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Incremental Cost, Measurable Savings: Enterprise Green Communities Criteria

By Dana Bourland

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Principal Author

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Enterprise green communities
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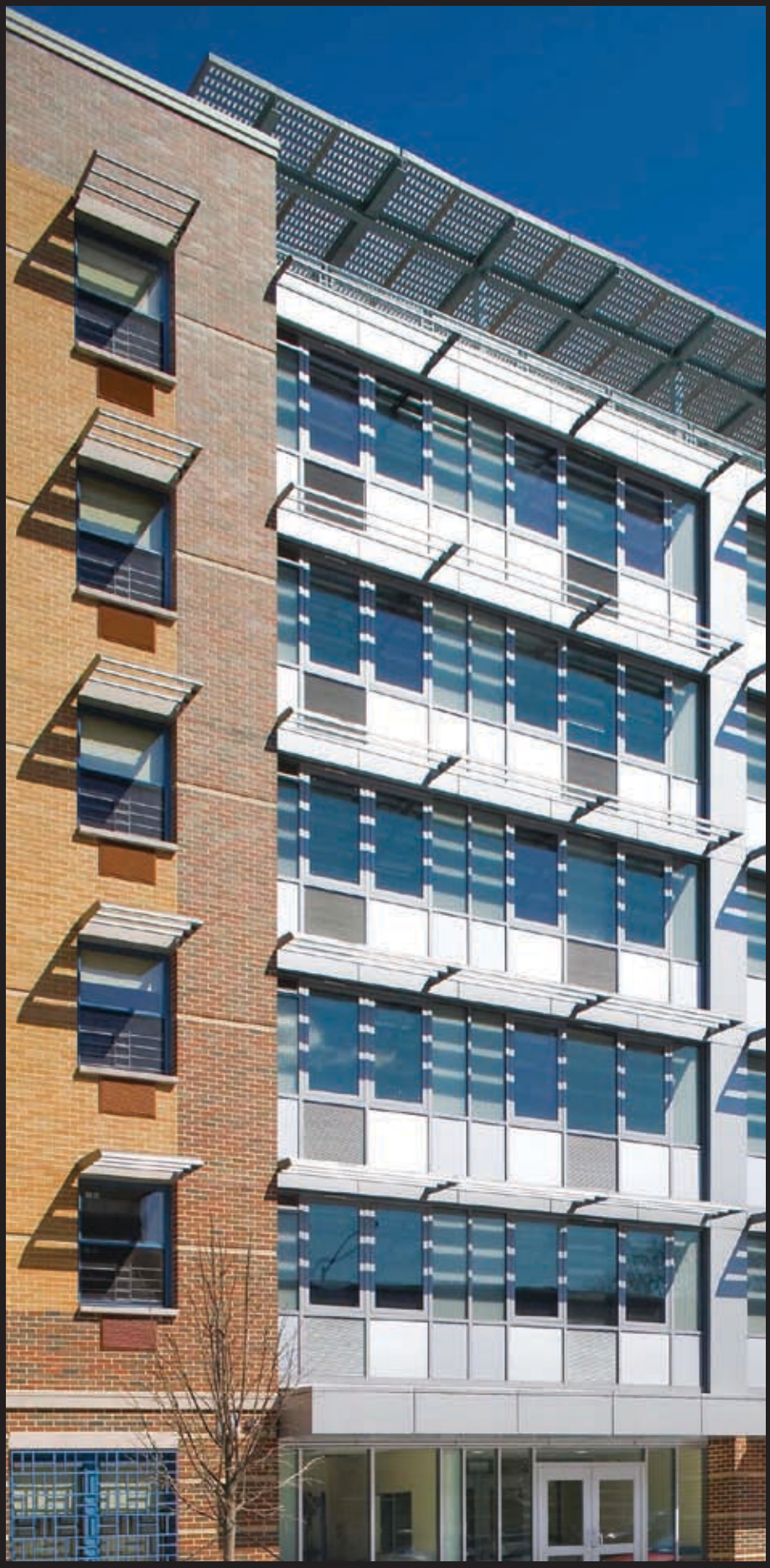
WITH THIS STUDY, WE KNOW THAT MEETING THE ENTERPRISE GREEN COMMUNITIES CRITERIA INVOLVES ONLY A 2 PERCENT INVESTMENT IN UPFRONT DEVELOPMENT COSTS — WHILE PROVIDING SIGNIFICANT LONG-TERM OPERATING COST SAVINGS AND SUBSTANTIAL HEALTH, ECONOMIC AND ENVIRONMENTAL BENEFITS.



David & Joyce Dinkins Gardens
Harlem, N.Y.

DEVELOPER: Harlem Congregations for Community Improvement and Jonathan Rose Companies

EXECUTIVE SUMMARY

Applying comprehensive green methods and materials to affordable housing developments invariably raises two hotly debated questions: 1) How much do these measures cost? and 2) Are these measures cost-effective? In-depth answers to both questions are now available from Enterprise Community Partners. This report shares findings from our evaluation of 27 affordable housing developments across the United States that meet the Enterprise Green Communities Criteria.

From a strictly financial standpoint, the projected "lifetime" utility cost savings—averaging $4,851 per dwelling unit discounted to today's dollars—are sufficient to repay the average $4,524 per-unit cost of complying with the Enterprise Green Communities Criteria.

In summary, estimated lifetime savings exceed the initial costs of incorporating the Enterprise Green Communities Criteria into affordable housing.

Integrating the required Criteria can also produce substantial increases in residents' quality of life. Developers of the 27 projects discussed in this report found it financially feasible to meet the Criteria, which go beyond energy and water conservation measures to include requirements that advance quality of life, such as:

- Promoting smart growth by choosing sites near public transit and community amenities, while avoiding sprawl, disturbance of wetlands and "leapfrog" development into greenfields.
- Using healthier materials such as the Carpet and Rug Institute's Green Label carpets, as well as paints and adhesives with no or low percentages of volatile organic compounds (VOCs).
- Ensuring better indoor air quality by directly venting kitchen stoves and bath areas to the outdoors, and using other methods to re-supply fresh air and reduce the potential for moisture infiltration, which could lead to possible mold growth and negative effects on residents' health.

While this report focuses on the cost-effectiveness of meeting the Enterprise Green Communities Criteria, forthcoming reports will examine the Criteria's impact on carbon reductions and improved health of residents. For example, through our experience with the Enterprise Green Communities Offset Fund, we calculated that, on average, the housing units studied will cut 2 tons of CO_2 emissions annually, compared to homes that only meet local building code standards.

Enterprise Green Communities

A national leader in investment capital and development solutions for affordable housing and community revitalization, Enterprise has invested more than $10 billion since 1982 to help finance more than 250,000 affordable homes in communities across the nation. Enterprise launched the Green Communities initiative in 2004, building on more than two decades of creating decent, quality, affordable homes and communities for low-income families.

To measure the impact of the Green Communities Criteria, Enterprise developed a survey and obtained data points on costs and utility cost savings from 27 housing development projects with a total of 1,640 single- and multi-family homes. This represents a quantifiable sample of the nearly 16,000 estimated units in 360 housing development projects that have complied with the Criteria. Enterprise will continue to actively collect data from all Green Communities projects, and plans to regularly release similar evaluation reports as projects are constructed and placed in service for at least one year.

Achieving full compliance with the Enterprise Green Communities Criteria requires housing developers to implement mandatory and a required number of optional criteria. Our evaluation calculated the additional costs and utility cost savings that resulted from applying 38 mandatory criteria and 13 optional criteria in the 2005 version of the Green Communities Criteria (available in the Appendices).

Meeting the Enterprise Green Communities Criteria yields striking savings in utility costs, especially when compared to the cost of implementing the Criteria's energy and water conservation measures. These savings make the cost of implementing the Criteria ($4,524) financially attractive. When considering the benefits

revealed in our study, the average cost per dwelling unit to incorporate the energy and water criteria was $1,917, returning $4,851 in predicted lifetime utility cost savings (discounted to 2009 dollars).

In other words, the energy and water conservation measures not only paid for themselves but also produced another $2,900 in projected lifetime savings per unit.

Moreover, water cost savings shared in this report are almost certainly underreported, given that we were unable to obtain complete data on sewer fee savings, which are a direct result of water-conservation measures.

Measures in the Criteria that do not have easily identifiable financial savings, but undoubted indirect financial benefit, include (though are not limited to) the integrated design process, ensuring a healthy living environment, reducing construction waste and providing operations and maintenance manuals. In fact, tradeoffs between cost expenditures and financial savings underscore the importance of executing an integrated design approach. Focusing on the design elements, such as orientation of the housing, location of the windows and optimization of daylight into the housing, can lead to less expensive mechanical and electrical system purchases, allowing room in the budget for other measures such as healthier building materials.

Our calculation of lifetime savings took into account the useful life of various improvements, anticipated increases in energy and water/sewer costs of nearly 5 percent, and a present value discount factor of 6 percent to express utility cost savings in 2009 dollars. The predicted savings from actual usage were based on a subset of 10 projects for which Enterprise had access to utility usage data for a one-year period.

How Utility Cost Savings Were Achieved

Implementing the following conservation measures produced dramatic utility cost savings:

- Building to Energy Star standards or better
- Installing all energy improvements with a 10-year or better payback for moderate rehabilitation projects
- Installing Energy Star appliances
- Installing Energy Star lighting
- Individually metering electricity for rental dwelling units (except supportive housing) to encourage conservation
- Installing water-conserving appliances and fixtures

The return on the subsidized investment of installing photovoltaic (PV) panels was a most impressive 194 percent per year. It should be noted, however, that the cost of installing photovoltaic (PV) panels to provide at least 10 percent of a project's estimated electricity demand—an optional Green Communities criterion—was not found to be cost-effective, unless subsidies made this measure feasible. For the particular project that both installed PV panels and reported actual energy usage data, the average return on the cash investment was only 3 percent when subsidies were not taken into account. Until the production and installation costs of renewable energy technologies decline, it is widely recognized that subsidies are needed to make PV panels a cost-effective proposition for developers and building owners.

The costs of adhering to the Green Communities Criteria were self-reported by project developers. The "premium" was defined as the cost increment of implementing a Green Communities criterion versus following local codes and previous development practices that may have exceeded code requirements. On the next page, Tables 1.1 and 1.2 illustrate the study's findings on these costs and financial cost savings.

TABLE 1.1

Costs of Meeting Green Communities Criteria

	Average Cost of Meeting Green Communities Criteria (27 projects)	Average Cost of Meeting Optional Renewable Energy Criteria Only (9 projects)
Green premium per ownership/rental unit	$4,524	$3,074
Green premium per square foot	$4.52	$3.22
Percent added to total development cost	2.1%	0.5%

TABLE 1.2

Actual Lifetime Savings from Meeting Green Communities Criteria

	Actual Average Lifetime Savings from Energy and Water Conservation Measures (10 projects)[1]	Actual Average Lifetime Savings from Optional Renewable Energy Criteria Only (1 project)
Utility savings per home/rental unit	$4,851	$5,034
Utility savings per square foot	$5.43	$5.17
Internal rate of return	17%	3%
Simple payback period (years)	8	40

[1] Ten of the 27 projects provided energy utility data; of those, eight provided actual water billing data. An additional two projects of the 27 also provided water billing data but not energy utility data.

Benefits of Tracking Utility Usage and Costs

Many affordable housing developers do not routinely track the costs and benefits associated with going green and therefore found it difficult to provide the data we requested. This was particularly true for tracking electricity, gas and water usage, whether paid for by residents, owners or property managers of rental housing. It appears that many homeowners and rental property managers pay these bills without knowing if their usage is above average, normal or below average when compared to local norms.

Accordingly, it is logical to assume that green building and property management practices would be more widely adopted and valued if property owners and residents paid greater attention to their energy usage. This would require tracking utility costs periodically and increased awareness of building features and habitual practices that influence utility costs. If rental property managers periodically tracked utility use by dwelling units, they would be more likely to identify under-performing HVAC and other building systems. Depending on the reason(s) for the low performance, property managers could make improvements and/or encourage residents to adopt conservation measures.

Additional Key Findings

- Project developers reported many instances of implementing individual Green Communities Criteria with no cost premium over their normal construction practices. These reports of zero additional costs were included to determine the weighted average costs for the mandatory criteria. We believe this non-reporting of cost premiums is explained by the large proportion of sampled projects located in cities and states with previously established green building standards. For example, six of the projects located in Oregon and Washington state reported no cost premiums for meeting the Enterprise Green Communities Criteria.
- Larger and more prevalent cost premiums were associated with providing adequate ventilation and improving energy efficiency, as well as installing Carpet and Rug Institute Green Label carpeting.
- On average, negligible cost premiums were reported for selecting "smart sites" for affordable housing that were located near public services and transportation, and minimized sprawling development of greenfields on the outskirts of developed areas. However, this finding may partly reflect the difficulty of quantifying land cost premiums.
- With respect to water-conserving irrigation methods, low-tech roof-water harvesting systems yielded modest costs, on average, while potentially offering significant future savings as described in this report.
- Integrating the Enterprise Green Communities Criteria has far-reaching environmental benefits—namely, the annual reduction of carbon emissions. In developing the Enterprise Green Communities Offset Fund, we calculated that, on average, the Green Communities homeownership and rental units studied would cut 2 tons of CO_2 emissions annually, compared to homes meeting local building code standards below the Green Communities Criteria.
- In all categories of occupancy, the per-unit costs of compliance were remarkably similar, while predicted utility cost savings varied considerably. The 15 supportive housing projects in our survey had the highest predicted lifetime savings, while the three projects with for-sale homes had the lowest. Based on our extensive experience with supportive housing developers, we presume that these developers paid careful attention to compliance to improve residents' health and reduce energy costs, most of which are paid by the supportive housing property owners.

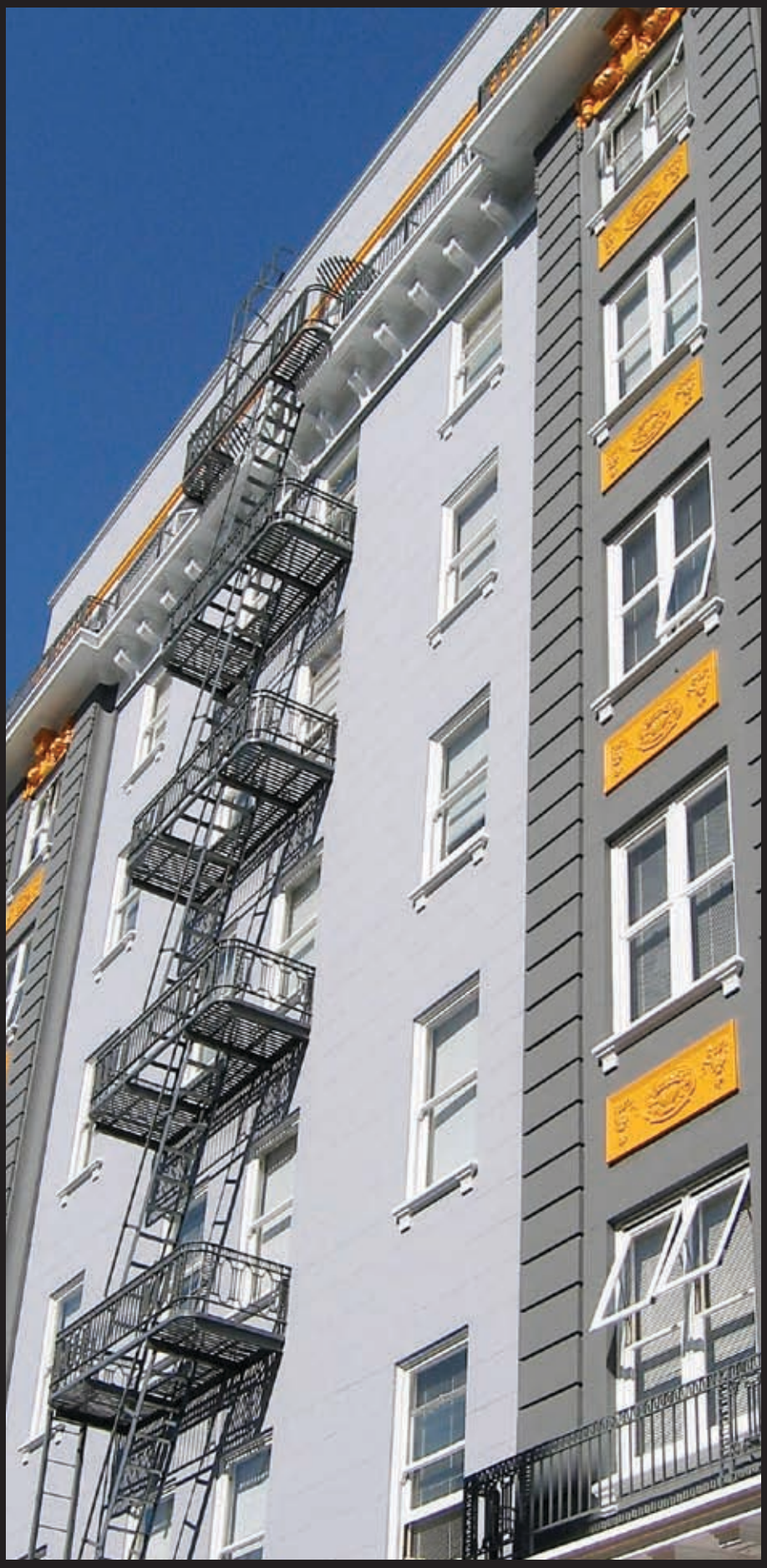
- By far, the study's three for-sale homes had the lowest predicted lifetime utility cost savings. This is likely the result of energy and water conservation measures already in place by builders, who reported an average incremental cost of only $1,137 for those features. This amount was then projected to yield $2,878 in lifetime utility cost savings—more than two and a half times the investment.
- The incremental cost of incorporating the Enterprise Green Communities Criteria was lowest among moderate rehabilitation projects—a fact that we attribute to the Criteria's ability to adapt to the realities of partially rehabilitated single- and multifamily homes. The predicted lifetime savings for these projects are now two times the reported incremental costs of complying with the Criteria, giving moderate-rehab projects the highest return on investment of any subset of the 27 projects we surveyed.
- Substantial rehabilitation projects had the highest cost premium for compliance. At the same time, these developments are projected to have remarkably high lifetime utility cost savings.
- One of the study's surprise findings involves the predicted lifetime savings for new construction projects, which were 23 percent lower than the average of all projects combined. Since our analysis does not reveal any specific reasons for this finding, we conjecture that new home developers had previously used relatively high standards for energy and water conservation measures and/or had to meet higher construction standards. In other words, there is strong evidence that starting from a higher baseline reduces the expected incremental lifetime savings.

Overview of the Report

This study is presented in two parts. The first part includes background on the study, an analysis of the Green Communities Criteria's financial benefits, and implications for future policy and practice. The second part, the Technical Report, describes how and why specific Green Communities Criteria are incorporated into development projects and provides detailed findings on the average costs to implement each criterion.

We hope that the study's information and analysis will help affordable housing professionals better understand the cost-effectiveness of meeting the holistic measures included in the Green Communities Criteria. Ultimately, Enterprise seeks to encourage more widespread adoption of the Criteria toward inspiring a national commitment to delivering the health, economic and environmental benefits that can be realized by greening all affordable homes.

TRULY AFFORDABLE GREEN HOUSING, EVEN FOR VERY LOW-INCOME RESIDENTS, CAN BE DEVELOPED AT A COST NOT SIGNIFICANTLY DIFFERENT FROM THAT OF CONVENTIONAL DESIGN.



The Essex
San Francisco, Calif.

DEVELOPERS: Mercy Housing California and Community Housing Partnership

SECTION 2

BACKGROUND ON STUDY

Despite recent declines in home prices, the nation faces a huge shortfall of decent, affordable housing. Currently, there is not a single county in the United States where an individual earning minimum wage can afford to rent a market-rate apartment, according to the National Low Income Housing Coalition. Nationwide, an estimated 55 million Americans live in unaffordable, overcrowded or substandard housing. Moreover, much of our existing subsidized housing stock—not to mention market-rate housing—has hidden costs for residents, rental property owners and the planet. The typical affordable single- or multifamily home wastes energy and water, unnecessarily adding to household costs. The location of many housing developments—situated far from public transportation options and existing city, town or village centers—contributes to greenhouse gas emissions.

Mounting evidence also links building conditions to public health issues, underscoring how the location of housing and site amenities can encourage more active, healthy lifestyles. The U.S. Centers for Disease Control and Prevention reports that low-income people endure the highest rates of asthma, with many known and suspected triggers linked to home conditions, including mold and dampness, which account for 21 percent of all asthma cases.

To encourage housing solutions that promote health, economic and environmental benefits, Enterprise Community Partners launched the Green Communities initiative in 2004 in partnership with the Natural Resources Defense Council (NRDC). We brought together community development and environmental professionals to create green building guidelines for affordable housing. All of the participants agreed that the guidelines must accomplish the following:

- Result in high-quality, healthy living environments
- Reduce utility and maintenance costs associated with single- and multifamily housing
- Enhance residents' connection to nature and promote more active lifestyles
- Protect the environment by conserving energy, water, materials and other resources
- Advance the health of local and regional ecosystems by reducing negative impacts on air quality, wetlands, waterways and undeveloped land
- Reduce global warming impact and depletion of natural resources

Guided by these principles, the Enterprise Green Communities Criteria were drafted by environmental and green building experts, and introduced in January 2005. Partner organizations assisting Enterprise in the development and promotion of the Criteria included NRDC, the American Institute of Architects, the American Planning Association, the National Center for Healthy Housing, Southface, Global Green, the Center for Maximum Potential Building Systems and the U.S. Green Building Council.

The Enterprise Green Communities Criteria are organized into eight categories:

1. Integrated Design
2. Location and Neighborhood Fabric
3. Site Improvements
4. Water Conservation
5. Energy Efficiency
6. Building Materials Beneficial to the Environment
7. Healthy Living Environment
8. Operations and Maintenance

The Enterprise Green Communities Criteria are the nation's most widely adopted comprehensive green affordable housing framework. The Criteria were developed with the goal of creating a holistic approach to delivering significant health, economic and environmental benefits to residents, owners and low-income communities. Enterprise and its partners sought to offer proven, cost-effective green building methods and materials for developers that could be integrated during the design and construction process.

At the time, many affordable housing developers were philosophically inclined to adopt green building standards but viewed additional costs as an unknown quantity that could jeopardize the financial feasibility of new or rehabilitated affordable housing. This concern persists among some affordable housing developers today.

Enterprise Green Communities

Based on earlier research by Tellus and New Ecology, along with Greg Kats's 2003 report, *Green Building Costs and Financial Benefits*, Enterprise estimated that the cost of complying with the Green Communities Criteria would add 2 to 4 percent to the total costs of developing typical affordable housing. Enterprise also believed that those additional first costs would have an associated payback because of reduced operating expenses related to energy and water conservation measures. Therefore, the initiative's guiding principles sought to ensure that Green Communities housing developments should be cost-effective to build, durable, and practical to maintain, while offering long-term financial savings.

The Criteria were also intended to provide a holistic threshold, within reach of all developers, from those with very little or no green building experience to the most seasoned green builders. This led to a prescriptive approach of predominantly mandatory measures based on national reference standards and proven methods and materials. But because the Criteria were developed to be flexible enough for use in all markets across the country, some measures with significant regional variances, such as those involving the availability and cost of certain materials, were made optional.

To comply with the Criteria, a project must meet each mandatory measure and acquire at least 25 optional points (see Green Communities Criteria Checklist at www.greencommunitiesonline.org). The Criteria include 38 mandatory measures and 13 optional ones. Optional measures offer an opportunity to acquire a total of 125 points. Each optional criterion includes a range of points based on the extent to which the criterion is pursued. For example, one optional measure relates to renewable energy. Developers can acquire a range of points, depending on the percent of the building's overall electricity demand that is met with energy from the renewable source.

When devising the Criteria, Enterprise and its partners made a deep commitment to ensuring that their guidelines delivered housing with significant health benefits. A 2007 survey by Robert Charles Lesser & Co. asked buyers about their attitudes toward green building, and their motivation and willingness to pay for green homes. Forty-one percent of respondents reported that they cared about and were willing to pay for the health and wellness measures in a green building, even if the costs were not recoverable. That result compares with 18 percent of respondents willing to pay for energy savings and 24 percent willing to cover costs relating to protecting the environment.

Another study emphasizing the importance of health measures in green affordable housing was completed by the National Center for Healthy Housing (NCHH) in 2008. The study compared four national green building programs: Enterprise Green Communities, the National Association of Home Builders' Green Home Building Guidelines, the U.S. Environmental Protection Agency's Energy Star with Indoor Air Package, and the U.S. Green Building Council's LEED for Homes.

NCHH compared each program to a detailed list of healthy home measures based on its own seven healthy homes principles. Those principles involve keeping homes dry, clean, ventilated, safe, contaminant-free, pest-free and maintained. Enterprise Green Communities ranked highest among the programs in the analysis, largely due to the fact that the Green Communities Criteria include many mandatory measures for indoor environments.

Evolution of the Green Communities Criteria

Since their introduction in 2005, the Criteria have been revised twice, in 2006 and 2008. For the purposes of this evaluation, Enterprise used the 2005 version of the Criteria, since most of the verified data obtained to date came from the early set of projects designed to conform to the 2005 version. The housing developments that enrolled in Enterprise's evaluation committed to apply all 38 mandatory measures and enough of the 13 optional measures of the Criteria's 2005 version to reach a required score. Enterprise required new construction projects to earn 25 points from the optional criteria; moderate-rehabilitation projects were required to earn 15 points from the optional criteria.

The Enterprise Green Communities Criteria are applicable to new construction projects, substantial-to-moderate rehabilitation projects and all housing types. Substantial rehabilitation projects are expected to meet all of the Criteria for new construction, but the Criteria are modified for moderate-rehabilitation projects, as described in the Technical Report.

One of the major differences for moderate-rehabilitation projects involves the energy conservation criteria. New construction and substantial rehabilitation projects must either meet Energy Star requirements, achieve a HERS design score of 86 or lower, or exceed ASHRAE 90.1 energy standards by 30 percent. In comparison, the 2005 version of the Green Communities Criteria required moderate-rehabilitation projects to conduct an energy analysis of the existing building and incorporate all energy conservation measures with a simple payback of 10 years or less. (In the 2006 and 2008 versions of the Criteria, rehabilitation projects must identify cost-effective energy improvements by preparing an energy improvement report and implementing measures that improve the building's energy performance by 15 percent.)

The current (2008) version of the Criteria gives developers more options for achieving the required minimum score, aligns more closely with the LEED for Homes rating system, includes clarifying language related to intended methods of meeting the Criteria, and references the newest Energy Star for Homes standard. It includes 40 mandatory criteria and 23 optional criteria.

The Enterprise Green Communities Criteria have been fully adopted by the following government entities: the U.S. Department of Housing and Urban Development (HUD), with regard to certain funding for public housing authorities; the states of Minnesota, Washington and Iowa; the cities of San Francisco, Cleveland, Miami and Denver; and the District of Columbia. In addition, 40 housing finance agencies have adopted portions of the Green Communities Criteria as part of their scoring systems for allocating Low-Income Housing Tax Credits.

TABLE 2.1

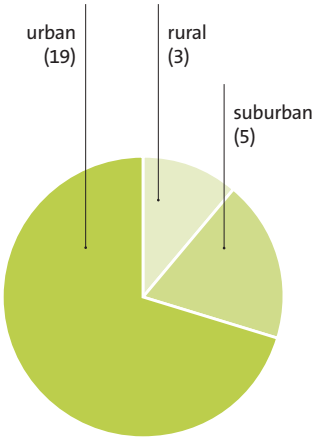
Characteristics of 27 Projects Included in Report

Project Information

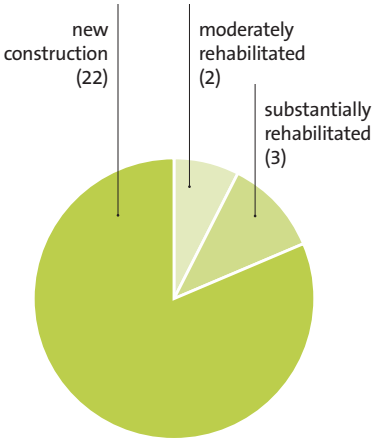
Average Unit Number per Project: 58 units
Average Unit Size: 1,001 sq. ft.

	Projects
Building Type	
Single-family	3
Clustered townhomes	6
Mid-rise (less than 4 stories)	6
High-rise (4–10 stories)	12
Year Completed	
2010	1
2009	7
2008	5
2007	9
2006	5
Geographic Location	
California	6
Colorado	2
District of Columbia	1
Massachusetts	1
Michigan	2
Minnesota	4
New Jersey	1
New Mexico	1
New York	2
Oregon	1
Pennsylvania	1
Texas	1
Virginia	1
Washington	2
Wisconsin	1

Location



Construction Type



Property Type

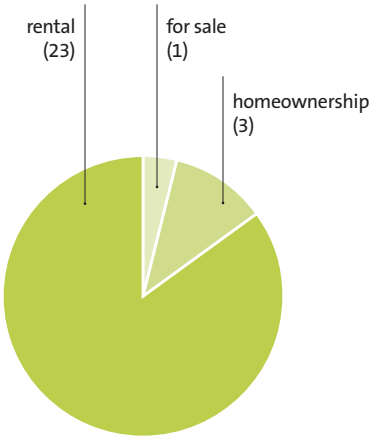
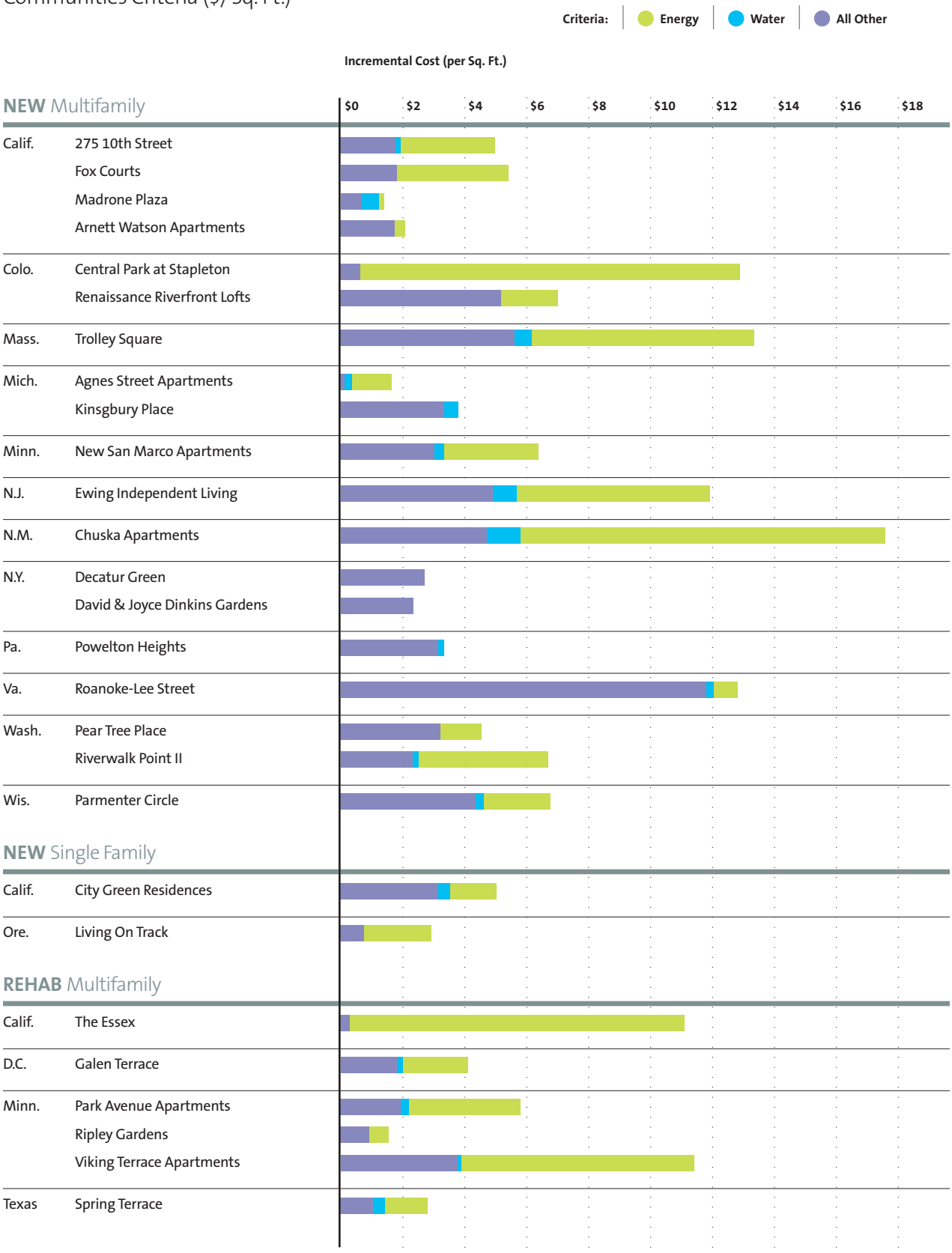


TABLE 2.2

Incremental Cost to Meet Enterprise Green Communities Criteria ($/Sq. Ft.)



Methodology

Our survey universe is composed of certain projects that have received Enterprise Green Communities grants, and agreed to report the costs and benefits of complying with the Green Communities Criteria. All grants were conditioned upon compliance with the Green Communities Criteria; submission of documentation outlining compliance measures; and agreement to report incremental design and construction costs, and utility usage and cost savings.

Many grantees reported extensive project data on our cost-benefit survey form and signed a release permitting the Enterprise survey team to obtain actual utility usage and cost data directly from utility companies for a project's first year of full operations. For each participating developer, a total of $3,000 in grant funds—out of grant amounts up to $50,000—were earmarked to offset the costs of reporting. Enterprise offered an additional $500 bonus to encourage developers to provide data by a specified time.

Once construction documents were completed, Enterprise used a two-step process to verify that projects incorporated all of the required Criteria. First, the developer was required to submit a certification of compliance signed by the project's green design specialist, architect and project sponsor. These certification forms described the methods (and in some cases materials) that would be used to achieve compliance with particular Green Communities Criteria. Second, Enterprise staff and consultants reviewed these certifications to confirm compliance.

For the purposes of both Green Communities and this survey, Enterprise determined compliance with the Green Communities Criteria for each project at the construction documents stage and did not require construction inspections or testing. Green Communities was designed to reduce the internal and third-party costs of compliance for developers—an approach that Enterprise presumed would lead to wider Criteria adoption. On a sampling basis, Enterprise incurs the cost to contract with a third party to visit completed projects and verify compliance.

Performance Systems Development (PSD), a third-party consultant, compiled and analyzed the data from the surveys. While a total of 53 grantees provided data, only 42 submissions were completed. Certain anomalies in data reporting—e.g., failure to provide cost data—forced Enterprise to eliminate several projects from the survey universe, leaving a total of 27 projects.

PSD calculated the predicted long-term energy and water usage, utility costs and utility cost savings resulting from applying the Criteria for 27 projects that provided complete submissions. The baseline for calculating utility usage, costs and savings for each model was a theoretical model—namely, a development built to the minimum construction code requirements of that locality. When this analysis was completed, PSD was able to predict utility usage and cost savings for each of the 27 projects.

In addition, Enterprise and PSD were able to obtain actual energy usage data from 10 projects that had been in service for at least one year. This data was normalized to project future yearly usage, costs and savings by adjusting for heating and cooling during the 12 months for which data was collected. From this smaller survey universe, PSD was able to more accurately predict future energy usage. Actual water usage data was obtained from seven projects that provided complete cost-benefit survey forms. Projections from these smaller survey samples appear in this report, in addition to the predicted usage and savings for the primary survey universe of 27 projects.

Enterprise staff and consultants then analyzed the data to produce the conclusions and tables in this report. Assumptions used to calculate "lifetime" utility cost savings, simple payback and internal rate of return are described in the Financial Benefits section of this report.

Lessons Learned

This evaluation effort has revealed a few very important yet simple conclusions.

- Tracking the costs of green measures is **not standard practice**.
- Tracking the cost-effectiveness of green measures is **not standard practice**.
- The Enterprise Green Communities Criteria **are cost-effective**.

Tracking Costs

Enterprise has always sought to ensure that our commitment to Green Communities would deliver significant health, economic and environmental benefits without compromising affordability. This report exposes some of the challenges that lie ahead as we continue our effort to benchmark performance, and measure and monitor improvements based on integrated design, construction, rehabilitation, operations and maintenance of green methods and materials. Now that we have a tool for uniformly collecting data upfront, we can work with our housing development partners to find better ways to capture this data as a matter of course.

Enterprise is currently including relevant parts of the survey tool in our green development plan template. Understanding the costs and associated lifetime savings will inform our decisions and help transfer knowledge across the affordable housing sector as data on the cost-effectiveness of green methods and materials becomes more widely shared. Even with a mandatory requirement for establishing both a green development plan and an integrated design process, the developers participating in our survey did not routinely track the costs of green measures. Determining the average cost of meeting the Criteria ($4,524) is significant, given the difficulty in acquiring this level of data from survey participants.

Tracking Cost-Effectiveness

Putting costs aside, we found that our development partners in this effort did not have established systems for measuring and monitoring the results of their investments in energy and water conservation. It was difficult to obtain the energy modeling work reportedly completed during the design phase. This was due in part to staff turnover and to a reliance on engineering consultants who may have only shared outputs from energy models in terms of recommending systems or requirements for windows and insulation values. If circumstances changed after modeling was completed, such as the number of residents actually living in the building, then the building's expected energy performance would no longer be known.

In most cases, we found that it was not common practice to complete post-construction assessments (for example, testing proper functioning of mechanical systems or adequately sealed ducts), regardless of who was paying for utilities. Enterprise hired a third party to complete post-construction audits of 20 projects; this consultant found higher-than-expected duct leakage in 10 projects. The leakage can be both more difficult and more costly to correct after construction is complete. In two projects, the residents had been the first to notify the property manager about the leakage because they experienced drafts and discomfort in their apartments and were turning up the thermostats to compensate.

We recommend that a local building performance specialist be hired on a routine basis to perform air sealing. Another strategy for eliminating discrepancies like this is to both complete the preliminary energy modeling report and to inform design and post-construction assessments.

An important component of this evaluation effort is verifying that expected energy and water savings are actually realized. As such, Enterprise reached out to numerous utility companies across

the country to collect energy and water consumption data in order to conduct a comparative analysis of predicted versus actual usage. We quickly learned that this is not an easy process. Energy usage data tracked by utility companies is not as readily available to building owners and third-party entities. This information is useful for improving energy efficiency and water conservation programs. We found that many utilities require additional permissions beyond what was originally secured by project sponsors who had completed our Utility Release Form. This release form enabled Enterprise to collect common area water and energy usage only, and would not authorize the release of tenant usage.

As a result, Enterprise worked closely with project managers to collect resident consent from a sample of units within select properties to access usage data from local utilities. We have since revised our form to address privacy concerns (see Appendix E for Utility Release Form); the new version includes a request for release forms from 15 percent of all units within a property. Owners have informed us that the best time to collect tenant release forms is during tenant lease-up. Moving forward, Enterprise will focus on creating easier access to utility data that can be understood and used to measure energy and water consumption against expected performance.

Other Lessons

This evaluation effort has led Enterprise to fully understand the importance of integrating green measures into the design process early. This ensures that all agreed-upon measures are appropriately documented in the plans and specifications, and follow an intentional, rigorous commissioning process to guarantee, for example, that insulation is installed properly, ducts are tightly sealed and water fixtures have the right flow rates. A well-established and ongoing integrated design process appears to deliver significant benefits. During the integrated design process, informed and innovative decision-making can help determine how to meet the green goals of the project, and who should champion which measures to ensure that they are integrated into the completed building. We found that when measures required in the Criteria are included in the plans and specifications of a project, 95 percent of the time those measures would be installed in the building.

