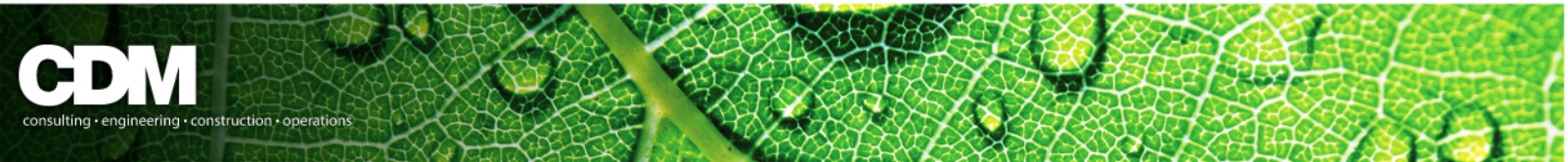
CITY OF ASHEVILLE

SUSTAINABILITY MANAGEMENT PLAN

AUGUST 2009



CITY OF ASHEVILLE

S U S T A I N A B I L I T Y M A N A G E M E N T P L A N

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and the

Office of Sustainability

in coordination with the

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SUSTAINABILITY MANAGEMENT PLAN

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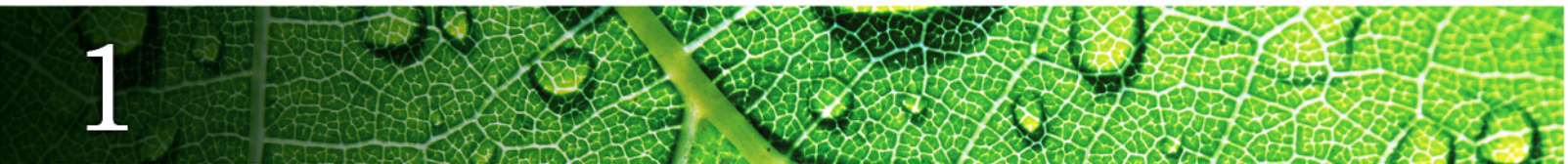
INTRODUCTION



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Section 1 Introduction:

Sustainable solutions meet the needs of the present without compromising the ability of future generations to meet their own needs. These solutions meet the "The Triple Bottom Line" by balancing environmental stewardship, economic growth and social responsibility.

The roots of sustainability in our culture originated in 1983 when the Brundtland Commission, also known as the World Commission on Environment and Development, was convened by the United Nations (UN) to address a growing concern "about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development." In 1987, the Brundtland Commission released their report, entitled *Our Common Future*, in which they defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The Brundtland Commission recognized that environmental problems were global in nature and that the unprecedented depletion of our natural resources would have rippling effects throughout the global economy and social structures. They also determined that it was in the common interest of all nations to establish policies for sustainable development and, because there are a finite amount of resources available to the world's growing population, there is a need for global management of these resources to ensure the continued high quality of life for future generations. The findings of the Brundtland Commission serve as the foundational basis and driver for the development of Asheville's Sustainability Plan (the Plan). Although the need for sustainable development is global in nature, responses begin on a local and regional level. The Plan will enhance the City and region's response in addressing this challenge.

In 1994, businessman and entrepreneur John Elkington coined the phrase "The Triple Bottom Line" (TBL) to describe a foundational approach to sustainability. The TBL has since become a widely accepted concept for sustainability management around the world. The TBL states that success is measured not only by financial performance (the traditional bottom line), but by balanced achievements in environmental stewardship, economic growth and social responsibility. The TBL is achieved when an integrated solution is found that simultaneously achieves excellence in these components, as opposed to finding tradeoffs among these areas. The City of Asheville uses this definition and approach to sustainability as the foundation of the Sustainability Plan.

Vision & Guiding Principles

Asheville is responding to the global and local imperatives for sustainability by determining what sustainability means for its community. The City of Asheville has taken the proactive approach of crafting a community vision for a future for Asheville that is based on sustainability. A Sustainability Vision and Guiding Principles statement was developed based on facilitated discussion with the City's Office of

Sustainability, Department Directors, the City's Sustainability Advisory Committee on Energy and Environment (SACEE), as well as information from the City Council's 2008-2009 Strategic Plan. In addition, a definition of sustainability was tailored for the City of Asheville. The definition and Vision and Guiding Principles will serve as the foundation for integrating sustainability into the City of Asheville's business strategy, policies and operations. A consensus-based definition of sustainability and key sustainability principles provide the underlying foundation for the Plan and constitute a vision for Asheville's future. For Asheville, being sustainable means:

"Making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs."

Accordingly, the City of Asheville strives toward sustainability in business strategy, policies and operations, and aims to demonstrate leadership to the community by the following guiding principles:

- Engaging and educating our employees and community about the challenges climate change presents, as well as driving a collaborative process to implement innovative solutions.
- Promoting inter-departmental collaboration for short- and long-term solutions to enhance the City's organizational excellence and financial efficiency.
- Modeling responsible energy management through efforts in energy efficiency and renewable energy generation.
- Addressing climate change through strategic management of our City facilities, transportation resources, water supply, infrastructure, land use planning, and solid waste.
- Supporting continued development of a diverse regional green economy.
- Measuring, monitoring and communicating the City's progress toward a defined goal set.

Focus Areas & Sustainability Goals

Every major sector of Asheville's City government has a role to play in advancing the sustainability vision; departments and individuals put the vision and guiding principles to work through their actions. As such, for organizational purposes, focus areas for improvement and strategic actionable goals were created. These focus areas and strategic goals cut across the City's organizational structure and require interdepartmental and intergovernmental coordination. An initial set of strategic goals were developed through facilitated discussions with the Office of Sustainability, SACEE, and Department Directors. These goals provided structure to the assessment of current progress in sustainability (Section 2 of this document) as well as the identification of opportunities for improvement (Section 3 of this document). Following the completion of the assessment and formulation of recommendations, the initial sustainability goals were refined to ensure that gaps in the sustainability program were

eliminated. The refined goals remain within the structure of the focus areas and comprise a comprehensive set of strategic goals that address the issues identified and analyzed throughout the planning process. Based on these sustainability goals, policies, plans, and actions in each area of government activity can advance the City's sustainability vision. The focus areas and refined strategic goals are presented in **Table 1.1**.

Table 1.1 - Sustainability Goals

Focus Area	Goal
Management Practices	Incorporate sustainability into the City's decision-making process.
	Provide adequate resources for the implementation of sustainability programs
	Increase the City's use of environmentally preferable products & services.
Employee Education	Incorporate sustainability into City communications & outreach efforts
	Increase voluntary employee energy conservation efforts through education
Greenhouse Gas Emissions	Participate in the City's energy management strategy to reduce greenhouse gas emissions
Land Use	Develop and redesign land use policies to support regional sustainable growth
	Support sustainable development projects, patterns, and building practices
Facilities	Reduce energy consumption from City facilities through demand reduction and energy efficiency.
	Increase renewable energy use for City operations
	Support the Resolution for LEED® certification for new City buildings
Transportation	Reduce vehicle miles traveled by City employees for commuting
	Reduce total fuel consumption of City fleet vehicles
	Increase transit ridership
	Establish a long term funding strategy for public transportation
	Support the reduction of vehicle miles traveled by City residents and visitors
Water	Continue to provide clean drinking water
	Reduce water consumption by City facilities
	Reduce energy use associated with treatment and distribution
	Increase renewable energy use for water production and distribution
	Support responsible consumption of water by residents and visitors.
Solid Waste	Reduce solid waste disposed at landfills from City facilities
	Increase our role as state leaders in sanitation and recycling

Applying a Management System Approach

As sustainability considerations become a larger part of our nation's business landscape, one emerging trend is that many organizations are setting sustainability goals and undertaking initiatives too often without a coordinated approach or a system to measure and report on the successes of implementation. Although this trend is likely the result of the unavoidable urgency surrounding sustainability and climate change as well as the need to respond to emerging mandates and public concern with limited resources, a sustainability program will achieve greater success through a consensus-based approach that is carefully planned.

Approaching sustainability in an organized manner is important to Asheville's success. A "sustainability performance improvement management system" has been identified for the City of Asheville as an organizational structure to help guide the City's efforts. A management system provides a decision-making structure and allows continual performance improvement by implementing processes that are synchronized with existing management systems and practices and by implementing these processes throughout the different levels of the City. A management system also enables organizations to define, communicate, and achieve balance in economic growth, environmental stewardship and social responsibility, through integration into planning and processes. **Figure 1.1** illustrates the steps that are involved in conducting a systematic program of advancing sustainability for the City of Asheville.

Figure 1.1 – Approach for advancing sustainability for the City of Asheville

Establish Vision and Strategic Goals

The initial step that was taken by the City of Asheville was to develop the sustainability vision, guiding principles and strategic sustainability goals for the program. These components serve as the foundation for the City's sustainability program, upon which future actions will be based. The stakeholder programs discussed above constituted this step of the process.

Conduct Assessment

An evaluation of the current conditions, programs, and important contextual factors was conducted to establish a baseline upon which further action can be taken (Section 2).

Identify & Rank Opportunities

The vision, goals, and current assessment were analyzed to derive opportunities for advancing sustainability. Opportunities were also captured through facilitated discussions with stakeholders (Section 3 of this document). The opportunities were then organized, aligned with the strategic goals and ranked according to a variety of criteria (Section 4 of this document).

Select Actions & Set Targets

Based on the rankings and the refined goals, opportunities will be selected for implementation. Measurement metrics and targets will be set for the refined goals.

Develop Action & Monitoring Plans

For the selected actions, Action Plans and Monitoring Plans will be developed to streamline resources, to determine roles and responsibilities, and to establish accountability for achieving progress.

Implement Initiatives

Upon approval and/or consensus on the Action Plans, the selected actions will be implemented.

Monitor Performance

Using identified metrics, targets, and the defined Monitoring Plan, Asheville will measure its performance towards achieving the established goals.

Communicate Progress

Asheville furthers its success in meeting the established goals by regular communication of achievements and milestones, as well as opportunities for improvement.

A management systems framework enhances the traditional planning process by allowing a continual reassessment of goals, as well as a monitoring of performance and communication of results. A structured management approach affords Asheville the opportunity to apply a comprehensive, dynamic structure to organize its sustainability efforts. This management system provides the overarching framework for operation; in order for the City's operations to effectively tackle the relevant issues, a detailed analysis of current conditions and future opportunities is needed.

The Sustainability Plan

The creation of this document, the Asheville Sustainability Plan, is the result of various concurrent impetuses. The Plan brings together the mandates and initiatives of various programs and constituents in the City of Asheville that have sought to address sustainability in a coordinated and comprehensive manner, including the following:

- The City of Asheville has been involved in several climate change initiatives. The City is a member of ICLEI – Local Governments for Sustainability, an international association of local and regional governments dedicated to sustainable development. ICLEI member cities are urged to participate in a GHG/climate change process with five important milestones, the third of which is the development of an action plan. Additionally, the City is a signatory to the U.S. Conference of Mayors' "Mayors' Climate Protection Agreement." Participating cities in the Agreement serve as conduits to spur local and state action in order to reduce global warming. In April 2007, the City Council passed a resolution committing the City to greenhouse gas (GHG) reductions of two percent per year from 2007 levels until an 80 percent reduction has been reached.

- Green building is a priority for the City. In April 2007, the City of Asheville also adopted a Resolution adopting the Leadership in Energy and Environmental Design (LEED) Standards for City-owned buildings. Buildings greater than

or equal to 5,000 square feet will be designed, contracted and built to achieve the LEED at least the Gold Certification level, and buildings under 5,000 will be built to Silver Certification level.

- In its 2008-2009 Strategic Plan, the Asheville City Council adopted 23 "Sustainable" goals and 15 "Green" goals. These goals included the creation of an Energy Management Plan and Municipal Action Plan for Climate change. The other "sustainable" and "green" goals, objectives, and action items are closely aligned with goals discussed earlier in this section, ranging from sustainable land use patterns to reduced energy consumption.

- As part of its commitment to Sustainability, the City Council created the Office of Sustainability in 2009. In addition, the Sustainability Advisory Committee on Energy and the Environment (SACEE), which advises the City County, has recognized the importance of a management plan for advancing the City's sustainability efforts.

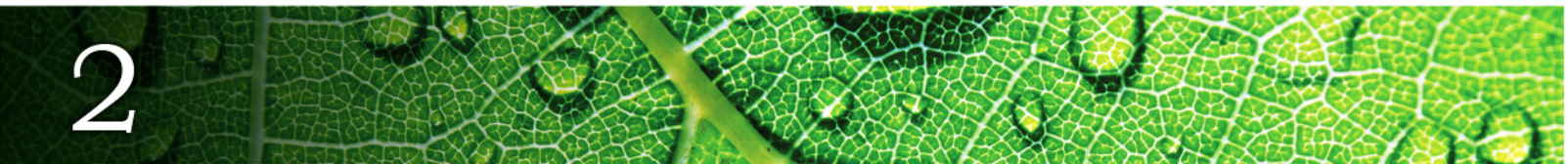
In 2007, the City Council passed a resolution committing the City to GHG reductions of 2% per year from 2007 levels until an 80% reduction is achieved.

This Sustainability Plan emerged from ambitious initial goals and initiatives. The Plan allows the City to address the "call to action" regarding individual issues, including climate change and green development, while expanding the sustainability program to encompass other important sustainability components and institute multidisciplinary approaches to achieving Asheville's commitment to sustainability and greenhouse gas reduction. The City of Asheville endeavors to make this Sustainability Plan as comprehensive as possible, not only for the benefit of its community but also so that it may be used as a resource for other cities nationwide.

The organization of this plan reflects the structure of the management system framework discussed above. In this section, the initial sustainability vision and strategic goals are presented. The analysis and recommendations provided in the plan address the major focus areas of Facilities, Transportation, Water, Solid Waste, Land Use, and Communication. Section 2 consists of the assessment of current conditions, while Section 3 contains analysis and detailed recommendations that present opportunities for further action. Section 4 of the Plan provides alignment of the opportunities with the strategic goals and applies a ranking protocol to assist in the prioritization of actions. Section 4 also discusses the remaining steps of the management system framework: implementation, monitoring, and communication. This framework serves as both an organization for this Plan and dynamic model that practitioners in Asheville will be able to use in conducting the practices advanced in the plan.

CITY OF ASHEVILLE

SUSTAINABILITY ASSESSMENT: THE FOUNDATION



Section 2
Sustainability Assessment:
The Foundation

This section presents the results of the assessment of current sustainability-related activities, and serves as the foundation for recommendations and actions towards a more sustainable future for the City of Asheville.

Greenhouse Gas Emissions

Summary of Supporting Science

A common theme in all of the focus areas discussed in this Plan is the reduction of greenhouse gas (GHG) emissions. Asheville's commitment to the reduction of 80 percent of the 2007 GHG emission levels was the principle impetus for this Plan. Underlying many of the analyses and recommendations in Sections 2 and 3 is the overarching objective to fundamentally shift away from unsustainable practices that contribute to environmental threats. As such, this section, while focusing on discreet operational areas, seeks to analyze the broader problem of Asheville's GHG emissions, specifically in regards to energy consumption. The baseline of current GHG conditions presented below establishes a foundation for other aspects of the City that are analyzed herein.

There is consensus among climate scientists that the increase of GHG emissions are anthropogenic or, in other words, caused by human activities such as the burning of fossil fuels, change in land use, and increased agriculture production. According to the International Panel on Climate Change (IPCC), concentrations of GHGs in the atmosphere have been on the rise since the industrial age. Currently, the concentration of carbon dioxide (CO2) is over 380 ppm, which far exceeds pre-industrial levels and those seen in the past 650,000 years (as determined through the analysis of ice core data). According to the IPCC, the concentration of CO2 in the atmosphere will need to plateau at 450 ppm in order to stabilize emissions and the effects of climate change. Because CO2 stays in the atmosphere for approximately 50 years, we are committed to a level of climate change from emissions already released, regardless of reductions made today.

There are six GHGs as identified by the IPCC: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF6). **Table 2-1** provides the common sources of each of these gases.

Each of these gases contributes to the greenhouse effect by trapping heat in the atmosphere and causing the global temperature to increase. The effects of climate change are already being seen throughout the world: global circulation models around the world indicate with high confidence that increased global temperature have led to a decrease in mountain glaciers and snow cover affecting water sources, increased global ocean temperatures, and melting of ice sheets. Both of the latter lead to a rise in sea levels, and in addition, an increase in ocean temperature may lead to greater storm intensity.

Table 2-1: Anthropogenic Sources of Greenhouse Gases

Carbon Dioxide	Fossil fuel combustion Solid waste combustion
Methane	Organic waste decomposition from landfills, water treatment, and agricultural sources Fossil fuel production
Nitrous Oxide	Agricultural sources Aerobic decomposition
Hydrofluorocarbons	Refrigerant sources
Perfluorocarbons	Various industrial processes
Sulfur Hexafluoride	Electrical transmission and distribution

The U.S. Environmental Protection Agency (EPA) projects that the effects of climate change on the state of North Carolina could include increased temperatures in all seasons, leading to more heat-related death and disease and affecting water quality and supply, increased precipitation resulting in flash flood events in the mountains and subsequent soil erosion, and the loss of species that have adapted to the state's historical climate. The City of Asheville feels that it is imperative that action to reduce GHGs be taken in order to avoid these effects.

In April 2007, the Asheville City Council passed a resolution committing the City to steady GHG reductions of two percent per year from FY 2007 levels until an 80 percent reduction has been reached. If the annual target is reached every year, the 80 percent reduction goal would be met in FY 2047. This Plan focuses on the City's existing processes and the actions the City could take in order to lessen its environmental impact. The aim of many of these measures, as reflected in the goals, is to decrease GHG emissions, mainly through the reduction in energy consumption and improvement in transportation activities.

This section establishes a baseline for greenhouse gas emissions by Asheville's service sectors, and profiles the existing conditions and ongoing activities related to addressing the goals for each sector.

GHG Emissions and Energy Consumption as a Sustainability Performance Metric

One indicator used to quantifiably measure sustainability is GHG emissions levels. As discussed in Section 1, climate change has multiple and far-reaching environmental, economic, and social effects. In order to begin to mitigate the effects of global warming and become a more sustainable city, Asheville has emphasized the importance of understanding their GHG emissions profile as part of their sustainability program. Since GHG emissions are, in part, the result of fossil fuel combustion the link between energy consumption and GHG emissions in City operations is apparent. This includes energy from streetlights, building heat and electricity consumption, energy used to treat water and wastewater, and from vehicle fuels.

Description of Process and Tools

The City of Asheville's greenhouse gas inventory used the ICLEI – Local Governments for Sustainability, Clean Air and Climate Protection Software (CACPS) tool to calculate emissions from City operations, including GHG emissions:

- Building heating, cooling, and electricity consumption;
- Vehicle fleet fuel consumption;
- Employee Commuting vehicle miles traveled consumption;
- Street lighting electricity use;
- Water and sewer treatment electricity use; and
- Asheville Transit fuel consumption.

The amount of energy used in each of the above sectors – or the activity data – was gathered for the City's baseline inventory year of FY 2007. The FY 2007 data were converted to emissions from the three major GHGs – carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) - through the use of activity and equipment-specific emission factors provided in the CACPS tool.

The total CH4 and N2O were converted to carbon dioxide equivalents (CO2e) using global warming potentials (GWP), then added to total CO2 emissions. A GWP represents the ability of each GHG to trap heat in the atmosphere and is the ratio of the heat-trapping ability normalized to that for CO2 (i.e., CO2 has a GWP of 1). The GWP values from the Intergovernmental Panel on Climate Change (IPCC) Second Assessment report were used. While these are not the most up-to-date GWP values available, they are the ones currently used by ICLEI and other accounting protocols, as shown in **Table 2.2.**

Table 2-2: IPCC GWP Values for GHG Pollutants

GHG Pollutant	GWP Values
CO_2	1
CH_4	21
N_2O	310

Summary of Results

GHG emissions from City operations in FY 2007 were 36,216 metric tons of carbon dioxide equivalents (MTCO2e). As **Table 2-3** and **Figure 2.1** demonstrate, City buildings are the largest single emitter, followed by water systems, vehicle fleet, employee commuting, street lighting, and the Asheville transit system. The figure below displays the percentage of GHG emissions each sector contributes to the total.

Table 2-3: GHG Emissions by Sector

Sector	$MTCO_2e$	% Total	Lbs CO_2e per Sq Ft	$MTCO_2e$ per Employee
Buildings	10,094	28	0.015	9.586
Vehicle Fleet	6,077	17	0.009	5.771
Employee Commuting	5,197	14	0.008	4.936
Streetlights	4,317	12	0.006	4.100
Water	7,967	22	0.012	7.566
Transit	2,564	7	0.004	2.435
Total	**36,216**		**0.053**	**34.394**

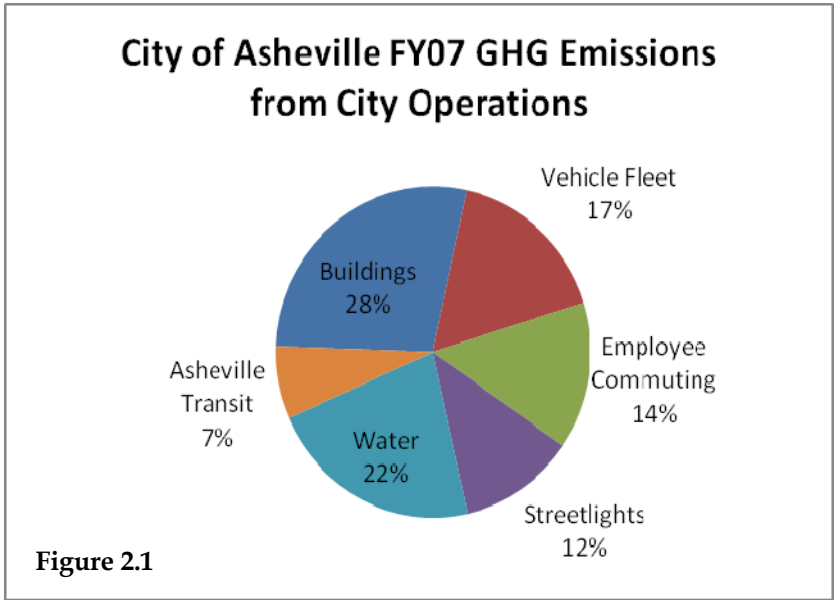


Figure 2.1

Future Emission Forecast (No-Action vs. Reduction Goals)

The emissions forecast attempts to compare the City GHG emissions based on current emission growth rates with the target reduction goal of a two-percent reduction annually until an 80 percent total reduction is reached The difference between the two scenarios shows where the gap in reductions are.

No-Action Scenario

The No-Action scenario demonstrates the estimated emissions from City operations if no reductions measures are taken (**Table 2.4, Figure 2.2**). This scenario uses the FY 2007 emission levels as a baseline. By 2050, GHG emissions in the City may increase from 36,216 $MTCO_2e$ to 50,653 $MTCO_2e$ – an increase of approximately 40 percent.

The most effective way to forecast emissions for City operations is to use goal square footage estimates for building expansion, changes in the number of City employees, and changes in the number and type of City vehicles. However, these future estimates were not readily available. Instead, in the absence of multiple consecutive year GHG inventories for the City, an annual growth rate of 0.6559 (0.66) percent was used. This is equal to the rate of increase between the City's FY 2007 baseline and FY 2008 inventories (the only two consecutive year inventories). To ensure this rate was a reasonable and conservative assumption, the average annual emissions growth rate between FY 2001 (the only other year inventoried) and the FY 2007 baseline was compared; it is 0.6427 percent or a difference of only -0.0132 percent.

No-Action Annual growth rate based on FY07 to FY08 increase = 0.6559%

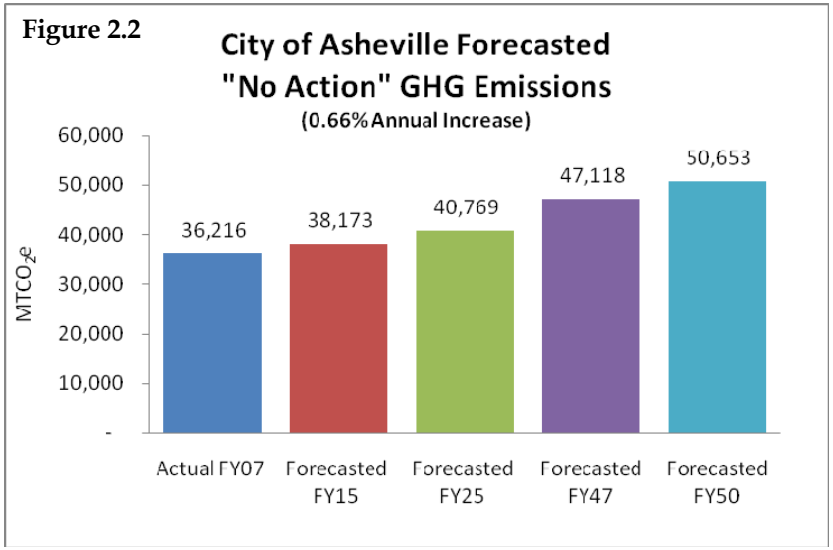
Table 2-4: No-Action Scenario Forecast[1]

Sector	Actual FY07	Forecast FY15	Forecast FY25	Forecast FY47[2]	Forecast FY50
Buildings	10,094	10,640	11,363	13,133	14,118
Vehicle Fleet	6,077	6,405	6,840	7,906	8,499
Employee Commuting	5,197	5,478	5,851	6,762	7,269
Streetlights	4,317	4,551	4,860	5,617	6,038
Water	7,967	8,398	8,968	10,365	11,143
Transit	2,564	2,703	2,886	3,336	3,586
Total	36,216	38,173	40,769	47,118	50,653
Percent Change since FY07		5.4%	12.6%	30.1%	39.9%

[1]Units = $MTCO_2e$

[2]FY 2047 is the year the 80% reduction target should be met

Figure 2.2



Reduction Goals Scenario

The Reduction Goals scenario demonstrates the estimated emissions from City operations if the City is able to reduce emissions two percent per year from the FY 2007 baseline or 719.60 MTCO2e. The City's full goal requires reductions until the 80 percent reduction from the FY 2007 baseline target is met – which in this scenario is in FY 2047 (**Table 2.5, Figure 2.3**). By 2050, GHG emissions in the City would decrease from 36,216 MTCO2e to 5,070 MTCO2e – a decrease of 86 percent. This scenario does not take into account any specific emissions reductions projects.

Reduction Goals Total 2% reduction from FY07 baseline ($MTCO_2e$) = 719.60

Table 2-5: Reduction Goals Scenario Forecast

Sector	Actual FY07	Forecast FY15	Forecast FY25	Forecast FY47[2]	Forecast FY50
Buildings	10,094	8,479	6,460	2,019	1,413
Vehicle Fleet	6,077	5,104	3,889	1,215	851
Employee Commuting	5,197	4,366	3,326	1,039	728
Streetlights	4,317	3,627	2,763	863	604
Water/Sewer	7,967	6,692	5,099	1,593	1,115
Asheville	2,564	2,154	1,641	513	359
Total	36,216	30,422	23,178	7,243	5,070
Percent Change since FY07		-16.0%	-36.0%	-80.0%	-86.0%

[1] Units = $MTCO_2e$

[2]FY 2047 is the year the 80% reduction target should be met

The Emissions Gap

The findings from the No-Action and Reduction Goals scenarios were compared to determine the gap in GHG emissions (**Table 2.6, Figure 2.4**). In other words, if the current trend of increasing emissions continues in the City, how far away from the original reduction goal does that bring the City?

Figure 2.3

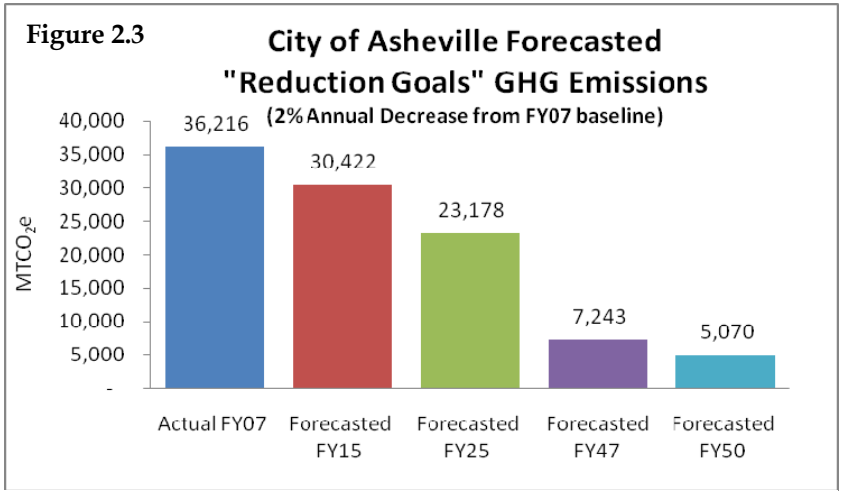


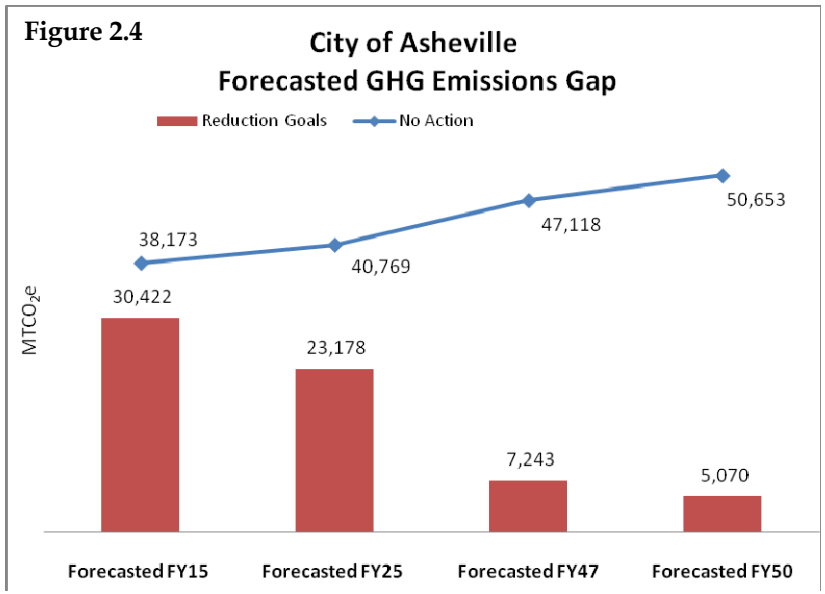
Table 2-6: GHG Emissions Gap between Forecasted No-Action & Reduction Goals

Scenario	Actual FY07	Forecast FY15	Forecast FY25	Forecast FY47*	Forecast FY50
Baseline	36,216	-	-	-	-
No-Action	-	38,173	40,769	47,118	50,653
Reduction Goals	-	30,422	23,178	7,243	5,070
Emissions Gap	-	(7,752)	(17,590)	(39,874)	(45,583)
Percent difference		-20%	-43%	-85%	-90%

[1] Units = $MTCO_2e$

[2]FY47 is the year the 80% reduction target should be met

Figure 2.4



By FY 2047, the year the 80 percent reduction from the FY 2007 baseline is projected to be achieved, there is a gap of almost 40,000 $MTCO_2e$, which is 85 percent higher than the emissions target for that year. By FY 2050, the gap jumped to over 45,000 $MTCO_2e$. These comparisons demonstrate the importance of early action. Proactive measures taken by the City to reduce GHG emissions can significantly affect whether the reduction goal is met.

Resolution Adopting LEED Standards

In April of 2007, the Asheville City Council adopted a resolution which states that all new construction of City buildings greater than or equal to 5,000 square feet must be designed, contracted, and built to LEED Gold Certification standards. However, if the payback period is greater than 10 years, a LEED Silver certification is acceptable. The resolution also stated that all new construction of City buildings less than 5,000 square feet must be designed, contracted, and built to a minimum of LEED Silver Certification (**Table 2.7**).

Table 2-7: Council Resolution Requirements

Square Footage	≥ 5,000	≥ 5,000	< 5,000
LEED Certification	Gold	Silver	Silver
Payback Period	≤ 10 years	>10 years	n/a

State and Federal Energy Planning

Energy planning within the state of North Carolina and the federal government may create opportunities for the City as it moves forward with its own initiatives. In some cases, there may be financial incentives that the City may take advantage of while others may give added support to current and future initiatives.

State Energy Plans

Effective on January 1, 2008, the state of North Carolina adopted a Renewable Energy and Energy Efficiency Portfolio Standard (REPS) under Senate Bill 3[1] which places an

[1] http://www.ncga.state.nc.us/Sessions/2007/Bills/Senate/PDF/S3v6.pdf

obligation on the electricity suppliers within the state to generate a certain percentage of electricity from renewable sources. Included in the list of eligible renewable sources are solar photovoltaic (PV) and heating applications, wind energy, biomass, demand side management, energy conservation, and energy efficiency. The renewable energy goal is 12.5 percent of retail electricity sales by 2020 for investor-owned utilities and 10 percent of retail electricity sales for municipal utilities and cooperatives by 2017.

The REPS created a market for Renewable Energy Credits (REC) to be sold and traded within a state. Every megawatt-hour (MWh) of electricity that is generated by a renewable energy source creates a REC, which is the bundle of the environmental benefits or attributes from generating a single MWh of electricity from a renewable source. Renewable energy generators feed electricity directly into the grid and may sell unique RECs to electric utilities within North Carolina. The utilities are required to hold enough RECs to meet the state-wide RPS in a given year, in order to avoid penalties.

The NC REC market could be a revenue source for the City of Asheville, which may improve the payback period for renewable energy projects. However, once a REC is sold into the market, the generator – in this case the City – may no longer take credit against its own carbon footprint for the environmental benefits from generating renewable energy since in effect; the utility that purchased the REC is allocated the reduction in GHG emissions. This means that if the City sells RECs, the energy or GHG reduction cannot count towards GHG or renewable energy goals.

Federal Energy Plans

With the recent change in federal leadership, there are many initiatives that are underway which may affect the City, including a Federal RPS, which Representative Bingaman (D-N.M.) is introducing in the Spring of 2009, as well as municipal incentives for energy efficiency and renewable energy.

Buildings, Public Facilities, and Street Lighting

Role of Facilities in Sustainability, Energy Consumption and Emissions

The U.S. Green Building Council (USGBC) provides statistics which claim that nationally, buildings impact resources by using 40% of primary energy use, 72% electricity consumption, 39% CO_2 emissions, and 13.6% potable water consumption. In fact, buildings are the largest contributor to global CO_2 emissions, followed by transportation and industry. Numerous studies by the GSA and Kats and Turner have determined that green buildings have staggering improvements over non-green buildings by percentages such as the following:

- Reduced energy use by 24-50%
- Reduced CO2 emissions by 33-39%
- Reduced water use by 40%
- Reduced solid waste by 70%

Green buildings or "high performance buildings" are typically the most significant contributor to energy reduction and achieving emissions targets at an organizational level. As a result, many cities, counties, corporations, and Federal agencies are adopting green building policies and ordinances to help reduce their overall energy consumption and carbon emissions.

Green buildings or "high performance buildings" are typically the most significant contributor to energy reduction and achieving emissions targets at an organizational level.

Buildings are not just energy consumers; they are the places where we work, and in the case of municipalities, they are the places where critical public services are housed. In addition to energy, GHGs, and costs savings benefits, there are other benefits which are difficult to quantify, including productivity related to cleaner indoor air, sun and daylight, thermal comfort and control, lower volatile organic compounds (VOCs) from carpets, paints, and sealants, higher building values, lower insurance rates, and a host of other benefits.

For Asheville, a comprehensive review of current conditions is necessary prior to planning for future improvements to the City's buildings and facilities. In this section, general commentary is provided related to the overall condition of the City's existing building portfolio, and in Section 3, detailed case studies of six major facilities are described as well as recommendations to address a few overarching deficiencies related to building operations, long term energy management planning, and missed energy savings opportunities.

Existing Conditions for Facilities

The City of Asheville owns and operates 62 buildings, varying in age and totaling over 700,000 square feet. In addition to these typical buildings, the City also maintains over 10,000 streetlights, water and waste wastewater treatment plants, and recreational facilities. These City facilities help support the services necessary for the approximately 76,000 residents of Asheville.

To provide an understanding of the existing conditions and current initiatives for City buildings and facilities, the following sections provide a general assessment of HVAC, lighting, building envelope, water and wastewater, irrigation, on-site renewable energy, operations and maintenance, and street lighting. These descriptions are based on site inspections of six representative public buildings in Asheville, with extrapolations made to the larger building inventory, as appropriate. Detailed case studies of the six buildings with enhanced analysis and identification of opportunities for improvement are presented in Section 3.

HVAC

Comprised of several different building types and occupancies, the City of Asheville's heating, ventilation, and air conditioning systems and equipment are as diverse as the buildings which they serve, with the age and condition of equipment varying greatly within and among buildings. Although maintenance staff has kept all equipment operational when possible, it is evident that equipment maintenance and upkeep are lacking, as is unfortunately typical with public facilities under tight budgets. Equipment and systems that have the potential for energy savings, such as variable frequency drives, have been bypassed or removed because repair funding has not been available. In addition, system controls are often outdated or do not allow for best energy management practices.

Lighting

According to the EPA, artificial lighting typically accounts for as much as 40 percent of total energy use in a commercial facility. The City has completed energy assessments and some energy efficiency upgrades to a few buildings, including City Hall, the Public Works Building, and the Civic Center, but much more can be accomplished. Some of the common energy inefficiencies throughout the buildings are light fixtures with T12 lamps, mercury vapor lamps, and incandescent lamps and exit signs. Additionally, some of the private offices, storage areas, bathrooms, and conference rooms with multiple luminaries did not have occupancy sensors. Energy conservation awareness is promoted, however, with "Save Energy" stickers posted on light plates as a reminder for City employees to practice energy conservation.

Building Envelope

It is estimated that the building envelop can contribute to as much as 20% of energy performance when considering glazing amounts, thermal performance, and daylight harvesting. The City has an existing building portfolio which is predominately older than 15 years and is a good candidate for envelope improvements. Observed areas for improvement should be window and glazing replacement, increasing insulation thermal r-Values for any roof replacements and interior renovations, daylight harvesting by lighting controls, and skylight or light tube additions.

Water & Wastewater

The City's facility water and wastewater sanitary systems are standard and typical for each given installation. Fixtures are of standard commercial design, with no observed water conservation measures utilized, such as low-flow sink fixtures, dual flush toilets, waterless urinals, or other. Limited, if any, grey water recycling has been implemented at City facilities.

On-site Renewable Energy

No onsite renewable energy systems are currently installed in public buildings or facilities. Renewable energy should be pursued after energy efficiency measures have been taken to maximize the energy savings and carbon benefits. Preliminary wind studies have been done by the Appalachian State University Energy Center, which identify potential on three City-owned parcels.

Operations and Maintenance

Current operations and maintenance procedures have generally been based on reactionary measures. Due to budget constraints, City maintenance staff devote much of their time to addressing current problems on an as-needed basis which has resulted in missed opportunities to provide energy efficient solutions and proactive prevention of facility issues. Currently, the City of Asheville employs (3) people to service and maintain 62 buildings. According to the International Facility Management Association (IFMA) Operations and Maintenance, staff benchmarking is approximately (1) staff member for every 50,000 GSF. IFMA staff requirements assume duties that include general maintenance and repair including painting every 5-7 years. It is evident by these numbers that City Maintenance staffing levels are below what is recommended by IFMA and other industry standards.

City maintenance staffing levels are below what is recommended by the International Facility Management Association and other industry standards.

Street Lighting

The City's street lighting is comprised of a variety of lamp light sources and wattages. Progress Energy owns, operates, and maintains the street lighting system. The City of Asheville pays Progress Energy a flat rate for the use of the equipment to light streets and for the electricity. Commonly used lamp types and wattages include 70W-400W Sodium Vapor lamps, 100W-400W Metal Halide (MH) lamps, and 175W-400W Mercury Vapor (MV) Lamps. Control of these systems is either via photocell or timer. There are approximately 2,850 Sodium Vapor Lights and 55 Metal Halide lamps; the remainder of the 6,900 street lights use Mercury Vapor Lamps, which are very inefficient, and current legislation now prohibits the manufacturing and importing of mercury vapor lamp ballasts. The total estimated energy consumption for the street lighting per year is 7,900,000 kWh based on an average operation of 12hours/day. Approximately 5,342,000 kWH of energy is consumed by the Mercury Vapor lamps.

Current Initiatives and Plans

LEED for New Construction

The City of Asheville is recognized among other cities for a resolution passed on April 24, 2007 stating that all new, occupied, City-owned buildings greater than or equal to 5,000 square feet will be designed, contracted, and built to achieve LEED Gold, and the highest level of certification (currently platinum) should be strived for whenever project resources and conditions permit. In addition, all new, occupied City-owned buildings which are less than 5,000 square feet will be designed, contracted, and built to incorporate measures that would allow them to be certified at a minimum of LEED Silver certification.

