

# **GREEN ROOF ADVISORY GROUP**

## **Report to Resource Management Commission**

### **September 2010**

## **Report to Austin City Council**

### **October 2010**

Please find attached excerpts from the Green Roof Advisory Group (GRAG) Report to Austin City Council for your review. The full report and appendices are very large, so we have included the following elements here:

1. Cover Page
2. Table of Contents
3. Executive Summary
4. Project Profiles (6 sheets)
5. Five Year Plan (RMC - note Austin Energy highlights)
6. Appendix D
7. GRAG Power Point Presentation

The entire report can be found at the following website:

<http://www.ci.austin.tx.us/council/place1>







*“Green Roofs represent an elegant opportunity to simultaneously mitigate environmental problems and create immediate life-enhancing value.”*

Leslie Hoffman  
Executive Director, Earth Pledge

## **GREEN ROOF ADVISORY GROUP**

**Report to Austin City Council  
September 2010**



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# Executive Summary

## CHARGE AND PROCESS

On August 27, 2009, Austin City Council charged the Green Roof Advisory Group (GRAG) to work with City staff to explore the feasibility of offering energy and stormwater credits and other incentives, based on performance, to encourage the creation of green roofs in the City. GRAG produced a policy document that included recommendations regarding those credits and incentives that would be appropriate for promoting green roofs in Austin. The stakeholder group was drawn from the fields of design, development, and green building and includes input from local green roof organizations and the Lady Bird Johnson Wildflower Center.

In order to accomplish these goals, GRAG established monthly meetings to occur from August 2009 to October 2010, formed separate committees to focus on specific green roof topics, and assisted staff in formulating a framework for interdepartmental review. We worked extensively with staff from the Watershed Protection Department; Austin Energy Green Building; and the Austin Climate Protection Program. The staff engaged other departments such as Planning and Development Review, Parks and Recreation Department, Public Works, and the Austin Water Utility. Through joint, collaborative efforts of staff and the stakeholder group, GRAG was able to assess the value green roofs within City of Austin policy, initiate discussions on best practices for green roofs in Austin, and develop a Five-Year Policy Implementation Plan.

## ADVISORY GROUP EFFORTS

GRAG stakeholders and staff have engaged in and accomplished the following:

- Developed consensus on the public and private benefits of green roofs as a component of green infrastructure, including improved air quality, stormwater abatement, urban heat island mitigation, open space, wildlife habitat, and others.
- Completed a review of green roof incentive and credit policies of other cities in North America.



- Established a database of green roofs in Austin.
- Documented existing City of Austin policies and incentives which encourage green roofs.
- Analyzed potential policies that could be developed to encourage green roofs.
- Developed proposals to integrate green roofs into departmental program efforts.
- Advocated for green roofs as a Public Benefit Option during the public hearings on the Downtown Density Bonus Plan..
- Supported the inclusion of green roof policy and benefit education on a City of Austin website.
- Developed a proposal for green roof monitoring research.
- Advocated for an increase in Austin Energy green roof rebates.
- Developed Five-Year Policy Implementation Plan.
- Initiated a framework for green roof design considerations.
- Organized a public seminar by a green roof industry leader on green roof water retention modeling.
- Provided an outreach seminar to present GRAG's efforts and solicit public feedback.
- Integrated principles from *Water Conservation 2020: Strategic Recommendations* into green roof recommendations.
- Developed and presented the interim and final reports to selected Boards and Commissions and the City Council.

## KEY FINDINGS AND CONCLUSIONS

### *Status of Green Roof Policy Development*

Since the Green Roof Advisory Group was the first combined stakeholder and staff body sponsored by the Council to review the status of green roof policy in the City and to bring together various diverse green roof initiatives, there is no surprise that there is not a unified green roof policy across City departments. Many of our key findings and recommendations have sought to bridge this gap.

In 2007, Austin Energy coordinated a departmental and staff perspective white paper called *Growing Austin's Living Roofs*. The white paper was written in conjunction with Watershed Protection, Water Conservation and the Planning and Development Review departments. It examined the many challenges and benefits of green roofs in Austin from the perspective of staff's area of expertise. The report, updated in 2008, is provided in Appendix P. Prior to GRAG, there was no documentation of other cities' policies and programs, no overall Austin policy in support of green roofs, and no database of successfully implemented green roofs in the City.

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*Benefits include urban heat island mitigation, reduction of energy demand, improvement of air quality, creation of green space for social and recreational use, wildlife habitat, local food production, and stormwater attenuation.*

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Through our joint deliberations, we have further established within GRAG that the multiple benefits of green roofs in Austin far exceed any one benefit. Multiple benefits include urban

heat island mitigation, reduction of energy demand, improved air quality, creation of green space for social and recreational use, wildlife habitat, local food production, and stormwater attenuation. We have also acknowledged that these benefits can be difficult to quantify. Different City departments may only address a specific benefit, making it a challenge to calculate the *cumulative* positive impacts of green roofs.

Review of other cities' green roof policies for incentives and credits, such as Portland, Chicago, and Toronto, have shown that those municipalities are far ahead of Austin in development of a robust framework to support green roofs. Through research, GRAG discovered that green roof policy development tends to follow a six phase time line:

- Phase 1: Introduction and Awareness
- Phase 2: Community Engagement
- Phase 3: Action Plan Development and Implementation
- Phase 4: Technical Research
- Phase 5: Program and Policy Development
- Phase 6: Continuous Improvement

(Source: Green Roofs: A Resource Manual for Municipal Policy Makers, excerpted in Appendix A.)

GRAG assert that Austin is in Phase 3 of policy development with the establishment of the Green Roof Advisory Group. By bringing together professionals with knowledge of green roofs all over Austin, GRAG has begun to synthesize the knowledge base. As a result, staff in the Watershed Protection Department and at Austin Energy have initiated an inventory of existing green roofs, documenting their location and various attributes.

### ***Green Roofs in Austin's Code***

Review of existing City code uncovered several existing open space credits and requirements referring to open space which may be able to be accomplished by the use of green roofs. Some of these requirements refer to Planned Unit Development (PUD) requirements, multi-family, parkland dedication, etc. Minor effort would be required to educate staff and the development community about the availability of green roofs to satisfy these requirements.

During this extensive review of code, it was determined that although green roofs are mentioned in different areas of the code, there is not one central location where a citizen can go to retrieve the information. GRAG acknowledged the need for education and advocated for a green roof web page on the City's website as a repository for all green roof information. Austin Energy's Climate Protection Program has agreed to develop the web page as a component of the existing Urban Heat Island section of the Climate Protection Program's website. This new green roof section of the website will house Austin-centric green roof information and benefits, reference specific code requirements which are satisfied by green roof infrastructure, publish monitoring data, and promote green roof construction. A complementary internal website for City Staff may also be developed.