In the early years of Green Communities, Enterprise placed a heavy emphasis on integrated design. While we continue to value the importance of an integrated design approach, we are now equally, if not more, focused on the commissioning, performance measurement, and testing necessary to realize the expected benefits. To earn back the initial upfront investment of $4,524 in green measures, we must know which financial cost savings we expect to achieve, and monitor the utility bills to make sure they are being realized.

Throughout the entire lifetime of the housing, we must also pay careful attention to routine performance testing. This entails engaging residents and homeowners in the green goals of the housing project. Residents can play a critical role by exercising proper maintenance and conservation practices, as well as by maintaining a healthy living environment through the use of non-toxic cleaning supplies and other best practices (see information resource for a Template for Healthy Home Guide for Residents in Appendix F).

Extending the integrated design process into the asset management of the building is essential. This entails engaging the professionals responsible for operating and maintaining the building as well as those working in the building. It is critical that everyone understands the green goals that were designed into the building and their respective roles in achieving expected performance levels as well as finding new opportunities for introducing additional green elements into the building.

DEVELOPMENT PROJECTS THAT MET OR EXCEEDED THE WATER-EFFICIENCY CRITERIA ARE ACHIEVING A $935-PER-UNIT LIFETIME SAVINGS OVER A 15-YEAR PERIOD, ALMOST THREE TIMES THE PREDICTED SAVINGS.

Ripley Gardens
Minneapolis, Minn.

DEVELOPER: Aeon

FINANCIAL BENEFITS

We measured the financial benefits of incorporating the Enterprise Green Communities Criteria—in terms of utility cost reductions—using three different methods:

- Simple payback—the estimated number of years of utility cost savings required to pay back the initial incremental costs of the green improvements
- Lifetime utility cost reductions—an estimate of the present value of future savings
- Internal rate of return (IRR)—the percentage return on investment in energy- and water-saving improvements, represented by the estimated future utility cost savings

Estimating Incremental Costs of Conservation Measures

All of the methods on the previous page require an accurate estimate or accounting of the incremental cost of each energy or water conservation measure. For the findings in this report, we relied on project developers to provide estimates of incremental costs, defining these as the additional costs incurred in adopting a particular criterion above the cost of what the developer otherwise would have installed. For example, we asked developers to estimate the incremental cost of installing water-conserving appliances and plumbing fixtures, as compared to appliances and fixtures that would otherwise have been specified.

Sixteen of the study's 27 developers reported additional costs because incorporating these Green Communities measures led to an upgrade of the features they normally would have installed. Eleven developers reported no additional costs, presumably because they were already installing fixtures that met Green Communities measures or were able to obtain these upgraded fixtures at no extra cost.

To determine average costs of the mandatory criteria, such as the one above, the estimated incremental cost per unit is the weighted average cost of the 27 projects reporting predicted results, including those for which the reported incremental cost was zero. For each of the optional criteria, we calculated the weighted average cost incurred only by those projects that opted to incorporate that criterion.

Estimated and Actual Utility Cost Savings

To estimate future utility cost savings, we used building plans and specifications to calculate average annual energy and water usage resulting from complying with particular criteria, compared to a benchmark for each project.

The benchmark usage assumed that the previous standards of the developer or federal or local codes were applied. For example, two water usage calculations were made for the 27 projects, one assuming the same development designed to include water fixtures and appliances in compliance with EPA federal requirements, the second assuming specifications for water-conserving appliance fixtures required by the Green Communities Criteria. Then, using current or recent energy, water and sewer rates for each project, we calculated annual expenses in both scenarios—the difference, of course, being the predicted savings resulting from incorporating a particular criterion.

From a smaller universe of the 27 projects, we were able to obtain actual energy and water usage and costs for one full year of operations. It was not within this report's scope to ascribe the gross savings resulting from energy conservation measures to individual Green Communities Criteria. The predicted savings from actual usage data resulting from water conservation measures were all due to the installation of water-conserving appliances and fixtures (criterion 4.1), since we collected water usage data only for interior water usage.

Simple Payback

The simple payback method of estimating financial benefits is useful for individuals who are not accustomed to "present value" financial analysis. It provides an easily understood estimate of financial benefits, but it is not well-suited for forecasting benefits precisely and making investment decisions. Unlike the lifetime savings and internal rate of return methods, it does not account for the useful life span of the improvements or the cost of capital used to finance the improvements. In addition, this method uses only the first year's estimated utility savings, without accounting for inflation of energy and water costs. (Because of the differences in methodology, the simple payback numbers in this report cannot be determined by dividing lifetime savings by the upfront costs.)

Simple payback calculations are useful, up to a point. Conservation measures with short payback periods—for example, five years or less—are typically good investments, because the useful life spans of almost all building components are at least 10 years, and the simple payback is 20 percent or more annually, which is far greater than the usual cost of capital to finance affordable housing projects. On the other hand, a more detailed analysis is required to decide whether measures with long payback periods are sound investments.

Using data from the 27 projects that reported predicted results, the simple payback associated with both criteria 5.1 and 5.5 (efficient energy use investments) was seven years. The simple paybacks of the 5.2 Energy Star appliance and 5.3 energy-efficient lighting investments occurred over an even shorter time frame—four years and three years, respectively.

On average, for the Efficient Energy Use, Energy Star Appliances and Efficient Lighting criteria combined, a six-year payback of the incremental costs was predicted for all 27 projects in our survey universe.

However, the 10 projects that provide actual energy use data show an average payback period of nine years. We predicted that optional criterion 5.6 (renewable energy) would achieve payback within 40 years without subsidy, or two years with subsidy. Currently, projects that reported actual results had on average a 40-year payback without a subsidy, and just a one-year payback with subsidy. We believe the latter result is atypical because of the major subsidies provided to these particular projects for installing renewable energy features.

We anticipate that this figure will change as more projects report data.

The investment in interior water efficiency (criterion 4.1) was predicted to be paid back within three years, based on the 27 projects that reported predicted results. To date, the actual results show a two-year payback period, based on reporting from the seven projects that met or exceeded the water-efficiency criteria.

Lifetime Savings

For this report, the first step in analyzing lifetime savings was to calculate both predicted and actual annual energy and water savings. We then projected a 5 percent annual increase in energy expenses and a 4.7 percent annual increase in water and sewer fees. The predicted inflation of energy costs was based on the average annual increase in the consumer price index for all urban consumers (CPI-U) for natural gas and electricity costs over the past 10 years, as reported by the U.S. Bureau of Labor Statistics. The predicted increase in water and sewer maintenance fees was also based on the average annual increase in the CPI-U over the past 10 years.

Table 3.1 on the following page illustrates the assumed useful life of energy conservation measures.

TABLE 3.1

Assumed Useful Life of Energy Conservation Measures

Criterion Number / Description		Assumed Useful Life
5.1	Efficient energy use[1]	25 years
5.2	Energy Star appliances	15 years
5.3	Efficient lighting	12 years
5.4	Individual electricity meters	N/A
5.5	Additional reductions in energy use	Case-by-case basis
5.1–5.5	Mandatory criteria plus optional 5.5	Weighted average of amounts above
5.6	Photovoltaic (PV) panels	20 years
4.1	Water-conserving appliances and fixtures	15 years

[1] Efficient Energy Use as defined in the Green Communities Criteria includes meeting Energy Star standards, achieving a Home Energy Rating System design score of 86, exceeding ASHRAE 90.1 by 30 percent or meeting the local energy code, whichever is most stringent. If the project is a moderate rehab, developers must demonstrate equivalent energy efficiency by implementing all cost-effective energy improvements with a 10-year or earlier payback, as identified by a qualified engineer or energy auditor.

For criterion 5.1, efficient energy use, the assumed useful life is a blend of industry standards for the life spans of components such as boilers and furnaces (15 years), high-performance windows and doors (20 years) and insulation (50 years).

All of these assumptions were used to estimate future utility costs and savings over the life spans described above. To express these in current (2009) dollars, we used a 6 percent discount rate. We chose that rate as an approximation of the highest cost of capital—i.e., loans—typically used to finance affordable housing projects or purchases by homeowners. In other words, our lifetime cost estimates assume that the incremental cost of incorporating each Green Communities criterion is being funded with loans at 6 percent interest, so we used that percentage as the discount rate.

Using data from the 27 projects that reported predicted results, the average lifetime savings per unit for the 5.1 and 5.5 criteria for efficient energy use was $3,056 over an average of 22 years. The average lifetime savings per unit for the 5.2 criterion, for Energy Star appliances, and the 5.3 criterion, for energy-efficient lighting investments, was $406 over 15 years and $799 over 12 years, respectively. On average for these criteria combined, we predicted $4,260 per unit lifetime savings over an average of 20 years; however, to date, our actual results show an average of $3,916 per unit savings over an average lifetime of 22 years, or 92 percent of the predicted amount.

The optional criterion 5.6, for renewable energy measures, was predicted to achieve $1,731 per-unit savings over 30 years, and in our data collection so far, the project that reported actual results shows $5,034 per-unit average savings over 30 years, or almost three times the predicted amount.

The investment in interior water efficiency (criterion 4.1) was predicted to generate lifetime savings per unit of $352, based on the predicted water usage data from the 27 projects analyzed. To date, using the first-year results supplied by the seven projects that met or exceeded the water efficiency criteria, the projects are achieving a $935 per-unit lifetime savings over a 15-year period, almost three times the predicted savings.

Internal Rate of Return

The estimated internal rate of return (IRR) of individual criteria is calculated with a method similar to the one used for lifetime cost savings, except that the resulting return on investment is expressed as a percentage. This is the method typically used by investors to determine the benefits of making a particular investment or alternative investments. In this report, the IRRs are indicators of the relative benefits of making decisions to adopt—i.e., invest in—individual Green Communities Criteria, based on the average IRRs of the projects surveyed.

The data in sections 4 and 5 of the Technical Report indicate that nearly all energy and water conservation measures called for in the Enterprise Green Communities Criteria have exceptionally high IRRs, ranging from 17 to 42 percent. The exception was photovoltaic panels in the project, which had a 3 percent IRR with the incremental costs measured against the savings. The results were mixed when subsidies of the PV systems were taken into account. The average predicted IRR of nine projects incorporating PV panels was only 6 percent when subsidies were taken into account. One project also reported actual savings; the IRR was 194 percent. That project had nearly 100 percent subsidies for the PV panel installations, reducing the effective cost to near zero.

When using data from the 27 projects reporting predicted results, the IRR for the 5.1 and 5.5 criteria, both for efficient energy use, was 17 percent over an average useful life of 22 years. The IRR for the 5.2 criterion for Energy Star

appliances and the 5.3 criterion for energy efficient lighting investments was 28 percent over 15 years, and 42 percent over 12 years, respectively. On average for these criteria combined, a 21-percent IRR was expected; however, our actual results to date, based on 10 projects, showed a return of 15 percent over an average lifetime of 22 years—still an impressive outcome.

The investment in interior water efficiency (criterion 4.1) was predicted to deliver a return of 38 percent over a 15-year useful life, based on the predicted water usage data from the 27 projects analyzed. To date, using the first-year results supplied by the seven projects that met or exceeded the water efficiency criteria, those green building measures are achieving a phenomenal 61 percent return.

Cost Premiums and Lifetime Savings by Occupancy Type

In the three categories of occupancy that we analyzed separately—supportive housing, rental housing for general populations and for-sale homes—the per-unit costs of compliance were remarkably similar, but the costs per square foot and predicted utility cost savings varied considerably, as illustrated in the following table.

TABLE 3.2
Costs and Benefits by Project Occupancy Type

	Entire Survey Universe (27 projects)	Supportive Housing (15 projects)	Rental Housing (9 projects)	For-Sale Housing (3 projects)
Average cost of compliance, per dwelling unit[1]	$4,524	$4,617	$4,408	$4,275
Lifetime savings (based on predicted usage, not actual)	$4,612	$5,441	$3,608	$2,878
Average cost per square foot	$4.52	$4.71	$4.93	$2.63
Average square footage of dwelling units	1,001	981	893	1,624
Percentage added to development cost	2.1%	2.1%	2.6%	1.1%

[1] Includes cost premiums of compliance with all but the energy conservation criterion for installing renewable energy sources (criterion 5.6). We found that costs of renewables distorted the numbers, because, in many cases, costs were exceptionally high and substantially funded by special subsidies. Renewables were among the optional criteria selected to allow developers to achieve a minimum point score. We believe developers would have chosen other options in many cases had the renewables not received special subsidies.

The 15 supportive housing projects in our survey universe had the highest predicted lifetime savings, while the three projects with homes for sale had the lowest. Analysis of the data showed no conclusive reasons for the higher predicted savings from supportive housing projects. However, discussions with supportive housing developers indicated that they generally paid extra attention to compliance with the Criteria to ensure better health among residents and reduce utility costs, which are generally paid by the property owner in these types of projects.

The three for-sale home projects had by far the lowest predicted lifetime utility cost savings. This was apparently the result of the builders already embracing energy and water conservation features, since these developers reported an average incremental cost for those features that was only $1,137 per unit, projected to yield $2,878 in lifetime utility cost savings—more than two and a half times the investment. However, the single-family homebuilders spent more than most other developers in our survey universe—about $3,500 per home on average—in order to meet the other requirements of the Green Communities Criteria. We believe that this was largely a result of the homes being 60 percent larger than the average dwelling unit we surveyed, given that the incremental construction cost of green features is largely associated with square footage and economies of scale.

Cost Savings Accruing to Property Owners versus Tenants

Our study clearly shows that adopting specific Enterprise Green Communities energy and water conservation criteria leads to cumulative "lifetime" savings that, on average, exceed the initial costs of meeting these measures—including smart siting, healthy materials and other tactics that do not generate quantifiable savings. Less clear, however, is how these savings can help developers afford to pay the marginally higher costs of green building.

Naturally, in building and selling homes to owner-occupants, developers do not benefit directly from long-term utility cost savings. They can only recoup the extra costs of complying with the Enterprise Green Communities Criteria through modest price increases, development subsidies or a combination of the two. Homebuyers are increasingly asking for—and seeing value in—green building features. Government agencies able to subsidize affordable homes also see this added value due to recent increases in federal subsidies for energy conservation.

With rental housing developmes, both property owners and tenants experience the long-term benefits of utility cost savings. But the relative shares of these long-term savings vary considerably. In many supportive housing projects for residents with special needs, the property owners pay all the utility bills; this is mainly due to the fact that these residents typically have very low incomes and thus would have difficulty establishing accounts and paying utility bills. Accordingly, these property owners tend to receive the most utility cost savings because of conservation measures.

In high- and mid-rise apartments for general occupancy, tenants typically pay bills for electricity service, but the property owner pays for heating and air conditioning because of the cost-effectiveness of large, centralized HVAC systems. In low-rise and town home-style rentals, tenants typically pay for the majority of utility costs.

This raises a key question: What are the incentives for rental housing developers to embrace green building measures? Clearly, providers of special needs rental housing who pay all the utility bills have the most immediate and measurable incentives. Similarly, having landlords pay all the utility bills is not a sound policy for operators of

rental housing for general populations, since this reduces or eliminates incentives for residents to conserve energy and water.

According to the prevailing federal rules governing rents and utility payments for subsidized housing, most of the benefits of utility cost savings should—in theory—eventually accrue to the property owners. This broaches the complex and controversial topic of adjusting the so-called "utility allowances" so that federally assisted housing can generate slightly higher rents.

Understanding the impact of these utility allowances requires some additional explanation. Almost all assisted rental housing in the United States is subject to rent caps based on the size of the dwelling unit, the tenant's household income, or both. But the allowed rental amounts must be further reduced based on an estimate of the utility costs paid by tenants. These adjustments are made based on utility allowance schedules, usually provided by the local public housing authority and based on a survey of average utility costs paid by rental units of different sizes, in different building types, and using different energy sources (natural gas, oil, propane and electricity) for heating and cooking.

Every federally assisted rental housing project answers to some monitoring agency, and one of the responsibilities of these agencies is to make sure that the proper rents are charged and utility allowances deducted. But developers of green rental housing projects find that exceptional conservation measures are almost never taken into account when properties are first occupied. Developers are required to deduct utility allowances from those rents derived from rental housing communities that, by definition, have average rather than low efficiency in terms of energy and water usage. Monitoring agencies give rental property owners the option of tracking utility costs over a period of several years and making the case for a customized set of utility allowances.

In practice, very few rental property owners go to the trouble of trying to reduce utility allowances and thus marginally raise rents, even for very high-performance buildings. The presumption is that residents may resist the resulting increases.

One solution to this problem is for federal and state housing agencies to establish special utility allowance schedules for buildings that agree to meet certain design criteria, such as the Enterprise Green Communities Criteria, at a project's outset, before buildings are built and financed. In this scenario, the financial underwriters will see slightly higher costs but also slightly higher rents that can support a mortgage that is a few thousand dollars higher per dwelling unit. Another solution is to phase in lower utility allowances and share some of the cost savings between the owner and the residents.

Until policies along those lines are established, developers of rental housing for general populations get direct benefits for only a part of the "lifetime savings" and internal rates of return described in this report. In the near term—since most affordable rental housing developers struggle to reach break-even on their development-cost budgets—they must rely on additional grants and low-cost financing from public agencies to pay for the modest additional costs of adopting green building standards.

It is our hope that the societal and financial values of green rental housing demonstrated in this report will encourage government housing agencies to provide these necessary subsidies in the short term and eventually adjust their rent-setting policies to favor energy and water conservation.

Other Financial Considerations for Rental Housing

Rental housing communities, where most utility cost savings accrue to residents, offer indirect benefits for property owners. Energy and water conservation features help lower-income tenants reduce their overall housing costs and should also increase residents' ability to pay rent timely. This, of course, increases the property's financial stability.

For these reasons, the asset management team of an affordable housing owner in Denver has provided group training, handouts and individual counseling to raise residents' awareness of ways to maximize energy-efficiency benefits. According to the team, this has been an extremely valuable experience for all involved and has helped to ensure efficient building performance.

Costs and Benefits in Projects of Different Construction Types

In the three categories of occupancy that we analyzed separately—substantial rehabilitation, moderate rehabilitation and new construction—the per-unit costs of compliance and predicted lifetime utility cost savings varied considerably, as shown in the following table.

TABLE 3.3
Costs and Benefits by Project Construction Type

	Entire Survey Universe (27 projects)	Substantial Rehab (3 projects)	Moderate Rehab (2 projects)	New Construction (22 projects)
Average cost of compliance, per dwelling unit[1]	$4,525	$6,620	$2,447	$4,583
Lifetime savings (predicted)	$4,612	$10,561	$5,890	$3,565
Average cost per square foot	$4.52	$7.40	$3.57	$4.26
Average square footage of dwelling units	1,001	894	685	1,077
Percentage added to development cost	2.1%	3.1%	3.2%	1.9%

[1] Includes cost premiums of compliance with all but the energy conservation criterion for installing renewable energy sources (criterion 5.6). We found that costs of renewables distorted the numbers, because the costs in many cases were exceptionally high and substantially funded by special subsidies. Renewables were among the optional criteria selected, allowing developers to achieve a minimum point score. We believe developers would have chosen other options in many cases had the renewables not received special subsidies.

The incremental cost of incorporating the Enterprise Green Communities Criteria was lowest with moderate rehabilitation projects—which we believe is due to the Criteria's adaptation to the realities of partially rehabilitating homes and apartments. Developers were not required to meet the Energy Star for Homes standard. Instead, the criterion requires identifying and installing conservation measures with a simple payback of 10 years or less. Furthermore, with regard to many other criteria, moderate rehab projects were required only to upgrade any materials and equipment being replaced. This approach—based on Enterprise's decades-long experience with housing rehabilitation—is apparently very effective in financial terms because the predicted lifetime savings identified in these projects is two times the reported incremental costs of complying with the Criteria. This savings amount would yield the highest return on investment of any subset of the 27 projects.

Substantial rehabilitation projects had the highest cost premium for compliance, but they are also projected to have remarkably high lifetime utility cost savings. These findings indicate the large potential for cost-effectively upgrading older housing to reduce energy and water costs. One of the most surprising findings of our study was that the predicted lifetime savings among new construction projects was 23 percent lower than the average of all developments. Since our analysis of the data does not reveal any specific reasons for this, we can only conjecture that the developers of new homes had previously used relatively high standards for energy and water conservation measures. In other words, according to our methodology, starting from a higher baseline reduces the incremental lifetime savings when all other factors are equal.

BY DEFINITION, AFFORDABLE HOUSING SHOULD BE GREEN.

Central Park at Stapleton
Denver, Colo.

DEVELOPER: Northeast Denver Housing Center, Inc.

SECTION 4

IMPLICATIONS FOR POLICY AND PRACTICE

This report only begins to examine the cost-effectiveness of integrating the holistic measures included in the Green Communities Criteria into affordable housing. However, the findings suggest several important implications for developers, policymakers and private and public funders.

Expect Green

The findings from this study strongly suggest that certain green methods and materials as defined within the Green Communities Criteria are cost-effective. Instead of value-engineering out criterion, development teams should constantly seek ways to value-engineer in green measures that can further increase energy efficiency, reduce water consumption and contribute to a healthy living environment. Affordable housing by definition should be green.

Affordable housing developers should start from the premise that building green is non-negotiable during the initial planning and predevelopment phase. It is important to set the bar increasingly higher with each development project, and seek innovative ways to achieve the maximum level of cost-effective energy and water savings, indoor air quality improvements and other green benefits. If developers encounter cost concerns from project team members they should consider alternative paths for meeting the intent of certain measures. It is our experience that early integrated design work can deliver significant cost savings. For example, design alternatives should be fully explored and exhausted before money is spent on high-efficiency equipment, appliances and lighting.

Policymakers and capital providers should expect affordable green development as well. A number of cities and states have added significant incentives and requirements for publicly funded affordable housing developments to include green measures. The federal government has taken initial, positive steps in this direction as well. We encourage the acceleration and expansion of these efforts. Although not fully discussed in this report, housing that meets the Enterprise Green Communities Criteria may also contribute to a healthier locality by not exacerbating pre-existing infrastructure deficiencies such as failing storm water management systems, overcrowded roads, and increasing demands on the electricity grid.

Combined, these factors make a compelling case for ensuring that taxpayer funds for affordable housing of any kind come with an expectation of cost-effective green performance.

To be sure, additional public and private subsidies for green affordable housing remain necessary and appropriate. As demonstrated in the report, subsidies play a critical role today in advancing the use of clean and renewable technologies and supporting innovation. Grant funds have an important place in promoting an integrated planning process, ensuring commissioning and performance testing, and engaging residents in ongoing maintenance of the building and individual dwelling units.

In addition, below-market and other favorable forms of public and private financing will remain vital to providing construction and permanent funding for affordable green development projects, while paving the way for more mainstream financial products.

Extend Integrated Design into Performance Monitoring

Enterprise's data collection tool was designed by leading experts, beta tested in the market, substantially revised after developer feedback and accompanied by financial incentives for developers. Yet many developers still struggled to provide basic data on energy and water usage. As noted, we received complete survey data from 27 of the 53 developers initially surveyed.

There were several primary reasons for these data-completion challenges. Affordable housing developers and owners—like developers and owners of all property types—are simply not accustomed to tracking building performance, and often lack an understanding of and access to the tools and resources needed to track performance. Additionally, unit-level data on energy and water consumption is not easily available from utilities and often not available in an easily understood format. Owners of green affordable housing must ensure that the benefits designed into the housing are realized over its lifetime.

Integrating the work of professionals who operate and maintain the building with the efforts of residents can help turn the performance monitoring process into an active and ongoing effort to further enhance the building's health, economic and environmental benefits.

Without greater building science and performance literacy among affordable housing developers and owners as well as their funder and investor partners, efforts to deepen the energy savings in affordable housing will not reach their potential. The challenge requires a concerted effort by policymakers at all levels of government to mandate and create incentives for taking advantage of existing resources and investing in expanded methods for benchmarking, modeling and monitoring building performance in the affordable housing sector.

Expand Financing Approaches to Leverage Energy and Water Savings

The substantial and recent growth in the number of green affordable housing projects and the results from this evaluation strongly suggest that current, conventional capital for newly constructed and substantially rehabilitated affordable housing may be sufficient from a funding perspective to create green housing opportunities. Yet there remains a huge shortfall of capital available for the development, rehabilitation and preservation of affordable housing. Moreover, new financial products may be needed as energy efficiency targets are tied to lowering greenhouse gas emissions below current levels.

With respect to existing affordable home and developments, however, there is both the need and opportunity to finance green retrofits by leveraging cash savings from future reductions in utility bills. Our evaluation used several approaches to illustrate the cost-effectiveness and potential cost savings from green measures in affordable housing. We found that, in most cases, developers could meet the Enterprise Green Communities Criteria through approaches that paid back their costs relatively quickly.

We also found that the present value of projected financial savings from certain Criteria exceeded the cost of implementing them.

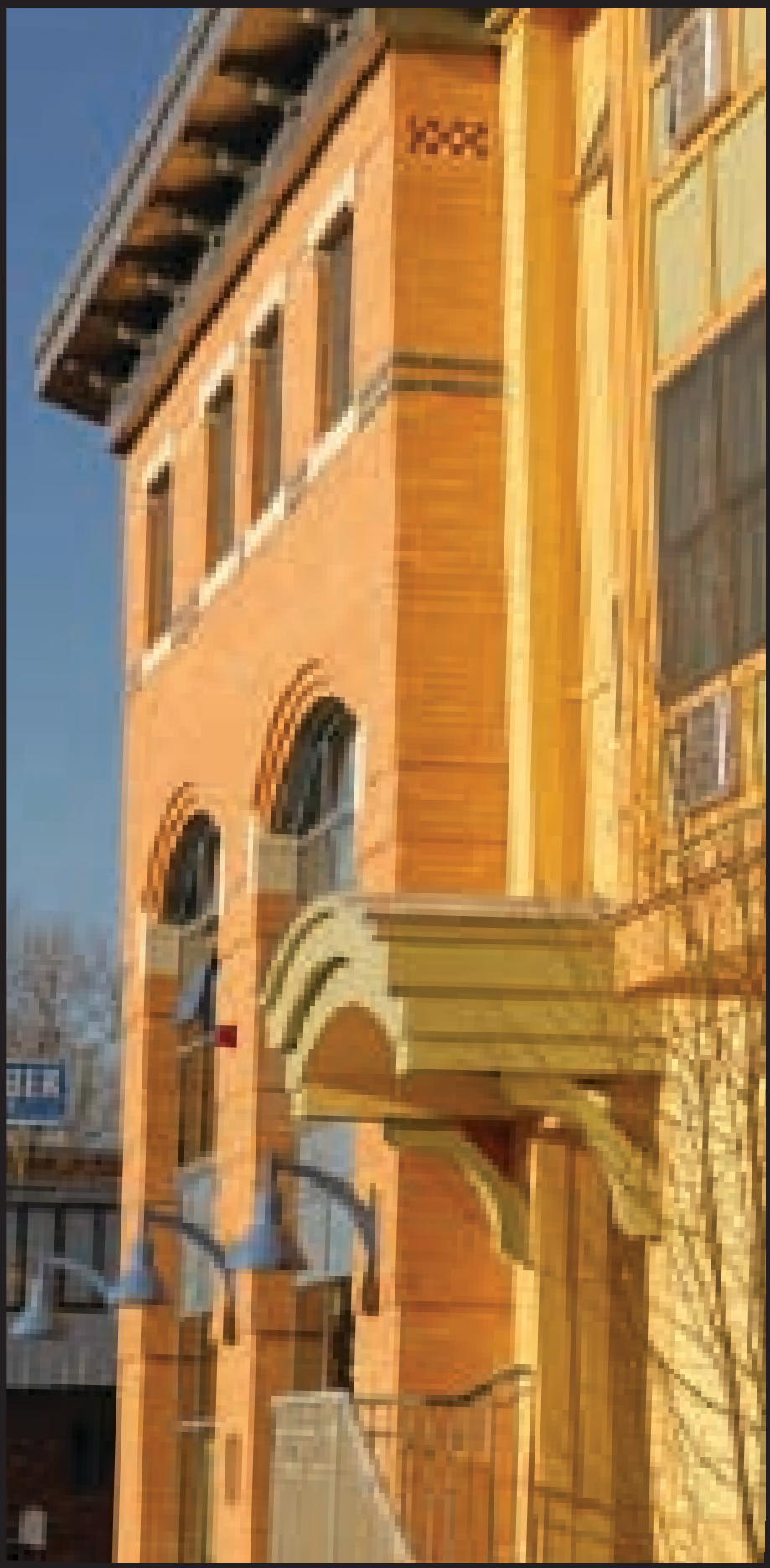
The average per-unit cost of $1,917 to incorporate only the energy and water criteria would return $4,851 in predicted lifetime utility cost savings, discounted to 2009 dollars.

This represents approximately a $2,900 net gain to cover the cost for other measures in the Criteria that contribute to health and environmental improvements.

Importantly, the extent to which future savings can be tapped as a source of upfront capital to make green retrofits of existing affordable housing will depend on a host of factors. These include the manner in which energy bills are paid and by whom, existing financing and current financial condition of the property, and the capacity of the owners and their partners to execute and maintain a green retrofit.

Our findings suggest that financing structures based solely on projected energy and water savings will require significant loan loss reserves, credit enhancements and/or subsidy. These requirements could be relaxed to the extent that retrofit pilot programs demonstrate the viability of add-on financing structures over time.

AN INTEGRATED DESIGN PROCESS ADDRESSES SUSTAINABILITY FROM THE OUTSET AND CONNECTS THE DESIGN TO THE REGIONAL CLIMATE CONDITIONS. IT ACCOUNTS FOR THE EXISTING COMMUNITY CONTEXT AND USES A HOLISTIC AND TOTAL-SYSTEMS APPROACH TO THE DEVELOPMENT PROCESS, PROMOTING GOOD HEALTH AND LIVABILITY THROUGH THE BUILDING'S LIFE CYCLE.



Trolley Square
Cambridge, Mass.

DEVELOPER:
Homeowner's Rehab, Inc.

TECHNICAL REPORT

Enterprise believes that a whole-systems approach is the best method for cost-effectively producing and preserving green affordable housing. As a result, an integrated design process is a central requirement of the Green Communities Criteria.

We strongly advocate adoption of the full scope of the Green Communities Criteria during the beginning stages of project planning. Direct experience demonstrates that an early commitment to meeting the Criteria offers the deepest benefits, and provides a valuable opportunity to explore how the whole building or development will operate as a system and interact with its community and the environment.

In no way should the following Technical Report be used as a means for choosing (or forgoing) specific criteria to include in policy or practice. Instead, we encourage readers to regard the report as a guide to better understand how the Enterprise Green Communities Criteria work in an integrated fashion to support the delivery of significant health, economic and environmental benefits to residents and their communities.

1. Integrated Design

< Criterion 1.1 > requires the submission of a written development plan. The plan must outline the development's integrated design approach and demonstrate the involvement of the entire development team.

An integrated design process addresses sustainability from the outset and connects the design to the regional climatic conditions. It accounts for the existing community context and uses a holistic and total-systems approach to the development process, promoting good health and livability through the building's (or development's) life cycle.

An integrated design process can result in substantially lower development costs and greater health, economic and environmental benefits for residents, property owners and communities. It is important that the development and property management teams commit to a written plan that they can refer to throughout the development process and over the long-term management of the property. The goal is that this plan will continually inform the project's green objectives throughout its life cycle.

The minimum requirements for the plan are as follows:

- The name and role of each member of the professional design and development team
- A statement of the project's overall green development goals, and the expected intended outcomes from addressing those goals
- A description of the process used to select the green building strategies, systems and materials to be incorporated into the project
- A description of the rationale for choosing each of the green features, and how each of the mandatory and optional items will be included in the project
- Identification of which design and development team members are responsible for implementing the green features
- A description of follow-up measures to be taken through the completion of design, permitting, construction and operation to ensure that the green features are included and correctly installed, and that the owners or tenants receive information about the function and operation of these features

The plan must include meeting minutes or another type of documentation capturing and summarizing the integrated design process components that have been completed at the time of application for an Enterprise Green Communities planning or construction grant.

Findings and Considerations

Early on, we learned that most developers had never fully implemented an integrated design process. As a result, Enterprise has provided more than 100 grants of $5,000 enabling developers to hire green building experts, even in instances when developers were uncertain whether they would be able to meet the Green Communities Criteria. These experts facilitated planning meetings initiating the integrated design process, and created a green development plan for the project sponsor.

The managers of the Green Communities initiative have found that the Criteria are extremely difficult or very expensive to implement for developers who did not decide at the beginning of the process to at least consider integrating the Criteria into their development.

The additional costs of this planning process are shown in Table 5.1. For the most part, any extra costs were nominal, averaging $94 per dwelling unit—a figure that includes 10 projects that did not experience additional expenses. Two projects raised that average cost considerably, spending, respectively, $30,000 and $50,000 in extra costs. Aside from those projects, the highest extra cost for a project was $15,000.

TABLE 5.1
Costs of Mandatory Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
1.1 Green development plan	17	$0.09	$94	$0.15	$0.90

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

One key facet of successful integrated design for rental properties is the inclusion of property management and maintenance staff in the design process. Occupancy management staff has the benefit of receiving continual feedback from tenants on what they like and don't like about previously built rental units and common space. Maintenance staff can advise on which materials and fixtures best hold up and on how maintenance costs can be minimized by design features for indoor and outdoor spaces. Both become critical in extending the benefits of the green design process into the building's actual operating program.

With the assistance of Advanced Energy's SystemVision process, one developer went one step further beyond the green charrette. Its design team monitored the entire construction process to ensure that the Green Communities Criteria were met and the building was constructed as designed.

2. Site, Location and Neighborhood Fabric

The Green Communities Criteria require the selection of "smart" sites—defined as being adjacent to existing development and services, protecting natural resources, encouraging walkable neighborhoods and minimizing use of land for development.

Location of new or renovated affordable housing within or contiguous to existing development helps conserve land, maximize existing infrastructure use and mitigate against the spread of stormwater runoff to new watersheds. It also reduces travel distances and costs, providing economic benefits to residents. Proper site selection avoids development of inappropriate sites and damage to or loss of fragile, scarce environmental resources.

Developing in areas with existing infrastructure and civic amenities can also yield savings in total development costs (although land costs may be higher in these locations). In addition, site selection can present opportunities to clean up and redevelop brownfields and to fill in gaps within the built environment.

TABLE 5.2

Costs of Mandatory Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
2.1a Smart site location—proximity to existing development	1	$0.00	$1	$0.01	$0.01
2.1b Smart site location—protecting environmental resources	1	$0.01	$12	$0.21	$0.21
2.1c Smart site location—proximity to services	0	$0.00	$0	$0.00	$0.00
2.2 Compact development	0	$0.00	$0	$0.00	$0.00
2.3 Walkable neighborhoods	3	$0.11	$109	$0.70	$1.05

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

TABLE 5.3

Costs of Optional Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Highest Cost per Square Foot
2.4a Smart site location— utilize passive solar heating / cooling	3	$0.54	$680	$1.46
2.4b Smart site location— grayfield, brownfield, or adaptive reuse site	2	$3.10	$3,427	$3.11
2.5 Compact development	0	$0.00	$0	$0.00
2.6 Walkable neighborhoods	4	$0.11	$122	$0.16
2.7 Transportation choices	3	$0.23	$407	$0.34

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

Locating adjacent to and within existing development also prevents leapfrog development, which carries numerous negative consequences, including fragmented ecosystems, the spread of polluted runoff to new watersheds, strain on municipal budgets to accommodate longer service routes and infrastructure lines, and damage to landscapes that nourish the connection between people and their local environments.

Locating projects in communities with established infrastructure and services provides economic and social benefits to residents and strengthens the fabric of existing neighborhoods.

Compact development—meaning higher densities of dwelling units and the use of less land per unit—encourages more resource-efficient development of land, reduces development costs and conserves energy. It also can contribute to creating more walkable communities, while helping to restore, invigorate and sustain livable neighborhoods.

Finally, making the streetscape safer and more inviting for walkers and bicyclists encourages alternative transportation choices to the automobile. It also promotes physical activity and public health, and creates opportunities for socializing and increased safety by drawing more eyes to public spaces.

Requirements and Considerations of Individual Criteria

< Criterion 2.1a > requires that developers provide a site map demonstrating that a development is located on a site with access to existing roads, water, sewers and other infrastructure within or contiguous (having at least 25 percent of the perimeter bordering) to existing development. Green Communities developers do not build on tracts of land that require installing a septic tank or a sanitary sewer line extension of 1,000 feet or longer from the property line of the tract being developed, or within critical potable watershed areas. Only one project reported a miniscule cost premium for choosing such a site.

We've determined two apparent reasons for the lack of reported cost premiums. First, many projects are located in urban neighborhoods where infrastructure already exists and where developers typically build or rehabilitate housing. Second, parsing out the cost differential was difficult for developers, who may not have been able to identify alternate sites with which to compare costs. It is our experience that incorporating affordable housing into newly planned developments that apply smart growth principles of compact development and walkable neighborhoods typically incurs a cost whether through impact fees, regulatory approval requests or other, and is not common practice.

< Criterion 2.1b > requires that developments cannot be located on land within 100 feet of wetlands or wetland protection buffer zones; land within 100 feet of steep slopes, prime farmland or parkland; or land within 1,000 feet of a critical habitat. Only one project reported a cost premium, which amounted to several hundred dollars per dwelling unit. It is our assumption this criterion was not applicable for other projects, and therefore, they did not incur a cost to relocate, purchase another site or redesign their site plan.

< Criterion 2.1c > requires developers to provide a location map with exact distances indicating that a project is located within a quarter mile of at least two, or a half-mile of at least four, of the following facilities accessible to residents: adequate public transportation, supermarket, public school, library, licensed child care center, usable park space, post office, convenience store, laundromat/dry cleaner, pharmacy, place of worship, or community or civic center. No cost premiums were requested or reported, since such a premium would have been

included under criterion 2.1. However, we do know of developers who said they were unable to meet the Green Communities Criteria because of this requirement. These were predominantly projects located in rural communities.

< Criterion 2.2 > Meeting the definition of "compact development" requires a minimum density for new construction of six units per acre for detached or semi-detached houses, 10 for town homes and 15 for apartments. Public street rights of way, buffered wetlands and open space that has been dedicated through a conservation program are not included in the density calculations.

No extra costs were associated with criterion 2.2, and for good reason, since compact development can substantially reduce costs. We did not attempt to quantify these savings because of the difficulty of determining a benchmark density for comparison. But as with criterion 2.1c, we learned that some developers working in small towns and rural areas opted out of the Green Communities program specifically because of this requirement. In these locations, densities are typically much lower than in urban or even suburban settings. Consequently, developers felt that providing housing with greater density either would not receive public approvals or would not be marketable.

< Criterion 2.3 > requires that the developer provide a site map indicating that sidewalks or suitable pathways have been created within a multifamily property or single-family subdivision to link the residential development to public spaces, open spaces and adjacent development. Only three out of 27 developments reported incremental costs—which averaged about $700 per dwelling unit—for landscaping, paving or surfacing materials. We therefore assume that the vast majority of the developers in our survey universe would have added these features in any case.

< Criterion 2.4a > (optional) encourages developers to maximize the use of passive solar heating and cooling to earn a possible five-point score. Only three developers indicated that they had experienced extra costs for land or construction, averaging about $680 per dwelling unit. The methods encouraged are as follows:

- Elongate building on an east-west axis.
- Position interior spaces requiring the most light, heating and cooling along the south face of the building.
- Optimize daylight penetration and passive ventilation via a narrow floor plate (less than 40 feet), single-loaded corridors and an open floor plan.
- Increase shading through overhangs and canopies on the south and trees on the west to prevent the summer sun from entering the interior.

< Criterion 2.4b > (optional) encourages developers to locate projects on grayfield, brownfield or adaptive reuse sites to earn a possible 10-point score. Grayfields are previously developed abandoned sites, such as parking lots and shopping centers. Brownfields require a Phase II Environmental Site Assessment and remediation plan. An adaptive reuse site is an area previously developed for non-residential purposes, in which at least 25 percent of the proposed development will reuse existing non-residential structures.

