Changing Cost Perceptions:

An Analysis of Conservation Development

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Executive Summary

While the environmental benefits of conservation approaches to development are well known, cost-sensitive municipalities and developers are often reticent to try a conservation approach. A common concern about alternative development approaches is the perception of increased cost. A project group, spearheaded by the Conservation Research Institute, came together to investigate this issue. Developers, local officials, policy analysts and staff from several development consulting firms helped to fill information gaps on the costs of conservation development.

This project was conceived to support the implementation of the Chicago Wilderness Biodiversity Recovery Plan, by informing players about the feasibility of development alternatives that can minimize damage to the ecosystems of the Midwest. The project set out to answer the following questions: Does conservation development, which helps to address the issue of environmental protection, have the potential to help mitigate the problem of the high cost of development? Or, does it exacerbate the current trend of rising costs, especially for stormwater management?

The conservation approach addresses stormwater on-site by distributing the water across the landscape, thereby mimicking or restoring the historical hydrological regime. The result is a range of environmental benefits: groundwater recharge, improved surface water hydrology, improved water quality, habitat protection, and others. On the other hand, conventional practices such as engineered stormwater ponds or concrete-lined drainage ditches have sometimes shown negative environmental impacts not present with conservation tools, such as increased flooding or decreased water quality.

To compare the stormwater management costs of conservation with conventional development, this project undertook three studies: a literature review, an analysis of built-site case studies, and a cost analysis of hypothetical conventional and conservation design templates, or layouts.

Literature Review

The literature consistently raised examples of how conservation development methods can save money in both construction and maintenance, from the broad metropolitan scale down to the site level, and further down to a comparison of specific Best Management Practices (BMPs). Here is a brief summary of conclusions from the literature:

1. Public infrastructure costs are higher when a development is built within the context of urban sprawl, as compared to smart growth patterns that conserve land.
2. At the site level, significant cost savings can be achieved from clustering, including costs for clearing and grading, stormwater and transportation infrastructure, and utilities.
3. Installation costs can be between $4,400 and $8,850 cheaper per acre for natural landscaping than for turf grass approaches.
4. Maintenance cost savings range between $3,950 and $4,583 per acre per year over ten years for native landscaping approaches over turf grass approaches.
5. Better site design can reduce paving costs.
6. While conventional paving materials are less expensive than conservation alternatives, porous materials can help total development costs go down, sometimes as much as 30%, by reducing conveyance and detention needs.
7. Swale conveyance is cheaper than pipe systems, by some claims as much as 80%.
8. The literature is not clear enough to resolve the cost differences between discrete detention and retention tools by themselves.
9. Costs of retention or detention cannot be examined in isolation, but must instead be analyzed in combination with conveyance costs, at which point conservation methods generally have a cost advantage.
10. Green roofs are currently more expensive to install than standard roofs. Yet costs are highly variable and going down. Green roofs also have significant cost advantages when looking at life-cycle costs.
11. Several specific conservation tools can actually have multiple positive economic effects by themselves, both directly and indirectly.

Perhaps the most significant theme gleaned from the literature is that, by *combining* multiple tools, such as clustering

with native landscaping, bio-swales, and other practices, deeper cost savings can be achieved from the resulting opportunities to downsize the infrastructure. When techniques are applied together, the individual benefits of specific tools cannot be separated from the overall benefits of a complete site design, but the cumulative economic benefits of site design can be impressive. Across ten case studies examined here, holistic conservation design treatments saved an average of 36% over conventional practices.

Built-Site Cost Analysis

Built-site analyses provide case studies from the real world to complement the lessons from the literature research. By analyzing engineering data and construction costs from actual built projects, this report compared specific aspects of development costs more closely to find from where cost-savings are derived between conventional and conservation developments.

Mill Creek and Sunset Prairie are similar subdivisions in Kane County, Illinois. Sunset Prairie was built conventionally, whereas Mill Creek used several conservation practices. Based on the cost results, about $3,700 per foot was saved in the conservation development relative to the conventional approach. Approximately 53% of the savings came from stormwater management construction costs and 21% come from site preparation costs.

Three Bielinski Homes residential subdivisions from Southeastern Wisconsin were analyzed for their estimated conventional cost scenarios and for actual cost of conservation construction. Total cost savings ranged from $563,764 to $1,288,646 and averaged $876,913 across the three Wisconsin sites. Overall, every item in construction cost less under conservation development except for landscaping costs, which were higher in Auburn Hills and Laurel Springs. Overall site preparation saved 23 to 32% of conventional development costs when built with conservation techniques. Savings ranged from 47 to 69%, or about $2,500, to $3,300 per unit where vegetated swales or bioswales substituted for storm sewers.

At Prairie Crossing, in Grayslake, Illinois, cost savings generated from conservation development were found in several areas: stormwater management, curb and gutter, site paving, sidewalks, and landscaping. Conservation development savings were $3,798 per lot for construction.