### ***Research and Monitoring***

The Watershed Protection Department (WPD) determined the need for monitoring research, a Phase 4 activity, to document the performance of green roofs for stormwater detention prior to giving credit for green roofs. Two efforts have been initiated to close this gap. First was the review of existing water retention modeling data specific to Austin provided by a leading green roof manufacturer. Second was the funding of monitoring research at the Lady Bird Johnson Wildflower Center. In addition, results of ongoing monitoring of an Austin green roof by WPD staff will be summarized for the record.

### ***Design and Performance Considerations***

Watershed Protection Department and Austin Energy (AE) underscored the need for development of design considerations for green roofs. GRAG has embarked upon the effort of creating baseline standards, but will require more time to flesh out and finalize the design considerations discussed in this report into tangible performance standards that can be published for use by staff and the development community.

### ***Water Conservation and Green Roofs***

During the timeframe of GRAG's efforts, the Citizens Water Conservation Implementation Task Force Report to City Council, *Water Conservation 2020: Strategic Recommendations*, was published. Many of the water conservation policies presented were in alignment with policies that GRAG supports, such as use of water conserving landscape and irrigation technologies, use of non-potable water, use of greywater, and more. (See section VI, Alignment with Water Conservation 2020 Strategic Recommendations, for details.)

### ***Green Roof Density Bonus***

Also during the timeframe of GRAG's efforts, the draft *Downtown Density Bonus Plan* was presented to Council.

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*Through GRAG's research into different cities' green roof policies, it was revealed that density bonus incentives are the green roof incentive most often implemented.*

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Similarly, the green roof density bonus option was one of the benefits most often selected by the private sector in exchange for increasing entitlements. This, coupled with the fact that the hottest area of the urban heat island and the area with the most impervious cover and stormwater runoff is the downtown core, led GRAG to recommend that green roofs be one of the individual Public Benefit Options in the Density Bonus Plan. While one position is that green roofs are optional in the Gatekeeper Sustainability requirement, GRAG believes that there is not enough incentive present unless green roofs are a separate, standalone option for selection.

### ***Green Roofs on City Buildings***

While reviewing the charge of the GRAG with various City departments, many City personnel were unaware the Austin City Hall had a green roof that was designed as an environmental education model and had been nationally recognized as an exemplary green roof project. It was clear that more green roof education should be provided to City staff, the

City Hall green roof performance should be monitored and documented, and the City Hall green roof should be used as a model to educate the public about the benefits of green roofs.

With the success of the City Hall project, the Public Works Department (PW) is investigating the potential of green roofs for any new City building projects. In particular, GRAG supports the inclusion of at least one additional green roof to the City's portfolio in the next five years.

### ***Outreach and Education***

As GRAG assessed the state of green roofs in Austin, it became evident that continued outreach and education were important to the progress of promoting and implementing green roofs. While the website will move green roofs forward, there is need to provide a more focused outreach effort to various organizations and entities. This effort is not the charge of GRAG, but individuals and organizations represented by its members could certainly continue to provide seminars, green roof tours, and other forms of publicity.

## **NEXT STEPS**

### ***Five-Year Policy Implementation Plan***

Once GRAG identified the need for various green roof activities which obviously could not be accomplished in one year, GRAG set out to develop a Five-Year Policy Implementation Plan. Staff worked with various City departments to create reasonable goals for each year which cumulatively ensure that green roofs would remain on the policy and program agenda and budget. (See section VII. Next Steps for the Five-Year Policy Implementation Plan, also represented graphically in Appendix B.)

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*The Five-Year Policy Implementation Plan was developed to systematically support the increased use of green roofs in Austin.*

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The primary basis for the Five-Year Plan was the Policy and Incentives Matrix (see section VII. Next Steps), developed by staff, which reviewed a wide range of options to offer credits, incentives, and other measures to encourage the use of green roofs in Austin. These options ranged from potential changes specific to Austin's regulatory system to measures used by other cities across the world. The GRAG and staff worked to identify the most feasible and productive of these options. Staff also met with targeted City departments to solicit staff input and recommendations for measure. The GRAG and support staff then developed a Five-Year Plan to carry out the most important measures, with the five-year period beginning in October 2010. Policy options were prioritized in years one through five according to their ease of execution and their critical-path nature for the development of future program elements.

### ***Request for GRAG Extension***

The Green Roof Advisory Group requests a one year extension to initiate the implementation of the group's recommendations outlined in the Five-Year Plan and to provide a solid basis for ongoing policy development.

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*The existing, mutually supportive relationship between city staff and GRAG stakeholder members is an important key to assisting the City in implementation of green roof policy goals.*

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All parties recognize the need for continued GRAG and other green roof stakeholder activities to complement future staff efforts and most effectively promote green roofs in the City. The critical need for the establishment of green roof design considerations—performance based criteria for successful green roofs—was identified. The development of the design considerations, however, is a substantial undertaking and was not possible to accomplish within the one-year timeframe allotted by Council for GRAG activity. Therefore, the task was pushed forward into Year 1 of the Implementation Plan. Additional Year 1 stakeholder tasks include support for staff educational activities, continued advocacy for green roofs as a density bonus public benefit option, assessment of green roof monitoring research, and progress review of policy recommendations for incentives and credits.

## GREEN ROOFS FIVE-YEAR POLICY IMPLEMENTATION PLAN

(Key to acronyms follows.)

### Year One (FY 2010-11)

<b>Activity</b>	<b>Lead</b>	<b>Discussion</b>
<b><u>Outreach and Education</u></b>		
• Green Roof Web page & support materials	AE	Develop; includes items below w/ asterisk (*)
• Green Roof program tracking & report*	AE/WPD/PDRD	Track GR initiatives/5-Year Plan progress
• Staff education and coordination*	Multiple	Done for each initiative; internal web page
• Urban Heat Island integration*	AE	Integrate GR into program
• Green Roof database*	AE/PDRD	Track projects in City maintained database
• City Hall educational model*	AE	Develop educational flyer and tours
• Outreach to focus areas	GRAG	Meet with professional organizations
<b><u>Green Roof Design Considerations</u></b>		
• Baseline Performance Criteria	GRAG/AE/	Define minimum standards for City
	WPD	incentivized projects; extend GRAG to accomplish task
<b><u>Existing Development Options with Green Roofs</u></b>		
• PUD Open space & landscaping*	PDRD	Show can meet requirements with GRs
• PUD Green Building requirements	AEGB	Show GRs can contribute to score
• PUD use of GR in Tier 2*	PDRD/AE	Show GRs can be "other creative or innovative [environmental] measures"
• Multifamily open space*	PDRD	Show can meet requirements with GRs
• Subsurface parking garage*	PDRD	Show GRs over subsurface garages do not count as impervious
• Parkland dedication using GRs*	PARD	Show can use privately owned and maintained GRs to meet requirements