Only three projects reported extra costs related to testing or remediation. Those costs averaged more than $3,400 per dwelling unit. While significant, these costs bear out the anecdotes from some market-rate and affordable housing developers that many brownfields can be remediated at a reasonable cost, and some even yield cost savings because the property cost is discounted.

< Criterion 2.5 > (optional) encourages developers to further increase average minimum density for new construction by meeting or exceeding the following guidelines: seven units per acre for detached or semi-detached; 12 units per acre for town homes; and 20 units per acre for apartments. Meeting this criterion yields an additional five points. As previously stated, there are no extra costs—only savings on land and construction—associated with compact development.

< Criterion 2.6 > (optional) encourages developers to incorporate walking and bike path connections to surrounding neighborhoods, which earns five points toward the required minimum overall score. To provide proof, developers must present a site map demonstrating at least three separate connections they provided to sidewalks or pathways in surrounding neighborhoods. Four developers reported extra costs averaging $122 per unit.

< Criterion 2.7 > (optional) encourages developers to locate projects close to public transportation, for 12 points. To prove that this requirement is met, developers must provide a context map demonstrating that a site is within a quarter-mile radius of public transit service or a half-mile radius from a fixed rail or ferry station. Three developments reported modest cost premiums averaging $407 per dwelling unit.

3. Site Improvements

Enterprise Green Communities Criteria include minimum standards for environmental remediation and erosion control, while also encouraging developers to use advanced techniques for surface-water management.

Completion of a Phase I site assessment is required by the Green Communities Criteria, federal funding programs, many private lenders and many local governments. This process involves an investigation of the site's conditions, often performed before purchase of the property, to satisfy the due diligence requirements of a property transaction. The site assessment helps to assess potential environmental liabilities associated with real property acquisition and ownership.

Another crucial factor in site improvements is erosion and sedimentation control during site development. These controls keep valuable topsoil on site and reduce pollution, stormwater runoff and sediment runoff associated with construction activities in local waterways. Compacted soils resulting from construction are less able to absorb water and resist plant root penetration, and lack the porosity needed for adequate aeration. Erosion and sedimentation control helps to avoid stormwater-related problems, which can delay construction, cause environmental degradation (to creeks, streams and coastal waters) and damage public and private properties downstream.

Reducing stormwater runoff through design and management techniques increases on-site filtration, prevents pollutants from entering waterways and reduces soil erosion. Water-storage and nutrient-collection processes reduce the need for irrigation, and contribute to forming a healthier ecological community within the landscape.

TABLE 5.4

Costs of Mandatory Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
3.1 Environmental remediation	10	$0.23	$227	$0.52	$1.74
3.2 Erosion and sedimentation control	4	$0.01	$11	$0.06	$0.09
3.3 Landscaping	This criterion was added to the 2006 version of the Criteria, but was not part of the evaluation.				

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

TABLE 5.5

Costs of Optional Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Highest Cost per Square Foot
3.4 Surface water management	13	$0.30	$764	$3.41
3.5 Storm drain labels	12	$0.01	$10	$0.04

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

Requirements and Considerations of Individual Criteria

< Criterion 3.1 > requires developers to conduct a Phase I Environmental Site Assessment and any additional assessments required to determine whether hazardous materials are present on site. Developers must provide one of the following: ASTM (American Society for Testing and Materials) Transaction Screen, Phase I Environmental Site Assessment or Phase II abatement plan, if required. The average cost across all evaluated projects was $227 per dwelling unit, including 17 projects that had no reported incremental costs—presumably because their developers complete these assessments routinely for all their projects. The average cost per dwelling unit for the 10 projects reporting cost premiums was about $569. The highest cost was more than $2,924 per dwelling unit.

< Criterion 3.2 > requires developers to implement the U.S. Environmental Protection Agency's (EPA's) Best Management Practices (BMPs) for erosion and sedimentation control during construction, referring to the EPA document Stormwater Management for Construction Activities. The developer's method of satisfying this item must clearly state which BMPs are/will be incorporated into construction and site development plans and contracts. Enterprise Green Communities provides a fill-in form for this purpose. We assume these to be common practices because only four projects reported extra costs due to compliance with this criterion, averaging about $71 per dwelling unit.

Among the developers surveyed, one installed a graywater recycling system and several installed rainwater harvesting systems. While not in our survey universe, Enterprise's recently completed High Point project in Seattle demonstrates a green stormwater management program on a neighborhood scale. The project site was graded to absorb stormwater from the entire site and divert the remaining runoff to a five-acre pond. By doing so, the developer avoided having to install a 10-acre retention pond required by local codes. This freed up land and allowed for the construction of an additional 72 units, yielding an enormous savings in land costs.

< Criterion 3.3 > was added to the 2006 version of the Criteria but was not part of this study. It requires developers to provide a landscape plan showing that any new trees and plants selected are native species appropriate to a site's soils and microclimate, and that any newly planted trees are located to provide shading in the summer and allow for heat gain in the winter.

< Criterion 3.4 > (optional) requires developers to grade sites and install landscaping features that capture the first half-inch of rainfall that falls in a 24-hour period, for a possible five optional points. To fulfill this requirement, developers make use of innovative, low-impact techniques such as rain gardens, green roofs, rain barrels and cisterns to capture and reuse stormwater. Site planners and building designers can also minimize impervious areas (surfaces that do not allow stormwater infiltration), including roofs, driveways, sidewalks and streets, or use porous materials for such areas. Thirteen projects reported extra costs for implementing this criterion, with an average cost of $764 per dwelling unit.

The examples below illustrate some of the technologies employed in projects.

- Rain barrels will collect rainwater and will be used to provide 40 percent of the irrigation needs on site.
- Bioswale planters that are visible to the public as a demonstration project will collect approximately 5 to 10 percent of the stormwater from roofs and unit decks, preventing it from running off into the public stormwater management system.

- A water recycling well will catch and store rainwater to provide 5 percent of the water needed to irrigate plants in a project's common area.
- Rain gardens will collect and manage 90 percent of the stormwater on site.
- A stormwater retention tank on the roof will collect 25 percent of the water necessary for irrigation.

< Criterion 3.15 > (optional) encourages developers to label all storm drains or storm inlets by clearly indicating where they lead. This provides a visual reminder that storm sewer inlets connect to area waterways and groundwater storages, and should not be used to dump garbage or pollutants of any kind. Typically, developers use a stencil to paint a warning that reads: "Caution—leads to [name of body of water]!" This earns two points toward the required minimum score. For the 12 projects that reported extra costs, the average cost was $10 per dwelling unit.

4. Water Conservation

Americans use about 80 gallons of water every day, and 70 percent of that water, on average, is used indoors. Showers and faucets account for approximately 33 percent of indoor water use, while toilets account for approximately 27 percent, according to the American Water Works Association Research Foundation publication, Residential End Uses of Water. Reducing water use translates into utility savings, both by reducing the energy required for heating water and by reducing water and sewer bills, since sewer fees are typically tied to water usage. EPA estimates that water-conserving fixtures meeting the national Energy Policy Act of 1992 guidelines reduce the amount of water used in showers and sinks by 75 percent and 50 percent, respectively, when compared with pre-1992 fixtures.

Among the projects we surveyed, installing water-conserving appliances and fixtures per criterion 4.1 resulted in very high returns on investment in terms of utility cost savings for residents and rental property owners. We calculated an average savings (in present value terms) of $352 to $935 per home, versus average costs of $80 per home. In simple payback terms, the investment is recouped in two to three years. The lower savings number was the result of a "desk" analysis of the 27 projects in our survey universe, while the higher savings number came from an analysis of actual water usage in seven projects.

The story behind the disparity between predicted savings from energy modeling and predicted savings from actual usage is one of the most telling lessons of this study.

One project showed that the difference resulted from the fact that no actual meter readings had been taken on water usage since 2006. New meters had not been installed after the rehabilitation work was completed and the existing meter had been based on historic usage. Unfortunately, a number of projects in our survey universe failed to achieve one of the easiest, most cost-effective ways to reduce utility usage—namely, installing fixtures with low-flow rates. To determine the average savings from actual usage of $935, we selected the seven projects that reported utility usage data and also complied fully with criterion 4.1. But in the universe of 27 projects that we used for predicted savings from modeling, we know of at least eight that installed fixtures that conserved less water than specified in criterion 4.1.

One reason for overlooking water fixtures may be that developers did not specify the right fixtures and sub-contractors defaulted to previously supplied fixtures. For example, in the case of one project, the development team created alternate specifications that could be integrated later if its

budget allowed but then forgot to make that change to the alternate specification, which included the water-efficient fixtures. It is our experience that criteria found both in the plans and specifications were included in buildings 95 percent of the time. Criteria found in neither the plans nor specifications were included only 37 percent of the time.

We also learned that developers were generally proud of and enthusiastic about their projects. However, they expressed frustration with the often overwhelming process of learning about and determining how to meet a new measure. This frustration and time spent on a few more prominent measures, such as efficient energy use, caused developers to ignore other measures such as water-conserving fixtures. Even within the category of water conservation, attention seems to be placed on low-flow and dual-flush toilets but not on showerheads and faucets. Our water calculation assumptions show that although toilet-flow rates may be low, sink usage and shower runtimes are much longer and account for slightly higher indoor water use.

According to the EPA's WaterSense program, 26.7 percent of our daily water use is consumed by flushing the toilet, 16.8 percent used in the shower, 15.7 percent at the faucet, 21.7 percent for clothes washers, and 5.3 percent for other usage, with the additional 13.7 percent accounted for by leaks. A leaky toilet can waste about 200 gallons of water every day. One strategy for ensuring that the appropriate water fixtures are installed is to review the project's plans and specifications for proper flow rates.

Additional Cost of Implementing Criteria

Additional cost of implementing each of the two mandatory water conservation criteria were reported by developers as follows in Table 5.6. While the rest of our evaluation is based only on the 2005 version of the Green Communities Criteria, we were able to obtain cost data for implementing a landscaping criterion that was added to the 2008 version of the Criteria. No optional measures were included in the 2005 version of the Criteria.

Developers reported few challenges in complying with the appliance and fixture requirements, with 11 out of 27 reporting no extra costs and 16 reporting costs averaging 16 cents per square foot, or about $152 for a typical dwelling unit. However, as noted above, at least eight projects did not fully comply with criterion 4.1, so the weighted average cost premium for all 27 projects in our survey universe may be underestimated. One the other hand, careful attention to fixture specifications seems to result in only small cost premiums. For example, the projects with actual water usage data that complied with criterion 4.1 spent only $128 per dwelling unit on average.

Calculation of Water and Sewer Cost Savings

To calculate water savings for the 27 projects surveyed, we predicted water usage and costs using assumptions about occupancy, building type and climate. Subsequently, for nine of those projects, plus one that was not in our primary sample group of projects, we were able to obtain actual usage and cost data for a full year of occupancy.*

Table 5.7 describes the predicted water and sewer cost savings from modeling for the criterion. Tables 5.8 describes savings from actual usage and cost data.

*Another project not included in this study uses a rainwater harvesting system for flushing toilets. Its self-reported annual water and sewer costs are $164 per unit, compared to $385 per unit annually, which is the average for nine other buildings in the developer's portfolio.

TABLE 5.6

Costs of Water Conservation Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
4.1 Water-conserving appliances and fixtures	16	$0.08	$80	$0.26	$0.42
4.2 Efficient irrigation	6	$0.10	$101	$0.36	$0.59
4.3 Water-conserving landscaping—added to 2008 Criteria	8	$0.06	$60	$0.22	$1.09

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

TABLE 5.7

Cost Savings of Water Conservation Measures (Predicted)

Criterion Number / Description	Number of Projects Reporting Savings	Units	Estimated Incremental Cost per Unit[1]	Estimated Lifetime Water Savings In 2009 Dollars per Unit[2]	Estimated Annual Percentage Savings in Water Use	Internal Rate of Return[2]	Estimated Simple Payback in Years[2]
4.1 Water-conserving appliances and fixtures	27	1,640	$80	$352	21%	38%	3

[1] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

[2] See Background on Study and Methodology in Section 2 for a description of how we calculated lifetime water savings, internal rates of return and simple payback.

TABLE 5.8
Cost Savings of Water Conservation Measures (Actual Usage from Complying Projects)

Criterion Number / Description	Number of Projects Reporting Savings	Units	Estimated Incremental Cost per Unit[1]	Estimated Lifetime Water Savings In 2009 Dollars per Unit[2]	Estimated Annual Percentage Savings in Water Use	Internal Rate of Return[2]	Estimated Simple Payback in Years[2]
4.1 Water-conserving appliances and fixtures	7	300	$128	$935	41%	61%	2

[1] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

[2] See Background on Study and Methodology in Section 2 for a description of how we calculated lifetime water savings, internal rates of return and simple payback.

Three more projects reported actual water usage for a year but failed to comply with the flow rates of criterion 4.1. In fact, the fixtures specified in these three projects were so inefficient that the developments had "negative savings" of $593 per dwelling unit per year when we compared their water and sewer bills to their estimated baseline water usage. This underscores the importance of requiring proper flow rates in plumbing fixture specifications and ensuring that the fixtures installed actually meet those specifications.

Requirements and Considerations of Individual Criteria

< Criterion 4.1 > calls for installing water-conserving fixtures with the following specifications, which are only slightly higher than the standards EPA published in 1992.

- Toilets: 1.6 GPF (gallons per flush) or better
- Showerheads: 2.0 GPM (gallons per minute) or better
- Kitchen Faucets: 2.0 GPM or better
- Bathroom Faucets: 2.0 GPM or better

< Criterion 4.2 > calls for installing efficient landscape irrigation, if irrigation is necessary—using graywater (from sinks, showers and tubs), roof water, collected site runoff or an irrigation system that will deliver up to 95 percent of the water supplied. Only six projects reported extra costs, which were generally modest since they were related to low-cost systems of diverting roof water to small holding tanks or directly to planters or swales. The six projects that harvested water averaged costs of about $435 per unit.

5. Energy Efficiency

The Green Communities Criteria related to energy efficiency are intended to increase resident comfort while also reducing utility bills and lowering carbon emissions. On a global scale, these criteria help to mitigate the accumulative burdens of energy production and delivery, extraction of non-renewable natural resources, air quality degradation, global warming and increasing concentrations of pollutants.

As a result of this study, we can now quantify two financial benefits of incorporating Green Communities energy efficiency criteria. First, meeting or exceeding our mandatory energy criteria will result in lower utility bills that substantially exceed upfront costs of the measures. Second, we calculate that on average, the homes and rental units studied will avoid emissions of 2 tons of CO_2 annually, compared to homes that just meet local building code standards.

Following are findings on the average costs of meeting the energy efficiency standards of the Green Communities Criteria, compared to calculations of the consolidated energy and water, or utility cost savings. **Our key findings are that energy efficiency measures added an average of $1,540 per dwelling unit to construction costs, while producing between $3,916 and $4,260 in expected lifetime savings, adjusted to today's dollars.** This additional investment is calculated to be paid back, on average, in six to nine years.

The higher savings amount and quicker payback period come from a "desk" analysis of the predicted energy use of the 27 projects in our survey universe. The slightly lower savings and longer payback period were calculated from 10 projects that provided one year of data on actual energy use by residents and in common areas of rental projects.

Cost Premiums for Implementing Criteria

The cost premiums for implementing each of the energy efficiency criteria were reported by developers as follows in Table 5.9 and Table 5.10. Descriptions of energy efficiency criteria begin on page 52.

TABLE 5.9
Costs of Mandatory Energy Efficiency Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
5.1 Efficient energy use	18	$0.85	$854	$1.34	$7.25
5.2 Energy Star appliances	17	$0.13	$128	$0.20	$0.64
5.3 Efficient lighting	16	$0.20	$197	$0.35	$3.67
5.4 Individual electricity meters	3	$0.13	$134	$1.03	$1.95

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

TABLE 5.10
Costs of Optional Energy Efficiency Measures

Criterion Number / Description	Number of Projects Selecting This Option	Weighted Average Cost per Square Foot[1]	Highest Cost per Square Foot	Weighted Average Cost per Dwelling Unit[2]
5.5 Additional reductions management	9	$0.95	$10.90	$1,038
5.6 Photovoltaic (PV) panels	9	$3.22	$8.32	$3,074

[1] In this table and all similar tables in this report describing optional measures, the average cost per square foot of living area only applies to projects that selected each option. "Optional" Green Communities Criteria are those selected by a builder to achieve a minimum required score of 25 for new construction and 20 for housing rehabilitation.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

Having a project sponsor who understands not only the Enterprise Green Communities Criteria, but also the construction processes into which they are being integrated, is invaluable. We realize that there may be organizations with a great deal of experience developing science-based theories and testing procedures as well as organizations with a great deal of green building experience.

However, it seems to be the exception for organizations to be heavily involved in both of those aspects. This may explain, in part, why some projects report higher costs, as many of the drawing sets submitted for this evaluation showed very little improvement over what is required by code in the envelope construction. The savings for most developments came from more expensive, higher-efficiency heating/cooling/domestic hot-water equipment, appliances and lighting.

In the projects for which we commissioned post-construction tests, we found that across the board, the factors we consider to be the foundation of green building—a tight envelope, a tight distribution system and combustion safety—were not accomplished regularly. An enormous opportunity is lost when basic energy efficiency measures that may have a tremendous impact on a building's performance—and may be the simplest and least expensive measures to integrate into developments—are overlooked during the early stages of construction.

Calculation of Energy Savings

To calculate energy savings, we used two survey universes. First, for 27 projects, we predicted energy usage and costs using typical methods employed by energy raters and HVAC engineers. Later, for 10 of those projects, we were able to obtain actual usage and cost data for one full year of occupancy.

Table 5.11 describes the *predicted* energy costs and savings for the 27 participating projects, while Table 5.12 describes the *actual* energy costs and savings for the 10 participating projects that reported actual results. Comparing predicted and actual results of the mandatory criteria, plus optional 5.5 criterion, shows the following:

- The 27 participating projects in our sample reported a *predicted* average incremental energy cost of $1,540 per unit, compared to the 10 projects that reported *actual* results and paid an average incremental cost of $1,784 per unit.
- These investments both resulted in *predicted* and *actual* average energy usage savings of 25 percent.
- However, when measured in dollars per unit, the lifetime energy savings was *predicted* to be $4,260 per unit but has *actually* averaged about $3,916 per unit to date.

Because the percentage usage savings for both predicted and actual results are the same at 25 percent, it would seem logical that both the predicted and actual lifetime dollar savings would be the same or at least similar. The 7 percent shortfall from the lifetime predicted savings from modeling of $4,260 per unit to the predicted savings from actual usage of $3,916 per unit is due to a variety of differences, including:

- Lower local utility rates
- A lower proportion of energy savings to the number of units
- The mix of energy savings between electric and natural gas
- A longer weighted average useful life of the measure

We will continue to closely monitor the difference between the predicted and actual lifetime savings as more projects report actual results.

The cost of implementing the optional Green Communities criterion 5.6—installing photovoltaic (PV) panels to provide at least 10 percent of a project's estimated electricity demand—is also included in Table 5.11 and Table 5.12. Comparison of the predicted and actual results of the optional criterion 5.6 shows the following:

- The *actual* average incremental energy cost of $8,018 per unit for the one reporting project is almost three times the *predicted* average incremental cost of $3,074 per unit for the nine participating projects.
- When measured in dollars per unit, the lifetime energy savings was *predicted* to be $1,731 per unit, but to date has *actually* averaged $5,034 per unit. The calculated simple payback is more than 40 years.
- Subsidies, although varied in the sample, have a dramatic impact on actual results.

We were able to pinpoint several additional reasons for the difference between the predicted savings from modeling and the predicted savings from actual usage data. In one farmworker housing project, a very large disparity resulted due to the faulty assumption that most residents would be away during the day—which was not the case when the building was occupied by the farmworkers and their families.

But the most important variable appeared to be the quality of workmanship. If, for example, even small air gaps are left inside insulated walls and ceilings, the energy efficiency of the envelope can be reduced substantially. Failure to properly seal heating and air conditioning ducts was a problem in some of the projects we physically inspected after construction.

Another common lapse in workmanship was the failure to properly insulate and caulk around windows and doors. Residents are often the first to know if installation was effectively completed and will complain of drafts or simply compensate by turning up the heating or cooling system. For example, one of the projects surveyed had poor air sealing and whole-house fans running higher than necessary, resulting in the fans pulling heat out of the units and causing tenants to compensate by turning up their heaters and using more energy than predicted.

According to Southface Energy Institute, air leakage is a major problem not only because it wastes hundreds of dollars in energy bills, but because it can also cause building durability problems, permit rodent entry, and create unhealthy indoor air quality. One strategy is for development teams to start a process requiring accountability from sub to sub to eliminate traditionally overlooked building failures; this process can also include using checklists and visual resources promoting better installation techniques.

Other reasons for the variance between the predicted savings from modeling and the predicted savings from actual usage data were the assumptions used in the energy modeling process. For example, one project's predicted savings were greater because its energy modeling did not account for elevator usage. The seven-story building has stairwells designated as "emergency stairs" and generally treated as such. That being said, most of the building's residents and guests "need" to use the elevators to reach their apartments, the community kitchen, the computer lab, etc. But since the elevators are old and fairly inefficient, the actual savings are lower than predicted, most likely because the elevators use so much electricity. Had this assumption been more accurate, it is likely that the developer would have replaced the older, inefficient elevators.

The following tables, 5.11 and 5.12, describe in detail the costs and predicted savings from modeling and from actual usage of energy efficient measures.

Requirements and Considerations of Complying with Individual Criteria

< Criterion 5.1 > To comply with this criterion, developers of new and substantially rehabilitated projects pledged to meet or exceed the following standards:

- Energy Star standards, which were developed and are promoted by the U.S. Department of Energy in cooperation with the construction industry. (See www.energystar.gov.) Energy Star's Builder Option Packages (BOPs) are used to determine components of an Energy Star-qualified new home. BOPs provide options for builders to select a set of construction specifications for particular climate zones, measuring performance levels for the thermal envelope, insulation, windows, orientation, HVAC system and water-heating efficiency. BOPs are provided for each of the 19 U.S. climate zones.
- Home Energy Rating System (HERS) design score of 86. HERS was developed by the Residential Energy Services Network, a nonprofit industry membership organization. (See www.natresnet.org) Third-party HERS raters evaluate the energy efficiency of a home or apartment, compared with a computer-simulated reference unit of identical size and shape. The HERS rating results in a score between 0 and 100, with the reference unit assigned a score of 80. From this point, each 5 percent reduction in energy usage (compared to the reference unit) results in a one-point increase in the HERS score.
- Exceed ASHRAE 90.1 standards by 30 percent (projects in California must exceed Title 24 2001 by 15 percent). ASHRAE is the American Society of Heating, Refrigerating and Air-Conditioning Engineers. (See www.ashrae.org)

TABLE 5.11

Cost Savings of Energy Efficiency Measures (predicted)

Criterion Number / Description	Number of Projects Reporting Savings	Units	Estimated Incremental Cost per Unit[1]	Estimated Lifetime Energy Savings In 2009 Dollars per Unit[2]	Estimated Annual Percentage Savings in Energy Use	Internal Rate of Return[2]	Estimated Simple Payback in Years[2]
5.1, 5.5 Efficient energy use	27	1,640	$1,215	$3,056	19%	17%	7
5.2 Energy Star appliances	27	1,640	$128	$406	2%	28%	4
5.3 Efficient lighting	27	1,640	$197	$799	3%	42%	3
5.4 Individual electricity meters	Not Available						
5.5 Additional reductions in energy use	Included with 5.1						
Total 5.1–5.5 Mandatory criteria plus optional 5.5	27	1,640	$1,540	$4,260	25%	21%	6
5.6 Photovoltaic (PV) panels	9	604	$3,074	$1,731	N/A[3]	2%	44
5.6 after subsidy- Photovoltaic (PV) panels	9	604	$1,618	$1,731	N/A[3]	6%	23

[1] With the exception of 5.6 costs, the estimated incremental cost per unit is the weighted average cost of the 27 projects reporting predicted results for specific criteria, including those reporting $0 incremental cost. Because the Criteria 5.6 costs are optional, their cost per unit represents the weighted average cost per unit for only those projects that reported costs.

[2] Estimated annual percentage savings are not applicable to installing PV panels, which represent a different supply of electricity, not a usage reduction.

[3] See Methodology in Section 2, Background on Study, for a description of how we calculated lifetime water savings, internal rates of return and simple payback.

TABLE 5.12
Cost Savings of Energy Efficiency Measures (actual)

Criterion Number / Description	Number of Projects Reporting Savings	Units	Estimated Incremental Cost per Unit[1]	Estimated Lifetime Energy Savings In 2009 Dollars per Unit[2]	Estimated Annual Percentage Savings in Energy Use	Internal Rate of Return[2]	Estimated Simple Payback in Years[2]
5.1–5.5 Mandatory criteria plus optional 5.5	10	550	$1,784	$3,916	25%	15%	9
5.6 Photovoltaic (PV) panels	1	18	$8,018	$5,034	N/A	3%	40
5.6 after subsidy-Photovoltaic (PV) panels	1	18	$108	$5,034	N/A	194%	1

[1] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

[2] See Background on Study and Methodology in Section 2 for a description of how we calculated lifetime water savings, internal rates of return and simple payback.

For moderate rehabilitation projects to comply with criterion 5.1, developers must employ a qualified professional to conduct an energy analysis of the existing building condition and identify cost-effective energy improvements. Developers must implement those improvements with a 10-year or earlier payback. Changes were made to this measure in the 2008 Criteria to require implementing energy improvements to improve a building's overall performance by 15 percent from pre-rehabilitation figures.

Developers of some moderate rehab projects reported difficulties in finding energy auditors who could provide the reports necessary for the 5.1 criterion, making it difficult for us to verify their compliance. Many developers also reported challenges with the availability and additional costs for the Energy Star advance lighting package.

< Criterion 5.2 > requires the installation of Energy Star clothes washers, dishwashers and refrigerators when providing new equipment.

< Criterion 5.3 > calls for installation of Energy Star–labeled lighting fixtures or the Energy Star Advanced Lighting Package in all interior units, and the use of Energy Star or high-efficiency commercial-grade fixtures in all common areas and outdoors. In addition, daylight sensors or timers must be installed on all outdoor lighting.

< Criterion 5.4 > requires the installation of individual or sub-metered electric meters to ensure residents' awareness of the cost associated with electricity consumption. This measure may reduce energy use.

< Criterion 5.5 > (optional) allows five scoring points for every 1 percent improvement in the HERS rating, or a 5 percent increase in energy efficiency for new construction and substantial rehabilitation. Moderate rehabilitation projects can score 10 points for each additional point awarded by HERS, or for adopting additional improvements that extend the payback period to at least 14 years.

Renewable Energy Measures

< Criterion 5.6 > (optional) allows five points for installing PV panels that provide at least 10 percent of a project's estimated electricity demand, and as many as 10 more points for going beyond that minimum. It also allows two points for making each building "PV ready"—meaning roof designs are conducive to accepting PV, and providing adequate space and wiring installed for PV panels. In practice, some projects were allowed to substitute thermal panels to offset water-heating costs, and one project installed a small wind turbine on the roof.

Costs of these installations ranged from $223 per unit for a small PV array and thermal water heater in Austin, Texas, to $8,111 per unit for an elaborate PV array in Denver. Looking simply at costs and paybacks in utility cost savings, renewable energy measures collectively do not appear to be a sound investment, since the present value of future savings is less than the upfront costs. However, grants and public subsidies can make these investments financially feasible.

For example, among the projects we surveyed, one received a total of $144,000 in subsidy, reducing the $145,000 cost for the owner to $1,000. This is a very small net investment when compared to the $91,000 savings over 40 years. The subsidy's effect raises the return on investment from 3 percent to 194 percent. However, data from other projects in our survey indicate that such high-level subsidies are not typical. Grants for installing renewable energy features are available from federal, state and local government agencies, as well as foundations and other philanthropic groups. To pay for renewables, some developers also tapped unused amounts in contingency line items of their development budgets.

6. Materials Beneficial to the Environment

Reducing, reusing and recycling building materials conserves natural resources and reduces emissions associated with manufacturing and transporting raw materials. Many techniques and building products on the market contribute to more durable, healthy and resource-efficient buildings.

Recycled materials have been recovered or otherwise diverted from solid waste streams either during the manufacturing process or after consumer use. Use of recycled materials or materials with some recycled content reduces the negative impact resulting from extraction and processing of virgin materials.

Less than 10 percent of the old growth forest remains in the United States. The use of Forest Stewardship Council–certified wood encourages forestry practices that are environmentally responsible, socially beneficial and economically viable. The use of salvaged wood and engineered wood products precludes the need to use old-growth lumber. Water-permeable materials reduce stormwater runoff by allowing water to soak into the ground. This runoff pollutes receiving waterways by carrying sediment and other pollutants, and raising water temperature. Stormwater runoff also causes downstream flooding and erosion, and hampers aquifer recharge and transmission of moisture for vegetation.

Urban heat islands disturb the atmosphere and cause energy waste by increasing loads on cooling systems. Heat islands create thermal gradient differences between developed and undeveloped areas. Using roof surfaces that do not retain heat reduces the heat island.

When this group of criteria was being developed, developers and green experts made us aware of issues with availability of materials and information about costs and methods. Accordingly, the criteria in this category were made optional.

Requirements and Considerations of Individual Criteria

< Criterion 6.1 > encourages developers to use at least 5 percent recycled materials in the construction of their projects, which earns two points. Each additional 5 percent increment earns another two points, not to exceed 14 points. The percentage of recycled content material is based on either cost or value, and does not include mechanical and electrical equipment. Eleven projects reported cost premiums, for an average of $369 per dwelling unit.

One project's developer reported savings from using recycled bricks from a nearby project. Since we did not consistently request savings or net costs after savings, the numbers above reflect only additional costs.

TABLE 5.13
Costs of Optional Materials Measures (all criteria are optional)

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Highest Cost per Square Foot
6.1 Recycled content material	11	$0.34	$369	$1.92
6.2 Certified, salvaged and engineered wood	5	$0.31	$272	$0.56
6.3 Water-permeable walkways and parking areas	4	$0.17	$274	$1.54
6.4a Roofing to reduce heat-island effect	7	$0.21	$235	$1.55
6.4b Paving to reduce heat-island effect	2	$0.61	$610	$0.85

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

< Criterion 6.2 > encourages developers to use at least 50 percent (by cost) wood products and Forest Stewardship Council–certified materials, salvaged wood or engineered framing materials. The percentage of certified, salvaged and engineered wood products is based on either cost or value. Meeting this standard earns 10 points. Five projects reported extra costs for using certified wood products, for an average cost of $272 per dwelling unit.

One project reported $16,000 in cost savings from following the intent, if not the letter, of this criterion. The developer achieved these savings by obtaining locally produced building materials, which reduced long-distance trucking costs.

< Criterion 6.3 > encourages developers to use water-permeable materials in at least 50 percent of walkways and driveways to earn five points (for walkways only) or 10 points toward the minimum scoring requirement. Water-permeable materials include pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel. Only four projects reported cost increments for installing water-permeable paving, at an average cost of $274 per dwelling unit.

< Criterion 6.4a > encourages developers to use Energy Star-compliant (i.e., reflectivity of greater than 6.5) and high-emissive roofing with an emissivity of at least 0.8 when tested in accordance with ASTM (American Society of Testing and Materials) 408, or to install a green (vegetated) roof on at least 50 percent of the roof area. Combinations of high-albedo and vegetated roofing materials can be used, provided they collectively cover 75 percent of the roof area. These measures earn five points. Seven projects reported extra costs averaging $235 per dwelling unit.

< Criterion 6.4b > encourages developers to use light-colored or high-albedo materials and/or an open-grid pavement, with a minimum Solar Reflective Index of 0.6, over at least 30 percent of the site's hardscaped area. This earns five points. Only two projects reported extra costs associated with using these materials, for an average cost of $610 per dwelling unit.

7. Healthy Living Environment

Designing buildings and selecting materials to promote a safe, healthy living environment is a significant green building issue that directly affects residents. Safety includes using materials that do not cause negative health impacts for residents, especially for more sensitive groups, such as children, seniors and individuals with existing respiratory problems and compromised immune systems. Creating a healthy living environment requires minimizing residents' and workers' exposure to toxic materials and using safe, biodegradable materials as alternatives to hazardous materials. Proper home ventilation and minimal moisture buildups are crucial to maintaining healthy indoor air quality and reducing the potential for mold growth in living areas and basements. Below are findings on the incremental costs of implementing 15 mandatory Green Communities Criteria and two optional criteria (in the 2005 version) that promote healthy living environments.

Requirements and Considerations of Individual Criteria

< Criterion 7.1 > requires that all interior paints and primers comply with current Green Seal standards for low volatile organic compound (VOC) limits. VOCs are chemicals containing carbon molecules volatile enough to evaporate from material surfaces into indoor air at normal temperatures. Interior paints and primers that release VOCs may pose

health hazards to residents and workers. The cost premium of this requirement averaged $179 per unit for the 11 projects that reported having extra costs for low-VOC paints.

< Criterion 7.2 > specifies that all adhesives comply with Rule 1168 of the South Coast Air Quality Management District. All caulks and sealants must comply with regulation 8, rule 51, of the Bay Area Air Quality Management District. Interior caulks, sealants and adhesives that release VOCs may pose health hazards to residents and workers. Reported cost premiums averaged about $47 per unit for the nine projects that reported extra costs.

< Criterion 7.3 > prevents the use of exposed particleboard (which contains added urea-formaldehyde, a toxin), unless the exposed area has been sealed. Formaldehyde exposure can cause watery eyes, nausea, coughing, chest tightness, wheezing, skin rashes, allergic reactions and burning sensations in the eyes, nose and throat. At the initial stages of their Green Communities projects, many developers reported problems obtaining kitchen cabinets and bathroom vanities made of materials other than particleboard at comparable costs. But when data was reported, the extra costs of following this criterion were modest, with only eight projects out of 27 reporting extra costs, averaging $150 per dwelling unit.

< Criterion 7.4 > rules out installing carpets in basements, entryways, laundry rooms, bathrooms or kitchens because of potential problems with moisture retention and mold growth. If carpeting is installed in other parts of the home, developers must use the Carpet and Rug Institute's (CRI's) Green Label-certified carpet and pad, which have low VOCs. Many developers of Enterprise Green Communities projects have expressed frustration with the cost and color selection of the CRI Green Label carpets. The average cost premium was about $259 per unit for the 12 projects reporting extra costs.

< Criterion 7.5 > requires the installation of Energy Star-labeled bathroom fans that exhaust to the outdoors and are equipped with a humidistat sensor or timer, or operate continuously. Also required in kitchens—except in moderate rehabilitation projects—are Energy Star-labeled power vented fans or range hoods that exhaust to the exterior. Properly sized and controlled exhaust fans in bathrooms and kitchens reduce moisture condensation, lowering the potential for indoor mold growth that may yield odors and pose health hazards to residents. Besides helping to reduce moisture, kitchen fans also help remove carbon dioxide and carbon monoxide over fuel-burning appliances, along with other air contaminants that may be byproducts of cooking. The average cost premium for 11 projects reporting extra costs was about $266 per unit.

< Criterion 7.6 > requires the design and installation of a ventilation system for the dwelling unit that provides 15 cubic feet per minute of fresh air, per occupant. Various means exist for achieving this standard, such as whole-house mechanical ventilation systems, constantly running low-speed exhaust fans, and "slit" ventilators in window frames. The cost premium for ventilation requirements was significant—adding $542 to the per-unit costs of seven projects that would otherwise have included less expensive or no ventilation systems. One developer reported a cost premium of about $2,500 per dwelling unit.

One Green Communities development in rural New Mexico is piloting natural ventilation strategies, integrating several measures to help keep houses cool in lieu of energy-intensive air cooling or water-intensive swamp coolers. The primary sustainable feature of each unit is a south-wall assemblage that includes vision glazing, a high-transmittance Trombe wall section and

TABLE 5.14

Costs of Mandatory Measures

Criterion Number / Description		Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
7.1	Paints and primers	11	$0.07	$73	$0.19	$1.63
7.2	Adhesives and sealants	9	$0.01	$12	$0.05	$0.12
7.3	Composite wood	8	$0.04	$38	$0.13	$0.25
7.4	Carpet	12	$0.11	$115	$0.24	$0.75
7.5	Exhaust fans	11	$0.09	$94	$0.23	$0.90
7.6	Ventilation	7	$0.15	$146	$0.52	$2.51
7.7	HVAC sizing	6	$0.05	$54	$0.26	$0.85
7.8	Water heaters	7	$0.05	$54	$0.17	$0.92
7.9	Cold water pipe insulation	6	$0.02	$19	$0.09	$0.32
7.10	Materials in wet areas	2	$0.01	$6	$0.09	$0.12
7.11	Basements and concrete slabs	6	$0.09	$93	$0.43	$1.23
7.12	Surface water drainage	6	$0.14	$138	$0.60	$1.40
7.13	CO sensors in garages	6	$0.04	$44	$0.15	$0.38
7.14	Clothes-dryer exhaust	3	$0.02	$15	$0.13	$0.20
7.15	Integrated pest management	5	$0.01	$8	$0.04	$0.17
7.16	Lead-safe work practices	0	0	0	0	0

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

TABLE 5.15
Costs of Optional Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Highest Cost per Square Foot
7.17a Healthy flooring materials—alternative sources	9	$0.58	$566	$3.07
7.17b Healthy flooring materials—reducing dust	1	$0.01	$9	$0.01

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

operable "uppers" for light and natural ventilation. The gable roof line is broken by a south-facing clerestory that allows light and solar gain deep into the house. The internal thermal mass, in the form of concrete slabs and a concrete block mass wall within the core of the house, stores and dissipates solar gain inside. In the future, solar energy will also be used to supplement the mechanical heating system by integrating solar hot water heaters into a combined domestic hot water and hydronic baseboard heating system. In addition to hot-water collectors, space is reserved on south-facing roofs for PV panels.

< Criterion 7.7 > requires builders to size heating and cooling equipment in accordance with the Air Conditioning Contractors of America, Manuals J and S, to prevent short cycling of heating or air conditioning, and ensure adequate dehumidification. Appropriately sized equipment can ensure adequate dehumidification, preventing short cycling that leads to excess moisture in the air, which can cause mold growth and resident discomfort. In the seven projects that reported extra costs, the average premiums were about $324 per dwelling unit. We believe that these "premiums" were mostly the result of a flaw in our data collection, since most of these costs seem to be linked to purchasing HVAC equipment with higher efficiency ratings. The 20 projects reporting no extra costs should be representative of the typical project that incorporates this criterion, which generally only requires usage of a smaller fuel nozzle at no extra cost. In some cases, following this standard can even result in savings from the installation of smaller, less expensive boilers and furnaces.

< Criterion 7.8 > requires builders to install tankless water heaters, or conventional water heaters in rooms with non-water sensitive floor coverings and drains or catch pans piped to the exterior of the dwellings. The use of heaters with drains and catch pans prevents moisture problems caused by leakage or overflow. The seven developments with extra costs reported an average premium of about $199 per unit.

< Criterion 7.9 > requires that builders insulate exposed cold water pipes in climates and building conditions susceptible to moisture condensation. This prevents condensation that can lead to mold growth. The six projects with extra costs reporting premiums averaged about $102 per dwelling unit.

< Criterion 7.10 > requires the installation, in wet areas, of materials with smooth, durable, cleanable surfaces, instead of mold-propagating materials, such as vinyl wallpaper and unsealed grout. Shower areas must have a one-piece fiberglass or similar enclosure, or if developers use any form of grouted material, they must use backing materials, including cement board, fiber cement board, fiberglass-reinforced board or cement plaster. Our survey indicated that this is a standard practice, with only two developers out of 27 reporting extra costs, which averaged about $114 per dwelling unit.

< Criterion 7.11 > calls for vapor barriers under all slabs in basements or under living areas, since water can migrate through concrete and most other masonry materials. Proper foundation drainage prevents water from saturated soils from being pushed by hydrostatic pressure through small cracks. Vapor barriers and waterproofing materials greatly reduce the migration of moisture that can occur even in non-saturated soils. Installation of radon-resistant features reduces concentrations of radon, a cancer-causing soil gas that leaks into homes through cracks in slab and foundation. The six developers reporting extra costs experienced premiums averaging about $477 per dwelling unit.

