

## STAFF REPORT

**DATE:** April 21, 2009

**TO:** City Council

**FROM:** Donna Silva, Parks and General Services Department Director  
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Mitch Sears, Sustainability Program Manager

**SUBJECT:** Greenhouse gas emission thresholds and standards for new residential development

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### **Recommendations**

1. Adopt the attached resolution establishing greenhouse gas emission thresholds, standards, and mitigation guidelines for new residential development projects.
2. Direct staff to use the thresholds and standards in the attached resolution to determine project GHG emission impacts and for negotiating development agreements.
3. Direct staff to return with an ordinance based on these thresholds and standards as soon as practical.
4. Approve policy guidelines included in this report for expenditure of transportation funds prioritizing transportation projects that minimize GHG emissions.

### **Overview**

This report provides a recommended framework for beginning to reduce greenhouse gas (GHG) emissions produced by new residential development projects. Staff recognizes that this framework exists within the context of a rapidly evolving economic and policy landscape that creates challenges in identifying the most ambitious and achievable GHG emission reductions possible. The recommended standards are designed to achieve critical long-term GHG reductions while maintaining the economic viability of new residential development. The general objective is to offer clear standards based on the best available information and allow flexibility in how those standards are met. To this end, the framework establishes multiple paths for meeting the overall requirements and includes suggested mitigation measures to help guide the development community's challenging work of achieving meaningful GHG reductions. The general rationale behind the standards is that housing built today will be here beyond the 2050; the target year for when society will need to be effectively carbon neutral to minimize the effects of global warming.

This framework builds on the workshop discussion the Council began in November 2008 and the discussions between staff and the development community in the intervening months as projects have been reviewed.

### **Council Goals**

The discussion items and recommended actions outlined in this report address the Council goal of conserving natural resources and protecting the environment. Specifically, the actions partially implement the Council objective of addressing global warming and reducing the carbon footprint of Davis. These actions, along with existing development requirements should also be evaluated in light of the Council’s goal to “Review city policy requirements to determine if the cumulative impact of such requirements affects the provision of certain types or total supply of housing.”

### **Fiscal Impact**

No direct costs associated with this report. Costs (and efficiencies) associated with the implementation of the actions recommended in this report will be assumed by the eventual homeowner, if the market will allow costs to be passed on to the buyer. Staff believes that the costs associated with the standards outlined in this report move the City toward a more accurate full cost accounting for new residential development that, for the first time, includes a metric for evaluating impacts associated with global warming. However, staff is also sensitive to the economic reality that until more communities adopt similar standards, development in Davis will be constrained or new houses in Davis will be less affordable than others in the Central Valley. In recognition, the framework phases in GHG reduction standards, sets a threshold project size, provides credit for smart growth measures, and allows for flexibility in how the standards are met. In addition, staff is recommending that existing development impact fees for transportation not be raised at this time to address GHG emissions, but instead be prioritized for projects that result in GHG savings.

Staff believes that this approach strikes a reasonable balance between the urgency of action on global warming and the economic realities associated with producing housing in Davis. Staff notes that from a GHG perspective, even a super efficient house that produces long commute trips is a global warming loser; it does not serve the City’s GHG emission reduction goals to adopt policies that result in commuter trips. Decisions on housing are complex and multifaceted, but if the issue of global warming is isolated from other considerations, reducing vehicle miles traveled is the most pressing priority.

### **Background**

In April 2007, the City Council adopted a strategy to reduce local GHG emissions. To achieve this objective, the City joined the Cities for Climate Protection (CCP) program along with hundreds of other communities across the globe working to reduce greenhouse gas emissions at the local level. The CCP is a performance-oriented campaign that offers a framework for local governments to reduce greenhouse gas emissions and improve livability within their municipalities. The framework includes the following 5 steps:

1. Conduct a baseline emissions inventory and forecast.
2. Adopt an emissions reduction target for the forecast year.
3. Develop a Local Action Plan.
4. Implement policies and measures.
5. Monitor and verify results.

The City completed an updated GHG inventory in May 2008 (Step 1). The Council adopted local GHG reduction targets in November 2008 (Step 2); Davis targets are included as Attachment 1. The targets are consistent with current accepted climate science and the state of California reduction goals and Scoping Plan. As noted in the November staff presentation, the Council has directed staff to pursue early actions to reduce local GHG emissions in parallel with the development of a local action plan (Step 3). Staff, the Climate Action Team, the Science Advisory Team, and the Natural Resources Commission continue to work on the development of the local action plan (Davis Climate Action and Adaptation Plan).

The recommended standards detailed in this report are consistent with the Council’s direction to pursue early actions in advance of adoption of the local action plan.

General note: Staff acknowledges that the GHG emissions from new residential projects make up only a small portion of Davis’ future emissions. The majority of local GHG emissions are will continue to be generated by residents of existing homes. In addition to the thresholds and standards recommended in this report, the City is considering other early GHG reduction actions to address emissions from existing residents and businesses, including the Low Carbon Diet and a community financing mechanism for household energy efficiency and solar power production. Staff considers these additional actions complementary to the new residential thresholds and standards.

### **Analysis**

The recommended framework addresses how new residential development projects perform relative to the adopted local GHG reduction targets and provides a method for how projects will contribute to meeting those goals. The analysis section is broken into the following sections:

1. General rationale
2. Amount of GHG from residential sector, how calculated, and what’s included (not included)
3. General standard – target year, project threshold, threshold of significance. Two paths:  
LEED ND or local standard
4. Credits – incentives for smart development
5. Mitigation scenarios - sensitivity analysis (certain and verifiable)
6. Current and recent projects - proposals to reduce GHG emissions
7. Questions and responses related to the overall methodology
8. Transportation development impact fees and GHG
9. Evaluation of the standard
10. Monitoring results
11. Project recognition

#### **1. General Rationale**

The City has studied and inventoried local GHG emissions using the best available data and methodology. This includes going beyond the current industry standard to engage a subject matter expert from UC Davis to supplement the local inventory analysis and provide a basis for analyzing GHG emissions at the project level (Carbon Development Allowances, Final Report, Deb Niemeier, September 2008). The City Council has adopted local GHG reduction targets that

are consistent with State targets outlined in AB 32 and Executive Order S-3-05. The GHG targets Council staff report is at:

[http://cityofdavis.org/meetings/councilpackets/20081118/05\\_Greenhouse\\_Gas\\_Emissions\\_Targets.pdf](http://cityofdavis.org/meetings/councilpackets/20081118/05_Greenhouse_Gas_Emissions_Targets.pdf)

In addition, the City has lead agency responsibilities under CEQA to address global warming when it approves an activity, including an application for development. CEQA requires mitigation of adverse impacts wherever feasible. The California Attorneys General Office recently commented:

*Mitigation measures must be “fully enforceable”. Adequate mitigation does not, for example, merely “encourage” or “support” carpools and transit options, green building practices, and development in urban centers. While a menu of hortatory GHG policies is positive, it does not count as adequate mitigation because there is no certainty that the policies will be implemented.*

*- Climate Change, CEQA, and General Plan Updates FAQ (March 2009)*

Given this context and the ability to perform a reasonable assessment of project level GHG emissions, the City has concluded that residential projects built today must make a fair share contribution to efforts to meet local and statewide targets. This conclusion follows on the logic that projects built today are expected to be in existence past the 2050 target date that calls for a minimum reduction of CO<sub>2</sub> to 80% below 1990 levels. The City has accepted the premise that it is not currently feasible to build projects to the 2050 standards, therefore a phase in approach is recommended.