**Potential Development Incentives (require code change & Council approval)**

- |                                   |      |                                     |
|-----------------------------------|------|-------------------------------------|
| • GR Density Bonus: Downtown      | PDRD | Add green roofs to program          |
| • Building cover increase with GR | PDRD | Allow more building cover if offset |

**Energy Impacts**

- |                         |    |   |
|-------------------------|----|---|
| • Austin Energy rebates | AE | Evaluate energy impacts & potential rebate incentives |
|-------------------------|----|---|

**Innovative Stormwater Management**

- |                                   |              |   |
|-----------------------------------|--------------|---|
| GR hydrologic study               | WPD/WFC      | Research of detention & runoff control by LBJ Wildflower Center (WFC)                                   |
| GR industry water quality control | Industry/WPD | Coordinate with staff to verify hydrologic model for WQ credit (option exists throughout 5-year period) |

**Green Roofs for New Buildings**

- |                      |     |  |
|----------------------|-----|--|
| GR on City Buildings | PWD | Evaluate feasibility & funding of green roofs for all new City buildings per Council resolutions 20071129-045 & 20071129-046 |
|----------------------|-----|--|

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**Year Two (FY 2011-12)**

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<b><i>Activity</i></b>	<b><i>Lead</i></b>	<b><i>Discussion</i></b>
------------------------	--------------------	--------------------------

**Outreach and Education**

- |   |             |                                       |
|---|-------------|---------------------------------------|
| • Green Roof Web page & support materials | AE          | Continue funding allocation           |
| • Green Roof program tracking & report    | AE/WPD/PDRD | Track GR initiatives to show progress |
| • Green Roof project database*            | AE          | Track projects to show progress       |

**Incentives for Green Roofs**

- |   |      |   |
|---|------|---|
| • Austin Energy rebates                 | AE   | Implement rebate if warranted, pending evaluation results from Year 1 |
| • North Burnet/Gateway GR density bonus | PDRD | Needs Council approval; follows Downtown density bonus                |

**Innovative Stormwater Management**

- |                                      |          |   |
|--------------------------------------|----------|---|
| • Water quality evaluation           | WPD      | Evaluate option to allow a limited number or pilot projects in DDZ Watersheds to receive partial WQ credit on condition of monitoring |
| • Plan for GR/LID design competition | WPD/GRAG | Follow City of Houston example  |

**Planning for Green Roof for City Building**

- |                                       |     |   |
|---------------------------------------|-----|---|
| • Collect, evaluate data on buildings | PWD | Create inventory of existing & proposed COA buildings/roofs, select subset for further GR consideration per Council resolutions 20071129-045 & 20071129-046 |
|---------------------------------------|-----|---|

**Green Roofs for New Buildings**

- |                                  |           |  |
|----------------------------------|-----------|--|
| • GR on New Commercial Buildings | GRAG/PDRD | Evaluate feasibility of green roofs for all new buildings within the Central Business District |
|----------------------------------|-----------|--|

**Year Three (FY 2012-13)**

<b><i>Activity</i></b>	<b><i>Lead</i></b>	<b><i>Discussion</i></b>
<b><u>Outreach and Education</u></b>		
• Green Roof program tracking & report*	AE/WPD/PDRD	Track GR initiatives to show progress
• Green Roof project database*	AE	Track projects to show progress
<b><u>Incentives for Green Roofs</u></b>		
• Airport Blvd. Corridor GR density bonus	PDRD	Needs Council approval; follows Downtown & N. Burnet/Gateway density bonuses
<b><u>Innovative Stormwater Management</u></b>		
• Flood detention and/or WQ sizing credit	WPD	Pending Wildflower Center results & possible other follow-up studies
• Hold GR/LID design competition	WPD/GRAG	Follow City of Houston example

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## Year Four (FY 2013-14)

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<i><b>Activity</b></i>	<i><b>Lead</b></i>	<i><b>Discussion</b></i>
<b><u>Outreach and Education</u></b>		
• Green Roof program tracking & report*	AE/WPD/PDRD	Track GR initiatives to show progress
• Green Roof project database*	AE	Track projects to show progress
<b><u>Innovative Water Quality Controls</u></b>		
• Green Roof as WQ control	WPD	Evaluate feasibility to add ECM Criteria for green roofs; pending Wildflower Center results & additional follow-up studies
<b><u>Subsidies, Grants, Low-Interest Loans</u></b>		
• Funding Allocation	EGRSO	Develop criteria pending staff review

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## Year Five (FY 2014-15)

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<i><b>Activity</b></i>	<i><b>Lead</b></i>	<i><b>Discussion</b></i>
<b><u>Outreach and Education</u></b>		
• Green Roof program tracking & report*	AE/WPD/PDRD	Track GR initiatives to show progress
• Green Roof project database*	AE	Track projects to show progress
<b><u>Development Process Incentives</u></b>		
• Fee Rebates, Expedited Process & Design Support	PDRD	Develop Incentive Program

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### Key to Acronyms

AE	Austin Energy
COA	City of Austin
DDZ	Desired Development Zone (Urban & Suburban watersheds)
EGRSO	Economic Growth & Redevelopment Services Office
FY	Fiscal Year
GR	Green Roof
GRAG	Green Roof Advisory Group
LID	Low Impact Development (design strategy to limit environmental impact)
PDRD	Planning and Development Review Department
PWD	Public Works Department
WFC	Lady Bird Johnson Wildflower Center
WPD	Watershed Protection Department
WQ	Water Quality