The City of Asheville's ordinance for LEED Buildings will help reduce new building environmental impact, but the ordinance does not address existing buildings within the City's portfolio. Improving existing building performance will require greater strategic planning, but will ultimately produce the greatest benefit to meeting the City's goals.

Capital Improvement Plan and Financing Strategies

The City has identified over $31 million dollars in capital improvement needs for over 60 City buildings and recreational facilities from Fiscal Year 2009/2010 to Fiscal Year 2014/2015. These improvements include replacement and enhancement of windows and doors, roofs, electrical systems, HVAC systems, restrooms and shower facilities, flooring, and structural improvements. These improvements represent only a small portion of the potential upgrades for improving building energy and water performance within Asheville's building inventory. The City has considered pursuing performance contracting as a mechanism for reducing energy use and emissions production within City buildings. Under a performance contract, an energy service provider would provide the capital for efficiency improvements, the debt for which would be serviced with the City's utility savings.

The City of Asheville's ordinance for LEED Buildings will help reduce new building environmental impact, but the ordinance does not address existing buildings within the City's portfolio

Transportation

Role of Transportation in Sustainability, Energy Consumption, and Emissions

In 2000, transportation fuel use accounted for more than 29 percent of North Carolina's gross greenhouse gas (GHG) emissions.[2] In the City of Asheville, the City's vehicle fleet accounted for nearly 17 percent of the total 36,216.4 tons of GHG emissions by City government activities in 2008. City employees' commutes accounted for another 14 percent of total GHG emissions. In the state, as in the City, only electricity usage produces more GHGs than the transportation sector.

In 2008, the City of Asheville's fleet and employees' work commute accounted for nearly 31% of the total GHG emissions by City government activities.

In 2000, gasoline- and diesel-powered vehicles accounted for nearly 93 percent of North Carolina's GHG emissions in the transportation sector.[3] Thus, fuel consumption must be minimized in order to reduce the level of pollutants being released, resulting in a more sustainable environment. Sustainability in transportation focuses on accessibility, mobility, and choice. Alternatives to the single-occupancy gasoline- or diesel-powered vehicle need to be convenient and interconnected in order to create viable modal choices for consumers.

[2] North Carolina Climate Action Plan Advisory Group (CAPAG). *Recommended Mitigation Options for Controlling Greenhouse Gas Emissions.* Final Report. October 2008.
[3] Ibid.

Existing Conditions for Transportation

City of Asheville employees commute on average nearly 13 miles to their primary workplace, and collectively travel by nearly all transportation modes. In order to ascertain the reasoning behind commuting choices, it is necessary to gain an understanding of existing conditions. This section of the Sustainability Plan provides an inventory of current transportation infrastructure within the City of Asheville.

Airport

The City of Asheville and its greater metropolitan region is served by the Asheville Regional Airport, a general aviation and commercial airport. The Airport is located in Buncombe County, approximately 10 miles south of Asheville's city limits. The Asheville Transit Service's Route 6 bus line serves the Asheville Regional Airport.

The Airport has an 8,001-foot runway, a full parallel taxiway, and a 163-acre terminal area. As of November 2008, the total year-to-date passenger traffic was 512,677.[4] Additionally, the total year-to-date aircraft operations, including commercial, general aviation, and military, was 72,068.

[4] November 2008 is the latest data available. Asheville Regional Airport. "Monthly Traffic Report." December 2008.

Bicycle

Within the City of Asheville, there are 10 locally signed neighborhood bicycle routes which primarily serve recreational users.[5] Additionally, multi-use and mountain bike trails are located in regional parks such as Bent Creek and the North Carolina Arboretum. Shared-use paths are located along W.T. Weaver Blvd (within the Glen's Creek Greenway), Amboy Road, and Broadway (within the Reed Creek Greenway). Bicycle racks and "Share the Road" signs are located throughout the City, although the former are primarily found Downtown. Designated bike lanes are found along Lyman Street/Riverside Drive, a segment of College Street located downtown, and a segment of Bleachery Road located near Wal-Mart. Additionally, all City buses have bicycle racks on the front of the bus, large enough to hold two or three bicycles. If the racks are full, bicycles may be brought on board if conditions permit. The City's Comprehensive Bicycle Plan proposes to expand and interconnect current facilities into a 181-mile network of bicycle facilities.

Greenway

A greenway is a corridor of preserved open space which often follows a natural or man-made feature, such as a creek or river. Greenways are often used for conservation and recreation and can also be used for transportation. They can serve as pedestrian amenities and provide links between bicycle facilities. Greenways are constructed according to the 1998 Greenway Master Plan and the subsequent 2003 Update and by the combined efforts of the City Transportation and Engineering Department and Parks, Recreation, and Cultural Arts Department. Approximately 2.93 miles of greenway have been developed in the City of Asheville. Fourteen corridors and 29 miles of trails are planned throughout the City.

Paratransit

Mountain Mobility serves as Buncombe County's Community Transportation System and is administered and operated by the Buncombe County Planning and Development Department's Transportation Division. Mountain Mobility operates deviated fixed routes serving the Black Mountain, Swannanoa, and the Enka-Candler communities. Additionally, it is planning to offer fixed route service to the Town of Woodfin. Mountain Mobility contracts with a number of agencies, including Asheville Transit Services (ATS). The agency provides transportation to all qualifying individuals who are unable to use the ATS bus due to a handicap. The Mountain Mobility Black Mountain and the Enka-Candler routes both connect to fixed ATS routes, thus offering feeder service into Asheville.

General service is provided Monday through Saturday, from 5:30 a.m. to 11:30 p.m. ATS paratransit services are available during ATS service hours for those within a three-quarter mile radius of an ATS route. Mountain Mobility has a fleet consisting of 34 vans and two small buses. On an average weekday, they provide approximately 500 passenger trips throughout the County.

[5] City of Asheville, Bicycle Comprehensive Plan, February 2008.

Pedestrian

The City of Asheville undertook a sidewalk inventory from 1995-1999 and created a supplemental inventory for *The City of Asheville Pedestrian Plan,* published in 2005. Along each street the presence, width, condition, and material of the sidewalks were recorded. The surveys identified approximately 151.75 linear miles of existing sidewalk. Of the existing sidewalk, 11.63 linear miles were rated in "Poor" condition, 2.86 linear miles were deemed "non-compliant" with the American Disabilities Act (ADA) federally mandated 48-inch width, and 36.64 linear miles were deemed "compliant with obstacles." Additionally, of the 1,519 wheelchair ramps on City streets, 266 were categorized as "non-compliant." Furthermore, the 2005 survey found that approximately 108 linear miles of identified needed linkages remained outstanding from the 1999 inventory.

The City of Asheville employs dedicated sidewalk crews in order to maintain and enhance the sidewalk network. Sidewalks are constructed by the combined efforts of the City Transportation and Engineering Department and Public Works Department. In 2008, five miles of sidewalks were installed by City crews, three of which were done in partnership with North Carolina's Department of Transportation (NCDOT).[6]

The City of Asheville is in the process of upgrading its entire traffic signal system. As of January 2009, the City maintained traffic signals at 38 intersections, mostly in the central business district with some outlying intersections. The City Traffic Engineer assesses pedestrian safety concerns at each signalized intersection. Pedestrian-specific signals and traffic signal phasing are incorporated into the transportation network. The City is also responsible for installing and maintaining crosswalks on all local City-maintained roadways.

Rail

Within the Asheville metropolitan region, there are three major rail corridors, all of which are limited to freight service and controlled by Norfolk Southern Railway.

Since 1997, the NCDOT's Rail Division has considered passenger rail service in Western North Carolina and has commissioned studies and a long-term funding plan for the infrastructure improvements necessary for the implementation of such a service. The Asheville Chamber of Commerce's 2008 Legislative Agenda urges the NC General Assembly to address the passenger rail need in the area. Additionally, the French Broad River Metropolitan Planning Organization (FBRMPO) supports a passenger rail line through Asheville, envisioning the rail station as not only a multi-modal hub for

[6] "2008 City of Asheville Highlights and Accomplishments." Accessed: www.ashevillenc.gov/government/subpage.aspx?id=14406.

passenger rail and transit but incorporated into the Asheville greenway system as well.[7]

Roadway

The City of Asheville is served by three interstate highways: I-26, I-40 and I-240 (**Figure 2.5**). I-26 runs north-south from Columbus, OH to Charleston, SC. I-40 runs east-west from Wilmington, NC to Barstow, CA. In Asheville, I-40 runs south of downtown, parallel to the French Broad River. I-26 does not yet meet interstate standards from where it intersects I-40 in Asheville to where it crosses the Madison-Buncombe County line, and is thus deemed incomplete. Completion of the corridor is not expected until at least 2015.[8] I-240 is an interstate loop running into downtown Asheville. It connects with I-40 to the south, and I-26 to the west. A four-mile segment of I-240 is being renumbered as I-26 as part of the I-26 Connector construction project.

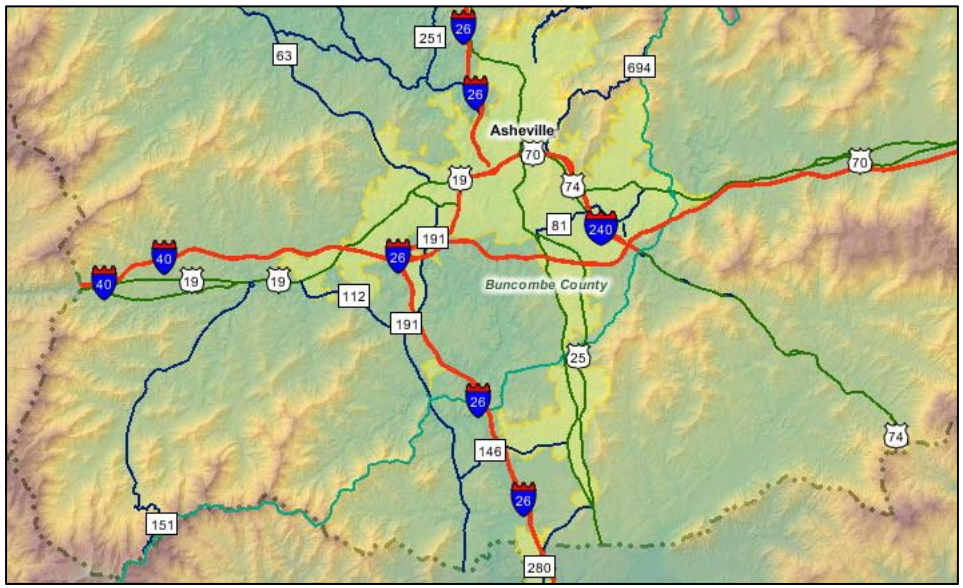


Figure 2.5: City of Asheville major roadways (Source: mapAsheville GIS)

Additionally, I-240 merges with several US highways, including US19/23 and US 70.

US 19/23, 25, 25A, 70, 74, and 74-A, as well as state routes, branch out from the City, providing local access to communities and towns within Buncombe County. Within the City of Asheville there are a total of 570 State- and City-maintained streets. The City-maintained local roadways comprise approximately 380 miles of that total.

Parking facilities within the City of Asheville include on-street short-term metered parking, on-street permit parking, off-street permit parking and garage parking. There are more than 700 on-street metered spaces throughout downtown Asheville.

The Civic Center Garage is the largest City garage with 550 spaces. The garage is located behind the Buncombe County Public Library, adjacent to the Civic Center. The Rankin Avenue Garage, with 262 spaces, is located immediately next door to the Civic Center Garage. The Wall Street Garage, located across from the Grove Arcade, has 232 spaces. Additionally, the City of Asheville owns two lots and a garage on Haywood Street that are managed by a private contractor. The City of Asheville's Parking Services maintains waiting

[7] French Broad River Metropolitan Planning Organization. *Transportation 2030: The Multi-Modal, Long Range Plan for Buncombe, Haywood and Henderson Counties.* Approved by the Transportation Advisory Committee September 22, 2005.
[8] Ibid.

lists for on-street, off-street, and parking garage permits and offers available permits on a first come, first served basis.

The Downtown Parking Action Plan, developed in 2006, projected that existing parking in downtown Asheville will not be sufficient by 2011. As of January 2008, an additional 700 parking spaces are necessary in order to meet projected peak demand.[9]

Bicycle parking is available in the three City garages as well as at City and privately owned bicycle racks throughout downtown. Bicycle parking equal to five percent of vehicular parking is a required component for new commercial and multi-family residential development projects.

Transit

Asheville Transit Services (ATS) is operated by the City of Asheville through a third-party operator, First Transit Management. ATS operates 24 fixed routes Monday through Saturday; their hours of operation range from 5:30 a.m. to 1:30 a.m. Of these 24 routes, 14 are day routes, six are evening routes, two are inter-city routes (to Weaverville and Black Mountain) and two are university partnership routes (with UNC-Asheville and Warren Wilson College). The ATS provides service within a quarter-mile of 75 percent of all households within the City limits. Service on each route originates and terminates at the downtown transit center.

ATS provided nearly 1.5 million trips during Fiscal Year 2008 (FY 2008).[10] The busiest routes, Routes 1 and 11, served over 120,000 riders each during FY 2008. Route 1 runs along Haywood Road, serving Pisgah View, an Asheville Housing Authority community; Route 11 runs along Montford Avenue, serving Hillcrest Apartments and Klondyke Homes, both Asheville Housing Authority communities. An additional five routes served over 100,000 riders each during the fiscal year. These seven routes are considered top-performing routes by the City's Transit Services Division. The lowest-performing route with just under 3,000 riders during FY 2008 was Route 3, the university partnership route with UNC-Asheville. However, this route only operates Friday and Saturday for 5.5 hours each day.

Current Fleet

During the 2008 fiscal year, the City of Asheville owned 672 vehicles, approximately five percent of which are alternative fuel vehicles (AFVs). AFVs are vehicles which run, at least partly, on fuels that are not derived from petroleum: i.e. gasoline, kerosene and diesel. The City's vehicles, excluding the ATS fleet, are maintained by the City's Fleet Management Division. The pie chart in Figure 2.6 displays the proportion of each vehicle classification type within the City's fleet.

[9] City of Asheville Comprehensive Parking Study. Public Workshop. January 30, 2008. Kimley-Horn & Associates

[10] French Broad River Metropolitan Planning Organization (FBRMPO). *Coordinated Public Transportation and Human Services Transportation Plan*, adopted April 17, 2008.

Figure 2.6

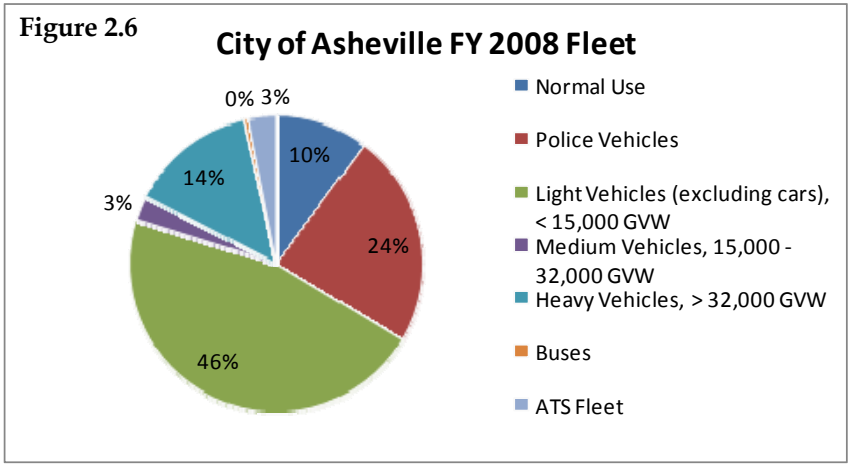


Table 2-8 provides a breakdown of vehicle by type and provides their average age and average miles per gallon (mpg).

Figure 2.7 demonstrates the total number of AFVs and diesel-powered and kerosene-powered vehicles within the City Fleet, as well as the proportion within each vehicle type.

Approximately 70 percent of the City's fleet runs on gasoline, all of which use a 10 percent gasoline fuel (E10). The City of Asheville determined that its fleet emitted a total of 6,076.5 tons of carbon dioxide equivalents in 2008, approximately 17 percent of the City government's total greenhouse gas emissions.

Table 2-8: City of Asheville Fleet Traits

Vehicle Classification	All Vehicles		
	Total No. of Vehicles	Average Age (years)	Average mpg
Normal Use	68	6.6	17.26
Police Vehicles	158	3.8	11.49
Light Vehicles (excluding cars), < 15,000 Gross Vehicle Weight (GVW)	310	7.7	11.04
Medium Vehicles, 15,000 - 32,000 GVW	19	13.1	5.34
Heavy Vehicles, > 32,000 GVW[1]	93	8.6	3.06
Buses[2]	3	20.2	6.43
ATS Fleet[3]	21	9.6	--
TOTAL	**672**	**7.08**	**8.97**

[1]Includes vehicles for sanitation, sewer and fire purposes.
[2]These buses are not included in ATS' fleet.
[3]The ATS Fleet is maintained by a private contractor, First Transit Management.

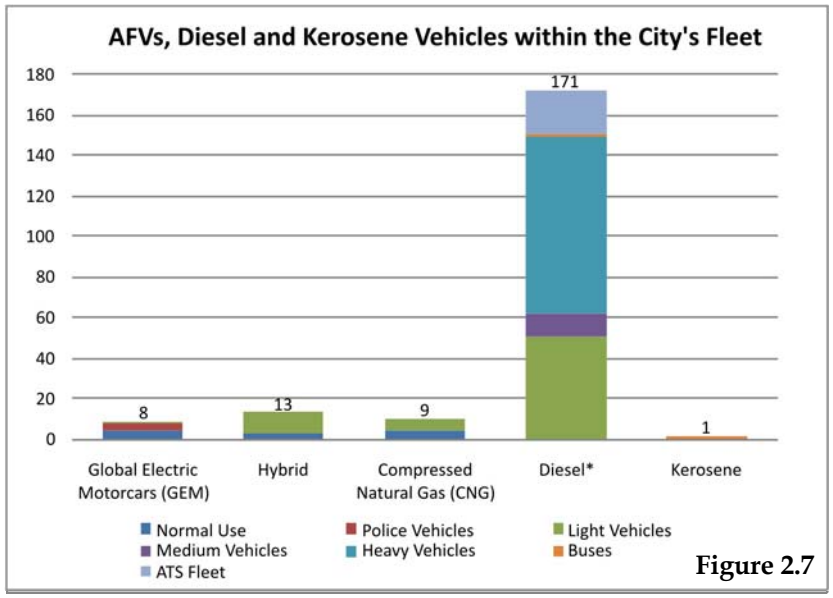


Figure 2.7

*All diesel vehicles use a 5% biodiesel fuel (B5). In addition, 5 of these vehicles are low-sulfur diesel fire engines.

Existing Commuter Data

In 2008, the City of Asheville's Sustainability Office conducted a survey of commuting habits of City personnel. There were a total of 854 respondents. As **Table 2-8** reveals, 14 percent of City employees live within five miles of their primary work site. Just over 12 percent live 25 miles or more from their primary work site.

Table 2-8: No. of Miles to Drive One Way from Primary Residence to Primary Work Site*

	0	<1	1-4.9	5-9.9	10-24.9	25-49.9	50-90
Total No. of Employees	2	10	105	207	408	98	5
	0.2%	1.2%	12.6%	24.8%	48.9%	**11.7%**	0.6%

*19 respondents left field blank

[1] A carpool is the arrangement between two or more individuals to share a ride to their primary workplace.

[2] 2 additional employees ride a bike to work 2 days per week or less; they are included in the private vehicle figure.

[3] 2 additional employees carpool 1-2 days per week (included in the private vehicle figure); 6 additional employees provide names of those they carpool with, but do not specify how often, and marked private vehicle as mode of transportation (and thus are included in the private vehicle figure).

Table 2-9: Mode by which Employees Commute to Work 3 or More Days per Week

	Bus	Walk	Bike	Carpool[1]	Private Vehicle	Assigned Vehicle	Telecommute
Total No. of Employees	6	9	6[2]	21[3]	553	257	2
	0.7%	1.1%	0.7%	2.5%	64.8%	30.1%	0.2%

As **Table 2-9** demonstrates, the surveys revealed that 65 percent of City employees commute to work by private automobile, three or more days per week. An additional 30 percent use an assigned City vehicle. A combined 5.0 percent utilize an alternative mode of transportation. The surveys showed that the nine individuals who walk all live within three miles of their primary work site. Of those who bike to work, one lives 29 miles from his primary workplace, another lives 10, and the others live six miles or less. The six individuals who take transit to work live within eight miles of their primary work site. The two individuals who claimed to live within zero miles of their workplace are both members of the police force and utilize assigned vehicles.

Of those who drive a personal vehicle to work, approximately 92 percent drive a car or truck. Three individuals drive a hybrid vehicle, which combine electric motors and gasoline engines. Of those individuals who drive a personal vehicle to work, nearly 92 percent drive one fueled solely by gasoline. These figures are demonstrated in **Tables 2-10** and **2-11**.

Table 2-10: If Personal Vehicle Driven to Work, Type of Fuel*:

	Biodiesel (B100)	Biodiesel (B20)	Diesel	Electric	Ethanol (E-85)	Ethanol (E-10)	Gasoline	Propane
Total No. of Employees	2	2	46	1	3	12	743	1
	0.2%	0.2%	5.7%	0.1%	0.4%	1.5%	91.7%	0.1%

Table 2-11: If Personal Vehicle Driven to Work, Type Driven:

		Auto			Truck			
	Hybrid	Compact/Sub-Compact	Midsize	Fullsize	Light	Heavy	**Motorcycle**	**Passenger Vehicle***
Total No. of Employees	3	145	151	38	196	147	22	37
	0.4%	19.6%	20.4%	5.1%	26.5%	19.9%	3.0%	5.0%

*Numbers between Tables 2-10 and 2-11 will not equate, for some respondents answered questions differently.

*Passenger vehicle refers to multi-passenger vehicles such as minivans.

The commuter survey requested information on work schedule, as shown in **Table 2-12**. Less than half reported a standard 9 a.m. to 5 p.m. five-day-a-week work schedule. Eighty-seven of the eighty-eight employees who work 24 hours on, 48 hours off and 171 of the 202 employees who work "Other" are police or fire department employees. Seventeen percent of City Employees have a flexible work schedule (or "flex time"). Of the 119 employees with flex time, more than 60 percent are police or fire department employees. The department with the next highest number of flex time employees is the Transportation & Engineering Department, with 15 employees. The Water Department, Planning Department, and Parks, Recreation and Cultural Affairs

Department all have five or more employees utilizing a flexible work schedule.

Table 2-12: Work Schedule*

			Flex Time			
	24 hours on, 48 hours off	**Other**	4 days a week	Every other Friday off	Personalized Flex Time	**Standard**
Total No. of Employees	88	202	92	7	20	292
	12.6%	28.8%	13.1%	1.0%	2.9%	41.7%

***153 respondents did not provide work schedule information.**

The City's Public Works Department, in coordination with the Sustainability Office, is conducting a pilot flexible scheduling program. This initiative is further explained in the following Current Transportation Initiatives and Plan section.

Current Transportation Initiatives and Plan

This section describes the initiatives and strategies the City of Asheville is currently undertaking to improve transportation options. The City takes a well-rounded approach to managing its transportation network, focusing on both travel demand strategies and system improvements.

Transportation Demand Management

Transportation Demand Management (TDM) strategies are designed to alter travel behavior in order to minimize congestion and provide viable and convenient transportation alternatives to driving alone. TDM measures include land-use management strategies such as infill development, incentives such as tax-free transit passes, enhancing existing transportation options such as providing an emergency ride home to transit users, and mitigating congestion such as encouraging telecommuting.

Emergency Ride Home

The City of Asheville began the Emergency Ride Home (ERH) program as a means to provide commuters who take alternative modes of transportation (vanpool, carpool, bike, walk or transit) with an immediate ride home in case of an emergency. Employees themselves must register for the program, which can be done online on the FBRMPO website. Employees over the age of 21 who live or work part- or full-time in Buncombe County are eligible. Additionally, employees must have used an alternative mode of transportation the day the emergency ride home is requested.

Employees qualify for an emergency ride home if they or an immediate family member suffers from an illness or severe crisis, they must work unexpected overtime, or their ridesharing driver has to stay late or leave early. Currently, participants fill out a registration form, sign a Liability Waiver and General Release Form, and submit the forms to the TDM Coordinator, who then issues two vouchers for the emergency ride home, which expires after six months. The program is currently being updated so that in the future, participants will be able to download the vouchers online. The emergency ride home is currently provided by a taxicab and must be paid for by the employee, who is reimbursed for the voucher. The TDM Coordinator is working to include rental cars in the ERH program.

The Fare Free Transit Promotion led to 19% increase in ridership.

PASSport Program

The City of Asheville's PASSport program is also considered a TDM initiative. The program enables participating businesses and organizations to pay a discounted transit rate on behalf of their employees. The employees and/or students show their staff or school ID when boarding the bus, instead of paying a fare each time. The employer/school is invoiced quarterly for all trips taken by their employees. Organizations such as the Grove Park Inn and schools such as UNC-Asheville have signed onto the program. According to an October 2007 UNC-Asheville press release, the PASSport program led to a 146 percent increase in UNC-Asheville bus boarding from November 2006 to May 2007. City of Asheville staff, by showing their employee IDs as they board, can ride the bus for free.

Flex Time

Flexible work schedules enable employees to avoid the morning and afternoon rush hours caused by those working the standard 9 a.m. to 5 p.m. five day a week work week. Thus, it reduces traffic congestion by decreasing the number of cars on the road during peak commuting times. The Asheville Public Works Department, in partnership with the Sustainability Office, is conducting a department-wide flex time pilot program. All department staff, excluding senior management, made the transition to work 10 hours a day for four days a week. Preliminary findings conducted by the Sustainability Office project that each Public Works employee will save $521 on commuting fuel alone over the course of the year. Additionally, the City expects to save 249 tons of greenhouse gas emissions annually as a result of this project.

Marketing and Education

According to the US Census Bureau, in 2007 approximately 71 percent of all US households had access to the internet. Web-based marketing can be an invaluable tool in educating the public on transportation choices and initiatives. The City of Asheville and the NC Department of Transportation (NCDOT) cosponsor the Blue Ridge Commuter Connections website (www.blueridgecommute.org). Blue Ridge Commuter Connections provides commuter assistance to residents of western North Carolina. The website provides information and links on local transportation options. It discusses not only benefits to the employee, but to the employer as well. It also provides marketing materials in the form of Commuter Benefit Briefs, a summary of frequently-asked questions on such topics as carpool incentive programs, commuter tax benefits,

and transit benefits. Additionally, the website touts Transportation Fairs, which are a means for City Staff to get the word out on transportation options. Another educational strategy promoted by Blue Ridge Commuter Connections is the establishment of Employer Transportation Coordinators within each workplace.

Participation in the Share the Ride Program grew by over 2400% over the course of three years

Another online service provided to Asheville commuters is the Share the Ride NC program (www.sharetheridenc.org). It is a rideshare matching service, enabling participants to find others with similar commutes and work hours who are interested in carpooling or vanpooling. The website also aids commuters in locating park and ride lots, public transit services, and bicycle routes, in order to demonstrate alternative options in traveling between home and work.

In August 2005, there were 40 participants in the Share the Ride program from Asheville; as of September 2008, that number grew exponentially to 975. Asheville's TDM Coordinator credits the price-of-gas radio spots, City- and County-owned public access television commercials, and word of mouth through employers as the reasons behind such local growth in the program.

The City employs not only virtual but also physical marketing campaigns. The City of Asheville worked with UNC-Asheville to develop the Great Bus About initiative. The Great Bus About is an annual one-day event, designed as a marketing tool for the PASSport program. UNC-Asheville students form teams and travel to various local businesses by riding the bus, biking, or walking. The students gather points and prizes at each business, and the team with the most points receives the grand prize. A 2,000 percent increase in bus ridership was realized the day of the inaugural 2006 Great Bus About.

Additionally, the ATS conducted a Fare Free Transit Promotion for three months in late 2006. During the campaign, ridership increased 38 percent over the same period the previous year. Once the campaign concluded, many new riders stayed with the system. After the promotion, ridership on evening routes increased by 82 percent and in May 2007, ridership was 19 percent higher than ridership levels of the same period the year before.

The City also worked with a number of local residents and the Blue Ridge Commuter Connections on the Strive Not to Drive Campaign. Strive Not to Drive is an annual week-long event to encourage individuals to avoid traveling by a single-occupancy vehicle for one day. ATS lowers its fee to twenty-five cents on the last day of the campaign, local participating restaurants offer free coffee or breakfast, and the campaign ends the week with a downtown community festival.

Another strategy the City employs is to focus exclusively on the commuting choices of its staff, as opposed to the general public. The City's Sustainability Office developed the Better Energy Savings Today (BEST) program in order to educate City staff on sustainability issues. The program involved education materials, informational emails and internal newsletter articles, all aimed to inform City staff of alternative transportation options and energy conservation tips. Additionally, the program is working with City managers in order to develop stewardship on sustainability initiatives. The

Sustainability Office reports a total 11.5% percent energy use reduction in the 14 participating facilities since the launch of the BEST program.

A total 11.5% energy use reduction was accomplished through a staff energy conservation education

Transportation System Management

Transportation System Management (TSM) describes a range of measures designed to enhance the efficiency and safety of the inter-modal transportation network as well as to minimize congestion and improve air quality of the region. Strategies include new or expanded infrastructure such as: new roadways, new transit or bicycle facilities, and widened sidewalks; and modifications to existing service such as: improved traffic signalization schemes, enhanced transit service and reserved lanes for high-occupancy vehicles and/or hybrid vehicles.. TSM initiatives serve to create a cooperative environment with all modes of transportation.

Traffic Calming

Traffic calming measures are a form of TSM; they are transportation techniques designed to slow traffic and lower traffic volume, so as to mitigate local safety concerns. Traffic calming techniques are often applied to residential neighborhoods. High volumes of high-speed vehicular traffic can be dangerous to walkers and bikers, and thus can deter residents from utilizing these alternative modes of transportation.

The City of Asheville's Traffic Engineering Division developed a Neighborhood Traffic Calming Policy in 2000. The Policy focuses on City-maintained residential streets, where at least 75 percent of the properties along the street are residential structures or are in a residential zoned area. Public input is a central component of the Policy. A citizen or group of citizens can request a street segment to be included in traffic calming studies. The Traffic Engineering Division then conducts an evaluation and rates the street segment based on average speed and volume, and any traffic safety concerns. A neighborhood committee will work with City staff in order to measure support by the surrounding community. A public meeting will be held to garner input, and subsequently the final conceptual plan for the proposed traffic calming techniques will be presented to the neighborhood. Six months following installation, an evaluation of the project's effects on traffic will be conducted.

As of March 2008, the City has implemented traffic calming techniques along 10 miles of Asheville's 380 miles of local streets.[11] Measures employed include instituting four-way stops, placing concrete islands and/or speed humps, and reassigning turn-only lanes to straight through-traffic. Additional techniques include police enforcement, traffic speed display signs, neighborhood awareness campaigns and education, on-street parking, road diets,[12] and re-striping the roadway.

[11] Postelle, Brian. *Mountain Xpress.* "Asheville City Council: Council ponders bond issue, traffic calming." Vol. 14 Iss. 35, March 26, 2008. Accessed: http://www.mountainx.com/news/2008/032608city.

[12] Road diets are considered those techniques which narrow a roadway by reducing its number of lanes or decreasing its width.

Green Transit

The Federal Transit Administration (FTA) selected the Asheville Transit System to receive special training to minimize the environmental impact of its operations. The ATS, working with Virginia Polytechnic Institute and State University (Virginia Tech) faculty, will develop a complete Environmental Management System (EMS) using the 14001 Standard of the International Organization for Standardization (ISO). The EMS is a set of operational processes that enables an organization to set specific environmental goals for its operations, and objectively measure its performance in achieving those goals. An EMS incorporates operational controls and environmental roles and responsibilities into existing job descriptions and work activities.[13] The EMS will include identification of all services with a potential for significant environmental impact; formulating performance objectives designed around pollution prevention, continual improvement and compliance; implementation strategies; and finally periodic performance reviews. The US Environmental Protection Agency participated in the development of the ISO 14001. It offers ATS the opportunity to create a framework for greenhouse gas reduction in its operations, as well as long-term cost savings, improved bond ratings, reduced insurance premiums, and better community relations. An EMS integrates the environmental ethic into business operations so that environmental stewardship becomes part of the daily organizational culture.[14]

CNG Fueling Station

In 2005, a compressed natural gas (CNG) Fast-fill Fueling Station opened in central downtown. The station is open 24 hours a day, 7 days a week and is operated by the City's Fleet Management Division. It is open to the public, thereby increasing the viability and practicality of an alternative mode of transportation: CNG vehicles.

[13]Federal Transit Administration. "News & Events: Environmental Management System." Number C-12-03, September 2003. Accessed: www.fta.dot.gov/printer_friendly/news_events_522.html.
[14] Ibid.

Water Systems

Role of Water Systems in Sustainability, Energy Consumption and Emissions

Drinking water supply is the lifeblood of a community. Serving residents, businesses, commercial and industrial interests, as well as fire protection, water is required for a community to sustain itself. Ideally water would be collected and used without resource depletion, environmental impact, or cost to the community. In this ideal scenario, an endless supply of pure water would be available requiring no treatment or long-distance conveyance.

Building from the early water systems from millennia ago, the drinking water industry has evolved to enhance public health. The abandonment of lead plumbing components, advances in treatment leading to the triumph over infectious disease in the industrialized world's water systems, and provision of robust, reliable water supplies that stand ready to serve industry and provide fire protection have significantly improved the lives of people around the world. This evolution, while highly valuable to society, comes at a cost, and is not infinitely sustainable. Our modern water systems inherently require many inputs, including the raw water itself, electrical energy to power pumps and miscellaneous treatment systems, chemicals to adequately condition and disinfect the water, energy sources to heat and air condition buildings, vehicle travel to inspect and maintain remotely located water system facilities, land consumption to support reservoir, treatment, and pumping facilities, and natural resource consumption to provide the materials from which we build supply, treatment, and distribution systems.

Holistic, system-based approaches to water system sustainability are the ideal. In practice, developed communities such as Asheville must manage their existing infrastructure and take a somewhat different approach to sustainability. Existing water system planning, design, operation, and optimization in the 21st century requires communities to adapt existing systems and future planning to lessen the carbon footprint of the operation.

Existing Conditions for Water Systems

The City of Asheville is known for its outstanding water quality. The City of Asheville owns and operates three treatment plants: Bee Tree Water Treatment Plant (WTP), North Fork WTP, and the Mills River WTP. Bee Tree and North Fork are the City's primary sources of water and located in eastern Buncombe County. These facilities are surrounded by 22,000 acres of undeveloped mountain forests that are owned by the City of Asheville. The Mills River WTP is used as the City's secondary source of water and is located at the junction of the Mills River and the French Broad River in Henderson County. The Mills watershed covers 47,440 acres in Henderson and Transylvania Counties. The treatment capacities of the Bee Tree WTP, North Fork WTP and Mills River WTP are 5 million gallons per day (mgd), 31 mgd and 5 mgd respectively.

The City's water distribution system contains approximately 1,625 miles of pipe with diameters ranging from 2 to 36 inches. The majority of the distribution lines are six inches in diameter. Most of the water mains were installed from 1920 to 1940 or from 1965 to the present; however some are dated as early as 1884. The majority of water mains that are four inches in diameter or smaller are galvanized iron pipe. Older larger mains are pit cast iron and newer mains are ductile iron.

Finished water from the Bee Tree WTP and the North Fork WTP flows by gravity from the clearwells at the WTPs into the gravity service area of the distribution system. Flow is conveyed from the Bee Tree WTP to Bee Tree Junction through a 24-inch diameter main. Flow from the Bee Tree WTP can be controlled by a throttling valve located at the Bee Tree Junction. Flow is transmitted from the North Fork WTP to the system through two parallel 16-inch diameter mains, a 24-inch main, and a 36-inch main.

After pumping raw water from the Mills and French Broad Rivers and treating it in the Mills River plant, finished water from the Mills River WTP is delivered from the relatively low-lying plant into the higher elevations of the water system's southern service area.

Because of the steep topography of the City's service area, booster pump stations are required to provide adequate water service to high elevations. The water system is equipped with 35 pumping stations with pumping capacities that range from 8 to 25,000 gallons per minute (gpm). The booster pump stations are all operated by a SCADA system, which enables the pump stations to be remotely controlled and monitored.

Storage in the water distribution system has three functions: storage needed to meet hourly fluctuations in demand, fire protection, and emergency storage. The water system is equipped with 33 storage reservoirs that provide millions of gallons of water storage. Two of the supply reservoirs are located at the Bee Tree and North Fork WTPs.

Asheville's water system is characterized by relatively mild seasonal water demand fluctuations. There is an increased water demand during the summer and fall months (June through October). This increased seasonal demand can be due to summer and fall tourist activities.

Breakdown of Electrical Consumption

Approximately 11 million kilowatt hours were drawn by the water system operations in Fiscal Year (FY) 2008; as a result the purchased electricity portion of the carbon footprint of Asheville's water system was 7,830 metric tons of CO_2e.

According to the City's 2007-2008 Electricity Usage, of the over 80 metered electrical accounts, the top ten users of the City of Asheville water system are provided in **Table 2-13**.

Nine of the ten top energy users listed above all had an increase in electricity use from fiscal year 2007 to fiscal year 2008, excluding Enka Lake Road Pump Station, whose electricity usage decreased by 21percent. Together, these ten represent over 92 percent of the FY 2008 water system electrical usage.

Table 2-13: Top Ten Energy-Using Water System Facilities in Ranking Order

	Facility	Electrical Use	Portion of Total Water System
1	Mills River Water Treatment Plant	4,072,800 kWh	37.0%
2	North Fork Water Treatment Plant	2,164,500 kWh	19.7%
3	South Buncombe Pump Station	885,000 kWh	8.0%
4	Mills River Water Treatment Plant Intake Pumping Station	686,400 kWh	6.2%
5	Peach Knob Pump Station	610,400 kWh	5.5%
6	Patton Mountain Pump Station	559,520 kWh	5.1%
7	Chandler Knob Pump Station	448,400 kWh	4.1%
8	Kimberly and Beaverdam Pump Station	325,600 kWh	3.0%
9	Enka Lake Road Pump Station	241,740 kWh	2.2%
10	Bee Tree Water Treatment Plant[1]	164,000 kWh	1.5%
	TOTAL OF ABOVE	**10,158,360 kWh**	**92.3%**
	Facility Nos. 11 through 86	844,818 kWh	7.7%
	SYSTEM TOTAL	**11,003,178 kWh**	**100.0%**

[1]The Bee Tree WTP was on-line only a portion of the 2008 fiscal year. It is expected that the Bee Tree facility will rise in energy consumption and rank during a complete year of operation.

Natural Gas Use at Water System Facilities

There are six natural gas accounts throughout the water system that used a total of 29,238 therms in FY 2008. This equates to the purchased natural gas portion of the carbon footprint of Asheville's water to be 137 metric tons of CO_2e. Electricity and natural gas combined gives a total carbon footprint of Asheville's water system to be approximately 7,967 metric tons of CO_2e.

Current Water Systems Initiatives and Plans

This section describes the initiatives and plans the City of Asheville has or is currently undertaking to preserve water quality. The City's Water Resources Department developed an overarching environmental policy as well as commissioned multiple master plans. Together these initiatives serve to guide the City's development of its water resources in a sustainable way.

Water Resources Department Environmental Policy

The City of Asheville Water Resources Department became International Organization for Standardization (ISO) 14001 certified by the National Sanitation Foundation (NSF) in 2004. ISO 14001 was developed by the NSF in conjunction with the ISO. At the time, Asheville's was the first water utility in North Carolina to achieve such certification. The Department was re-certified by the NSF in 2007. The certification is awarded when an agency can demonstrate a commitment to environmental protection through implemented practices and procedures. The

Department developed a mission statement through which its environmental policy is implemented.

The Department is "committed to manage and protect our resources and to provide the highest quality of water service to our customers through:

- **Continuous Improvement** in product, systems and processes to maximize customer satisfaction;
- **Communication** among and between staff, customers, vendors, contractors and governing board;
- **Compliance** with relevant federal, state and local environmental regulations;
- **Commitment** to a clean, healthy environment through prevention of pollution."[15]

The purchased electricity and natural gas portion of Asheville's water system carbon footprint represents 7,967 metric tons of carbon dioxide equivalent emissions in FY 2008.

1995 Master Plan

A Water Distribution System Master Plan was developed in 1995 for the Asheville-Buncombe Water Authority.[16] The Master Plan contained recommendations to meet projected water demands through year 2020. Such recommendations included additional storage facilities required for the gravity system as well as the booster areas.