Additionally, the best estimates of local growth and likely advances in state wide GHG savings (e.g. fuel economy improvements), have been factored into the project level GHG calculations. In addition, commute miles have been factored into the calculation with Davis “owning” half and the destination/origin community owning the other half (Carbon Development Allowances, Final Report, Deb Niemeier, September 2008). Staff acknowledges that there will be advances in modeling that may yield more precise results in the future, however the City’s current methodology is the most sophisticated approach to staff’s knowledge.

## **2. Amount of GHG from residential sector, how calculated, what’s included (not included)**

The City’s GHG inventory shows that more than three-quarters of the total GHG emissions generated in Davis are associated with the energy used in Davis’ homes and personal transportation associated with residential land uses; residential energy use (33%) and transportation (53%) (Source: City of Davis GHG Inventory and Forecast Report, May 2008). Though some of the transportation GHG emissions are associated with the movement of goods, the majority are associated with personal transportation and are therefore linked with residential activities.

Based on the report prepared by Deb Niemeier (Ph.D., P.E, Director John Muir Institute of the Environment, UCD) for the November Council meeting, staff has developed the following table showing the average baseline GHG “allowance” for each Davis resident, and by extension, each

Davis household. The methodology behind the summary table uses peer reviewed state wide GHG emission totals broken down to the local level and factors in regional growth assumptions and foreseeable statewide initiatives designed to reduce GHG emissions (e.g. low carbon fuel standard). Using the recently adopted City GHG targets (and State targets), staff has calculated the allowances for key target years. This table forms the basis for establishing GHG emissions standards for new residential development projects. Note: this table has been updated since the November Council meeting to correct a misprint that allocated both residential *and* non-residential GHG emissions to each residential unit. Based on this correction, the average GHG emissions that each residential unit generates dropped from 20.25MT/unit to the current 16.6MT/unit. The remaining 3.65MT is allocated to non-residential sources and will be addressed in future actions by the City.

**Table 1: Carbon Allowances**

Target year Minimum/Desired	Target	Carbon allowance to meet GHG reduction target* (annual metric tonnes per dwelling unit and per person)**	
		New Residential	% reduction over existing
Existing/Base year (2010)	N/A	16.5 per unit/ 6.6 per person	0% per unit/ 0% per person
2012 (Min.)	1998 level	15.0 / 6.0	9%
2012 (Desired)	7% below 1990	8.6 / 3.4	48%
2020 (Min.)	1990 level	9.25 / 3.7	44%
2020 (Desired)	28% below 1990	6.7 / 2.7	59%
2030 (Min)	28% below 1990	6.7 / 2.7	59%
2030 (Desired)	53% below 1990	4.35 / 1.75	74%
2040 (Min.)	53% below 1990	4.35 / 1.75	74%
2040 (Desired)	80% below 1990	1.85 / .75	89%
2050 (Min.)	80% below 1990	1.85 / .75	89%
2050 (Desired)	Carbon Neutral	Net 0	100%

\* Source: Carbon Development Allowances, Final Report, September 2008.

\*\* Assumes 2.5 persons/dwelling unit and an annual growth rate of 1%/yr (Source: City of Davis GHG Inventory and Forecast Report, May 2008).

Staff notes that the carbon allowances represent an average across the community. Some development projects may be more or less efficient than the average. These project specific differences are addressed as part of the GHG emission mitigation process in the form of credit for smart growth factors (e.g. project location) and project specific features (e.g. better than Title 24 home energy efficiency). It should also be noted that the calculation for new residential projects does not include GHG emissions from secondary factors such as carbon embedded in construction materials. As more sophisticated models are developed (by the City or others), the City may choose to add in additional factors that it believes are significant.

### 3. General standard – target year, project threshold, threshold of significance

The recommended general GHG emissions standard for new residential development projects is a phased approach that provides meaningful GHG reductions and rewards creative design that takes advantage of existing community form. The general standard includes two paths: the first

is a package approach that the City would recognize as sufficient to satisfy GHG emission standards. The second would be a project specific calculation of GHG emissions and customized mitigation program to reduce project GHG emissions to target year levels.

Initial target year:

Seeking a balance between project viability and meaningful GHG reductions, the recommended initial target year is 1990. Based on Table 1 above, each project would receive a per unit carbon “allowance” equal to 1990 levels. If the project achieved better than 1990 level reductions, it could trade with other future projects. It is recommended that this initial target would be in effect until December 2010. Beginning in January 2011, the target would automatically roll to the next target year based on a linear interpolation to achieve the next key target year (e.g. 2012, 2020 etc.). Review of the target year would be incorporated into regular review of the standard.

Project and CEQA thresholds:

Based on Council adopted residential growth guidelines and working from an assumption that 250 residential units will be built per year between 2010 and 2013, staff is recommending that new residential projects of less than 5% of the total units assumed to be built in a particular year (12 units), are exempt as a de minimus impact. Projects up to 10% of the total units assumed to be built in a particular year (25 units), may pay a GHG mitigation in lieu fee of cost of achieving 35% better than 2005 Title 24 plus \$1,000/unit to fund implementation of community GHG emission reduction programs with no further requirement. Projects over 10% of the total units assumed to be built in a particular year (25+ units), are required to mitigate under one of two paths outlined below.

General standard:

- a. Meet standards for LEED Neighborhood Development Gold certification. The City considers this certification process consistent with the intent of the City GHG (and other) policies and standards. The US Green Building Council has recently completed its pilot program on LEED Neighborhood Development and expects to formally launch the program this summer;

or

- b. Achieve 1990 level project GHG allowances for the house portion of the project (33% of total residential GHG emissions) as specified in Table 1. Mitigation credit for smart growth features, up-graded infrastructure (over 2009 standards), and other project components are addressed in the mitigation section of this report.