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
ZONING						
Planned Unit Development (PUD) Requirements: CHAPTER 25-2 Division 5						
§2.3.1.C Open Space Required (Tier 1)	A	Must be 10-20% of project area. Many designers are not aware this may be met using green roof.	Better educate potential development applicants that green roof may be used to meet 10-20% open space requirement.	Green roofs may contribute attractive, functional open spaces if designed correctly & accessible.	If green roof not accessible, then open space benefits will be lost.	Recommend staff assemble educational materials for the City's web site and other possible locations. Apply same cap on amount of open space that is not publicly accessible as 25-2-514.
§2.3.1.D PUD 2-Star Green Building Rating Required (Tier 1)	A	Projects with green roofs may contribute to up to 4 points on the rating scale. But many designers are not aware of this fact.	Better educate potential development applicants that green roof is means of achieving many points for one system.	Small effort to increase awareness might result in more green roof projects.	None.	Recommend staff assemble educational materials for the City's web site and other possible locations.
	B		Grant additional points to and/or create additional categories for green roofs.	Further incentivize green roofs for Green Building projects.	Green roofs already given multiple points. More would be disproportionate.	Re-write of Water Pt 3: "Stormwater Management" section to acknowledge green roof can be incorporated as part of innovative BMP water quality control system. Other changes not justified at this time.
§2.3.1.H Landscaping (Tier 1)	A	PUD must exceed standard landscaping requirements. Many designers are not aware this "over and above" landscaping may be met using green roof.	Better educate potential development applicants that green roof may be used to meet additional landscaping requirement.	Green roofs create landscapes in areas normally devoid of them.	Need to ensure that ground-level landscaping is provided per code.	Recommend staff allows green roof to count for landscaping exceeding code requirements. Standard code landscaping must be met at ground level.
§2.4 Tier 2 Options	B	Green roofs not explicitly part of the current tier 2 options, although they could already be counted under "other creative or innovative [environmental] measures."	Explicitly add green roof to Tier 2 list ("other creative or innovative [environmental] measures.").	Further incentivize green roofs in PUDs.	Not all green roofs will provide net environmental benefits. Need to ensure minimum standards for water quality & conservation met.	Recommend staff educate applicants about possibility of green roof as a Tier 2 option. Subject to meeting conditions ensuring environmental design is provided.
Zoning Impervious Cover Limits						
§ 25-2-492 Site Development Regulations: Building Cover	B	Green roofs are currently counted as "building cover" by code. Yet they act and perform as pervious for many social and environmental functions.	Allow increased building cover (BC) if a green roof of a minimum size were provided. Increase Floor-to-Area Ratio (FAR) proportionately.	Acknowledges that green roof provides aesthetic, open space & social benefits sought by the zoning BC limits. Would allow more site BC & encourage more green roofs.	Could result in heavy "massing" of buildings on site. Need to ensure that intent of requiring non-building areas respected.	Allow up to 10% extra BC (gross site) with an FAR increase if an equivalent green roof area twice as large is provided (i.e., 2:1 ratio of green roof to increased BC). Need minimum media depth, IPM plan & water conservation plan. Ensure public or private access.
§ 25-2-492 Site Development Regulations: Impervious Cover (IC)	C3	Green roofs are currently counted as "impervious" by code. Yet they act and perform as pervious for many social and environmental functions.	Allow increased zoning impervious cover (IC) if a green roof of a minimum size were provided.	Acknowledges that green roof provides aesthetic, open space & social benefits sought by zoning IC limits. Would allow more site IC & encourage more green roofs.	Could result in heavy "massing" of buildings and IC on site. Need to ensure that intent of requiring pervious/non-building areas respected.	Not recommended. Recommend experimenting with building cover incentives.

Appendix D. Policy and Incentives Matrix

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
§25-1-23 <i>Impervious Cover Measurement</i>	A & C	Subsurface parking structures considered "pervious" if avg. soil depth is 4 feet & min. depth is 2 feet.	Soil and landscaping above a garage is a form of green roof. Explore reduction of 4-foot depth to make more technically & financially feasible.	Reduction in soil depth reduces cost & increases green roof project feasibility.	Must ensure pervious function of area maintained; groundwater problems and baseflow reduction possible.	Not recommended. Very limited application & need; downside outweighs positives.
<b>Density Bonuses</b>						
<i>Downtown Density Bonus Program (under consideration)</i>	B	Green roofs not explicitly part of the public benefit options, although they could already be counted under Green Building.	Explicitly add green roof to public benefit options. FAR bonuses are used in Portland.	Further incentivize green roofs downtown.	Too many options may hinder the effectiveness of the program.	Still under review.
<i>North Burnet-Gateway NP &amp; Airport Blvd. Corridor Density Bonus Programs</i>	C1	Much of the N. Burnet-Gateway Neighborhood Plan & Airport Blvd. corridor areas contribute to significant downstream flooding areas.	Allow greater height and FAR if new development provides a green roof.	Green roofs on new development could help mitigate flood impacts downstream and boost aesthetics of a currently industrial area.	Ordinance for this area already passed by Council; would require new ordinance.	[Still under review.] Minimum size to have meaningful impact would be necessary. Green roof would be provided <u>in addition to</u> any previous water quality or detention requirement.
<b>Open Space Requirements</b>						
§25-2-514 <i>Open Space Requirements for Multifamily</i>	A	Private and, in some cases public, open space is required for many multifamily zoning categories. But it is not widely known that §25-1-21(70) defines open space to include roofs. Green roofs are rarely proposed to meet open space requirements.	Better educate potential development applicants that green roof is means of meeting open space requirements.	Small effort to increase awareness might result in more green roof projects.	If green roof not accessible, then open space benefits will be lost.	Recommend staff assemble educational materials for the City's web site and other possible locations. Ensure common access.
<i>Comm. Design Std §25-2 Subchpt. E, Sec. 2.7 Private Common Open Space &amp; Pedestrian Amenities</i>	A	Private open space with amenities required on min. 2% of site for all commercial projects over 5 acres. But it is not widely known that §25-1-21(70) defines open space to include roofs. Green roofs are rarely proposed to meet open space requirements.	Better educate potential development applicants that green roof is means of meeting open space requirements.	Small effort to increase awareness might result in more green roof projects.	If green roof not accessible, then open space benefits will be lost.	Recommend staff assemble educational materials for the City's web site and other possible locations. Ensure user access.

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
Parkland Dedication						
§25-1-603 Standards for Dedicated Parkland	B	The Parks director determines whether land offered for parkland dedication (PLD) complies with the standards for dedication. Green roofs have not been considered for PLD but could be, especially where other available public open space is limited.	Better educate potential development applicants that a green roof may potentially be used to meet privately-owned & maintained PLD requirements.	A green roof might be the only feasible means of providing parks in built-out areas with little or no existing parkland/open space. It could also increase the attraction of the development (example: amenity roof garden at Whole Foods at 5th & Lamar).	Some green roofs will have access and/or accessibility barriers that will make them unsuitable for use as parks. Some property owners will not want to offer public access.	Recommend consideration of green roofs for privately-owned & maintained parks. Acceptance subject to PARD approval. Green roof must be publicly accessible; provide proper signage & 3 traditional amenities per PLD ordinance. Green roof park would have to have private ownership and maintenance due to dedication and liability issues. (Note: private parks, including potential green roof parks, may receive a max. 50% PLD credit.)
Green Roof Requirement						
Mandatory Requirement	C5	Projects are not required to build a green roof.	Require green roofs for specific building types, geographic areas, or public projects. Some form of mandatory requirements used in Tokyo, Chicago (projects receiving public assistance), and Portland (city-owned facilities).	Ensure green roofs used in projects.	Green roofs not necessarily warranted or feasible for every project. Overly prescriptive.	Further demonstration of green roof effectiveness required before this major step should be considered.



Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
ENERGY CONSERVATION, AIR QUALITY & CLIMATE PROTECTION						
Energy Code	A & B	Austin Energy Code requires a high reflectivity for flat roofs. Exception: vegetated roofs or rooftop pools.	Better define "green roof" to enable AE Credit for reflectivity.	Definition of what constitutes a vegetated roof will help plan reviewers assure high performance.	Difficult to strictly define.	Staff asks for GRAG input towards this definition
Austin Energy (AE) Rebates associated with Green Roofs	B & C	Existing Roof rebate: AE rebates \$0.15/sq ft for applying reflective coating on an existing dark roof.	Provide the same \$0.30/sq ft rebate for replacing a dark roof with a green roof.	Potential reduction in consumption & peak energy demand.	When replacing an existing roof, the new roof must meet energy code by providing a high reflectivity or green roof and AE can not justify paying a rebate for meeting and not exceeding code requirements. \$0.15/sq ft is an insignificant incentive when considering the cost of green roofs.	Recommend providing \$0.15/sq ft for replacing a dark roof with a green roof.
AEGB ratings associated with Green Roofs	A & B	All Austin Energy Green Building (AEGB) rating systems promote green roofs within the rating points: * BR3 Roofing to Reduce Heat Island * S6a Site Development Protect or Restore Open Areas * S6b Site Development Maximize Vegetated Open Area * S7b Additional Heat Island reduction - Roof	Grant additional points to and/or create additional categories for green roofs.	Further incentivize green roofs for Green Building projects.	Green roofs already effect multiple points. More would be disproportionate.	Re-write of Water Pt 3: "Stormwater Management" section to acknowledge green roof can be incorporated as part of innovative BMP water quality control system. Other changes not justified at this time. Green roofs affect one Basic Requirement & 4 points. This effort is underway and should be introduced in 2011 version of AEGB rating.
Air Quality, Climate Protection & Urban Heat Island Mitigation Program	B & C	Urban Heat Island Mitigation funds for tree planting; not yet available for green roofs; community not aware green roofs mitigate rising urban temperatures, air quality pollution, and a/c related energy use.	Create educational outreach campaign & monetary incentives/ rebates for green roofs for Urban Heat Island abatement.	Green roofs provide more urban heat island mitigation than other roof types, reduce energy use, & can remove particulate matter from the air. Increased cooling of surrounding environment benefits community & local ecosystem. Counters conventional dynamic of increased energy use & higher urban temperatures increase the production & incidence of ground level ozone formation & production of carbon.	Cost-benefit ratio for funding green roof may not merit expenditure for developers or owners who are only concerned with their site and not its impact on the larger community environment.	Create educational outreach campaign & monetary incentives/rebates for green roofs. Specifically recommended for application on lower-rise buildings in the CBD & urban core where there is a high percentage of impervious cover.

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
WATERSHED PROTECTION						
Flood Control						
DCM 8.3.4.J Parking Lot Detention	A	Flood detention requirements may be met on a site using "parking lot detention." This method may not be widely known to design professionals and could be employed on a roof.	Better educate potential development applicants that parking lot detention is an option and could be used in conjunction with a green roof.	Saves space on the site to combine the detention footprint on the roof rather than have a separate roof and flood detention pond.	Additional weight of stored water on roof likely to dissuade use of this practice. But may be helpful for parking garages with heavy-duty structural supports.	Recommend staff assemble educational materials for the City's web site to show the various flood control options, including parking lot detention.
DCM ____ Detention	C2	Green roofs may slow rate and quantity of stormwater runoff to help reduce flood impacts. No credit is currently given.	Assign prorated detention credit for green roof performance and/or assign green roof adjusted Curve Number.	Creates incentive to building green roofs; credit should be given if systems perform function. Could help with smaller (2-year) storm detention.	Not likely to be effective for larger (e.g., 10, 25, 100-year) storms. Needs study to demonstrate effectiveness. May require large green roof to have any impact.	Preliminary study being conducted by LBJ Wildflower Center. Follow-up study may also be required.
Water Quality (WQ) Structural Control Requirements						
ECM 1.6.7 Innovative Water Quality Controls	C3	Green roofs not considered an approved water quality control for use to meet on-site WQ requirements.	Develop criteria in ECM to allow use of green roof to meet WQ requirements.	Creates significant incentive to building green roofs: land and resources for separate WQ control reduced or not required.	Green roof technology not proven in Austin climate to perform as a stand-alone WQ management practice.	Further demonstration of green roof effectiveness required before this major step should be considered.
	C1		Industry demonstrates that green roof technology can meet water quality requirements.	Same as above. But also does not require City resources.	None to City of Austin. Requires research expenditure on part of green roof industry.	Recommend & encourage research of this type by green roof industry.
	A & B	Green roof could be used as area for re-irrigation of captured stormwater. Not widely known in design community.	Allow green roof systems to be used for re-irrigation component of retention-irrigation systems.	Creates incentive to building green roofs: land and resources for separate WQ control reduced or not required. No further code or criteria modifications required. Re-irrigation systems help address water conservation concerns.	Potentially high export of nutrients and high use of potable water need to be prevented. Green roof area may not be large enough to accept all water, requiring supplemental irrigation area (e.g., other landscaping).	Recommend overflow be directed to vegetated area (e.g., rain garden, veg. filter strip, or other landscaping).
	A	Biofiltration or other water quality control could be integrated into green roof design. Not widely known in design community.	Incorporate a biofiltration or rain garden (or other approved) system into a green roof design.	Allows water quality requirements to be met in conjunction with green roof with no further code or criteria modifications.	May be more difficult to maintain and inspect a WQ control on a roof. Greater media depth may be structural or financial burden.	Recommend staff assemble educational materials for the City's web site to include the possible integration of a biofiltration system (or other WQ control) on a green roof.

