. Ultimately, sprawl leads to the impairment of the services and resources provided by the watershed.

Dr. Tachiev explains that the connected networks advocated in New Urbanist development create a symbiotic connection between built and natural environment. He says, “The methods we apply to design our built environment affect the balance of economy, energy, environment and society. From an engineering point of view, New Urbanism is a methodology that implements sustainability in all four aspects. When discussing sustainability, we need to place an emphasis on the watersheds since they are the natural containers hosting the human habitat. Maintaining the watershed in its natural condition is the key factor for ensuring continued quality services of the watersheds (expressed in biodiversity, water quality and quantity, and assimilative capacity).”

In spite of providing these qualities of environmental protection, New Urbanist development has been criticized for not being “green” enough; however, it is in fact very green when applied comprehensively. Further supporting this, there are newly developed techniques for “Light Imprint New Urbanism” (LINU) - a development technique which aims to “lie lightly on the land,” by coordinating engineering practices and New Urbanist design practices. Light Imprint New Urbanism developed out of the need to coordinate engineering concerns with design concerns. It enables developers to give added consideration to environmental and preservation factors without compromising design priorities such as connectivity and the public realm. Like all New Urban planning, LINU respects site terrain and topography while it prioritizes public civic space. Additionally, LINU offers a range of cutting-edge environmental strategies for differing landscapes and urban conditions.

LINU planning introduces a tool set that deals with stormwater run-off through natural drainage, conventional engineering infrastructure, and innovative infiltration practices. These tools are to be used collectively at the sector, neighborhood, and block scale. The combination of tools are adjusted according to the appropriateness of their use in each transect zone. This toolset not only offers a great range of environmental benefits, but can also significantly lower construction and engineering costs. By using different tools in each transect zone, LINU is not limited to a single approach for environmentally sensitive development. Rather, it offers a set of context-sensitive design solutions that ultimately work together on the community level.

Much of the criticism aimed at New Urbanist development and the Light Imprint model comes from advocates promoting their own specific environmental techniques within the framework of different development practices. Those techniques may be sound in their own individual agendas, but few offer a comprehensive approach to community development. Additionally, few take into account the general principles which make pleasant and livable communities, which are outlined in the Charter of the New Urbanism (http://www.cnu.org/cnu_reports/Charter.pdf). The Charter prioritizes diversity, walkability and connectivity, all of which contribute to the creation of sustainable neighborhoods. Leading planner Andres Duany, a principal of Duany Plater-Zyberk & Company, describes the layout of a typical New Urban community as an “open-mesh network” where a fine-grain system of connected streets mitigates traffic congestion and reinforces community connections. By prioritizing these design and planning issues, New Urbanist development offers multi-faceted environmental and community planning benefits, unlike more isolated environmental approaches.

Green Urbanism (GU) is one alternative environmental approach promoted by landscape architects. Green Urbanism, which is considered a more environmentally viable alternative than New Urbanism, emphasizes an increased percentage of open space within a development site, typically in the range of 60% or greater per project. Greenway fingers serve as the primary organizing spines for development, and storm water filtration mechanisms are placed outside of and around these green spaces. However, when compared with New Urbanist developments, Green Urbanism developments offer far less connectivity, because streets are often terminated to prevent encroachment on greenway fingers. Three problems often arise in these developments. First, important connections are so disrupted that functional issues such as traversing the site become difficult. A second problem encountered is that land development issues make reserving significant open space impracticable. And finally, the increased requirement for open space may so reduce the amount of developable land that the project may not be economically feasible.

Low Impact Development (LID) is another popular environmental development strategy. The origins of LID are found in conventional suburban development. Many municipalities have adopted this approach. LID attempts to manage stormwater quality by using both on-site design techniques and Best Management Practices (BMP – see below). LID techniques can be applied to both conventional suburban residential development and commercial development. However,

LID offers similar approaches to these different sorts of development. High-density residential development, such as a typical suburban apartment complex, is thrown into the same classification as commercial development, such as a strip shopping center. This lack of differentiation between developments of different characters is one downfall of LID.