2008 Master Plan (ongoing)

An updated Water Systems Master Plan is currently being developed. As part of this process, population projections are being analyzed and extended 30 years. In 2007, the population of Buncombe County was 243,565. The preliminary Plan estimates Buncombe County's population to be approximately 368,135 in 2037.[17] Recommendations include necessary upgrades to the existing water infrastructure such as 14 pipeline installations, one pump station replacement, one new pump station, and additional treatment plant capacity, in order to accommodate Asheville's future growth.

[15] Water Resources Department. "ISO 14001 Environmental Policy." Accessed: www.ashevillenc.gov/departments/water_services/default.aspx?id=900

[16] The Asheville-Buncombe Water Authority has since dissolved and water operations are managed by the City of the Asheville.

[17] "Water System Master Plan Update" Jordan, Jones & Goulding.

Solid Waste

Role of Solid Waste in Sustainability, Energy Consumption, and Emissions

The relationship between transportation or public infrastructure and emissions of climate warming greenhouse gases (GHGs) are readily apparent: cars or buildings that burn fuel and electricity emit GHGs from exhaust pipes or power plants. The connection between solid waste management (SWM) and emission of GHGs is not as obvious. The collection and transport of solid waste is perhaps the most evident cause of GHG emissions. Nevertheless, throughout every step of the management process of solid waste, GHG emissions are generated and solutions or improvements can be employed.

Greenhouse gas emissions (from solid waste) nationwide decreased from 1974 to 1997, despite a two-fold increase in waste production

A study by RTI International found that due to the adoption of new technologies in SWM practices (recycling and composting, energy recovery from combustion, source reduction, etc), GHG emission levels nationwide decreased from 1974 to 1997, despite a 2-fold increase in waste production. American cities are avoiding the release of almost 52 million metric tons of carbon-equivalent (MMTCE) of GHGs annually through the utilization of modern SWM practices. Compared to the estimate of what GHG emissions would be today assuming continued use of technology and practices of the early 1970s, the total quantity of GHG emissions from SWM was reduced by a factor of 6 (from 60 to 8 MMTCE). The largest reductions have been gained through energy recovery and recycling, both of which ease the need for new energy production from fossil fuel sources or from the harvest of raw, virgin materials.

The same study found that emissions associated with transportation and collection of MSW and recyclables grew from 0.5 to 1 MMTCE between 1974 and 1997. This increase is due to the fact that waste production over this period doubled and vehicles' emission rates remained relatively constant. Relatively speaking, this is a small portion of overall GHG emissions from SWM; however, because it represents one area that has experienced an increase, it signals a real opportunity to reduce not only GHG emissions, but also other local pollutants (such as sulfur dioxide, nitrous oxides, carbon monoxide, particulates, and ozone).

Traditionally, solid waste management focuses on the collection and disposal - and potentially pre-disposal treatment - of waste generated by human populations. Solid waste management has typically sought a balance between disposition in an environmentally and socially satisfactory manner and disposition in the most economically effective way possible. However, as the characteristics of the solid waste streams change and public awareness of environmental concerns increases, what is "satisfactory" is continually evolving. Not only have accepted practices of municipal waste collection and disposal changed drastically over the past century, but the nature of the solid waste produced is fundamentally different. Our population and current lifestyle produces solid waste with vastly different characteristics and must contend with the rampant

proliferation of those waste products. These changes are the impetus for rethinking standards for solid waste management and moving towards cleaner and more sustainable management systems.

Similar to Asheville, many public entities seek to represent the community's common interest by setting positive examples of civic responsibility. Conserving community resources and protecting the public health are elements of this common interest that are directly related to the fundamental objective of sustainable waste management. Inevitably, a municipal government generates wastes throughout its standard daily operations. By initiating this planning process, the City of Asheville is actively seeking new ways to set a better example by managing the municipal government's contribution to solid waste generation and management.

This report focuses on emissions resulting from the collection and transport of waste since it is one aspect of Asheville's current solid waste management program over which the City has direct purview. Section 3 of this report will examine in more detail the types of programs and policies that have been proven effective in reducing GHG emissions from solid waste management, with special consideration for Asheville's specific capabilities and needs.

Accepted practices of waste collection and disposal, and the nature of solid waste produced, have changed drastically over time.

Existing Conditions for Solid Waste

Establishing a baseline of existing conditions for solid waste generation in City facilities is the first step towards reducing waste to landfills from City facilities. Knowing a starting point is essential to track progress and identify gaps in policy and programming. The following synthesis of information about Asheville's solid waste management sector may subsequently be used as the starting point for assessing future progress and as a benchmark for measuring progress moving forward. The important metrics examined in this section include: population data and growth projections, waste generation rates and waste types, collection and disposal procedures, and existing programs and policies that potentially affect each of these factors.

Solid Waste Generation

Solid waste generation is both diverse and prolific; it is necessary to distinguish between the sources of waste generated as well as the character of the waste itself. Asheville's solid waste originates from the same sources as in most cities: residences, municipal, commercial, industrial, and medical facilities. In many cities - as is the case in Asheville-- the availability of data across sectors is limited. This report examines aggregate waste generation in the service area, but includes a detailed examination into recycling, residential waste, and yard waste, as the data is most robust for these sectors.

Municipal Solid Waste

As any other productive establishment in a community, the municipal government generates waste. At this time, the solid waste produced by City facilities is not well-understood in terms of generation rates and characterization of the waste streams. The discussion of the City's solid waste is limited to

the degree that data is not yet available for the basic indicators about the City's generation. Waste is collected from City facilities by two methods: a contracted collector hauls waste from the facilities with dumpsters and City crews pick up carts from smaller offices and buildings.

Initiating a system for collecting and organizing information about the nature of its own waste stream and directing it to a facility where it can be separated, quantified, and categorized, will be critical for the City to make meaningful improvements towards sustainability in solid waste management. Section 3 of this report presents some recommendations on sampling and separating the waste stream.

Residential Solid Waste

During fiscal year 2007-2008, the City's residential waste collection program serviced 28,300 single-family households and collected some 25,000 tons of waste, excluding recyclables and yard waste. The total program cost for collection and disposal of this waste was $1,592,277 ($56.26 per household, $62.15 per ton). Including the costs for recyclables and mulching/composting of yard wastes (see below for detailed figures) the overall solid waste management program costs were $4,035,801 ($143.61 per household, $91.53 per ton). Year-over-year figures for program cost and cost per household since FY 2005-06 increased by an average of ~5%. **Table 2.14** shows the cost comparisons and service metrics for the last three years.

Since FY 2005-06, the number of households receiving collection service has increased nearly 7.5%. In that same time, waste going to the landfill has actually decreased by 0.25%. This is possibly explained by the increases in residential recycling - households are increasing the proportion of recyclables to non-recyclable waste types.

Estimates from the Environmental Protection Agency find that Americans produce an average 1131 pounds of non-recyclable waste per capita per year. Current data for Asheville reveals the average citizen produces 671 pounds of non-recyclable waste annually— 40.7% less than the national average. Not even unanticipated statistical factors negate the impressively low rate of residential waste generation.

Table 2.14 Solid waste management program cost for FY 2005-06 to FY 2007-08.*

	FY 2005-06	FY 2006-07	FY 2007-08
Program Cost	$3,668,447	$3,755,805	$4,035,801
Households	26,300	27,200	28,300
Cost Per Household	$140.22	$139.20	$143.61
Tons Collected	43,512	44,975	44,092
Cost Per Ton	$84.31	$85.51	$91.53

*includes solid waste collection, disposal, recycling, mulching/composting

Recyclable Waste

Recycling has been shown to have a significant impact on GHG emissions reductions. It displaces the need for virgin raw materials, avoiding environmental releases associated with raw materials extraction and materials production. In addition, recycling avoids sending waste to a landfill where it

produces methane and other GHGs as it decomposes. A study by RTI International found that between 1974 and 1997 recycling and composting increased from 8 MMTCE to 53 MMTCE nationwide. This is a 19% increase, from 8% of all waste to 27%. In 2008, the national rate of recycling was 33%.

Although the population of Asheville has increased, increased recycling since FY 2005-06 has produced a reduction in waste sent to the landfill. In fact, there has been only a slight increase in actual tonnage of waste arriving at the county landfill. The number of homes receiving recycling collection increased 6% while the tons of recyclable waste collected increased 9.5%, demonstrating the increasing propensity of the citizens to participate. **Figure 2.8** shows the monthly trend of recycling waste collected from 2004 to 2007.

The EPA estimates recyclable waste generation to be 547 pounds of recyclables per person per year. This past fiscal year, Asheville residents recycled or composted an average of 483 pounds of waste per person. This represents 42% of all waste collected and reported- quite larger than the national average of 33%. **Figure 2.9** shows this comparison for non-recyclable and recyclable waste as portions of the entire residential waste stream. Though at varying rates, both Asheville and the nation show trends of decreased waste to landfills and increased waste recovery and recycling. This is a critical piece of the puzzle when strategizing to decrease GHG emissions from solid waste management.

Figure 2.8 Yearly recycling waste collected FY 2000-01 to FY 2007-08.

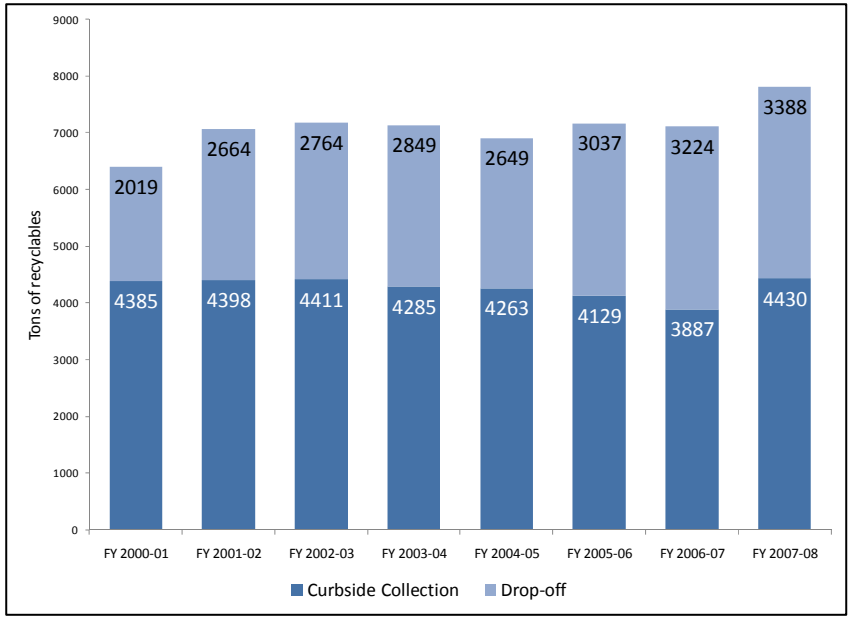
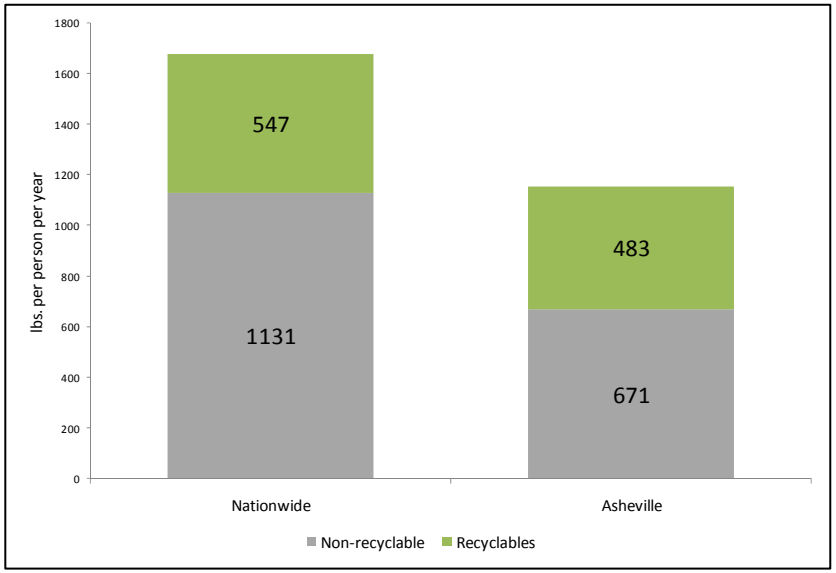


Figure 2.9 National and Asheville average for non-recyclable and recyclable residential waste generation.



Yard Waste

Composting and mulch production is a form of recycling organic materials such as leaves, twigs, grass clippings, and vegetable food waste. Organic waste, or yard waste, can be composted either onsite at the point of waste generation (i.e. individual homes) or at a central processing facility. Each has costs and benefits. On-site composting reduces the costs and impacts of hauling the waste away and subsequently, to another site after processing. Composting at centralized facilities can handle more waste and produce a more consistent product than on-site composting but is more expensive due to transport and capital costs and is subject to regulation.

Every household that receives solid waste pick-up is also served by the mulching/composting program. In FY 2007-08, the City collected 10,633 tons of waste through the mulching and composting program at a cost of $931,900 ($87.64 per ton, $32.93 per household). Seventy percent of yard waste is sent to a private mulching/composting facility and the remainder goes to a City-run facility. This material is used by the City for internal landscaping projects. Loads of leaves are also delivered for free directly to homeowners and businesses upon request, for use as mulch and natural soil additive, during leaf season (November to January). A more detailed look at collection and processing management follows.

Solid Waste Collection

Collection Methods

The City of Asheville employs a common approach to solid waste management where the collection and disposal responsibility is shared among the City, County, and private contractors. The City offers curbside collection of typical residential wastes, including yard waste. The waste is disposed in the Buncombe County Landfill. The collection and processing of residential recyclables is contracted out to Curbside Management, Inc. In fiscal year 2007-2008 the contract of the program was $650,000.

The City provides once a week garbage collection to residents by utilizing ninety six gallon roll carts. 30,034 roll carts are in use and emptied each week. The costs of collection are paid from the General Fund. Commercial and industrial entities directly contract with a private company for collection service.

Private solid waste collection companies operating in Asheville include: GDS, Waste Management, Wyatt Waste, Consolidated Waste Services, Griffin Waste Services, and Hamilton Refuse. White goods (i.e. oven, refrigerator, washing machine, microwave, etc.), bulky items, and extra trash are collected by the City each week. The City's contracted recycling collection operates bi-weekly. Brush and bagged leaves are collected twice per month by the City.

The City's weekly collection of solid waste consists of seven daily routes (Monday-Thursday). An automated side-loading refuse truck operates each route, making an average of two, six-mile trips to the county transfer station per day. The fleet includes a spare truck. Three brush routes are run each week by three rear-loading refuse trucks and three knuckle boom trucks. Knuckle boom trucks are also used once a week to collect appliances. Two rear-loading trucks run each day to pick-up bulky items upon request. One pak–rat is used to collect street refuse receptacles along the sidewalk each day in the business districts. During leaf season, seven routes are run each day to collect loose leaves with leaf vacuum machines.

Quick Look –
City Waste Collection Equipment

- 8 Automated Side-loading Trucks
- 3 Rear-loading "Brush" Trucks
- 3 Knuckle Boom Trucks
- 2 Rear-loading Bulky Item Trucks
- 1 Pak-Rat
- 7 Leaf Vacuum Machines
- 30,034 96-gallon Roll Carts


Knuckle boom truck
Source: MAWaste.com

Collection Facilities

The majority of waste collected is hauled to the Buncombe County Transfer Station, at which point the county is responsible for hauling it to the County Landfill. Some municipal waste is also taken to a transfer station operated by Waste Management.

Leaves collected during leaf season are composted through various publicly- and privately-operated mechanisms. The City operates a site for leaf compost and uses the compost for internal projects. Christmas trees are mulched at a drop-off center in town and the mulch is given away each January. All other brush and bagged leaves collected throughout the year are taken to a private facility that grinds the material for mulch and use as a fuel source.

Financing and Regulatory Framework

The City's solid waste management program is housed within the Public Works Department. The program's most recent operating budget was set at $3,688,000. Funds to subsidize free basic collection services are drawn from the General Fund. Recyclables, as well as some other specific items are collected for a fee (**Table 2.15**).

Chapter 15 of the Code of Ordinances describes the rules and procedures for solid waste management. The ordinance sets forth required practices for residents and businesses: what wastes the City will collect, how waste items should be prepared prior to collection, and penalties for noncompliance. The ordinance also sets forth the roles and responsibilities of the Public Works Director, Solid Waste Manager, (Ordinance No. 3625).

Rates and Rate Structure

Table 2.15 presents the various waste collected by the City, County, or private contractor and the fee for each service.

Table 2.15 Waste collection services and service charges

Service	Operator	Rate
Landfill Tipping	Buncombe County	$38.00/ton (general public & city government)
Transfer Station Tipping	Buncombe County	$42.00/ton (general public & city government)
Residential waste	City	Free
Residential recycling	Curbside Management, Inc.	$1.32/month
White goods	City	$5.00/item
Bulky items	City	Free
Dead pets	City	$10.00/animal
Leaves and brush	City	Free
Extra Trash	City	$3.50/month/trash can

Current and Planned Initiatives

In the past few years, the City has ramped-up its commitment to solid waste educational activities and waste reduction programs. In 2006, the only official educational programs administered were newspaper advertising/articles and informational materials accessible on the Sanitation Department's web site. In the past year, the City has developed radio and television advertisements, mass mailings, take home items (brochures, pencils, etc.) and public school programs. The City is also participating in the "RE 3" and "Recycle Guys" campaigns as well as reward programs. More information on these programs is presented below.

City Facilities Collection

The City is currently developing a new collection contract to provide collection of trash and recycling with bulk containers at City buildings.

Recycling and Reuse

Most of the City's solid waste programming is focused on increasing participation in recycling. There have been several reward programs and promotions in addition to the RE3 and Recycle Guys Campaigns administered by NC Department of Pollution Prevention and Environmental Assistance (DPPEA).

America Recycles Day

November 15th is America Recycles Day. This year Asheville encouraged citizens to sign up for recycling collection by offering prizes in a contest drawing. Citizens who filled out a recycling pledge on the City's web site would be registered to win various recycled-content products, such as a metal fire pit, kitchen supplies, and home and garden supplies.

Cans for Cash Challenge

In October 2008, Asheville participated in the Cans for Cash City Recycling Challenge. The contest, sponsored by The United States Conference of Mayors and Novelis Corporation, challenges cities across the country to collect aluminum beverage cans and promote resident participation. Asheville competed with other cities of the same size for up to $10,000 in

awards. The awards money would be used to support recycling efforts through local education and awareness programs. The contest ran from October 1st to 31st.

Feed the Bin and Win

The City of Asheville and Curbside Management, Inc. jointly sponsored the Feed the Bin and Win recycling contest, which awarded $100 a week for 16 weeks. The contest began the week of February 4, 2008.

Residents of Asheville who are served by the City's residential curbside recycling program were eligible for the contest and entered by simply submitting a completed enrollment card. Enrollment cards and a contest brochure were delivered to each house along with a 2008 recycling and brush collection calendar.

Each week of the 16-week contest, one enrollment card was randomly drawn. If the selected household set out its recyclables meeting the recycling guidelines that week, then the resident won $100. If not, the $100 prize rolled over to the next week, giving the next household selected a chance to win $200.

Another Feed the Bin contest was done in May 2008, in conjunction with DPPEA awarding 250 pairs of tickets to Asheville Tourists games. Tickets were also offered in a recycling pledge drive.

RE3 and Recycle Guys Campaign

RE3 is a public information and awareness campaign begun in 2005 and administered by the DPPEA. It targets post-college-age adults and encourages the three "R's," reduce, reuse, and recycle. The statewide program airs television and radio ads, appears at concerts and events, hosts workshops, and connects people through social media online. Local communities are encouraged to become a campaign sponsor. Asheville joined the RE3 campaign in FY 2007-08. Thirty local governments reported using the program last fiscal year.

The Recycle Guys is another waste reduction and recycling educational campaign created by the DPPEA that targets young children.

EPA WasteWise

The City is a member of the WasteWise program administered by the U.S. Environmental Protection Agency. WasteWise offers a range of benefits to its membership network, which exceeds 2000 organizations. Benefits include:

- Reduced purchasing and waste disposal costs;
- Toll-free helpline for technical assistance;
- Annual Climate Profile describing greenhouse gas reduction;
- Public recognition in WasteWise publications, case studies, and meetings;
- Networking in member and regional forums;
- Opportunity to receive WasteWise Awards that recognize outstanding achievements; and
- Outreach and educational materials.

The program provides the opportunity for knowledge exchange and collaboration between diverse groups of partners striving for improved solid waste management.

Land-of-Sky Regional Council

Land-of-Sky Regional Council (LOSRC) is a multi-county, local government planning and development organization in North Carolina. It includes the counties of Buncombe, Henderson, Madison, and Transylvania. The Council, which meets monthly, is made up of elected officials from its member governments, one private representative of economic development interests in each county, and two at-large members. The City's solid waste manager attends quarterly solid waste director meetings that are coordinated through LOSRC to facilitate regional recycling and waste management efforts.

The LOSRC has worked with the public school systems of its member counties to promote school recycling programs. Recycling coordinators were appointed by the principal in each school. Coordinators are responsible for collection and delivery of recyclables from the school to a drop-off site.

Land Use

Role of Land Use in Sustainability, Energy Consumption, and Emissions

The way in which the residents of a community locate their homes and businesses on the land plays a central role in the consumption of energy and impact on natural resources. The geography of land development, i.e. a spread-out, suburban development pattern or a dense, city-like layout, Asheville will foster different kinds of land use and community activities among residents that affect energy and the environment. The City's regulation and management of land use is thus a key tool for achieving sustainability. The City of Asheville's plans, policies, and regulations can work together to advance the City's sustainability goals and targets. In keeping with the goals identified in the introduction, this component of the Sustainability Master Plan lays out principles for sustainable land use planning and provides an analysis of the City's current land use tools in addressing sustainability. Section 2 lays out key sustainable principles for land use, which are then used to assess the strengths and weaknesses of current planning tools. In Section 3, planning needs and policy alternatives are identified and explored with respect to their possible application in Asheville.

Sustainable land use principles provides a common baseline by which existing land use tools can be assessed.

Principles for Sustainable Land Use Management

A set of principles, agreed upon by the community, that promote sustainable land use is an important first step in shaping the priorities and actions that the City will take to address land use issues in the future, and provides a common baseline by which existing land use tools can be assessed. Reflecting the land use goals (in Section 1), a set of principles was developed with a combination of local input from City planning and sustainability staff and a review of several leading municipal sustainability and land use plans from across the country. The following principles distill this information into a list of desirable qualities for the sustainable future development of Asheville. Some principles will only be followed in full in the long term, while others pertain to practices that the City has already begun to implement. Vetted by City planners and leaders, this list of principles should be shared with the public and modified as input is received.

- The City and developers actively pursue **infill development**.
- Public and private sector work together to redevelop **underused urban properties** in the most sustainable manner.
- The City encourages **dense development** patterns.
- Greater density makes **transit options** more viable.
- New development provides options for **non-automobile transportation.**
- The r**egulatory process** encourages sustainable development.

- **Mixed use** development promotes efficient land use and transportation.
- The **regulatory process** encourages sustainable development.
- New and existing development uses **energy at economically and environmentally sustainable levels**.
- Sustainability planning extends **beyond the building level** to neighborhoods and regions.
- Sustainability is economical and can help provide **workforce housing**, when considering total life-cycle cost.
- There are mechanisms to achieve both **historic preservation** and sustainability simultaneously.
- Land use management **conserves open space, natural resources, and agricultural land**.
- The City's **stormwater management** and land use planning are integrated to minimize environmental impacts.
- The City's land use decisions address **changes in climate** and the environment.
- The community is **informed and aware** of sustainability and the City's sustainability resources.
- The City's land use policies and decision-making are continually updated to include **new technologies and practices**.
- Developers and managers design individual sites that incorporate **green building** principles, such as those included in the LEED rating systems.
- Asheville maintains a reputation as a sustainable city in the region and nation.

Land use management for implementation of sustainability principles occur at the regional, neighborhood, and site scales

Sustainable Land Use at the Regional, Neighborhood, and Site Levels

Land use decisions affect multiple facets of the community, and represent actions at a variety of scales, from regional planning, to the design or re-design of individual neighborhoods, down to the site and building scale.

Regional and Community Level

Sustainable planning is best achieved through land use management and regulation of the density and layout of the built environment. At this top level, improvements in sustainability come primarily from increasing density of development and providing for mixed land uses (residential/business). This affects the vehicle miles traveled, the ability to support mass transit, and the cost and energy used in providing potable water, wastewater collection, solid waste provisioning, and transportation and communication infrastructure. This scale of sustainable planning serves as a foundation—or base layer—upon which other sustainability practices are applied.

Neighborhood Level

The second level of sustainable planning involves optimizing site design and layout related to building use and orientation, building interrelationships, advancing opportunities for walking and biking, and designing site layout to reduce the distribution of utility systems.

Site Level

The third level of sustainable planning focuses principally on the design of buildings and residences, applying energy efficient designs, interior recycling systems, and LEED technologies, via development ordinances and codes.

The Land Use components of the plan will provide an assessment of the City's current land use practices and provide recommendations for further actions that address land use sustainability at the three scales of action described above. Recommendations for sustainable land use presented later in this plan address the identified land use goals and the principles outlined above.

Existing Conditions for Land Use

Asheville has a population of 76,000 and is located in the Blue Ridge Mountains where the City's natural environment plays a major role in its built development. The City's mountain location has affected land use in the metropolitan area, as steep slopes restrict viably developable land and create important viewsheds. Located at the confluence of the Swannanoa and French Broad rivers, Asheville also possesses miles of riverfront. These natural features provide a backdrop for a relatively dense downtown, which is surrounded by a variety of new and historic residential neighborhoods, as well as several sizeable institutional campuses.

Development Patterns

The City's current comprehensive plan, *Asheville City Development Plan 2025*, advances the idea that automobile use has defined development patterns in the last 50 years, moving the trend from dense walkable neighborhoods to more sprawling districts connected by automobile routes. This is the case in many American cities. Asheville is home to an urban core and some historic neighborhoods with traditional dense patterns, such as the Montford, and surrounding suburban-style development along each of the corridors leading to and from the City core.

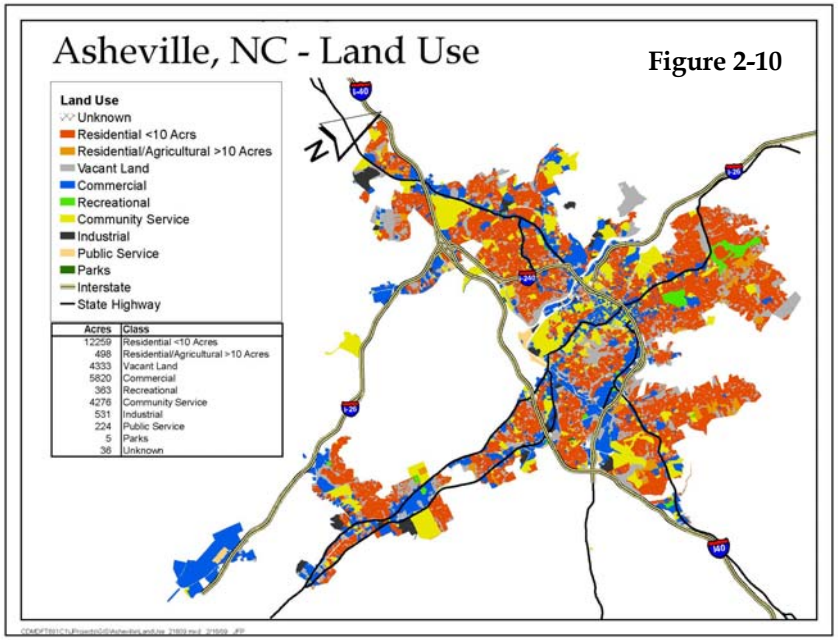


Figure 2-10

Asheville 2025 states that "During the period 1950 to 1990, Asheville's urbanized area grew 4.8 times faster than the population….these statistics rank Asheville near the top of the most sprawling cities in North Carolina." In fact, Asheville metropolitan area's (which includes Hendersonville, Waynesville and several unincorporated towns) 2000 housing density of 93.8 units per square mile is no more than two-thirds that of other metropolitan areas in the state, such as Greensboro, Charlotte, and Raleigh-Durham-Chapel Hill.

Current Land Use

The City of Asheville has not undertaken a recent analysis of land use and does not use conventional land use mapping in its most recent comprehensive plan. Using parcel-level data provided by the City, an approximation of land use is possible. As indicated in **Table 2-16**, the primary land use in the City of Asheville is residential, comprising 45% of the land within the City borders. Commercial land use constitutes the second greatest land use, at 21%. As show in Figure 2.10, commercial activity is concentrated primarily along major transportation corridors. In the areas surrounding the downtown and between the major corridors, residential and "community service"—city-administered property and services, such as police, fire, and schools—are prevalent.

Table 2-16: Asheville Land Use

Land Use/Land Cover	Acres	Percentage
Residential	12,757	45%
Vacant Land	4,333	15%
Commercial	5,820	21%
Recreational	363	1%
Community Service	4,276	15%
Industrial	531	2%
Public Service	224	1%
Parks	5	0.02%
Unknown	36	0.13%
Total	28,345	100%

Key Corridors

Downtown Asheville is home to a mix of uses: residential, retail, office, institutional, and other commercial. The downtown is largely a dense, pedestrian-oriented area with sidewalks and street-level activity. The major commercial corridors that extend from the downtown are Merrimon Avenue, Tunnel Road, Patton Avenue, and Hendersonville Road (**Figure 2-11**). These corridors were developed primarily after the 1960s and therefore are of a more automobile-

oriented nature, with features such as low density large parking facilities fronting the street, limited safe pedestrian or biking opportunities, and separation of land uses. These corridors lead to the City's primary nodes aptly described by the cardinal directions, including North Asheville/Montford/University, West Asheville/River District, South Asheville/Biltmore, and East Asheville. The I-240 expressway links the City to the state's major highway network and runs around the downtown, dividing it from residential neighborhoods to the north.

(For a more in-depth description of Asheville's land use and future demands, see the "Land use and Transportation" Section of the *Asheville City Development Plan 2025*)

Current and Planned Initiatives

In accordance with the land use goals indentified in Section 1, this section assesses the strengths and weaknesses of current planning tools. The City's primary regulatory and planning instruments are evaluated against the sustainable land use planning principles.

Unified Development Ordinance

The City of Asheville's Unified Development Ordinance (UDO) serves as the primary land use regulatory tool. Organized as a traditional zoning code, the UDO specifies permitted uses and dimensional requirements for land development in the City's various zoning districts. The following items summarize key aspects of the UDO, highlighting strengths and weaknesses regarding alignment with sustainability principles:

STRENGTHS

- The Central Business District (CBD) zoning district encourages a mix of commercial, retail, and residential development, providing for a dense, mixed-use, urban neighborhood. Infill development is encouraged by the absence of height and lot size restrictions, which allows for high density and greater flexibility in the design of projects. (UDO Ch. 7 Article VIII)

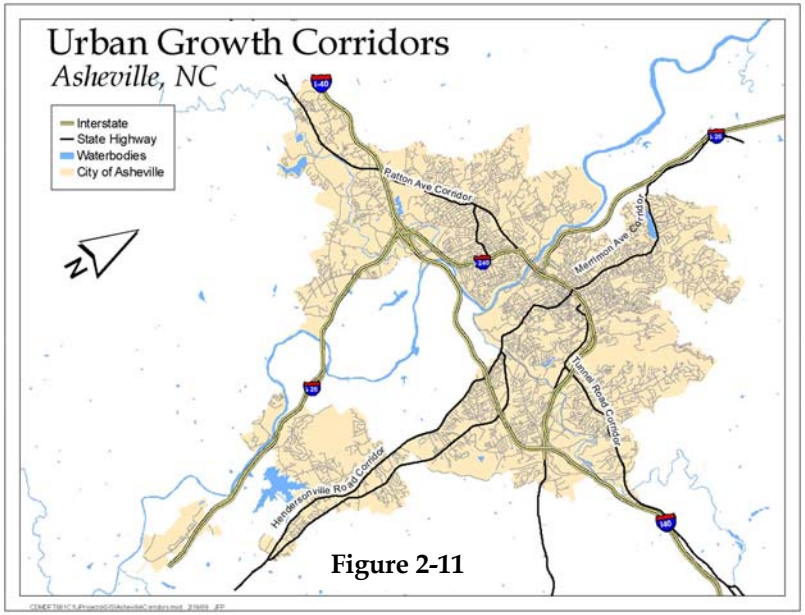


Figure 2-11

- A wide mix of uses is allowed in virtually all of the zoning districts. In theory, allowing residential use throughout the City promotes mixed use development, which is crucial in creating a development pattern that does not require automobiles in order to travel between use-segregated neighborhoods, and instead promotes locally sustainable neighborhoods. (UDO Ch. 7 Article VIII)

- The Neighborhood Corridor, Urban Place, Urban Village, and Urban Residential explicitly promote mixed use development and diverse housing and building types. These districts, by allowing denser development, encouraging ground floor retail, and requiring the integration of open space into development, set parameters for an urban fabric that is more sustainable. The Urban Village district requires a master plan review, creating what can be a collaborative process in the design of New Urbanist-style neighborhoods. (UDO Ch. 7 Article VIII)

- Maximum parking requirements in certain districts curb the ability of developers to create buildings and neighborhoods that rely on automobile access, thereby encouraging the use of alternative modes of transportation, such as transit, bicycle, and walking. (UDO Ch. 7 Article XI)

- Restrictions on big box retail, which is widely known to dramatically reduce site perviousness, encourage auto-only access, and disrupt the urban street fabric, are in place in the Regional Business district. Integration with surrounding development is one of the district requirements' intents. (UDO Ch. 7 Article VIII)

- There are tree shading requirements for parking lots, which can help reduce heat-island effect, thereby reducing energy costs and lowering impacts on human health. (UDO Ch. 7 Article XI)

- The building permit fee waiver for green buildings is a small incentive for green design of new development.

WEAKNESSES

- Front setback requirements are present in almost all zoning districts, including areas whose other dimensional requirements promote density. Reducing or removing front setback requirements facilitates urban development and creates a more pedestrian-oriented atmosphere. Parking in commercial districts can be moved (or placed behind) so that the interface of the street and store front is not interrupted by large parking lots. (UDO Ch. 7 Article VIII)

- A pre-development conference with City planners is required and encouraged for development review, but a discussion of sustainability or smart growth is not explicitly required at this important juncture. Clearly defining these expectations at the front end of the development review process, particularly for Level III review, is important for assuring development occurs in keeping with City goals. (UDO Ch. 7 Article V)

- Review of Level II and Level I projects does not allow the opportunity or leverage to require and suggest more sustainable designs. On the other hand, Level III projects, which are ultimately decided by City Council, are subject to a review that their proponents may not have anticipated earlier in the permitting process. (UDO Ch. 7 Article V)

- Much of the City's most developable areas are zoned low- to medium-density residential. Denser mixed-use development would require less infrastructure investment and consumes less energy resources. In order to increase mixed use development, higher densities and a greater diversity of uses

should be incentivized in the zoning districts that cover developable areas in the City.

- The explicitly mixed-use districts (Neighborhood Corridor, Urban Place, Urban Village, and Urban Residential) constitute only a very small share of the land in Asheville.

Asheville City Development Plan 2025

Completed in 2005, the *Asheville City Development Plan 2025* is a comprehensive plan based on the principles of smart growth. The plan is forward-thinking and by focusing on smart growth, it inherently establishes a precedent for sustainable land use planning in the City. The following items summarize key aspects of *Asheville 2025, highlighting* strengths and weaknesses regarding alignment with sustainability principles:

STRENGTHS

- Smart Growth Land Use Policies were adopted by the Asheville City Council in 2000. These include a number of density, transit, mixed use, and open space policies that are aligned with the City's sustainability objects. (*Vision*) [Smart Growth Land Use Policies]

- Infill development in the downtown is promoted: *"Compatible, higher density commercial and residential infill development should be encouraged…Existing neighborhoods near Downtown Asheville should be strengthened through infill development, housing rehabilitation, proactive enforcement of zoning and building standards, and housing code enforcement."* Infill development creates a denser urban core, which makes use of the existing impervious, developed land that is available. (*Vision*)

- The need to expand transit options is a high priority. Providing alternatives to automobile transportation is central to reducing emissions. (*Vision*)

- Mixed-use development is promoted. Mixed-use neighborhoods reduce the need for vehicle trips for basic services and create more attractive and practical pedestrian corridors. *"Mixed use developments and buildings should be encouraged." … The City can no longer afford to have land uses fully segregated by type, resulting in people driving long distances to their jobs or to access every day services." (Land Use and Transportation)*

- *Asheville 2025* contains a detailed introduction to the general concept of transfer of development rights (TDR) to protect undeveloped land and foster denser development in the City. This is a useful tool for achieving great regional land conservation and for promoting infill development, however, there is no specific discussion of possible sending or receiving areas, or how a program would work in the broader intergovernmental region. *(Land Use and Transportation)*

- Affordable housing is a goal. Housing for Asheville's workforce is essential to sustain the economy, and housing can be made more affordable by implementing green building and sustainable design techniques to reduce energy and water utility payments by residents. (*Vision*)

- There is recognition throughout Asheville 2025 that the City depends on tourism and outside reputation for economic prosperity, which in turn raises the importance of conservation of natural resources.

WEAKNESSES

- Energy conservation and energy use, including its relation to land use, are not discussed or analyzed in *Asheville 2025*.

- The land use and transportation analysis and recommendations are intermixed, at the expense of a thorough current or future land use discussion. While the connection between transportation and land use is important, framing land use as a consequence of transportation policy diminishes the importance of guiding land use. There are no data or maps on current land use breakdowns, nor a City-wide future land use recommendation, save a transportation-based recommendation of development nodes. *(Land Use and Transportation)*

- Green building and the LEED development standard are discussed as possible tools for integration with land use and development planning, but not in a specific manner.

- A specific analysis and discussion of conservation lands and conservation priorities is not a component of the plan.

- Climate change could have substantial impact on the City of Asheville both by direct weather impacts (water supply stability, for example) and by increased population in-migration. Climate change vulnerability assessments and discussions of adaptation planning are not included in the plan.

- While not part of the *Asheville 2025* document, the City also has six neighborhood-specific plans. These plans are not in active use, and updates to several of them are on hold.

Downtown Plan

Currently in draft form, the Downtown Development Plan, is an urban-design-focused revitalization plan. The following items summarize key aspects of the Downtown Development Plan:

Sustainability is a goal: "Make downtown a national model of sustainable development and operations at every level" is a master plan vision principle." Green building is a proposed element; bonuses for LEED buildings and a LEED Gold standard are recommended. The plan proposes few strategies that specifically address sustainability or employ sustainable methods.

Streamlining the development review process is a major priority. "Strategy 6: Update downtown design guidelines to be current, clear, and promote sustainable development." Proposed actions include consolidating the design review process (UDO, building code, downtown design guidelines). Sustainable development guidelines could be incorporated into this renewed process.

The draft downtown plan recommends the creation of a Community Benefits Program requiring larger downtown development (and redevelopment) projects to contribute proportionately to projects that offer shared benefits or reflect

community values, e.g., green space, affordable housing, public art, workforce training, minority business programs, historic preservation and other capital improvements. In return, developers receive the right to build to bonus heights and benefit from the significant returns commonly earned by upper floors with views.

Wilma Dykeman Riverfront Plan

The Wilma Dykeman Riverfront Plan is an urban design strategy plan for the regeneration of Asheville's waterfronts. The plan proposes design and development schemes for seven distinct districts along the City's various riverfronts. Urban design and economic development analysis provide a range of options, including arts, recreation, business, and housing. The plan's urban design recommendations provide a very detailed vision that represents a thorough public involvement process. This plan provides a strong design template, which can serve an early step should the City choose to embark on projects in the waterfront areas. A consolidated approach to implementation, however, is lacking. The riverfront areas are a major asset for the City, and piecemeal implementation of the plan may prove insufficient and ultimately render the plan outdated before substantive redevelopment momentum occurs.

Regional Planning Initiatives

Regional planning in the areas including and surrounding Asheville do not exert substantial influence over the City's planning authority; however, several planning and planning-related organizations address land use and sustainability. Among these are the following key items.

- Land-of-Sky Regional Council (LOSRC) is a multi-county, local government planning and development organization in North Carolina. It is one of 17 such organizations in the state and serves Region B, which includes the Buncombe, Henderson, Madison and Transylvania Counties. Consisting of high-level elected officials and local business representatives, the Council also retains full-time planning staff. The LOSRC develops regional plans, such as economic and greenway plans, and provides planning services to municipalities,

- The Comprehensive Economic Development Strategy, or CEDS, is a five-year strategic economic development plan for 2007-2012 developed and adopted by the LOSRC in 2007. A Board-appointed Strategy Committee developed the CEDS with input from an online survey, a Regional Resource Group, a strategic planning exercise by the full Board, and a staff review of local, regional and state plans and policies. Among the plan's major initiatives is regional growth management planning, which calls for identification of regional partners, provision of planning resources, and coordinated growth management by 2009.