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
Watershed Impervious Cover (IC)						
§ 25-8-63 Impervious Cover Calculations: IC Amount	C5	Green roofs are considered "impervious" just like conventional roofs, despite their ability to absorb and retain rainfall.	Change code to make green roofs (with a minimum media depth) to be considered "pervious."	Creates significant incentive to building green roofs: increases functional level of impervious cover allowed.	Green roof technology not proven in Austin climate to perform as natural pervious soils. Issues: (1) typical Green roof soil depths result in more runoff than natural soil profiles; (2) irrigation leads to saturation & thus runoff more like a conventional roof; (3) fertilizers & other landscape products used to care for the Green roof may lead to increased pollutant loads; and (4) lack of connectivity with ground-level soils prevents contributions to groundwater & creek baseflow.	Further demonstration of green roof effectiveness required before this major step should be considered.
§ 25-8-63 Impervious Cover Calculations: IC Amount with GR mitigation	C4		Allow increased impervious cover (IC) if a green roof of a certain size were provided, e.g., allow 5% additional IC if a green roof with 10% of the site area were provided. Possibly require retention-irrigation for site WQ control.			
§ 25-8-63 Impervious Cover Calculations: Pct IC for WQ Control Calcs	C1	Green roofs considered "impervious" just like conventional roofs; resulting calculations for water quality control sizing may overstate the amount of runoff and control size required.	Change code to discount a portion of the green roof area for purposes of sizing WQ & flood controls depending on the soil depth and system storage capabilities.	Resulting water quality controls will be smaller and less expensive and will reflect the reality of the site's hydrology.	Increases complexity of oversight to permit. May require monitoring and modeling to confirm assumptions granting discount are justified.	Recommend with time period to evaluate success and accuracy of approach. Use approved model to determine discount.
Drainage Utility Fee						
Stormwater Drainage Fee Reduction	C5	Green roofs are considered "impervious" for purposes of calculating the Drainage Utility Fee.	Discount a portion of the green roof area for purposes of calculating the Drainage Utility Fee. Portland, Minneapolis, Seattle & Munster (Germany) use some form of stormwater drainage fee credit.	Further incentivize green roofs. City already provides a discount for proper maintenance of approved water quality controls.	Provides less funds for Drainage Utility. Green roofs need further design improvement to qualify as water quality components (see Innovative WQ Controls above).	Green roofs are already eligible for drainage fee discounts to the extent that they contribute to approved water quality controls. Additional fee incentives not warranted.

Potential Option	Type **	Description of Current Status/Concern	Potential Improvement	Anticipated Impacts		City Staff Recommendation
				Advantages	Disadvantages	
FINANCIAL INCENTIVES						
Subsidies, Grants, Low-Interest Loans	C3	City does not provide any funding for green roofs.	Provide funding (e.g., subsidies, grants, low-interest loans) for green roofs. Chicago, Montreal, Toronto, & cities in Germany & Switzerland provide some form of funding for green roofs. Portland provides up to \$5 per sq ft for green roofs that provide stormwater management as part of their Grey to Green initiative.	Further incentivize green roofs.	Economy in recession: funds not likely available at present. Need to justify why money to be spent on green roofs and not other options.	Review if potential funding becomes available. Will need to weigh advantages of green roofs against those of other worthy environmental & cultural solutions not receiving such a subsidy.
Development Process Incentives (Fee Rebates, Expedited Process, Design Support)	C3	City does not provide development process incentives for green roofs.	Provide development process incentives (fee rebates, expedited process, design support) for green roofs. Chicago & Washington D.C. offer expedited review & permit process. Chicago also provides a dedicated review team and fee waiver.	Further incentivize green roofs.	More complicated for Development Review while receiving less money through fees.	Limited design support from City staff may be available, especially for pilot projects. Fee waivers and expedited process not recommended.
Local Improvement Credits	C5	City does not provide local improvement credits (municipality offers loans for upfront improvement costs and is reimbursed through property taxes over time) for green roofs.	Provide local improvement credits for green roofs. Similar to City of Austin program currently proposed for solar panels.	Further incentivize green roofs. Shifts cost of green roof off of developer and onto owner (who is receiving long-term benefits - e.g., energy savings).	Economy in recession: funds not likely available at present. Need to justify why money to be spent on green roofs and not other options.	Review if potential funding becomes available. Will need to weigh advantages of green roofs against those of other worthy environmental & cultural solutions not receiving such a subsidy.
Property Tax Credit	C5	City does not provide property tax credits for green roofs.	Provide property tax credits for green roofs. New York City offers a one-year property tax credit of up to \$100,000.	Further incentivize green roofs.	City receives less property tax revenue. May be difficult to justify in time of economic recession. Need to justify why money to be spent on green roofs and not other options.	Review if budgetary climate supports. Will need to weigh advantages of green roofs against those of other worthy environmental & cultural solutions not receiving such a subsidy.
OVERALL CONSIDERATIONS						
In order to receive credits for the above (open space, zoning impervious cover, water quality, etc.), the following considerations must be adequately addressed: * Water Conservation/Potable Water Use * Integrated Pest Management (IPM) * Minimum soil depth						* Minimum green roof size (building coverage) * Suitable plant species * Maintenance/assurance green roof continues to exist in adequate condition

\*\* Key to "Type" Codes:

A = Already Implemented (but may need clarification, publicity, etc.);

B = Near-Term Action Desired;

C = Longer-Term Item (needs further study, validation, etc.; C2, C3, C4, C5 = 2nd, 3rd, etc. year of work plan)



Photo courtesy of Ed Jarger, American Hydrotech

# GREEN ROOF ADVISORY GROUP

## Final Report

September 2010



# Council Resolution

## **RESOLUTION NO. 20090827-057**

**WHEREAS**, green roofs, as a component of green infrastructure, can conserve energy, mitigate stormwater runoff volume, provide wildlife habitat, and reduce the urban heat island effect; **NOW, THEREFORE,**

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:**

The City Manager is directed to convene and work with a green roofs stakeholder group to explore the feasibility of offering energy and stormwater credits and other incentives, based on performance, to encourage the creation of green roofs in the City.