If option b. is selected, the City would encourage a majority of GHG savings to occur on-site. The advantage of on-site mitigation is based on the premise that it is much more cost effective to make improvements in houses and infrastructure during construction than to retrofit at a later date. This reduces the likelihood that the City will need to develop and fund programs in the future to retrofit the newly developed portion of the community housing stock in the decades ahead. In addition, it is anticipated that a more efficient home would provide benefits when homes are marketed, and serve as an example for other builders and homeowners.

#### 4. Credits – incentives for smart development

Although the focus of the GHG allowance concept is on emissions released by operations of a new dwelling unit, staff recognizes that will would not meet our long-term goals if we focused only on the structure. As previously noted, the structure (HVAC, hot water, and appliances) is responsible for approximately one-third of the emissions from a household. The majority of the emissions is from commute and other vehicle trips. For that reason, staff is proposing that the program provide credit for developments that are designed and located to reduce vehicle trips.

**Table 2 - Initial list of accepted GHG credit measures**

Factor	Recommended GHG Credit
Overall Project Density (General Plan density) – incorporates proximity to employment opportunities <ul style="list-style-type: none"> <li>● High</li> <li>● Medium</li> <li>● Low</li> </ul>	<ul style="list-style-type: none"> <li>● 5%</li> <li>● 2%</li> <li>● No credit</li> </ul>
Proximity to Transit <ul style="list-style-type: none"> <li>● Less than ¼ mile</li> <li>● ¼ mile to ½ mile</li> <li>● over ½ mile to ¾ mile</li> <li>● Over ¾ mile</li> </ul>	<ul style="list-style-type: none"> <li>● 5%</li> <li>● 2%</li> <li>● 1%</li> <li>● No credit</li> </ul>

Notes:

1. Credits are additive. For example, a high density project located near a transit line would receive a 10% credit.
2. Credits applied to total project GHG emissions.
3. Credits based on best available information adapted from SACOG traffic modeling to measure effects of project density and location near employment and transit on VMT. These credits may adjust up or down over time as more accurate data and modeling becomes available.

Staff recognizes that there is an imperfect correlation between project design/location and the number of miles that its residents will drive. Staff has asked SACOG to assist with this analysis so that we could make sound recommendations on the value of these credits. Unfortunately, the research hasn't been completed. Pending a more precise resolution of the effects of location and density on vehicle use by Davis residents, staff believes that it is reasonable to conclude that this combination of factors could reduce vehicle use by up to 10% at the project scale.

Staff will continue to work with SACOG to refine this analysis and make recommendations to the Council as additional information becomes available.

#### 5. Mitigation scenarios - sensitivity analysis (certain and verifiable)

The general approach is to provide projects with a clear GHG reduction target and allow for maximum flexibility for mitigation within two basic parameters:

The GHG savings must be:

- a. Verifiable (measurable) and;
- b. Long-lasting

The City is seeking a reasonable level of certainty in GHG mitigation. In general, the City is focused on proven methods but may accept new approaches for a limited portion of project GHG mitigation requirements when a compelling argument can be made that the potential GHG savings outweigh the risk of an underperforming measure. For example, a low confidence rating may be outweighed by high potential reduction that is measurable, or contribution to the knowledge base on best practices.

In order to allow for flexibility and innovation, staff recommends that each GHG mitigation measure be given a confidence rating and a longevity rating on a scale of 1-5 to guide evaluation and acceptance of the measure. The confidence and longevity rating would be recommended by the applicant proposing a new measure. The City would evaluate and accept or reject the recommendation based on supporting material/data supplied by the applicant. In addition, independent of new project proposals, the City would continue to research and incorporate measures that meet the criteria.

By combining a prescriptive project level GHG goal with a performance based mitigation approach, the City hopes to encourage innovation and low cost options for GHG emission reductions. Staff acknowledges that early projects will pioneer new approaches which later projects will benefit from (i.e. the menu of acceptable mitigation options will increase over time as the program matures). In recognition that early project proposals bear this responsibility, staff has developed a set of recommended pre-approved potential mitigation measures that project applicants can use to satisfy their GHG mitigation.

The pre-approved measures are shown in Table 3 below and are divided into two categories: (1) Full credit measures that provide sufficient certainty in the expected results and (2) Partial credit measures that do not provide adequate certainty but hold high potential for GHG reductions. Under the recommended standards, partial credit measures can satisfy up to 10% of the total GHG mitigation requirements for a project.

Note: One of the early GHG reduction strategies being explored by the City is a community engagement program designed to raise awareness and provide citizens with a way to save energy, money, and reduce local GHG emissions at the household level (Davis Low Carbon Diet). Several development applicants have proposed funding for this type of program as a key mitigation measure for their projects. Though the initial results from the City's pilot of this program indicate the potential for significant GHG emission savings if the program is brought to scale, it is difficult to measure or verify the longevity of those savings. Therefore, staff recommends that this particular mitigation measure be included in the partial credit category.



**Table 3 – Initial list of accepted GH mitigation measures**

Type	Estimated Annual GHG Savings	Longevity rating (1-5)	Confidence rating (1-5)
<b>Full Credit Measures</b> (Longevity and Confidence Ratings > 3)			
Energy efficiency upgrades to new units above existing Title 24 standards.  Example: 25% above Title 24 standards for a 1,882 sq ft home	Dependent on measure  2,973 lbs/unit <sup>1</sup>	Dependent on measure  5	Dependent on measure  5
Household PV (4kW average system)	3,300lbs/unit <sup>2</sup>	4	5
Energy efficiency upgrades to existing structures (residential/non residential)	Dependent on measure	Dependent on measure	Dependent on measure
PV on existing structures	Dependent on measure	4	5
Energy efficient and/or low carbon producing project infrastructure upgrades (over 2009 standards)  Example: Use of high volume fly ash concrete	Dependent on measure	5	5
Hybrid incentives for homeowners	2,900lbs/unit <sup>3</sup>	3	4
Neighborhood Electric Vehicle incentives for homeowners <sup>4</sup>	913lbs/unit	3	3
Local employee designated housing (school district, city, UCD, etc.)	5,218lbs/unit <sup>5</sup>	4	4

<sup>1</sup> Estimate of building energy use based on MICROPAS that takes effect for the new standards beginning July 2009. MICROPAS is an industry standard computer modeling tool used to calculate compliance with the California Residential Energy Standards (also known as *Title-24*). The heating, cooling, and water heating energy use from MICROPAS was combined with miscellaneous usage determined from Building America's benchmark process which is used to estimate miscellaneous consumption. The projections are based on many assumptions, and are intended give a reasonable indication of usage patterns with house size. Building America's benchmark process based on US Department of Energy, Building America Research Benchmark Definition, Updated December 20, 2007 (<http://www.osti.gov/bridge>)

<sup>2</sup> Source: PG&E Climate Smart Program, Typical residential system is 3 to 5 kW (4kW average); 18% capacity factor; operating 8,760 hours per year <http://www.pge.com/about/environment/calculator/assumptions.shtml>  
US EPA 2007 emissions rate for California (electric): 0.724 lbs CO<sub>2</sub> per kWh  
[http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007V1\\_1\\_year05\\_GHGOutputRates.pdf](http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007V1_1_year05_GHGOutputRates.pdf)

<sup>3</sup> Source: PG&E Climate Smart Program, Assumes 12,000 miles traveled/yr. Compares hybrid-electric subcompact with comparable vehicle: 2007 Toyota Prius (46 miles per gallon average fuel efficiency) and (non-hybrid) 2007 Honda Civic (29 miles per gallon average fuel efficiency)  
<http://www.pge.com/about/environment/calculator/assumptions.shtml>

<sup>4</sup> Assume NEV used for 20% of total trips, all local at average of 2.5 miles/trip. Total miles 1,800/year. NEV equivalent of 120 mpg.