- Buncombe County, which surrounds Asheville, adopted zoning in 2007. The County's land use plan was updated in 2006, and amendments to the subdivision ordinance are under consideration.

Education and Communication

Role of Education and Communication in Sustainability, Energy Consumption, and Emissions

Changing a daily routine to incorporate more environmentally conscious decisions can be an overwhelming and time-consuming task. Many people feel they have neither the time nor resources to make the necessary lifestyle changes, and often these responsibilities appear to be unattainable. Education can address this problem and empower City employees to become community leaders. Educational tools can inform and motivate employees to not only make practical decisions independently, but also support a culture change among daily work routines. With over 1000 men and women serving the City of Asheville, education and outreach efforts can make a considerable impact on individual actions while on the job, thus providing significant progress in achieving carbon reduction goals. Each subject area of this Plan could easily have its own education and communication section. This section is to serve as a conceptual overview for communication and education that can be applied to any of the subject areas addressed in this Plan.

Educational tools can inform and motivate employees to not only make practical decisions independently, but also support a culture change among daily work routines.

Existing Conditions for Education

The City of Asheville has ample opportunities to fold sustainability education into established educational tools and programs. The Community Relations division of the City Manager's Office successfully centralizes communication and outreach efforts for the City. Through their existing framework, the City can pursue a holistic approach to lead other departments in communicating sustainability goals and educating staff about ways to become more sustainable. In Section 3 the "how to communicate about sustainability" question is expounded to evaluate the materials we use to communicate and educate to ensure they demonstrate sustainability principles as well. This section focuses on reviewing the various existing methods that effectively capture the attention of staff and promote awareness.

Continuing Education and Training

Educational opportunities in the form of continuing education courses, trainings, seminars, and degrees exist for City employees, with a wide selection of subject matter. Infusing the educational opportunities with options to learn more about sustainability and energy usage will be a successful tool to achieve City-wide green house gas emissions goals. See the current initiatives section that follows to see the programs already under way.

Outreach

Large organizations with a strong structure for their chain of command are typically well-equipped to implement new programs. Communicating shared goals and sustainability expectations through the chain of command has worked with the City of Asheville for other management-led initiatives, and would be a strong opportunity to reinforce other outreach and communication strategies for sustainability. Any time a group

of staff formally meet can be a chance to reach out and communicate about sustainability goals and programs.

From the Division level to the City-wide level, there exist events that bring staff together. Notably is a successful annual Public Works Day with a free picnic lunch and a series of field competitions for staff to demonstrate their job skills, including dump truck races and tree climbing. Events like this typically include a space with booths set up for staff to access information about health care, new City policies, or programs such as sustainability initiatives. The winter holiday season offers opportunities for outreach at various events throughout the organization. For example, the community center directors celebrated the holiday season with an ice skating group activity at the Civic Center, and the Energy Coordinator joined them as a speaker to close the event.

Incentives

Quality of Service Awards

The purpose of the City's Quality of Service Awards (QSA) Program is to recognize employees in a timely manner for their contributions to the organization. These contributions go above and beyond the normal scope and responsibilities of the performance of job duties. The value of the award ranges from a mug or pin to $250 cash bonuses and is determined through a structured tier system. The breadth of contributions recognized makes this incentive opportunity a strong option for encouraging staff to incorporate sustainability principles into their work life. Eligible contributions include: customer service, innovation, efficiency, cost savings, educational achievement, and goal attainment, among others. Recognitions of this sort must be approved by the employee's Department Director and eventually the City Manager, with a recommendation from the Human Resources Department.

Employee of the Month

Similar to the QSA award, employee of the month is awarded to staff members who rise above the surface through their actions and contributions to the organization. This incentive program is not formalized City-wide but has various manifestations in the different departments. Rewards for staff include a preferred parking space for the month, lunch with the department director, their picture on bulletin boards, and/or additional points earned for their annual employee evaluation.

Marketing

FYI Newsletter

FYI is a monthly newsletter created in the Human Resources department and distributed to all staff through email, the intranet (see below) and in a few cases, hard copy. This typically 10- to 20-page document always includes a letter from the City Manager and articles submitted from any interested departments. This resource is beneficial for educational purposes, but provides challenges for measuring effectiveness because it casts a wide net. From a resources perspective, this is a desirable marketing tool because it requires little paper, ink, or electricity for printing.

Paycheck Stuffers

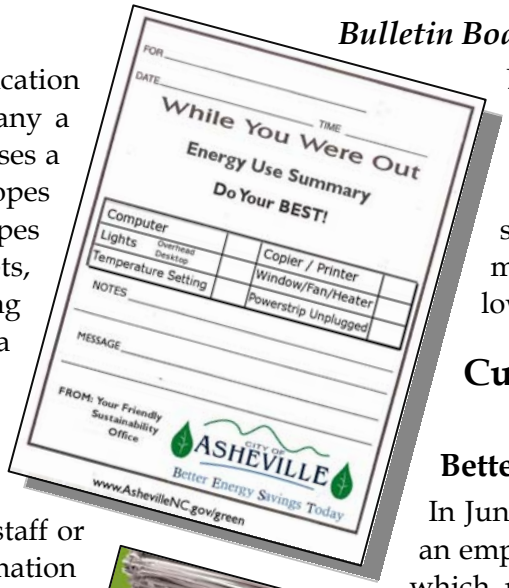
This paper-intensive method for communication involves creating a marketing piece to accompany a paycheck or pay receipt. The City of Asheville uses a service that pre-assembles receipts in the envelopes for each staff every two weeks. When the envelopes reach the City staff who distribute the receipts, they are already sealed. Therefore, adding additional marketing materials requires extra effort to rubber and or staple materials to paycheck envelopes.

E-Mail Blasts

E-mail messages can easily be distributed to all staff or sub sections of staff with announcements, information or crafted communication messages.

Website/Intranet

The City's Office of Sustainability currently has a website with information regarding programming, goals, and additional links for educational purposes regarding sustainability in municipalities which is available to the public as well as staff: www.AshevilleNC.gov/green. The Intranet is a site available only to staff from the City server. This site has information ranging from benefits to City policies to more technical operational information. The intranet is a great place to host information pertaining only to staff.



Bulletin Boards

Bulletin boards share information and are located in a myriad of different locations throughout City buildings. This method requires creating a poster or flyer of sorts to share information. Though a widely utilized method of communication this strategy has a low rate of effectiveness (site)

Current and Planned Initiatives

Better Energy Savings Today

In June 2008, the Office of Sustainability launched an employee conservation campaign called B.E.S.T. which represents "Better Energy Savings Today". The campaign combined educational messaging with action suggestions that were distributed in the major office facilities as well as a cross-section of fire stations and community centers. The initial analysis of this program displayed an 11.5% energy usage reduction in the participating buildings. The messaging was communicated using bulletin board posters, conservation reminder stickers on light switches, electrical outlets and thermostats; and "While You Were Out" energy use summaries. The summaries were specifically used as a tool to congratulate people who were already exhibiting conservation behavior as an informal "pat on the back".

Employee Appreciation Day

The annual employee appreciation day features a free picnic lunch, prizes and outdoor games like Frisbee or volleyball. Employees from all departments enjoy a slow pace work day and the chance to connect with colleagues. At this event, there are tables with information from benefits and service providers and specialists available to employees. Last year, the Office of Sustainability teamed up with the Transit Division to have a table with literature, prizes and games. Two communication pieces were featured at this event. The first piece was a postcard with a photo of City Hall on the cover and conservation tips for staff on the back with instructions to send to a co-worker who did a good job conserving energy. The second piece was double-sided and laminated. One side had conservation suggestions and the other side had a template for a to-do list. The intention of this piece was for use as a dry erase board to aid staff in using less paper. Both of these products were designed to be functional and to include educational messaging, instead of the traditional flyer that has a sole function of sharing information.

Recycling Program

The City of Asheville began a residential recycling program in 1997. Since that time, this program has risen to have the second highest diversion rate in the State. The early success of this program generated interest within the City government to implement an internal recycling program. The City launched an internal paper recycling program in the three largest City facilities with a grant from the State Department of Environment and Natural Resources. The program started with seed money for the bins and now includes educational signage, displays, and fact sheets regarding what can and can't be recycled. Over the years, this program has grown to include recycling plastics and glass, and now serves 55% of City facilities totaling 35 locations. In addition to promoting recycling in City facilities, the Sanitation Division has also hosted in partnership with Buncombe County events to collect non-traditional recyclables and to sell compost bins:

- Electronics Recycling Day: This event was promoted to employees and citizens of both the City and County in order to collect electronics for recycling.
- Hazardous Waste Recycling Day: This event was promoted to employees and citizens of both the City and County in order to collect hazardous waste for recycling.
- Compost Bin Sale: This event sold compost bins at a reduced rate to City residents and employees.
- Street Division Laborer Apprenticeship Program

Asheville's Streets Division has worked with the North Carolina Department of Labor to design an apprenticeship program for its employees. The national program allows participating agencies to partner with the Department of Labor to design a curriculum of classes and on-the-job training to certify employees as journeymen in one of several fields. The curriculum for next year includes a workplace sustainability course. The curriculum provides employees with much needed training at a standardized level, and completion earns the employee a journeymen's certificate that is accepted nationwide. Participating agencies also benefit from the higher skill sets these advanced training

opportunities provide, and from the cross-training that creates a more well-rounded and capable workforce.

Building Safety Insurance Certificate Program

The Building Safety Department requires continuing education training for their inspectors. Subject matter changes to reflect upgrades in the building codes and new technologies and building practices. In 2007, the Building Safety Department created a partnership with the Western North Carolina Green Building Council (WNC GBC) to incorporate green building practices, techniques, and technologies in these continuing education trainings. Representatives from the WNC GBC speakers' bureau have lead lectures, trainings, and seminars with the entire inspections staff, covering topics such as solar technology, alternative building materials, and basic energy efficiency construction methods.

Water Department ISO 14001

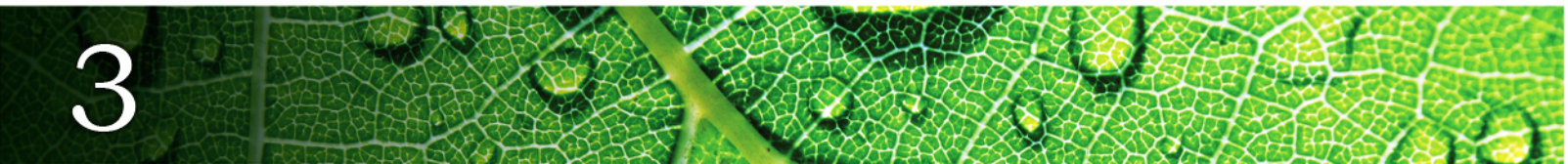
In December 2004, the City of Asheville Water Resources Department became the first ISO 14001-registered water utility in North Carolina. The ISO 14001 International Standard requires education to both employees and contractors about environmental policy and what the environmental impacts are of the activities performed. Through this certification, the department has embraced the four C's environmental policy: continuous improvement, communication, compliance, and commitment to prevent pollution. In 2007, the department was re-certified by the National Sanitation Foundation (NSF), showing continued commitment to protect the environment and educate staff about their roles and responsibility to environmental protection.

Transit Environmental Management System

The City of Asheville Transit System has been selected to receive Environmental Management System (EMS) training. The process of receiving this training will support the efforts of the division to manage and operate in a more sustainable and efficient manner. The EMS is a set of operational procedures that allow an organization to set specific environmental goals for its operations, and objectively measure its performance in achieving those goals. An EMS integrates strong operational controls, environmental roles, and responsibilities into existing job descriptions and work activities. Organizations with an EMS report are able to better manage their environmental obligations effectively by analyzing, controlling, and reducing environmental impacts.

CITY OF ASHEVILLE

OPPORTUNITIES: A SUSTAINABLE FUTURE



Section 3 Opportunities: *A Sustainable Future*

Section 3 builds upon the foundation identified in Section 2 by providing emission reduction strategies, best practices, and institutional/policy recommendations towards a more sustainable future for the City of Asheville. The recommendations provided in each section are aligned with the strategic goals outlined in Section 1.

Sustainable solutions meet the needs of the present without compromising the ability of future generations to meet their own needs. These solutions meet the "The Triple Bottom Line" by balancing environmental stewardship, economic growth and social responsibility.

Buildings, Public Facilities, and Street Lighting

Opportunities for Innovation, Tools & Best Practices

Many cities are confronted with how to plan for a long term sustainable future with regard to their new and existing facilities. Commonly, it is discovered that existing buildings are poor performers with regard to energy, water use and waste to landfill operations. When benchmarked against the EPA Energy Star program, buildings over 20 years old and without recent renovations perform at around 50% of energy performance of what a newly constructed LEED building would. Energy audits and performance contracts will help with regard to energy reduction but do not give an overall comprehensive and sustainable approach to existing facilities which is needed for long term implementation of sustainable principles.

As indicated in Section 2, the City of Asheville's building and lighting systems are not yet operating in a sustainable manner. In order to reach this goal, the City will have to consider a number of systematic design, construction, and operation changes to its current approach to building and lighting systems. Changing its approach to building operations does not require an entire overhaul of the existing system; however a consistent, comprehensive framework with standards for current and future decisions is beneficial. This section takes a broad look at a range of subsectors of the City's Building and Lighting system, and in keeping with the stated goals listed in the previous sections, provides guidance for the reduction of energy consumption from City facilities through the following:

Identification of energy saving opportunities for the buildings assessed.

- Identification of system-wide best practices and techniques that reduce energy consumption across all City facilities
- Recommendations for long-term management of City buildings.
- Assessment of City renewable energy production and purchase opportunities;

- recommendations for developing, tailoring, or adopting existing standards for energy efficiency for retrofits, upgrades, operation, and maintenance to Asheville's facilities;

This section presents two tiers of assessment and recommendations for improving and managing the City's building infrastructure:

- Case studies and specific recommendations for the six buildings assessed, including City Hall the Public Works building, Fire Station #8, the Montford Community Center, the Steven-Lee Recreation Center, and the Civic Center.

- General assessment and policy recommendations for overarching management of the City's building infrastructure.

Recommendations for each are organized according to the system categories outlined in Section 2, and include HVAC, Lighting, Building Envelope, Water & Wastewater, On-site Renewable Energy, and Operations and Management. This section uses the term Energy Use Index or EUI as a way to baseline Asheville's energy use compared to other buildings of similar use as collected by the EPA (Environmental Protection Agency) ENERGY STAR program. EUI can be defined as the ratio of total BTU's used per year to the total number of square feet of conditioned space. A typical office building in the U.S. has a EUI of about 90,500 BTU/SF/YEAR.

Energy Use Index (EUI) can be defined as the ratio of total BTU's used per year to the total number of square feet of conditioned space.

Case Studies

Site visits were conducted at City Hall, the Public Works building, Fire Station #8, the Montford Community Center, the Steven-Lee Recreation Center and the Civic Center over three days in July 2008. These six facilities provided a cross section of small, medium and large facilities built over various time periods and utilizing diverse building systems. The purpose of conducting the six case studies was to provide the City a more in-depth look at both energy opportunities and constraints that should be considered for further evaluation and implementation. Common areas for improvement have been identified within these case studies, which can help to inform the broader recommendations for the City's full building inventory.

City Hall

Initially constructed in the 1920s and now classified as a historic landmark, Asheville City Hall is an eight story structure that houses several of the City's municipal services. While a building renovation was completed in 1989, these upgrades were limited to the first six floors of the building. Partial upgrades to the seventh floor offices were also included, however the eighth floor was not renovated. There was an energy audit that was completed in 2005 by Waste Reduction Partners and the Land-of-Sky Regional Council and in 2007 by Advance Energy which covered the electrical lighting system. In addition to what was discussed in these audits, there are incandescent lights in the lobby, throughout the building, and within exit signs.

The lack of a complete renovation has resulted in temperature and humidity problems, as well as architectural and structural issues on the upper floors of the building. It is believed that extreme temperature and humidity levels have helped to contribute to deteriorated plaster and other leaks in the building exterior wall system.

Over the years, several energy audits have been completed for City Hall by outside entities; these studies have been attached in the report appendices. In summary, a review of the utility bills provided indicate that City Hall has an Energy Utilization Index (EUI) of 98.04 kBtu/ft2/yr – compared to the EUI of similar multistory buildings of 85, or a 15% increase over the average. This suggests strong potential for efficiency upgrades.

City Hall has an Energy Utilization Index (EUI) of 98.04 kBtu/ft2/yr – compared to the EUI of similar multistory buildings of 85, or a 15% increase over the average. This suggests strong potential for efficiency upgrades.

The building is served by a mix of both central plant and packaged HVAC units and equipment. Located in the basement of the facility are a central plant chiller and two steam boilers. Steam boiler systems not only provide steam for general heating, but also provide steam for conversion to the building hot water system. Building systems are in general, pneumatically controlled. The existing chiller has been supplied with a more efficient variable frequency drive (VFD). However, due to maintenance funding, this VFD has been bypassed and is inoperable and needs repair.

Packaged (stand-alone) units are evident in localized areas (phone room & council area) and provide needed supplemental thermal conditioning. The building appears to suffer from indoor air quality problems, as there is no make-up air unit located within the building to serve office areas, and occupants must rely on operable windows for fresh air ventilation. In concert with the 1989 building renovation, chilled water is not available on the 7th or 8th floor to provide cooling in these areas. On the lower levels building offices are generally conditioned by fan coil units with individual controls and are not tied to a building-wide system. Additional temperature and humidity issues persist in the print shop. As control is limited and space reheat is most likely needed in this area, due to the system configuration this is not currently available as the boilers need do not operate in the cooling season.

The building envelope for City Hall consists of a brick and stone exterior façade with several small roof decks that are flat and a large slope roof with Spanish barrel clay tile shingles. Most of the windows have been replaced during the most recent renovation; however the eighth floor windows are not new and due to their unique pattern may remain single pane. Because of the masonry wall system only interior thermal improvements can be made.

The City Hall's water and waste water systems (potable & sanitary) are typical for a building of this type. Fixtures and equipment are of standard commercial construction and use. Low flow fixtures and equipment were not observed, nor were automatic/sensor water faucets or flush valves.

Recommendations

The building would strongly benefit from repaired equipment and general upgrades, programmable controls, a building management system, and a general operation and maintenance plan. Low flow toilet fixtures and automatic sensors should be added to all faucets, urinals and water closets. All remaining incandescent lights and exit signs should be replaced with compact fluorescent. Occupancy sensors should be added to areas such as bathrooms, offices, storage rooms and meeting rooms.

It is recommended that if the eighth floor goes through a renovation in the future that both increased insulation and thermal barrier be added to the inside surface of the exterior wall. Also, a study to determine the cost impact and options available for replacing the remaining original windows should be performed.

Exterior building lighting was observed but not evaluated. Opportunities for decreased energy use may be achievable, either through more efficient lighting technology or decreased lighting times via timer control

The Public Works Building has an EUI of 87.05 kBtu/ft2/year, which is close to buildings of similar construction, vintage and utilization benchmarked at 85 kBtu/ft2/year.

Public Works Building

Constructed in 1992, the City's Public Works building currently houses several of the City's Public Works staff and services. A review of the facility's utility bills has resulted in identifying the buildings EUI as 87.05 kBtu/ft2/year, close to buildings of similar construction, vintage and utilization which are benchmarked at 85 kBtu/ft2/year.

The building is served by constant volume with reheat forced air systems. The central cooling forced air system is coupled with individual fan-coil reheat boxes located throughout the various building zones. Cooling chilled water is provided by an external (outdoor) air cooled chiller, while heating is provided by a hot water boiler. Individual fan-coil boxes were not inspected or observed due to access limitations. Equipment observed, however, was generally in good working condition.

There was an energy audit that was completed in 2007 by Advance Energy which discussed the electrical lighting system. The building envelope for the Public Works building consists of an insulated perimeter stud and gypsum board wall with an exterior brick veneer. The building exterior walls are new and well insulated. The roof is flat with a ballasted membrane and rigid insulation on a metal deck. The roof is also insulated well and there are no recommendations for insulation improvements.

Recommendations

The building would benefit from continued equipment maintenance and general upgrades as necessary. As building occupancy layout is altered/modified, systems should be reviewed for zoning and applicability. In addition, the use of HVAC economizers is recommended to provide free cooling in temperate climates.

It is also recommended that existing non-conservation water fixtures be systematically converted to low flow/water conservation type units with automatic flush valves.

Fire Station #8

The Asheville Fire Station # 8 is adjacent to the East Asheville Recreation Center and Library. This structure utilizes a common roof between three independent buildings that have open breezeways between them. The fire station portion of the structure faces Tunnel Road and is a relatively small and simple structure of approximately 4,000 square feet. A review of this facility's utility bills has indicated an EUI of 108.6 kBtu/ft2/yr. Buildings of similar construction and utilization have an EUI of 78. However, it should be noted that in this particular instance, the utility meters serving this building also provide service to an additional two (2) buildings at this location (Community Center & Library) which have the potential to skew the data.

Utility meters serving Fire Station 8 also provide service to the Community Center & Library. Separate metering should be provided for these facilities to accurately account for Fire Station 8 energy usage.

The facility's HVAC systems are typical of a small commercial or residential installation. The building is served by multiple gas-fired heating/direct expansion cooling split system forced air units. The units are controlled by programmable thermostats.

With the recent building renovations, new energy efficient fluorescent T8 lighting and LED exit signs were installed. In the existing areas that did not go through any lighting improvement, including but not limited to, the truck garage, gym and bathrooms, there is existing T12 fluorescent and incandescent lighting.

The building envelope for the fire station consists of exterior concrete block walls with a stone veneer. The exterior walls serve as bearing walls and more than likely are grouted solid for added structural capability. The roof consists of a perimeter flat roof of approximately six-feet in depth with a sloped portion of roof for the central roof section. There is already roof insulation within the roof structure. The exterior windows are single pane except for the front windows which were replaced with insulated aluminum framed windows.

Recommendations

Given building HVAC systems are generally new and in good working condition, systems should be reviewed for space/zone applicability as there are apparent moisture and humidity problems. Areas that are used for exercise should be treated as such just as those that are for sleeping quarters. HVAC equipment should utilize economizer systems at a minimum and the use of energy recovery units should be reviewed.

It is also recommended that utility data be monitored separately for the different buildings currently being fed from the primary system. This will allow the City to better gauge energy consumption and utilization.

The exterior walls can gain increased insulation from the inside face by adding metal studs, insulation, vapor barrier and gypsum board, which would be recommended for future renovation plans. It is recommended that the ten exterior windows be replaced with aluminum thermal break windows

and insulated glass. The last area for consideration should be the two overhead sectional garage doors which currently are un-insulated and if replaced should be changed to insulated doors.

Within the areas of the fire station that did not undergo the recent upgrades, specifically the garage, gym and bathroom, there are existing inefficient T12 fluorescent fixtures, which should be replaced with more efficient T8 fluorescent fixtures. If capital costs are not available to replace the existing fixtures then as a minimum the ballasts and bulbs should be replaced when the existing ballasts fail. Additionally, where there are manual wall switches within the bathrooms and gym, these should be replaced with occupancy sensors. It is also worth noting that there are three "main" disconnects located in the Fire Station Electrical Room. It appears that the utility provided only one service to the three municipal facilities located at this site which includes the Fire Station and that power is extended to the other two municipal building from the Fire Station electrical Room. This should be further investigated. If it is confirmed that there is only one meter for all three municipal buildings then metering should be provided for the other two municipal facilities to accurately account for Fire Station 8 and enable these facilities to be held accountable for their energy usage.

Montford Community Center

The Montford Community Center is a single story building with a high bay gymnasium portion and lower office and support spaces on two sides of the high bay gym. The building serves the neighboring community and is open year round providing activities for the community. The building appears to be built in the 1980s and is in fair condition. A review of this facility's utility bills has indicated an EUI of 69.71 kBtu/ft2/yr. Building of similar construction and utilization have an EUI of 68, or close to average energy usage.

The community center's HVAC systems are of mixed condition and vintage. In speaking with maintenance staff, it was noted that four new rooftop air handling units had recently been installed on the gymnasium roof. These units are controlled with programmable thermostats. Hot water is provided via a natural gas fired boiler. Additional heating in the meeting area is generated using residential type gas radiant heater.

Throughout the building there are existing inefficient incandescent T12 fluorescent and Mercury lamps. Specifically, there are incandescent lamps for the stage, 400W Mercury Vapor and 300W Incandescent lights in the gym, and incandescent exit signs and T12 lamps throughout the building. There is however, evidence of energy conservation within the center, including "Save Energy" stickers posted on light plates as a reminder for City employees to practice energy conservation and vending machine with the light turned off.

The building envelope is composed of concrete block exterior bearing walls that are grouted solid for strength. The roof is flat over the gymnasium portion and has a single ply fully adhered EPDM roof with 2" rigid insulation. The lower flanking roof is sloped with recently replaced shingles. There are very few windows on the lower portion of office and support rooms.

Recommendations

Existing HVAC equipment that was not recently replaced should be reviewed for equipment condition and operating efficiency. Systems should be automated when possible and the use of a Building Management System is recommended. It is also recommended that the meeting area HVAC systems be reviewed as the alterations were made due to system inefficiencies. The additional heater may have been installed due to uncoordinated architectural cabinet modifications that render installed systems useless.

The only recommendations for the building envelope would be to replace the deteriorated perimeter caulking at the existing windows and to provide new perimeter weather seals around all existing doors.

For the quickest payback, the gym lighting should be replaced with High Pressure Sodium or Metal Halide lamps. Additionally, the T12 lamps throughout the building should be replaced with fluorescent T8 lamps and the Incandescent lamps in the bathroom and stage area should be replaced with more energy efficient compact fluorescent lamps. All exit signs should be replaced with LED type exit signs and all manual switches in the kitchen, meeting room, bathrooms, storage area, locker rooms and offices should be replaced with occupancy sensors. It is also worth noting that near the building's exterior utility transformer there is an exposed conduit that is hanging from the roof, which poses a safety issue and should be fixed.

The building is in excellent condition. For the quickest payback, the gym lighting should be replaced with High Pressure Sodium or Metal Halide lamps.

Stephens-Lee Recreation Center

The Stephens-Lee Recreation Center is a recently renovated building formerly used as a school. The structure is used for offices, activity rooms, and a weight room on the first floor, with offices and an open gymnasium on the second floor. The building's overall condition is good mainly due to the recent renovations. The Stephens-Lee Recreation Center's EUI is 19.94 kBtu/ft2/yr in comparison with Recreational Sites (as defined in ASHRAE HVAC Applications 2007) of 68.

The facility's HVAC systems consist of a commercial kitchen exhaust system, steam radiators with thermostatic control valves, steam unit heaters, a steam boiler, and forced air ventilation systems. The gymnasium ventilation system is provided with chilled water via an air cooled chiller located next to the building. Domestic hot water is provided by two commercial natural gas water heaters.

The building envelope consists of perimeter block, plaster and brick veneer and is in good condition. The windows have been replaced with new aluminum frames and insulated glass. The building roof is replaced and in good condition.

The lighting system in the Stephens-Lee Recreation Center was upgraded in 1998 to include high efficacy (lumen/watt) HID lighting in the gym and new energy efficient Fluorescent T8 luminaires throughout the remainder of the building. Additionally, there is further evidence of energy conservation within the center, including "Save Energy"

stickers posted on light plates as a reminder for City employees to practice energy conservation.

Recommendations

Building HVAC systems would benefit from general maintenance and the installation of a Building Management System. Enhanced controls would allow for better system utilization and energy efficiency.

Occupancy sensors should be installed in accordance with ASHRAE 90.1 in all offices, bathrooms, storage areas and other administrative type areas where life safety is not compromised.

There are no recommendations for the building envelope for this building.

Civic Center

The Civic Center is the largest and most complicated structure evaluated of all the case study facilities. Constructed in 1975, the building contains multiple spaces for a variety of functions, including an arena for basketball, an ice rink, expositions, and the lower level exhibit hall. The Civic Center is also connected to an older theatre structure that houses offices as well as conference rooms. Since the building is two structures combined into one, the building systems are fairly complicated and somewhat interconnected. This complicates the level of improvements with regard to construction and design.

The Civic Center's EUI is 58.9 kBtu/ft2/yr, with buildings of similar sue typically at 65 kBtu/ft2/yr. It is our understanding however, that this might not be an accurate comparison, as it is currently understood that the Asheville Civic Center is not operating at full capacity. Due to reduced usage, its potential actual energy use could be severely understated.

The Civic Center's HVAC systems are numerous and expansive. Climate control is generally provided by steam heating and chilled water cooling air handlers, and additional radiant heating is also located throughout. Heating in the exhibition level is provided by hot water, generated from a steam to hot water converter, and air condition is segregated into areas provided by packaged direct expansion cooling units (offices, administration). A multi-cell cooling tower is located on the Civic Center roof, which provides condenser cooling for both the HVAC and Ice Rink Chiller Systems.

The entire facility is served by an older (20+ years) building management system and systems are provided with pneumatic control. During the ice skating season, the facility operates an ice chiller to provide ice for the civic center skating rink. Systems not in operation are typically turned off. Additionally, system zones are not always appropriate for intended use. Larger pieces of equipment must be run to serve relatively small areas due to configuration and layout.

Given the infrequent use of most Civic Center systems, highly occupied areas should be separated from central systems.

There was an energy audit that was completed in 2007 by Advance Energy which discusses the electrical systems and a lighting study by EGI Associates, Inc. in 2007, which discusses the Arena lighting. Additionally, throughout the building there were existing

inefficient incandescent down lights in the lobby, up-lights and floodlights in the auditorium and exit signs.

The building envelope for the Civic Center is a stone exterior on a concrete block support wall. The exterior walls have no opportunity for improvement. However, the lower level exhibit hall overhead doors should be replaced with new, insulated doors. The older theatre portion of the building has only the two exposed exterior brick walls with no recommended improvements. The windows on the Civic Center are original to the building but are composed of aluminum frames and insulated glazing. The windows will need to be replaced with a newer technology but this is not necessary in the immediate future.

Recommendations

HVAC systems should be replaced with high efficiency units only when they are in need of replacement. Pneumatic control lines should be examined for leaks and the system should be reviewed for potential energy management system upgrades. Given the infrequent use of most civic center systems, it is also suggested that highly occupied areas be separated from central systems. For example, the meeting room located on the top floor should be on its own dedicated system to provide adequate space temperature control, without the use of the central system. In addition, lower level exhibit hall overhead doors should be replaces with new insulated doors.

The incandescent lamps in the auditorium should be replaced with more energy efficient lamps. A detailed lighting study should be completed for this area. The exit signs should be replaced with LED type signs and the Arena lighting study by EGI Associates, Inc. study should be validated prior to making a decision on moving forward with the retrofit.

A summary of the existing and recommended EUI for the buildings assessed are provided in **Table 3.1**.

Table 3.1: Summary of Energy Use Index (EUI) and recommendations based on EPA (Environmental Protection Agency) ENERGY STAR program.

Building name	Square Feet	Current EUI	Recommended EUI	Deficiency %
City Hall	110,081	98.04	85	13.30%
Public Works	27,379	87.05	85	2.35%
Fire Station #8	8,902	108.6	78	28.18%
Montford Community Center	13,382	69.71	68	2.45%
Steven-Lee Recreation	27,144	19.94	68	NA
Civic Center	235,442	58.9	65	NA

Inventory-Wide Policy Recommendations

This section addresses the City's building infrastructure at a higher level than provided in the case study assessments, providing system-wide planning, policy, and practice recommendations for operation, maintenance, and upgrade of existing structures. The section is organized by system categories outlined in Section 2, with recommendations oriented toward solutions for the stated goals for management of City-owned buildings.

The City should consider utilizing the US Green Building Council's Leadership in Energy and Environmental Design for existing buildings (USGBC's LEED EB) best management practices as a guideline to system-wide planning and improvement. Although LEED EB certification is not necessary for any of the City's existing portfolio, it would benefit the City to utilize the strategies outlined for each credit in LEED EB and follow the intent of the point to maximize building performance. The strength of this rating system is the evaluation of environmental performance from a whole-building perspective over a building's life-cycle and in providing definitive standards that are industry accepted. In addition to the improved building performance, the USGBC has encouraged users to balance the cost of any modifications with the neighborhood and environment always weighing the synergies between these factors. Categories within LEED EB include: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation in Operations.

HVAC

A general review of Asheville's HVAC systems shows a diversity of types and vintages. Systems range in type from: commercial to light-commercial/residential, and new (Community Center) to old (Civic Center). To work with such a diverse arrangement of systems and applications (office spaces, civic centers to recreation facilities) the City needs to consider a policy/standard as broad as its buildings that emphasizes the following for existing facilities undergoing renovations:

- Building Commissioning – Periodically examine building equipment, systems, and maintenance procedures as compared to design intent and current operational needs.
- Remove and phase out of CFCs to prevent Ozone depletion – Identify all existing CFC-based refrigerant uses and upgrade the equipment if economically feasible and/or develop a phase-out plan that identifies a schedule for future replacement.
- O&M Staff Building Education to ensure systems are maintained and operated in accordance with manufactures recommendations and to sustain peak efficiency and operating conditions.
- Building Systems Monitoring – Install and/or maintain a BAS (Building Automation System) to automatically control key building systems.
- Energy Efficiency Improvements – follow a staged approach for planning upgrades that enable the City to maximize energy savings.
- To realize these goals, measures such as those suggested by the EPA's Building Upgrade Manual should be reviewed. The manual highlights the following energy efficient steps that every building should be evaluating.

The City should consider utilizing the USGBC's LEED EB (existing building) best management practices as a guideline for system-wide planning and improvement

- Equipment Upgrades – retrofit or install energy efficient models to meets buildings cooling loads, upgrade boilers and other central systems.

- Energy Recovery Equipment – install energy recovery unit where applicable to recovery energy otherwise wasted through building exhaust and ventilation systems.

- Ventilation Upgrades – employ operating tactics such as demand control ventilation and optimized scheduling

- Variable Speed Controls – install variable speed drives to allow system to operate depending upon actual conditions

- Energy Efficient Motors – install motors that meet minimum federal energy efficiency standards

- Improved Controls – employ equipment and building control system that allows for options such as: optimized scheduling, supply-air temperature reset, chilled water temperature reset, hot water temperature reset, pressure reset, economizer cooling and demand control ventilation.

To this extent, all facilities should be equipped with programmable thermostats, economizers, and basic temperature reset principles. Other upgrades and recommendations would be made based on occupancy and utilization determinations.

Lighting

Commission, measure and verify lighting systems and their controls. All incandescent lights should be recycled and replaced with equivalent lumen output compact fluorescent lamps. Occupancy sensors should be installed in accordance with ASHRAE 90.1 in all offices, bathrooms, storage areas and other administrative type areas where life safety is not compromised. All incandescent exit signs should be phased out and replaced with LED type signs and all mercury vapor lighting should be replaced with high pressure sodium or metal halide lighting.

Building Envelope

Glazing or window upgrades to double pane insulated glass and low-e glazing films can produce significant energy performance improvements for heat gains or losses. Single pane windows should be replaced with a minimum of 1-inch insulated glazing with low-e film. Specifying Low-e 1-inch insulated glass is standard practice in all regions and will provide good performance at a reasonable cost.

In addition to window replacement, both interior wall insulation and roof insulation should be replaced when major renovations are performed. For a flat roof it is typically easy to add 2-6 inches (Min. R-30) of additional rigid polyisocyanurate (or equal) insulation to a roof, increasing R-value by 3-4 per inch of increase. Likewise, during interior renovations, adding additional batt or rigid insulation, as well as thermal barriers can significantly improve thermal performance of a building.

Water & Wastewater

The first step to improving water efficiency is to understand current performance. Accurate water measurement is important for understanding consumption patterns over time so that building operation staff can remedy possible deficiencies in water systems and thereby minimize the

environmental impacts associated with water use. Purchasing and installing water meters is an upfront cost, and with personnel costs for logging data, tracking and maintenance of meters are continuing expenses. Water performance measurement should have a phased approach. Consider starting with permanently installed water meters that measure the total water use for the entire building and associated grounds. Meters will need to be recorded on a regular basis and compiled into monthly and annual summaries. Step two would include adding sub-metering for larger water uses like irrigation, indoor plumbing fixtures, cooling towers, domestic hot water and other process water.

After the data has been collected for analysis the City should follow the International Plumbing code 2006 or EPACT 1992 for plumbing fixture and fitting standards. For landscaping, use of water conservation approaches promoted by The Irrigation Association is recommended. Other standards and resources include the American Rainwater Catchment Systems Association, The Department of Energy's Federal Energy Management Program, Water Measurement Manual: A Water Resource Technical Publication.

There are a series of Federal water Efficiencies Best Management Practices (BMP) that have been developed by the department of Energy Federal Energy Management. The BMP tools help achieve efficiencies in the following categories:

BMP # 1 - Water Management Planning
BMP # 2 - Information and Education Programs
BMP # 3 - Distribution System Audits, Leak Detection and Repair
BMP # 4 - Water-Efficient Landscaping
BMP # 5 - Water-Efficient Irrigation
BMP # 6 - Toilets and Urinals
BMP # 7 - Faucets and Showerheads
BMP # 8 - Boiler/Steam Systems
BMP # 9 - Single-Pass Cooling Equipment
BMP #10 - Cooling Tower Management
BMP #11 - Commercial Kitchen Equipment
BMP #12 - Laboratory/Medical Equipment
BMP #13 - Other Water Use
BMP #14 - Alternate Water Sources

On-site Renewable Energy

Based on the Appalachian State University Energy Center's Wind Study, there are three locations with eligible wind speeds to produce wind energy in Asheville. According to the observed wind speeds, wind energy will have the quickest payback given current renewable energy systems costs and energy pricing, and is discussed in more detail later in this document. Solar energy could also be utilized for key public installation where educational and public outreach opportunities exist, but with a longer payback period.

Operations and Maintenance

According to the International facility Management Association (IFMA) Operations and Maintenance staff benchmarking is approximately (1) staff member for every 50,000 GSF. IFMA staff requirements assume duties that include general maintenance and repair including painting every 5-7 years. It is evident by these numbers that City Maintenance staffing levels are below what is recommended by IFMA and other industry standards. If these activities are outsourced, then the number can be conservatively doubled to one (1) staff member for every 100,000 GSF. Whatever the staff

O&M numbers equate to it is clear that the current three (3) staff for the number and amount of City-owned facilities is insufficient for long term building performance and energy savings.

Performance Contracting

A viable solution to address City capital and energy concerns is performance contracting. A performance contractor can help the City save energy and generate capital for equipment replacements and improvements. The City would enter into a performance contract to have a contractor research, design, build & maintain capital improvements which are expected to save energy related funds. The City would pay the contractor from the savings realized by these energy related improvements during the contract period. The City is presently pursuing performance contracting, with assistance from the State Energy Office, and anticipates releasing a request for proposals for energy service companies in 2009.

Street Lighting

There are approximately 6,900 luminaires with Mercury Vapor lamps, which are the least energy efficient compared to High Pressure Sodium and Metal Halide lamps in terms of lumens/watt. By replacing these Mercury Vapor lamps an immediate energy savings could be realized.

Based on the Energy Policy Act of 2005, as of January 1, 2008, this act prohibits the manufacturing and importing of mercury vapor lamp ballasts. With that being stated, maintenance and replacement of these existing fixtures is going to become more costly.

Mercury Vapor and High Pressure Sodium Lamps have the same lamp life at approximately 24,000 hours. Metal Halide lamps are slightly less at approximately 20,000 hours and Low Pressure Sodium has an average lamp life of 18,000 hours. Depending on the location, it may be difficult to maintain the lamps, e.g. highway lighting, so the longer lamp life of High Pressure Sodium (HPS) should be used.

Aesthetics should also be considered prior to deciding on a lamp replacement. Depending on the location of the street lights, a particular lamp source may be desired to achieve the desired effect. Additionally, all lamps on the same street should be replaced during the same upgrade to avoid the Christmas tree lighting effect with different lamp colors along the same street.

Some typical wattages for major highways or streets are 180 , 135 or 90 watt Low Pressure Sodium, or 400, 250 ,150 watt High Pressure Sodium, Previously 1000 ,400 or 250 watt Mercury Vapor lamps were used. Typical values for residential streets might be 90 or 55 watt LPS, or 150, 100 or 70 watt HPS, Previously 175 watt mercury vapor lamps were used. Full-cutoff fixtures should be used for all applications to reduce light pollution.

Table 3.2 provides a summary of equivalent lamp source wattages based on equivalent mean lumen output per lamp. Identified are the types of existing Mercury Vapor Lamp Wattages used in the City of Asheville and equivalent lamp source wattages, which can be used when replacing the Mercury Vapor Lamps.