Best Management Practices (BMP) is an approach that typically focuses on engineering rather than planning and design for addressing methods for stormwater treatment. The EPA proposes using smart growth techniques as a best management practice for stormwater. However, problems arise when Best Management Practices designed to solve suburban engineering issues are applied to more urban communities. For example, compact development suffers when BMPs dictate the need for storm water detention areas in front of, or beside buildings. This approach can harm a community's social connectivity. It may even interfere with retail merchandizing needs.

New Urbanist Conventional Engineering deviates from these conventional engineering practices to accommodate the broader range of development standards necessary for community-oriented design. Municipalities reviewing New Urban communities are often interested in embracing the New Urbanist approach; however, their governing bodies may be conservative regarding acceptance of different standards. Problems arise when designers attempt to overcompensate with standards and design. This overcompensation, or "gold plating," of infrastructure has adverse effects on the ability to successfully implement a New Urban community. Project delays and additional infrastructure cost can ultimately prevent the implementation of a good community development.

Light Imprint New Urbanism offers a more manageable alternative by coordinating innovative engineering practices with the New Urban design approaches in specific transect zones. This strategy will ease implementation - which is crucial, given that currently only a limited number of New Urbanist practitioners have significant implementation experience – and also offer great environmental benefits. According to Tachiev, LINU reduces infrastructure on the neighborhood scale in terms of roads, public works and facilities. On the block scale, the implementation of light imprint methods results in reduced ecological footprint of individual buildings and reduced stormwater runoff.

Griffin Park, a DPZ-designed traditional neighborhood development in Greenville, South Carolina, offers one example of Light Imprint New Urban development. While there have been numerous studies comparing Conventional Suburban Development (CSDs) with Traditional Neighborhood Development (TNDs), there have been few comparing standard TNDs to "Light Imprint" TNDs. The DPZ Charlotte office recently took on such a project, using Griffin Park as a case study.

Landscape architect Guy Pearlman and designer Patrick Kelly, both of the DPZ Charlotte office developed the LINU model for Griffin Park to create an environmentally sensitive community, preserve mature tree stands, and lower the construction costs for the first development phase. Pearlman explains, "The conventional TND engineering plan is engineered for both county review and bidding purposes; it reaches an extensive level of detail. The light-imprint engineering plan is based on many of the variables developed in the conventional plan. Added consideration, however, is given to environmental and preservation factors. Those factors enhance the overall value of the community and lower the total cost of construction."

Environmental strategies at Griffin Park included the introduction of rain gardens and a tree protection fence. The introduction of these elements allowed for the development's underground piping system as well as curbs and gutters to be downsized thereby lessening the environmental impact of the development and saving significant sums on construction.

In order to achieve the desired goals of the light-imprint TND plan, a tree protection fence is introduced in the erosion control phase to protect the existing mature trees. That strategy results in a 27% cost increase when compared with the conventional proposed method. Yet, a cost saving between the two methods was found in the storm water management phase. A 50% cost savings would be achieved by the following simple actions: 1) omission of curb and gutter in strategic areas; 2) reduction in the amount of pipe required as well as reduction in their lengths and size; 3) reduction in the need for inlets to underground pipes; and 4) the introduction of smaller rain gardens throughout the community to replace the one large retention pond.

The introduction of rain gardens also adds aesthetically pleasing natural areas and neighborhood recreation areas. Rain gardens would remove a greater amount of pollutants from runoff before the pollutants could reach the Reedy River. Also, there are two road pavement issues that reduce costs. First, building 24 feet wide roads instead of 26 feet wide roads results in a significant reduction of land coverage and paving costs. Second, substituting crushed stone in place of asphalt-paved alleys saves over 20% in development costs.

Pearlman summarizes, "Implementing the light-imprint engineering method results in over 30% cost savings in actual construction dollars for the first phase. That cost saving is in addition to the added value realized by the preserved mature trees and communal rain gardens."

Stephen L. Davis, P.E., of Davis & Floyd Engineers, is also active in the development of Griffin Park. He is an enthusiastic supporter of the Light Imprint 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 Light Imprint communities approved by municipalities and then actually built. Ultimately, their success must be measured over the life of the community.