<sup>5</sup> Assume 40 mile commute round trip, 48 weeks/yr: 9,600 miles/yr. Local commute not offset: 1,800/yr. Total miles avoided: 7,800/yr. Commute car average 29mpg (Honda Civic 2007).

Type	Estimated Annual GHG Savings	Longevity rating (1-5)	Confidence rating (1-5)
Contribution to local PV solar farm  To fully offset GHG emissions to meet new residential standard (1990 level)	Dependent on measure  4.9kW/unit <sup>6</sup>	4	5
<b>Partial Credit Measures (up to 10% of total project mitigation)</b> (Longevity or Confidence Ratings < 3)			
Car share program	Dependent on measure	Dependent on measure	2
Community engagement program (Davis Low Carbon Diet)	Dependent on measure	2	2

These measures are intended as a starting point and should not limit the development of potential mitigation measures by either the City or the development community.

In order to explore issues related to these mitigation measures, staff has outlined 3 mitigation scenarios for projects of several sizes using the mitigation measures from Table 3 above. The intent of the various scenarios is to advance the discussion of appropriate GHG mitigation measures and provide a general estimate of potential costs associated with the mitigation measures.

All mitigation scenarios are based on the following assumptions:

- GHG reduction amount is based on GHG emissions of the house portion of the overall GHG emissions associated with a residential land use (33% of residential GHG's)
- To achieve 1990 levels, each unit is required to reduce from 5.5 MT CO<sub>2</sub> to 3.1 MT CO<sub>2</sub> (a 44% reduction).  $5.5\text{MT} - 3.1 = 2.4\text{ MT reduction/unit}$ . Calculations based on Table 1 above.
- Total project credits for location on transit line and density varies in each of the examples (e.g. high, medium, and low density projects) and are applied to the total GHG emissions of the project.
- All costs are estimates based on general cost information and may vary significantly based on project specific factors (e.g. size of project). For the purposes of these scenarios, cost/unit is equal in all examples.

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<sup>6</sup> For calculation of GHG savings assume 1500 kWh per kw peak per year installed on a fixed tilt angle. Total reduction of 7,306 kWh/unit/yr needed based on EPA estimates (see footnote 2 above). Total estimated installed PV to offset residential energy use (electricity and natural gas) to reach 1990 levels is approximately 4.9kw/unit.

**Mitigation Scenario 1**

Project	Project Credits: 10%	GHG Reduction Req'd to meet 1990	Total project reduction of GHG
30 unit high density project on transit line	16.5 MT	72 MT	55.5 MT (122,322 lbs/CO2)
Total project GHG (house): (5.5 MT)(30 units)= 165MT	(165 MT)(10%)= 16.5 MT	(2.4 MT)(30 units)= 72MT	72MT-16.5MT= 55.5MT

**Mitigation Program: Scenario 1**

Mitigation	Reduction lbs CO2 / unit	Units	Total	% of reduction total	Potential Cost
Energy efficiency upgrades to new units: 25% above Title 24  Assume: 1,882 sq ft home	2,973 lbs/unit	30	89,190	72.9%	\$5,000/unit*
Household PV (4kW ave. system)	3,300lbs/unit	5	16,500	13.5%	\$15,000/unit
Energy efficiency upgrades to existing affordable housing units – air duct sealing, dual pane windows, HVAC upgrades, insulation, etc.	1,500lbs/unit	10	15,000	12.3%	\$3,000 unit
Energy efficiency upgrades to school district buildings – air duct sealing, energy- star lighting and appliances, HVAC upgrades, insulation, etc.	---	---	2,000	1.6%	\$2,000
<b>Subtotal</b>	---	---	<b>122,690 lbs</b>	<b>100%</b>	<b>\$257,000</b>
Contribution to local PV solar farm (Remaining reduction needed: 0 lbs)	786 lbs/kW	0	0	0	
<b>Total</b>	---	---	<b>136,690 lbs</b>	<b>100%</b>	<b>\$257,000</b> <b>(\$8,566/unit)</b>
<b>Credit</b>	---	---	<b>368 lbs</b>	<b>&lt;1%</b>	

\* City currently requires 15% better than Title 24 under its Green Building Ordinance. Incremental cost of achieving higher energy efficiencies than the current standard is less than amount shown.

**Mitigation Scenario 2**

<b>Project</b>	<b>Project Credits: 5%</b>	<b>GHG Reduction Req'd to meet 1990</b>	<b>Total project reduction of GHG</b>
150 unit low density project on transit line	41.25 MT CO2	360 MT	318.75 MT (702,525 lbs/CO2)
Total project GHG (house): (5.5MT)(150 units)=825MT	(825 MT)(5%)= 41.25 MT	(2.4MT)(150 units)=360MT	360MT-41.25MT= 318.75MT

Mitigation Program: Scenario 2

<b>Mitigation</b>	<b>Reduction lbs CO2 / unit</b>	<b>Units</b>	<b>Total</b>	<b>% of reduction total</b>	<b>Potential Cost</b>
Energy efficiency upgrades to new units: 35% above Title 24  Assume: 1,882 sq ft home	4,162 lbs/unit	150	624,300	88.9%	\$7,000/unit*
Household PV (4kW ave. system)	3,300lbs/unit	15	49,500	7.0%	\$15,000/unit
Energy efficiency upgrades to existing affordable housing units – air duct sealing, dual pane windows, HVAC upgrades, insulation, etc.					
Energy efficiency upgrades to city buildings – air duct sealing, energy-star lighting and appliances, HVAC upgrades, insulation, etc.	---	---	10,000	1.4%	\$10,000
Hybrid incentives for homeowners	2,900lbs/unit	5	14,500	2.1%	\$37,500
Neighborhood Electric Vehicle incentives for homeowners	913lbs/unit	10	9,130	1.3%	\$50,000
<b>Subtotal</b>	---	---	<b>707,430 lbs</b>	<b>100.1%</b>	<b>\$1,372,500</b>
Contribution to local PV solar farm (Remaining reduction needed: 0 lbs)	786 lbs/kW	0	0	0	
<b>Total</b>	---	---	<b>707,430 lbs</b>	<b>100.1%</b>	<b>\$1,372,500 (\$9,150/unit)</b>
<b>Credit</b>	---	---	<b>4,905 lbs</b>	<b>0.1%</b>	

\* City currently requires 15% better than Title 24 under its Green Building Ordinance. Incremental cost of achieving higher energy efficiencies than the current standard is less than amount shown.