Table 3.2: Summary of equivalent lamp source wattages

Existing Lamp Type & Wattage	Lumen Output	Equivalent Replacement Lamp		
Mercury Vapor (MV) - 175W	7000	150W – Metal Halide	100W - High Pressure Sodium	55W - Low Pressure Sodium
Mercury Vapor (MV) - 400W	21000	400W - Metal Halide	200W - High Pressure Sodium	100W - Low Pressure Sodium

As stated in section two, approximately 5,342,000 kWH of energy is consumed by the Mercury Vapor lamps. By replacing these 175W and 400W MV lamps with 100W and 200W High Pressure Sodium Lamps, respectively, the City will reduce their annual street lighting energy consumption by approximately 1,275,000kWH per year. Based on the flat rate billing and Progress Energy's ownership and maintenance of these lights this makes for a difficult situation for cost savings. The City of Asheville has been requesting these Mercury Vapor lamps be replaced with high pressure sodium, however due to contract limitations, only a small quantity can be replaced at a time. The City of Asheville/Progress Energy contract should be renegotiated to reduce the City's flat rate with the replacement of the mercury vapor lamps.

Suggested Metrics for Measuring Future Progress

There are currently only a few green building rating systems in existence of which the USGBC's LEED process is one. The LEED rating system is often regarded as the most comprehensive approach to designing and constructing new buildings and now is rapidly becoming the most recognized approach to greening existing buildings as well. The USGBC's LEED Existing Buildings (EB): Operations & Maintenance rating system is intended to both re-certify existing LEED buildings after five years of occupancy and to help building owners operate their existing facilities in a more sustainable manner. The existing building rating system helps to establish a framework for owners to evaluate their buildings system performance and operation needs in categories of Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials and Resources, and Indoor Environmental Quality. This comprehensive outline to whole building sustainable practices is gaining popularity with large organizations as a way to plan and implement long term operation and maintenance best practices.

The City of Asheville should consider using the LEED EB rating system as a tool to guide operation, management, and upgrade of its existing building inventory. While LEED EB certification takes a high level of owner commitment and effort and is not necessary at this point, the City can follow the approach for appropriate credits without filing for the actual certification. The benefit of using LEED for existing buildings can include the following related to the use of industry standards:

- LEED-referenced standards are consistent with the International building code and well known by Design Professionals and contractors.

- The resource base that understands the standards and the LEED process is currently at 60,000 LEED AP professionals and growing every day.

- The standards are always being updated and the USGBC evaluates those updates for incorporation into the most current LEED version.

- The standards provide a foundation for quality assurance and baseline metrics to be established.

The USGBC's LEED EB rating system utilizes industry standards as the baseline metric to measure performance and improvements. These standards include American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Energy Policy Act of 1992 (Epact), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), South Coast Air Quality Management District, and dozens of others. By measuring against an industry standard the City can easily recognize the performance of any given system or material.

Transportation

Opportunities for Innovation, Tools & Best Practices

The City of Asheville has a number of transportation initiatives and strategies aimed at decreasing greenhouse gas (GHG) emissions. Yet, transportation continues to be a major contributor to the City's GHG emissions. The City's vehicle fleet and employee commute were responsible for a combined 36.6 percent (12,398.9 tons) of the total City baseline 2001 greenhouse gas emissions. In 2008, the City's fleet and employee commute decreased to a combined 31.1 percent (11,273.7 tons) of the total City GHG emissions. The annual reduction in GHG emissions between 2001 and 2008 averaged 0.8 percent. Thus, in order for the City to meet its goal of an overall reduction of 80 percent of the baseline 2001 emissions, further measures are needed. A comprehensive approach to cutting transportation GHG emissions focuses on reducing vehicle miles traveled and fuel consumption, as well as encouraging an increase in public transportation.

Reducing Vehicle Miles Traveled

According to the U.S. Department of Energy, each gallon of gasoline a vehicle burns releases 20 pounds of carbon dioxide into the air. Thus, a reduction of vehicle miles traveled (VMT) by City employees serves as a reduction of greenhouse gases released into the atmosphere. The Sustainability Office's survey of City employees' commuting habits revealed that City staff travel on average 13.07 miles each way to their primary work site. As Table 2-3 demonstrates, approximately 2.5 percent of employees walk, bike or ride transit three or more days per week. An additional 2.5 percent carpool to work and 0.2 percent telecommute. Therefore, nearly 95 percent of City workers drive alone to work. In 2006, the Federal Highway Administration calculated that the average miles per gallon for all vehicles on the road was 17.2.[1] Thus, taking that average, if one employee who currently drives alone to and from work changes his/her travel habits to an alternative transportation mode, nearly 1.5 gallons of gasoline is saved as well as 30 pounds of greenhouse gas emissions. Consequently, if just one individual chooses an alternative travel mode three or more days per week for a year, nearly half a ton of GHG emissions are saved.

If one individual chooses an alternative travel mode three or more days per week for a year, nearly ½ ton of GHG emissions are saved

In an effort to determine the likelihood of altering travel habits, the survey asked employees to state their willingness to try different alternative transportation modes. **Table 3-3** reveals the results. The greatest number of respondents, more than one-quarter, was willing to take a City-provided shuttle.

[1] Federal Highway Administration. "Highway Statistics 2006: Annual Vehicle Distance Traveled in Kilometers and Related Data - 2006." Accessed at: http://www.fhwa.dot.gov/policy/ohim/hs06/htm/vm1m.htm.

Additionally, approximately 23 percent of respondents were willing to carpool or vanpool. Thirty-two respondents were willing to try all alternative forms of transportation.

Table 3-3: Employees Willing to Try the Following Alternative Forms of Transportation:

	Bike	Bus	Carpool/ Vanpool	Walk	Co. Provided Shuttle	Park & Ride Shuttle
Total No. of Employees	126	207	286	85	324	220
	10.1 %	16.6 %	22.9%	6.8%	26.0%	17.6%

Furthermore, the survey provided a list of incentives and asked respondents which would persuade them to change their primary mode of travel. The most popular incentive, with 276 respondents, was access to a vehicle during work hours. The list of incentives and the corresponding number of respondents who chose each one is presented in **Table 3-4**.

Among the 172 individuals who stated no incentive would sway them to change how they travel to work, seven currently utilize an alternative mode of travel: three carpool, three walk and one rides a bicycle. Additionally, 101 of those individuals are in the Asheville Police and Fire Departments, where being on call is a concern. Thus, of the total 715 survey respondents who answered these questions, nearly 81 percent expressed interest or willingness to try an alternative transportation mode.

Table 3-4: Incentive(s) to Persuade Change of Mode of Travel:

Incentives	Total No. of Employees
Access to vehicles at work	276
More convenient bus service	197
More flexible work hours	166
Free taxi ride home in case of an emergency	140
Help finding someone to carpool/ vanpool with	134
Available bus, bicycle and park and ride information	90
Free bus passes provided by your employer	88
No incentive	172*

***Of those 172, 27 stated in a previous question that they were willing to try other forms of transportation.**

Approximately 81% of City employees expressed interest in trying an alternative transportation mode.

Case Studies

A number of cities throughout the U.S. have focused on various types of incentives in order to capture those willing to leave their vehicles at home.

Oregon Department of Transportation Individualized Marketing Program

The City of Portland, Oregon implemented a pilot "individualized marketing" program called TravelSmart® in 2002. The program conducts a baseline survey of the target population's travel behavior. Those who are interested in changing their travel habits are identified and contacted personally by program staff with tailored information on their available transportation options. The City found that following the implementation of the program, car travel in the target area decreased by eight percent, and travel by walking and public transit increased by 27 percent. The Oregon Department of Transportation also observed positive results in a 2005 study conducted in Bend, Eugene and the Salem-Keizer areas.

Dallas Area Rapid Transit Vanpool Program

The Dallas Area Rapid Transit (DART), serving Dallas, Texas and its surrounding counties, runs a vanpool program. A group of 6-15 individuals can share the ride to work for $270 or $290 a month, depending on the size of the van. The monthly fee is divided among all riders. The Vanpool Captain, a vanpool participant who volunteers as the driver, participates free of charge. An interested individual contacts DART, and DART will determine whether the individual can be included in an existing vanpool, and if not, assist with recruitment. DART supplies the van and covers the insurance. Vans are available every day of the week, but are issued on a first come, first served basis. An Emergency Ride Home is provided for vanpoolers for a $10 co-pay. Each participant gets a $5 gift card at startup to a major coffee store chain. As a further incentive, DART pays for the second month of services. Additionally, once a group participates for three months, each rider receives a $25 gift card, and the driver receives a $50 gift card. As of November 2008, 43 groups, consisting of 516 individuals, were on the waiting list for the program.

Parking Cash Out Programs

Many municipalities, including the City of Asheville, provide free parking spaces to their employees, which can serve as a disincentive to trying other modes of transportation. Parking Cash Out programs offer such commuters a choice between a free parking space, transit pass, carpool or vanpool subsidies, or cash. The City of Alexandria, Virginia offers employees up to $75 per month, as well as an additional $35 pre-tax option, for taking public transit or a vanpool to and from work. The City of Atlanta, GA also implements a parking cash out program for its employees. The City partnered with the Clean Air Campaign, a non-profit focusing on combating traffic congestion and air pollution in Georgia, to enable their employees to participate in the Cash for Commuters and Carpool Rewards programs. Under the Cash for Commuters program employees who switch from driving alone to an alternative transportation mode can earn $3 per day, up to $180 over three months. The Carpool Rewards program gives carpools with three or more people $40-60 monthly gas cards once a certain number of carpool trips during a month are logged. Participants in both programs use an online

commuting log, which also automatically enters them in monthly raffles. These programs strive to increase the viability of employees choosing to leave their cars at home.

Approximately 18% of all survey responses displayed an unawareness of existing alternative transportation incentive programs.

City of Roswell, Flexible Work Arrangements Policy

In addition, several municipalities are encouraging employees to stay at home themselves. In 2007, Roswell, Georgia, which is located in the Atlanta metropolitan region, formalized flexible work schedules into the Flexible Work Arrangements Policy. Nearly 50 percent of the City's 615 employees are able to work flexible schedules, staggered shifts or compressed work weeks. Since implementation of the policy, the City noted a reduction in overtime, an expansion of customer service coverage times, and a slight reduction in traffic congestion. The City of Atlanta has taken Roswell's lead. It plans to begin a telecommuting and compressed work week program in early 2009 for its more than 8,000 employees.

Policy Recommendations

Marketing Campaign

The City of Asheville has already implemented several strategies designed to reduce vehicle miles traveled, including the Emergency Ride Home program and the PASSport Program. However, as **Table 3-4** shows, 88 employees and 140 employees stated that free bus passes and free emergency ride homes respectively would serve to persuade them to change their travel behavior. Furthermore, 90 employees stated that available bus, bicycle and park and ride information could persuade them to change their travel habits. Thus, an individualized marketing campaign, similar to the one undertaken by Portland, could serve to make employees not only aware of such transportation options, but also more likely to utilize them. The Blue Ridge Commuter Connections website should be budgeted for so that it can be maintained and updated periodically. The website serves as a clearinghouse for local commuting information and should be used in conjunction with any City marketing campaign.

Carpool/Vanpool Program

Although the City is a part of the Share the Ride NC ridesharing matching program, it can go further by instituting a City-sponsored vanpool and carpool program. As Table 3-2 illustrates, nearly a quarter of all survey respondents expressed interest in carpooling and vanpooling and 134 individuals stated that help finding someone to carpool and vanpool with would persuade them to alter their travel behavior. The Sustainability Office's commuting practices survey could be used for such purposes; it can be analyzed in order to compile groupings of employees on similar work schedules. For instance, the survey revealed that 25 individuals who work a standard eight hour day, five days per week live in the 28806 zip code. Nine of these respondents work for the Water Department and eight work for the Parks, Recreation and Cultural Arts Department. These groupings are the first step to identifying potential carsharing partners. The City could then institute a vanpool program similar to DART's: providing vans to interested parties. Additionally, vanpool and carpool vehicles could be given preferential

parking spaces to not only serve as an added incentive to participate in the program but also to showcase the City's endorsement of such activities.

Expanded Flex Time Program

The City of Asheville is currently conducting a pilot flex time program with the Public Works Department. The program involves instituting a compressed work week department-wide. The possibility of employees being able to telecommute should also be considered. Currently, only two of the 715 survey respondents telecommute, although 166 stated that more flexible work hours would encourage them to try an alternate mode of transportation and four expressed explicit interest in telecommuting in the comments section of the survey. Thus, nearly a quarter of all City employee respondents, representing all 13 City departments (not including the Public Works Department), would consider taking advantage of flexible work schedules if given the opportunity. An expanded flex time program applying City-wide would capture these individuals. Under such a program, each employee who would like to take advantage of a flexible work schedule, including telecommuting, would discuss the possibility with his/her manager in order to ensure that job duties and department goals will not be negatively affected.

Parking Cash Out Program

The City does not charge employees for parking and provides no compensation for those who do not utilize the parking facilities. Thus, the existing situation advances commuting by private automobile. Therefore, it is also recommended that the City of Asheville pursue a parking cash out program in order to encourage employees to avoid driving alone to work. A parking cash out program is where an employer offers its staff the option of cash or a free or subsidized parking space. As individuals choose cash over parking, less maintenance and upkeep is required in the parking garages and lots. Additionally, the program could serve to offset the 700 parking space deficit estimated in the City's Comprehensive Parking Study, or potentially reduce the size of the needed parking lots, resulting in decreased capital outlay.

Support Bicycle, Greenway and Pedestrian Infrastructure and Connectivity

The City should also support bicycle and pedestrian infrastructure and greenway development and connectivity. Although only 15 respondents of the City employee community survey walk or bike to their primary workplace, 51 individuals live within three miles of their workplace and an additional 49 live within five. The 2008 Comprehensive Bicycle Plan found the existing bicycle facility network as lacking. Although, "Share the Road" signs are located throughout the City, many of the City's roadways are not an appropriate width to allow bicyclists to travel safely with automobiles. Additionally, motor vehicle speeds on many roads do not account for the safety and comfort of bicyclists sharing the road space. Key areas of town and important destinations are not well-connected; for instance traveling between South Asheville and Downtown is considered difficult and unsafe. The Plan proposes to expand and interconnect current facilities into a 181-mile network of bicycle facilities, including the addition of bicycle racks and storage areas throughout the City. Secure bicycle parking facilities located in convenient locations are vital in promoting bicycling as a viable commuting alternative. Bicycle racks

should be installed within the City's parking garages, lots, and transit stations and bus stops. The U.S. Green Building Council recommends bicycle racks and/or storage areas be located within 200 yards of a building's entrance for five percent or more of all building users (measured at peak periods).2 Showers and lockers should also be available. The USGBC also recommends shower and changing facilities to be in the building or within 200 yards of the building's entrance. Alternatively, the City could establish a relationship with a local nearby gym, such as the downtown YMCA, where the City pays a discounted bulk membership in exchange for limited access to the gym's shower facilities and lockers.

The Bicycle Comprehensive Plan proposes that bicycle facilities could be connected not only through the roadways but through the greenway system as well. The relationship between the two networks would be complementary, filling in the gaps of the greenway system and supplementing the existing bicycle system. The Greenway Master Plan outlines the next steps for the emerging greenway system and seeks to incorporate the trails into the bicycle network. The City is in the process of completing an update to the Greenway Master Plan.

Additionally the 2005 Pedestrian Plan found approximately 108 linear miles of identified needed sidewalk linkages, as well as 14.49 linear miles of sidewalks in poor condition or non-compliant with ADA-standards. If the City of Asheville implements the recommendations of its Bicycle Plan, the forthcoming Greenway Plan and the Pedestrian Plan, a significant increase in bicycle ridership and walking, specifically among those 211 survey respondents who expressed such an interest, could be realized.

Reducing Fuel Consumption by City Fleet

Asheville's fleet released a total of 6,076.5 tons of GHG into the atmosphere in 2008. In recent years, the City downsized 75 vehicles in its fleet and in the 2008 fiscal year the City purchased six hybrid vehicles and one CNG vehicle. The fleet's size, fuel type and efficiency are the determining factors in its level of emissions. Thus, in order to reduce GHG emissions effectively and sustainably, all three aspects must be addressed.

Case Studies

City of Philadelphia, Carsharing Program

The City of Philadelphia has contracted with carsharing companies since 2004. The current contract is with Zipcar, a company which offers cars on-demand. On average, the City uses six to ten cars daily from the contractor. The program costs the City $30-35,000 a year. However, Philadelphia estimates that carsharing helped eliminate nearly 330 vehicles from its fleet, which more than offset the program costs. City employees have access to Zipcar's diverse fleet selection, including hybrids, standard sedans, and small SUVs. Customers can reserve cars online or over the phone. As of June, 2008 Zipcar worked with more than 35 municipalities and government organizations throughout the U.S., Canada and the U.K.

[2] U.S. Green Building Council. "LEED-NC for New Construction: Reference Guide." Version 2.2 First Edition, October 2005.

Washington D.C., Bikesharing Program

Washington D.C.'s Department of Transportation (DDOT) partnered with an outdoor marketing company to initiate the country's first bikesharing program, SmartBike DC®. The system is an automated bicycle rental system similar to those employed by carsharing companies like Zipcar. Members pay an annual fee of $40 and are issued a membership card, similar in style to a metro card. The card is used to release one of 120 bikes located at 10 kiosks throughout downtown D.C. Bike availability at the various locations can be checked online. There is a three-hour time limit and they can be returned to any of the 10 kiosks. SmartBike® debuted in May 2008.

Richmond, B.C., Idle Free Program

The City of Richmond, British Columbia, Canada instituted their Idle Free Program in 2004. The program was designed to minimize the fuel consumption and pollution associated with the City's vehicle fleet and equipment. The Idle Free Program consisted of a focused marketing campaign to raise awareness among City employees of idling's negative effects on fuel economy, health and air quality. The City placed nearly 750 all-weather idle-free stickers on fleet vehicles and equipment. Additionally, the City posted 36 idle-free signs throughout the Works Yard, which is where the fleet vehicles are kept. The City Mayor and Council endorsed the program and City Managers took an active role in its promotion.[3] During its first year the Idle Free program saved Richmond approximately 10 percent of its total fuel costs and reduced GHG emissions by nearly 243 tons (220 metric tons).[4]

B20 Biodiesel Fuel Upgrade

The Cities of Boulder, CO, San Francisco and Santa Monica, CA and Fayetteville, AR use B20 fuel for their fleet. The City of Fayetteville, AR conducted a pilot test of B20 biodiesel fuel in its fire department vehicles. The City evaluated mileage, power output, condition of fuel filters, and the possibility of fuel gelling during the winter months. The City determined that neither the vehicles nor the services they provided were negatively affected. Over the course of a year, the City replaced 70,000 gallons of petroleum diesel with B20, and as of Fall 2008, is saving 2.4 cents per gallon with B20 as opposed to petroleum diesel.

Policy Recommendations

Downsize Fleet

The City of Asheville should continue to downsize its fleet. In the employee commuting survey, 222 employees responded that they could effectively use a Segway or electric vehicle while performing professional duties. A downsize of the 58 gasoline-fueled vehicles classified for normal use to either a Segway or electric car would reflect this stated interest. Additionally, the Bicycle Comprehensive Plan proposes a Police Bicycle Patrol which would increase the visibility of bicycling as well as downsizing the Police Department's assigned vehicle fleet. The City should continue to downsize

[3] Hay, Gerry, Fleet Training Officer, City of Richmond. "City of Richmond: Idle Free Program." Presentation at the "Idling Reduction and Green Fleets Workshop." September 20, 2007. Accessed: www.idlefreebc.ca/events.php.

[4] Idle Free BC. "City of Richmond's Internal Idle Reduction Program." Accessed: www.idlefreebc.ca/resources/downloads/IdleFreeResources/City_of_Richmond.pdf.

in size and continue to do so systematically based on level and type of use. Additionally, the City should establish a formal percent reduction goal, which would serve as a quantifiable means to measure implementation success.

Vehicle Pool

Two hundred seventy-six employees responded in the survey that if they were provided access to vehicles at work, they would be more likely to leave their own vehicles at home. The City should analyze the usage of its assigned fleet. If any prove to be idle for long stretches of time, they should be reassigned to a general vehicle pool. A general vehicle pool would be accessible to all City employees and would be available on-demand. Additionally, the City should pursue a bicycle sharing program for its employees. A bicycle fleet would enable the City to downsize its vehicles while still maintaining the same level of service.

Nearly 5% of the City's vehicle fleet are AFVs.

Idling Reduction Program

The City of Asheville should implement an idling reduction program aimed at reducing fuel emissions and fuel costs. A program like Richmond's would serve to remind employees to turn off their vehicles' engines while the vehicles are inactive. The North Carolina State Board of Education instituted an idle reduction requirement. Their sample policy and administrative procedure could be used as guidance.

Virtual Meetings

In order to minimize inter- and intra-department travel and thus reduce the need for City vehicles during the day, the City should strive to maximize technological communication by encouraging teleconferencing whenever feasible.

Alternative Fuel Usage Recommendations

Approximately five percent of the City of Asheville's fleet are alternative fuel vehicles (AFVs): compressed natural gas (CNG) vehicles, hybrids, or electric cars. The 68 vehicles in the City's fleet classified for normal use average 17.26 mpg. Whereas the CNG vehicles within this classification average 27.99 mpg and the hybrid cars average 34.47 mpg. The greater fuel efficiency of the CNG and hybrid cars translates into greater savings for the City. The City operates a CNG fueling station which serves to facilitate the acquisition of additional CNG vehicles. As the fleet ages, the City of Asheville should phase out all standard vehicles, and establish an AFV goal for its fleet.

Seventy-five percent of the Parking Services fleet are electric vehicles. Currently, there are plug-ins for electric cars in two locations, one of which is utilized for overnight charging. The Department reports a positive experience with the vehicles with regards to reliability, safety and cost. The City should pursue expanding its electric fleet and establishing an electric charging station.

Biodiesel is a type of fuel created from vegetable oil or animal fat and alcohol. Biodiesel has lower emissions than petroleum-based diesel. Biodiesel can be used in its pure form or in a petroleum blend. The greater the percentage of biodiesel in the petroleum blend, the greater the reduction of polluting emissions. All of the City's diesel vehicles use a five percent biodiesel fuel (B5) under a pilot program initiated in mid-2007.

Although the City has done no formal studies, anecdotal evidence reveals a slight decrease in miles per gallon since the switch from diesel to B5. Yet, overall the City is pleased with the performance of its vehicles since the switch.[5] The City should undertake a formal analysis on the effects of the fleet upgrade to B5.

Additionally, according to the U.S. Department of Energy, B20 (a 20 percent biodiesel - 80 petroleum diesel blend) is the most common biodiesel blend in the U.S. and can be used with nearly all diesel equipment. Thus, the City should also investigate the possibility of upgrading to B20 in order to further reduce GHG emissions.

Approximately 48% of survey respondents would be willing to try a shuttle service.

Increase Transit Ridership

For every individual who chooses public transportation over driving a personal vehicle, the collective carbon footprint decreases. As more automobiles are left at home, the more greenhouse gas emissions are avoided. Thus, an increase in transit ridership is a key component towards reaching the City of Asheville's GHG reduction goals.

Case Studies

Des Moines, Downtown Shuttle

The City of Des Moines, in partnership with the State of Iowa, the Downtown Community Alliance and the Des Moines Area Regional Transit Authority (DART) launched the D-Line, a downtown shuttle service, in May 2008. The City employs four trolley buses to run the route, an east-west loop from the State Capitol to the Central Campus Middle and High School. Stops along the route are located at every block, including one stop at City Hall. The D-Line is free and runs every 10 minutes from 7 a.m. to 6 p.m. Monday through Friday. According to the Greater Des Moines Partnership the shuttle averaged over 600 riders per day in its first month and was proven to be most popular during lunchtime, from 11 a.m. to 2 p.m. By July 2008, the number of riders had risen to 700 per day,[6] and according to DART continues to rise.

King County Metro Transit, Park and Ride Lots

The King County Metro Transit (Metro), serving King County, Washington, including the City of Seattle, operates 130 park and ride lots. Metro partnered with a number of private institutions in order to lease their parking lots and incorporate them into the park and ride network. For instance, 55 park and ride lots are located at churches, one is located at a Masonic lodge, and another is located at a Home Depot. In 2007, Metro reported a seven percent increase in daily lot usage, which translates into a total of 17,700 commuters utilizing the lots. During that year, Metro opened two lots along the Interstate 90 (I-90) corridor, the Eastgate lot, holding 1,614 spaces, including three electrical car outlets, and the Issaquah Highlands lot, holding 1,000 spaces. Although Metro expected several years before the lots became well used, by February

[5] Communication with Mr. David Foster, Streets Superintendent. February 2009.

[6] City of Des Moines. "Making Transportation Systems Work in Medium-Sized Cities." September 2008. Accessed: http://www.ci.des-moines.ia.us/departments/cmo/pdf/IDA-Mid-CitiesTransportation-post.pdf

2008 the Eastgate and Issaquah Highlands lots had reached 85 percent capacity on an average weekday. During 2007, Metro also witnessed a seven percent increase in transit ridership.

Policy Recommendations

Expand Transit Services

The City of Asheville should develop and support a strategic transit master plan. Nearly 28 percent of survey respondents agreed that more convenient bus service would persuade them to change their travel behavior. The transit master plan would identify exactly what "convenient" means. The master planning process would work with the public as well as City employees to determine where expanded coverage, extended service hours and increased service frequency would be most beneficial. Additionally, the City could work with Global Positioning Systems (GPS) in order to provide vehicle arrival times to transit users. Such a system would make the ATS a more user-friendly service.

Park and Ride Lots

Connectivity between the bicycle, pedestrian, transit and roadway networks is a determining factor in modal choice. The City of Asheville's Transit Services Division is currently exploring options for potential park and ride lots. Park and ride lots allow commuters to leave their cars or bicycles and ride public transit. The FBRMPO Comprehensive Transportation Plan (CTP) and the Long Range Transportation Plan (LRTP) recommended the development of a comprehensive park and ride system, consisting of 21 park and ride stations throughout the region. The City of Asheville should continue to pursue the development of a park and ride network. The lots should be within close proximity to main roadways, and be incorporated not only into the transit network but the bicycle and pedestrian systems as well. Bicycle racks and storage areas should be located within the park and ride facility. The City could pursue leasing lots from private entities as a means to minimize costs and capitalize on existing land use.

Downtown Shuttle Service

The City of Asheville should pursue the possibility of a downtown shuttle service. A downtown shuttle, linking park and ride lots, transit stations, and employment and tourist destinations, would enhance the transportation options of residents and visitors. Nearly 48 percent of survey respondents are willing to try a City-sponsored shuttle or a park and ride shuttle as a means to commute to work. A shuttle, operating on a high frequency, would offer employees a means to travel between destinations during the work day. Approximately 39 percent of respondents stated that access to a work vehicle during the day could persuade them to leave their own vehicle at home. Thus, if the shuttle could serve as a sort of department vehicle and work to eliminate even a portion of the workday errands conducted, a significant shift in travel habits could be realized.

Secure Appropriate Funding

In order for the City of Asheville to implement any GHG-reducing measures, reliable funding sources are necessary.

Federal Funding

The Federal Surface Transportation Program (STP) is authorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy of Users (SAFETEA-LU)

enacted in 2005 and scheduled for reauthorization in 2009. Highway, transit, pedestrian and bicycle projects are all eligible for STP funds. The funds are allocated and managed through the states.

Applicable federal programs, both within and associated with the STP, include but are not limited to the following:

- Bus and Bus Facilities Program (5309, 5318): This program is a Federal Transit Authority (FTA) grant program designed to provide assistance in procuring new and replacement buses and associated equipment and facilities.

- Clean Fuels Grant Program (5308): This program is a formula-based discretionary grant program administered by the FTA. The program aims to assist regions in meeting the requirements of the Clean Air Act, and to support emerging clean fuel and advanced propulsion technologies for transit buses.

- New Freedom Formula Grant Program (5317): The 5317 Program administered by the FTA, aims to increase and enhance transportation access to individuals with physical disabilities, beyond those required by the American with Disabilities Act (ADA). Projects eligible for 5317 funding are those that would not be funded otherwise. Examples of projects funded under this program include extending paratransit service hours, vehicle procurement for vanpooling, and marketing materials for rideshare programs.

- New Starts Program (5309): The New Starts Program is also an FTA grant program, funded under Capital Investment Grants. The program provides funds for new fixed guideway projects or extensions to existing systems. Eligible projects include the construction of a new bus facility and extensions to an existing transit network.

- Recreational Trails Program (RTP): RTP administers funds to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses. The North Carolina Division of Parks and Recreation receives the funds and allocates them to various projects throughout the state.

- Transportation Enhancement Program (TE): Each state is required to set aside 10 percent of its total STP apportionment for TE activities. Initiatives are considered transportation enhancement activities if they increase transportation choice and access, enhance the built and natural environment and provide a sense of place to local communities. Funds can be used for project construction, including pedestrian and bicycle projects and programs, but not for routine maintenance. Examples of TE-funded projects include sidewalk creation, procurement of bicycle racks and the development of shared use paths. The NCDOT Enhancement Program oversees the allocation of TE funds.

- American Recovery and Reinvestment Act of 2009: This act authorized a $787 billion stimulus package, including $8.4 billion in transit investments and $29 billion for modernizing roads and bridges. North Carolina expects to receive approximately $900 million for the state's transportation needs. However, how these funds will be distributed within the state has yet to be determined.

State Funding

The North Carolina Department of Transportation (NCDOT) allocates state funding for transportation initiatives. State funding programs include, but are not limited to, the following:

- Governor's Highway Safety Program (GHSP): This program offers grants to support roadway safety initiatives, including those aimed at pedestrians and bicyclists. Grants are awarded annually and vary according to the specific amounts requested.

- Public Transportation Grant Program: This program supports the Transportation Demand Management Program as well as matches local federal capital and planning grants.

- State Maintenance Assistance Program (SMAP): SMAP funds go toward the operating costs for urban and regional transit systems. Allocations are approved by the NC Board of Transportation. Local governments must match the State's contribution.

- Urban/Regional Bus and Facility Program: The State provides a monetary match to direct recipients of FTA grants under Sections 5307, 5308 and 5313.

- Urban/Regional Technology Program: This program funds public transportation systems' technology needs.

Urbanized Area Formula Program: The State matches FTA Section 5307 funds for urban transit system operating assistance. Additionally, the NCDOT provides up to 50 percent of the local government match for planning activities and major capital purchases.

Proposed State Funding

The North Carolina Climate Action Plan Advisory Group recommends that the State adjust motor vehicle registration fees based on GHG emissions. Vehicles which release more pollutants than other types would be charged a higher fee. In turn, these fees would be placed in a fund for the State to support projects which aim to reduce greenhouse gas emissions from transportation activities. The City of Asheville should work with the State on creating such a program.

Suggested Metrics for Measuring Future Progress

There are a number of ways the City of Asheville could measure its progress on reducing greenhouse gas emissions from the City's transportation activities. Follow-up annual surveys and associated studies of City staff commuting habits would be a valuable tool in measuring progress on transportation GHG reduction and the effectiveness of implemented strategies. Moreover, as each new policy or strategy is implemented, measurable indicators should be identified. For instance, a periodic inventory of vacant parking spaces on-street and in City garages and lots will reveal how many city employees and visitors commute to and from work by private automobile. Additionally, vanpools, carpools, hybrid and electric cars could be given preferential signed parking spaces, which would serve not only as an incentive for these alternative transportation modes but also as a way to easily quantify their levels of participation. Once performance

indicators are established and measured, existing strategies can be adjusted according to their level of effectiveness.

Water Systems

Water systems treat water to protect public health, and pump it for delivery to the customer. Whereas these tasks inherently require the consumption of resources, several innovative measures can be very effective in mitigating the environmental impact of water operations. Given continued regional growth and the need to provide clean, reliable drinking water, Asheville is seeking to develop multi-faceted strategies to reduce water consumption and energy use for treatment and distribution through:

- Existing system efficiency improvements;
- Incorporation of energy efficiency measures in system upgrades;
- Application of renewable energy technologies to current and future system;
- Land use and development strategies to reduce energy demands on the system;
- Identification of a water efficiency standard for City facility upgrades and water conservation best practices;
- Rate restructuring to encourage water conservation while protecting revenue; and
- Outreach and education tools and strategies for encouraging water conservation.

While Section 2 addressed on existing systems and their improvement potential, this section addresses the above goals by providing solutions for the City's water system.

Opportunities for Innovation, Tools & Best Practices

This section presents two tiers of assessment and recommendations for improving and managing the City's water infrastructure:

- Case studies and specific recommendations for the facilities assessed, including the three water treatment facilities and South Buncombe and Peach Knob pump stations.
- General assessment and policy recommendations for overarching management of the City's water system.

Case Studies

Site visits with key staff in the Water Resources Department were conducted in July 2008. The field visits consisted of touring the City's three water treatment plants: Bee Tree WTP, North Fork WTP and Mills River WTP and also three of the highest energy using booster stations: South Buncombe Pumping Station, Patton Mountain Pump Station, and Peach Knob Pump Station. A detailed examination of these six facilities provides the City with clear examples of mitigation opportunities, which can then be extrapolated to the water system as a whole.

Bee Tree Water Treatment Plant

The Bee Tree reservoir is surrounded by mountain forests that are owned by the City of Asheville, and the reservoir and surrounding land is protected from development and use. Of the more than 80 individual metered accounts in the City's water system, the Bee Tree Water Treatment Plant was Asheville water system's tenth largest energy-consuming facility in the 2008 fiscal year.


Bee Tree Reservoir

Process

The Bee Tree plant is a conventional treatment facility, featuring gravity conveyance of flow into the plant, flow control through valve throttling inside the plant (the subject of potential energy recovery noted later in this document), flash mixing, flocculation, sedimentation, gravity filtration served with pumped water backwash and auxiliary air scour, and disinfection through free chlorine. Flow travels by gravity out of the plant, where the majority of the flow is pumped higher into the distribution system at the East Asheville Booster Pump Station. Serving both the Bee Tree and North Fork plants, the East Asheville booster station is located a considerable distance from the Bee Tree plant. Its electrical usage is metered separately from the Bee Tree WTP site, and by itself ranked as Asheville's eleventh largest energy-consuming facility in the 2008 fiscal year.

Electrical, HVAC and Mechanical

Lamps and exit signs throughout the facility make up the WTP's electrical system. The facility utilizes T12 lamps, incandescent lamps and exit signs. HVAC and general mechanical systems observed in this plant are of recent construction. Heating, cooling and ventilation is provided for occupant comfort in the office/control areas and ventilation cooling and heating is provided in process areas. Standard equipment, consisting of electric unit heaters and exhaust fans, are utilized in process related spaces. Three-ton water-source heat-pump systems are utilized to provide air conditioning and heating to the administration building. These energy efficient units utilize plant water as a heat sink/source.

Recommendations

The existing electrical system is inefficient. The City should replace the T12 lamps with higher efficiency (lumen/Watt) 28W T8 lamps. All incandescent lamps should be replaced with equivalent compact fluorescent lamps and all incandescent exit signs should be replaced with the LED type exit signs during the next lamp failure or planned upgrade. Occupancy sensors should be installed in office, lab and bathrooms. Additionally, the low efficiency motors should be upgraded to premium efficiency motors during the next planned upgrade or motor failure.

North Fork Water Treatment Plant

The largest portion of Asheville's drinking water supply comes from the North Fork Water Treatment Plant, which is also located in eastern Buncombe County. The reservoir is similarly protected and is surrounded by mountain forests owned by the City of Asheville. Of the more than 80 individual metered electrical accounts in the City's water system, the North Fork Water Treatment Plant was the water system's second highest energy using facility in FY 2008.

Process

The North Fork plant is a direct filtration treatment facility. It features gravity conveyance of flow into the plant (with pumping of raw water into the plant during low reservoir and/or high demand periods), flocculation, and direct gravity filtration. Disinfection is provided with free chlorine. Filtration is serviced by backwash water that is pumped to elevated storage and released to the filters when backwashing is initiated. Flow travels by gravity out of the plant, where the majority of the flow is pumped higher into the distribution system at the East Asheville Booster Pump Station. Serving both the Bee Tree and North Fork plants, the East Asheville booster station is located a considerable distance from the North Fork plant. Its electrical usage is metered separately from the North Fork WTP site, and is Asheville's eleventh largest energy-consuming facility in the 2008 fiscal year.

North Fork WTP Entrance and Reservoir

Electrical, HVAC and Mechanical

Like the Bee Tree WTP, the existing electrical system at the North Fork WTP consists of T12 lamps, incandescent lamps and exit signs. HVAC and general mechanical systems located at the North Fork WTP are of both new and existing construction. The recently constructed chemical building is heated by electric unit heaters and coils and ventilation is provided by exhaust fans and intake louvers. The filter building contains a mix of roof mounted air conditioning a/c equipment (for the office/training area), an a/c unit for the office, electric unit heaters, exhaust fans and dehumidifiers for the pipe gallery. Use of the equipment located in the pipe gallery is process and pipe condition related, leaving little availability for adjustment. Energy use will be directly correlated to outdoor temperature and humidity conditions. The administration and garage areas are conditioned by packaged and/or split system direct-expansion equipment. The unit serving the garage area was replaced in 2006. Also observed was the installation of a new exhaust fume hood in the laboratory. It should be noted that this unit will require "make-up" air which will require conditioning. Increased energy costs associated with this equipment should be expected.

Recommendations

Recommendations to improve the efficiency of the existing electrical system are the same as those identified for the Bee Tree WTP. The metered electrical use for plant versus office facilities should be reconciled. In addition, the high service pumps are considered to be oversized and are thereby inefficient. Service pumps should be sized appropriately.

The North Fork WTP's hydropower generation was studied by others and deemed not cost-effective. Such a concept should be reviewed again in light of the City's focus on this sustainability master plan. HVAC and mechanical system energy reduction opportunities are generally related to the administration building. The administration building should employ a night-setback temperature strategy. The potential for additional opportunities exists by way of utilizing "economizers" in the administration and conference area of

the filter building. Energy savings and efficiency will be further retained through regularly scheduled system preventative maintenance and repair.

Mills River Water Treatment Plant

The Mills River Water Plant is the top energy using facilities owned by the City and has been since it went into operation in late 1999. It is used as the Asheville's secondary source of water with a firm capacity of 5 mgd (7.5 mgd emergency capacity). The Mills Watershed covers 47,440 acres in Henderson and Transylvania counties. The actual plant is located at the junction of the Mills River and the French Broad River in Henderson County.

Process

The Mills River Water Treatment Plant was designed to produce drinking water that is comparable to the high quality water that comes from the City's North Fork Reservoir. The treatment process is more complex than at the North Fork facility and includes ozone treatment for disinfection. Water is taken from the Mills River and pumped first to an untreated water storage reservoir where suspended materials are settled out. The settled water is pumped to the pre-ozonation system to begin disinfection; flows to the rapid mixers where chemicals are added to produce suspended particles; moves into settling basins where the heavy particles settle out; and then travels back to the ozonation system for further disinfection. The water then passes through filters containing granular activated carbon, the pH is adjusted, and fluoride is added. Finally, corrosion inhibitors and chlorine are added to enhance water quality in the distribution system.

French Broad River, Mills River, and Mills River Treatment Plant

Electrical, HVAC and Mechanical

Since the plant was designed in 1996 and came online in 1999 it had to comply with applicable electrical codes at that time. Considering the modern systems in place at Mills River, the overall energy efficiency of the plant is acceptable from an electrical systems viewpoint.

The HVAC and Mechanical Systems located at the Mills River Treatment Plant are of late 1990s design. Heating cooling and ventilation for occupied spaces is provided by a mix of direct-expansion cooling units coupled with hot water heating elements (baseboard & duct heaters). Chemical areas are provided with ventilation/ventilation cooling, and heat by means of hot water unit heaters and hot water duct coils.

Recommendations

In general, most systems appear to be operating as designed. However at the time of inspection there was one air conditioning system in the switchgear building that was not operating correctly and should be repaired.

Additional recommendations include the use of a night-setback strategy and economizers, which are described in the Recommendations Section for the North Fork WTP.

Additional energy savings and efficiency will be retained through regularly scheduled system preventative maintenance and repair.

South Buncombe Pump Station

The South Buncombe Pump Station is Asheville's third highest energy using facility of the City's more than 80 metered water system accounts. The pump station was modified in 1995 to serve the Fairview area which is located in the southeastern section of the system and serves ground elevations ranging from 2,200 feet to 2,500 feet. Additional pumping capacity was required and the upgrade made it possible to retire the Mills Gap, Weston Road, Lower Ballentree, Park Avenue, Mine Hole Gap, and Rosscraggon pump stations and reservoirs.

The South Buncombe Pump Station exterior and two of its three pumps

Process

City personnel indicated that when two pumps are operational, valve throttling is practiced at South Buncombe, to be certain that the pumping system operates within the City's desired output range. The practice of throttling, while sometimes necessary and unavoidable, represents energy expended to push water against a partially closed valve. Staff reported that the installation of a standby generator is being considered for future installation.

During the site visit, an extreme level of noise was noted emanating from the station, even while the doors were closed, and even with some sound-attenuating materials on the interior walls.

Patton Mountain Pump Station

Of the more than 80 metered water accounts, this 14-year-old pump station is the fifth highest energy using facility owned by the City of Asheville. It is located off of Cameron Street and services parts of the distribution system on Patton Mountain and the Patton Mountain reservoir storage tank.