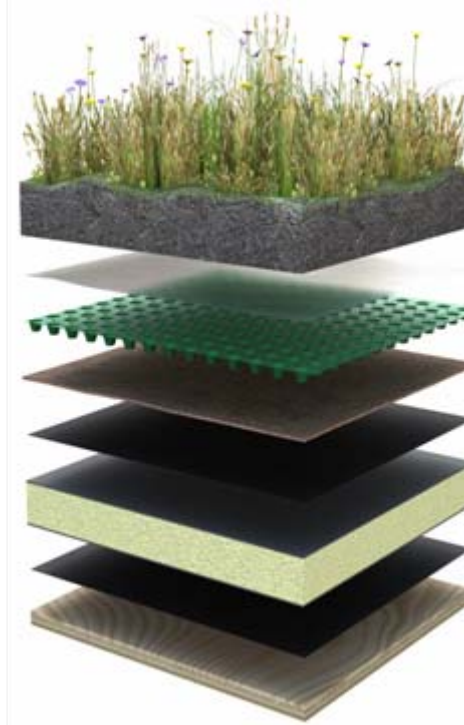


# Green Roof Types



Photo courtesy of Atelier Wong

AMENITY DECK  
Sterling House



GREEN ROOF  
Diagram



Photo courtesy of Kathy Zarsky

RESIDENTIAL TERRACE  
Hill Country Residence

Case for Green Roofs

# Public Benefits & Considerations

- Urban Heat Island Mitigation
- Stormwater Detention
- Air Quality
- Carbon Dioxide Impact
- Water Quality
- Well-being
- Wildlife Habitat



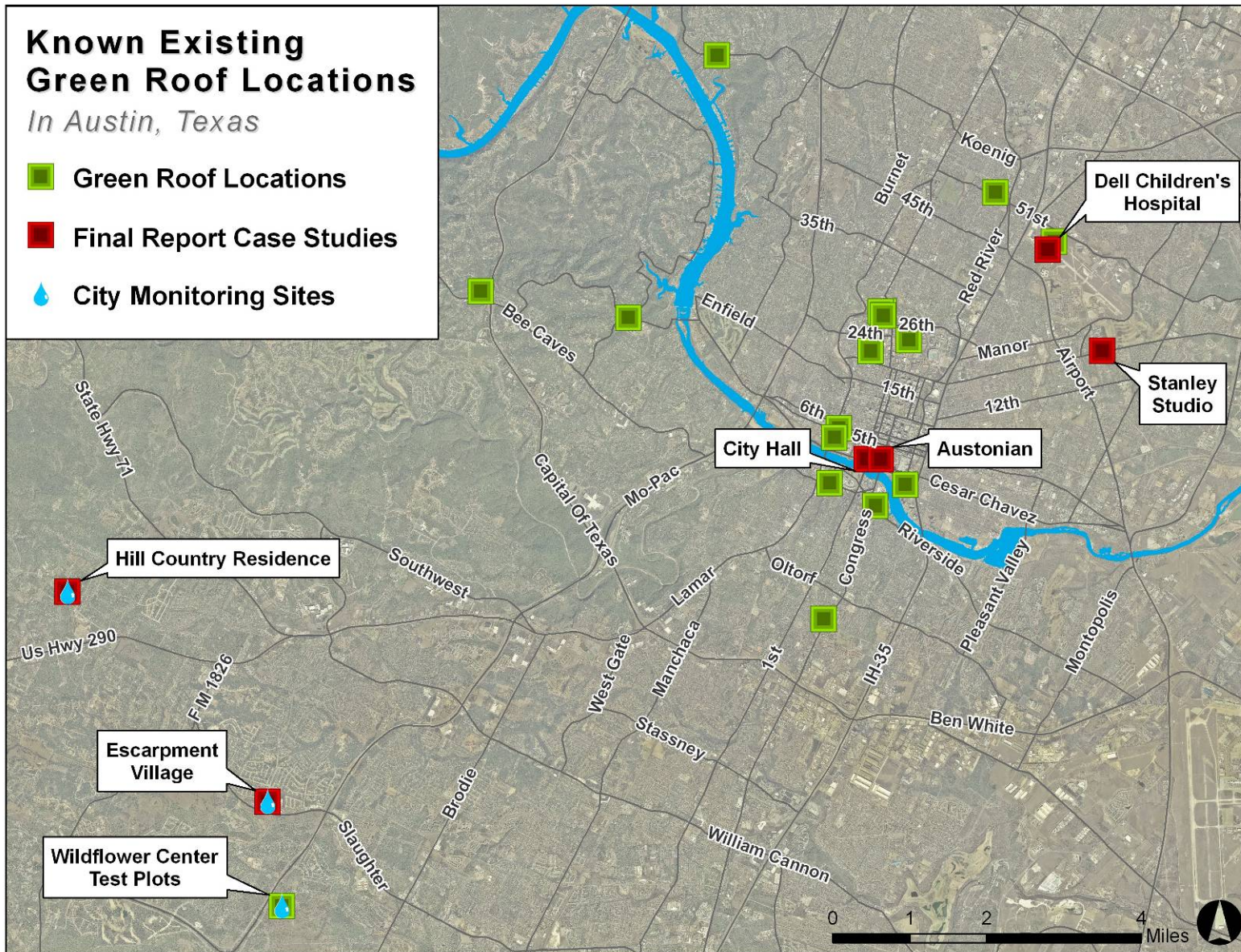
# Private Benefits

- Energy Use
- Open Space
- Uses and Activities
- Real Estate Value
- Extended Roof Life
- Sound Attenuation





# Green Roof Locations







# Austin City Hall

Location:  
Downtown Austin

Project Type:  
Institutional

Year Installed:  
2005

Green Roof Area:  
13,625 sq. ft.



Photos courtesy of Michael Knox, Rick Jarger, Ed Jarger, and Atelier Wong





# Hill Country Residence

Location:  
Southwest Austin

Project Type:  
Residence

Year Installed:  
2005

Green Roof Area:  
1,125 sq. ft.



Photos courtesy of Kathy Zarsky





# Accomplishments

- Reviewed international incentives and credits
- Established an Austin green roof database
- Documented existing City policies and incentives
- Analyzed potential policies and incentives
- Developed Five-Year Policy Implementation Plan

# Accomplishments

- Advocated for green roofs in the Downtown Density Bonus Plan
- Supported the creation a City green roof website
- Developed a proposal for monitoring research
- Advocated for Austin Energy rebate increase

# Accomplishments

- Initiated design and performance considerations
- Organized a seminar on water retention modeling
- Provided an outreach seminar to solicit feedback
- Integrated *Water Conservation 2020* principles
- Developed Interim and Final Reports

# Green Roof Policy Development

Phase 1: Introduction and Awareness

Phase 2: Community Engagement

Phase 3: Action Plan Development and Implementation

Phase 4: Technical Research

Phase 5: Program and Policy Development

Phase 6: Continuous Improvement

Key Findings  
and Conclusions

# Incentives and Credits

- Zoning
- Energy Conservation, Air Quality, and Climate Protection
- Watershed Protection
- Financial Incentives

Note: Green roofs will be subject to design and performance considerations in order to receive incentives and credits

# Zoning

## Existing

- Green roofs for Planned Unit Developments (PUD)
  - Open Space, Green Building, Landscaping, Tier 2 Option
- Green roofs as open space for multifamily and commercial projects
- Green roofs over subsurface parking garages
- Green roof parks



# Zoning

## Potential

- Downtown Density Bonus
- Other density bonus options (e.g., North Burnet-Gateway)
- Increased building cover credit
- Green roofs on all new Central Business District buildings