**Mitigation Scenario 3**

Project	Project Credits: 7%	GHG Reduction Req'd to meet 1990	Total project reduction of GHG
250 unit medium density project on transit line	96.25 MT CO2	600 MT	503.75 MT (1,110,265 lbs/CO2)
Total project GHG (house): (5.5MT)(250 units)=1375MT	(1375 MT)(7%)= 96.25 MT	(2.4MT)(250 units)=600MT	600MT–96.25MT=503.75MT

**Mitigation Program: Scenario 3**

Mitigation	Reduction lbs CO2 / unit	Units	Total	% of reduction total	Potential Cost
Energy efficiency upgrades to new units: 35% above Title 24  Assume: 1,882 sq ft home	4,162 lbs/unit	250	1,040,500	93.7%	\$7,000/unit*
Household PV (4kW ave. system)	3,300lbs/unit				
Energy efficiency upgrades to existing affordable housing units – air duct sealing, dual pane windows, HVAC upgrades, insulation, etc.					
Energy efficiency upgrades to city buildings – air duct sealing, energy-star lighting and appliances, HVAC upgrades, insulation, etc.	---	---			
Hybrid incentives for homeowners	2,900lbs/unit	15	43,500	3.9%	\$112,500
Neighborhood Electric Vehicle incentives for homeowners	913lbs/unit	10	9,130	0.8%	\$50,000
Local employee designated housing (school district, city, UCD, etc.)	5,218lbs/unit	5	26,090	2.3%	
<b>Subtotal</b>	---	---	<b>1,119,220 lbs</b>	<b>100.1%</b>	<b>\$1,912,500</b>
Contribution to local PV solar farm (Remaining reduction needed: 0 lbs)	786 lbs/kW	0	0	0	
<b>Total</b>	---	---	<b>1,119,220 lbs</b>	<b>100.1%</b>	<b>\$1,912,500</b> <b>(\$7,650/unit)</b>
<b>Credit</b>	---	---	<b>8,955 lbs</b>	<b>0.1%</b>	

\* City currently requires 15% better than Title 24 under its Green Building Ordinance. Incremental cost of achieving higher energy efficiencies than the current standard is less than amount shown.

These scenarios show several possible mitigation programs. Flexibility is a key feature of the approach, with developers choosing the mitigation options (or proposing new) that provide the greatest benefit to their project while meeting the mitigation standards. Several projects have been proposed and approved during the development of the draft standards. The GHG mitigation proposal for each project is outlined below.

## **6. Current and recent projects - proposals to reduce GHG emissions**

Staff has been in discussion with the applicants for five projects during the development of the proposed new residential GHG standards. The draft standards have informed discussions with applicants regarding project GHG emissions. The direct and indirect effects of these discussions between project applicants and City staff are summarized below:

### Verona - Mace Ranch (Approved Summer 2008):

- Project approvals predated initial draft standards.
- Served as an early test case to understand the implications of the research and development of project level GHG standards.
- No GHG mitigation required or proposed (1<sup>st</sup> subdivision to meet Green Building Ord.)

### Grande (Approved January 2009):

- Project agreements with School District predated final draft standards.
- Project level GHG analysis advanced the understanding and implications of potential mitigation standards.
- Through Development Agreement negotiations, the City accepted a GHG mitigation in-lieu fee payment of \$500/unit and a commitment by the School District to create programs/curriculum to improve student and community awareness and develop solutions regarding global warming.

### Chiles Ranch (Planning Commission hearing scheduled for Spring 2009)

- Project applications and pre-application public input process predated adoption of recommended final draft standards.
- Sustainability principles incorporated into early project discussions with applicant and public input process.
- Mitigation proposal submitted by applicant to meet proposed 1990 GHG levels includes:
  - 35% better than Title 24 (2005 code)
  - 0.18 acre community garden (74 sq/ft per household)
  - \$1,000/unit contribution to a community engagement program (Low Carbon Diet)

Staff note: This proposal is the most well developed local project level GHG analysis and mitigation program reviewed to date. The community garden and low carbon diet measures rely on behavior change and lack certainty in GHG reductions. Therefore, if the recommended standards are adopted by the Council, the GHG savings associated with these two measures can satisfy up to 10% of the total required mitigation for the project.

Based on the recommended thresholds and standards, the Chiles Ranch GHG mitigation proposal would meet approximately 95% the project GHG mitigation requirements.

### Willowbank Park (Planning Commission hearing scheduled for Spring 2009)

- Project pre-applications predated adoption of recommended final draft standards.
- Sustainability principles incorporated into early project discussions with applicant.

- Preliminary mitigation proposal submitted by applicant focuses on behavioral change in existing households to address community scale issue.

Staff note: The preliminary proposal relies on behavior change (Davis Low Carbon Diet), which lacks certainty in GHG reductions. Therefore, if the recommended standards are adopted by the Council, the GHG savings associated with this measure can satisfy up to 10% of the total required mitigation for the project. See also discussion in analysis section above on the advantage of incorporating GHG mitigation into the project design.

Wildhorse Ranch (Planning Commission hearing scheduled for Spring 2009)

- Project applications predated adoption of recommended final draft standards.
- Project Draft EIR will include analysis of GHG emissions impacts and related mitigation measures. The GHG emissions standards and thresholds adopted by Council will help guide the EIR analysis.
- Sustainability principles incorporated into early project discussions with applicant.
- Sustainability proposal includes reducing residential energy demand by 25% below 2009 Title 24 standards, photovoltaic systems with a total capacity of 460 kW, and exceeding the targets of the City’s Green Building ordinance by 10 points.

If approved by the Council, the recommended standards will guide analysis of projects in process and negotiations of development agreements. Recommended follow up actions include development and adoption of an ordinance to establish a clear and consistent approach.