< Criterion 7.12 > requires the installation of foundation drainage systems to divert surface and underground water down to the lowest level of concrete, away from windows, walls and foundations. This also requires that foundation walls be carefully waterproofed on the exterior to avoid moisture migration, and that surface water be diverted away from the building by gutters, downspouts, drainage systems and proper grading of lawns, patios and walkways. Only six developers reported cost premiums—which averaged around $635 per dwelling unit. This finding, together with the cost reports on 7.11, indicates that most builders typically meet these quality standards, while others are persuaded to do so because of their participation in Enterprise Green Communities.

< Criterion 7.13 > requires installation of a continuous air barrier between the conditioned (living) space and any unconditioned garage space to prevent the migration of any contaminants into the living space. In single-family houses with attached garages, developers must install a carbon monoxide (CO) alarm inside the house on a wall attached to the garage or outside the sleeping area. Again, only six developers reported extra costs, which averaged around $198 per dwelling unit.

< Criterion 7.14 > requires that clothes dryers be exhausted directly to the outdoors, to reduce moisture buildup in living areas. Only three developers reported extra costs, which averaged around $156 per dwelling unit.

< Criterion 7.15 > requires that builders seal all wall, floor and joint penetrations to prevent pest entry. Developers must also provide rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh) for large openings. Only five developers reported extra costs, at an average of about $33 per dwelling unit.

< Criterion 7.16 > requires that builders renovating properties built before 1978 use lead-safe work practices during renovation, remodeling, painting and demolition. Any activity that disturbs painted surfaces or building components in pre-1978 dwellings that contain lead-based paint may generate and spread lead dust and debris, increasing the risk of lead poisoning for exposed children and families. Controlling lead dust and debris helps minimize lead in the environment. We did not collect data on cost premiums, because this is a requirement generally established for affordable housing by either local codes or federal financing requirements.

< Criterion 7.17a > (optional) encourages developers to use non-vinyl, non-carpet floor coverings in all rooms, which earns five points toward the minimum required score. Green materials selected by builders in our survey included non-vinyl composite tile, colored concrete, ceramic tile, natural linoleum and wood. While certain health hazards are linked with the production of vinyl products, some alternative flooring materials that are natural and renewable have demonstrated low-VOC emissions and environmentally friendly production processes. Carpeting can serve as a sink for dust, allergens and other substances that may pose health hazards to susceptible residents. This requirement was one of the most expensive add-ons, costing an average of about $566 extra per dwelling unit for the nine developers selecting this option.

< Criterion 7.17b > (optional) encourages developers to install whole-house vacuum systems with high-efficiency particulate air filtration, for a two-point score. Frequent vacuuming reduces the amount of dust burden in the home, and HEPA (High-Efficiency Particulate Air Filter) filtration prevents the airborne distribution of irritating or allergenic particulate matter during vacuuming. Only one developer of a very small homeownership project reported choosing this option, for an average per-unit cost premium of $9.

8. Operations and Maintenance

The benefits of integrating green building features into a project are maximized only if building systems are well maintained and residents understand how their use of the home and surrounding space can affect not just their utility bills, but also their own health and the environment.

A building's maintenance staff is the link between a building designed and built with green features, and a building that will continue to be green and realize the associated benefits. Without guidance for the maintenance staff on specific measures—such as requirements to re-paint with low-VOC paints, replace carpets with CRI Green Label carpets, change filters regularly, irrigate only according to the landscape architect's water efficiency guidelines, replace bulbs with compact fluorescent lamps, etc.—a project will likely perform beneath its potential.

Templates for creating resident and building-owner green manuals are available on the Enterprise Green Communities website (www.greencommunitiesonline.org). However, without an intentional strategy for transferring knowledge from a development team to its operations and maintenance staff, as well as residents, a manual alone will not accomplish the intent of these criteria. In a focus group conducted by the Cedar River Group and involving residents in a Seattle development (not included in this report's data set), most participants were aware of at least some of the resource conservation measures on site but did not know the purpose of many of them. Residents also had good ideas for maximizing green features in their building, like installing timers on tankless water heaters because, according to one resident, "The water never gets cold, and my children stay in the shower forever."

Requirements and Considerations of Individual Criteria

< Criterion 8.1 > requires a developer or builder to provide rental property owners with a manual. The manual should include: a routine maintenance plan; instructions for all appliances, HVAC operation, water-system turnoffs, lighting equipment and other systems that are part of each occupancy unit; an occupancy turnover plan that describes in detail the process of educating the tenant about proper use and maintenance of all building systems; and information on how to maintain the site's green features, including paving materials and landscaping.

< Criterion 8.2 > requires a developer or builder to provide homeowners and renters with a manual explaining the intent, benefits, use and maintenance of green building features, and encouraging additional green activities such as recycling, gardening and use of healthy cleaning materials.

Developers must provide a walk-through and orientation to the homeowner or new resident that reviews the building's green features and operations, and maintenance processes.

< Criterion 8.3 > requires a developer or builder to conduct a walk-through and orientation with the new property owner—whether a homeowner or rental property owner—to help ensure that the green development plan achieves its intended environmental and economic benefits.

Typical costs of implementing these criteria were very small on a per–square foot and per-unit basis, as indicated by Table 5.16.

TABLE 5.16
Costs of Mandatory Measures

Criterion Number / Description	Number of Projects Reporting Cost Premiums	Weighted Average Cost per Square Foot[1]	Weighted Average Cost per Dwelling Unit[2]	Weighted Average Cost per Square Foot for Projects Reporting Premiums	Highest Cost per Square Foot
8.1 Owner's manual	7	$0.01	$7	$0.02	$0.11
8.2 Resident's manual	11	$0.01	$15	$0.03	$0.10
8.3 Owner orientation	7	$0.01	$6	$0.02	$0.06

[1] Weighted average costs per square foot of living area are calculated from 27 projects in the survey universe, including those reporting zero-cost premiums.

[2] To illustrate whole-house cost impacts in this and other similar tables in the report, dwelling units are assumed to have 1,001 square feet of living area, the average dwelling-unit size of the projects surveyed.

Enterprise Green Communities Criteria: Appendices

APPENDIX A

EVALUATION METHODOLOGY FOR ENTERPRISE GREEN COMMUNITIES

Produced by
PERFORMANCE SYSTEMS DEVELOPMENT

Background and Overview

Performance Systems Development (PSD) was contracted by Enterprise Community Partners to perform an evaluation of the costs and savings achieved by developments meeting the Green Communities Criteria. Systems were developed for gathering and tracking development characteristics and costs, and for calculating and tracking the predicted savings from meeting the Enterprise Green Communities energy and water criteria. Additionally, as housing developments were completed, actual building performance was tracked by comparing the actual utility bill usages against the predicted usages.

The following methodology was followed for this study:

- Cost comparison between Green Communities building and baseline building at the development level
- Cost comparison at the individual criteria level
- Tracking predicted and actual energy savings
- Tracking predicted and actual water savings

Description of Methodology

Cost Comparison at the Development Level

The first part of this study looked at determining the overall cost premium for building an affordable housing development to the Enterprise Green Communities Criteria. The method used for this was to compare the total development costs of the Green Communities development to a similar existing development, called the baseline development.

Each developer was asked to complete a Enterprise Green Communities Cost Benefit Survey. Part One of the required survey information includes:

- General site and building information
- Total development costs, which are broken down into:
  - Design and other "soft" costs (i.e., permits, fees, consultants)
  - Land and site works
  - Construction costs
- The year each of these are completed

This information was completed by the developer for both the Enterprise Green Communities development and a baseline development chosen by the developer. The baseline development was chosen based on close proximity to the Green Communities development, one that the developer had access to, being affordable housing and of similar construction type to the Green Communities development.

In order to more accurately compare the costs, the baseline development costs were adjusted for size and age. These two factors were chosen as they tend to dominate the cost differences and the information is accessible. The size adjustment was made by scaling the costs of the baseline development by the ratio of the baseline total square footage to the Enterprise Green Communities development. The age difference adjustment was made using the Price Deflator (Fisher) Index of new one-family houses under construction from the U.S. Census Bureau, Construction Price Indexes. This is an acceptable index for this study as much of the affordable housing developments studied are wood-framed, low-rise construction as included in the index. This index data is not currently available for multifamily housing developments.

Cost Comparison at the Individual Criteria Level

Each housing development is different and therefore many different factors play into the overall initial construction costs. To further enable market transformation, developers and industry need to know more than just an overall cost-premium percentage for going green. For this reason, the incremental cost to meet each of the Enterprise Green Communities Criteria was gathered and tracked.

The last section of the Enterprise Green Communities Cost Benefit Survey lists all Green Communities Criteria and asks the developer to report the incremental amount spent for each criterion that they are meeting. This incremental cost was to be calculated or estimated as compared with what they would have spent if they were building this same affordable housing development to their typical construction practices and not to the Green Communities standard. These incremental costs are self-reported by the developer. It is understood that the accuracy of these figures depends on the level of detail the developer used in tracking costs and knowledge of what typical construction practices would have cost. All cost data were normalized by the total development square footage and checked for outliers. For any outliers, the developers were asked to verify that these reported incremental costs were associated with the correct criterion and that they were calculated or estimated correctly. These data will be used to determine relationships such as, which criteria are the most and least costly to achieve, and what development characteristics influence the incremental cost to meet each criteria.

Tracking Predicted Energy Savings

The criteria chosen for tracking savings were the energy and water criteria (4.1, 5.1 through 5.6). These criteria have a direct monetary benefit and can be used in the calculation of the cost-effectiveness of these criteria. This involves comparing the incremental cost to the operational cost savings over the lifetime of the technology or equipment installed to meet the criteria.

The method chosen to track predicted energy savings was to compare the predicted usage of the proposed design meeting the Enterprise Green Communities Criteria to a conventional baseline design using whole-building energy simulation models. The energy modeling tool chosen was TREAT. TREAT is a fully verified (passes BESTEST) whole-building modeling tool used extensively in the multifamily building market for its ease of use, proven track record, and capability to export the energy savings results into a common database. A TREAT energy model was built for each development that submitted a full drawing set of the proposed design. A change set of building characteristics is applied to this energy model that reflects the performance of the baseline design. The energy simulation is run for each model, proposed design and baseline, and the difference is the predicted energy savings.

TABLE A.1

Assumptions Used in Both the Proposed Design and Baseline Energy Models

General	Occupants	= Number of bedrooms
	Entering Cold Water	= 50°F
	Cooling Latent Load	= 25%
	Occupied hours/day	= 16 hours/day for all conditioned residential spaces
Infiltration	Conditioned space	ACH = 0.35
	Unconditioned space	Attics and well-ventilated crawl-spaces = 2.0 ACH, basements = 0.2 ACH
Distribution	Hot water and steam piping	If not specified on drawings, assume insulated to R-3
	For ducted systems	If not specified on drawings, assume insulated to R-3 and duct leakages of 150 CFM 25
Thermostats	Heating setpoint	68°F, no setback
	Cooling setpoint	78°F, no setup
Exhaust Fans	Ganged rooftop fans	If not specified on drawings, assume 50 CFM per dwelling unit and operating 24 hours/day
	Individual bath/kitchen fans	Use CFM from drawings, assume 0.5 hours/day if on switch
Domestic Hot Water	Set point temperature	If not listed on drawings, set point = 120°F
	Piping in conditioned space	No insulations
	Space	Insulation = R-3
Lighting	Apartment bathroom	2 hours/day
	Apartment bedrooms	2 hours/day
	Apartment kitchen	4 hours/day
	Apartment living/dining room	4 hours/day
	Corridors	24 hours/day
	Stairwells	24 hours/day
	Exterior	12 hours/day
	Community rooms	4 hours/day
	Interior entrance way	12 hours/day
Appliances	Cooking range	Usage = 0.5 hour per day per person, quantity = number of bedrooms
	Refrigerator	Quantity = number of dwelling units
	Clothes washer	Loads =1.5 loads/person/week
	Clothes dryer	Loads =1.5 loads/person/week
	Misc. apartment plugload	Loads = 500kWh/year, quantity = number of dwelling units
	Dishwasher	Loads = 1.5 loads/person/week

The energy simulation models built by the developer's team to meet Enterprise Green Communities criterion 5.1 are "asset rating" models (e.g., ASHRAE 90.1 Appendix G, HERS). These models are meant for ranking a building's theoretical performance and for making design decisions of one technology over another. They do not take into account plugloads, actual occupant usages, actual operation schedules, etc. of the proposed design building. Therefore, they will not be a good predictor of the annual energy savings that will be realized in a particular building.

An analogy of this difference can be seen in understanding car mileage ratings. One might select a car based on its performance as stated on the yellow MPG rating sticker; however, it is accepted that only under certain conditions will that same gas mileage be achieved. A more accurate measure of the car's projected performance for the way it is driven would be to look at historical mileage driven and gas purchased. Unfortunately, the new car has not been driven yet by the new owner, so the new car's MPG rating has to be modified by some factor that accounts for the new owner's driving behavior as related to the MPG rating of their old car. In the same way, in order to predict the annual energy usage of the proposed design building, the information from the asset rating model has to be modified to reflect how the tenants will use the new building based on historical behavior of similar tenants in similar buildings.

To accomplish this in the TREAT energy models, building envelope, HVAC, domestic hot water and lighting equipment size and performance were taken directly from the submitted construction drawings. The thermostat set points, lighting operation schedules, ventilation schedules, hours of occupancy, domestic hot water usage patterns, appliance power and appliance usage patterns were taken from data collected in the Cost Benefit Survey, guidelines from the NYSERDA Multifamily Performance Program, and EPA sources. The building usage and operation schedules assumed for both the proposed design and baseline energy models are provided in table A.1. Additionally, each of the changes to the proposed design model to create the baseline model were tagged so that the predicted savings could be associated with one the Green Communities energy criteria. This allowed a further breakdown of the cost-effectiveness of each of the energy criteria.

Even with a high confidence level that the proposed design operational model will be an accurate predictor, the amount of predicted savings also depends on how the baseline model is defined. In order to have a true measure of the potential savings from meeting the Enterprise Green Communities Criteria, the baseline model should reflect the building that would have been constructed if the developer was not trying to meet the green criteria. HERS, ASHRAE 90.1 Appendix G and Title 24 all have predefined baselines; however, as stated earlier for the proposed design model, these baselines are part of an asset rating. Therefore, these baselines may or may not reflect the performance of the building that the developer would have constructed had they not followed the Green Communities Criteria.

The minimum construction code can vary dramatically by state, city or other local code requirements. In the state of California, this is simple because the baseline construction is Title 24; this happens to be same metric used for meeting Green Communities criterion 5.1 (beat Title 24 by 15 percent). However, in all other states the baseline construction code for energy efficiency differs greatly. For example, the 2007 NY State Energy Efficiency Code is based on ASHRAE 90.1-2004 which is a more stringent

version of this standard than meeting Green Communities 2005 criterion 5.1 (ASHRAE 90.1-1999). But the Minnesota State Energy Code is much lower in its requirements than those that are required by ASHRAE 90.1-2004, for that climate zone. Therefore, it should cost less to meet the criterion 5.1 for the developer in New York than it would be in Minnesota. In terms of energy savings, the developer would actually be saving a lot more energy if the development was measured against how it would have been built if the Green Communities Criteria had not been met versus just the 15 percent increment above ASHRAE 90.1–1999.

To account for these differences, each developer was asked in the Cost Benefit Survey to report the surface U-values and fenestration U-values and SHGC values defined in their local construction code. For performance characteristics that are not readily found in construction codes (e.g., HVAC efficiencies, lighting power densities, water fixtures) standard values are used. All of this information is used to create a baseline model from the proposed design operational model. The thermostat set points, lighting operation schedules, ventilation schedules, hours of occupancy, domestic hot water usage patterns and appliance usage patterns are kept the same between both models and stated in Table A.1.

Details about the standard values used for the baseline model not found in the local construction code are as follows:

- HVAC and domestic hot water baseline efficiencies are taken from Chapter 6 of ASHRAE 90.1–1999 as of 10/29/2001. This is the same version of 90.1 that the Green Communities criterion 5.1 references.
- For CFL lamps (2-pin or screw-in), the baseline equivalent is an incandescent lamp with a wattage of three times that of the CFL (NYSERDA MPP Guidelines). For T8 lamps on electronic ballast, the baseline equivalent is a T12 lamp on magnetic ballast.
- Water fixture (faucets, showerheads, toilets) baseline performance is assumed to meet Energy Policy Act of 1992.

Tracking Predicted Water Savings

The predicted water savings for meeting the Enterprise Green Communities interior water criterion (4.1) were calculated in a similar manner. A spreadsheet analysis was performed to calculate the predicted annual water usage and savings for the Green Communities development as compared to a baseline. The usage assumptions used for calculating the annual interior water usage are shown in Table A.2.

The values for the water using appliances and devices for the Proposed Design building came directly from the Cost Benefit Survey. When Energy Star was specified but no performance values were listed, a standard value was used. These, and the baseline comparison values used for the same appliances and devices, are shown in Table A.2.

TABLE A.2

Assumptions Used for Calculating Annual Interior Water Usage

Water Usage Assumptions	Values	Source of Information
Common laundry (loads/person/week) Mulitplier for in-unit laundry use versus common	1.5 1.5	National Research Center, Inc., *A National Study of Water and Energy Consumption in Multifamily Housing: In Apartment Washers vs. Common Area Laundry Room*, November 2002
Dishwasher (loads/person/week)	1.5	Average of Several Sources
Sink: bathroom (minutes/person/day) Sink: kitchen (minutes/person/day)	1.75 2.75	U. S. Environmental Protection Agency (USEPA), *Water Conservation Plan Guidelines: Water Use Efficiency Program. Appendix B: Benchmarks Used in Conservation Planning*, 2002
Multiplier to reduce kitchen sink usage if there is a dishwasher	50%	Estimate
Shower duration (minutes/shower) Showers per person per day	15 1	Biermayer, Peter, *Potential Water and Energy Savings from Showerheads*, September 2005
Flushes per person per day	3	ASPE's Data Book Volume 2, Plumbing Systems
Assumptions for Water-Using Appliances and Devises	**Values**	**Source of Information**
Washing machines: Standard top load (gallons/load)	32.57	08/08 calculator from *energystar.gov*
Washing machines: Energy Star front load (gallons/load)	14.77	08/08 calculator from *energystar.gov*
Standard toilet (gallons/flush)	1.6	EPAct 1992
Dishwasher: Standard (gallons/load)	6	08/08 calculator from *energystar.gov*
Dishwasher: Energy Star (gallons/load)	4	08/08 calculator from *energystar.gov*
Standard sink: bathroom (gallons/minute)	2.2	EPAct 1992
Standard sink: kitchen (gallons/minute)	2.2	EPAct 1992
Standard shower (gallons/minute)	2.5	EPAct 1992

Tracking Actual Energy and Water Savings

In order to measure the actual cost-effectiveness of meeting the individual energy and water criteria, the cost savings should be based on actual performance. The actual performance of the development comes from analyzing the post-construction utility bills. The analysis of the utility bills is then compared with the monthly predictions of the proposed design operational model and hence how well it is predicting actual performance of the building. This provides instructive feedback that can be used to understand if the development is being used similarly to the assumptions made in the proposed design TREAT model. It can also provide first-level "commissioning" as to whether or not the systems and equipment were installed as called out in the construction design documents.

This analysis was performed for each development that had sufficient utility data. Because a TREAT model could not be made for a couple of developments that had billing data, it was decided to track actual performance to model predicted performance by doing a normalized billing comparison, which requires 12 months of utility data.

TREAT has an integrated utility bill analysis, and provides exportable data of the weather-normalized utility bills and of the predicted monthly energy usages of both the proposed design and baseline energy models. Actual monthly utility bills were imported into TREAT as well as local daily weather for the period of the utility bills. TREAT produces a regression equation from these data and then calculates the weather-normalized monthly energy usages by driving this regression equation with the appropriate long-term average weather (TMY2) file. This same TMY2 file is used by TREAT to calculate the predicted annual energy usages of both the proposed design and baseline models. Because of this weather normalization, direct comparisons can be made of model predictions and actual utility bills.

APPENDIX B

COST BENEFIT SURVEY

Produced by Enterprise Green Communities

Developer Name

Project Name

Contact Name Phone

Contact E-mail Date

Introduction

An important goal of Enterprise's Green Communities initiative is to document the costs and benefits of affordable housing developments designed to the Green Communities Criteria. Specifically, Enterprise seeks to determine as accurately as possible any incremental costs of applying the Green Criteria on a per-unit and per–square foot basis, and the expected energy and water savings that will accrue to the building and the residents over time. As indicated in your grant agreement, you have agreed to help quantify these figures. Enterprise will perform an energy modeling analysis of energy and other savings based on this information if you have not already done so.

We greatly appreciate your cooperation in completing this survey. The findings will enable Enterprise to provide new tools and resources to support your and other leading developers' groundbreaking work to create healthier, more energy efficient and more environmentally sustainable homes for low-income families. We will share our analysis of your data with you.

Status of Enterprise Green Communities Development

Please indicate current status of development:

- ☐ Schematic Drawings
- ☐ Working Drawings
- ☐ Construction Contract Awarded
- ☐ Currently under construction

  Please indicate projected construction end date [month/year]: _____
- ☐ Development Complete

  Please indicate date of construction completion [month/year]: _____

  Please indicate percentage of tenant occupancy [month/year]: _____

Supplemental Document Request

1. Development Budget

Please submit electronically actual development budget. If the actual budget is not available at this time, please email us with a copy of the development's most recent projected budget.

☐ Attached

2. Energy Modeling Documents

Provide documents under Option 1or 2:

☐ *Option 1:* If you met Criterion 5-1a by conducting an energy model of your development, please submit electronically the energy modeling file(s) to yhernandez@enterprisecommunity.org.

☐ *Option 2:* If you did not perform an energy analysis of your development, please submit a complete set of drawings of your development electronically to yhernandez@enterprisecommunity.org.

Provide the following information for the Green Communities Development:

- Number of buildings
- Acres of land
- Total square footage of building (conditioned and unconditioned spaces)
- Total square footage of residential (conditioned)
- Total square footage of commercial (conditioned)
- Total square footage of common areas (conditioned)
- Total number of residential units
- Total number of affordable units
- Total number of bedrooms
- Total cost
- Land and site work costs
- Design and other "soft" (i.e., permits, fees, consultants) costs
- Construction costs
- Date of land purchase
- Date of design completion
- Date of construction completion

Survey

1. **Enter the name and date of the Construction Code or Building Standard you would use if you were not building to the Green Communities Criteria.** (We will refer to this as the "*benchmark standard*" for the rest of this survey.) This will be used to model a hypothetical building of the same dimensions as your Green Communities development for a comparison between developments.

   Please provide the name and date of Construction Code or Building Standard:

   _____

2. **Using this benchmark standard and/or the actual R and U values used in your previous developments please complete the following** (provide values based on requirement within the *benchmark standard* or the actual values used in your baseline development):

   Above-grade walls: R –
   Below-grade walls: R –
   Floors over unconditioned spaces: R –
   Slab-on-grade floors (insulated floor): R –
   Slab-on-grade floors (insulated perimeter): R –
   Ceilings adjacent to vented attic: R –
   Flat or sloped insulated roof: R –
   Doors: U –
   Window glazing: U –
   Window glazing shading, if known, SHGC –

Please provide the following information from your Green Communities Development:

3. Put an "X" next to the construction type from the list below that represents your Green Communities Development:

☐ Scattered-site single
☐ Clustered single
☐ Clustered townhouses
☐ Mid rise (< 4 stories)
☐ High rise (4 – 10 stories)
☐ High rise (> 10 stories)

4. Enter the number of stories in your Green Communities development. If the number varies between buildings, enter the average:

5. List any unconditioned spaces in your Green Communities development. For example, basement, crawlspace, boiler room, parking garage, etc.:

Space Name	Where is it attached to the main building?	Square Footage

6. Is there a central exhaust system in your Green Communities development?

Typically, this is where exhaust vents for the kitchen and bathrooms are ganged together and large exhaust fans on the roof continuously ventilate these spaces.

☐ Yes ☐ No

7. If you answered "No" for #6, do the bathrooms and kitchens in your Green Communities development have individual exhaust fans?

Bathrooms: ☐ Yes ☐ No
Kitchens: ☐ Yes ☐ No

8. Enter the following information detailing the water fixtures in your Green Communities development.

Toilets: Quantity _____ Gallons per flush _____
Bathroom sinks: Quantity _____ Gallons per minute _____
Kitchen sinks: Quantity _____ Gallons per minute _____
Showers: Quantity _____ Gallons per minute _____
Dishwashers: Quantity _____ Gallons per cycle _____
Clothes washers: Quantity _____ Gallons per cycle _____

9. Please select all applicable fuel types, equipment types, and metering information that apply to your Green Communities development as follows:

Heating Fuel:
☐ Natural Gas ☐ Propane ☐ Electric ☐ Fuel Oil
☐ Other (explain) _____

Heating Type:
☐ Furnace ☐ Hot Water Boiler ☐ Steam Boiler ☐ Heat Pump
☐ Electric Resistance ☐ Other (explain) _____

Cooling Type:
☐ Furnace ☐ Ductless Split ☐ Heat Pump ☐ Evaporative ☐ Chiller
☐ PTAC ☐ Room AC ☐ N/A ☐ Other (explain) _____

Domestic Hot Water Fuel(s):
☐ Natural Gas ☐ Propane ☐ Electric ☐ Solar

Domestic Hot Water Type:
☐ Stand alone fired tank ☐ Storage tank off of Heating Boiler ☐ Tankless Heater
☐ Dedicated boiler and storage tank ☐ Other (explain) _____

Location of Laundry Machines: ☐ In Unit ☐ Common Facility ☐ N/A

Fuel for Clothes Dryers: ☐ Electric ☐ Natural Gas ☐ Propane

Electric Meters: ☐ Master ☐ Individual meters ☐ Master with sub meters ☐ N/A

Natural Gas Meters: ☐ Master ☐ Individual meters ☐ Master with sub meters ☐ N/A

Water Meters: ☐ Master ☐ Individual meters ☐ Master with sub meters ☐ N/A

10. Please enter the local and current energy and water prices. Please do not include the flat monthly fee in the $/unit field.

☐ *Electricity:*

Supplier Name _____

Cost ($/kWh) _____

☐ *Water and Sewage:*

Supplier Name _____

Cost ($/1,000 gallons) _____

☐ *Additional Fuel or Electricity Meter #1:*

Supplier Name _____

Cost ($/Unit) _____

☐ *Additional Fuel or Electricity Meter #2:*

Supplier Name _____

Cost ($/Unit) _____

11. List any renewable energy technologies and the expected percentage of energy usage provided by that renewable technology:

_____

_____

12. List any rainwater collection techniques, explain how the water will be reused, and provide the expected percentage of total water to be provided by rainwater harvesting:

_____

_____

13. *Optional:* List anything else that Enterprise should know about the energy, fuels, or meters in your Green Communities development that would be relevant to determining the costs and benefits of meeting the Green Communities Criteria.

_____

_____

14. Please provide us with an overall cost *estimation* of the green features of this development:

Green Premium, or cost difference between building that meets the mandatory Green Communities Criteria and the same building constructed using conventional building practices ($/square foot):

Cost of Green Communities Optional Criteria items, e.g., onsite renewables, constructed wetlands, green roof. Please list cost and item name below($/square foot):

15. Please provide us with any information related to additional benefits you received for this green development such as expedited regulatory approvals, overcoming project opposition, special financing, additional points from a housing finance agency, and or any other special circumstances attributable to building green:

16. Please list any local green building programs in which you are participating:

Additional Cost of Satisfying the Enterprise Green Communities Criteria

Within the table below, please specify, to the best of your ability, any additional costs incurred in satisfying the Green Communities Criteria. The intent of this table is to track and evaluate the incremental cost of implementing each criterion, which we understand is inherently difficult to do given the integration of systems.

Please use your best judgment to distribute costs across the four (4) categories listed below. For example, the additional cost of adhering to the criterion 1-1 Green Development Plan would fall under the Design Cost category. It's important to note that the allocation of costs may fall under more than one of the four categories.

If your development is not far enough along and you are unable to provide this information please indicate that within the comment field.

Please enter a "zero" value in the cost allocation cells for any Green Communities criteria that your development satisfied but was not an additional cost. Enter "N/A" in the cost allocation cells for any Green Communities criteria that you did not satisfy.

Allocate Additional Cost of the Green Communities Criteria

Criterion Item / Description	Land / Development Costs	Design Costs	Construction Costs	Commissioning Costs (optional)	Comments
1.1 Green development plan					
2.1a Smart site location—proximity to existing development					
2.1b Smart site location—protecting environmental resources					
2.1c Smart site location—proximity to services					
2.2 Compact development					
2.3 Walkable neighborhoods					
2.4a Smart site location—make use of passive solar/heating					
2.4b Smart site location—grayfield, brownfield or adaptive reuse					
2.5 Compact development					
2.6 Walkable neighborhoods					

Additional Cost Allocation *(continued)*

Criterion Item / Description	Land / Development Costs	Design Costs	Construction Costs	Commissioning Costs (optional)	Comments
2.7 Transportation choices					
3.1 Environmental remediation					
3.2 Erosion and sedimentation control					
3.3 Surface water management					
3.4 Storm drain labels					
4.1 Water-conserving appliances and fixtures					
4.2 Water-conserving landscaping					
4.3 Efficient irrigation					
5.1 Efficient energy use					
5.2 Energy Star appliances					
5.3 Efficient lighting					
5.4 Electricity meter					
5.5 Additional reductions in energy use					
5.6 Photovoltaic (PV) panels					
6.1 Recycled content material					
6.2 Certified, salvaged and engineered wood					
6.3 Water-permeable walkways and parking areas					
6.4a Reduce heat-island effect — roofing					
6.4b Reduce heat-island effect — paving					

Additional Cost Allocation *(continued)*

Criterion Item / Description	Land / Development Costs	Design Costs	Construction Costs	Commissioning Costs (optional)	Comments
7.1 Paints and primers					
7.2 Adhesives and sealants					
7.3 Composite wood					
7.4 Carpet					
7.5 Exhaust fans					
7.6 Ventilation					
7.7 HVAC sizing					
7.8 Water heaters					
7.9 Cold water pipe insulation					
7.10 Materials in wet areas					
7.11 Basements and concrete slabs					
7.12 Surface water drainage					
7.13 CO sensors in garages					
7.14 Clothes dryer exhaust					
7.15 Integrated pest management					
7.16 Lead-safe work practices					
7.17a Healthy flooring materials — alternative sources					
7.17b Healthy flooring materials — reducing dust					
8.1 Owner's manual					
8.2 Resident's manual					
8.3 Owner orientation					

APPENDIX C

PROJECT TABLES

TABLE C.1
Summary Table of Project Characteristics

Project Name / Developer	Total Development Cost (TDC)	Green Premium	% of TDC	Total Sq. Ft.	Total Units	Building	Location	Construction	Property	Housing
California										
275 10th Street, San Francisco Episcopal Community Services	$32,729,028	$434,484	1%	88,500	135	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
City Green Residences, Los Angeles Eden Housing, Inc.	$20,500,000	$110,910	2%	21,910	57	Clustered singles	Urban	New	For-Sale	Single-family
The Essex, San Francisco Mercy Housing California and Community Housing Partnership	$33,741,763	$421,850	2%	38,500	84	High-rise (4–10 stories)	Urban Infill	Substantial Rehab	Rental	Multi-family
Fox Courts, Oakland Resources for Community Development	$34,500,000	$723,000	2%	134,420	80	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Madrone Plaza, Morgan Hill South County Housing	$40,500,000	$232,925	1%	161,440	95	Clustered townhouses	Surburban	New	For-Sale	Multi-family
Arnett Watson Apartments, San Francisco Tenderloin Neighborhood Development Corporation and Community Housing Partnership	$31,124,115	$140,250	0%	66,357	83	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Colorado										
Central Park at Stapleton, Denver Northeast Denver Housing Center, Inc.	$4,183,462	$222,000	5%	17,541	18	Clustered townhouses	Urban	New	Rental	Multi-family
Renaissance Riverfront Lofts, Denver Colorado Coalition for the Homeless	$17,341,682	$671,950	4%	96,406	100	High-rise (4–10 stories)	Urban	New	Rental	Multi-family

Summary Table of Project Characteristics *(continued)*

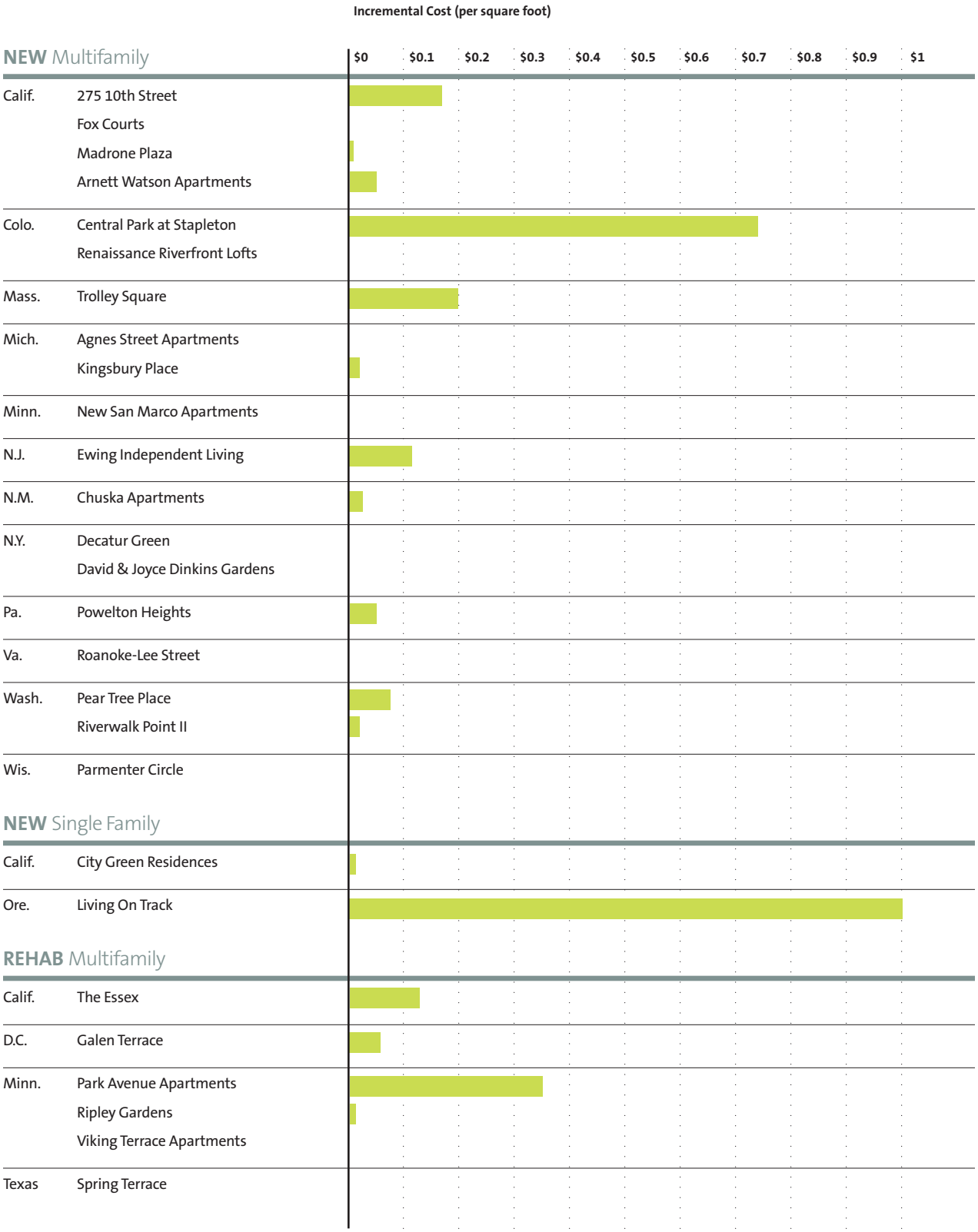
Project Name / Developer	Total Development Cost (TDC)	Green Premium	% of TDC	Total Sq. Ft.	Total Units	Building	Location	Construction	Property	Housing
Michigan										
Agnes Street Apartments, Detroit Agnes Street Apartments, Inc.	$4,561,930	$50,167	1%	29,110	24	Mid-rise (< 4 stories)	Urban	New	Rental	Multi-family
Kingsbury Place, Walker Genesis Non-Profit Housing Corp.	$7,200,000	$162,000	2%	41,650	44	Mid-rise (< 4 stories)	Suburban	New	Rental	Multi-family
Massachusetts										
Trolley Square, Cambridge Homeowner's Rehab, Inc.	$14,198,000	$997,000	7%	75,747	40	Clustered townhouses	Urban	New	Rental & For-Sale	Multi-family
Minnesota										
New San Marco Apartments, Duluth Center City Housing Corp.	$9,245,264	$291,627	4%	45,998	70	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Park Avenue Apartments, Minneapolis Lutheran Social Service of Minn.	$11,313,433	$493,000	4%	85,311	48	High-rise (4–10 stories)	Urban	Substantial Rehab	Rental	Multi-family
Ripley Gardens, Minneapolis Aeon	$14,498,432	$121,500	1%	77,519	60	Mid-rise (<4 stories)	Urban	New & Substantial Rehab	Rental	Multi-family
Viking Terrace Apartments, Worthington Southwest Minnesota Housing Partnership	$4,708,716	$535,200	11%	47,860	60	Mid-rise (<4 stories)	Rural	Substantial Rehab	Rental	Multi-family
New Jersey										
Ewing Independent Living, Ewing LLC Rely Properties	$13,517,684	$830,925	6%	71,000	72	Mid-rise (< 4 stories)	Suburban	New	Rental	Multi-family
New Mexico										
Chuska Apartments, Gallup Supportive Housing Coalition of New Mexico	$8,097,602	$572,431	8%	32,216	30	Clustered townhouses	Suburban	New	Rental	Multi-family

Summary Table of Project Characteristics *(continued)*

Project Name / Developer	Total Development Cost (TDC)	Green Premium	% of TDC	Total Sq. Ft.	Total Units	Building	Location	Construction	Property	Housing
New York										
David & Joyce Dinkins Gardens, New York Harlem Congregations for Community Improvement, Inc./ Jonathan Rose Companies	$19,623,481	$185,000	1%	75,190	85	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Decatur Green, New York Fordham Bedford Housing Corp.	$5,650,000	$44,000	1%	17,023	18	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Oregon										
Living On Track, Medford Tracking Opportunities, LLC	$8,066,000	$164,818	2%	55,661	63	Clustered singles	Urban	New	Rental	Single-family
Pennsylvania										
Powelton Heights, Philadelphia 1260 Housing Development Corporation	$9,154,625	$140,124	2%	41,092	48	High-rise (4–10 stories)	Urban	New	Rental	Multi-family
Texas										
Spring Terrace, Austin Foundation Communities	$5,230,000	$232,144	4%	69,845	140	Mid-rise (<4 stories)	Urban	Moderate Rehab	Rental	Multi-family
Virginia										
Roanoke-Lee Street, Blacksburg Community Housing Partners Corp.	$3,307,175	$207,050	6%	16,399	14	High-rise (4–10 stories)	Scattered-Site	Rural	For-Sale	Multi-family
Washington										
Pear Tree Place, Yakima Next Step Housing and Office of Rural and Farmworker Housing	$4,804,035	$126,848	3%	27,940	26	Clustered townhouses	Rural	New	Rental	Multi-family
Riverwalk Point II, Spokane SNAP	$8,949,468	$340,852	4%	51,268	51	Clustered townhouses	Surburban	New	Rental	Multi-family
Washington D.C.										
Galen Terrace National Housing Trust-Enterprise Preservation Corp., Somerset Development Co. and the Galen Terrace Tenants Association	$13,600,000	$358,089	3%	86,276	83	High-rise (4–10 stories)	Selective Urban Infill	Rehab	Rental	Multi-family
Wisconsin										
Parmenter Circle, Middleton Nakoma Development LLC	$6,333,719	$466,700	7%	69,480	50	High-rise (4–10 stories)	Urban	New	Rental	Multi-family

TABLE C.2

Incremental Cost to Meet Enterprise Green Communities Criteria for Integrated Design ($/Sq. Ft.)



NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	
Mass.	Trolley Square	
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	
	Riverwalk Point II	
Wis.	Parmenter Circle	
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	
Minn.	Park Avenue Apartments	
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

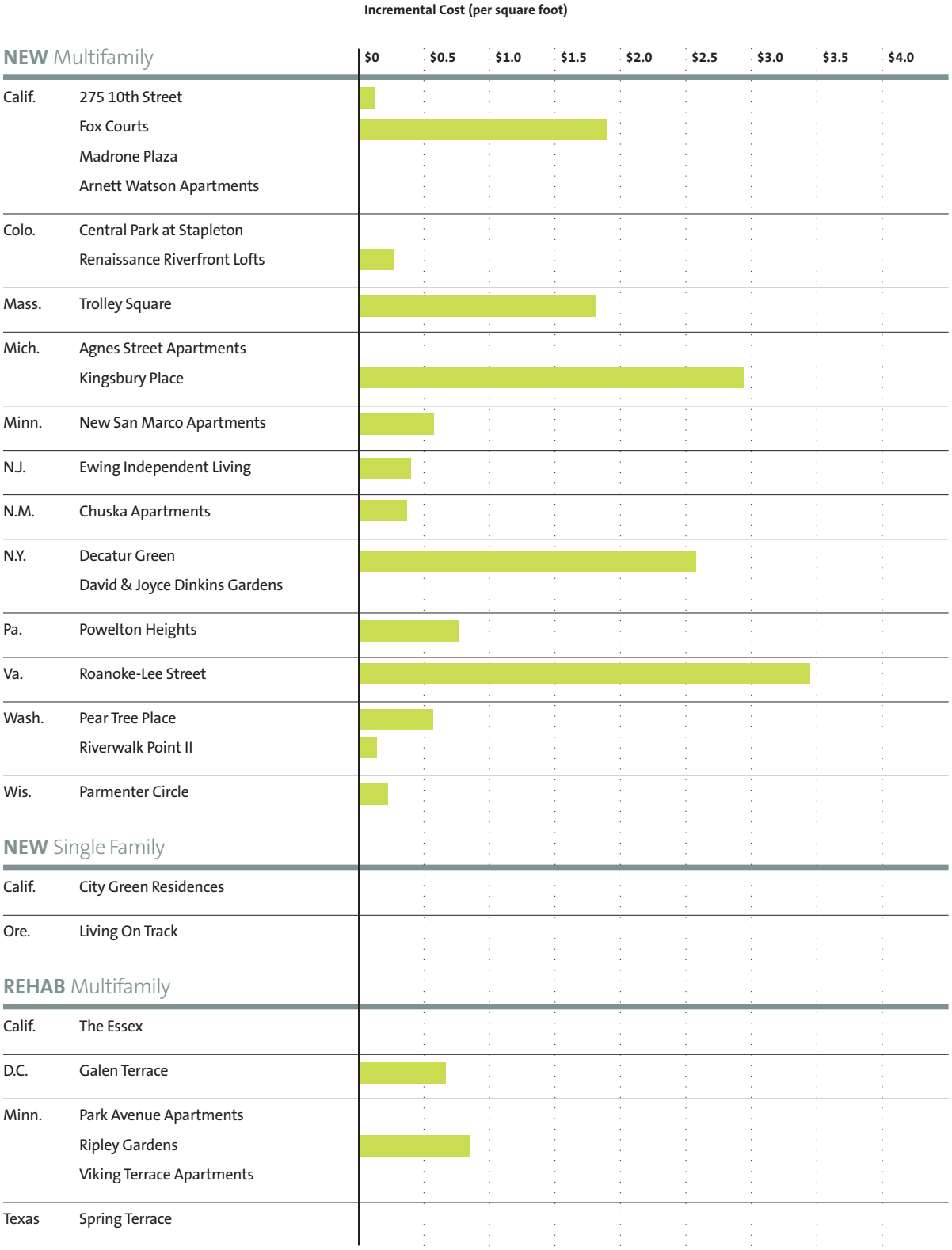
TABLE C.3

Incremental Cost to Meet Enterprise Green Communities Criteria for Site, Location and Neighborhood Fabric ($/Sq. Ft.)

NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	$3.25
Mass.	Trolley Square	$0.40
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	$0.75
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	$1.00
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	$0.10
	Riverwalk Point II	$0.10
Wis.	Parmenter Circle	$2.75
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	$0.60
Minn.	Park Avenue Apartments	$0.10
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

TABLE C.4

Incremental Cost to Meet Enterprise Green Communities Criteria for Site Improvements ($/Sq. Ft.)



NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	
Mass.	Trolley Square	
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	
	Riverwalk Point II	
Wis.	Parmenter Circle	
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	
Minn.	Park Avenue Apartments	
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

TABLE C.5

Incremental Cost to Meet Enterprise Green Communities Criteria for Water Conservation ($/Sq. Ft.)

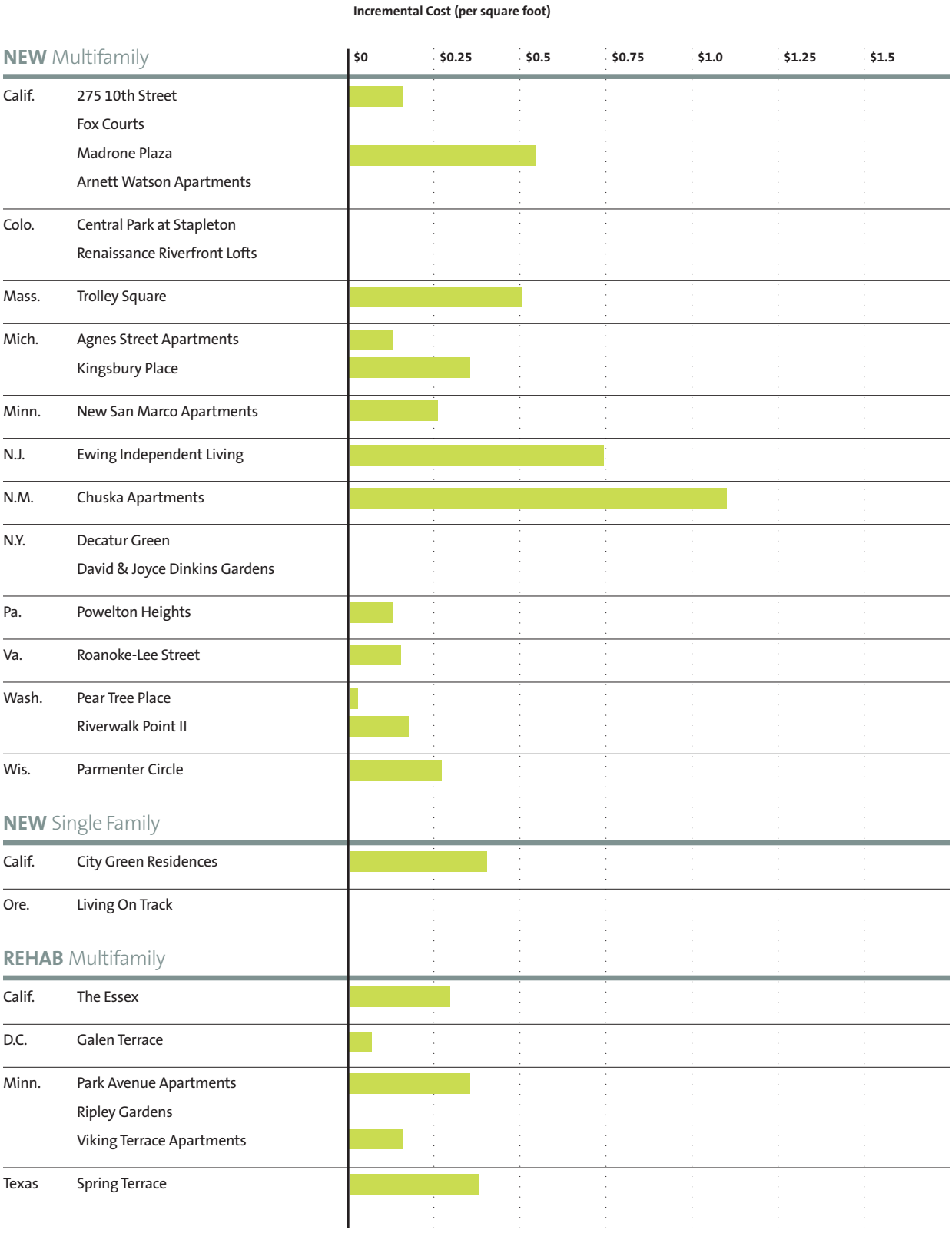
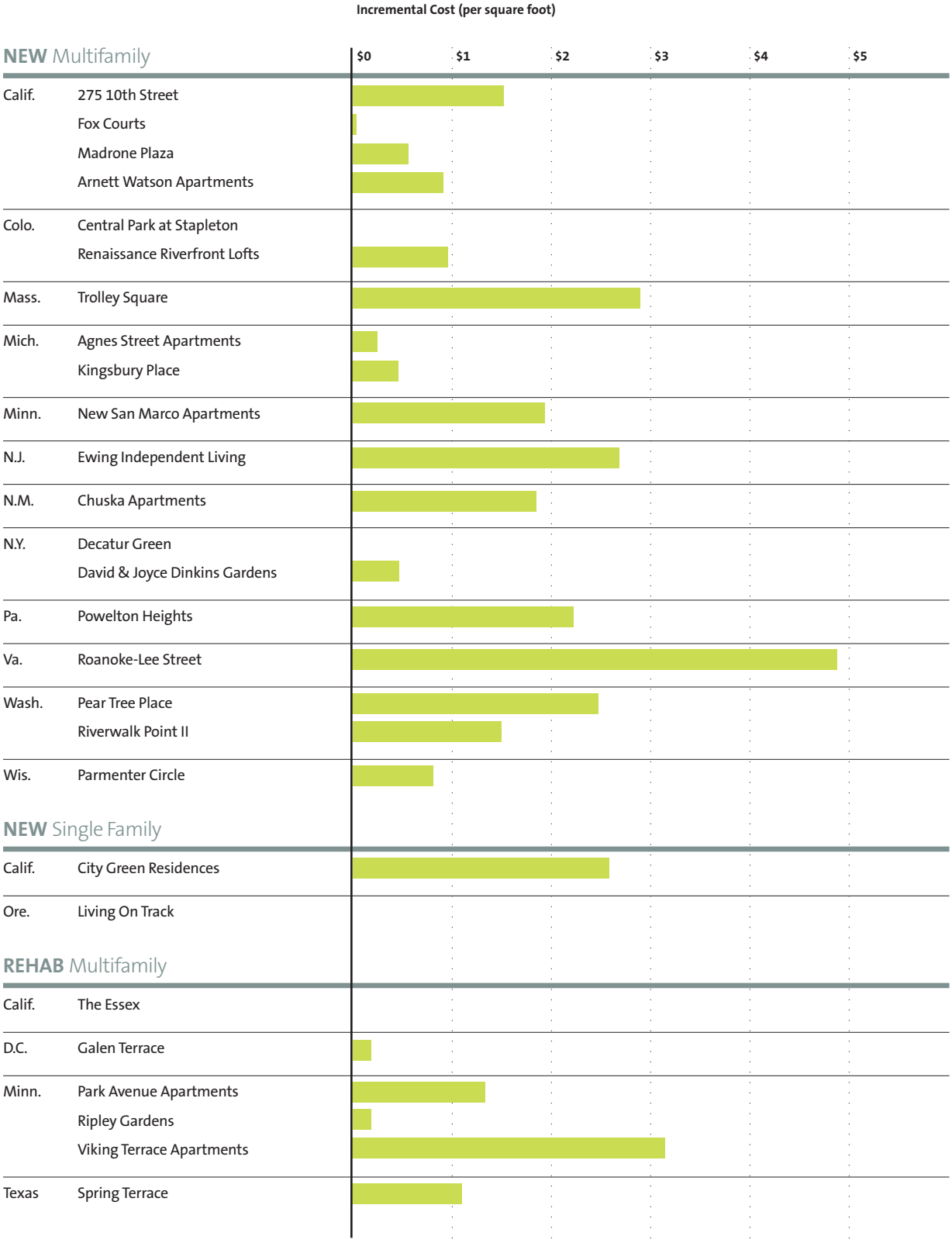


TABLE C.6

Incremental Cost to Meet Enterprise Green Communities Criteria for Energy Efficiency ($/Sq. Ft.)

TABLE C.7

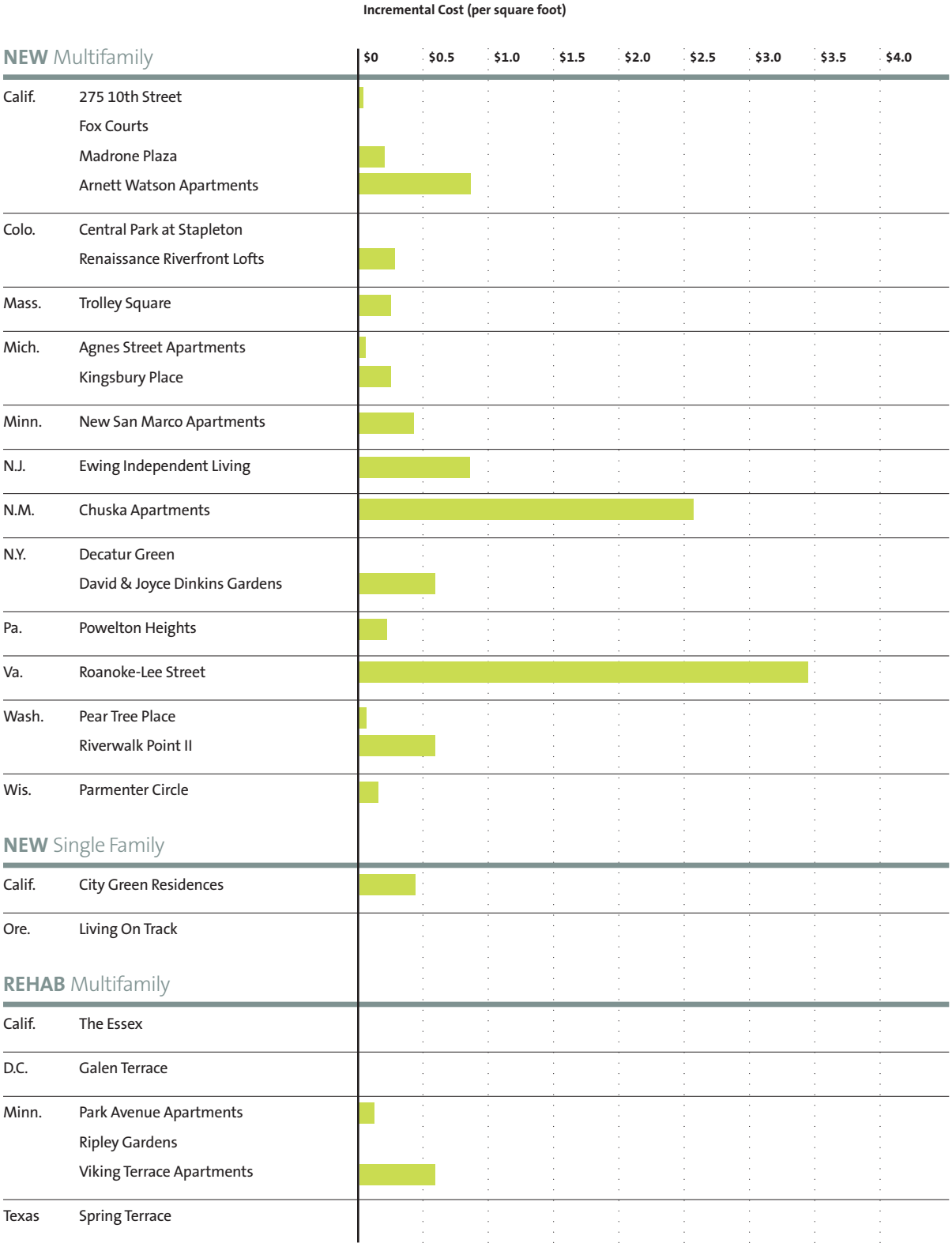
Incremental Cost to Meet Enterprise Green Communities Criteria for Healthy Living Environment ($/Sq. Ft.)



NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	
Mass.	Trolley Square	
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	
	Riverwalk Point II	
Wis.	Parmenter Circle	
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	
Minn.	Park Avenue Apartments	
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

TABLE C.8

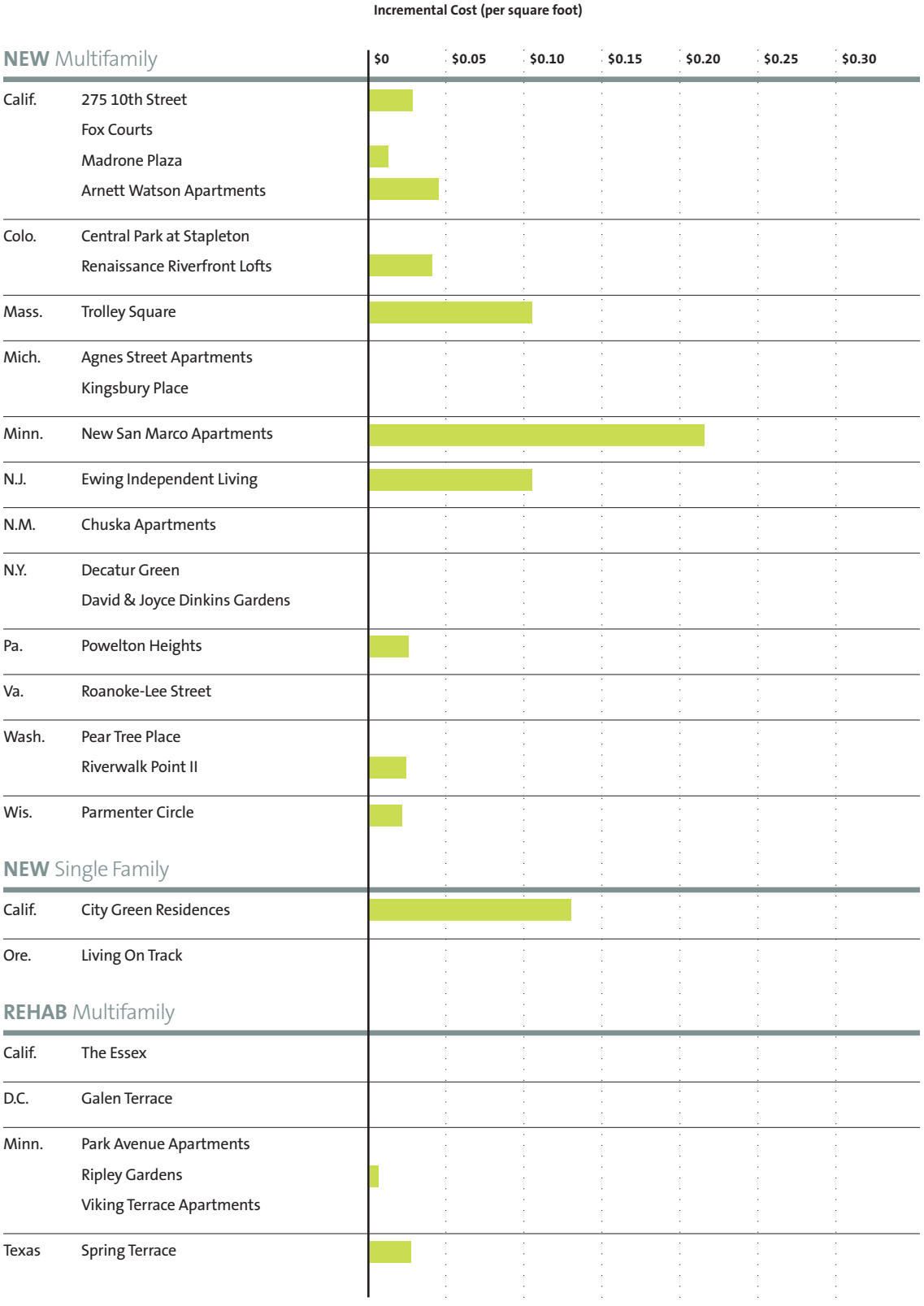
Incremental Cost to Meet Enterprise Green Communities Criteria for Materials Beneficial to the Environment ($/Sq. Ft.)



NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	
Mass.	Trolley Square	
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	
	Riverwalk Point II	
Wis.	Parmenter Circle	
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	
Minn.	Park Avenue Apartments	
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

TABLE C.9

Incremental Cost to Meet Enterprise Green Communities Criteria for Operations and Maintenance ($/Sq. Ft.)



NEW Multifamily		
Calif.	275 10th Street	
	Fox Courts	
	Madrone Plaza	
	Arnett Watson Apartments	
Colo.	Central Park at Stapleton	
	Renaissance Riverfront Lofts	
Mass.	Trolley Square	
Mich.	Agnes Street Apartments	
	Kingsbury Place	
Minn.	New San Marco Apartments	
N.J.	Ewing Independent Living	
N.M.	Chuska Apartments	
N.Y.	Decatur Green	
	David & Joyce Dinkins Gardens	
Pa.	Powelton Heights	
Va.	Roanoke-Lee Street	
Wash.	Pear Tree Place	
	Riverwalk Point II	
Wis.	Parmenter Circle	
NEW Single Family		
Calif.	City Green Residences	
Ore.	Living On Track	
REHAB Multifamily		
Calif.	The Essex	
D.C.	Galen Terrace	
Minn.	Park Avenue Apartments	
	Ripley Gardens	
	Viking Terrace Apartments	
Texas	Spring Terrace	

TABLE C.10

Incremental Cost to Meet Enterprise Green Communities Criteria ($/Sq. Ft.)

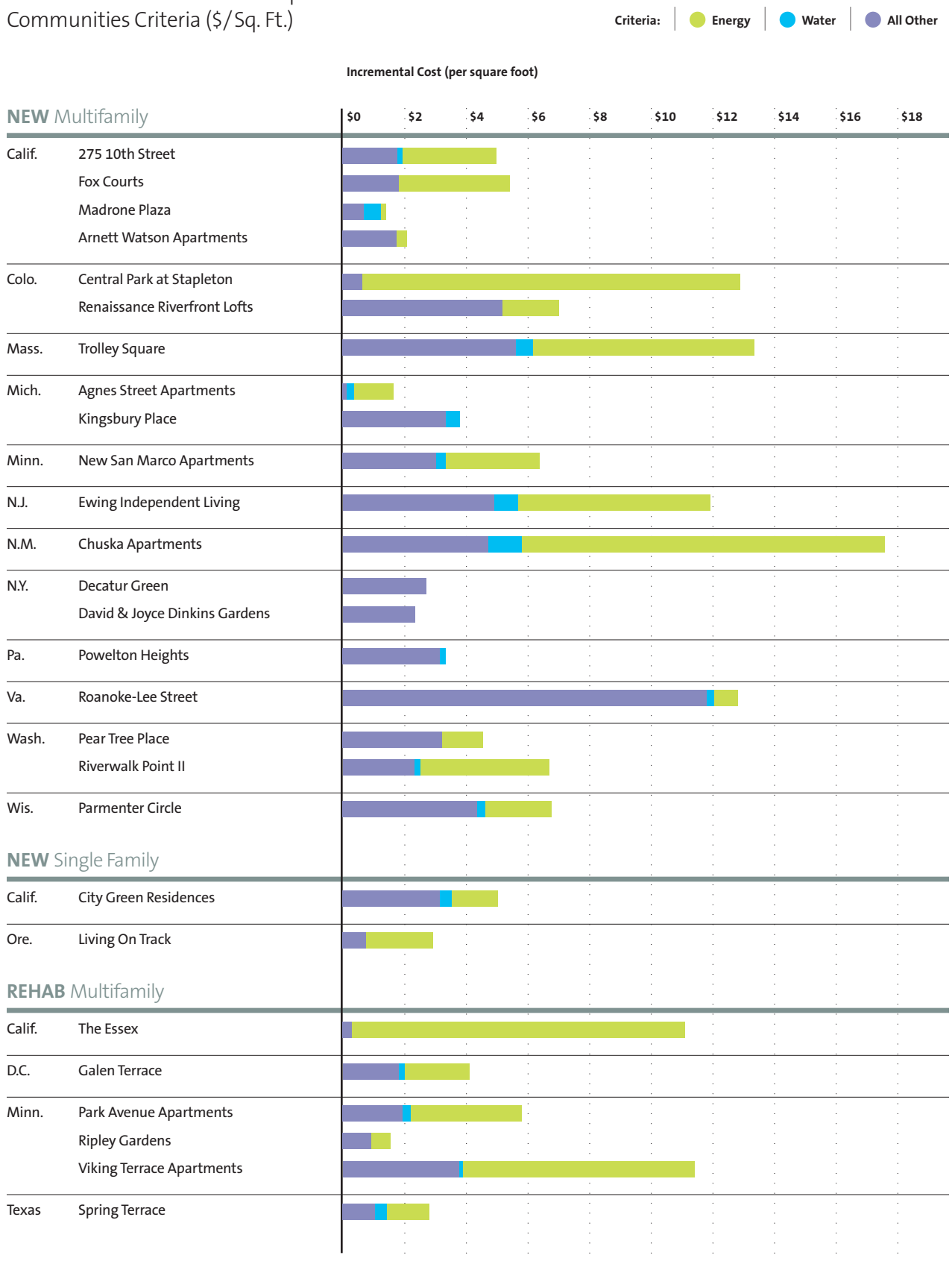


TABLE C.11

Incremental Cost to Meet Enterprise Green Communities Criteria (% of TDC)

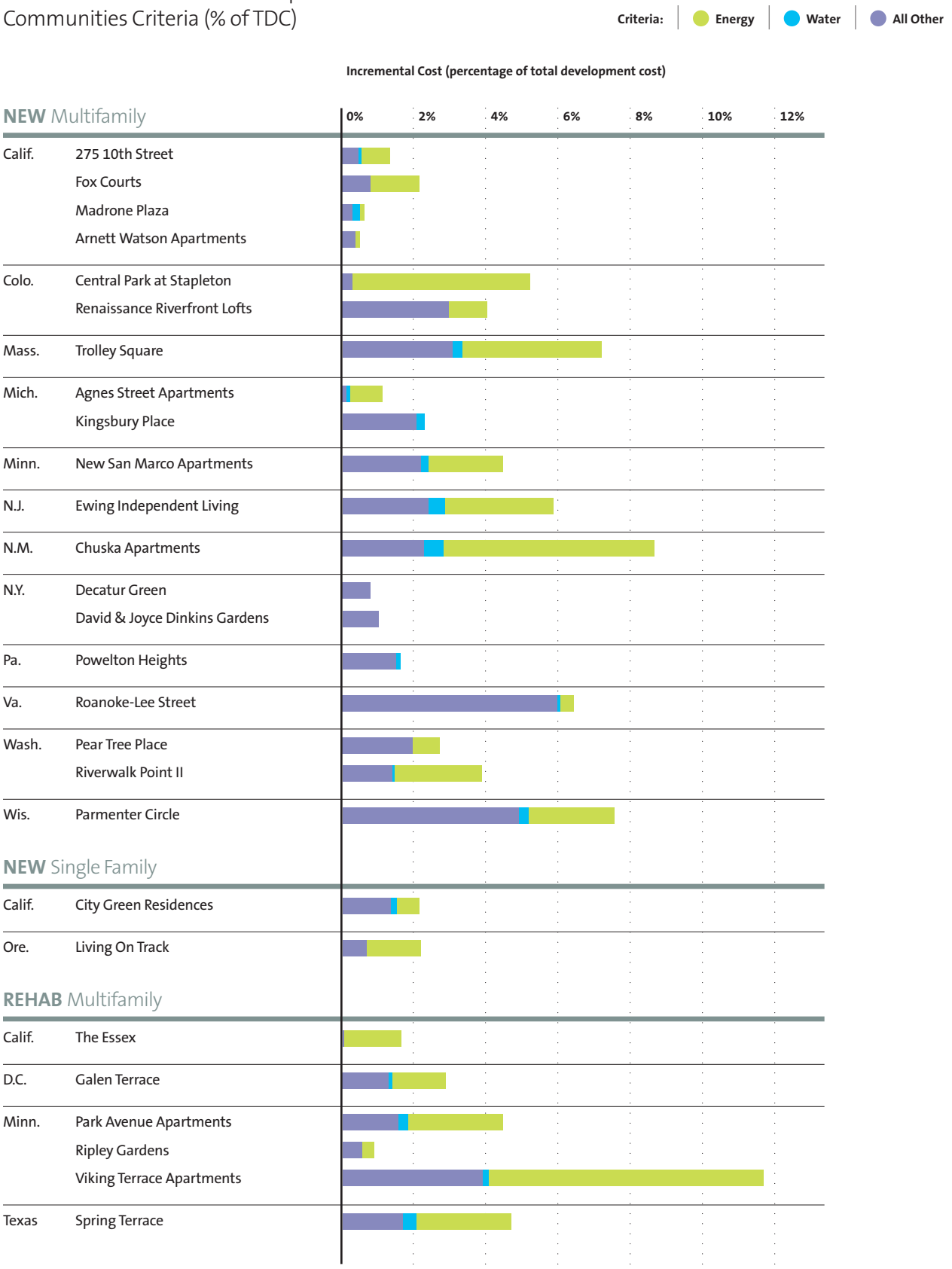


TABLE C.12

Predicted and Actual Energy Usage Savings Over Baseline (% of BTUs)

TABLE C.13

Predicted and Actual Annual Water Savings Analysis (% of Gallons)

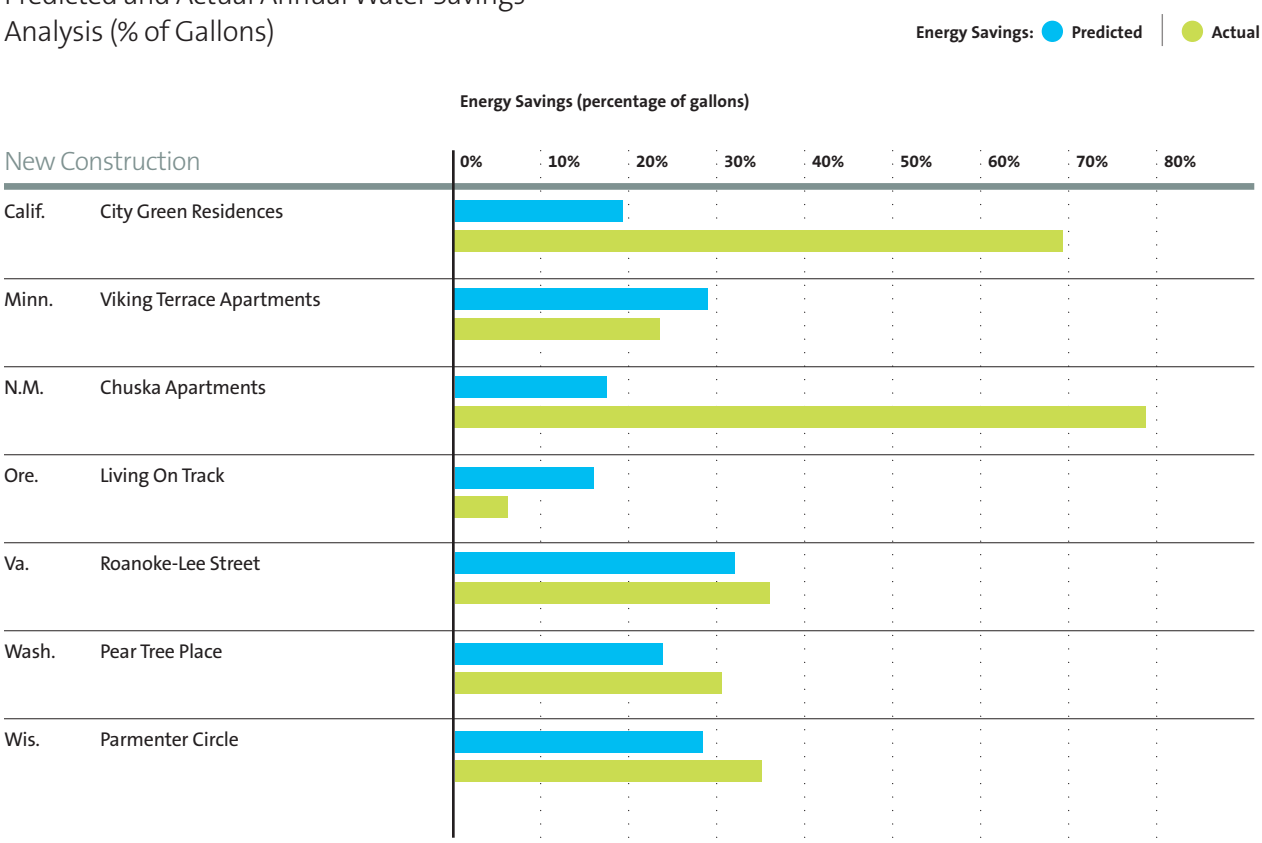


TABLE C.14

Annual Energy Savings for Meeting All Green Communities Energy Criteria (% over Baseline)

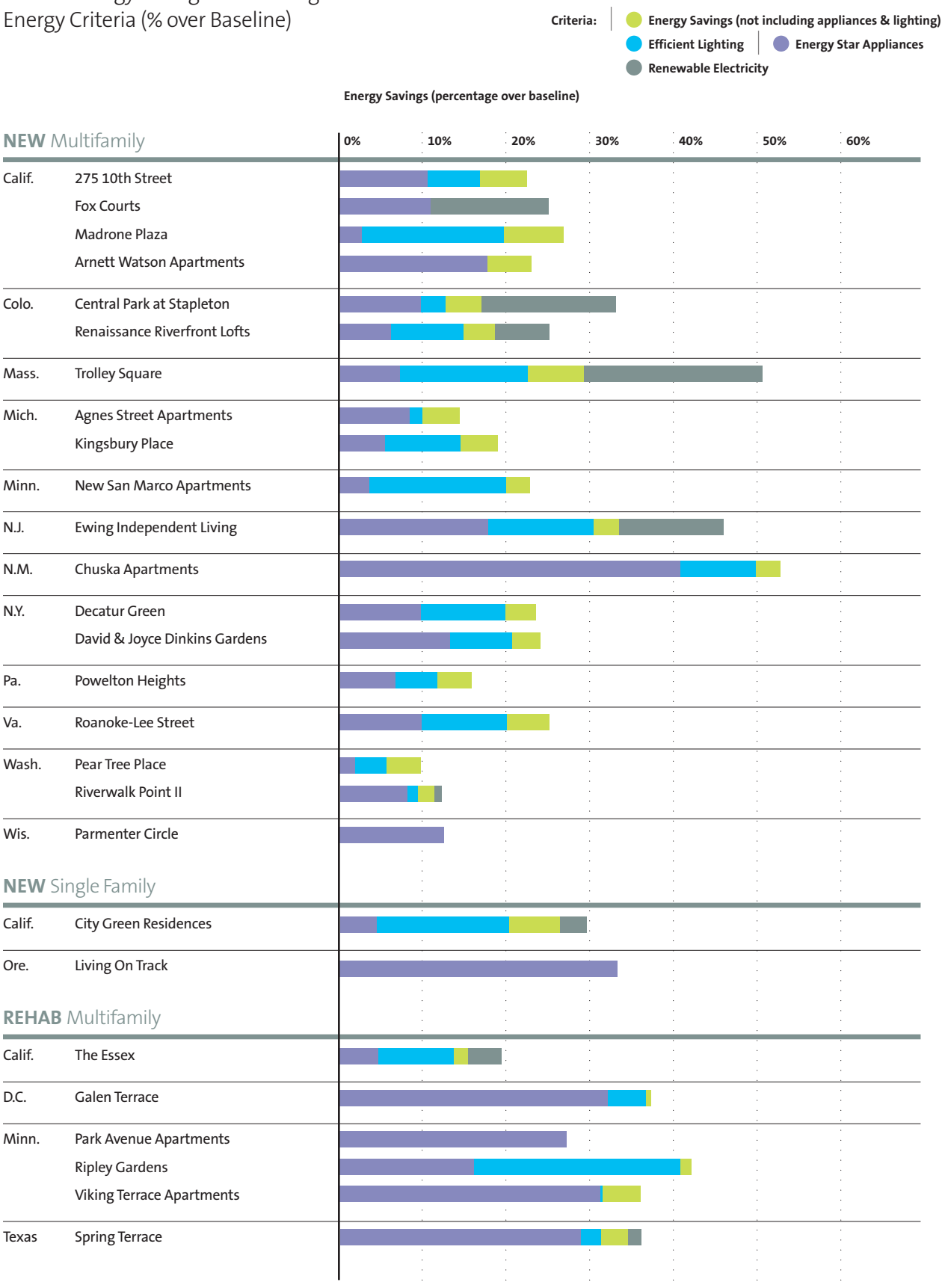


TABLE C.15

Annual Energy Savings for Meeting All Green Communities Energy Criteria (Site MMBtu / Year)