Process

Two centrifugal pumps boost water system pressure from 90 psi on the suction side to 380 psi exiting the Patton Mountain station. This boost of 290 psi, or 670 feet is substantial by water industry standards. The station operates nearly 20 hours per day according to water system personnel, leading this high-energy system to its number five ranking in the system.

Peach Knob Pump Station

In 2007-2008, Peach Knob was Asheville's sixth highest energy using facilities throughout the water system. The pump station is located on Patton Mountain Road. It draws water from the Peach Knob reservoir storage tank and services the Peach Knob reservoir storage tank and parts of the high service area within the distribution system.

Process

The Peach Knob station features two constant-speed vertical turbine pumps boosting water from atmospeheric pressure (in the adjacent Peach Knob storage tank) to some 400 psi exiting the station. At 360 gpm, over 900 feet discharge pressure, and

20 hour per day operation, this facility understandably ranks as the sixth largest energy demand in the system, and should be targeted as part of future energy reduction efforts.

Electrical: South Buncombe, Patton Mountain and Peach Knob Pump Stations

The electrical systems at both pumping stations are similar to those at the Bee Tree and North Fork WTPs.

Recommendations: South Buncombe, Patton Mountain and Peach Knob Pump Stations

The South Buncombe Pumping Station, of the six facilities highlighted in this Section, features the greatest potential for energy reduction and sustainability enhancement. In conjunction with work involving a standby generator or pump/motor work, the City should evaluate variable frequency drive (VFD) installation.

Peach Knob Pump Station and Peach Knob Storage Tank

The fugitive sound noted during the site visit at the South Buncombe Pumping Station erodes the "social responsibility" tenet of sustainability, can have the effect of lessening the quality of life in this rather rural area, and is potentially a disturbance to area wildlife.

Additionally, the electrical recommendations as described in the Bee Tree WTP section apply to the pumping stations as well.

Recommendations: All Facilities with Pumping in the "Top Ten"

The dominance of pumping in water system energy consumption outranks treatment (ozonation included), lighting, heating, cooling, and other uses substantially. Asheville should undertake a detailed, system-by-system review of all pumping systems at facilities that rank among the top ten water system electrical users. Through such an effort, actual run-time, water flow and pressure output, power draw, and replacement benefit analysis can identify the cost-effectiveness and environmental benefit of improving individual pumping systems. Such a review moves beyond cursory reviews of motor/pump nameplate data, and identifies opportunities not seen where worn pump impellers, partially closed valves, inefficient re-wound motors, and the like are needlessly consuming additional power.

System-Wide Policy Recommendations

This section addresses the City's water infrastructure at a higher level than provided in the case study assessments, providing system-wide planning, policy, and practice recommendations. This section is organized according to the goals outlined in Section 1 for the City's water system.

Existing System Efficiency Improvements

Electrical Improvements

The water treatment facilities and pumping stations described previously provide insight into how the existing system can

improve its efficiency. Throughout all of the water system facilities, the existing electrical system is inefficient. A lighting upgrade plan should be created for each facility, which would require more energy efficient lighting fixtures.

Leak Detection

Additionally, water conservation is aided greatly when the water system has tight control over the amount of "unaccounted for water". Industry practice is to manage unaccounted for water to percentages that are minimized to the extent possible. The American Water Works Association's Manual M36, *Water Audits and Leak Detection* (2nd edition, 1999) is the foremost industry reference on this matter. Asheville is encouraged to actively optimize master flow metering accuracy and pursue the detection and repair of leaks to the extent possible.

Filter Backwashing

The North Fork filter backwashing practices vary widely among individual plant operations personnel. Given the large amount of water required to backwash a filter, filter backwashing operations offer an opportunity for optimization not possible in other portions of a conventional treatment plant. The City is in the process of standardizing filter backwashing practices. Once completed, the City should mandate compliance with the filter backwashing procedures as a means of good treatment practice and resource conservation at all three of its water treatment plants.

Incorporation of Energy Efficiency Technologies

When upgrading any segment of the water system, the City should strive to incorporate energy efficiency technologies.

Occupancy Sensors and Night-Setback Systems

The case studies stated the need for all private offices, bathrooms, storage rooms and conference rooms to have occupancy sensors installed. When individuals are no longer in the room, the lights will automatically turn off, thus reducing energy-based emissions. Additionally, general guidelines and recommendations for the HVAC systems at the water system facilities would be to monitor and control thermostat set points temperatures listed in **Table 3.5** to the extent acceptable to the staff at each facility:

Furthermore, night-setback systems should be installed for areas that are regularly not occupied during certain time periods. As described previous, these systems lower the temperature in a room at preset times.

Table 3-5: Recommended Water Facility Thermostat Set Points

Space	Thermostat Setpoint (degrees F)	
	Winter	Summer
Occupied	68	78
Un-Occupied	55	Ambient[1]

[1]Unless process and equipment considerations dictate otherwise.

Pump and Motor Upgrades

Recommendations for the pump stations included replacing the existing motors with premium efficiency motors. Pump vendors were contacted in October 2008 and reported that replacement pumps and motors for the South Buncombe station would cost $65,000 plus installation, variable frequency drives, miscellaneous piping modifications and engineering services. Preliminary calculations indicate nearly 100 megawatt-hours per year (or $6,000 in electrical costs per year) could be saved as part of an equipment upgrade at South Buncombe and would reduce 51 metric tons of CO_2e annually.

Additionally, replacement pumps and motors for the Patton Mountain station would cost $46,000 plus installation, miscellaneous piping modifications and engineering services. Initial calculations indicate 250 megawatt-hours per year (or $16,000 in electrical costs per year) could be saved as part of an equipment upgrade at Patton Mountain, translating into a 125 metric ton CO_2e annual reduction.

A preliminary estimate for the Peach Knob pumping station and preliminarily reveal that 80 megawatt-hours per year and 40 metric tons of CO_2e (or $4,500 in electrical costs per year) could be saved as part of an equipment upgrade at Peach Knob.

Water Metering

Water is a finite natural resource requiring careful management. Public awareness can be valuable, but studies have shown that customers with individually metered water service are more cognizant of consumption than those without. Asheville is encouraged to maintain an accurate, modern, frequently-read water metering system.

LEED® Certification

The City should also consider applying its LEED building requirements or LEED building principles for future planned construction of pumping stations, water treatment facilities, and other water system buildings, which will involve thoughtful attention to site selection, on-site water management, the use of locally-available building materials, efficient HVAC and lighting systems, and the like.

Application of Renewable Energy Technologies

For Ashville's water systems, opportunities exist to integrate renewable energy systems into the processes used for water production and distribution. Energy recovery, solar photovoltaics (PV), wind, and geothermal energy are recommended for further investigation to determine if these systems are feasible for installation at the City's water system facilities. Details on these technologies as well as a description of the basic process that can be used to conduct renewable energy feasibility studies are included below.

Renewable Energy Systems Recommended for Feasibility Studies

Energy Recovery Potential

Asheville's mountainous terrain creates the requirement for high-intensity, power-intensive booster pumping. However, the same challenging terrain offers potential for energy recovery.

Rentricity Inc. is one example of a renewable energy and monitoring company that uses its proprietary and patent-pending energy recovery configurations called **Flow-to-Wire**sm systems to transform untapped energy in various man-made processes into electricity. The surplus energy being targeted is contained in pipes where the materials moving inside them exert excess pressure.

The mountainous terrain and energy within the flowing water may hold the potential for energy recovery in Asheville through the use of turbine generators at pressure reducing stations.

The initial application focus is renewable energy recovery for water utilities. The **Flow-to-Wire**sm systems convert excess pressure in public water distribution mains into clean electric power. A single **Flow-to-Wire**sm system produces between 20 and 300 kW. Rentricity gives its generating partners an additional source of revenue.

Areas with high line pressure may be worth examining for their energy recovery potential. Another possible location with energy recovery potential is the entry to the Bee Tree WTP from the reservoir, where the head is currently broken.

Solar Photovoltaics

The use of solar photovoltaic cells to convert sunlight into electricity has recently expanded in response to urgency surrounding the mitigation of greenhouse gas emissions and climate change impacts. Production of solar photovoltaic panels has been doubled every two years, increasing by an average of 48 percent each year since 2002, making it the world's fastest-growing energy technology[7]. According to preliminary data, cumulative global installations reached 15,200 megawatts at the end of 2008[8].

For the City of Asheville's water systems, two options are available for the installation of solar PV systems. The first is for the City to fund the design, procurement, construction and maintenance of the solar panels. The second is to consider third-party ownership, where a third party, commonly known as an energy service company or ESCO, designs, installs, maintains and provides the capital for the photovoltaic system. In this second scenario, the City would essentially lease their roof or ground space to this third party and enter into a contract with the party for a fixed electricity rate over a set duration. The third party would own the electricity generated, the greenhouse gas benefits, and the RECs. The City of Asheville would be compensated for providing their roof or ground space.

Wind

Conversion of wind into electricity using both stand-alone wind turbines and building-mounted wind turbines is another commonly used renewable energy system. Surpassing solar

[7] Data retrieved from http://www.socialfunds.com/news/article.cgi/2639.html (March 2009)
[8] Data retrieved from http://www.prlog.org/10198293-global-solar-photovoltaic-market-analysis-and-forecasts-to-2020.html (March 2009)

PV generated electricity, global nameplate capacity of wind-powered generators was 121.2 gigawatts at the end of 2008[9].

Based on the results of the Appalachian State University Energy Center Wind measurements, wind is feasible at some of the City's water system sites. Specifically, with average wind speeds of 18.6 mph at Bee Tree Road, this site has great wind energy potential. Additionally, the Peach Knob Drive site shows high wind speeds averaging 16.5 mph. South Buncombe Pump Stations experiences similar wind. Moderate wind turbines (250kW) may be considered at these locations.

According to True Wind Solutions, small wind turbines (less than 50kW) may be feasible at wind speeds between five and six meters per second at 30 meters (11.8-13.4 mph at approximately 100 feet). Considering this, Reservoir Road, which has wind speed at 12.5 mph, and Buchanan Place with an average wind speed of 11.2 mph has wind energy potential. Roof mounted turbines appear to be the most viable solutions for these locations with lower wind speeds.

Geothermal

Geothermal heating and cooling systems are a proven technology that taps into the earth's temperate supply of thermal energy and using it to augment, or sometimes replace, fossil fuel use. Geothermal systems can also be coupled with thermal storage techniques, such as energy piles, to reject heat into the ground in the summer for storage for use during the winter. This technology should be considered as part of any new facility construction or HVAC/building rehabilitation effort. Closed-loop geothermal systems are recommended. They require minimal land use and can be scaled to meet the needs of each facility.

Conducting Renewable Energy Feasibility Studies

For the renewable energy system technologies identified above, feasibility studies are recommended to determine technical, economic and regulatory viability for the City of Asheville. A four-step feasibility process – technical feasibility, regulatory analysis, evaluation of GHG risks and opportunities, and economic analysis - may be used to further investigate the potential of integrating renewable energy at these sites. The results of these feasibility components will provide important decision-making criteria upon which the City of Asheville can base its selection of renewable energy systems for installation. The four components of the feasibility study process are described below.

Technical Feasibility

The first step in the feasibility study is to eliminate technologies that are not technically viable on a site-by-site basis. Considerations include:

- Available space (aboveground and belowground)
- Physical conditions for each technology:
  - Pressure condition for energy recovery
  - Solar radiation
  - Wind speed & direction

[9] Data retrieved from http://www.wwindea.org/home/images/stories/worldwindenergyreport2008_s.pdf (March 2009)

  - Subsurface conditions for geothermal
- Environmental conditions for each technology
  - Noise, flicker, ice throw and pedestrian safety impacts of wind turbines
  - Glare impact for solar panel arrays
- Topography
- Roofscape
- Neighboring properties
- Compatibility with existing equipment
- Availability of new equipment
- Impacts of easements
- Impacts on wetlands and other sensitive receptors
- Aesthetics
- Infrastructure to connect to the local electricity grid

For the feasible technologies at each site, potential electricity generation or demand reduction (in the case of the geothermal systems) will be estimated. Preliminary layouts of the renewable energy systems will also be produced as part of the technical feasibility study.

Regulatory Analysis

For the renewable energy systems deemed technically feasible at each site, an analysis of existing and emerging local, state, regional or federal regulations will be conducted to further eliminate the consideration of technologies that will not conform to these regulations. Considerations during this step of the feasibility study includes existence and impacts of easements, impacts on wetlands and other sensitive receptors and, for wind energy, conformance with the Ridge Top Law, among others.

Evaluation of GHG Risks and Opportunities

The benefits and impacts on the City's overall GHG management strategy and business growth model will also evaluated for the technologies that have both technical and regulatory feasibility. Because renewable energy systems are closely linked to the mitigation of GHG emissions as well as compliance with existing and pending GHG regulations, it is important to align energy strategies with the GHG management strategy for the City of Asheville. Energy and GHG management plans may also support City's growth strategy and, thus, should be coordinated with future development and expansion.

For each renewable and alternative energy system, a GHG risk and opportunity evaluation will be conducted to determine the effect on the facility's GHG footprint, regulatory status, and opportunities for carbon credits. Measures such as "metric tons of carbon dioxide equivalent (MTCDE) reduced or added" and "cost per MTCDE reduced" will be used to compare renewable energy alternatives and serve as decision-making criteria for selection.

Other considerations that will be taken into account during the GHG evaluation will include:

- Evaluation of whether the renewable energy system increases the facility's Scope 1 emissions (direct emissions as defined by the World Resources Institute (WRI)) such that the facility passes through a regulatory threshold that will require GHG emission reduction targets to be met under penalty of law;
- Determination if surplus electricity generated on-site can be sold back to the grid and at what rates (retail or wholesale), thus creating a potential revenue stream;
- Determination if a renewable energy project is eligible to sell renewable energy certificates (RECs) under Senate Bill 3 based on the project type, generator status and location;
- Analysis of the advantages and disadvantages of selling RECs and creating a revenue stream versus claiming the reduction of Scope 2 emissions (indirect emissions from purchased electricity and steam as defined by WRI) against the facility's own GHG footprint;
- Determination of whether carbon credits may be generated by a project, and sold for profit, and if so, if it would be better to keep the credits as a hedge against rising carbon costs or future regulation;
- Analysis of the risks and benefits of selling carbon credits for an additional revenue stream;
- Projection of potential costs associated with carbon taxes or fees;
- Evaluation of potential conflicts with existing contracts with energy providers; and
- Assessment of qualitative benefits, including improved public image and socioeconomic advantages, related to the installation of alternative and renewable energy systems and their contribution to the facility's overall GHG management strategy.

Because renewable energy systems are closely connected to GHG emissions, selection of energy alternatives for a facility should be aligned with overall GHG management strategies. In fact, existing and emerging GHG regulations are driving changes to energy markets nationwide. As part of the feasibility studies, the GHG implications of each energy system will be considered to provide important decision-making criteria.

Economic Analysis

The final step of the feasibility studies will be to conduct a comprehensive economic analysis for each technology at each site as well as for combinations of technologies at each site. Considerations taken into account during the economic analysis include:

- Capital costs
- Operation & maintenance costs
- Cost avoidance associated with decreased energy purchase

- Cost avoidance associated with potential carbon taxes or fees, as evaluated during the "GHG risk and opportunities" study

- Potential revenue streams, including the sale of surplus electricity, RECs or carbon credits, as evaluated during the "GHG risk and opportunities" study

- Availability of grants, rebates and tax credits

The economic analysis will yield payback periods and net present values for the renewable energy systems considered for each site.

Land Use and Development Strategies

Development most assuredly drives water demand and stresses infrastructure. North Carolina's Sullivan Acts require that the City provide water, as long as it is available, at City rates to those that build outside of City limits. Often the new development is in remote, high elevation areas that require dedicated water main extensions and in some cases dedicated booster pumping stations.

Developers are required to follow a variety of standard details and specifications for development services for the water distribution system. The standards are available on the City's website at www.ashevillenc.gov.

Based on a review of City's water distribution system design standards, the following opportunities could enhance sustainability in the City's water distribution system:

- Allowance of ozone disinfection of piping in lieu of the traditional chlorination/de-chlorination procedure, as a means of lessening chemical consumption and pipeline downtime. As a point of reference for City of Asheville officials, Denver Water in Colorado uses this ozonation practice. (Reference Standard Para. 6.10. C)

- Often developers will submit the least expensive pumping system available, and in turn do not provide an optimally-efficient pump selection. These systems are usually owned and operated by the City of Asheville after final startup and acceptance, and thus impact Asheville's operating costs and environmental impact in perpetuity. A requirement should be considered, wherein a North Carolina-registered Professional Engineer submits evidence of consideration of three or more manufacturer's pumping systems, to demonstrate that the most efficient pumping system available is being proposed for use in a given application. (Reference Standard Para. 6.12)

- A requirement that all electrical motors that will drive pumps be premium efficient type, to assure the motor will draw the minimum amount of power possible for the application. (Reference Standard 6.12.E.7)

- A requirement that noise levels (measured in decibels on the A scale) be limited to a specified value, in order to assure social equity and environmental protection from unnecessarily loud pumping and/or standby power equipment.

Identification of a Water Efficiency Standard

A benchmark, target per capita consumption value is established by many water systems, to assess the consumption of individual households. The use of modern automated meter reading systems facilitate this effort, wherein real-time data is accessed by the water system owner, and data anomalies are flagged daily or weekly. Through the use of such systems, water systems have been able to contact individual customers to alert them of unusual water use patterns, and to suggest corrective actions. A common scenario involves a call to a single family homeowner, during which the water utility notes a "spike" in water usage in the past week. The customer often is pleased to receive such a notice, remedies a leaking fixture, saves money, and consumes less water. Such a scenario benefits the environment and the utility's public image.

Rate Restructuring

Nonessential water use can be reduced through rate structuring. Rate structures that can have such results include:

- ***Increasing block rates.*** Tiered pricing provides the incentive for users to remain in the "lowest tiers", to avoid the high charges that result from water use above specified thresholds.

- ***Seasonal rates.*** Increasing block rates are sometimes placed into effect during warmer, high-demand periods, particularly in cases where summer demands are notably higher than the remainder of the year.

Rate restructuring carries the benefit of reduced water consumption and the resulting reduction in power and chemical costs, but must always be weighed with changes in revenue and with political and customer economic considerations.

Outreach and Education Tools and Strategies

Water is a finite natural resource requiring careful management. Public awareness can be extremely helpful in reminding the community to be mindful of their water consumption. Residential customer reminders can be distributed to encourage citizens to minimize lawn watering, increase xeriscaping, avoid running the water while brushing teeth, take quicker showers, run laundry and dishwashers when loads are full, and decrease water use through Energy Star certified laundry machines and dishwashers. All of these ideas have the potential to prompt people to change some small habits. These ideas can be spread through the community by meetings, public announcements, brochures, mailings, and through in-school education programs for Asheville's youth.

Suggested Metrics for Measuring Future Progress

Building a culture of sustainability should become a primary mission for the City in its water operations. Much like the focus on safety, a culture of sustainability should be a value that all employees take ownership of. An overt means of tracking results, analogous to the safety regimen commonly employed in industry, is suggested as depicted in **Figure 3.1**. Measurable goals can be tracked on such a chart, such as gallons of water produced, kilowatt-hours of electricity used, gallons of chemicals used, quantity of natural gas consumed, miles driven, and gasoline and diesel purchased.

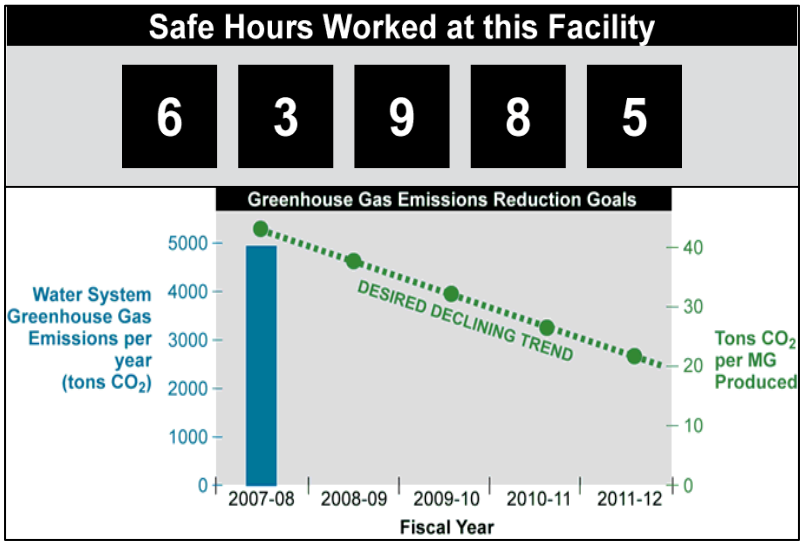


Figure 3.1 Akin to a culture of safety, a culture of sustainability will truly take root when operations personnel embrace and take ownership of the issue. This culture may be fueled by overt, visible tracking of results and success. Water system operations and engineering are unique among professions, given the substantial impact professionals can make on energy consumption and the resulting impact on the environment.

Solid Waste

Opportunities for Innovation, Tools & Best Practices

The goals set forth for solid waste at the introduction to this report cut across several elements of the waste management process, from internal City operations and leadership, to alternative collection fee structures. The common thread among these goals however, is to either reduce waste generation, or to improve the effectiveness and fairness of collection schemes. This section begins the process of identifying steps and processes towards fulfilling these goals.

Municipal Leadership

The City provides exemplary waste management services to its citizens. However, these same services are not as robust for the City's own facilities. This report demonstrates a commitment by the City to seek improvement and become more sustainable in how is manages its own waste, setting an example to the private industrial and commercial sectors. The City would be positioned to share experience with their private counterparts.

The City provides exemplary waste management services to its citizens. However, these same services are not as robust for the city's own facilities.

The goals presented in Section 1 emphasize the importance of tracking and quantifying wastes. Data must be collected and analyzed before a program can be implemented. The creation of a sustainable system requires that the City find a means to account for all the waste it generates. Accurate information will allow the City to properly budget for and design program facilities, such as the number and type of recycling bins to provide.

There are three techniques typically employed for characterizing waste streams that the EPA defines as follows:

- Modeling Techniques: Modeling techniques use generic waste generation rates. This method is inexpensive but only provides a general idea of the volume and type of waste.
- Physical Techniques: Physical techniques are more accurate than modeling, but are more expensive and require more time. These techniques sample the waste stream to develop a profile. Three techniques are quartering, block, and grid. Quartering involves sampling a truck or group of trucks and "quartering", reducing a selected pile by one-fourth, remixing it between each split until a sample at least over 200 pounds is reached. The block technique is done by a sampling team that chooses what it deems to be a representative sample from a collected pile dumped in a clear area. The sample is separated and characterized. This technique is dependent on the ability of the sampling team to determine what is representative. Lastly, a grid technique involves dividing the waste into equal sized squares, with each square assigned a number and letter code. Waste is unloaded in equal quantities onto the grid and measured from a preset number of grid squares. Any sampling technique should be done to avoid seasonal events or other factors that might skew the results such as, the week after Christmas.

- Direct Measurement Techniques: Pilot studies represent a common direct measurement technique, and, if done correctly, can produce accurate volume and type estimates. Some communities weigh and characterize the waste as it is collected.

In addition to resources available through the EPA, the Waste Reduction Partners program, administered by the Land of Sky Regional Council, can assist in designing a waste stream survey. The program uses retired professionals to provide businesses, industry and public institutions with pro bono technical surveys on ways to promote waste reduction, including waste stream audits, policy development, marketing negotiations.

The City's next step should be to adopt a systematic approach to tackling the issue. Two complimentary approaches are discussed here: Environmental Management System (EMS) and Integrated Waste Management (IWM).

Environmental Management System for Solid Waste

An Environmental Management System (EMS) is a set of formal policies that describe how an organization will evaluate, manage, and track its environmental impacts. An EMS can be applied to almost any sector and may address a plethora of environmental issues. The following discussion offers an introduction to this method.

Most EMSs follow a "Plan-Do-Check-Act" model that builds on itself through continuous examination and improvement of the processes and policies in place. The four steps move in succession but form a feedback loop, which gives continuity of program through evaluation and reformulation to address changing situations. This process is simply the same process espoused in the sustainability management system, as applied to solid waste.

Plan: identifying issues and establishing goals

The first step is to define what should be accomplished by instituting the EMS. What is success and how will it be measured? This step is currently underway at the City. By authorizing the preparation of this report Asheville is engaged in a visioning process for defining what an improved solid waste system would entail. This is also the time to define the scope of a solid waste system improvement. A scope would be framed by the goals. The scope in this case would focus on City operations and quantification of a waste stream. An EMS could be created specifically for City office spaces or the Sanitation Department-- it is common for an EMS to be tested as a pilot on a smaller scale.

One of the most important steps towards creating an EMS is securing commitments from top management. Asheville has largely accomplished this as there is widespread support for improvement in the sustainability of each of the sectors described in this report. Initial buy-in is not entirely sufficient, however; when it comes to the specifics of establishing targets and strategy, continued commitment will remain an important factor. The establishment of an EMS will require a champion--sometimes a top management person can serve as a champion, and this has its benefits. Surrounding this leader is an EMS task force, or implementation team, representing a variety of skill-sets (engineering, finance, human resources, planning). Including external partners in the team can have its benefits as well when appropriate.

Once a commitment and implementation team is in place, more targeted planning tasks may begin. This commonly includes a kickoff meeting, preliminary review, budgeting and scheduling, regular communications and reporting of progress.

The importance of creating a firm planning foundation cannot be overemphasized. Front-loading the EMS with as much thought and organization as possible will continue to provide benefits over time.

Do: implementation, including training and operational procedures

This stage is often the most challenging--in many respects, as this is where "the rubber meets the road." The steps in this stage will test the vitality and viability of the planning activities carried out in the initial EMS.

A recommended first step in the implementation phase is to develop a clear understanding of the legal requirements that surround the process under consideration. Once the legal framework is understood, focus may shift to identifying how the issue is impacting the environment. In this case, that entails conducting a critical evaluation of the City's waste stream. What are the environmental impacts of the different waste streams and where are they generated. As the impacts are identified, initial brainstorming for monitoring programs is appropriate. Subsequently, a series of developmental steps should be undertaken: establishing an environmental policy, defining key roles and responsibilities, and identifying objectives and targets. A solid waste policy would include the views of stakeholders and would be consistent with existing programs and policies. Roles and responsibilities of upper management positions are most important to define.

Possibly the most critical and challenging step in the implementation stage is the development of management programs, operational procedures, and monitoring systems. These tasks are often iterative and overlap. This step provides a clear example of the cyclical nature of EMS since these procedures and systems will continue to develop over time as needs change. It will likely be necessary to revisit management programs, operational procedures, and monitoring processes over time to ensure that they are consistent, effective, and up-to-date.

Although communication of progress can be done many ways, formal records-keeping becomes a requirement at this stage. Commonly, an EMS manual is created that summarizes all the salient information for parties outside the EMS team. This will also be a time to evaluate the overall EMS. There is a professional industry of EMS certifiers that can be consulted.

Check: monitoring and corrective acts

Activities carried out in this stage are one-dimensional, focused on review and modification of the system so far. Internal audits of the EMS may be done in shorter increments, on a small scale, or may be done less frequently, more comprehensive and intensive in nature. Staff can be trained to carry-out these audits. Although seemingly straightforward, this stage--as with the planning stage--can save time and resources when done properly or vice versa.

Act: progress reviews and initiating needed changes to EMS

This stage has the singular purpose: to follow up on information gathered by internal audits in order to make meaningful and effective adjustments to the EMS. Actions should be focused on significant and identified barriers to meeting objectives and targets, regulatory compliance, monitoring systems, etc. The parties that make changes should be consistent with the roles and responsibilities defined at an earlier stage.

IWM is a systematic way of responding to the various issues, environmental, social and economic, surrounding solid waste by treating the different components of the waste stream with customized approaches, always looking to reduction of waste as the ultimate objective.

Environmental Management Systems are in use across a wide variety of public and private organizations of all scales. When done properly an EMS can reduce costs, improve environmental performance, increase efficiency, and enhance employee performance, morale, and recruitment. There are a variety of additional resources available which can provide further assistance with developing an EMS. The EPA offers many of these resources and Asheville can access them through the WasteWise program.

An Integrated Waste Management System

While the Environmental Management System provides a framework for the procedural and planning level, the practice of integrated waste management (IWM) offers a programmatic-level framework. The two systems could be combined-- with the IWM approach being implemented during the program development stage of the EMS.

The standards and practices of solid waste management have evolved to include new ways of thinking beyond simply disposal and waste reduction. With this change also comes a wider array of players in the solid waste management arena, from the traditional municipal employees in engineering and sanitation, to waste reduction specialists, recycling managers, politicians, planners, and nonprofit organizations.

IWM--used in municipalities throughout California and the country--is generally seen as the next step in the evolution of sustainable waste management programming. IWM became state policy in North Carolina with the passage of Senate Bill 111 in 1989. The truth is, most communities across the country have adopted at least one element of IWM, recycling. It was during the late 1980s that recycling, as a component of IWM became widely used. Fewer municipalities have adopted a more comprehensive use of IWM, though the number is increasing every year.

IWM is defined as a program that integrates waste prevention, recycling, composting, thermal processing and disposal rather than focusing on only one or two means of waste management. An effective IWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. IWM involves evaluating local needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions.

IWM is a systematic way of responding to the various issues, environmental, social and economic, surrounding solid waste by treating the different components of the waste stream with customized approaches, always looking to reduction of waste as the ultimate objective.

The Land of Sky Regional Council and the state Department of Environment and Natural Resources are willing partners for communities who wish to implement IWM on a more comprehensive scale. For example, studies are under way with the LSRC on waste to fuels operations.

Programming Activities

There are several program models that have proven to provide a positive affect on solid waste management programs. A few are described here for the City's consideration. These recommendations directly support the goals presented in the introduction to this report.

Expanding Recycling Downtown

Improvements to on-street recycling and pick up in downtown Asheville can be two-fold, targeting both downtown visitors with recycle bins and commercial businesses with curbside pickup. Funding the placement of recycle bins downtown can be an important signal and have meaningful impact for the City. Asheville has a thriving tourism industry, much of it based on the historic, lively downtown. Not only is this an untapped area for recycling collection, but it is also important for Asheville to send the message that it is a City dedicated to sustainability. Asheville has taken a similar, notable step in this direction in its use of the BigBelly™ solar trash receptacles. The BigBelly™ Solar Compactor is self-powered trash compactor that can hold five times more trash in the same size receptacle. When combined with informational displays and recycling bins, this is just the kind of installation that gets people's attention and sends a strong message about the City's commitment to sustainability.

BigBelly™ Compactor and recycling bin
Source: CSNStores.com

To target commercial entities, the City of Raleigh, NC began a *Downtown Raleigh Recycles* in August 2006. Curbside recycling service is available within the central business district through Solid Waste Services. Acceptable materials for the 64-gallon blue roll carts include: white paper, newspaper, corrugated cardboard, chipboard, magazines, aluminum beverage containers, glass bottles and jars, and plastic bottles. Collection is done four days a week. Over 100 organizations have joined the service, from nightclubs and restaurants, to law firms and coffer houses. Businesses receive a "We Recycle" window decal to show their involvement and receive a quarterly electronic newsletter. In the first five months of 2008, the program recycled over 280 tons of materials.

The City of Raleigh, along with many other communities, operates a swap shop at its yard waste recycling facility. The purpose of the swap shop is to reduce waste through reuse, diverting items from the waste stream back into active use. Residents having items in working, useable condition donate them to the Swap Shop. Residents in need of items visit the Swap Shop looking for the items. If the items are available, they take them. "Swapping" extends both the life of the items and the life of the landfill. It

is free to drop off any items and all items are free to take. The City clearly states which items are acceptable and unacceptable.

Pay-as-You-Throw

In nearly 6,000 communities across the country, a program called "pay-as-you-throw" (PAYT) is offering residents an equitable way to pay for collection and disposal of their trash. In addition, the program also encourages citizens to create less waste and increase recycling. The solid waste goals support the pursuit of a PAYT program to further Asheville's role a state leader in sanitation. Below is a description of how PAYT works and an example of a successful program in Eden, NC.

If Asheville were to institute a PAYT system, it could reduce annual GHG emissions by 6500 metric tons.

PAYT programs, also called unit-based or variable-rate pricing, provide a direct economic incentive for residents to reduce waste. Under PAYT, households are charged for waste collection based on the amount of waste they throw away, in the same way that they are charged for electricity, gas, and other utilities. If they throw away less, they pay less. Some communities charge residents for each bag or can of waste they generate. In other communities, households are billed based on the weight of their trash.

PAYT gives residents greater control over their costs since residents who reduce and recycle are rewarded with a lower collection bill.

Studies have shown that PAYT programs are effective in reducing household waste generation and GHG emissions. A study by Duke University (Unit Based Pricing in the United States: A Tally of Communities, M.L. Miranda, 1999) looked at statistics from 212 PAYT programs across the country and calculated average per capita waste reduction. The EPA then calculated the estimated climate change impacts of waste reduction based on these number and GHG emission factors. It found that for each person participating in a PAYT program GHG emissions were reduced by an average of 0.085 metric tons of carbon equivalent (MTCE) the standard unit of measurement for GHG. If Asheville were to institute a PAYT system citywide, it could reduce annual GHG emissions by 6500 MTCE, based on current population and waste generation data.

Another kind of pricing system is the fully-variable where customers are charged solely based on how much waste they produce such as the number of bags collected. This system provides a strong incentive for waste reduction, though cost recovery is more difficult due to uncertainties in reduction levels and full program costs. This is why a two-tier system is normally employed.

If Asheville were to pursue a PAYT system, a new fee structure would be required. Currently waste collection is paid for through the general tax fund, while the recycling service is billed at $1.32 per household on bi-monthly water bill. One option would be to pay for the recycling program out of the general fund, and charge a monthly PAYT fee to fund collection and disposal. Going even further, fees for recycling service could be built into the PAYT fee structure along with incentives for recycling alongside waste reduction. In this way citizens are not subject to receiving two monthly bills for solid

waste services, and the new PAYT fees are structured in a manner that protects critical revenue for the City's solid waste services. This fee structure discourages waste generation and encourages recycling.

The Pay-As-You-Throw Programs Fact Sheet provided by NCDENR explains the different program elements. There are currently 16 counties and five municipalities using some type of PAYT programs in North Carolina, and over 4,000 nationwide.

The City of Eden, NC has operated a PAYT program since 2002. Implementation began with a pilot project in 1998 that served roughly a third of all households. At the time, the flat waste collection fee covered only 30 percent of all residential solid waste services. The remaining 70 percent came out of the general fund. Residents who participated were notified as to how their costs would change as their waste disposal increased or decreased but did not actually pay the varied costs. The primary objectives of the pilot were to raise awareness about how the system would work and to serve as a test-run for the City to inform logistical decisions, should a permanent system be established.

There were two encouraging results from the pilot study, which led to the full adoption of PAYT in 2002. First, despite the fact that households' actual rate did not change in the pilot and 66 percent either maintained or increased their waste disposal, there was still a net reduction in the amount of waste generated. This means that those households that did reduce their waste (32 percent), reduced significantly. Second, the cost for waste services during the six-month pilot was $197,880. Under the existing flat fee structure revenue received was $60,000, covering only 30 percent of program costs and resulting in $137,880 in lost revenue. If households paid the unit-based fees under the PAYT structure revenue would have been $173,886.88, covering 88 percent of program cost and resulting in only $23,993.12 in lost revenue. The total cost for the pilot program was $2,000.

Residents who participated in the pilot were much more likely to feel that the current flat fee structure was unfair and placed a burden on those generating less waste to subsidize the cost of other residents' waste disposal. When done correctly, a PAYT program can meet each metric of the "triple bottom line", economic, environmental, and equitable.

It is recommended that Asheville use a similar strategy of beginning with a pilot program of some sample population before using PAYT City-wide.

Food Waste Reuse

In the United States, food waste is a significant part of the waste stream. The EPA estimates that Americans throw away a quarter of the food we prepare, about 96 billion pounds each year. This makes food waste the single largest source of waste by weight. The cost to the nation as a whole for food waste disposal is almost $1 billion per year.

In 2007, 12.5 percent of all municipal solid waste was food waste and less than three percent was recovered before going into the landfill. The methane produced in landfills, which contributes more per unit to global warming than carbon dioxide, is the product of food decomposition. Landfills are the single largest source of methane emissions, 34 percent, in the U.S. Recovering (i.e., food donations) and recycling (i.e.,

composting) this food waste rather than sending it to a landfill would greatly reduce GHG emissions.

Unlike with some other solid wastes, there are a variety of alternatives to landfill disposal for food waste including donating wholesome surplus food to the needy, animal feed, industrial uses, and composting. This report focuses on food composting.

Many municipalities include food wastes in their collection programs, alongside other organic wastes such as yard waste. Some important characteristics distinguish food waste from yard waste that should be considered while designing a collection program. Bacteria present in food waste as it decomposes can pose threats to human health if not handled properly. To avoid safety concerns, as well as nuisances such as odor, food wastes should be collected and disposed of in a timely and efficient manner.

Food waste must also be source separated, much like recycling, to avoid contamination with common related materials such as plastics, kitchenware, and beverage containers. A list of acceptable waste products should be generated and distributed to the public. Seattle accepts the following food wastes and food soiled paper products in the same 96-gallon bin as yard waste: fruit and vegetables, bread, pasta and grains, eggshells, nut shells, coffee grounds and filters, tea bags, pizza boxes, paper food wrap, and paper towels and napkins. Absent from this list but collected by other cities are meats and dairy products.

The City of San Francisco's famous Fantastic Three program provides each household with a green cart for organics, a blue cart for recyclables, and a black cart for all remaining trash. The Fantastic Three program was the main driver behind the City's 67 percent reduction in landfill waste in 2004.

Great things are already happening in North Carolina with food composting as well. North Carolina diverts six percent of its food waste (primarily nonresidential), double the national average. The volunteer Food Diversion Task Force is trying to raise that number. The task force formed in January 2007, is made up of members from composting, food, and waste industries, and is supported by the DPPEA and Carolinas Composting Council. The task force is seeking out ways to engage the public and private sectors in food waste composting and diversion.

Of course, waste collection is only one side of the equation. There must be facilities to handle the waste that is collected. In North Carolina, six of the state's 36 composting facilities are now permitted to process food waste. North Carolina has a four-tiered permit structure. All but one of the sites is in the top tier, meaning they can take all organic materials. Two more sites, in Greensboro and Hickory, were set to be operational in 2008.

Construction and Demolition Waste

Construction and demolition (C&D) waste includes solid waste that comes from construction, remodeling, repair or demolition operations on pavement, buildings or other structures. C&D waste accounts for a significant part of the waste stream in North Carolina, estimated at about 11 percent. Typically, C&D waste is divided into three categories – wood, rubble and asphalt, and other materials. Wood is estimated to be about 25 to 40 percent of all C&D waste. Rubble (which

includes concrete, cinder block, stone, clay brick and soil) and asphalt is almost half of all C&D waste. Other materials consist of gypsum board, roofing materials, plastic, paper, etc. Depending on the availability of processes facilities and the local market, up to 90 percent of all C&D waste could be recycled or reused.

To encourage recycling and reuse, regulations divide the waste stream into four categories: construction or demolition wastes, land-clearing wastes, inert wastes, and yard trash. The North Carolina Division of Solid Waste Management recommends the following methods for handling these materials:

- Construction and demolition debris should be separated into recyclable and non-recyclable materials.
- Inert debris (defined by the state as concrete, brick, concrete block, uncontaminated soil, rock, and gravel) should be recycled and reused as clean fill material.
- Yard trash and land-clearing debris should be reduced, reused, or recycled as mulch or compost. (Yard trash was banned from municipal solid waste landfills as of January 1, 1993.)

The City of Asheville, as an owner and operator of buildings, can set for its own construction and demolition projects goals to divert C&D waste from the landfill and pursue policy towards that goal. There are three areas that actions fall under – reducing waste at the source, reusing scrap, and recycling materials.

Some ways to reduce waste at the source include designing with standard material sizes, which avoids custom manufacturing. Store left over supplies for future projects. Ask suppliers to remove packaging before shipping materials to the site, and wrap materials in reusable blankets or padding. Some manufacturers will also take back used packing supplies. Require sub-contractors to include cost of C&D waste removal and disposal in bids to give an incentive to reduce waste.

Many of the materials leftover on a construction site still have valuable use, certainly above simply throwing them away. Leftover masonry materials can be crushed on site to be used for fill in driveways. Joist off-cuts can be cut up and used for other purposes. Pallets can be returned to vendors. Salvageable materials can be given to businesses that collect and resell used construction materials.

Materials that serve no obvious use in their present state can be recycled. Untreated wood scraps can be composted along with yard waste. Metals, perhaps the most easily recycled waste material, can be sold to scrap yards. Cardboard is banned from disposal in the Buncombe County landfill and is collected in separate dumpsters at all City facilities. Asphalt shingles can be used in asphalt paving and pothole repair.