**7. Questions and responses related to the overall methodology**

- a. Question: What is the appropriate conversion rate for CO<sub>2</sub> per kWh?  
Response: To maintain consistency with the City’s GHG inventory, the conversion rate is based on the 2007 US EPA Annual Emissions Rate for California (0.724 lbs CO<sub>2</sub> per kWh). This impacts the calculation of the GHG emissions reduction associated with mitigation measures.
- b. Q: Should credit for transportation related factors (e.g. location on a transit line) be permitted if the City is currently only requiring mitigation for the non-transportation related GHG emissions?  
R: Staff believes this credit is appropriate as it recognizes the value of implementing smart growth policies. In addition, staff is recommending that an even stronger emphasis be placed on transportation projects that minimize GHG emissions. Therefore, transportation impact fees currently collected from projects will be more specifically directed toward projects that yield GHG savings over time.
- c. Q: Should there be a minimum “on-site” reduction requirement?  
R: No, a requirement is not anticipated to be necessary. The majority of GHG reductions are likely to take place on-site since these types of improvements have been shown to be a marketing advantage (e.g. more efficient homes, PV

systems, etc.) See discussion in analysis section: General standard – target year, project threshold, threshold of significance.

- d. Q: Should the City consider reallocating development impact fees/requirements to address GHG impacts?

R: Yes, see discussion in section below.

- e. Q: Should credit be given for energy efficiency improvements that have occurred in home design since 1990 (GHG targets baseline year)?

R: Staff does not believe that credit should be given for home design improvements since 1990 for the primary reasons that: (1) the 1990 date for GHG targets is arbitrary and therefore no significance can be attached to it. For the purposes of GHG reduction, the City could use 2009 as the baseline year and require that projects reduce below the current level, and (2) this would be giving a credit for meeting minimum standards that have not produced a decline in overall community GHG emissions.

## **8. Transportation development impact fees and GHG**

Davis has prioritized transit, walking and biking as a strategy to slow traffic growth in neighborhoods and improve the environment. With a better understanding of the substantial effect personal transportation has on local GH emissions, staff believes that it is appropriate to begin to place an even greater emphasis on creating and maintaining a greater range of transportation choices. These enhanced transportation options would be intended to work in concert with the City's strong land use policies that bring more people closer to shops, services, and jobs, reducing their need to travel long distances. Although the car will continue to play an important transportation role, its use will need to be deemphasized further to achieve a low carbon future.

To clearly articulate the City's mobility objectives, staff suggests that the following basic priorities guide future transportation investment by the City:

Minimize GHG emissions from local transportation by prioritizing:

1. Walking
2. Biking
3. Transit
4. Goods movement
5. Single-occupancy vehicles

These priorities will be considered in review and approval of the City's annual Capital Improvements Plan, as well as through grant funding activities. By prioritizing funding for transportation projects that minimize GHG emissions, new development projects would be making a small contribution toward the City's GHG reduction targets. It is anticipated that in future revisions to these GHG standards, projects will be asked to directly address a greater portion of the personal transportation GHG emissions associated with new residential projects.



### **9. Evaluation of the standard**

In order to maintain progress toward future GHG emission targets, staff recommends that the GHG standards for new residential projects be reviewed by the City at a minimum of every two years. The current effort is definitely a work in progress. Additional research at the regional and state level will allow for refinements in the City's approach unless/until there is a coordinated approach through SACOG or the state.

### **10. Monitoring results**

Monitoring mitigation performance is dependent on what measures are implemented. When CEQA approvals are necessary, monitoring can be included in the overall project mitigation monitoring program. Where CEQA approvals are not required but other discretionary approvals are, a basic monitoring program can be incorporated into the project conditions of approval. With the phased in approach that is recommended where most of the GHG savings are anticipated to come from energy efficiency in the house, the monitoring would be limited to verification of compliance with energy efficiency which is currently performed as part of the building permit review process (i.e. Title 24 calculations) and consistency with the Green Building Ordinance. Staff also believes that collaboration with UCD could serve both research and GHG monitoring purposes if long-term research projects are established.

### **11. Project recognition**

Quantification of GHG emissions at the project level enables the City to also recognize projects that exceed standards. Staff is recommending the following categories for project recognition:

- 7% better than 1990 levels (equal to 2012 Kyoto targets): Davis Green Residential Project
- 28% better than 1990 levels (equal to City 2020 desired target): Davis Deep Green Residential Project

Development of a recognition program could include recognition in the project approval process, development of outreach materials, logos, etc. This type of recognition program would be intended to work in conjunction with the existing Davis Green Building Ordinance recognition program.

### **Attachments**

1. Davis GHG Emission Targets – Resolution (2008)
2. Davis GHG Emission Thresholds and Standards for New Residential Projects - Resolution

**RESOLUTION NO. 08-166, SERIES 2008**

**RESOLUTION ADOPTING GREENHOUSE GAS REDUCTION TARGETS  
FOR THE CITY OF DAVIS (CITY OPERATIONS AND COMMUNITY)**

WHEREAS, the Davis General Plan establishes visions, goals and policies that guide the community away from impacts on natural systems and toward sustainability; and

WHEREAS, Davis has pursued policies and implemented innovative projects over the past four decades that place it among the leaders in the sustainable communities movement; and

WHEREAS, the adopted City Council goals for 2007/08 provide clear direction that action on climate change and related issues is a City priority; and

WHEREAS, as part of its action in adopting the City of Davis Climate Protection/Community Sustainability Framework Strategy in April 2007, the City Council directed staff to aggressively pursue actions to reduce the City's greenhouse gas emissions; and

WHEREAS, the City has adopted resolutions that outline the emerging global warming threat and encourage cities of all sizes to take preventative steps; and

WHEREAS, there is a scientific consensus, as established by the Intergovernmental Panel on Climate Change and confirmed by the National Academy of Sciences, that the continued buildup of anthropogenic greenhouse gases in the atmosphere threatens the stability of the global climate; and

WHEREAS, there are significant long-term risks to the economy and the environment of the United States, California, and the City of Davis from the temperature increases and climatic disruptions that are projected to result from increased greenhouse gas concentrations; and

WHEREAS, the potential impacts of global climate change, including long-term drought, famine, mass migration, and abrupt climatic shifts, may lead to international tensions and instability in regions affected and thereby have implications for the national security interests of the United States as well as security, economic, and environmental interests of the State of California and the City of Davis; and

WHEREAS, local governments greatly influence their community's energy usage by exercising key powers over land use, transportation, building construction, waste management, and in many cases energy supply and management; and

WHEREAS, local government actions taken to reduce greenhouse gas emissions and increase energy efficiency provide multiple local benefits by decreasing air pollution, creating jobs, reducing energy expenditures, and saving money for City government, for its businesses, and for its citizens;

WHEREAS, on September 29, 1999, the City of Davis adopted a resolution to participate in the Cities for Climate Protection Campaign; and

WHEREAS, on April 18, 2006, the City of Davis adopted a resolution endorsing the US Mayor's Climate Protection Agreement and committing to strive to meet the Kyoto emission reduction targets of 7 percent below 1990 levels by 2012.