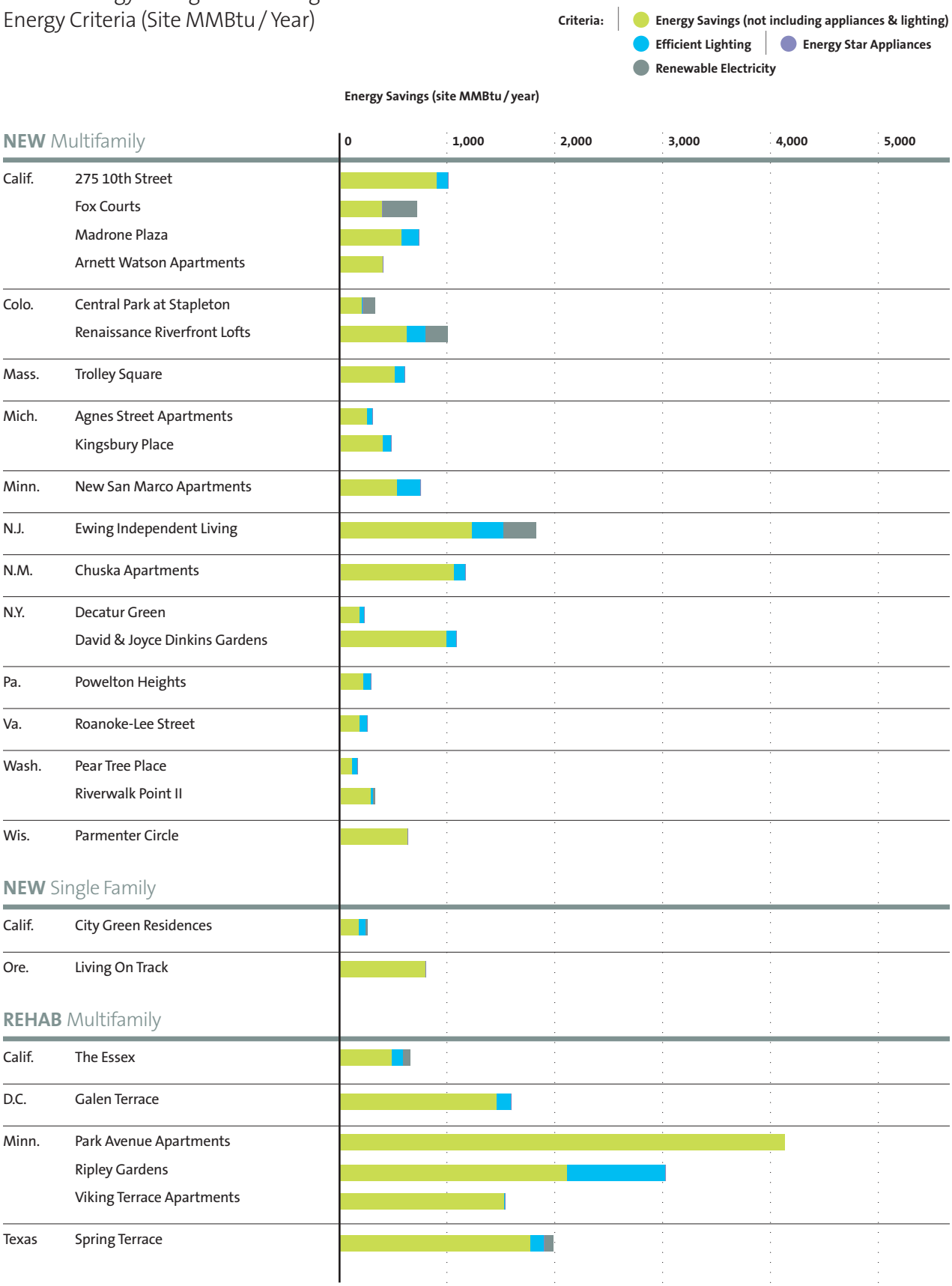


TABLE C.16

Breakdown of Predicted Annual Energy Savings for Developments Modeled with TREAT

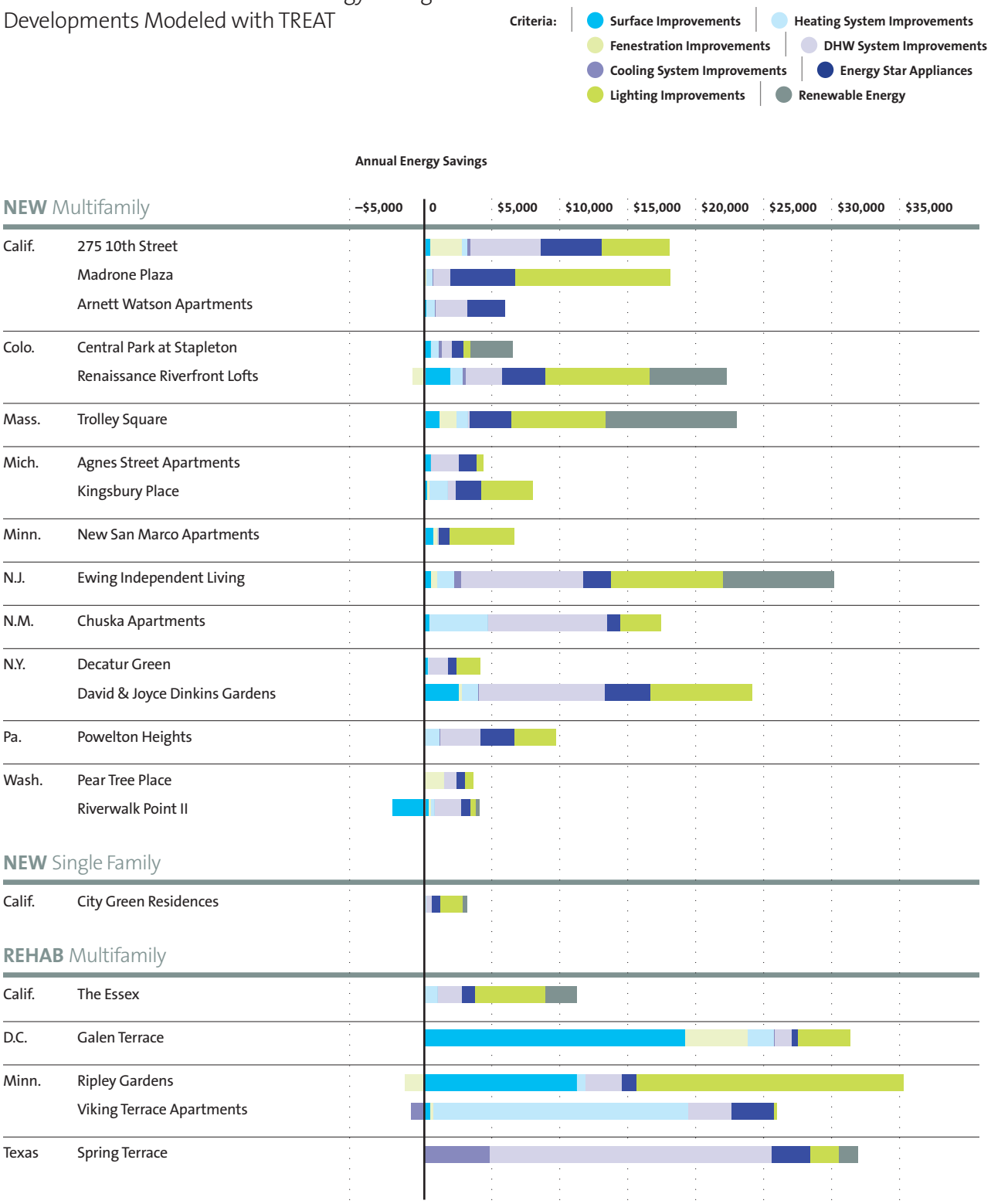


TABLE C.17

Predicted Annual Water Usage Savings Over Baseline for Meeting Enterprise Green Communities Criteria 4-1 (% of Usage)

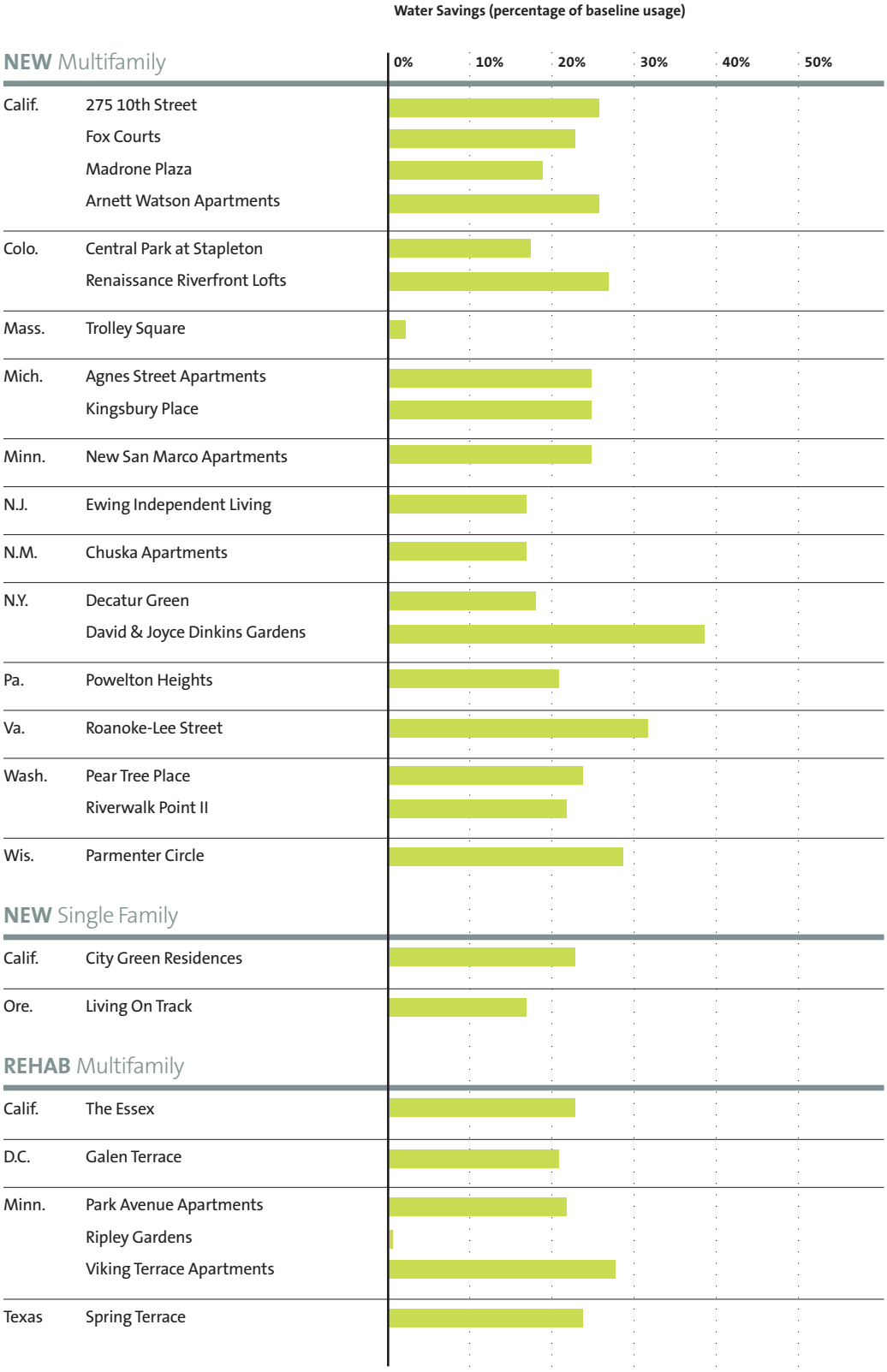


TABLE C.18

Predicted Source Energy Intensity of Enterprise Green Communities Developments (Source kBTU per Sq. Ft./Year)

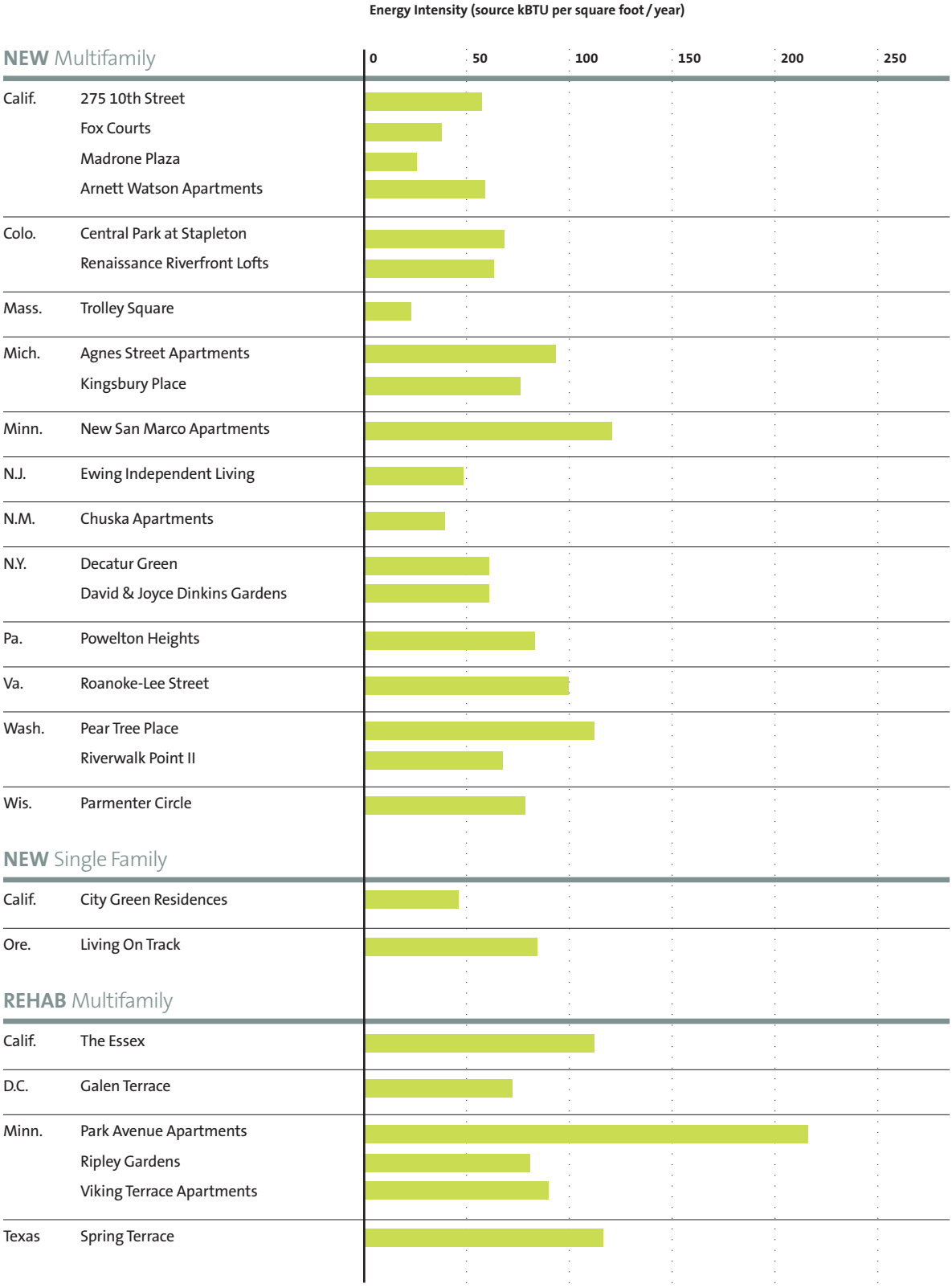
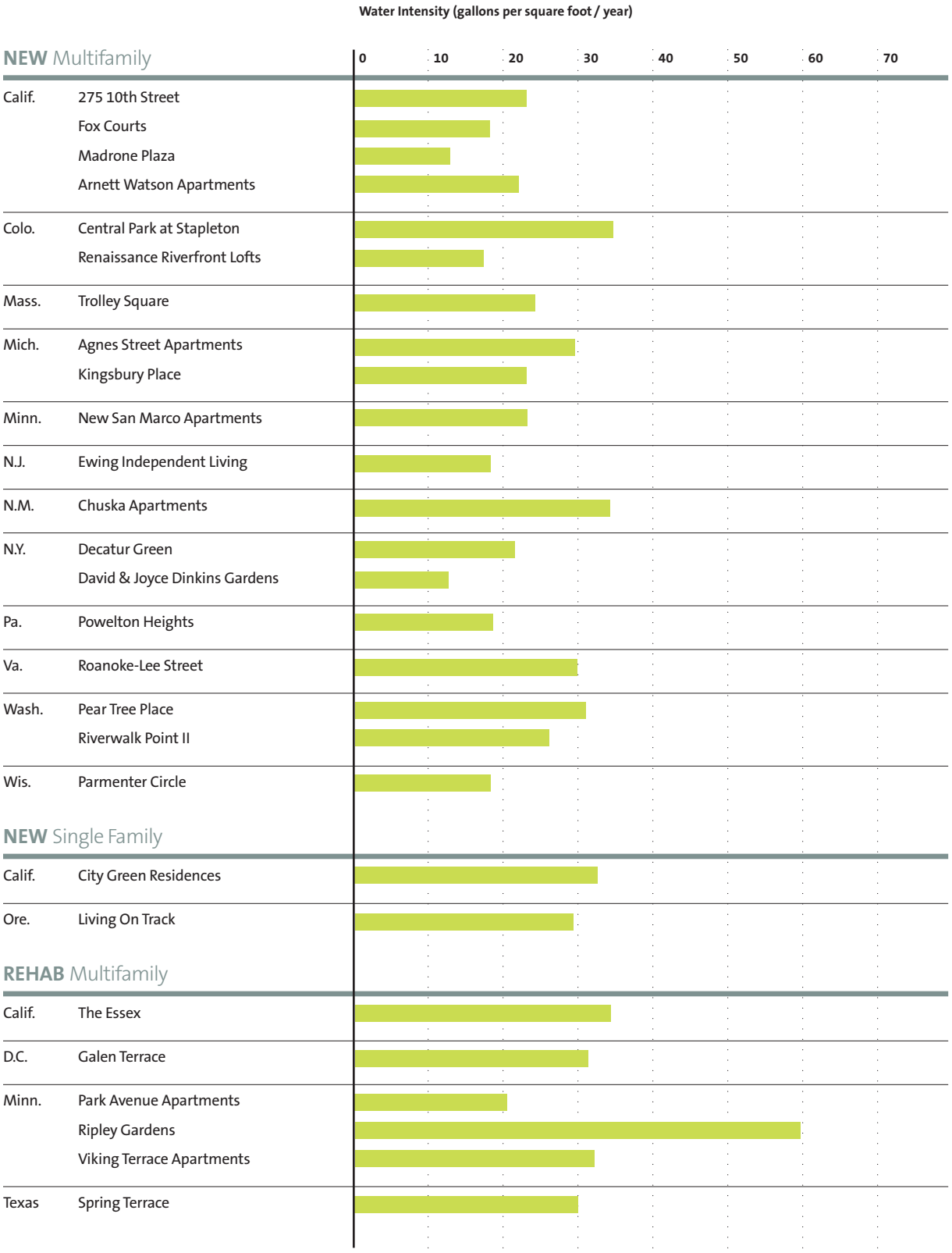


TABLE C.19

Water Intensity of Enterprise Green Communities Developments (Gallons per Sq. Ft./Year)



APPENDIX D

ENTERPRISE GREEN COMMUNITIES PROJECT PROFILES

275 10th Street, San Francisco

DEVELOPER: Episcopal Community Services of San Francisco | TOTAL UNITS: 134

A development of Episcopal Community Services of San Francisco, 275 10th Street features 134 single-room occupancy units for chronically homeless single adults in San Francisco.

Included in the project was the demolition of three light industrial buildings on the site, clearing the way for a single, five-story building. Residents of 275 10th Street are chronically homeless adults, many with multiple special needs or disabilities including mental health problems, substance abuse and HIV/AIDS. They have access to a full array of supportive services through ECS and other community organizations. Moreover, because of its location, residents have easy access to several transit lines, including buses, street car and regional light rail.

Financing

Mayor's Office of Housing	$12,310,355
Enterprise Grant	$55,000
Affordable Housing Program	$675,000
Tax Credit Equity	$12,638,673
Multifamily Housing Program	$7,000,000
Episcopal Community Services	$50,000
TOTAL	**$32,729,028**

A Green Advantage

The green features included in the 275 10th Street development begin with its location, a formerly underutilized light industrial site. Redeveloping sites such as this with higher densities appropriate for the neighborhood not only helps protect undeveloped green parcels in the region, it also ensures that the neighborhood remains compact and walkable, which is important given the project's proximity to the city's major transportation systems. In addition to location and redevelopment, locally appropriate plants and water-efficient systems are incorporated into the community, resulting in grounds that are both attractive and environmentally beneficial.

Inside the building are a number of other features that are good for both the residents and the environment. Notably, low-flow water fixtures in bathrooms and kitchen areas help to conserve water, while Energy Star appliances conserve energy and lower utility costs. Meanwhile, paints, sealants and other building materials were chosen based on their low levels of VOCs and other harmful pollutants that reduce indoor air quality and contribute to health problems. Finally, numerous steps were taken to prevent moisture from accumulating inside the building and leading to the formation of harmful mold.

Rent

Seventy-one homes are affordable to residents with incomes at 30 percent of AMI. Sixty-three are affordable to residents with incomes at 25 percent AMI.

Amenities

275 10th Street has two open courtyards that, combined, total more than 4,500 square feet of open space. Amenities include a 4,000-square-foot common space along with a community kitchen and central laundry facilities on each floor.

Social Services

275 10th Street provides 134 permanent supportive homes for homeless single adult residents of San Francisco. Eligible tenants experience varying levels of mental illness, substance abuse disorder or other health conditions, such as symptomatic HIV or AIDS. Tenants must be capable of living independently in a community setting with on-site support services that are voluntary, client-centered and based in harm reduction.

Tenants achieve residential, economic and emotional stability through a broad range of services including on-site health and mental health services, basic living skills development, access to representative payee and money management services, benefits advocacy, substance abuse evaluations and referrals, special focus support groups, crisis intervention, recreational activities and vocational training.

Developer

ECS is dedicated to helping people who are homeless or very low incomes move toward self-sufficiency by providing compassionate, individualized services with access to comprehensive resources. ECS has been active in San Francisco for almost 20 years, providing permanent housing and supportive services for nearly 1,000 men, women and children suffering from chronic homelessness at 10 sites around the city.

In addition to these and 275 10th Street, ECS operates three shelters that provide hot meals, warm beds, laundry facilities and social services for nearly 500 people each night. 275 10th Street is being developed with the assistance of another local group, Bernal Heights Neighborhood Center.

Architect

Herman and Coliver Architecture

Agnes Street Apartments, Detroit

DEVELOPER: Agnes Street Apartments, Inc. | TOTAL UNITS: 24

Two blocks north of the Detroit River, which forms part of the international border between the U.S. and Canada, is Agnes Street Apartments. The Low-Income Housing Tax Credit urban development consists of two three-story apartment buildings on a former grayfield—a property with infrastructure in place, but is currently outdated and underutilized, like an aging shopping center. The Agnes Street Apartments site is slightly larger than an acre, and was assembled from multiple residential tax lots, some vacant and two with condemned residential structures that were demolished.

Agnes Street Apartments's effort to create a wholesome, affordable living environment for low-income families near downtown Detroit has been successful. Prior to opening, developer Agnes Street Apartments hosted a community picnic for the new residents to meet one another. One of the day's activities included a game for kids from 3 to 12 years old. The young children received ribbons for cleaning up trash near the apartments, and a year later, the kids continue to keep the grounds around the buildings clean.

Construction began on this 29,100-square-foot development in December 2006 and was completed in December 2007.

Financing

Low-Income Housing Tax Credit Equity	$3,743,670
Capital Fund Investment Corp. Loan	$620,380
General Partner Contribution	$82,784
Deferred Developer's Fee	$64,096
Enterprise Green Communities Grant	$51,000
TOTAL	**$4,561,930**

A Green Advantage

The benefit of making Agnes Street Apartments a green development is significant. With rising utility costs, these efficient and healthy units help residents and the local community by decreasing these costs, conserving energy and natural resources, and reducing pollution. The average monthly electric bill for an apartment is $27, and total utility costs are about half what residents paid in previous homes.

Green features include:

- Water-conserving fixtures
- Individual electric and gas meters
- Energy Star appliances and fixtures
- Low-VOC paints and sealers
- Exterior-vented kitchen and bath exhaust fans (bath fans are on timers), and dryer
- High-efficiency, front-loading washing and dryers

Rent

All apartments are leased to families earning between 31 and 50 percent AMI. In 2009, AMI for a family of four in the Detroit metro area is $71,000. At 50 percent AMI, that family earns $35,500.

Amenities

Each apartment has a balcony or patio, and a washer and dryer. There is a playscape with benches and a bike rack in a courtyard area. Within a half mile of the site are a public bus stop and medical clinic. Grocery stores, restaurants and banks are within one mile and are accessible by bus.

Social Services

A wide variety of social services are available throughout the nearby downtown area. Agnes Street Apartments provides residents with free transportation to church services.

Developer

Agnes Street Apartments, Inc. works to promote and develop safe, beautiful, affordable housing for low-income Detroit residents. The organization's latest development is a 50-unit senior complex similar to Agnes Street Apartments.

Architect

Fusco, Shaffer & Pappas, Inc.

Central Park at Stapleton, Denver

DEVELOPER: Northeast Denver Housing Center, Inc. | TOTAL UNITS: 18

Central Park at Stapleton is a new rental development in Denver, designed to provide affordable units for households making less than 50 percent AMI, while also incorporating principles of sustainable design and green building standards. Although this is a new housing construction, the site is part of the old Denver Stapleton Airport redevelopment, a "sustainably designed" planned community that has received local and national awards development consists of two buildings housing 18 homes, including five three-bedroom/three-bath apartments and 13 two-bedroom, one-bath apartments.

Financing

City of Denver – Home Funds	$490,852
State of Colorado Division of Housing	$167,618
Governor's Office of Energy	$73,200
Energy Outreach Colorado	$67,882
Forest City Stapleton (land donation)	$650,000
Federal Home Loan Bank of Topeka	$100,000
Enterprise Green Communities	$18,000
Enterprise Social Investment LIHTC	$1,916,710
Private & NDHC Equity	$64,200
Colorado Housing Finance Authority	$635,000
TOTAL	**$4,183,462**

Construction Lender:
First Bank of Denver ($1,000,000)

A Green Advantage

The community is located in a nationally recognized urban infill planned community recognized for exemplifying good environmental stewardship. This is the first of the Northeast Denver Housing Center's developments slated to achieve all possible green certifications. It is the first Gold LEED certified multi-housing development in Colorado and the first to be certified by Enterprise Community Partners in Colorado. It has also won the first Governor's Excellence in Renewable Energy award for its solar power application.

- Solar Panels for each unit, producing up to 55 percent of electrical needs
- Five-Star-Plus Energy Star rating
- Sustainable floor coverings — bamboo and carpet, padding and rubber flooring made with recycled materials
- Landscaping with irrigation and native plants to minimize water usage
- Low-flow bath and kitchen fixtures
- Low- and no-voc paint and adhesives
- Energy-efficient lighting

Rent

Of the 18 units, five serve tenants at 30 percent AMI; four serve those at 40 percent AMI; and nine serve those at 50 percent AMI.

Amenities

The site is located on a major arterial bus route and will be served by a new light rail line with access to downtown, the airport corridor and regional shopping centers. The site itself is within a half mile of a grocery store, several "big box" stores, restaurants, medical facilities, employment centers such as hotels and service shops, a skating rink and a major regional park system with swimming pools. Schools, churches and entertainment outlets are also nearby.

Social Services

The residents at Central Park can participate in Northeast Denver Housing Center's Continuum of Service Enriched housing. The services include comprehensive housing counseling that addresses credit, debt, financial literacy and next step housing. Next step housing is to encourage clients about purchasing their home if they choose and desire to do so.

Developer

Northeast Denver Housing Center has demonstrated a commitment to green, affordable housing over the past 12 years and has received several awards for its efforts.

Architect

Eckalizzi Design —
Stephen Eckert AIA/ Jade Polizzi

Chuska Apartments, Gallup, N.M.

DEVELOPER: Supportive Housing Coalition of New Mexico (SHC) | TOTAL UNITS: 30

Chuska Apartments is the first affordable housing development supported by the Enterprise Rural and Native American Initiative that works with tribes to create healthy, safe, affordable housing and to increase opportunities for economic advancement. Chuska Apartments is a 30-unit, new construction property with six residential buildings and a community center. The buildings are organized in clusters around a communal space and are divided into two elongated courtyards. The project features energy-efficient design with a one-story floor plan and built-in ventilation.

There are 15 two-bedroom/one-bath apartments, including a manager's unit, and 15 three-bedroom/two-bath apartments. The homes feature enclosed rear patios or front yards, dishwashers and storage lofts above the kitchens. Residents and service providers also will enjoy a large community center.

Gallup is a town of approximately 20,000, located in northwest New Mexico, two hours west of Albuquerque, near the Arizona border. Located on the famous Route 66, Gallup began as a railroad and mining town, but recently has become a tourist destination. Surrounded by natural beauty, Gallup is a regional commercial center with an emphasis on Native American arts and crafts, due in part to its proximity to the Navajo Nation.

Financing

City of Gallup, State of New Mexico	$50,000
New Mexico Mortgage Finance Authority (MFA) Grant Funds	$240,000
Federal Home Loan Bank AHP Funds	$150,000
State of New Mexico Capital Outlay	$639,000
Supportive Housing Coalition	$414,000
USDA Rural Community Development Initiative	$15,000
Deferred Developer Fee	$204,238
LIHTC Equity through Enterprise	$6,265,364
Enterprise Grant	$96,000
Enterprise Green Communities Grant	$24,000
TOTAL	**$8,097,602**

A Green Advantage

The design of Chuska Apartments incorporates several green features that conserve energy and raw materials, including:

- Day lighting in all rooms
- Passive solar space heating
- Drought tolerant landscaping
- Energy-efficient windows
- Rooftop water heating (for domestic hot water and baseboard heating)

Rent

Ten of the units are set aside for households at or below 30 percent AMI and targeted to homeless families. The remaining 20 units will house families at or below 60 percent AMI. Units will be rent restricted for a minimum 45-year period.

Amenities

Chuska Apartments features a community building with offices, a community room, kitchenette and laundry room. Other amenities include courtyards with community gardens, a playground area and a rock garden integrated into an existing natural rock outcropping.

Social Services

Care 66, a local nonprofit organization, provides supportive services to formerly homeless residents. Families receive intensive case management and a 24-month enriched service program. Supportive services include medical and psychiatric care, substance abuse treatment, general counseling services, budgeting and money management, job skills development, independent living and other skills training, homeownership counseling, and linkage to other community resources. Counseling and case management is done in the community center offices with classes offered in the community room.

Developer

SHC was founded in 1996 in response to a gap in safe and affordable housing for homeless and near-homeless persons with behavioral health disorders. As the largest developer of supportive housing in New Mexico, SHC represents a collaboration among some of Albuquerque's oldest and most respected providers of homeless and health services. Together, these organizations offer a continuum of services and housing options for homeless people with special needs, from street outreach to aftercare, from emergency drop-in services to permanent independent living. In addition to Chuska Apartments, SHC owns seven multifamily properties totaling approximately 140 homes.

Architect

Autotroph, Inc.

City Green Residences, Hayward, Calif.

DEVELOPER: Eden Housing, Inc. | TOTAL UNITS: 57

City Green Residences is an affordable family housing development designed to create a supportive family environment immediately adjacent to a busy four-lane boulevard. Its architecture complements both the rolling hills of the nearby regional park and the surrounding neighborhoods. City Green Residences consists of four buildings around a large open space with a play area. The largest building has 30 two- and three-story townhomes on top of a concrete podium. The other three buildings are three-story, wood frame structures clad in stucco. The first floor of each building consists of adaptable one- and three-bedroom apartments and the upper floors are two- and three-bedroom, two-story townhomes. Each apartment has a private patio or deck. An office, community room and laundry facility are located near the main entrance. Parking is provided in 62 garage spaces and 35 surface spaces.

Financing

City of Hayward HOME	$4,500,000
City of Hayward CDBG	$286,273
Redevelopment Agency of the City of Hayward	$1,813,727
Lenders for Community Development (bridge acq.)	$1,650,000
Silicon Valley Bank (construction)	$12,215,000
Silicon Valley Bank (permanent)	$2,565,000
Enterprise Tax Credits	$11,478,000
Green Building in Alameda County Grant	$40,000
Bay-Friendly Landscaping Grant	$15,000
Enterprise Green Communities Grant	$50,000
Home Depot Foundation Affordable Housing Built Responsibly Grant	$25,000
TOTAL	**$20,500,000**

A Green Advantage

The original site included a milk and juice processing plant, dry cleaner and gas station causing substandard soil. Eden Housing remediated the environmental problems and City Green Residences became one of the first developments to be certified under a new regional green building rating system. Some of its green features include:

- Raised heel roof trusses offering both structural stability and room for more insulation
- All appliances are Energy Star rated
- Water-efficient toilets, faucets and showerheads
- Natural linoleum flooring and low-emissions carpet
- Low-VOC interior paints, adhesives and sealants
- Shade trees and California native or drought-tolerant plants used in landscaping
- The playground surface was made with recycled content manufactured from old tires
- Jobsite waste was reduced, reused or recycled

The project was built to be 20 percent more energy efficient than required by California's Title 24–2001 building energy standards.

Rent

Homes are reserved for households with incomes ranging from $17,400 for one person, to $61,620 for a seven-member family. Apartments range from $581 to $1,227 a month. The apartments are rented to households as follows: six each for families earning 30 and 40 percent AMI, 28 for those earning 50 percent AMI and 16 for those earning 60 percent AMI. There is one on-site property manager's apartment.

Amenities

City Green Residences is within walking distance of the local elementary and middle schools, grocery store, a low-cost medical clinic, public parks and a bus line. Mexico Super, a full-service grocery store, is located across the street. El Rancho Verde Park, Dry Creek Regional Park and the Tiburcio Vasquez Health Center are located within one mile. Site amenities include barbeque and picnic areas, a community room and computer lab.

Social Services

Eden Housing is committed to offering its residents an enhanced living environment. They offer youth and adult programming to facilitate educational and economic advancement and promote a sense of community on the property. These services are coordinated by Eden's affiliate, Eden Housing Resident Services, and are provided on-site in the computer lab, community room and central courtyard. The comprehensive programs include after school and summer educational programs for children, financial literacy and homebuyer training, technology programming and a resident scholarship program.

Developer

Founded in 1968, Eden Housing Inc. has a mission to build and maintain high-quality, well-managed, service-enhanced affordable housing communities that meet the needs of lower-income families, seniors, the formerly homeless, first-time homeowners and persons with disabilities.

Architect

Pyatok Architects

Decatur Green, New York

DEVELOPER: Fordham Bedford Housing Corporation | TOTAL UNITS: 18

Decatur Green is a six-story development built on an urban infill—a built-up, but obsolete or underutilized, area that can be reused or repositioned—instead of a greenfield in a rural area. The18-unit building sits on a third of an acre in the Bronx. Building includes an 815-square-foot community room and 1,500 square feet of landscaped backyard and sitting areas.

Enterprise Rose Architectural Fellow Esther Yang served as a secondary construction supervisor on Decatur Green and oversaw the developer's compliance with the Enterprise Green Communities Criteria. Yang also met with residents before they moved in, and discussed sustainability with them. Yand expects that the discussion gives tenants a sense of empowerment and ownership, and that they will take good care of the property.

Financing

Construction of Decatur Green began in 2007 and was completed in May 2009.

Financing for Decatur Green includes a $3.9 million Low-Income Housing Tax Credit equity investment and a $35,000 Enterprise Green Communities grant.

A Green Advantage

Constructing Decatur Green on an unused, vacant lot helps to rebuild the fabric of this urban neighborhood. Plus, other green measures like a 3,000-gallon rainwater collection system makes the community healthier. The system supplies water to some of the building's water needs, like the bathrooms. If the system's collector fills up with rain just twice a month, the building's toilets will not need city water to flush. The system also saves Fordham Bedford Housing Corporation money, by helping the nonprofit avoid a $1.59 sewer charge for every $1 saved in city water fees.

Other green approaches include:

- Native trees and plantings
- A 96 percent efficient gas boiler heating system (subsidized by a local weatherization program)
- Raised roof drains that release water slowly into the system after a storm, keeping as much water on site as possible
- Energy-efficient fixtures, motion sensors and Energy Star–rated appliances
- Low-flow water fixtures, some even exceeding Enterprise Green Communities Criteria
- Bamboo flooring
- Low-VOC paints, primers, adhesives and sealants
- A welcome cleaning package helps residents reduce dust (a leading cause of asthma) and the use of industrial cleaners

Rent

No family pays more than 30 percent of their gross income for rent and utilities, and all 18 units are leased to families earning less than 60 percent of the AMI. In metropolitan New York City, AMI for a family of four is $87,600, in 2009 so families living in Decatur Green make a maximum of $52,560 this year.

Amenities

High-efficiency washers, dryers and a recycling station for paper, cardboard, glass and cans are located in the building's basement. Within easy walking distance are a commuter rail line, three subway lines and 13 bus lines, as well as a hospital, a center-based day care, two retail corridors, two health centers, two large supermarkets and several convenience stores. Community facilities include a post office, numerous public schools, public parks, the New York Botanical Gardens, the new Bronx Central Library, Fordham University and Lehman College.

Social Services

Decatur Green has services available within half a mile at some of the developer's other buildings. They include a transitional shelter for women and children, and meeting spaces for residents involved in community improvement efforts.

Fordham Bedford Children's Services serves the educational and recreational needs of local residents at little or no charge. It also offers assistance with childcare and immigration, operates a technology center, and provides English as a Second Language and citizenship classes.

Developer

The mission of the Fordham Bedford Housing Corporation is to improve their Bronx neighborhood by providing community run housing that is safe, sound and affordable. It is the newest development in Fordham Bedford Housing Corporation's portfolio, which includes approximately 90 buildings with 3,000 homes.

Architect

Jack Coogan of Oaklander, Coogan, Vitto Architects

David & Joyce Dinkins Gardens, New York

DEVELOPERS: Harlem Congregations for Community Improvement, Inc. (HCCI) and Jonathan Rose Companies | TOTAL UNITS: 85

The David & Joyce Dinkins Gardens, named in honor of former Mayor David N. Dinkins and his wife, is a green building that includes homes for families earning less than 60 percent AMI and youth aging out of foster care. It consists of 28 studio, 24 one-bedroom and 33 two-bedroom apartments. It also includes a 2,500-square-foot community facility to house HCCI's Construction Trades Academy, a program that provides local residents with skills in the construction trades and building maintenance industries. Built on formerly city-owned property in Harlem's Bradhurst neighborhood, the building is designed to meet the community's critical social and environmental needs. The affordable housing and community space are key elements in the nearly 20-year-old Bradhurst plan, a blueprint for revitalizing 32 square blocks of north central Harlem.

Financing

New York City Housing Development Corporation Tax-Exempt Bond Proceeds	$2,470,000
New York City Housing Development Corporation Second Mortgage	$4,675,000
Tax Credit Equity	$8,486,000
New York City Department of Housing Preservation and Development Mixed-Income Rental Program	$2,590,879
Manhattan Borough President Grant	$500,000
Deferred Developer's Fee	$501,602
General Partner Capital	$300,000
Enterprise Green Communities Grant	$50,000
Home Depot Foundation Grant	$50,000
TOTAL	**$19,623,481**

A Green Advantage

The development incorporates green building innovations and materials such as:

- Non-toxic and recycled material
- Energy Star–rated appliances and light fixtures
- A green roof with a rainwater harvesting system to be used to irrigate a community garden that will also be an outdoor classroom
- Permeable paving
- Natural day lighting
- Sun shading on the south-facing exposure
- Energy-efficient lighting

Rent

Fifty-five of the homes created are rented to families earning less than 60 percent AMI, with three apartments rented to families earning less than 50 percent of the AMI. The 26 remaining units are for young people aging out of foster care.

Amenities

The site is in a dense urban location on northern edge of central Harlem, approximately three blocks from a subway stop and about 20 blocks from a regional commuter train stop. Frederick Douglass Boulevard, one block away, is a major traffic thoroughfare and contains a variety of storefront retail shops within a half-mile of the building. In addition to the roof terrace and backyard garden that are an integral component of David & Joyce Dinkins Gardens, residents are also a short walk away from Jackie Robinson Park.

Social Services

The development's 2,500-square-foot community facility houses classrooms and offices for HCCI's Construction Trades Academy. In addition to this job training program, an on-site case manager works with the development's young people transitioning out of foster care to create individual educational and career plans.

Developers

HCCI is a diverse interfaith consortium of more than 90 congregations established to revitalize the physical, economic, cultural and spiritual elements of the Harlem community. HCCI has made a substantial impact on the social and living conditions prevalent in Harlem by developing low- to moderate-income housing, creating supportive health and human service facilities and programs, providing commercial development opportunities to local businesses and expanding cultural programs.

The co-developer Jonathan Rose Companies LLC is a network of community and land-use planning and development firms that collaborate with cities, towns and nonprofit organizations to plan and develop environmentally responsible projects.

Architect

Dattner Architects

The Essex, San Francisco

DEVELOPERS: Mercy Housing California and Community Housing Partnership (CHP)
TOTAL UNITS: 84

A seven-story hotel in San Francisco's Tenderloin neighborhood has been converted into 84 single-room occupancy apartments for homeless individuals with disabilities. Known as the Essex, the building was first constructed in 1912 and has undergone substantial renovations, a process that included several upgrades to meet current safety standards as well as features that satisfy Enterprise's Green Communities criteria. Offering a supportive but independent living environment, the studio apartments each have bathrooms and kitchenettes. In addition to the apartments, the building features 3,000 square feet of street-level commercial space and 5,500 square feet of community facilities where the CHP provides supportive services to residents. CHP also serves as the building's property manager and owner.

Financing

Mayor's Office of Housing	$6,096,483
State of California, HCD, Multifamily Housing Program	$7,000,000
FHLB—Affordable Housing Program Citibank	$680,000
Enterprise Green Communities Grant	$55,000
LIHTC Equity Through Enterprise	$8,315,918
Tax-Exempt Bond-Backed Construction Loan (Citibank)	$11,594,362
City of San Francisco Dept Human Services Annual Operating Support	
TOTAL	**$33,741,763**

A Green Advantage

CHP and Mercy Housing incorporated many green features into the Essex to enhance the living and natural environments.