# Energy Conservation, Air Quality, & Climate Protection

## Existing

- Green roofs equivalent to cool roofs

## Potential

- Air Quality, Climate Protection, and Urban Heat Island Mitigation Program rebates
- Austin Energy rebates





# Watershed Protection

## Existing

- Green roofs for flood control
- Existing green roof options for water quality

## Potential

- Less runoff allowing smaller water quality controls
- Water quality control research needed
- Not ready to count as “pervious” cover



# Financial Incentives

## Portland

- Bonus floor area ratio (FAR) for green roofs in central city



## Chicago

- Up to \$5000 to residential and small commercial projects



## Toronto

- Incentive of \$50 per square meter, up to a maximum of \$100,000





# Research and Monitoring



Photos courtesy of City of Austin Watershed Protection Department

Key Findings  
and Conclusions



# Design and Performance Considerations

- Size
- Soil Depth and Mulch
- Plant Cover and Variety
- Water Use
- Drainage
- Integrated Pest Management (IPM)
- Visibility and Access
- Maintenance Requirements

Note: Continued development in future phases of work

Key Findings  
and Conclusions



# Water Conservation and Green Roofs



Photo courtesy of Marsha Miller, UT

## Stanley Studio

Rainwater Catchment  
for Irrigation



Photo courtesy of Thomas McConnell

## The Austonian

HVAC Condensation  
for Irrigation

Key Findings  
and Conclusions

# Green Roof Density Bonus



Graphic courtesy of Downtown Austin Blog/Schlosser Development

## Key Findings and Conclusions

Shoal Creek Walk – At least 20,000 sq. ft.  
of green roof shall be provided



# Green Roofs on City Buildings



Photo courtesy of Ed Jarger, American Hydrotech

Key Findings  
and Conclusions



# Outreach and Education

- City of Austin Urban Heat Island Mitigation Program will create a green roof educational campaign, including:
  - Website
  - Brochure
  - Presentations



Photo courtesy of City of Austin

Key Findings  
and Conclusions



# Five-Year Policy Implementation Plan

## Short Term

- Multi-departmental coordination
- Downtown density bonus
- Performance standards development
- Raise importance of green roofs for PUDs
- Initiate building cover ordinance
- Support incorporation in City building projects
- Support of education/website work

Next Steps

# Five-Year Policy Implementation Plan

## Mid to Long Term

- Density bonuses for targeted areas
  - North Burnet/Gateway, Airport Boulevard, East Riverside Corridor, Transit-Oriented Developments (TODs)
- Continue financial support of watershed studies
- Explore financial incentives



# Request for GRAG Extension



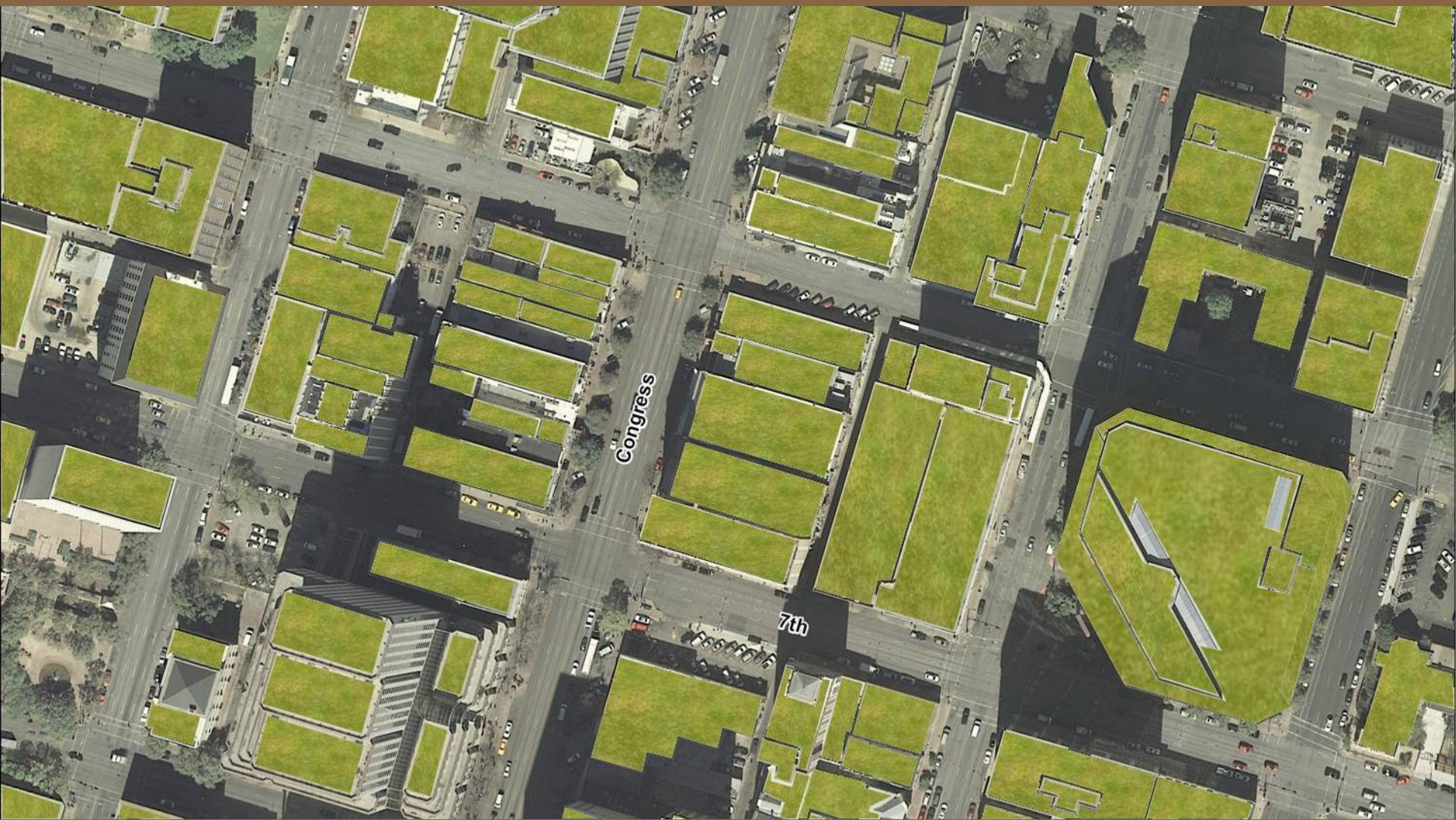
Next Steps





# QUESTIONS

<http://www.ci.austin.tx.us/council/place1>



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