Prior to construction of a conservation designed corporate campus, Tellabs, in Naperville, Illinois, compared costs between conservation and conventional scenarios on the same site. In this case, earthwork, stormwater management, and landscaping were the design components that drove most of the differences between conventional and conservation scenarios. Total savings for capital costs were $564,473, or just over 12 percent. Savings of site preparation from conservation development were as much as $214,500 (or $3,900 per acre) less than the conventional scenario, and the conservation design preserved six more acres with minimum disturbance. Integrated stormwater management and landscaping in conservation site design helped save money in the beginning because of the combined integrity present by concurrent installation of the bioswales, wetlands, and native landscaping.

Seattle's Street Edge Alternatives program used natural drainage systems in an urban residential retrofit context to allow infiltration and detention as part of their stormwater management system. Seattle's conservation streets cost $217,253 less than a conventional street would have on overall construction costs, which is equivalent to $329 savings per foot. Savings resulted from use of conservation alternatives for conveyance, detention, paving, and street design.

The largest cost savings across all built-site case studies were mainly derived from site preparation, stormwater management, site paving and sidewalks. Two conservation techniques appear to have the most direct and significant influence on cost savings: clustered site design and naturalized stormwater management systems.

Template Cost Analysis

These cost evaluations were prepared as a follow-up to the recent Blackberry Creek Watershed Alternative Futures Analysis project, where templates, or design models, were developed to illustrate the differences between conservation and conventional site design and stormwater management approaches. The templates were based on a hypothetical forty acre site in the Blackberry Creek Watershed in northern Illinois. This cost analysis compared the capital costs associated with developing a land parcel using a conservation design template versus a conventional one, using real unit-costs from the Midwestern development industry. The design templates were categorized by land use and reflected the same densities for both the conservation and conventional designs within each category. Conservation and conventional template costs were compared for four land-uses: moderate density residential, rural residential, estate residential, and commercial/industrial.

For a Moderate Density Residential land use, overall capital cost savings from conservation were 15% of conventional. The conventional form exhibited wide roads, no public open space, storm sewers, and turf detention basins, whereas the conservation template had narrow streets, integrated natural stormwater system, clustering and open space.

Rural Residential Development cost slightly less for the conservation alternative. The conventional form included cul-de-sacs, drained with traditional roadside swales and culverts into a detention basin. The conservation alternative had narrower drives, naturalized stormwater system, trails and open space.

The Estate Residential Conservation template saved 40% of conventional costs. Both had the same cul-de-sac pattern, lot lines, and open swale systems. In the conservation alternative, natural areas beyond the building footprint were preserved or restored, and driveways shortened.

The Commercial/Industrial alternatives were nearly equivalent, except for a "premium" conservation alternative, which added a green roof, thereby increasing costs over conventional. The conventional form was an auto-access strip mall with two single-story big box retail, isolated outlets, parking and detention. The conservation template also had big box retails, but in a "main street" retail setting with plaza, permeable paving and bioswales.

A majority of the conservation template designs are cost competitive or even more economical than the conventional forms. Plus, the land-uses show a general correlation where, as density decreases, the percentage of capital cost savings for conservation design increases. The largest potential cost savings are in stormwater management infrastructure.

Cumulative Discussion and Recommendations

By looking across all three analyses, a set of common conclusions can be offered. Perhaps most importantly, these results contradict the notion that conservation design is always more expensive than conventional practices. Not only do the three analyses show conservation is cost-competitive, but they also raise many situations where conservation methods can save the developer significant expense that translates directly to their bottom lines. In terms of overall approaches then, a gentle footprint on the land will reduce construction costs. Clustering and minimal site disturbance go a long way to cut infrastructure costs significantly, especially for stormwater management.

These conclusions call out for significant consideration of conservation development across the spectrum of development forms. Yet, even in the light of these conclusions, it is critical to point out that favorable cost comparisons are only one reason to consider conservation development. Ecological and social reasons should also be considered and, while not components of this study, they can complement and in some cases may even outweigh cost considerations.

Given the wide variety of conservation approaches that can be used in isolation or combination, the analyses reveal that there is a continuum of choices; in other words conservation design is not all or nothing. A spectrum of approaches and mixes of conservation tools can be considered for every budget and every site. BMPs, such as rain gardens and infiltration trenches, are more easily adapted to suburban and rural development sites. Tools such as porous pavements and green roofs may be more appropriate for urban sites, where land area is at a much greater premium and cannot be utilized economically for stormwater detention basins.

Further research work is needed on several fronts. The next steps should include:

- Gathering and analyzing information on operation and maintenance costs of conservation development, where possible, using life-cycle cost analyses as a method of comparison to conventional methods.
- Taking into account systematically both cost and effectiveness in future analyses of conservation design alternatives.
- Analyzing conservation development costs in a higher-density context where tools such as porous pavement and green roof are generally perceived to be more competitive.
- Conducting more economic benefit studies that can provide information on the economic values obtained by conservation development, as guidance for planning efforts.

Even where costs are competitive, incentives for conservation development should be offered by municipalities and governing agencies two reasons: 1) to help communities and developers overcome market inertia that can become entrenched, even when they have supporting information for change; 2) to enable financing mechanisms to pilot innovative approaches in new locations, especially as part of larger municipal stormwater management programs.

The project team recommends outreach and dialog with municipalities and developers. Use of the Internet could provide this cost information and new reports as they become available in the form of a clearinghouse for costs and benefits. Such a website could include a relational database that helps users tailor the information to their needs.