The City could benefit greatly from adopting a construction and demolition waste reuse and recycling policy. A good policy would include elements such as conducting a pre-demolition audit whereby all materials within a site will be documented by both location (floor plan) and quantities. The audit would determine whether any materials may be reused by architecture salvage operations, the City or private citizens.

A walk through inspection will include someone with "salvage/reuse" expertise who understands the value and market for architectural and other salvage materials. The policy would also set forth guidelines for the handling of certain types of materials, as described above, and pre-activity meetings between the contractor and/or City staff to discuss expectations for materials handling, as well as the drafting of a materials management plan is considered best practice.

Environmentally Preferable Purchasing

One way to tackle waste reduction at the source is through what is termed "environmentally preferable purchasing/procurement" or EPP. EPP is the practice of choosing products and services with a reduced impact on the environment and human health than competing products that serve the same purpose. A wide range of characteristics distinguish environmentally preferable products, including: recycled content, durability, maintenance, packaging, production, toxicity, energy and water efficiency, and delivery and transportation methods.

EPP, also referred to as green purchasing by the Federal government, is widely seen as an effective means of improving the health of the environment and human health. It is particularly effective for public agencies and businesses as purchasing policies lay within a controlled decision-making process. A commitment to EPP can have immediate and significant impact on waste production.

North Carolina is only beginning to reap the benefits of EPP, following the example set by other states such as Massachusetts and California. North Carolina Department of Pollution Prevention and Environmental Assistance (DPPEA) offers support to local communities wanting to adopt EPP procedures. Several local governments have already enacted policy on EPP including: Chatham County, Chapel Hill, Gaston County, New Hanover County, Pasquotank, Town of Hope Mills, Hendersonville, Mecklenburg County, and the Land-of-Sky Regional Council.

An EPP program can have direct impacts on solid waste generation and GHG emissions. Selecting products that are more durable, come with less packaging, and included recycled materials immediately reduces waste. Purchasing energy efficient products from copiers to light bulbs and getting these products from sources in proximity, requiring less transit, reduces GHG emissions and can create cost savings over the life of the product.

Suggested Metrics for Measuring Future Progress

The two primary ways the City of Asheville could measure its progress towards meeting its goals include monitoring:

- Annual tons of solid waste hauled to landfills from City facilities.
- Annual tons of recyclable materials collected at City facilities and sent to recycling facilities.

Land Use

Opportunities for Innovation, Tools & Best Practices

A variety of land use tools and practices should be considered in order to better align Asheville's land use management with its sustainability principles. Given the strengths and weaknesses analyzed in Section 2.7.2, many of the proposed strategies directly address the specific issues in Asheville's current regulatory tools. Other strategies discussed in this section are longer-term solutions that can be tailored to the City's demands if they are selected. Learning from other communities' success and failures in sustainable land use planning, the City of Asheville can select strategies that best address its sustainability priorities at many implementation levels, ranging from regional/City-wide polices to practical programs for individual building owners.

The top level is the regional or community level of sustainable planning, which is the foundation upon which other sustainability practices are applied, and addresses City-wide and cross-jurisdictional factors such as infrastructure and housing density. The second level of sustainable planning is the neighborhood level. This tier relates to building orientation, building interrelationships, advancing opportunities for walking and biking, optimizing solar orientation, and designing site layout to reduce the distribution of utility systems. The third level of sustainable planning focuses principally on the design of buildings and residences, applying energy efficient designs, interior recycling systems, and LEED technologies, via the development ordinances and codes.

A climate change adaptation plan should be developed as an addendum to this and the Asheville 2025 Plans.

The tools and practices put forward in this section range from innovative and experimental techniques to practical easy wins. In order for Asheville planners to easily prioritize action on these recommendations, they are summarized and grouped by the estimated amount of effort required to implement each recommendation.

Regional and Community Level

Climate Change

Asheville's current land use plan does not include a thorough consideration of the effects of climate change. Adapting to and mitigation of climate change is a cornerstone of sustainability. Asheville can address climate change through the framework of land use regulation, as well as through the measures addressed in the other chapters of this Plan. While this Plan primarily addresses mitigation strategies, it is recommended that Asheville develop a climate change adaptation plan as an addendum to this and the Asheville 2025 Plans.

Climate change has been associated with several factors that can impact land use decisions, including: climate migration, coastal erosion, excessive precipitation, flooding, food

shortage, heat-related illness, loss of biodiversity, rising sea level, saline intrusion, water scarcity, and wildfires. Adaptation will require adjusting growth and development to these factors. As such, preparing for climate change is an enormous topic that cannot be fully addressed in this plan, though its omission from Asheville 2025 is the impetus for recommending that Asheville address climate change planning in its next update to the comprehensive plan. Integration of climate change policies and decisions into long-term land use planning is the missing link between Asheville's progressive environmental and land use policies.

The City of Asheville can select strategies that best address its sustainability priorities at the range of implementation levels, ranging from regional/city-wide polices to practical programs for individual building owners

An important first step is predicting reasonable climate scenarios for the Western North Carolina region. The City of Asheville is fortunate to have an abundance of climate data and climate experts, from agencies and institutions including the National Atmospheric and Administration Service (NOAA) National Climatic Data Center (NCDC), the Air Force Combat Climatology Center (AFCCC), the University of North Carolina at Asheville, Warren Wilson College, and others to support this assessment. Once climate scenarios are developed, the following steps can be taken to plan for these potential outcomes:

- Evaluate vulnerability of infrastructure, energy, land use, human health, emergency response, agriculture, and the economy.
- Address potential changes related to infrastructure, including water supply, demand and quality, strormwater, and transportation systems.
- Develop resiliency strategies to those potential impacts that proactively manage risk and minimize the financial burdens of infrastructure impacts and other costly damages.

Next Steps:

- Maximize and optimize partnerships with federal climate agencies in Asheville.
- Work with stakeholder groups, such as Sustainability Advisory Committee on Energy and the Environment (SACEE) and NOAA, to identify climate change risks and local climate data.
- Seek guidance from current partners and experts, such as ICLEI Local Governments for Sustainability, regarding the creation of a Climate Change Adaptation Plan.
- Identify land use priorities that are related to climate change for incorporation into the Asheville 2025 Plan.

Relevant Sustainable Land Use Principles:

- The City's land use decisions address changes in climate and the environment.

- The City's land use policies and decision-making are continually updated to include new technologies and practices.

Regional Planning

Approaches to addressing issues such as conservation, climate change adaptation, transportation improvements, and even tax revenues, must be addressed at the regional scale. Hendersonville and surrounding areas of Buncombe County are absorbing much of the growth that is centered on Asheville. In addition, these are the locations of some of the least sustainable growth patterns—sprawling subdivisions, automobile-centric corridors, and high-energy use buildings. Yet, the City of Asheville has no control over land use in these areas, even though its sustainability depends upon it. As has occurred in the past, Asheville may be in a position to annex these areas in the future and will be forced to adapt to the land use and development that are being put in place today.

The Asheville region is missing effective cross-jurisdictional planning. In order to stay ahead of growth and development, the City of Asheville should spearhead an integrated and regional approach to planning.

In order to remain truly competitive and sustain itself economically, Asheville must look outside its borders. Transportation nodes must be regional in nature, and links with other nodes in the region—commercial and intellectual, in addition to physical—must be made. While both opportunities and constraints clearly exist with the City's water system, the City should consider advocating for region- and state-wide infrastructure standards that promote sustainable transportation and utilities for the City and its entire regional network.

Thinking regionally about planning issues and taking control collectively of land use in the region leads to cost-effective investment in infrastructure, efficient provision of services, links to other communities and resources, and effective positions from which to address regional/global threats. It is recommended that future land use planning in the City be carried out in conjunction with neighboring jurisdictions to

Next Steps:

- Create regional partnerships: among municipalities, organizations, and agencies.
- Identify land use planning efforts that are best suited for a regional approach, e.g. corridor planning as opposed to zoning updates.
- Conduct regional visioning sessions among City, County, and regional planning and economic development agencies to create a shared goal and foster buy-in, to discuss current land use controls and initiatives, and to develop mechanisms for coordinated growth management.
- Assess opportunities and constraints related to development of more formal regional planning authority and jurisdiction.

Relevant Sustainable Land Use Principles:

Sustainability planning extends beyond the building level to neighborhoods and regions.

Conservation Planning

The City of Asheville does not currently have a conservation or natural resources management plan. It is recommended that the City take steps toward planning the conservation, protection, and even partial development of its natural lands. This exercise, while valuable for areas within the City jurisdiction, is most appropriate as a multi-jurisdictional effort to include the unincorporated areas surrounding the City.

A conservation or natural resources plan is crucial to determining the shape of City-wide development patterns. A key component of sustainable land use is that ecologically sensitive and resource-rich land should be maintained as undeveloped property. In developing a conservation plan, the City could set the ground work for several regulatory and development practices. A natural resource plan can help with other planning functions such as updates to zoning, conservation subdivision design and review, greenway planning, water quality improvement, and even future TDR zones. It is recommended that the City work in concert with Buncombe and Henderson Counties, surrounding municipalities, local land trusts and conservation practitioners, and regional agencies whose expertise in regional natural resources can provide an important first step in setting priorities for conservation regional. Factors that are particularly important in determining conservation areas for Asheville will include natural habitats, prime agricultural land, watershed and floodplain boundaries, steep slopes, undeveloped forested lands, and important viewsheds.

Essentially, a non-regulatory map of potential conservation lands should be created. GIS is a useful tool for this exercise, with potential data layers including riparian corridors, wetlands, floodplains, existing land use, and valuable ecosystem and wildlife sites. A conservation suitability model can be created, with each data layer and classification within those data layers weighted to adjust the impact on the model results. Public involvement and buy-in during the mapping process is a critical component for success to identify community needs, interests, concerns, available data sources, potential properties or projects, accuracy/scale, and to provide input on conservation priorities affecting model development.

By identifying potential conservation resources, as well as community-based conservation priorities, Asheville-area planners will be creating a land use decision-making tool to guide development pressures away from the most sensitive natural resources. The map of potential conservation areas provides a common baseline for regional conservation efforts which can be used by local landowners, land use planners, local and State agencies, and conservation practitioners to visualize individual projects as part of a larger whole; and to lend credibility to funding requests for implementing conservation projects. Communities can use the map to further investigate and identify the "low hanging fruits;" those properties that have a high conservation value and/or would be relatively easy to protect, for any of a variety of reasons, including land owner interest, community support, potential funding interest, or other. To accompany the map, conservation planning should profile the available

conservation toolset such that land use planners, local and State agencies, and conservation practitioners can successfully engage public and private partners for implementation.

Next Steps:

Assemble a Conservation Plan Committee from members of local governments, the Land of Sky Regional Council, citizen advisors, and local conservation groups.

- Identify data availability and data needs, key conservation priorities and locations.
- Host regional stakeholder meetings.
- Develop non-regulatory map of potential conservation lands and associated conservation implementation toolbox.
- *Relevant Sustainable Land Use Principles:*
- Land use management conserves open space, natural resources, and agricultural land.

By identifying potential conservation resources, as well as community-based conservation priorities, Asheville-area planners will possess a land use decision-making tool to guide development pressures away from the most sensitive natural resources.

Future Land Use

As discussed in Section 2, Asheville's current comprehensive plan does not contain a thorough analysis of current land use, nor the need or value of land that may be developed in the future, as is standard in municipal comprehensive or master plans. Visualizing and understanding the lay-out of land use across the county is central in forming policy. Likewise, any future land use planning should include a map of land use in the future based on land use recommendations. It is recommended that in order to meet its sustainability goals, the City of Asheville's next planning initiatives include a mapping and visioning component of future land use, and that these planning processes strive to include the sustainability recommendations contained in this plan. This effort could build upon the conservation planning exercise.

The City of Asheville should undertake an update to its future land use plan, with an eye for identifying ideal mixed use and high density areas. Future land use is analyzed in *Asheville 2025*, and this analysis can be built upon within the context of other sustainability initiatives. For instance, which areas are best suited for high density, renewable energy-powered developments, and which areas are best suited for single family housing? An ongoing reevaluation and update of land use will lead to more informed zoning and development decision making. Possible mixed use districts with higher intensity development in the north, south, east, and west areas of the City could strengthen the nodes that currently exist in those neighborhoods. An up-to-date and approved future land use map will facilitate zoning and development review decisions as they arise.

Next Steps:

- Map and characterize current land use.

- Collect and evaluate population projections, transportation usage, zoning restrictions, and other data that are required to project future land use.

- As part of the City's next planning initiative, develop priorities (based on community input and Plan recommendations) for future land use.

Relevant Sustainable Land Use Principles:

- Sustainability planning extends beyond the building level to neighborhoods and regions.

Transfer of Development Rights

Future housing and development demand in Asheville and adjacent communities threatens the prized mountain slopes and natural, undeveloped areas in the region. Maintaining these natural areas in undeveloped form is important to the City's economic sustainability, which is centered on tourism and recreation, and the region's environmental sustainability, as these areas are home to important ecosystems. It is recommended that the City of Asheville consider strategies to prevent increased and unregulated development in outlying areas through long-range land use planning. Implementation of a Transfer of Development Rights (TDR) program would provide a mechanism for creating desirable infill and for protecting natural resources without a "taking" of property rights.

A Transfer of Development Rights (TDR) program provides a mechanism for creating desirable infill and for protecting natural resources without "taking" property rights.

As noted in Section 2, the current comprehensive plan introduces TDR but does not provide recommendations that are specific to Asheville. In further considering this tool, the City should undertake an analysis to determine priority sending and receiving areas on a regional or inter-municipal basis. An efficient market for development rights needs to be based on a resident, landowner, and developer consensus indentifying areas that can benefit from more intense development and areas that can benefit from conservation. This effort can and should utilize the exercise described in the Conservation Planning section: development of a map of potential conservation lands.

The delineation of sending and receiving zones should be carried out in concert with a broader future land use planning process. As noted, because of the City of Asheville exhibits dense development patterns and relatively little undeveloped land, a regional approach to TDR should be considered. It is recommended that the steep slope areas of Asheville receive special consideration in the process of evaluating development rights sending zones. These areas are important to conserve for a variety of reasons: they constitute the natural viewshed that upholds Asheville's tourism and recreation economies; they are home to important local ecosystems that support the local environmental integrity; and providing service to these hard-to-access areas can be a burdensome cost to the City. Receiving zones that are recommended include urban infill sites in the downtown, as well as select portions of the riverfront areas that are ripe for development.

Chief among the other factors evaluated should be the financial mechanism and rules that would permit both the City and the surrounding counties and to benefit financially from a cross-jurisdictional TDR program. The design of a TDR

program includes defining which areas can sell development rights, and which areas can purchase additional development rights; outlining how development "credits" are determined on conservation properties in the sending zones, and how they are applied to development projects in the receiving zones; and creating the processes for transfer among sending and receiving zones. TDR programs work in conjunction with existing zoning ordinances, and are established with a clear understanding of the real estate market trends.

Next Steps:

- Collect, compile, and analyze data (relevant plans and ordinances, Council goals and pertinent resolutions, existing development incentive programs, economic development and real estate trends, and the existing legal basis in North Carolina) for implementing TDR.

- Assess sending area potential using available data sources, to possibly include existing land use, steep slopes, riparian buffers, the Greenway Plan, Wilma Dykeman Riverway Plan, areas identified in City Development Plan 2025, critical viewsheds, floodplains, wetlands, aquifer recharge areas, public lands/easements, existing and planned conservation subdivisions, and current zoning classifications, and other relevant variables, including potential development of a Conservation Plan. Identify key regional partners, such as Buncombe County and Land of Sky Regional Council.

- Assess receiving area potential using available data sources, to possibly include current land use, zoning classifications for areas that could accommodate higher density, proximity to and capacity of infrastructure, current or planned transit routes, areas identified in Downtown Master Plan, City Development Plan 2025, and other plans and relevant variables.

- Solicit public input for and acceptance of potential sending and receiving area maps.

- Develop program logistics and implementation strategy, including definition of credits, ratio of sending and receiving zones, and an accounting and tracking mechanism

Relevant Sustainable Land Use Principles:

- The City and developers actively pursue infill development.

- Land use management conserves open space, natural resources, and agricultural land.

Efficient Use of Energy

As discussed in Section 2, efficient energy use and conservation is a topic that is conspicuously missing from the City's current comprehensive plan. Asheville does not have a local, abundant source of energy, and current land use does not maximize the potential of energy that is currently consumed. For economic and environmental sustainability, it is recommended that the City of Asheville address energy use and consumption in its next land use planning efforts. Results from the Progress Energy Community Energy Advisory Council's (CEAC) work sessions on community energy efficiency strategies should support this effort.

Building and transportation energy use accounts for the majority of carbon-based energy consumption in cities like Asheville. Updates to the comprehensive plan should include energy as a key factor. There are many ways in which land use

affects energy consumption; the primary, underlying factor is development density. Dense development reduced building energy costs such as heating; complete neighborhoods and streets reduce the need for driving and increase the economic viability of transit.

At a less fundamental level, energy efficiency ordinances can be adopted and incorporated into the development process. Other North Carolina cities, such as Chapel Hill have successfully adopted ordinances that promote efficient use of energy. These can serve as models for Asheville as it investigates energy saving options. There is public support for energy management planning in Asheville; the creation of an energy management plan was voted as a top-ten priority at the 2007 Sustainability Workshop led by Johnson Controls, and Asheville was among select Cities named in North Carolina Session Law 2008-22 for enabling incentives for energy efficient development.

It is also important that the City's zoning and land use planning allow for on-site renewable energy. The City should review its zoning ordinances and clarify language regarding the allowed use of photovoltaic panels and wind turbines and how such technology is regarded under the regulations.

Green building and affordable housing goals should not be mutually exclusive, but rather complimentary.

Next Steps:

- Calculate/estimate energy consumption in Asheville; narrow in on energy consumption differences between high- and low-density neighborhoods.
- Analyze and develop policies and priorities for energy conservation in the City's next comprehensive planning efforts.
- Compile density-increasing tools (many listed in this Plan) and integrate into land use planning decisions.
- Revise ordinances to allow and remove barriers for on-site renewable energy technology.

Relevant Sustainable Land Use Principles:

- New and existing development uses energy at economically and environmentally sustainable levels.
- City encourages dense development patterns.

Affordable Housing

In Asheville, the stakeholder groups involved in affordable housing development and sustainability have not always overlapped in their goals and priorities. A large reason for this is the misperception that sustainable design and development is necessarily not affordable. In fact, as illustrated throughout the many sections of this plan, sustainable measures can be affordable to implement in the short term, and all of them strive towards long-term economic savings. With regard to housing, it is recommended that the City of Asheville reach out to the housing and environmental protection communities to elucidate how many of goals are mutual and achievable through sustainable practices. Green building and affordable housing goals should not be mutually exclusive, but rather complimentary.

As a model, Asheville might consider the City of Portland, Oregon's green affordable housing outreach brochure that may serve as a useful example. This brochure walks through a variety of green/affordable features such as energy, water, materials, site layout, ventilation, and maintenance, pointing out what kind of construction (new, rehab, etc.) each strategy applies to. It is important to educate developers and homeowners regarding the cost-savings associated with conserving energy through green features. Examples should be specific, such as explaining the environmental benefits and life cycle costs of green HVAC systems.

Going beyond education, the City of Asheville should consider adopting environmental and energy standards for its public housing programs. In addition, an affordable housing construction requirement for new developments could include additional green features.

Next Steps:

- Reach out to affordable housing and environmental stakeholder groups.
- Develop fact sheet or marketing materials on affordable green design and construction practices.

Relevant Sustainable Land Use Principles:

Sustainability is economical and can help provide workforce housing, when considering total life-cycle cost.

Building Awareness

Asheville's residents and business community are among the most progressive and active in the State regarding sustainability. However, sustainability planning through better management of land use is an area that most people are unfamiliar with because of the long-term and underlying nature of land use. In order to move forward on sustainable land use, the City should devote resources to educating the public on the link between its sustainability goals and land use decisions.

Raising awareness in the community about sustainability is a key component of a successful, community-wide effort to increase the City's sustainability. Land use and sustainability issues are among the most important that need to be communicated to Asheville's various constituencies. It is recommended that the City of Asheville develops and carries out and sustainability-focused education and public relations campaign that addresses land use issues.

Next Steps:

- Identify target populations and forums for dissemination of information.
- Develop marketing materials that are context sensitive for varying audiences.
- Work with SACEE on focused public outreach and with Planning Department staff that communicate regularly with the public.

Relevant Sustainable Land Use Principles:

The community is educated about sustainability and the City's sustainability resources.

Neighborhood Level

Unified Development Ordinance

Asheville currently has few regulations in place to carry out the sustainability recommendations contained in this plan. One method for adopting certain strategies is the integration of sustainability features into the Unified Development Ordinance. Tied to land use and development, certain strategies can be seamlessly inserted in the current development procedure.

While normally not part of a traditional zoning code, the City could take an innovative approach to land use regulation and could consider integrating the following issues into the UDO.

- Reduced greenhouse gas (GHG) emissions from solid waste facilities.
- Safe construction and demolition materials and procedures.
- Require recycling and composting facilities per site or per acre.
- Percentage of on-site renewable energy generated.
- Percentage of water collected and reused on-site.
- Provision of car-share or shuttle-bus service.

Next Steps:

- Review Sustainability Plan to identify which measures are related to development and land use. Many sustainable practices involve installation of new low energy technologies in residential, commercial, and large buildings. However, the layout, orientation, density and interaction of structures in the built environment determines the range of feasible transportation and infrastructure designs that support sustainable use of resources.
- Coordinate with Asheville Planning and Zoning Commission and City Council to discuss possible changes to UDO and procedure for making amendments. The existing UDO is an excellent land use management tool that can be significantly enhanced by integrating other planning documents, policies, and practices into a single wide-ranging UDO. For example, the UDO does not currently fully integrate the ideas, opportunities, and requirements of the Downtown Plan, neighborhood plans, the Riverfront Plan, and other plans so as to compile all regulations relating to land development and redevelopment in one document. This simplifies the process of assuring consistent and innovative practices in land use and building construction.

Relevant Sustainable Land Use Principles:

- The regulatory process encourages sustainable development.

Transit Oriented Development

Asheville residents and workers are largely dependent on automobiles for transportation in part because of the City's development patterns. In order to reduce auto-dependence—which helps fulfill several of the City's sustainability objectives—it is recommended that future development in Asheville be concentrated in dense nodes that can support and take advantage of public transit. Currently, there are not enough sufficiently dense neighborhoods and nodes to support substantial bus ridership.

Transit Oriented Development (TOD) consists of mixed use, higher density zones centered on a public transit access point, traditionally a bus or rail terminal. Asheville's current development patterns preclude substantial investment in transit that links the central business district to outer neighborhoods. The creation of denser neighborhood nodes in the North, South, East, and West, where population centers already exist, could be linked with the opportunity to provide more demand for transit—in the form of bus riders. TOD neighborhoods reduce energy consumption because of reduced vehicle transit and also provide a type of housing that is currently not available in Asheville other than in select areas of the downtown. Subsequent comprehensive planning efforts should include an analysis of which areas are best suited for TOD development, and zoning in those districts should correspond with planning analysis.

Studies have shown that generally six residential units per acre in residential areas and 25 employees per acre in commercial centers are needed to support transit oriented development. TOD neighborhoods typically encompass the 1/2 –mile radius around the transit hub. (Densities of about twice as much are needed for higher quality transit, such as rail, which is not presently appropriate for Asheville.) An area such as West Asheville, further described in the case study at the end of this section could sustain a transit hub. Transit hubs may also be well suited in new development areas. In the Southern portion of the City—and even in areas that may be annexed in the future—new development should be built at the necessary density and use mix to sustain a transit hub.

In addition to evaluation of possible locations, the next recommended steps in implementing TOD in Asheville are evaluating the regulatory tools and incentives that can be used. Overlay districts are a commonly used tool for fostering this kind of development. In Asheville, such a district could be applied on top of the low- or moderate-density residential areas that cover much of the City. Overlay districts allow greater density, more diversity of uses, and more flexibility in dimensions and setbacks. Using tax increment financing, sharing transit development costs, and location efficient mortgages are tools that Asheville should consider in the financing of TOD projects. These issues are likely being addressed in detail in the current Transit Master Planning process.

Next Steps:

- Identify possible locations/neighborhoods for transit hubs.
- Assess current transit routes and future demand projects to identify areas of need and/or future potential.

Relevant Sustainable Land Use Principles:

- Greater density makes transit options more viable.
- New development provides options for non-automobile transportation.
- Mixed use development promotes efficient land use and transportation.

Complete Streets

Many of Asheville's transportation corridors are not accessible or accommodating to forms of transportation other than automobiles. Because the reduction of automobile use and the increase of bicycle and pedestrian activity can help achieve

several of Asheville's sustainability goals, it is recommended that City planners employ Complete Streets practices in corridor planning.

Complete Streets is a planning philosophy that addresses the fact that many streets in America are designed with the automobile as the exclusive user, ignoring pedestrians, bicyclists, and even buses. Complete Streets calls for the redesign of streets to include all such users. It is recommended that Asheville adopt a policy that embraced the Complete Streets philosophy, as roadways that are truly multimodal greatly reduce the consumption of energy and output of emissions. In addition to being an environmentally sustainable choice, Complete Streets roads set the groundwork for urban design patterns that create more traditional neighborhoods. The Merriman Biltmore, Haywood, and Tunnel corridors are logical places to consider. Each is central thoroughfares lined with commercial activity. However, many portions are inaccessible to pedestrians and bicycles.

The City should consider incremental steps in the planning of future roadway improvements in certain key corridors that open these routes to more modes of travel. The first step in advancing complete streets is regulatory. The US DOT Design Guidance recommends bicycle and pedestrian ways be established in new construction and reconstruction. It is therefore important that the City of Asheville formally adopt a policy that is in line with US DOT guidance. It is recommended that Asheville's policy should require rather suggest inclusion of pedestrian and bicycle ways. Complete Streets advocates suggest policies that allow for few exceptions to this rule but do not determine design of roadways. Funding is an important question. Gas taxes have been effective in funding at the state level in various parts of the country. Federally funded projects, as suggested by the DOT guidance, can include provisions for multi-modal access.

Next Steps:

- Review US DOT Guidance and state roadway improvement policies to determine legal support and examples for a local policy.
- Coordinate with local MPO to identify partnerships and current multi-modal transportation initiatives and funding sources.
- Write and adopt a City policy for inclusion of pedestrian and bicycle ways in new design and construction. Prioritize corridors for implementation.
- Reach out to transportation department and public works department to discuss feasibility of bike lane and sidewalk improvements.
- Update zoning codes to reflect multiple uses along key corridors.

Relevant Sustainable Land Use Principles:

- New development provides options opportunities for non-automobile transportation.

Conservation Subdivisions

New residential development in Asheville, such as the growing communities in the south of the City, are continuing the sprawling pattern that was identified as undesirable in the City's comprehensive plan, *Asheville 2025*. In order to curtail

further expansion of land-inefficient development, it is recommended that Asheville consider updating its regulations for subdivisions (UDO Article XV Subidivsion Regulations) and new residential development with the conservation subdivision model.

The interrelationship of buildings and open space at the neighborhood level presents a local scale opportunity to effect sustainable development patterns where City- and region-wide planning is not yet in place. Conservation subdivisions balance density with open space. Studies have shown that nearly half of golf course community residents do not play golf, and are drawn to these communities because of their proximity to open space. Buildings in conservation and cluster subdivisions buildings are located in a layout to maximize contiguous, commonly held open space. Such subdivisions provide flexibility in housing density on a parcel and integrate open space into the residential fabric.

Asheville's historical development patterns are relatively dense and incorporate parks. It is recommended that this pattern be extended to new development. The first step in shaping this sort of development is to draft a subdivision ordinance or to reassess Asheville's site plan review for possible areas in which conservation and clustering features could be required and/or encouraged. Important factors for Asheville to consider in assessing regulations for conservation development include greater flexibility in lot size, density, and setbacks. Most conservation subdivisions can achieve similar parcel-wide density as sprawling subdivisions by mere manipulating lot sizes and the orientation and dimension of buildings.

Currently, as indicated in UDO Sec. 7-11-4, single-family subdivisions are required to allocate 20% of the parcel property to open space. In addition, a density bonus is allowed for additional open space provided. However, it is recommended that the City consider adding additional language to the ordinance—or institute a policy during plan review—that stresses the ecological significance of land designated for open space in subdivisions, for example priority on riparian corridors and buffers.

Next Steps:

- Draft possible updates to UDO Sec. 7-11-4, Open Space Standards, and 7-15-1, Subdivision Regulations, including greater detail on ecological function of open space.
- Reach out to development community to test which features of an updated policy and ordinance would be favorable.

Relevant Sustainable Land Use Principles:

- City encourages dense development patterns.
- The regulatory process encourages sustainable development.
- Land use management conserves open space, natural resources, and agricultural land.

Neighborhood Plans

Master planning at the neighborhood level is not currently meeting the needs of the City's diverse districts. The Asheville Planning and Development Department has prepared neighborhood plans that supplement the comprehensive plan for the following key districts. While some plans were

prepared as recently as 2007, others are not currently updated and are not in use.

- WestEnd/Clingman Avenue
- Haywood Road Corridor
- Charlotte Street
- Broadway Corridor
- River Redevelopment Plan
- Shiloh

Next Steps

- Neighborhood plans should be updated to align with the sustainability principles

4-D Integrated Landscape Visualization

As indicated in *Asheville 2025,* Asheville's current land use planning is based on solid, yet traditional, methodology of land use and transportation modeling. Innovative, computer-based approaches are being developed that would replace traditional land use analysis using four-dimensional visualization. Four-D visualization involves modeling the existing built environment using computer-based three dimensional models to show how current and future development would exists in the natural landscape, and how growth over time might consume valuable natural resources or generate cumulatively significant levels of pollution.

Planning and design of sustainable development frequently occurs in separate project stages. Often, there is either no specific thinking about innovative resource conservation, or else so-called "green features" are added as architectural elements without regard to how they fit within the specific project site. This generally results in missed opportunities for coordination of design elements and reduced opportunities to maximize sustainable utility and transport systems. This leads to projects that fall short of sustainable design potential and sometimes unnecessary increases in design, construction, and operating costs.

Conversely, when the design of buildings and structures is planned in the visual context of the site features and natural environment, many more options for sustainability can be explored and applied beyond the typical "green" architectural design elements. For instance, by coupling decisions about site layout, utility service, and transportation with decisions about design elements, it is possible to identify sustainability improvements that maximize use of solar power, better transportation and pedestrian movement systems, and more efficient resource use, reuse, and recycle options.

Using models more typically applied to design of building and utilities systems, Asheville might work with a local university to model the City or region's landscape, including environmental constraints that are normally not considered in real time during land use analysis. Inputs such as water, power, and road infrastructure; traffic; transit; pedestrian activity; housing values; climate change factors such as temperature and flooding seasons can be visually depicted in a 3-D model, and incorporate a fourth dimension of change over time. Such an analysis would provide a very rich

underlying set of data to support evaluation of alternative configurations of future land use, and site and building design.

Development of a customized 4-D visualization model is an expensive and cutting-edge undertaking that should be shared with an educational or research institution that can share costs and contribute technical knowledge, as well as benefit from the innovations that arise during the development process. An alternative to such models is the more affordable CommunityViz 3-D land use and visualization tool designed and distributed by the Orton Family Foundation. This product is a user-friendly program that is targeted to municipal planners, and that evaluates land use changes, but without detailed reference to sustainable technology and infrastructure.

More explicit guidance for developers on minimum expectations and desired outcomes for sustainable development, and a streamlined, more predictable review process, will be mutually beneficial for city leaders and developers.

Next Steps:

- Assess current land use modeling and forecasting to determine if future needs and pressures are being accurately accounted for.
- Identify priority inputs and data sources to define parameters of 4-D model.
- Initiate work with a research institution/university to create a prototype model to assess the most valuable elements that contribute to more sustainable land use planning and management, and review of development options.

Relevant Sustainable Land Use Principles

- The City's land use policies and decision-making are continually updated to include new technologies and practices.

Site Level

Development Review

The development review and approval process is unpredictable for developers of large projects in Asheville. The City should take measures to facilitate the approval process. A more user-friendly process will allow the City to more easily encourage and require sustainable design and development.

Currently, the development process, especially for large Tier III projects relies on a highly negotiated decision by the City Council at the end of the review process. It is recommended that the City work to improve the predictability of the review process and streamline the review process in order to attract more development, as developers' perceptions of the process may be deterring investment. In fact, a 2007 community sustainability forum conducted by the Sustainability Advisory Committee on Energy and the Environment (SACEE) identified decreased approval time and reduced fines as two of the top priorities for developers. The following suggestions deal with addressing the development permitting process, particularly with opportunities to incorporate sustainability.

- Sustainability should be among the topics discussed at the pre-development conferences between developers and city planners. Currently, landscaping, permitting, and development requirements are the main focus. Sustainability should be one of the main points.

- In order to provide consistency throughout the review process and to make discussions between developers and planners more informative, it is recommended that City continue to develop a detailed list of sustainability development goals. This list could be a simple roster of topics, or a point-based system that ranks a project's sustainability on factors such as efficiency of HVAC systems, pedestrian/bike accessibility, and use of renewable materials. Ultimately, this list will create a standard that should reduce the possibility of discrepancies between guidance from City planners and final decisions made by the City Council.

- In order to incentivize sustainable buildings and streamline the development review process, the City of Asheville might consider a separate review track for green projects. A possible example is the Chicago Department of Buildings (DOB) Green Permit Program, reduces the permit process timeline for projects which are designed to maximize indoor air quality and conserve energy and resources. The number of green building elements included in the project plans and project complexity determines the length of the timeline.

Next Steps:

- Review past development proposals and compile "lessons learned" regarding issues that arose in the design, staff consultation, and board approval phases.

- Review development review procedures in Asheville and compare to best practices and examples from comparable cities.

- Revisit exploration of point system-based fast-track development review; consider adding sustainability features to points.

Relevant Sustainable Land Use Principles:

- The regulatory process encourages sustainable development.

Green Building Code

Green building and green design are advocated throughout this Plan, but the City of Asheville does not currently have any regulations that require or encourage green buildings. These goals can be achieved through land use in the form of an ordinance or amendments to current documents and plans. It is recommended that the City of Asheville consider the adoption of green building codes.

A green building code or green building-inclusive zoning combines land use regulation tools with green design in an effective tool targeted at individual property owners. Integrating green building standards, principally LEED, can be present a difficulty given the extensive and detailed nature of these standards. The USGBC, which runs the LEED program, provides a toolkit for integrating green design into land use regulation, which Asheville should consider. Standards such as North Carolina's HealthyBuilt and EnergyStar, which are less rigorous than LEED could also be considered.

Next Steps:

- Research into other cities' green building codes and rating systems that might serve as a model for Asheville.
- Review current regulations to identify ways in which, alternatively, green building requirements could be integrated into current regulations.

Relevant Sustainable Land Use Principles:

- Developers and managers design individual sites that incorporate green building principles, such as those included in the LEED rating systems.

Zoning Districts and Dimensional Requirements

Asheville's zoning code, while not outdated, has not been designed to take into account the City's sustainability goals. In certain cases, zoning requirements may be allowing appropriate density, while in others unnecessary low-density is mandated. In reviewing its zoning ordinance, the City should assess the current justification for dimensional requirements with respect to sustainability.

The City's smart growth and "New Urbanist" zoning districts (Neighborhood Corridor, Urban Place, Urban Village, and Urban Residential) contain requirements that promote sustainable development patterns. However, they cover only a very small fraction of the land in Asheville, and a large portion remains in low- and medium-density residential. The City should consider the possibility of rezoning residential areas to smart growth districts.

An alternative to rezoning is an analysis of dimensional restrictions in the residential and commercial districts to determine whether development in these districts is constrained to unsustainable patterns, a problem faced by many communities in America. Requirements for lot sizes, setbacks, and building height often reduce density to unsustainable levels. Most residential and commercial districts in the UDO currently require a minimum front setback of 15 feet, which should be analyzed and reevaluated. (The City's current comprehensive plan suggests that wide setbacks were required to allow for possible road widening, which is not in line with Asheville's current sustainability priorities.) Likewise, height restrictions, currently absent to promote infill development in the downtown, should allow appropriately intense development and respect local character.

Next Steps:

- Conduct a thorough review of zoning districts to determine if dimensional requirements allow desired building types and density patterns.
- Compare future land use map with zoning districts to verify if zoning allows for planned development trends.
- Assess the use of additional overlay districts, or further use of the Transition Overlay District, which is designed for areas in which current zoning is not effective.

Relevant Sustainable Land Use Principles:

- The regulatory process encourages sustainable development.
- City encourages dense development patterns.

Incentives

The City of Asheville does not provide substantial incentives at the project level for green design and sustainable land use. Session Law 2008-22 enables the City of Asheville to provide incentives for energy efficient construction. In the Fall of 2007, the SACEE committee conducted developer workshops in response to House Bill 1097 to gather feedback on possible incentives, and provided City leadership research into best practices and alternatives for developing incentive programs. It is recommended that the City continue to work towards developing a formal policy for incentivizing green development.

Creating incentives for individuals to green their homes and businesses, when carried out on a large scale, can create land use that is substantially less energy dependent. Notable examples of such incentives include Marin County, California's solar rebate program, Santa Monica, California's green building grant program, and Arlington, Virginia's green building fund. The Database of State Incentives for Renewables and Efficiency is an extremely comprehensive searchable database of federal, state, and local incentives for renewable energy and energy efficiency.

Using models such as these, Asheville planners would be able to shape projects and neighborhoods, on a case by case basis, in a manner that is in line with the City's overall sustainability goals.

Next Steps:

- Prioritize land use policies that would be best encouraged through incentives, rather than regulation.
- Build upon research from SACEE to develop formal incentive policies and programs.

Relevant Sustainable Land Use Principles:

- The regulatory process encourages sustainable development.

From Concept to Reality

Translating the recommendations in this plan into discrete, implementable, and inter-linked projects is the ultimate goal of sustainable land use planning. In order to do so, this section reorganizes the recommendations into implementation levels and example project vignettes that illustrate the ways in which sustainable planning can applied. Recommendations are grouped into categories according to their ease of implementation—from innovative, long-term strategies to simple changes in current programs. In addition, four sample projects that mix a variety of the recommendations are described briefly in order to explain and perhaps plant the seed for future planning initiatives the City may wish to pursue.

Innovative practices new to Asheville

- Coordinate with neighbors and state to initiate regional planning.
- Develop transit oriented development communities.
- Use 4-dimensional landscape visualization in land use analysis.
- Carry out conservation and natural resources planning.

- Develop transfer of development rights trading system.

Practices that build on current programs or trends

- Address climate change in planning and regulations.
- Employ Complete Streets methods in road design.
- Conduct future land use analysis and mapping.
- Incorporate efficient use of energy into planning analysis and policies.
- Adopt green building code.
- Provide incentives for green design and sustainable development.
- Enhance public awareness of sustainable land use issues.

Modifications to current practices

- Encourage development of green affordable housing.
- Encourage or require conservation-oriented subdivision design.
- Update and implement neighborhood plans.
- Regulate a greater variety of sustainability measures through the Unified Development Ordinance.
- Streamline the development review process.
- Review zoning districts and zoning dimensional requirements to ensure compatibility with sustainability objectives.

Riverfront Development: Making a Link to the Downtown

The riverfront district that currently contains warehouses and galleries poses an excellent opportunity for renewal and increased use. The City of Asheville should consider rezoning or using an overlay district to facilitate mixed use redevelopment of this neighborhood, which is located very close to the central business district. An architecturally unique district located next to the French Broad and near the City center, this neighborhood would benefit from a zoning other district restrictions.

There is an opportunity both to preserve open space and create dense development in this area. The riverfront is an outstanding natural resource. With increased access, the area can be turned into a recreational focal point within the City that will add to Asheville's well-known reputation as a

Relevant sustainable land use principles:

- *Land use management conserves open space, natural resources, and agricultural land.*
- *Asheville maintains a reputation as a sustainable city in the region and nation.*
- *Mixed use development promotes efficient land use and transportation.*

Recommended strategies:

- *Conservation planning*
- *Mixed use development*
- *Zoning/Overlay district*

destination for outdoor recreation. Maintaining the waterfront as an undeveloped park will conserve ecosystems that depend on the French Broad. Simultaneously, warehouse buildings can be reused and expanded to create a more actively used mix use neighborhood. The current low intensity uses can be mixed with condominiums and additional arts functions.

By increasing both built density and recreational activity in the area, this district can take advantage of its very close proximity to downtown, creating a link between the downtown and the waterfront that is currently weak.

Downtown Infill Redevelopment: Revitalizing Downtown

Asheville's downtown contains several underused sites that are surrounded by otherwise dense development. Redeveloping these sites is an important step towards sustainability because concentrated activity creates an economically viable City center, where pedestrian movement is possible, businesses can benefit from close proximity to one another, and preserved historic downtown architecture provides an aesthetic attraction to visitors and residents. In addition, dense development, as discussed throughout this plan, consumes less energy and produces fewer emissions. Generating density in districts that are already laid out for high density is a logical policy for sustainability.