Located in a dense, urban neighborhood in San Francisco, the Essex allows residents to easily access community services, transportation, restaurants, shops and other civic amenities without having to drive. Moreover, since the Essex rehabilitation involved adaptive reuse of an older building, the character of the neighborhood was able to be preserved and less waste material was generated during the process.

The Essex interior was designed to ensure a comfortable, efficient and healthy living environment. Low-flow water fixtures replaced older, less efficient ones while Energy Star lighting fixtures, insulated pipes and a high-efficiency boiler help keep energy costs and the developments carbon footprint down. Also, materials such as green-certified carpets and bathroom surfaces were selected for being both healthy for residents and environmentally friendly.

Rent

Residents of the Essex are all formerly homeless and earn on average less than 12 percent AMI. Rent for an approximately 250 square foot unit is $216 per month.

Amenities

The basement includes a community room, kitchen and laundry facilities.

Social Services

CHP provides a continuum of services. Services provided at the Essex include:

- Housing retention services
- Case management and counseling
- Crisis intervention services
- Information and referral services
- Family and senior services
- Community building/tenant organizing
- Employment and training programs

Developers

Mercy Housing California is committed to creating healthy, supportive communities with quality, affordable housing for families throughout the U.S. Founded in 1981 by the Sisters of Mercy in Omaha, Mercy Housing has developed nearly 20,000 homes that provide safe living environments for more than 58,000 people. Mercy's developments aren't just about housing, however; its communities serve to strengthen connections between families and provide opportunities for advancement, such as a better job, higher education or economic independence.

Established in 1990, CHP is the only agency in San Francisco exclusively dedicated to providing permanent affordable housing to people who have been homeless. CHP currently owns and/or serves 774 homes for formerly homeless individuals and families. CHP offers integrated property management, supportive services, job training and civic engagement opportunities to its residents, all part of their work toward a permanent solution to homelessness.

Architect

Barcelon & Jang Architects

Ewing Independent Living, Ewing, N.J.

DEVELOPER: Rely Properties LLC | TOTAL UNITS: 72

Ewing Independent Living is a newly constructed, 72-unit affordable community in Ewing, N.J., dedicated to seniors 55 and over and adults with disabilities. With 56 one-bedroom and 16 two-bedroom apartments in an elevator building, Ewing Independent Living has 58,000 square feet of residential space. All apartments consist of, at a minimum, a kitchen, living room, bathroom and bedroom. The building surrounds two large courtyards which contain a patio, bocce ball court, raised gardens, shuffleboard and a sandbox for children.

Ewing Independent Living is designed to provide an environment where seniors and those with disabilities can maintain independence while obtaining assistance with activities of daily living as needed. Trained and certified staff are available to provide companionship, supervision and help with tasks such as escorting residents to the common dining room. Twelve homes are reserved for residents with developmental disabilities.

Financing

Enterprise Green Communities Grant	$47,000
Construction/Bridge Loan — Sun Bank	$8,648,647
Mercer County HOME Funds	$600,000
NJHMFA Developmental Disability Housing Program	$500,000
Division of Developmental Disabilities	$250,000
LIHTC and Sponsor Equity	$54,859
Federal Home Loan Bank of New York	$670,105
NJHMFA Special Needs Revolving Loan Fund	$219,000
Ewing Affordable Housing Trust Fund	$299,000
Deferred Developer's Fee	$1,334,258
TOTAL Development Costs	**$13,517,684**
Construction Financing: New Jersey Housing and Mortgage Finance Agency (NJHMFA) Special Needs Housing Trust Fund	$894,815

A Green Advantage

Ewing Independent Living incorporates a variety of green features:

- Photovoltaic solar panels to power common space
- Energy Star–certified appliances
- Low-E fiberglass windows
- Recycled carpet
- Non-vinyl composition tile
- Low-VOC paints and glues
- Superior Walls (prefab concrete with R-15 insulation) on first floor
- Drip irrigation in the courtyard gardens

Along with reducing use of fossil fuels, the solar panels reduce electric bills. Approximately one-third of the electricity for all the common spaces is produced by the window panels.

Rent

Two apartments are reserved for households earning up to 30 percent AMI. Forty-two are reserved for people earning up to 50 percent AMI and 28 target households earning up to 60 percent AMI. Rent plus utilities approximately $828 for one-bedroom apartments, and $971 for two-bedroom apartments. A single person at 50 percent AMI in Mercer County makes approximately $29,900.

Amenities

All homes are fully accessible, with kitchens that can be adapted for wheelchair use and roll-in showers with seats in the bathrooms. The two-bedroom apartments have tubs with showers in the second bathroom. The building contains more than 20,000 square feet of community space, including a barber shop/beauty salon; laundry, recycling and trash facilities on each of the three floors; a common dining room; two large courtyards with therapeutic raised gardens; bocce and shuffleboard; and a play area for visiting children. Also available in the building are a spa with walk-in tub, library, electronic security access and security cameras. Ewing Independent Living is within walking distance of churches, community gardens, the ARC Mercer education and administration building, multiple retail establishments and public transportation.

Social Services

Visiting nurses, physical and occupational therapists, home health aides and social workers are available to residents. Supportive services are offered on site by Assisted Living Inc, a 501(c)(3) nonprofit corporation. Services include assistance with bathing, dressing, grooming, medication administration, meal preparation and housekeeping, as well as an emergency call system and transportation. All on-site services are offered in conjunction with visiting nurses; physical, speech, and occupational therapists; and other care professionals with the goal of helping residents remain independent.

Architect

Steven S. Cohen, Architect, PC

Fox Courts, Oakland, Calif.

DEVELOPER: Resources for Community Development (RCD) | TOTAL UNITS: 80

Fox Courts is a transit-oriented, arts-enriched, family-focused, affordable housing development in the Uptown District of central Oakland. It is one part of a redevelopment that also includes 700 market-rate homes, the historic Fox Theater, the Oakland School for the Arts, restaurants and retail opportunities. Fox Courts' .88-acre site used to be a parking lot. Community activists banded together to negotiate a community benefits agreement for the redevelopment, and Fox Courts is the resulting affordable housing component.

The five-story building is designed in two parts, each centered around an internal courtyard with apartments surrounding them. There are 18 studio, nine one-bedroom, 13 two-bedroom, 35 three-bedroom and five four-bedroom apartments. One of the courtyards includes a playground and child care center.

The development, which was completed in November 2008, ties the neighborhood together with a large public pedestrian walkway between 18th and 19th Streets.

Six of the building's homes are reserved for people living with HIV/AIDS, and four are reserved for residents diagnosed with mental illness.

Financing

City of Oakland Redevelopment	$7,400,000
County of Alameda	$700,000
California State HCD MHP	$5,800,000
Tax Credit Investor — Alliant	$15,100,000
General Partner Equity	$1,500,000
Grants (Including Enterprise Green Communities)	$285,000
Union Bank Permanent Loan	$3,200,000
AHP/Silicon Valley Bank	$395,000
TOTAL	**$34,500,000**

A Green Advantage

Grants from Enterprise Green Communities helped RCD solidify the vision and planning of Fox Courts, as well as conduct a solar shadow study to inform the placement of photovoltaic panels, design a system to power common areas, and reduce stormwater runoff with bioswales and pervious pavers.

Green features at Fox Courts include:

- Energy performance exceeding California Building Standards Codes by more than 15 percent
- Floor plans that maximize natural light and ventilation
- Energy Star refrigerators, dishwashers and light fixtures
- Double glazed, low-E windows
- Recycled content carpet, ground concrete and linoleum flooring
- Formaldehyde-free cabinet boxes, countertop substrates and building insulation
- No- and low-VOC paints
- Drought tolerant landscaping
- Solar thermal panels for hot water and hydronic radiant space heating

Rent

In this Low-Income Housing Tax Credit development, the majority of households are earning between 31-50 percent AMI. All homes are rented to households earning less than 60 percent AMI, and residents pay no more than 30 percent of their income for rent and utilities. In 2009, AMI in the Oakland-Fremont area is $89,300 for a family of four.

Amenities

Fox Courts has much to offer its residents in addition to an affordable place to live, including a childcare center, community room, computer lab, two laundry rooms, a lounge/exercise room and two internal courtyards. Just a block away are a rail station served by three lines and a stop for 13 bus lines. Another major Bay Area transit hub is less than half a mile away. Two drug stores and a department store are within two blocks, and two grocery stores are within a half-mile. Next door is the newly renovated Fox Theater, a national historic landmark, and the Oakland School for the Arts.

Social Services

Fox Courts' Resident Services Program is a community-driven, service-enriched model that is voluntary and free of charge to all residents, including those with special needs. Services include on-site office hours and case management, and information and referrals that link residents to a comprehensive, integrated network of local resources. There are community meetings and educational workshops; computer classes and a free computer lab; employment and job skills training seminars; and an after school youth program on site. Programming is focused on building a sense of community among residents and providing the necessary support services that individual households might require.

Developer

RCD creates and preserves affordable housing for those with the fewest options, to build community and enrich lives. Since 1984, RCD has created over 1,600 homes for low-income residents of Alameda, Contra Costa and Solano counties in California. RCD is the largest provider of housing for people living with HIV/AIDS in Alameda County and provides on-site supportive services and referral assistance at 28 of its properties.

Architect

Pyatok Architects, Inc. Oakland, Calif.

Galen Terrace, Washington, D.C.

DEVELOPERS: National Housing Trust-Enterprise Preservation Corp. (NHT), Somerset Development Company and the Galen Terrace Tenants Association | TOTAL UNITS: 83

Galen Terrace is a rehab of an existing Section 8 housing community made up of three three-story apartment buildings on two separate parcels in the Anacostia neighborhood of South East Washington, D.C. The neighborhood is among the lowest-income and highest crime rate areas in D.C.

With significant input from community residents, Galen Terrace underwent a major renovation to address safety, crime and security including the incorporation of recommendations from a safety audit. The renovation corrected ineffective perimeter fencing and broken hardware and added more security features, such as electronic access at the entrance, improved lighting and fencing and security cameras. The renovation also included new kitchens and baths, painting, carpeting, drywall repair, sanitary sewer repairs, new HVAC, stairwell upgrades, handrail modifications, roof replacement, exterior painting and improvements and new windows. Also added was an on-site management office and community space with a computer center.

Financing

D.C. Housing Finance Agency Tax Exempt Bonds	**$5,660,000**
DHCD HOME Loan	**$3,250,000**
LITHC Equity Enterprise Community Investment	**$4,670,000**
Enterprise Green Communities Grant	**$50,000**

Total development cost was $13.6 million and included tax exempt bonds, 4 percent low-income housing tax credits, subordinate loan from the District of Columbia and HUD housing assistance payments.

A Green Advantage

The development included a comprehensive review by an energy auditor to identify and help incorporate all cost-effective energy improvements with a 10-year or less payback period. The plans include Energy Star refrigerators, washers, light fixtures and daylight sensors on all outdoor lighting. Other elements such as hot water heaters, pipes, dryers, reflective roofing, wood, carpeting, water collection rain barrels for landscape watering and plant selection also comply with green standards. Renters receive a Green Home Guide and orientation to explain and review green building features, operations and maintenance. The site also satisfies Enterprise Green Communities Criteria in terms of proximity to community facilities and stores.

Rent

Despite persistent socio-economic challenges, the neighborhood is ripe for gentrification due to the Washington, D.C., region's strong job and housing markets, with the potential to displace current low- and moderate-income residents. Real estate tax assessments in Anacostia have increased 99 percent in the past three years, exerting pressure on housing prices and rents, making the preservation of affordable housing an even more pressing priority. The development partnership secured a 20-year extension of the HUD Housing Assistance Payment Section 8 contract allowing tenants to remain and experience no rent increase.

Amenities

The property is within a quarter mile of a public bus stop, supermarket, elementary school, library, licensed child care facilities, laundromat, places of worship and a community center. Within a half mile are pharmacies, convenience stories and open park space with a public swimming pool and basketball courts.

Social Services

Operating income and individual grants will help support a comprehensive array of services such as after-school and workforce development programs, computer and personal financial training and organized activities for senior citizens.

Developers

Somerset Development Company is a real estate development company specializing in multifamily and mixed-use commercial development in urban areas. It focuses on the preservation of affordable housing and the development and redevelopment of properties that contribute to the revitalization of communities.

NHT is a national nonprofit organization formed to preserve and improve affordable multifamily homes for low- and moderate-income use. NHT has preserved more than 4,000 homes in seven states and Washington, D.C. NHT incorporated many green elements in renovating and preserving the Friendship Court Apartments in Charlottesville, VA., before the Enterprise Green Communities Initiative existed.

Architect

The Environmental Design Group

Kingsbury Place, Walker, Mich.

DEVELOPER: Genesis Non-Profit Housing Corporation | TOTAL UNITS: 44

Kingsbury Place is Genesis' fourth housing development for low-income individuals and families with special needs. The development has 44 units in 10 buildings: 29 one-bedrooms, 13 two-bedrooms, and two three-bedrooms. The housing is targeted to extremely low-income (earning less than 40 percent AMI) and chronically homeless individuals in the Kent County area. Enterprise's $93,000 grant helped the sponsor to provide the first Michigan Green Communities project by a nonprofit housing developer. Kingsbury Place achieved silver LEED-H certification.

Financing

Low-Income Housing Tax Credits	**$4,500,000**
Michigan State Housing Development Authority (MSHDA) HOME	**$1,800,000**
Federal Home Loan Bank of Indianapolis (FHLBI) Affordable Housing Program	**$150,000**
HUD Program	**$660,000**
Michigan Green Communities*	**$91,000**
TOTAL	**$7,200,000**

*Michigan Green Communities is a collaboration between the Michigan State Housing Development Authority, Great Lakes Capital Fund and Enterprise.

A Green Advantage

Genesis incorporated the following green features into Kingsbury Place:

- 60,000-gallon underground groundwater detention system to water lawn and bushes immediately around houses
- Native vegetation on two-thirds of the site, including wild flowers, trees and bushes, and low-maintenance landscaping
- Open-cell foam insulation on all walls and ceilings to reduce air penetration and transfer
- Energy Star appliances
- Low-VOC paints and interiors
- Within walking distance of two shopping malls
- Within 500 feet of a public transit system stop

Rent

- One bedroom: $235–$500 per month
- Two bedrooms: $271–$650 per month
- Three bedrooms: $650–$800 per month

Amenities

- On-site play area
- On-site community room for recreation and resident gatherings
- High-efficiency washer and dryer in each unit
- All ground-floor units accessible
- Nine ground-floor units with accessible showers
- Each apartment wired for high-speed Internet connection

Social Services

The developer provides a full-time, on-site accredited social worker to offer voluntary support services to help all residents maintain a stable living environment. The social worker links residents with other community resources to supplement on-site supports.

Developer

Genesis formed in 1998 specifically to provide permanent supportive housing for people with disabilities in west Michigan. Kingsbury Place marks the fourth affordable housing project developed by Genesis, a certified Community Housing Development Organization. Low-income individuals with disabilities have representation on its board.

Architect

Dattner Architects

Living on Track, Medford, Ore.

DEVELOPER: Tracking Opportunities, LLC | TOTAL UNITS: 63

Living on Track is a two-site development providing new construction of 63 units of supportive housing in Medford, Ore. Sky Vista has 48 units and Lithia Place has 15 units. The community provides 18 one-bedroom, 41 two-bedroom and 4 three-bedroom units on two parcels of land, six acres of development total. Living on Track homes house residents in need of supportive housing earning less than 50 percent AMI. The development is geared to address the needs of developmentally disabled adults in recovery from alcohol and drug issues, chronically medically ill citizens, homeless individuals and victims of domestic violence.

Financing

LIHTC equity from Enterprise	$4,600,000
Enterprise Green Communities Grant	$50,000
Oregon Affordable Housing Tax Credit Program (NOAH Loan)	$1,600,000
Affordable Housing Program HOME Loan	$745,000
Deferred Developer Fee	$282,000
Continuum of Care	$211,000
Other General Partner Grants	$225,000
Other General Partner Capital	$353,000
TOTAL	**$8,066,000**

A Green Advantage

Tracking Opportunities incorporated a number of green features into Living on Track:

- Located on arterial and collector streets, the project is in close proximity to green space, community health services, public schools, retail and employment opportunities. As infill sites, both developments utilize existing urban services and increase neighborhood density.
- The project enhances sidewalk connectivity, improves pedestrian and bicycle access and increases neighborhood density, promoting mass transit feasibility and increasing neighborhood circulation through new street development.
- Indoor fans and operable windows provide energy-efficient ventilation options.
- Outdoor water-conserving measures include an on-site stormwater collection and filtration system, microclimate-specific landscaping and a drip irrigation watering system.
- Energy efficiency advantages include Energy Star appliances and lighting, submetered units and upgrades to roof insulation, window efficiency and HVAC system.
- Living on Track exceeds the State of Oregon energy code by 37 percent.
- Over 50 percent of the wood utilized on-site is certified, salvaged or engineered.
- Low- and no-VOC paints, primers and sealants are utilized throughout the project and cabinetry is sealed with low-VOC laminate to capture formaldehyde.
- Recycled-content carpeting, drywall and insulation are utilized throughout the project.
- A Green Home Guide is distributed to residents.

Rent

16 homes: 0–30 percent AMI
47 homes: 31–50 percent AMI

Amenities

Sky Vista has 48 units designed to serve special needs populations including residents with criminal or bad credit histories, mental illness, histories of substance abuse and victims of domestic violence. Lithia Place has 15 units designed for developmentally disabled residents. During the selection process, tenants are placed in the most appropriate site according to their service needs.

Social Services

The services within Living On Track support a wide variety of service needs, including those for persons in recovery from chemical dependency, persons who are developmentally disabled, persons with a chronic mental illness, victims of domestic violence, those who are homeless or at risk of homelessness and others who have been living in poverty who may lack employment skills, education or other life skills. The property management firm, The Neel Management Team, Inc., provides on-site management services.

Developer

Tracking Opportunities, LLC sponsors the project — composed of two agencies with significant experience in managing property with intensive services.

OnTrack Inc. is Medford's largest provider of services to substance abusers. It was created in 1971 to offer residential and out-patient recovery and treatment. OnTrack has 125 staff members, most of whom work in substance abuse services delivery.

Living Opportunities, Inc. is a nonprofit, created in 1974, that provides housing and supportive services to developmentally disabled individuals. Services provided by a 120-person staff include job training and placement, supervised recreational opportunities, assistance with budgeting and access to public benefits, nutrition and dietary training, safety skills and assistance with medication and treatment.

Architect

Daniel Horton

Madrone Plaza, Morgan Hill, Calif.

DEVELOPER: South County Housing | TOTAL UNITS: 95

Madrone Plaza, built by South County Community Builders, is a mixed-income housing development located on 6.5 acres of previously vacant land. Madrone Plaza homeowner's association provides all residents, regardless of income, with access to a park, barbecue/picnic area, tot lot, clubhouse, swimming pool, bocce ball court, putting green and basketball court. The development features Craftsman architecture and incorporates many green building elements. It offers spectacular views of the mountains, with plenty of outdoor opportunities for walking, biking, golfing and other activities. The majority of the townhomes front a pedestrian paseo lined with shade trees to encourage community interaction.

Construction Financing

Wells Fargo Conventional Construction Loan	$34,137,000
California Housing Financing Agency Residential Development Loan Program	$2,000,000
California Department of Housing and Community Development Workforce Housing Reward Program	$152,140
Enterprise Green Communities	$60,600
Pacific Gas and Electric rebates	$90,260

Permanent Financing

California Department of Housing and Community Development Building Equity and Grown in Neighborhoods	$2,160,000
City of Morgan Hill Redevelopment Agency	$1,900,000
TOTAL	**$40,500,000**

A Green Advantage

The development incorporates a number of green features:

- Landscaping using native water-conserving plants
- Super low-E glass
- Energy Star light fixtures and appliances
- Low-flow faucets, toilets and showerheads
- Low-VOC paints
- 90 percent high-efficiency furnaces
- R38 Ceiling Insulation, cellulose recycled wall insulation, radiant barrier sheathing and insulated hot water pipes
- All construction waste sorted and recycled

Home Price

The homes are offered to middle- and low-income residents, with preference given to people who live or work in Morgan Hill. Thirty-six of the homes serve homeowners between 51 percent and 80 percent AMI; 30 will serve homeowners between 81 percent and 100 percent AMI; and 29 serve homeowners above 101 percent AMI. The Morgan Hill California Department of Housing and Community Development BEGIN and California Housing Finance Agency provide deferred payment loans and down payment assistance to help make the homes more accessible to low-income residents.

Amenities

The site is located near a major arterial route in Morgan Hill, making access by car easy. Six lanes of a newly widened street lead directly to the development. There are two bus stops within one-half mile of the site that run hourly and a Caltrain (commuter train) station just one mile away. A large mall is less than one-half mile from the site featuring several department stores as well as shops, restaurants and professional services. The development also features a park area with a tot lot, swimming pool, basketball court, bocce ball court, putting green and walking and biking paths.

Social Services

South County Housing offers first-time homebuyer workshops on financial management, budgeting, home maintenance and repair, insurance and how to be good neighbors.

Developer

South County Housing is a nonprofit community development corporation operating in the California counties of Santa Clara, Santa Cruz, Monterey and San Benito. It is a unique organization that has a development team, construction specialists, loan packaging/marketing experts and a neighborhood team, all working together to help build quality homes, train people to become homebuyers and provide access to financial assistance programs. Since 1979, South County Housing has built nearly 2,700 homes, including 1,400 affordable apartments. These buildings, which residents take pride in maintaining, have won national awards for their beauty and utility.

Architect

The Dahlin Group

New San Marco Apartments, Duluth, Minn.

DEVELOPER: Center City Housing Corp. (CCHC) | TOTAL UNITS: 70

The New San Marco Apartments is a new construction serving the homeless. The project is located on an urban infill redevelopment site donated by the City of Duluth. The building has two wings. Thirty permanent supportive homes for chemically dependent individuals are in the first wing. The second wing has 40 units of supportive efficiency apartments for people with a history of homelessness. Thirty-six of the units are set aside for individuals experiencing chronic homelessness for a year or more, or for those who have had at least four episodes of homelessness in the past three years. New San Marco opened in May 2007, and the building quickly filled with residents. Since then, occupancy has been near 100 percent.

Financing

Minnesota Green Communities	$150,000
LIHTC Equity — NEF	$5,964,410
Minnesota Housing Ending Long Term Homelessness Investment Fund	$621,077
Minnesota Housing Trust Fund	$529,522
Minnesota Housing HOME	$500,000
Federal Home Loan Bank of Des Moines	$500,000
HUD Program	$400,000
Greater Minnesota Housing Fund	$300,000
City of Duluth, HOME	$200,255
Duluth Housing Investment Fund	$50,000
Owner Equity	$20,000
Minnesota Power Grant	$10,000
Total	**$9,245,264**

A Green Advantage

New San Marco was constructed with various sustainable elements that benefit both the residents and the surrounding community, including:

- Re-use of urban infill site next to public transportation and downtown amenities
- Overall energy efficiency — 32 percent more efficient than state code
- High-efficiency steam heating and hot water system
- Natural daylighting, energy-efficient lighting and controls
- Ceiling fans and Energy Star appliances
- Low-maintenance landscaping not requiring irrigation
- Continuous ventilation of bathrooms for moisture control
- Low-VOC paints, sealants and adhesives
- Durable building materials — brick exterior, high-impact sheetrock interior
- Construction waste management plan

Early indications suggest the New San Marco is exceeding energy performance expectations.

Rent

All rents are affordable to persons making 50 percent AMI with 25 units further restricted to persons making 30 percent AMI. Thirty of the units are assisted by state Group Residential Housing supplements and 40 units have Project Based Section 8 rental assistance.

Amenities

The New San Marco has multiple common and support areas to meet the needs of the residents. These include enclosed courtyards, a dining area, lounges, laundry facilities, offices for social service providers, an exam room and a 24-hour, fully staffed front desk area. Meals are provided for persons residing in the single-room occupancy units and available to efficiency-unit residents for a small fee.

Social Services

The New San Marco brings housing and supportive services under one roof to help overcome the causes of persistent homelessness in Duluth. Service provision is a collaborative effort of two local nonprofits: the Center for Alcohol and Drug Treatment (CADT) and the Human Development Center (HDC).

CADT provides one case manager, as well as a nurse, to assist with health and security issues and offer connections to social services on a 24-hour basis. HDC provides one case manager to assist residents with their mental health issues including case management, psychiatric nursing services and medication management.

Developer

CCHC, a community-based Minnesota 501(c)3 corporation, was established in August 1986. CCHC endeavors to be Duluth's primary and preferred nonprofit developer of affordable housing with projects distinguished by quality construction and a commitment to tenants' rights and affordability. CCHC currently owns and manages 229 units of housing affordable to low-income households ranging in size from single-room occupancy to five bedrooms. CCHC will own and operate the New San Marco Apartments as well as coordinate the provision of services to the project.

Architect

LHB

Park Avenue Apartments, Minneapolis

DEVELOPER: Lutheran Social Service of Minnesota (LSS) | TOTAL UNITS: 48

Park Avenue Apartments are adjacent to Lutheran Social Service of Minnesota's new service center, Center for Changing Lives, which opened in the winter of 2008. The new center houses mental health counseling services, after school services for kids, wellness services, housing, and financial services. All 48 units are affordable, with 38 units targeted to households earning up to 45 percent AMI and the remaining 10 units targeted to households earning up to 15 percent AMI. Thirteen apartments are specifically designated for households experiencing long-term homelessness or near homelessness. These households pay no more than 30 percent of their income toward rent.

Financing

Minnesota Green Communities	$27,000
Low-Income Housing Tax Credits	$7,003,700
State of Minnesota General Obligation Bonds	$2,052,656
Hennepin County Affordable Housing Incentive Fund	$1,000,000
City of Minneapolis Affordable Trust Fund	$500,000
State of Minnesota Planning Grant	$350,000
General Partner Equity	$153,000
Minnesota Housing Ending Longterm Homelessness Initiative Fund	$140,077
Family Housing Fund	$27,000
TOTAL	**$11,313,433**

A Green Advantage

Park Avenue Apartments were constructed using various sustainable methods and will include a variety of green features that benefit both the residents and the surrounding community, including:

- Use of previously developed urban sites; close to transit and with secure parking
- Approximately 65 percent of all construction and demolition waste diverted from the waste stream through recycling and reuse
- Rehabilitation of a brownfield site
- Recycle/reuse of existing building materials
- Low-impact native and adaptive landscaping
- Management of storm water on site through collection of water in rain gardens and drywells
- Energy Star appliances, lighting, and daylight sensors for outdoor fixtures
- Low- or no-VOC paints, sealants, adhesives and finishes to improve comfort and health
- Water-conserving appliances and fixtures will reduce consumption by approximately 40 percent
- Underground parking (with reduced number of spaces) for a more walkable site, reduced need for impervious surfaces and reduced heat island effect
- Limited or no carpet usage

Rent

Park Avenue Apartments consists of nine one-bedroom units ($400 for three near-homeless units and $600 for six units), 15 two-bedroom units (approximately $200 for five units for long-term homeless and $750 for remaining 10 units), 20 three-bedroom units (approximately $250 for five long-term homeless units and $860 for remaining 15 units) and four four-bedroom units ($960 for four units).

Amenities

Park Avenue Apartments is located next to the Center for Changing Lives with access to a variety of social services and community support. The development is well-located on a bus line and within walking distance to commercial and retail establishments. For residents with cars, underground parking is included in the rent. Park Avenue Apartments provides convenient on-site laundry facilities and a playground.

Social Services

Services are provided by LSS's Housing Services, a leading provider for the past 20 years. With compassion and fairness, they help individuals and families identify their needs and develop a plan to achieve their goals using the Strength Based Model.

Developer

LSS, founded in 1864, is the largest private, nonprofit organization in the state of Minnesota, providing social services to over 100,000 Minnesotans every year. LSS has acquired, owned and managed properties for decades and became involved in housing development in the early 1990s. Through its involvement with the Phillips Park Initiative, and previous ownership experience, LSS embarked on this journey to rebuild its service center and develop 48 units of affordable housing.

Architect

BKV Group

Parmenter Circle, Middleton, Wis.

DEVELOPER: Nakoma Development LLC | TOTAL UNITS: 50

Parmenter Circle is the new construction of a four-story elevator building that brings green, affordable housing to Middleton, Wis., Madison's largest suburb. As part of Middleton's Highway 12 Plan, to transform the former highway corridor into an urban retail district, Parmenter Circle not only adds new, affordable housing on the west side, it also contributes to the revitalization effort underway in Middleton's downtown area. Enterprise Green Communties' first development in Wisconsin, Parmenter Circle provides four efficiencies, three studio lofts, 16 one-bedroom, 23 two-bedroom and four three-bedroom apartments.

Financing

Wisconsin Housing and Economic Development Authority Loan	$1,960,000
John Deere Credit Loan	$665,000
Nakoma Development Deferred Fee	$156,719
Focus on Energy	$70,000
Madison Gas and Electric Green Grant	$68,000
Enterprise Green Communities Grant	$43,000
LIHTC Equity through Enterprise	$3,371,000
TOTAL	**$6,333,719**

A Green Advantage

Parmeter Circle's green features protect the environment and create tangible benefits for low-income residents. The building includes elements that will reduce utility costs and improve air quality, such as:

- A high-efficiency HVAC system, including forced-air furnaces located in the apartment interior to maximize daylight to the living spaces and limit air infiltration
- Energy Star appliances
- High-efficiency light fixtures with occupancy sensors
- Low-flow plumbing fixtures
- Green Label floor coverings
- Insulated basement, hot and cold water pipes, roof and walls
- Close to public transportation and community services

Rent

Rents for 40 of the apartments are affordable to individuals and families earning between 30-60 percent AMI. The remaining 10 units are leased at market rates.

Amenities

Parmenter Circle features a secure entry system, surface and underground parking, a private playground, community patio and a business center with two computers and printers. Located three blocks from downtown, Parmenter Circle is within walking distance of a community center, several child care centers, Meriter Medical Clinic, the Middleton Public Library and Middleton High School. A variety of restaurants and shopping facilities are also within walking distance. The units are designed with spacious floor plans, nine-foot ceilings, walk-in closets, and full-size patios and balconies comparable to market rate apartments in the region.

Developer

Nakoma Development LLC is a private development group started in 2004 by Robert Schwarz and Robert Gake, principals. Parmenter Circle is their first development project. Mr. Schwarz has extensive experience financing affordable housing through the Low-Income Housing Tax Credit program, and has worked in syndication, development, land acquisition and property management. Mr. Gake is a licensed mechanical engineer with experience in the area of HVAC design and energy efficiency system retrofits in large commercial buildings. Mr. Gake recently acquired his MBA degree with a concentration in Finance and Entrepreneurship from University of Wisconsin-Madison.

Architect

Knothe and Bruce Architects, LLC

Pear Tree Place, Yakima, Wash.

DEVELOPERS: Office of Rural and Farmworker Housing and Next Step Housing (NSH)
TOTAL UNITS: 26

Pear Tree Place (PTP) is a Low-Income Housing Tax Credit development and consists of five buildings on two-and-a-half acres of an obsolete pear orchard. Dedicated to helping people struggling with alcohol addiction, PTP is the very first alcohol- and drug-free community in Washington to serve large families with children.

Financing

Tax Credit Equity	$2,573,743
Washington State Housing Trust Fund	$1,600,000
Washington Community Reinvestment Association	$110,000
City of Yakima	$200,000
Green Communities	$26,000
2060 Funds	$161,000
Home Depot	$26,000
Enterprise Community Partners	$5,500
Washington Mutual	$50,000
Anonymous	$48,035
Yakima Federal	$1,000
TOTAL	**$4,804,035**

A Green Advantage

The developers had several reasons for going green, including lower life cycle costs of materials and greater energy efficiency to achieve utility cost savings for residents. PTP minimizes water consumption — which is important in a region where there are 300 days of sun each year and summertime highs are regularly 90-100 degrees. PTP incorporates the following green features:

- Energy Star heat pump, appliances and lighting fixtures
- Comprehensive sealing to minimize air leaks
- Radon gas mitigation system
- Low-VOC paints and sealants
- Water-conserving plumbing fixtures
- Drip irrigation system
- Individual electric meters
- Strategic placement of shade trees to keep the buildings cooler and provide pleasant outdoor spaces
- Laminate flooring

Rent

Of the 26 apartments in PTP, 25 are for families and individuals earning less than 50 percent AMI; the other apartment is for the resident manager. In 2009, AMI for a family of four in Yakima is $50,900. A single person at 30 percent AMI earns $11,450 per year.

Amenities

PTP is located directly across the street from Robertson Elementary School and Trinity Lutheran Church. Stone Church is a half block away. Public transportation is less than a half mile from the site. A city-owned walking trail runs along the southwest side of the site providing excellent walking, jogging and cycling opportunities. Robertson Elementary has play equipment, open fields and courts. Chesterly Park is less than one mile from the site.

Social Services

Triumph Treatment Services' Riel House is across the street from PTP. Some residents of PTP also have case management from the Washington Department of Social and Health Services, with an independent living assistant. And PTP's resident manager is also a case manager if there is ever a need for intervention, emergency case management or brief, strategic counseling. A half block away is the EPIC Place Campus with many child and family services provided by Casey Family Foundation, Children's Hospital, Triumph Treatment and Enterprise for Progress in the Community (EPIC).

Developers

NSH provides affordable, clean and sober transitional and permanent housing in Washington's Yakima Valley. NSH residents are predominantly individuals and families impacted by substance abuse and in long-term sobriety. They also house individuals and families living with developmental disabilities.

The Office of Rural and Farmworker Housing is a private, statewide nonprofit corporation that develops and helps preserve housing for farmworkers and other rural residents of Washington State. They provide direct, comprehensive development services to local nonprofit corporations, housing authorities, growers/employers and other organizations and individuals interested in developing new or preserving existing affordable housing.

Architect

Zeck Butler Architects

Powelton Heights, Philadelphia

DEVELOPER: 1260 Housing Development Corporation (1260 HDC) | TOTAL UNITS: 48

Powelton Heights is a new construction of 48 one-bedroom units in one four-story building in the West Powelton Village neighborhood of West Philadelphia. Despite assets such as employment opportunities, transportation and recreation options, West Philadelphia contains a mix of deteriorated neighborhoods, streets and bridges that need repair. Many of the neighborhoods are in need of major private investment, and unemployment is high. The housing stock in the area is old and higher prices in the surrounding area are pushing people to new neighborhoods in search of affordable housing opportunities. Thus, the city of Philadelphia has classified the production of housing for extremely low and low-income households as a priority.

There are numerous stores and services available within walking distance of the project and employment opportunities throughout the city are accessible via trolley, bus and elevated train. Powelton Heights' blend of service-enriched housing and green building design serve as an innovative contribution to the active redevelopment of Philadelphia's neighborhoods.

Financing

HUD SHP Loan	$400,000
HOME Loan	$525,000
General Partner Deferred Developer's Fee	$246,625
Enterprise Green Communities™ Grant	$50,000
LIHTC Equity through Enterprise	$7,933,000
TOTAL	**$9,154,625**

A Green Advantage

Powelton Heights includes numerous features that are consistent with environmentally sound building practices that focus on reducing energy consumption and conservation of raw material. Green features include:

- Energy Star appliances
- Green Label carpeting
- Sustainable design through redevelopment of an underutilized urban site
- Low-flow plumbing fixtures
- Low-toxicity floor coverings and paint

Rent

Ten of the units are restricted to households at or below 40 percent AMI and 38 units are at or below 50 percent AMI. Ten of the units are designated to serve homeless persons with a disability. The development receives project-based Section 8 funding for 30 of the units, and six of the units are further restricted beyond the Low-Income Housing Tax Credit requirements to serve physically disabled tenants at or below 20 percent AMI.

Amenities

Amenities in the newly constructed building are superior to those found in the market. The project includes a computer room, on-site laundry facilities, electronic security access and one elevator. Unit amenities include central air conditioning, carpeting and appliances.

Social Services

COMHAR, Inc. provides specialized supportive services to formerly homeless residents with mental illness. COMHAR has over 30 years of experience and offers case management, life skills training, regular supervision and community support, crisis intervention, counseling, alcohol and drug treatment services, and medical and psychiatric services.

The Inglis Foundation helps identify and serve the needs of individuals with physical disabilities. Inglis has developed a system of services designed to maximize the independence of adults with physical disabilities and has been serving people with physical disabilities in Philadelphia since 1877.

Developer

1260 HDC was formed in 1988 as an affiliate of the Philadelphia Mental Health Care Corporation with a mission to acquire, develop and maintain affordable housing for low-income persons with mental illness and other disabilities. 1260 HDC has built or renovated more than 800 units of affordable housing, including five tax credit properties. 1260 HDC manages the units through its management arm, Columbus Property Management.

Architect

Francis Cauffman Foley Hoffman, Architects Ltd.

Renaissance Riverfront Lofts, Denver

DEVELOPER: Renaissance Housing Development Corporation (RHDC) | TOTAL UNITS: 100

Renaissance Riverfront Lofts is a transit-oriented development integrating supportive housing for homeless persons and affordable housing for individuals who otherwise could not afford to live downtown. It is a five-story, new construction building on a 1.4 acre site. At 97,000 square feet, it contains 86 one-bedroom and 14 two-bedroom apartments. It is on a former brownfield site that was home to an asphalt plant. The north parcel of land was developed as a neighborhood retail center, and the south parcel is home to Riverfront Lofts. Construction of the Lofts began in December 2007 and the Grand Opening was April 2009.

Financing

JPMorgan Chase — Permanent Loan	$1,200,000
JPMorgan Chase — Construction Loan	$7,350,362
Colorado Office of Energy Management and Conservation's Energy Funds	$104,869
RHDC Sponsor Loan	$2,000,000
CCH Sponsor Loans	$1,800,000
General Partner Capital Contribution	$500,000
Tax Credit Equity	$3,724,884
Deferred Developer Fee	$611,567
Enterprise Green Communities Grant	$50,000
TOTAL	**$17,341,682**

A Green Advantage

Renaissance Riverfront Lofts include:

- Recycled and locally available materials used whenever possible
- A double "C" footprint and orientation that maximizes natural light through south and west exposures and protects against buffeting northwest winds
- Rooftop photovoltaic panels generate 39,650 kWh of electricity annually, equivalent to offsetting 79,000 pounds of carbon dioxide per year
- Ecospace elevators that use one-third of the energy required for hydraulic lifts and don't need oil
- Energy Star appliances and light fixtures
- 'Right Sized' Aquatherm heating and cooling system for each unit
- Continous fresh-air exchange
- Large Energy Star–rated windows with reflective thermal coating and thick glass for superior sound insulation
- Low-flow toilets, faucets and showers
- Non-toxic primers, paints, sealants and adhesives
- Natural fiber carpeting
- Compound wood products that do not contain urea formaldehyde
- Individually metered apartments for electricity and water
- Fifty percent of the construction waste was recycled

Rent

Approximately 50 units are reserved for individuals earning 0–30 percent AMI. These households pay 30 percent of their income for rent, subsidized by public grants and private donations. The remaining units are available to households earning up to 60 percent AMI, approximately $36,000. Unsubsidized rents range from $300 to $650 per month for a one-bedroom apartment and $480 to $700 for a two-bedroom apartment.

AMI in metro Denver for a family of four is $76,000 in 2009, and a single-person household at 30 percent AMI earns $15,950.

Developer

RHDC is the development subsidiary of the Colorado Coalition for the Homeless (CCH). CCH and RHDC have developed more than 1,200 homes in the Metro Denver area in the past 10 years.

The Renaissance Housing Model is focused on integrating formerly homeless families and individuals into mixed income housing developments that enhance the neighborhoods in which they are located. At each Renaissance housing site, approximately one-third of tenants have special health needs and are formerly homeless or at risk of homelessness; approximately two-thirds of tenants pay higher but affordable rents and do not require supportive services. This financing strategy helps CCH provide more highly subsidized housing with supportive services to permanent supportive housing tenants.