NOW, THEREFORE, BE IT RESOLVED, the City Council of the City of Davis does hereby adopt the following greenhouse gas emissions targets for the Davis community and its own city operations:

**Davis GHG Reduction Targets: Community and City Operations**

Year	Target Range*		Notes
	State	Davis**	
2010	2000 levels	1990 levels	<u>Minimum:</u> State target.  <u>Desired:</u> Provides baseline for subsequent average annual reductions.
2012	1998 levels	7% below 1990 levels	<u>Minimum:</u> State does not establish target for this year; linear interpolation from 2010 target.  <u>Desired:</u> Consistent with Kyoto – Mayors Climate Protection Agreement Pledge – City of Davis Reso. 2006.
2015	1995 levels	15% below 1990 levels	<u>Minimum:</u> State does not establish target for this year; linear interpolation from 2010 target.  <u>Desired:</u> Consistent with initial ICLEI modeling conducted by the City.
2015 to 2020	Average annual reduction	Ave of 2.6% reduction/yr to achieve 80% below 1990 levels by 2040	<u>Minimum:</u> State does not establish target for these years.  <u>Desired:</u> Average reduction encourages monitoring of progress and some flexibility in implementation.
2020	1990 levels	28% below 1990 levels	<u>Minimum:</u> State target.  <u>Desired:</u> Average reduction encourages monitoring of progress and some flexibility in implementation.
2020-2040	No formal target, but must reduce an ave. of 2.66%/yr to achieve 80% below 1990 levels by 2050	Average of 2.6% reduction/yr to achieve 80% below 1990 levels	<u>Minimum:</u> State does not establish target for these years.  <u>Desired:</u> Reduction level adopted by the state based on climate stabilization levels of 3-5.5 degree increase in temp. Average reduction encourages monitoring of progress and some flexibility in implementation.
2050	80% below 1990 levels	Carbon neutral	<u>Minimum:</u> State target. Reduction level adopted by the state based on climate stabilization levels of 3-5.5 degree increase in temp. Average reduction encourages monitoring of progress and some flexibility in implementation.  <u>Desired:</u> Combination of actions at the local, regional, national, and international levels <b>and</b> carbon offsets. Similar to UC system, City of Berkeley, and Norway.

\* It is anticipated that Davis will achieve reductions within the range of the state targets (minimum) and local targets (desired).

\*\*Due to residency time of GHG gasses in the atmosphere, early GHG reduction is generally more beneficial for mitigation of the most severe impacts of climate change.

NOW, THEREFORE, BE IT FURTHER RESOLVED, the City Council of the City of Davis, to this end, continues to call upon all community members who live, work and attend school in the Davis area to participate in the achievement of the greenhouse gas reduction targets to the greatest extent feasible.

PASSED AND ADOPTED by the City Council of the City of Davis this 18th day of November, 2008 by the following vote:

AYES: Greenwald, Heystek, Saylor, Souza, Asmundson

NOES: None

Ruth Uy Asmundson, Ph.D.  
Mayor

ATTEST:

Zoe S. Mirabile, CMC  
Deputy City Clerk

**RESOLUTION NO. \_\_\_\_\_, SERIES 2009**

**RESOLUTION ADOPTING GREENHOUSE GAS REDUCTION THRESHOLDS AND STANDARDS FOR NEW RESIDENTIAL PROJECTS**

WHEREAS, the Davis General Plan establishes visions, goals and policies that guide the community away from impacts on natural systems and toward sustainability; and

WHEREAS, Davis has pursued policies and implemented innovative projects over the past four decades that place it among the leaders in the sustainable communities movement; and

WHEREAS, the adopted City Council goals for 2007/08 provide clear direction that action on climate change and related issues is a City priority; and

WHEREAS, as part of its action in adopting the City of Davis Climate Protection/Community Sustainability Framework Strategy in April 2007, the City Council directed staff to aggressively pursue actions to reduce the City's greenhouse gas emissions; and

WHEREAS, the City has adopted multiple resolutions that outline the emerging global warming threat and encourage cities of all sizes to take preventative steps; and

WHEREAS, there is a near unanimous consensus among climate scientists, as established by the Intergovernmental Panel on Climate Change and confirmed by the National Academy of Sciences, that the continued buildup of anthropogenic greenhouse gases in the atmosphere threatens the stability of the global climate; and

WHEREAS, there are significant long-term risks to the economy and the environment of the United States, California, and the City of Davis from the temperature increases and climatic disruptions that are projected to result from increased greenhouse gas concentrations; and

WHEREAS, the potential impacts of global climate change, including long-term drought, famine, mass migration, and abrupt climatic shifts, may lead to international tensions and instability in regions affected and thereby have implications for the national security interests of the United States as well as security, economic, and environmental interests of the State of California and the City of Davis; and

WHEREAS, local governments greatly influence their community's energy usage by exercising key powers over land use, transportation, building construction, waste management, and in many cases energy supply and management; and

WHEREAS, local government actions taken to reduce greenhouse gas emissions and increase energy efficiency provide multiple local benefits by decreasing air pollution, creating jobs, reducing energy expenditures, and saving money for City government, for its businesses, and for its citizens;

WHEREAS, on September 29, 1999, the City of Davis adopted a resolution to participate in the Cities for Climate Protection Campaign; and

WHEREAS, on April 18, 2006, the City of Davis adopted a resolution endorsing the US Mayor's Climate Protection Agreement and committing to strive to meet the Kyoto emission reduction targets of 7 percent below 1990 levels by 2012;

WHEREAS, on November 18, 2008, the City of Davis adopted a resolution establishing local greenhouse gas emission reduction targets that establish minimum and desired targets that are consistent with or exceed State of California GHG emission reduction targets; and

WHEREAS, it is estimated that a residence built today in Davis will last more than 100 years; and

WHEREAS, in order to meet future local GHG emission reduction targets, the residences built today must perform to future standards to minimize the need for and burden of future neighborhood scale retrofits that the community currently faces with the existing housing stock; and

WHEREAS, to address the financial burden on new residential development projects, these standards will be phased in over time, credit will be given for projects which build upon the City’s existing smart growth land use and transit patterns, and innovation will be encouraged with a flexible approach to mitigation that allows project applicants to develop low cost mitigation options provided certainty in the effectiveness of the measures is maintained;

NOW, THEREFORE, BE IT RESOLVED, the City Council of the City of Davis does hereby adopt the following greenhouse gas emission thresholds and standards for new residential development projects for the period from adoption to December 31, 2010:

**Davis GHG Reduction Thresholds and Standards: New Residential Projects**

**Table 1**

<b>Thresholds and Standards: 2009 to December 31, 2010</b>		
<b>New residential units</b>	<b>Standard</b>	<b>Mitigation</b>
Up to 12 units (less than 5% of total units in given year)	De minimis	No direct mitigation required – required to meet green building ordinance
13 to 25 units (up to 10% of total units in given year)	Reduce to 1990 levels (2.4 Metric Tons of CO2e reduction per unit)	In lieu fee option, LEED ND Gold standard or Individualized program
Greater than 26 units (greater than 10% of total units in given year)	Reduce to 1990 levels (2.4 Metric Tons of CO2e reduction per unit)	LEED ND Gold standard or Individualized program

Table 1 notes:

1. GHG reductions from 2010 baseline calculation of energy used in average Davis residential unit. GHG calculation excludes transportation.
2. Assume up to 250 units approved per calendar year based on City Council guidelines on residential growth.
3. In-lieu fee based on time of project approval cost of achieving 35% better than 2005 Title 24 plus \$1,000/unit to fund implementation of community GHG emission reduction programs.