Davis explains, "Standard engineering methods are quicker to complete and easier to submit for permits for processing. In order to have the Light Imprint approach embraced by advocates of New Urbanism within municipalities and the development and building industry, it is important to have the Light Imprint model presented as a comprehensive strategy." He also advises that this strategy should not substantially affect the New Urbanist design of street and lot layout along with other standard practices for common infrastructure elements including water and sanitary sewer. Additionally, when practicing Light Imprint New Urbanism, he states emphatically, "Engineering hydrology becomes critical." For example, soil analyses are needed to verify that soil is in compliance with rain garden absorption requirements and to confirm that smaller pipe size is sufficient for the system.

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Even though a comprehensive approach works best when applying the Light Imprint model, it is also important to make sure some of the technical issues work within the framework of good engineering practices. Davis points to the LINU strategy of allowing more storm water surface sheet-flow across pervious surfaces to encourage onsite absorption and to reduce the typical number of drain inlets and length of drainage pipe. This technique is good, but users should still apply the rule-of-thumb of a 400 linear feet maximum distance from a drain inlet using curb and gutter. Davis also finds additional ways to reduce infrastructure that may become over-designed for LINU. He suggests considering that the lots and streets along the neighborhood perimeter may not need swales since it may be possible to sheet flow the storm-water through the filtration landscaping directly into existing natural drainage systems.

Field supervision and on-going maintenance issues are also a major factor to consider. Additional supervision is needed to make sure the rain gardens are constructed properly. Proper design assures that water does not bypass the drainage area. Perforated drainpipes must be installed properly. Davis voices concern that there may be some binding with the rain gardens where they become dysfunctional over time. It helps if the rain garden plant material is indigenous and water tolerant; it should also be compatible with the desired community character and maintenance program. If pervious road surfaces are being considered for alleys, lanes, and streets without curb and gutter, then measures are needed to stabilize the road and alley shoulders to prevent soil erosion and tire rutting.

Finally, Davis advises that it will take time for LINU to become the norm rather than the exception. Designers and developers may not be able to implement all Light Imprint elements right away, but they could implement LINU in incremental stages as certain components are approved. Due to the pace of development and the need for projects to succeed, it is especially important to plan for incremental implementation.

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

In forthcoming articles, the authors will elaborate on this approach including other case studies that have formulated different green engineering techniques based on transect zones and how the proposed methodology reduces the impact on watersheds on a larger regional scale.

Charts and Graphs:

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 light imprint engineering. The second two plates show the engineering infrastructure for each of these plans. The fifth plate shows the Light Imprint TND catchment drainage area plan. The sixth plate shows the master plan with proposed reductions of pavement and curb and gutter. The chart is key, as it shows the substantial cost savings associated with applying the light imprint engineering techniques.

The referenced table 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, storm water infrastructure, and pavement width and materials. Finally, it summarizes the cost of each.

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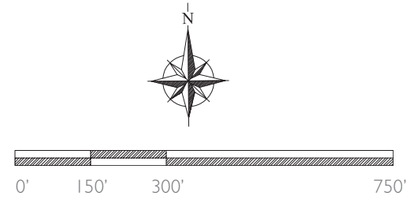
CONVENTIONAL TND MASTER PLAN

LIGHT IMPRINT TND MASTER PLAN



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CONVENTIONAL TND STORM WATER PLAN

LIGHT IMPRINT TND STORM WATER PLAN

STORM WATER INLET

MANHOLE

STORM WATER PIPE

STORM WATER DISCHARGE

UNDERGROUND STORM WATER STORAGE

RAIN GARDEN

N

0' 150' 300' 750'

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LIGHT IMPRINT TND CATCHMENT DRAINAGE AREA PLAN

STREET AND ALLEY REDUCTION PLAN

STORM WATER INLET

MANHOLE

STORM WATER PIPE

STORM WATER DISCHARGE

UNDERGROUND STORM WATER STORAGE

RAIN GARDEN

1) REPLACE IMPERVIOUS PAVING WITH CRUSHED STONE

2) REMOVE CURB AND GUTTER FROM STREET

3) REDUCE ALL STREET WIDTHS BY 2 FEET

N

0' 150' 300' 750'

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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

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