Architect

Carvell Page Southerland Page

Ripley Gardens, Minneapolis

DEVELOPER: Aeon | TOTAL UNITS: 60

Ripley Gardens is the redevelopment of the former Ripley Maternity Hospital in the Harrison Neighborhood of Minneapolis. The development includes the restoration of three historic buildings and the addition of three new buildings to provide 52 rental and eight home ownership units. The Maternity Hospital closed in 1956 and the property was transformed into Queen Care Nursing Home, which operated until 2000. The site was vacant until Ripley Gardens opened in October 2007. The plans for the site were developed with extensive participation by the Harrison Neighborhood Association, which is a strong supporter of the project.

Financing

Minnesota Green Communities	$78,000
Limited Partner Equity, LIHTC	$5,091,851
First Mortgage	$2,730,000
City of Minneapolis (CPED-CDBG, HOME,AHTF, Seed)	$1,145,000
Historic Rehab Tax Credits (HTC)	$1,067,149
Pending HTC Adjustment	$50,000
Tax Increment Financing (TIF)	$600,000
Hennepin County AHIF	$550,000
Hennepin County ERF	$542,600
Minnesota Housing	$478,000
Met Council — LCDA	$450,000
Aeon Gap Loan	$318,898
Neighborhood Revitalization Program	$300,000
Federal Historic Save America's Treasures Grant	$295,000
Foundation / Other	$235,128
General Partner Deferred Developer Fee	$149,841
Investment Account Interest	$107,922
Family Housing Fund	$100,000
Historic Preservation Grants	$65,000
Private Donations	$62,043
Hennepin County Lead Grant	$42,000
CPED — Non-profit Admin	$30,000
Hennepin County TOD	$10,000
TOTAL	**$14,498,432**

A Green Advantage

The Ripley Gardens development incorporates a wide range of sustainable design elements, including:

- Adaptive re-use of existing historic structures
- Clean-up of asbestos, lead, and petroleum contamination
- Density exceeds 30 units per acre, while preserving one acre of green space
- Pedestrian-friendly site design located next to public transportation with direct service to downtown Minneapolis and the western suburbs
- New construction apartments take advantage of passive solar heating
- Maximizes natural light, energy-efficient lighting and controls
- Energy Star appliances
- Storm water retention through the collection of water in three rain gardens
- Two levels of underground parking creates a more walkable site, reduces need for impervious surfaces and reduces heat island effect
- Continuous ventilation of bathrooms and direct ventilation of range hoods to the exterior
- Low-VOC paints, sealants, and adhesives
- Interior finish materials using recycled content

Rent

Rents are affordable to families at or below 50 percent AMI in 20 of the rental units, and six of the rental units are affordable at or below 30 percent AMI. The eight ownership units are affordable to buyers at 50 percent AMI. Four units are designated for previously homeless individuals.

Amenities

Ripley Gardens includes a community room with a kitchen and patio, central courtyard with a tot-lot playground, and roughly one acre of green space throughout the site.

Social Services

People, Inc. provides services to residents in the four units for previously homeless individuals. People, Inc. uses the Assertive Community Treatment model as a starting point for the residents and makes program adjustments as needed to tailor their services to the needs of the residents.

Developer

Aeon is a private, nonprofit, community-based provider of affordable housing in the Twin Cities. Incorporated in 1986, the organization began as an effort to replace housing units lost through construction of the Minneapolis Convention Center. Aeon has developed more than 1,500 homes. Aeon emphasizes development, management, and maintenance of quality affordable housing that strengthens lives and communities. Ripley Gardens is Aeon's second partnership with Enterprise; the first was the St. Barnabas Apartments, which restored a historic hospital wing to provide housing for homeless teens.

Riverwalk Point II, Spokane, Wash.

DEVELOPER: SNAP (formerly Spokane Neighborhood Action Partners) | TOTAL UNITS: 50

Completed in September 2009, Riverwalk Point II provides affordable one-, two- and three-bedroom apartments for 50 families with low incomes. There are four residential buildings and a large community building on site, and all have been arranged to blend harmoniously with the existing Riverwalk Point complex, an affordable development that started in 1999. Riverwalk Point II is west of the original buildings, and has a mixture of flats and townhomes, ranging in size from 790 to 1,270 square feet.

Lots of open space has been preserved at this development. The green spaces provide both informal play areas for children and a wildlife corridor for animals. The road system and parking remain outside of the whole Riverwalk Point development.

Financing

Financing for Riverwalk Point II included a $25,000 Enterprise Green Communities grant.

A Green Advantage

The emphasis at Riverwalk Point II is on sustainability. The community was designed, developed and constructed to conform to the Enterprise Green Communities Criteria. It incorporates a host of sustainable features and has received Washington State's first certification for Energy Star Multifamily Housing. It exceeds the Enterprise Green Communities Criteria by 28 percent and reduces annual CO_2 emissions by 49 tons a year.

The community building functions as a green demonstration project, incorporating straw-bale exterior walls, a net-metered solar electrical system and solar pre-heated hot water. The community building also houses the on-site management office, offices where service providers may meet with residents, a computer room and a large multi-purpose community room.

In each of the apartment buildings, there are common heating and hot water systems. Heating comes via a hydronic system that minimizes wall-mounted registers, thus eliminating heating-related obstructions in the apartments and allowing greater flexibility in the placement of furnishings. In one of the residential buildings, hot water is preheated through solar hot water panels.

Rent

Of the 50 units, 20 units are affordable to families living at or below 30 percent AMI. Fifteen units are affordable for households living at or below 40 percent AMI and another 15 were affordable to those with incomes at or below 50 percent AMI.

Developer

SNAP offers many programs for homeless and low-income residents of Spokane County, Wash. Their services are designed to help individuals and families survive short-term crises and stabilize their living situations. Energy assistance programs are available to help residents get through those difficult months when there isn't enough money left over to pay the heating bill. Minor home repairs, weatherization, access to affordable rental housing and assistance on helping people acquire a home are supported daily by the efforts of SNAP's Housing Improvements and Housing Opportunities program.

Architect

Zeck Butler

Roanoke-Lee Street, Blacksburg, Va.

DEVELOPER: Community Housing Partners Corporation (CHP) | TOTAL UNITS: 14

The development includes 14 duplex homes in the town's historic Roanoke-Lee Street neighborhood. This development has four building designs, with nine two-bedrooms and five three-bedrooms. Homes are situated in an established neighborhood with mature trees and sidewalks, within walking distance of public transportation and community amenities. All homes were constructed in an area targeted by the town for revitalization and were restricted for sale to homebuyers with incomes at or below 80 percent AMI.

The project began with an integrated design process with community meetings co-hosted by CHP and town officials and attended by local officials, neighborhood residents and construction and funding partners. These stakeholders' input was incorporated into the project design increasing the sustainability and livability of the dwellings and the community.

CHP received numerous awards for Roanoke-Lee Street, including:

- The 2007 National Home Depot Foundation Award for Excellence in Affordable Housing Built Responsibly
- The 2007 Energy Star Award for Excellence in Energy-Efficient Affordable Housing
- The James River Green Building Council 2007 Go Green Award
- Two National Association of Home Builders awards: The HUD 2007 Best in American Living Award and a 2008 Silver Energy Value Housing Award

Financing

Enterprise Green Communities Grant	
NeighborWorks America on behalf of the Home Depot Foundation Green Building Grant	
Housing Assistance Council Green Fund Grant	
Development Budget: Town of Blacksburg—CDBG	$356,175
NeighborWorks Home Depot Green Grant	$30,000
Enterprise Green Communities	$17,000
Housing Assistance Council Green Fund	$10,000
HAC SHOP	$210,000
Construction Financing	$2,684,000
TOTAL	**$3,307,175**

A Green Advantage

The homes were built to be energy-efficient and low-maintenance, as well as affordable for low- to moderate-income buyers. Energy-efficient and green features include:

- "Smart Site" location
- Advanced framing techniques
- Fiber cement siding, hardwood and ceramic tile flooring and Trex decking
- Low-VOC paints and finishes
- Energy Star appliances, lighting and windows
- Water-saving dual flush toilets
- Cellulose insulation, duct sealing and high-efficiency 14 SEER heat pumps
- Water conservation through efficient appliances, rain barrels, rain gardens, pervious paving and native landscaping

Home Price

Ten of the units are restricted to households at or below 40 percent AMI and 38 units are at or below 50 percent AMI. Ten of the units are designated to serve homeless persons with a disability. The project receives project-based Section 8 funding for 30 of the units and six of the units will be further restricted beyond the Low-Income Housing Tax Credit requirements to serve physically disabled tenants at or below 20 percent AMI.

Social Services

CHP's certified NeighborWorks home-ownership center, HomeWorks, provided a variety of services for the project's qualified homebuyers, including homebuyer education, housing counseling, down payment and closing cost assistance and access to below-market-rate financing and HOME subsidies. They also provided additional education to homebuyers that focused on budgeting, financial literacy, foreclosure prevention and home maintenance. Each homebuyer was given an Owner's Operation and Maintenance Manual with information on how to maintain the green environment — both inside and outside of the home.

Developer

CHP is a 501(c)(3) community development corporation that serves the needs of low-income and low-wealth individuals and families in the southeast. CHP's mission is to create affordable, green, sustainable housing opportunities and services.

Architect

Colin Arnold

Spring Terrace, Austin, Texas

DEVELOPER: Foundation Communities | TOTAL UNITS: 140

Formerly an extended-stay hotel, Spring Terrace was renovated into furnished efficiency apartments, each with a private bath and kitchenette, as well as community areas and green spaces. Spring Terrace provides permanent supportive housing to 140 formerly homeless individuals with extremely low incomes.

On-site case managers help residents access public services such as employment services, health care and counseling.

Financing

Financing for Spring Terrace included a $5,000 Enterprise Green Communities charrette grant.

A Green Advantage

Spring Terrace has environmentally friendly features like solar electric power, energy-efficient air conditioners, water conservation systems including rainwater harvesting, a landscaped courtyard and building materials that promote healthy indoor air quality. Other green features include:

- Interior and exterior windows to increase daylight and views — solar screens on the windows diminish solar gain by 65 percent
- An 18-kilowatt photovoltaic system, which provides 3 percent of the building's electricity, and a solar hot-water system, which provides 21 percent of the building's hot water
- Compact fluorescent lighting
- Low-VOC paints, sealants and cabinets
- Replacement of older mechanical systems serving the common areas of the building with more energy-efficient models

Additionally, rainwater is harvested from the building, collected in a 13,500-gallon tank, and used to irrigate the landscape, eliminating the need for potable water for irrigation. A courtyard added to the site increases green space using plants that require little irrigation.

Rent

Spring Terrace provides furnished apartments and supportive services for those who are homeless or living alone on less than $24,900 a year.

Social Services

Spring Terrace was designed to empower people with low incomes to take care of basic needs and maximize their self-sufficiency. Residents can get help with housing, income and self-care issues. The community also offers classes, like money management, and social activities, like yoga, based on the needs and interests of residents.

Developer

Foundation Communities operates 10 affordable housing communities in the Austin area; two of these, including Spring Terrace, provide rental units for recently homeless or low-income single adults.

Trolley Square, Cambridge, Mass.

DEVELOPER: Homeowner's Rehab, Inc. (HRI) | TOTAL UNITS: 40

Trolley Square was built on a vacant lot, formerly the site of a bus storage facility. It includes 40 affordable rental and for-sale units, 2,800 square feet of office and community space, an underground garage and 14,000 square feet of open space. Building facades were designed to enhance the streetscape and enliven a previously blank stretch of Massachusetts Avenue. A rhythmic pattern of windows, doors, canopies and bays suggests individual townhouses. Multiple entries make for more lively engagement with the street. Entries to the townhouses are raised above grade to provide privacy within the units and stoops, planters and pavers create a transitional space between the street and the buildings. The development includes a plaza with a garden providing sheltered open space for the residents above the underground parking. The site directly abuts a public park and a bike and walking path that goes through five communities.

Financing

Financing for Trolley Square included a $5,000 Enterprise Green Communities charrette grant.

A Green Advantage

Trolley Square was designed to achieve Smart Growth Principles. A Living Green Manual is provided to all residents to help them take advantage of all the features of the project and save energy, water and money. Some of the many environmentally friendly features are:

- Low-flow showerheads, dual-flush toilets and sink aerators in bathrooms and kitchens
- Chemical-free carpets, hypoallergenic carpet cushions and Marmoleum flooring
- Damp blown-in cellulose insulation in walls and rigid insulation in the roof and floors, exceeding code by 30 percent
- Insulated windows, argon-filled glazing and low-E coating
- High-efficiency boilers, thermostats and variable-speed fans throughout
- Energy-efficient lighting, appliances and controls, including a gearless traction elevator and common area lights controlled by occupancy sensors, daylight sensors and timers
- Storm water retention tanks slow the flow of storm water into the city system, as well as help irrigate the drought-tolerant native plants on the grounds
- Photovoltaic array installed on the roof provides solar energy for the underground garage — which is under a central courtyard to minimize surface asphalt and create more space for plants
- Low-VOC paints and sealants throughout

Rent

Trolley Square has been built to serve households with average incomes less than 60 percent AMI. Seventeen rental apartments are available to households at less than 30 percent AMI. Of the eight homeownership units, five are for families at less than 80 percent AMI and three for less than 90 percent AMI.

Amenities

Thistle Community Housing provides financial and homeownership counseling or residents in its service area.

Developer

HRI believes that it is the responsibility of affordable housing developers to address environmental issues such as air pollution, global warming and landfill shortages. Drawing on years of experience and creative thinking, HRI works to combat these issues during the construction and renovation process so that families can enjoy healthy, energy-efficient and less expensive homes that help preserve the surrounding local environment and the planet. HRI continually seeks new ways to lessen buildings' environmental impacts through smarter decision-making, design, construction and operations that help conserve resources.

Architect

Mostue & Associates Architects, Inc.

Viking Terrace Apartments, Worthington, Minn.

DEVELOPER: Southwest Minnesota Housing Partnership (SWMHP) | TOTAL UNITS: 60

The Viking Terrace Apartments is an existing, affordable 60-unit HUD Section 236 apartment building located in the rural community of Worthington. Constructed in 1978, the project involved the extensive redevelopment of three buildings of one-, two-, and three-bedroom apartments. The development included substantial rehabilitation on the inside and outside of the building, installation of a geothermal heating and cooling system and financial restructuring.

The Southwest Minnesota Housing Partnership is working with the National Center for Healthy Housing and the Center for Sustainable Building Research at the University of Minnesota to evaluate the benefits gained by residents as a result of incorporating healthy housing improvements. All three buildings were completed and occupied May 2007.

Financing

Minnesota Green Communities	$150,000
LIHTC Equity — Enterprise Social Investment Corporation	$2,430,540
HOME Funds	$764,949
HUD Section 236 Loan Assumption	$613,835
Greater Minnesota Housing Fund	$367,500
NeighborWorks America	$206,564
Greater Minnesota Housing Fund Energy Efficient Mortgage	$100,000
Deferred Developer Fee	$29,418
Enterprise Grant	$25,000
City of Worthington and Worthington Regional Economic Development Corp.	$21,000
TOTAL	**$4,708,716**

A Green Advantage

The Viking Terrace Apartments feature a wide range of improvements that focus on a reduction in energy consumption producing tangible and long-term benefits for the owners and tenants, including:

- Rehabilitation of an existing affordable apartment building close to downtown amenities
- High-efficiency geothermal heating and cooling system
- Enhanced insulation of the building envelope
- Energy Star appliances
- Water-conserving appliances and fixtures
- Whole-unit ventilation system, including continuous ventilation of bathrooms
- Low-VOC paints, sealants, and adhesives
- Metal roofing
- Cement fiber siding
- Interior finish materials using recycled content
- On-site recycling of demolition and construction materials
- Radon testing, monitoring, and remediation

Rent

Four apartments are affordable to families earning 30 percent of AMI, 47 apartments will be affordable to families earning 50 percent of AMI, and the remaining nine homes will be rented at market rates. The project will work with the Worthington HRA to utilize existing Section 8 Vouchers for non-project-based assisted units.

Amenities

The Viking Terrace Apartments are located within an existing single-family residential neighborhood and have excellent access to services, retail employment, transportation and recreation. Amenities include an on-site playground and open green space on the grounds.

Social Services

Case management is provided to residents who meet the State of Minnesota's definition of chronically homeless. The Southwestern Mental Health Center managed the mental health program and offers self-sufficiency and other social service programs through a referral system.

Developer

SWMHP is a private, nonprofit community development corporation that serves over 25 rural counties in southwestern Minnesota. In May of 1992, four area community agencies joined forces to form SWMHP in response to a growing need for the development of affordable housing in the region. Based on that observed need, the mission of the Southwest Minnesota Housing Partnership is "to provide a sufficient supply of adequate, safe, sanitary and affordable dwellings to ensure the health, safety, and welfare of the citizens of Southwestern Minnesota." Since its inception in 1992, the SWMHP has created, preserved or financed more than 5,600 housing units, bringing a substantial investment of public and private sources to the region.

Architect

I & S Architects and Engineers

Arnett Watson Apartments, San Francisco

DEVELOPERS: Tenderloin Neighborhood Development Corporation and Community Housing Partnership | TOTAL UNITS: 83

Tenderloin Neighborhood Development Corporation (TNDC) and Community Housing Partnership (CHP) joined together to develop 83 supportive homes for formerly homeless individuals and families at 650 Eddy Street, renamed Arnett Watson Apartments. The nine-story building houses several different apartment types and an assortment of amenities aimed at assisting residents—many of whom suffer from mental illnesses, HIV/AIDS, physical disability or chronic substance abuse, in addition to homelessness—achieve permanent stability and independence. The unit types for the $32 million development break down to 36 studios, 33 one-bedrooms and 14 two-bedrooms.

Augmenting the project's internal features is a wide range of nearby, community-based services and facilities, including several public transportation lines, numerous retail establishments and civic amenities. Arnett Watson Apartments is located on a formerly underutilized parking lot in a compact, walkable urban neighborhood near the center of San Francisco. The project is owned by CHP, which provides property management and supportive services to the residents.

Financing

San Francisco HOME Loan	$5,022,442
San Francisco Affordable Housing Fund	$7,177,673
CA DHCD Multifamily	$7,000,000
FHLB Affordable Housing Program	$581,000
Merritt Community Capital Corp Equity	$11,288,000
Enterprise Grant	$55,000
TOTAL	**$31,124,115**

A Green Advantage

There are a number of features at Arnett Watson Apartments that make it much better for the environment and the neighborhood than the drab, that sat there since a 1906 earthquake. The outside of the building features an Energy Star roof and an attractive architecture design that blends with the surrounding community.

The addition of the dense mixed-use project increases the walkability of the area, which is good for residents and the environment, especially considering the close proximity of several metropolitan transportation hubs near the site. Likewise, the street and courtyard plantings of locally appropriate, drought-resistant trees — hand watered by staff — ensure aesthetic compatibility with surroundings, and in concert with light-colored paving and the trees help reduce the urban heat island effect.

Inside the building, green measures help reduce resource use and provide a safe, healthy environment for residents. Accordingly, low-flow water fixtures and Energy Star appliances and lighting fixtures are found throughout the building. Moreover, recycled materials used throughout the building lessened the project's ecological footprint. Other materials — paints, sealants and carpets — were chosen because they lacked or contained only very low levels of harmful chemicals and toxins. Finally, several systems are in place to ensure that water and dirty air can easily and efficiently exit the building, while clean air is allowed back in.

Rent

Residents of Arnett Watson Apartments are all formerly homeless, many receiving government assistance or without any income at all. Rents for the various apartment types are 10 percent AMI, which is anticipated to be the income level of the homeless households. Studio apartments are affordable to residents at a price of $198, one-bedrooms are $212 and two-bedrooms are $254.

Amenities

Arnett Watson Apartments includes a number of amenities to improve the living environment for residents, including a laundry room, community meeting space with kitchen, children's play area, outdoor courtyards, supportive services offices, on-site parking and retail space.

Social Services

The on-site services at Arnett Watson Apartments are designed to promote stability and independence in the lives of its residents. In a dedicated services space within the building, residents can access a number of programs, including housing retention support; case management; crisis intervention; information and health care provider referrals; family, youth and senior services; tenant events; and employment and training programs.

Developers

Since 1981, TNDC has worked in San Francisco's Tenderloin neighborhood to provide housing and supportive services for individuals and families with extremely low incomes. Currently, it provides housing for over 2,500 people — seniors, children, people with disabilities, low-income wage earners, people with AIDS, families and immigrants — in 1,800 apartments and residential hotel rooms in 25 buildings.

Its partner in Arnett Watson Apartments project, CHP, began working 17 years ago to address chronic homelessness in the city of San Francisco by developing permanent, affordable, well-maintained housing with integrated support services and employment and training programs. CHP owns and/or operates more than 430 units of such housing and provides assistance to over 630 men, women and children and has five projects in development with 376 homes for individuals and families who have experienced homelessness.

Architect

Hardison Komatsu Ivelich & Tucker

APPENDIX E

REFERENCE MATERIALS

Utility Release

An important goal Enterprise Green Communities is to document the costs and benefits of affordable housing developments designed to the Green Communities Criteria. For evaluation purposes only, Enterprise will contact the local utility company directly to verify and/or obtain energy consumption data for your project. This release will authorize the electric, gas and water utility to disclose the development's actual energy and water consumption data.

Disclaimer: No cost or payment information will be released. Please note that this form will only be used if your project receives Green Communities grant funding or becomes certified as a Green Communities development.

I, _____ (please print or type name), *authorize my utility to release energy/water usage information about my account*.

If account and/or meter number information is *not available at this time*, please check the following box:

☐ Yes, if awarded grant funding, I agree to provide my utility account information when it becomes available.

Resident Utility Data Collection: In connection to this release, the developer agrees to collect waivers from 15% of residents in order to track actual utility data of a sample of homes.

Project Name _____

Developer Name _____

Number of Single-Family Units _____ Number of Multi-Family Units _____

Name on Account _____

Account Number _____ Meter Number(s) _____

Street and House / Apartment(s) Number _____

City, State _____ Zip Code _____

If billing address is different than building address, please provide the billing address below:

Street and House / Apartment(s) Numbers _____

City, State _____ Zip Code _____

Project Sponsor Signature _____ Date _____

THE CENTRAL PARK ENERGY FLYOVER

North East Denver Housing Center

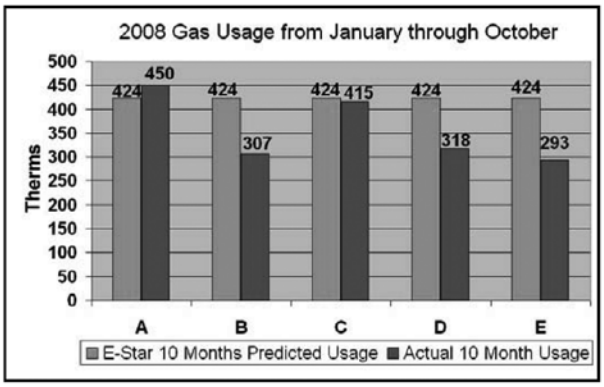
December
Unit 101

How Much Energy Have You Used?

Our Central Park @ Stapleton community focuses on sustainability! What does this mean? A part of being sustainable means SAVING ENERGY!! Northeast Denver gave you a head start by installing many energy efficient measures. We also had energy raters estimate the amount your Gas (Therms) and Electricity (Kwh or Kilowatt Hours) usage before you moved in. We used this to determine how much energy you should be using over the past 10 months. The good news? Many of you have "beat" the estimates and are using less energy than predicted!! The graphs below allow you to see how YOUR unit compares to the estimate.

Blue = Estimated Usage and Purple = How much you have used and other identical units.

Natural Gas Usage from January 2008 to October 2008

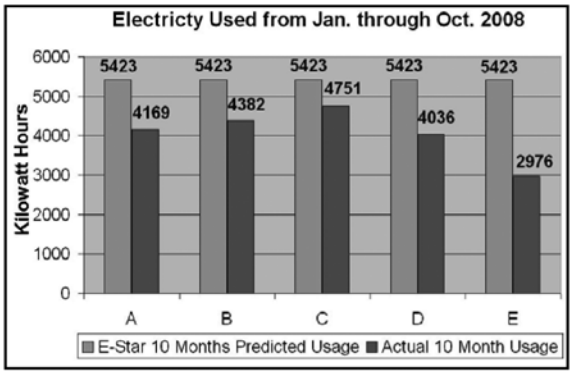


Your Unit A

Getting Better!! You have used 450 Therms, 26 more than predicted, but you have reduced the gap by 2 Therms since June.

Use the tips on the back of the newsletter to keep on saving energy!

Electricity Usage from January 2008 to October 2008



Of the 4169 kilowatt hours you used, 1861 kilowatts or 45% of your electricity was produced by the PV Panels on your roof. This 45% equals a savings of $186.00.

Your Unit A

Great Job!! You have used 4169 Kilowatt Hours, 1,254 less Kilowatt Hours than predicted.

Here are a few Energy Tips to save even more:

- Turn off lights and TVs when you leave the house or a room for a long period of time
- Turn your dishwasher off during the dry cycle and let them air dry

Important Phone Numbers:

Maintenance Hotline:
303-377-6363

Continental Divide:
303-393-7368

Xcel Energy:
800-895-4999

Stapleton Master Community Association:
303-388-0724

Denver Police: (Non Emergency):
720-913-2000

Park Hill Library
303-331-4063

Poison Control:
303-739-1123

Upcoming Event!!!

Gingerbread House Workshop!

Where: Cherry Creek Dance
When: Sat., Dec. 20th from 1-3 PM
What: Gingerbread House Decorating Sessions, Face Painting, and children's 'holiday' story time at Hermitage Bookshop
Cost: Free, but you have to register at events@cherrycreeknorth.com to participate

THE CENTRAL PARK ENERGY FLYOVER

Two Ways to Save Money on Winter Heating Bills!

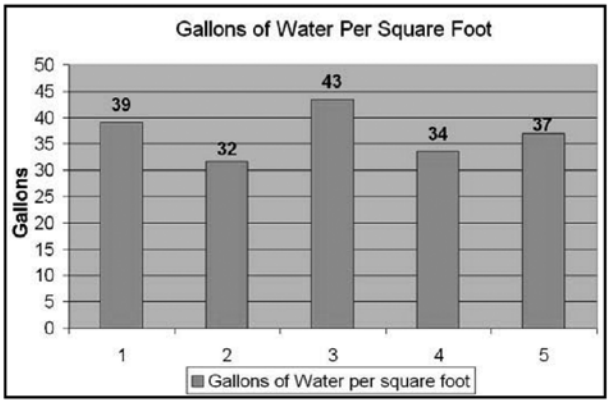
Use a Programmable thermostats:

- Simply setting your house's temperature lower while you are away from home or at night will save a great amount of money.
- A programmable thermostat allows you to do this without having to worry about it each day
- Don't set or program the thermostat higher than you actually want it. It will not heat your house any faster
- If you go out of town, set your thermostat to a low temperature, yet high enough to keep pipes from freezing
- If you need any help programming your thermostat, please call Peter Rusin at 303-399-9337.

Use Cold Water when Washing Clothes:

- Use the cold water setting as much as possible
- Use hot water only for very dirty loads
- Always use cold water for the rinse cycle
- Run the washer with a full load

How Much Water Have You Used?



Your Unit 1

You have used a total of 57,773 gallons of water since January or 39 gallons per square foot of your living area. Some of your neighbors have been able to use a little less.

Tip: Turning off the water while washing your hands or brushing your teeth is a small step you can take to reduce your water consumption.

Cold Air Coming in Above the Kitchen Stove?

In November, Northeast Denver Housing Center and Frontier Mechanical went through each unit to investigate cold draft issues in each unit. One common problem has been the cold air coming into the unit above the stove. We have found a solution. The parts are on back order, but we will be installing them as soon as they arrive. This improvement will help to keep your unit more comfortable and lower your energy bill. If you have any questions on cold air entering the unit, please call Peter Rusin at 303-399-9337. For all other maintenance issues please call Continental Divide.

APPENDIX D

INFORMATION RESOURCES

Evaluating the Financial Impact of Integrating the Green Communities Criteria into Affordable Housing

1. General

Building Science Corporation (website)
Building Science provides objective, high-quality information about buildings, combining building physics, systems design concepts, and awareness of sustainability to promote durable, healthy, and economical buildings. www.buildingscience.com

Cedar River Group
Sharing the Benefits of Building Green: A Study of the High Point Community. (2009)
High Point is the first community in the country to offer Breathe-Easy Homes, and this study detailing the project proposes a new paradigm to get the most out of sustainability features in public housing.
www.cedarrivergroup.com/projects/high_pt_bldg_green_rpt01-21-09.pdf

Enterprise Green Communities (website)
Enterprise Green Communities is the first national green building program focused entirely on affordable housing. It provides financing, funding and expertise to enable developers to build and rehabilitate homes that are smartly located, healthier, water conserving, more energy efficient and better for the environment—without compromising affordability. Since 2004, Enterprise has invested $700 million to create more than 15,800 green affordable homes in 350 developments in 30 states. www.greencommunitiesonline.org

Sustainable, Affordable, Doable. (2008)
This report collects firsthand experiences and lessons from participants in eight Green Communities developments. www.practitionerresources.org/cache/documents/666/66601.pdf

Global Green USA
Blueprint for Greening Affordable Housing, Second Edition. (2007)
This publication offers housing developers, designers, advocates, public agency staff, and the financial community specific guidance on green practices and innovative strategies for incorporating green building strategies into the design, construction, and operation of affordable housing developments.
www.globalgreen.org/publications/

Pettit, Betsy
Understanding Green Homes & Durability. (2008)
Presentation discussing the systems integration approach to energy-efficient, durable, sustainable homes.
www.buildingscience.com/documents/reports/rr-0508-understanding-green-homes-durability

Reconnecting America (website)
Reconnecting America is a national non-profit organization that is working to integrate transportation systems and the communities they serve, with the goal of generating lasting public and private returns, improving economic and environmental efficiency, and giving consumers more housing and mobility choices. www.reconnectingamerica.org

Southface Energy Institute
Fact sheets and technical bulletins.
Fact sheets that include technical information, checklists and construction details for greening all aspects of a home. southface.org/web/resources&services/publications/factsheets/sf_factsheet-menu.htm

Urban Land Institute (website)
The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. www.uli.org

2. Integrated Design

Enterprise Green Communities
Green Development Plan.
The Green Development Plan template provides a teaching tool—a guide for the developer to utilize the integrated design process and gain an understanding of all that is involved in preparing a charrette and satisfying the Green Communities Criteria. www.greencommunitiesonline.org/tools/funding/grants/documents/charrette_development_plan_template.xls

Macaulay, David R.
Integrated Design. (2008)
Recognized as one of the preeminent leaders of the new "green-design" revolution emanating from the Pacific Northwest, Mithun, through this publication, opens its doors to reveal first-hand details of the integrated approach to design and practice that has led to numerous award-winning projects.
www.ecotonedesign.com/ecotone/bookstore/bookdetail.asp?ID=37

Prowler, Don, FAIA — Donald Prowler & Associates
Whole Building Design Guide. (2008)
This website describes the core elements of "whole building design," which includes the combination of an integrated design approach and an integrated team process. www.wbdg.org/wbdg_approach.php

7group
The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability. (2009)
In this book, 7group's principals and integrative design pioneer Bill Reed introduce design and construction professionals to the concepts of whole building design and whole systems.
www.sevengroup.com/integrative-design-guide

3. Site, Location and Neighborhood Fabric

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy
Passive Solar Design for the Home—Report # DOE/GO-102001-1105. (2001)
The report details the techniques, options, design, and costs of passive solar design for the home.
www.nrel.gov/docs/fy01osti/27954.pdf

U.S. Green Building Council
LEED for Neighborhood Development Rating System. (2008)
LEED for Homes is a rating system that promotes the design and construction of high-performance green homes; the Rating System lists intents and requirements for each credit and includes the Project Checklist.
www.usgbc.org/ShowFile.aspx?DocumentID=3638

4. Site Improvements

Environmental Protection Agency (EPA)
EPA Erosion and Sediment Control Model Ordinances. (2006)
This resource is geared toward helping municipalities draft ordinances for erosion and sedimentation control and might serve as a helpful tool in developing company policies for meeting related green criteria.
www.epa.gov/owow/nps/ordinance/erosion.htm

U.S. Forest Service
Celebrating Wildflowers. (2004)
A site hosted by the U.S. Forest Service has extensive information on native gardening, selecting appropriate native plants, invasive plant species, and basic instructions for restoration and native landscaping projects.
www.fs.fed.us/wildflowers/nativegardening/instructions.shtml

Vermont Department of Environmental Conservation
Low Risk Site Handbook for Erosion Prevention and Sediment Control. (2006)
This is an easy-to-follow guide that describes specific strategies, including diagrams and photos.
www.vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

5. Water Conservation

California Urban Water Conservation Council
Maximum Performance (MaPTM) Testing. (2009)
The Maximum Performance testing project was initiated in 2003 to test toilet models' performance, and this testing protocol simulates real-world use to help consumers identify high-efficiency toilets that not only save water but also work well. www.cuwcc.org/maptesting.lasso

Central City Concern
Achieving Water Independence in Buildings. (2009)
This report explains water reuse strategies and what current Oregon regulations allow; their approach helped achieve statewide rainwater and greywater allowances in Oregon and may offer guidance for those in other states wishing to explore the possibilities of water reuse in buildings and those wishing to reform limiting regulation. ilbi.org/resources/research/water/oregon

Environmental Protection Agency (EPA)

Water-Efficient Landscaping: Preventing Pollution and Using Resources Wisely.
This manual from the EPA provides information about reducing water consumption through creative landscaping techniques. www.epa.gov/owm/water-efficiency/docs/water-efficient_landscaping_508.pdf

WaterSense: Efficiency Made Easy. (2009)
This site provides information on the Environmental Protection Agency's WaterSense labeling program for water-efficient landscape irrigation products plus tips and recommendations for water-efficient irrigation. www.epa.gov/owm/water-efficiency/pp/irrprof.htm

Rosenbaum, Marc

"Composting Toilet Reviews," Environmental Building News. (1998, June 6)
An article discussing commercial composting toilets. www.buildinggreen.com/features/mr/waste.html

6. Energy Efficiency

Advanced Energy

Air Sealing (A how-to guide). (2005)
A step-by-step photo guide detailing the air sealing process.
www.advancedenergy.org/buildings/programs/affordable_housing/documents/Air%20Sealing%20[SV].pdf

Duct Sealing (A how-to guide).(2005)
A step-by-step photo guide detailing the duct sealing process.
www.advancedenergy.org/buildings/programs/affordable_housing/documents/Duct%20Sealing%20[SV].pdf

Insulation (A how-to guide). (2005)
A step-by-step photo guide detailing the insulation process.
www.advancedenergy.org/buildings/programs/affordable_housing/documents/Insulation%20[SV].pdf

Building Science Corporation

Building America Pilot Program: Guaranteed Resource- & Energy-Efficiency Now. (2008)
A performance-based industry collaborative program in which energy, water, and maintenance guarantees can be translated into home buyer savings. www.buildingscience.com/documents/reports/rr-0217-building-america-pilot-program2014guaranteed-resource-energy-efficiency-now

Lstiburek, Joseph

Heating Choices. (2008)
Based on Building America experience, this report is about selecting furnaces, water heaters, both or sometimes just one to accomplish both space heating and domestic hot water.
www.buildingscience.com/documents/reports/rr-9911-heating-choices

Southface Energy Institute

Air Sealing Checklist. (1999)

A step-by-step checklist for proper air sealing to increase home energy efficiency.
www.southface.org/web/resources&services/publications/factsheets/8_airsealing.pdf

Whole-Housing Energy Checklist. (2003)

This fact sheet from Southface offers 50 steps to energy efficiency in the home.
www.southface.org/web/resources&services/publications/technical_bulletins/WH-Energy%20Checklist%20GO-10099-766.pdf

U.S. Department of Energy

Department of Energy's Building Energy Codes (website)

An information resource on national model energy codes. www.energycodes.gov

7. Materials Beneficial to the Environment

Federal Trade Commission

Guides for the Use of Environmental Marketing Claims—Pub. No. 16 CFR 260.7(e)

Many commonly used products, such as metals, concrete, masonry, acoustic tile, drywall, carpet, ceramic tile and insulation, are now available with recycled content, and this guide details these products.
www.ftc.gov/bcp/grnrule/guides980427.htm

NAHB Research Center

Residential Construction Waste Management: A Builder's Field Guide. (1997)

This guide may be used to create a step-by-step construction waste management and recovery plan.
www.nahbrc.org/bookstore/cw0503w.aspx

Best Practices for Construction Waste Management. (1997)

This page includes frequently asked questions, case studies, reports, and various links. It also includes *A Builder's Field Guide*, which includes guidance for creating a step-by-step construction waste management and recovery plan. www.toolbase.org/Best-Practices/Construction-Waste/waste-mgmt-field-guide

Natural Resources Defense Council (NRDC)

Efficient Wood Use in Residential Construction. (1998)

This NRDC handbook describes the advantages of several wood-efficient approaches to design, material selection, and construction for residential applications and includes extensive practical and resource information for builders, architects, engineers, and developers. www.nrdc.org/cities/building/rwoodus.asp

8. Healthy Living Environment

Air Conditioning Contractors of America (ACCA)
HVAC Quality Installation Specification. (website)
This website provides free links to various articles detailing the ACCA Standard, as well as other links to various articles and other ANSI and ACCA standards. www.acca.org/tech

Building Science Corporation
Review of Residential Ventilation Technologies. (2006)
Report that reviews current and potential ventilation technologies for residential buildings with particular emphasis on North American climates and construction. www.buildingscience.com/documents/reports/rr-0502-review-of-residential-ventilation-technologies/view

California Energy Commission
Procedures for HVAC System Design and Installation. (website, 2009)
This site provides an overview of good practices for designing and installing the HVAC system, as well as detailed strategies and measures for the "house as a system" approach to construction.
www.energy.ca.gov/efficiency/qualityhomes/procedures.html

Home Ventilating Institute (HVI)
Ventilation Systems and Controls. (2001)
HVI provides consumers an assurance of product performance, works to increase public awareness of the need for good ventilation and provides resources for selecting the proper ventilation products.
www.hvi.org/resourcelibrary/tradeart.html

National Center for Healthy Housing
How Healthy are National Green Building Programs? (2008)
The analysis focuses on national guidelines created by government, non-profit or industry associations. These green programs have varying goals, such as energy conservation, improved quality of life, and preventing adverse environmental impacts. www.practitionerresources.org/cache/documents/668/66851.pdf

Pontolilo, Brian
"Making Sense of Caulks and Sealants," Fine Homebuilding. (2004)
A guide to choosing the best caulking and sealing products.
www.finehomebuilding.com/how-to/articles/making-sense-of-caulks-sealants.aspx

Seattle Housing Authority
Breathe-Easy Homes Ease Asthma Symptoms in High Point's Low-Income Children. (2008)
This brochure highlights the preliminary results of a three-year health study to assess the impact of healthy green public housing on children with asthma at Seattle's High Point community.
www.practitionerresources.org/documents.html?c=319

9. Operations and Maintenance

Connecticut Department of Environmental Protection

A Green Home is a Healthy Home.

A brochure detailing the various green operations and maintenance in a modern home.

www.ct.gov/dep/lib/dep/p2/individual/healthyhome.pdf

M. Landman Communications & Consulting

Template for Green Operations and Maintenance Manual. (2006)

An Operations and Maintenance manual is essential to optimal building performance and energy savings, and this document serves as a basic template for such a manual.

www.practitionerresources.org/cache/documents/639/63995.doc

Template for Healthy Home Guide for Residents. (2006)

This template is based on the guide written for residents of The Plaza Apartments in California. The template is intended to be used as a boilerplate for creating resident manuals for other projects. The guide includes tips on healthy housekeeping and cleaning practices, trash and recycling procedures, pest control suggestions, and tips on how to save energy and water. The guide also lists some resources for more information on green housing. www.practitionerresources.org/cache/documents/639/63997.doc