**Project Credit Calculation**

**Table 2**

<b>Factor</b>	<b>GHG Credit</b>
Overall Project Density (General Plan density) – incorporates proximity to employment opportunities	

Factor	GHG Credit
<ul style="list-style-type: none"> <li>• High</li> <li>• Medium</li> <li>• Low</li> </ul>	<ul style="list-style-type: none"> <li>• 5%</li> <li>• 2%</li> <li>• No credit</li> </ul>
<b>Proximity to Transit</b> <ul style="list-style-type: none"> <li>• Less than ¼ mile</li> <li>• ¼ mile to ½ mile</li> <li>• over ½ mile to ¾ mile</li> <li>• Over ¾ mile</li> </ul>	<ul style="list-style-type: none"> <li>• 5%</li> <li>• 2%</li> <li>• 1%</li> <li>• No credit</li> </ul>

Table 2 notes:

1. Credits are cumulative.
2. Credits applied to total project GHG emissions.
3. Credits based on best available information adapted from SACOG traffic modeling to measure effects of project density and location near employment and transit on VMT. These credits may adjust up or down over time as more accurate data and modeling becomes available.

The following list of mitigation measures and estimated GHG savings are acceptable to satisfy the new residential GHG emission reduction standards. Alternative measures may be proposed by project applicants. The GHG savings, longevity and confidence of new alternative measures will be evaluated by the City and assigned as either full or partial credit measures or rejected. Partial mitigation credit measures may satisfy up to 10% of the total GHG mitigation requirements for a project.

**Table 3**

**Initial list of accepted GHG mitigation measures**

Type	Estimated Annual GHG Savings	Longevity rating (1-5)	Confidence rating (1-5)
<b>Full Credit Measures</b> (Longevity and Confidence Ratings > 3)			
Energy efficiency upgrades to new units above 2005 Title 24 standards.	Dependent on measure	Dependent on measure	Dependent on measure
Example: 25% above Title 24 standards for a 1,882 sq ft home	2,973 lbs/unit <sup>1</sup>	5	5
Household PV (4kW ave. system)	3,300lbs/unit <sup>2</sup>	4	5
Energy efficiency upgrades to existing structures (residential/non res)	Dependent on measure	Dependent on measure	Dependent on measure

<sup>1</sup> Estimate of building energy use based on MICROPAS that takes effect for the new standards beginning July 2009. MICROPAS is an industry standard computer modeling tool used to calculate compliance with **the California Residential Energy Standards (also known as Title-24)**. The heating, cooling, and water heating energy use from MICROPAS was combined with miscellaneous usage determined from Building America's benchmark process which is used to estimate miscellaneous consumption. The projections are based on many assumptions, and are intended give a reasonable indication of usage patterns with house size. Building America's benchmark process based on US Department of Energy, Building America Research Benchmark Definition, Updated December 20, 2007 (<http://www.osti.gov/bridge>)

<sup>2</sup> Source: PG&E Climate Smart Program, Typical residential system is 3 to 5 kW (4kW ave.); 18% capacity factor; operating 8,760 hours per year <http://www.pge.com/about/environment/calculator/assumptions.shtml>  
US EPA 2007 emissions rate for California (electric): 0.724 lbs CO<sub>2</sub> per kWh  
[http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007V1\\_1\\_year05\\_GHGOutputRates.pdf](http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007V1_1_year05_GHGOutputRates.pdf)

Type	Estimated Annual GHG Savings	Longevity rating (1-5)	Confidence rating (1-5)
PV on existing structures	Dependent on measure	4	5
Energy efficient and/or low carbon producing project infrastructure upgrades (over 2009 standards)  Example: Use of high volume fly ash concrete	Dependent on measure	5	5
Hybrid incentives for homeowners	2,900lbs/unit <sup>3</sup>	3	4
Neighborhood Electric Vehicle incentives for homeowners <sup>4</sup>	913lbs/unit	3	3
Local employee designated housing (school district, city, UCD, etc.)	5,218lbs/unit <sup>5</sup>	4	4
Contribution to local PV solar farm  To fully offset GHG emissions to meet new residential standard (1990 level)	Dependent on measure  4.9kW/unit <sup>6</sup>	4	5
<b>Partial Credit Measures (up to 10% of total project mitigation)</b> (Longevity or Confidence Ratings < 3)			
Car share program	Dependent on measure	Dependent on measure	2
Community engagement program (Davis Low Carbon Diet)	Dependent on measure	2	2

**PASSED AND ADOPTED** by the Davis City Council this \_\_\_ day of April 2009 by the following vote:

Ayes:

Noes:

Abstain:

\_\_\_\_\_  
Ruth Asmundson, Mayor

Attest:

\_\_\_\_\_  
Zoe Mirabile, City Clerk

<sup>3</sup> Source: PG&E Climate Smart Program, Assumes 12,000 miles traveled/yr. Compares hybrid-electric subcompact with comparable vehicle: 2007 Toyota Prius (46 miles per gallon average fuel efficiency) and (non-hybrid) 2007 Honda Civic (29 miles per gallon average fuel efficiency) <http://www.pge.com/about/environment/calculator/assumptions.shtml>

<sup>4</sup> Assume NEV used for 20% of total trips, all local at ave. of 2.5 miles/trip. Total miles 1,800/yr. NEV equivalent of 120 mpg.

<sup>5</sup> Assume 40 mile commute round trip, 48 weeks/yr: 9,600 miles/yr. Local commute not offset: 1,800/yr. Total miles avoided: 7,800/yr. Commute car ave. 29mpg (Honda Civic 2007).

<sup>6</sup> For calculation of GHG savings assume 1500 kWh per kw peak per year installed on a fixed tilt angle. Total reduction of 7,306 kWh/unit/yr needed based on EPA estimates (see footnote 2 above). Total estimated installed PV to offset residential energy use (electricity and natural gas) to reach 1990 levels is approximately 4.9kw/unit.