Working with the Downtown Development Commission, specific sites can be identified and prioritized for investment and redevelopment. The sites and selection process employed in the City-Owned Property Redevelopment Process, such as Eagle Market Street and Haywood Street, provide a good example for similar privately owned properties that can be redeveloped under this program.

Development review that fast-tracks green design and infill sites will be particularly important in the downtown. Urban design standards and predictable, straightforward standards for approval will entice developers to take on a project such as this one.

Relevant sustainable land use principles:

- *City encourages dense development patterns.*
- *Greater density makes transit options more viable.*
- *Sustainability is economical and can help provide workforce housing, when considering total life-cycle cost.*

Recommended strategies:

- *Transit Oriented Development*
- *Green buildings*
- *Affordable housing*

West Asheville: Developing a Mix of Uses in a Thriving Neighborhood

West Asheville affordable housing and active commercial activity on Haywood Road have made it an emerging successful neighborhood with a distinct character. To capitalize on this existing node, Asheville can focus on enhancing the qualities that have led to its revival as a unique neighborhood.

Dense development, affordable housing, and transit options are important in creating a sustainable Asheville, and West Asheville can be an incubator for the implementation of these programs. A bus station at the intersection of Haywood Road and State Street will serve as a transit anchor providing a non-vehicular transportation option to West Asheville residents.

Multi-unit development, as part of a TOD center, will increase the density of the district and provide affordable housing that complements the current offerings of mostly single-family homes. Green design incentives and fast-track permitting could be used in this district to encourage green design.

Relevant sustainable land use principles:

- *The City and developers actively pursue infill development.*
- *There are mechanisms to achieve both historic preservation and sustainability simultaneously.*
- *Public and private sector work together to redevelop underused urban properties in the most sustainable manner.*
- *The regulatory process encourages sustainable development.*

Recommended Strategies:

- *Infill development*
- *Development review*

UNCA Campus: Creating Connectivity

The University of North Carolina at Asheville is an important part of the Asheville community. However, the campus remains relatively insular. Integrating the UNCA campus into the City, both physically and culturally, will strengthen both parties and can serve as the catalyst for redevelopment along the Broadway corridor.

Broadway is not entirely accessible for bicycle and pedestrian use along the route from the UNCA campus to the downtown. The university community can be brought into the City by providing greater non-vehicle transit options. Using a complete streets design approach, and by increasing bus service, greater access will be provided, increasing commercial activity in the downtown, and allowing greater movement between the nodes. Inter-nodal transit can subsequently encourage redevelopment along Broadway. Development along this corridor will be more traditional in its scale, avoiding the large parking lots and deep setbacks that are currently ubiquitous. The result will be increased local commercial development, fewer vehicle trips, and the redevelopment of a corridor that spans several neighborhoods.

Relevant sustainable land use principles:

- *New development provides options opportunities for non-automobile transportation.*
- *Sustainability planning extends beyond the building level to neighborhoods and regions.*

Recommended Strategies:

- *Complete Streets*
- *Transit options*

Suggested Metrics for Measuring Future Progress

Because land use is a long-term, underlying component of sustainability, there are many different ways to measure progress. Several indicators that point to the condition of land use with respect to sustainability that should be incorporated as part of the City's long-term performance measures. These indicators include: resident vehicle miles traveled; residential energy consumption; number and distance of transit routes; transit ridership; participation in development programs such as fast-track review or green building incentives; rates of impervious surface paving; building and development densities; and building water consumption. As is evident from this list, many of these factors tie back to recommendations made in other sections of this plan, which highlights the fact that land use is an underlying component of sustainability planning that can foster improvements across the community.

Education and Communication

Opportunities for Innovation, Tools & Best Practices

Education and communication are powerful tools for fostering sustainability innovation and change. While an established plan and set of goals will carry an organization closer to their end goal, successful communication will make sure the organization goes the full distance. Lastly, successful communication will likely result in employees understanding their role and receiving positive encouragement for their efforts.

This section builds upon the communication and education initiatives presented in Section 2 that are already underway, and presents opportunities for improving the City's communication and education with regard to the myriad of sustainability improvement possibilities. The following sections and the associated recommendations are organized around the Education and Communication goals identified in Section 1.

Proper communication can empower employees by providing them the necessary tools and direction to succeed. The City's Office of Sustainability has already observed an 11.5% voluntary energy use reduction through the B.E.S.T. program.

Increasing Voluntary Employee Conservation

The City's Office of Sustainability has already observed an 11.5% voluntary energy use reduction through the B.E.S.T. program (described in Section 2). The primary reason for this large energy usage reduction in such a short time period as eight months is based on the community of staff voluntarily striving to meet the organizations carbon reduction goal and cost cutting desires. This strong example of efficiency through volunteerism highlights the high capability potential for continued improvements in reduced energy usage. Nurturing volunteerism plays three crucial roles in achieving sustainability goals: secures buy in from the active community, provides a space for valuable feedback on effective strategies, and fosters innovation. The following ideas could be used to increase volunteer conservation:

Annual Green Challenge

An annual employee challenge provides the opportunity to build support from staff by providing them with a chance to participate and make a difference in the organization. Building the expectation for an annual event effectively renews support from enthusiastic volunteers while serving to recruit new supporters. It is essential to replicate the same event each year so that staff knows how to succeed, and to maximize word of mouth solicitation for participation. An annual City-wide campaign of this sort needs to have readily actionable tasks for staff to achieve so that it has broad appeal to a wide cross section of staff, while simultaneously having quick and measurable results to provide prompt positive feedback on performance. The last aspect of a successful annual challenge is to solicit feedback after each challenge to learn how to make the experience better for

participants, then apply those recommendations in the next year's challenge which confirms your value in their experience and participation.

For example, an annual No Cost Campaign where City employees have the opportunity to showcase their on-the-job technical knowledge inspires innovation and promotes knowledge transfer. Each department would pick leaders to help develop and submit no cost methods of saving energy at the workplace. All submitted ideas could be displayed in common areas, easily accessible by other departments. These ideas can range from carpooling to work meetings, to as technical as engine parts in fleet vehicles.

After the ideas have accumulated, they can be put to the test. Each department would be tasked to perform these no-cost methods as a part of daily practice, with the energy and fuel bills reviewed monthly. During annual staff appreciation day, the Office of Sustainability could present the submitted ideas, and announce two winners: one for the greatest energy usage reduction, and the other for the most innovative and unique ideas. Each of these winners would receive an energy efficiency gift basket, including motion sensors, smart electrical strips, home insulation materials, and other gifts that can be used at their home to conserve energy.

Sustainability Awards Ceremony

Recognizing an employee for a job well done or for going above and beyond their duties may be as simple as expressing words of appreciation in front of their colleagues. The powerful effect from commending an action or behavior that is valuable can be expressed in a myriad of ways. The important element to replicate is reinforcing behavior that supports established goals. A strategy to enhance this basic principal is to create a high profile experience for commending desirable behavior. These recognition events provide an opportunity to honor and reward employee efforts, as well as reinforce the actions and behaviors you want to see people repeat.

An annual "Go On Green Goblet" could be created and awarded annually to one division who has demonstrated exemplary leadership in sustainability through widespread principal and practice within the division. The goblet serves as the symbolic ribbon of honor for their efforts, and can be supported while one day paid time off could serve as a specific reward and incentive for each member of the division. The Goblet should be presented at the annual employee appreciation picnic so that all employees recognize the leading division's efforts. Following the employee appreciation picnic, that division could also be honored in a public forum at a City Council meeting. To sustain desirability and friendly competition, the winning department would hold the goblet for the remainder of the year before other divisions have the opportunity to steal it away through their sustainability efforts.

Establishment of Employee Conservation Policies

Green Team

A cross-departmental Green Team could act as a volunteer steering committee for organizational sustainability initiatives. Successful diffusion of an organization-wide initiative is dependent on wide scale buy in and support which can begin through a Green Team. The Green Team can ensure that the larger program represents accountability, inclusivity,

information sharing, cross-departmental collaboration, and identification of organizational barriers to sustainability.

The City of Asheville should establish a Green Team to institute and maintain employee conservation policies and program implementation. Membership could be composed of assistant directors, who have the authority to initiate administrative policy change within their departments, the ability to lead their staff towards successful goal achievement, and the ability to provide insight and experience regarding what will and will not work. A sub-committee of the Green Team could involve volunteers from each department who can support program implementation. The Green Team could meet monthly to share information, with each session educating members on various sustainability topics, providing updates on City initiatives, and promoting cross-departmental support. This collaboration could play an integral part in achieving organizational carbon reduction goals.

Corporate University Greening Course

This institutional education series is an ideal example to weave sustainability education and communication material. Through building upon trusted sources and experience, sustainability messaging and information may be able to reach more employees that have otherwise been reluctant to reach out for information about the new program.

This platform may be used, for example, to design a course for the Park Maintenance Division regarding green fertilizers, xeriscaping, native plant selection, and other park maintenance techniques and tools that relate to their work. Another example could be a course taught for the Information Technology Department regarding disposal and end of life management of electronic equipment, in concert with information about energy efficiency product selection. This course would aim to provide employees the information on the impact their work has on the environment to empower and encourage sustainable choices at work. Courses like these have the added benefit of being provided in-house by and for City of Asheville employees, which has three immediate benefits:

- Providing in-house instructors will be far more cost effective
- Employees may be more inclined to attend a course taught by one of their own
- This will further enforce the idea that we as a City government are in this together

Incorporation of Sustainability into Communication and Outreach Materials

Material Use and Design

An organization's face is shown through their communication materials and is an ideal opportunity to symbolically demonstrate their commitment to sustainability. Communication materials like business cards, flyers, brochures, gift incentives, and others share a written message, but what they are made from and how they are designed and presented can also communicate a sustainability message as well. Examples of these concepts are presented in **Table 3-6**.

Table 3.6: Examples of Opportunities for Innovation in Sustainable Practices

Opportunity for Innovation	Concept	Example
Go Electronic	There are many times that communication can be accomplished most effectively through electronic means. Maximizing email, websites and blogs is just skimming the surface of options to share information.	The Community Relations Division chose to post the 2008 annual highlights on the internet instead of printing paper copies. This decision reduced the amount of paper needed and drove citizens to the website which helps to teach the customer more about the organization and how we can meet their needs.
Use Less	Design and produce communication materials that use space efficiently and reduce the need for excess materials.	When the Information Technology Department published their annual report in 2008, they decided to only print out business cards that had links to the website where people could find the PDF in an electronic file. This creative idea not only uses technology effectively, but also significantly reduces the use of paper from a 13 page document to a small business card.
Give it a Purpose	Design and create multi-functional communication materials. The first and foremost function is to convey a message, but what happens when that message is conveyed? Often the information is stored away from sight, thrown away, or recycled if we are lucky. Try to design marketing pieces that have a shelf life that provides purpose above and beyond a one-dimensional message.	"Being Green Made Easy" is an energy conservation flyer the Office of Sustainability uses to share tips for reducing energy use around the office. This informational flyer found its purpose when it was printed double- sided with a "To-Do List" template printed on the back and then laminated. This basic flyer turned into a dry erase board for staff to keep at their desks for notes. Not only does the marketing piece maintain shelf life, but it also helps staff use less paper for notes and lists.
Go Local	Supporting a local economy reduces the use of transportation fuel and invests in our community. Try finding locally owned and produced materials.	Purchase items from local owned stores and restaurants when providing quality of service awards to staff. Purchase mugs with the City logo on it for gifts that are made from local artists.
Put the Green Foot First	We decide a lot about the character of a person by "what they are made of." Let people view what the organization is made of through sustainable products. Try using materials with some of the following components: recycled, recyclable, biodegradable, reusable, organic, energy efficient reduced packaging.	Print all City business cards on 100% post consumer recycled paper with soy ink and make sure to include a footnote on each card that displays this choice. Look for these trusted certifications when choosing paper products:  
Make it Desirable	Target who you need to communicate with, learn what they want and need, and then cater your messages and materials to them.	The "Office Energy Conservation" postcard series from the Office of Sustainability uses the postcard format to present energy conservation information on one side various historic photos from downtown Asheville and notable City buildings on the other side. This postcard can be sent from employee to employee to remind folks to conserve energy, but most importantly, it shares a desirable photo that staff can keep in their office to look at while reminding them to save energy.

Tools & Best Practices

Viral Marketing

Viral marketing, or word-of-mouth marketing, depends on a high pass-along rate among the message recipients. A classic example is a highly entertaining internet video that one watches, enjoys, and enthusiastically forwards to a number of friends, who then forward it to a number of their friends, thus creating a "snowball effect". This method often works best when there is some type of incentive for the viewer to pass along information. The incentive could be of entertainment value, useful information, or a tangible reward. The most successful viral marketing campaigns are very unique, providing the viewer with an experience unlike anything previously viewed. This rapidly expanding method of marketing also inherently holds a degree of sustainability. Typically, viral marketing pieces are viewed and passed along via an electronic medium, such as the internet. This, as opposed to a flyer or poster, substantially reduces the use of raw materials.

Putting Ideas to Practice

City employees will often know best, just what ideas will and will not work on the ground. With the assistance of the City Public Relations Division, employees should have the opportunity to voice these opinions by writing and directing their own short communications, showcasing *energy efficiency at the workplace*. Different sectors could be selected for this project, all working individually and submitting the end result to a contest. Each department could have a chance to rate the videos, with the winners receiving various prizes, as outlined in the incentives section. Given the comradery and humor of these hard working men and women, these communications will not only educate and spur discussion among sectors, but also have a high pass-along rate.

Social Marketing

Social marketing aims to influence behaviors to achieve specific goals for the overall social good. This method borrows tools from traditional marketing to promote socially valuable outcomes. The differentiating element to social marketing is that it always starts with targeting an audience to communicate with and surveying that group. The intention of spending pre-planning time to survey the audience is to learn what the audience feels are existing and perceived barriers to the sustainability behavior. The pre-survey also strives to gain insight to solutions for resolving those barriers based on the audience criticism and feedback. Without a pre-survey, the tenets of social marketing would suggest that attempts to influence behavior are based on assumptions that are often false or partially address the barriers. The pre-survey is designed to learn the audience's cost/benefit perception.

After this research is completed, programs can then be catered to the participants, thus increasing the likelihood of its success. The efficiency of the project should be continually monitored and adjusted as needed. A basic example is highlighted through a project to increase at-home composting. A municipal campaign to increase at-home composting may start out assuming that the biggest perceived barrier is that people do not know what can and cannot be composted. Therefore that municipality creates a visually appealing educational public service announcement (PSA) explaining with a catchy song what can go into a compost pile and what needs to go into the trash bin. The best crafted public service

announcement may not influence behavior if odor concerns were instead that audience's perceived barrier rather than knowledge of compostable materials. If that municipality starts out with a survey and learns that the number one barrier to citizen composting is not that people are confused about what to compost, but rather is the belief that composting produces unpleasant odors, then the communication efforts will be considerably more effective. Once that primary barrier is addressed, the municipality can design a well crafted announcement to address odor concerns. Designing a social marketing campaign to influence behavior change with the pre-survey information allows an organization to maximize their efforts and focus their message.

Case Study: Increasing recycling rates at Independence Mall in Washington, D.C.

A successful social marketing campaign was conducted to increase recycling rates at Independence Mall in Washington DC after a first attempt based upon assumed barriers was unsuccessful. The first attempt to change behavior of the diverse audience was based on using graphically appealing display boards to communicate directions for what products were placed in what receptacle. These display boards included written information and pictures to capture the attention of diverse audiences. The displays were placed behind the side by side waste and recycling receptacles at each waste station on the mall. The assumption was that if you give clear directions, people will follow them. This assumption proved to be wrong when the waste stream was audited and no improvement was seen.

This waste audit turned out to be extremely valuable for the second program by serving as the pre-survey where the team learned that most of the waste was from food packaging and drink containers that were sold by food cart vendors located along the mall. With this information, the research team decided to test out a new solution which involved incentivizing food vendors to end each customer transaction that included the sale of a recyclable can or glass bottle with the phrase "Thanks in advance for recycling your can/bottle." Vendors were incentivized with a cash reward to do this for a pre-determined period of time, and if recycling rates improved, they received the reward. After the test period was over, this solution proved to increase recycling rates by 10%. The conclusions from this campaign determined that the barrier was not lack of information, but lack of social expectation. When the expectation to recycle was introduced, a portion of the population responded and changed their behavior.

Direct Marketing

As the name implies, direct marketing is tailored to a specific audience, who are typically contacted via direct mail, e-mail, flyers, posters or any combination of these. Measuring the positive elements of direct marketing is often easy, such as counting the replies or purchases from a direct mail coupon. However, measuring the negative impacts of such a campaign may prove to be difficult, such as confirming how many recipients became offended or annoyed from receiving direct mail. Also, most forms of direct marketing require a list of recipients, their contact information, and often categorical information such as age, gender, etc; gathering this information can be time consuming. However, given that

direct marketing is characteristic of physical objects, often requiring paper, ink, and delivery, a considerable amount of raw materials are typically needed. This resource-intensive process poses difficult problems in terms of sustainable practices.

Putting Ideas into Practice

Employees could receive a small direct-marketing paper with their paycheck receipt. The flyer could display a cartoon that explains the positive sustainable aspects of the City of Asheville using the direct deposit pay check system. The cartoon character would learn throughout the comic strip how the payroll division saves labor hours and operating costs, how employees save time, money and fuel not driving to the bank, and how the more efficient system is inherently more sustainable. This direct marketing flyer would educate employees on the system benefits, which would incentivize staff to utilize the Office of Sustainability website for program enrolment, offering secondary educational benefit. Once on the website, employees would be encouraged to submit suggestions for other system changes that can support the City sustainability goals. The bundled incentives associated with this direct marketing campaign could include a component for employees who suggest ideas on the blog could receive a 6-month carbon offset for their work commute.

Outreach

An outreach campaign is a useful tool for organizations to connect with a target audience. A successful outreach project will generally intrigue, educate, and motivate individuals towards a specific behavior. If the campaign is strong, it will often hold similar qualities of a viral marketing campaign, namely the vast spreading of information through word-of-month. Outreach campaigns differ from other marketing methods in that it doesn't typically revolve around a specific product or strategy; faith groups, civic groups and non-profit organizations frequently utilize this marketing method.

Outreach events provide the unique opportunity for relationship building through personal interaction, either one-on-one or with a group. This allows for the personal presentation of an initiative and the chance to directly address barriers or concerns about the initiative. Employees are likely to become more enthusiastic by meeting and talking with the source of an outreach campaign.

Putting Ideas to Practice

A full day of sustainability workshops and presentations could be designed to provide valuable information to staff about how they can contribute to reducing the City's carbon footprint. Topic ideas could be generated through feedback from an employee survey regarding their questions about sustainability. The Office of Sustainability would be the primary presenter at these sessions, but other staff who lead different sustainability functions for the City could also be present to discuss their area of specialty: for example, representatives from fleet and storm water would be appropriate for discussions of alternative fuel vehicles and storm water runoff. By coordinating with management, employees could be given a work break to attend a presentation. These quarterly workshops can be themed seasonally or can vary depending upon employee feedback. The key components include: providing a space to teach interested employees about how they can contribute to the

sustainability goals, build relationships with concerned staff and address any concerns.

Incentives

Incentives can be useful and often necessary tools when attempting to motivate employees to perform a task more efficiently, or to begin an activity they otherwise would not consider. When creating an employee incentive plan, certain aspects should be considered to ensure efficiency:

- Performance progress should be continuously tracked and made available to employees.
- Any incentive pay should be separated from regular pay, preferably on a separate day.
- Non-cash incentives should also be considered; this easily separates the incentive from regular pay.
- Individual incentives are often more effective than group incentives. If a group incentive is implemented, individual accomplishments should also be acknowledged.
- Keep daily communications positive, practice positive reinforcement even for small improvements, and always strive for daily contact.
- Have a system for measuring the effectiveness, efficiency, cost, and employee satisfaction.[10]

The power of positive reinforcement can be persuasive, as described in the below example:[11]

A literature review revealed that sign prompts can be effective in reducing the amount of litter. In order to further investigate the effects of prompts, a questionnaire was given to university students and campers. The questionnaire was designed to determine the effectiveness of two different types of prompts. The first prompt was rather ambiguous and negative ("We treat litterbugs like all insects") whereas the second prompt was clear and positive ("Please save our landscapes: don't litter"). The questionnaire contained items designed to reveal intentions to litter.

Results: Thirty percent of participants responded that the "Please save our landscapes: don't litter" prompt would make them think about the litter problem. Furthermore, 20% indicated that this prompt would influence their decision not to litter. On the other hand, 40% said the "We treat litterbugs like all insects" message would actually make them want to litter.

Putting Ideas to Practice

Various City sectors will work to reduce energy and fuel consumption while on the job. A large billboard showcasing daily progress could be placed in a central location visible to all employees. If a sector is unable to reduce fuel or energy consumption in a competitive manner, supplemental activities (such as educational) can be used to gain needed points. The

[10]Daniels, Aubrey C. Ph.D. "Choosing an Employee Incentive Program: with So Many Choices Out There, How Do You Pick the Best One for Your Business." September, 2, 2002. Accessed: www.entrepreneur.com/humanresources/employeemanagementcolumnistdavidjavitch/article54952.html

[11]Community-Based Social Marketing. Accessed at: www.cbsm.com/CasesDatabase/Detail.lasso?-KeyValue=111&-KeyField=ID

winning sector will earn cash quality of service awards, with the runners up receiving cash quality of service awards of a lesser amount.

Suggested Metrics for Measuring Future Progress

To ensure the efficiency and effectiveness of any campaign, results should continually be tracked to optimize performance. Tools for measuring progress will differ with most projects. The important concept to account for with education outreach measurement, is that what matters most is what response in the form of action you receive from your efforts, not simply your efforts alone. Someone could send out a well crafted email soliciting action, but if we cannot track how many people read that email and acted, we cannot assess our level of impact. Metrics also provide a history to refer back to, helping to characterize both successes and inefficiencies. The most successful measurement tools will be well researched, targeting variables most telling of a campaign's efficiencies. These tools are not expensive; with common sense and a working knowledge of the measured program, metrics could require little administrative costs. **Table 3.7** provides a summary of possible metrics.

Table 3.7: Possible Metrics Communication Method	Example Project	Possible Measuring Metric
Viral	An entertaining online video with a specific call to action.	The viewed, or pass-along rate can be obtained by a counter tracking website visits. In addition the total usage of paper can be recorded to monitor if the video had an effective call to action.
Social	A conservation campaign designed by staff through a staff survey.	Survey response numbers validate input and number of participants in campaign validates breadth of the campaign.
Direct	A form distributed to all employees requesting specific ways to reduce energy consumption while at the workplace.	Tracking the number of returned forms, with a follow-up asking employees which suggestions they are implementing at the workplace.
Outreach	Full day presentations and workshops addressing various aspects of sustainability and worker safety while on-the-job.	Contact employees shortly after event to: ■ obtain feedback, such as likes and dislikes, and what aspects of the seminar are being adapted at the workplace ■ administer short, anonymous quiz to measure the retention of information
Incentives	Contest among sectors to reduce energy consumption and increase environmental literacy.	Document each campaign's results to track continual progress in energy reduction. Administer short quizzes at the beginning and end of each campaign to track environmental knowledge obtained.

CITY OF ASHEVILLE

NEXT STEPS: MOVING FORWARD

Section 4
Next Steps: *Moving Forward*

To improve the City of Asheville's overall sustainability performance, this Plan was developed to establish a management approach for organization of sustainability initiatives, assessment of the current status of sustainability achievements, and identification of opportunities and recommendations for moving forward. The City's definition of sustainability as well as its sustainability vision and guiding principles is also included in this Plan to set the foundation on which many City initiatives will build upon. In addition, this Plan serves to communicate Asheville's commitment to sustainability and to keep all interested stakeholders informed of the status of the City's overall sustainability program.

In the previous chapters, the Plan presented goals, vision and guiding principles, assessment of existing conditions and on-going initiatives, and identification of opportunities, as provided in Sections 1, 2 and 3, respectively. Section 4 presents the next steps for furthering the implementation of the City's sustainability initiatives by providing:

- A summary of the identified opportunities aligned with the goal set;
- A general approach to rating and ranking the identified opportunities;
- An assessment of the goals as informed by the assessment of current conditions and the identified opportunities;
- Strategies and tools for developing action plans for specific opportunities selected by City leadership for timely implementation;
- Strategies and tools for establishment of metrics and targets and for measuring and communication progress;
- Identification of roles and responsibilities of the stakeholders participating in the sustainability program;
- Ideas for integration of the City's sustainability program into the overall management approach for long-term viability of program.

Summary of Recommendations

Opportunities and recommendations for improving the City's sustainability performance were identified in Section 3 through a variety of activities, including assessment of current activities and achievements, facilitated stakeholder meetings with the Department Directors and SACEE, strategic planning sessions with the Office of Sustainability and various participants in the sustainability program, and review of emerging communication materials from the City Council. The opportunities and recommendations were compiled and their contribution to the achievement of the overall sustainability goals were evaluated, summarized and aligned with the overall sustainability goals.

In addition to consolidating the recommendations for Asheville, the step in the process provided the opportunity to further focus the City's goals. As discussed in Section 1, the initial goals developed with stakeholders were refined and

slightly modified by comparing the summary recommendations, as part of the management system process.

The recommendations aligned with the goal set are presented in **Table 4.1**, along with the opportunity rating scores described below.

Ranking of Opportunities

For implementation to be successful, mechanisms for prioritizing the recommended actions are needed, and a structure for organizing the responsible entities should be identified. Opportunities, however, will "ripen" at different rates and for different reasons. Accordingly, the Plan provides a flexible approach for implementation and recognizes that opportunity is based on a variety of logistical, financial, technical, and other variables that change over time.

To help organize the opportunities, the Plan contains a dynamic ranking system that prioritizes all the recommendations according to various factors. In coordination with the Office of Sustainability, a rating protocol was applied that generated a score for each action item based on the following criteria:

- Existence of current program or activity
- Environmental benefit
- Economic benefit
- Social benefit
- Financial incentive
- Personnel availability and capacity
- Technical feasibility
- Stakeholder concerns
- Regulatory requirement
- Contribution to established goals
- Timeframe to realize benefits

For each criterion, an individual score of 0, 1, 2 or 3 was assigned that represents the status of the opportunity in relation to the criteria. In addition, each criterion was weighted by multiplying the individual scores by 1, 2 or 3 to reflect the relative importance to the City of Asheville, as presented in **Table 4-2**.

The final score for each opportunity was calculated by summing the individual weighted scores for each criterion. The ranking summaries for each opportunity are presented in **Table 4-1**, and can be used by City leadership to prioritize or select opportunities. To select future actions and initiatives, users of the Plan can sort the opportunities by any of the above criteria, or by a series of ranking or organizing parameters, including:

- A "triple bottom line score," which highlights how well each opportunity balances the environmental, economic, and social benefits.
- The opportunities were matched with the goal set, to allow sorting by individual goals.
- Opportunities were grouped by implementation categories representing the City's organizational leadership, to help individuals in the organization identify how they contribute to implementing solutions.

Table 4.1: Opportunity rating and alignment with goals.

	Opportunities	Score	TBL Score (0 - 9)	Goals																						
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
Major support needed through capital dollars																										
1	Produce renewable energy in appropriate facilities	46	8						•			•	•	•								•	•			
2	Support bicycle and pedestrian infrastructure and greenway development and connectivity.	44	8						•	•	•				•											
3	Replace lighting fixtures with T12 lamps with the more energy efficient 28W T8 lamps, any remaining incandescent lamps should be replaced with equivalent lumen compact fluorescent lamps and exit signs should be replaced with LED type	42	3						•			•														
4	Increase bus service frequency and expand hours of service	41	9						•	•	•				•		•		•							
5	Install a building automation system in all City facilities	40	5						•			•									•					
6	Make showers and lockers available or partner with a local nearby gym.	40	5						•						•											
7	Pursue the possibility of a downtown shuttle service.	37	6						•						•				•							
8	Pursue sanitation services expansion in areas that increase awareness of source reduction methods i.e. organic food waste or downtown on street recycling	35	4				•		•																•	•
9	Continued attention to water metering, accuracy assurance through periodic water meter repair and replacement, and through the proper meter size selection to match the rate being demanded by the given customer.	34	3																		•			•		
10	Recycle in all City owned facilities	30	3						•																•	•
11	All inefficient motors should be replaced with premium efficiency motors during the next	30	3						•			•														
12	Install bicycle racks within the City's parking garages, lots and transit stations and bus stops.	33	4						•						•											
13	Continued capital commitment and focus on leak detection and reduction within the City's aging system to reduce unaccounted for water.	31	6																		•					
14	All private offices, bathrooms, storage rooms, conference rooms should have occupancy sensors installed.	30	2						•			•														

	Opportunities	Score	TBL Score (0 - 9)	Goals																						
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
15	Assess actual efficiency of plant water system pumps and motors, and upgrade with more efficient pumping units.	29	2						●			●								●		●				
16	Upgrade its diesel fleet from B5 to B20.	27	4						●																	
17	Employ a "night-setback" strategy and review the general temperature guidelines.	27	3						●			●										●				
18	Assess actual efficiency of 20-23 year old 75-horsepower backwash supply pumps and motors, review filter backwashing standard operating practices, and upgrade with more efficient pumping units.	27	2						●			●								●		●				
19	Allocate capital to perform a feasibility study for wind power in Asheville. The feasibility should	26	4		●				●				●										●			
20	Reinvigorate discussion of hydropower feasibility, in light of the City's focus on sustainability and greenhouse gas reduction in its operations.	24	4						●				●													
21	Commission a detailed study of all pumping systems at facilities in the "top ten" energy-using water facilities.	21	3						●			●										●				
Major support needed by general staff																										
22	Include sustainability courses in the corporate university curriculum	42	6	●		●	●	●	●						●	●					●	●			●	
23	Use the Sustainability Office's employee commute survey to help people find others to share rides with.	41	6						●						●											
24	Create lighting upgrade plan with schedule for each of the City's buildings.	40	5						●			●														
25	Employ Complete Streets methods in road design.	37	6							●																
26	Monitor and control thermostat set points for HVAC systems in all facilities.	35	4						●			●														
27	Develop and implement neighborhood plans	33	6							●									●							
28	Create and implement a long term plan to address the City's aging infrastructure	32	4								●										●	●				
29	Adjust rental rates of City facilities to better incorporate energy costs	32	4						●			●														
30	Establish a blog on the City's website to communicate sustainability achievements.	32	4	●			●																			

	Opportunities	Score	TBL Score (0 - 9)	Goals																							
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
31	For all of the plant's on-site pumping systems, obtain actual pump run hours per year, and gather precise measurements of discharge flow, pressure [illegible]	29	2						●			●								●		●				
32	Conduct future land use analysis and mapping.	26	2							●	●								●							
33	Pursue reconciliation of metered electrical use for plant versus office facilities.	26	2						●																	
34	Complete the Greenway Master Plan process.	25	4							●	●															
35	Update the Blue Ridge Commuter Connections website periodically.	21	3				●		●						●		●		●							
36	Modify the City's water distribution system design standards to enhance sustainability through the consideration of ozone-aided pipe disinfection, adding requirements for developers to demonstrate the submitted pumping system is "best in class" in terms of efficiency, and modifying electrical motor specifications to require all motors to be premium efficient.	20	4						●			●								●	●	●				
37	Review zoning districts and zoning dimensional requirements to ensure compatibility with sustainability objectives.	17	2							●	●															
38	Retain an engineer to work with staff to establish and document filter backwashing procedures for all three water treatment plants.	15	3																	●						
39	Use 4-dimensional landscape visualization in land use analysis.	10	2							●																
40	Work with vendors to develop a list of available environmentally preferable products and include cost differentials.	47	6			●																				
	Major support needed by Green Team																									
41	Identify and apply for Federal, State and Local funding for sustainability initiatives.	49	6		●																					
42	Develop a Municipal Action Plan for Climate Change.	41	9						●																	
43	Establish an energy efficiency standard for all retrofits and upgrades	41	5						●		●	●														
44	Provide incentives for green design and sustainable development.	41	5						●	●	●	●		●					●					●		

	Opportunities	Score	TBL Score (0 - 9)	Goals																						
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
45	Increase education on water conservation measures.	38	7				●													●	●	●		●		
46	Phase out all standard vehicles, and establish an AFV goal for its fleet.	34	4						●							●										
47	Incorporate energy efficiency standards into existing specs for water distribution infrastructure	33	3						●												●	●				
48	Explore implementing an Energy Performance Certificate program that rates and rewards the degree to which buildings are energy efficient.	32	6						●			●										●				
49	Set construction and demolition waste standards.	32	4						●																●	●
50	Establish water conservation best practices	28	5						●												●	●		●		
51	Establish energy efficiency building maintenance requirements	28	4						●			●														
52	Establish energy efficiency building operations requirements	28	4						●			●														
53	Adopt Pay-as-You-Throw and develop a new fee structure.	25	4						●																●	●
54	Establish a water efficiency standard for all facility upgrades/ retrofits	25	2						●												●	●		●		
55	Pursue incentive based waste reduction methods	23	4						●																●	●
56	Establish a baseline for waste generated in City facilities to be included in City GHG emissions reporting	16	0						●																	●
57	Establish guiding principles for employee conservation	48	6					●				●									●				●	
	Major support needed through management leadership																									
58	Pursue a parking cash-out program in order to encourage employees to avoid driving to work.	35	5						●						●											
59	Create a cross departmental green team to steer the implementation of the sustainability management plan	47	6	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
60	Address climate change in planning and regulations.	45	9						●	●	●															
61	Institute a City-sponsored vanpool and carpool program.	41	6						●						●											
62	Adopt green building code.	37	7						●	●		●		●										●		

	Opportunities	Score	TBL Score (0 - 9)	Goals																						
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
63	Develop departmental business plans for Department Directors for achievement of sustainability goals.	44	6	●																						
64	Increase staffing of building maintenance division	35	5						●		●	●														
65	Incorporate efficient use of energy into planning analysis and policies.	33	4						●			●														
66	Consider expansion of Mills River plant instead of new plant construction to provide the projected overall system capacity increase from 37 mgd to 41 mgd.	32	4						●											●						
67	Establish a revolving energy fund	50	5		●	●		●	●		●	●	●	●		●						●	●	●	●	
68	Give vanpool and carpool vehicles preferential parking spaces at City facilities.	30	3						●						●											
69	Maximize technological communication by encouraging teleconferencing whenever feasible.	25	2						●						●	●										
70	Explore, plan, and implement EMS (An Environmental Management System (EMS) is a set of formal policies that describe how an organization will evaluate, manage, and track its environmental impacts.)	25	1	●			●		●	●	●	●	●		●	●			●	●	●	●		●	●	●
71	Expand electric fleet and establish an electric charging station.	22	4						●							●										
72	Continued emphasis on culture of sustainability and environmental stewardship among personnel.	21	3				●															●				
73	Explore, plan, and implement an IWM (Integrated Waste Management is defined as a program that integrates waste prevention, recycling, composting, thermal processing and disposal rather than focusing on only one or two means of waste management.)	19	2						●															●	●
74	Continue to pursue the development of a park and ride network.	46	9						●						●				●							
75	Streamline the development review process.	34	3							●	●			●												
Major support needed by a variety of means																										
76	Enhance public awareness of sustainable land use issues.	34	7				●		●	●	●								●							
77	Expand public transportation routes consistent with sustainable land use practices	34	5						●	●	●				●		●									

	Opportunities	Score	TBL Score (0 - 9)	Goals																							
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
78	Support regional efforts to establish a commercial scale composting facility	31	6						●																●	●
79	Develop transit oriented development communities.	30	7						●	●	●						●	●	●							
80	Expand recycling. Target commercial facilities. Develop market-based incentive program.	30	4						●																●	●
81	Support efforts to expand the variety of materials collected for recycling in the region	26	3						●																●	●
82	Address food waste (i.e. separate food waste and dispose of quickly).	24	2						●																●	●
83	Carry out conservation and natural resources planning.	22	4						●	●	●									●						
84	Carry out individualized marketing campaign to educate employees about free bus passes and free emergency ride homes.	18	4				●		●						●		●		●							
85	Investigate energy recovery potential at entry to water treatment plant from reservoir.	14	3						●			●										●				
Major support needed through political leadership																											
86	Coordinate with neighbors and states to initiate regional planning.	46	7							●	●															
87	Encourage development of green affordable housing.	45	7						●	●																
88	Participate in State legislation to pass regulations favorable to installation of renewable energy systems.	35	6						●				●										●			
89	Participate in State legislation to pass regulations favorable to recycling practices.	35	6						●																●	●
90	Work to enable voluntary annexation to support healthy growth of the City	33	4							●	●															
91	Develop and support a strategic transit master plan.	29	3						●						●		●	●	●							
92	Consider applying the City's LEED® building requirements or LEED® building principles for future planned construction of pumping stations, water treatment facilities, and other water system buildings.	25	4						●			●									●					
93	Connect bicycle network through roadways and greenway netowrks.	24	4						●	●	●				●											
94	Develop a transfer of development rights trading system.	23	6							●																

	Opportunities	Score	TBL Score (0 - 9)	Goals																							
				MP-1	MP-2	MP-3	EE-1	EE-2	GHG-1	LU-1	LU-2	F-1	F-2	F-3	T-1	T-2	T-3	T-4	T-5	W-1	W-2	W-3	W-4	W-5	SW-1	SW-2
				Incorporate sustainability into the City's decision-making process.	Provide adequate resources for the implementation of sustainability programs	Increase the City's use of environmentally preferable products & services.	Incorporate sustainability into City communications & outreach efforts	Increase voluntary employee conservation efforts	Participate in the City's energy management strategy to reduce GHG emissions	Develop and redesign land use policies to support sustainable growth	Support sustainable development projects, patterns, and building practices	Reduce energy consumption from City facilities through demand reduction and energy efficiency	Increase renewable energy use for City operations	Support Resolution for LEED® certification for new City buildings	Reduce vehicle miles traveled by City employees for commuting	Reduce total fuel consumption from City fleet vehicles	Increase transit ridership	Establish a long term funding strategy for public transportation	Support the reduction of vehicle miles traveled by City residents and visitors	Continue to provide clean drinking water	Reduce water consumption in City facilities	Reduce energy use associated with treatment and distribution	Increase renewable energy use for water production and distribution	Support the reduction of water consumption by residents and visitors.	Reduce the amount of solid waste going into landfills from City facilities	Increase our role as state leaders in sanitation and recycling
95	Encourage or require conservation-oriented subdivision design.	23	5						●	●									●								
96	Pursue tiered rate structure for water distribution	23	2																								
97	Increase purchases of renewable energy	23	2						●				●										●				
98	Regulate a greater variety of sustainability measures through the Unified Development Ordinance.	20	1							●	●																
Major support needed through the Office of Sustainability																											
99	Create an annual Sustainabilty Award for staff demonstrate sustainability leadership	45	6	●		●	●	●	●						●	●					●	●			●	
100	Implement an annual sustainability challenege to	43	6	●		●	●	●	●						●	●					●	●			●	
101	Develop a Balanced Scorecard to monitor the City's progress in improving sustainability performance.	42	6	●																						
102	Publish an annual Sustainability Report	40	5	●			●																			
103	Implement a car and bicycle sharing program so as to provide vehicles and bicycles on-demand, while also reducing the overall size of its own fleet.	38	6						●	●	●				●											
104	Establish a baseline for water used in City facilities to be included in City greenhouse gas emissions reporting.	31	4						●												●					
105	Implement an idling reduction program.	30	3						●							●										
106	Conduct quarterly progress meetings with Department Directors to specifically discuss progress on sustainability initiatives	30	2	●																						
107	Contact the City's Duke Energy representative and express interest in "volunteering" their roof and/or open space for solar panel installation at the Mills River Water Treatment Plant	23	5						●				●										●			
108	Systematize annual reporting for waste generated from City facilities	19	0						●																●	●

Table 4.2: Ranking Criteria for Opportunities

Criteria Scoring Guide			Weight
Existence of Current Program or Activity: A program or activity currently exists and can be further improved upon.			Weight = 1
0		A program to implement the opportunity does not exist.	
1		A program to implement the opportunity has been developed but not implemented.	
2		A program to implement the opportunity is in place however improvement in performance is needed.	
3		A comprehensive program to implement the opportunity is currently underway.	
Environmental Benefit: Environmental benefits derived from implementing opportunity.			Weight = 3
0		No environmental benefits realized from implementing opportunity.	
1		Minimal environmental benefits realized.	
2		Partial benefits realized from implementing opportunity.	
3		Significant benefits to the environment from implementing opportunity.	
Social Benefits: Benefits to society from implementing the opportunity.			Weight = 3
0		No benefit to society from implementing opportunity.	
1		Minimal benefit to society from implementing opportunity.	
2		Moderate benefit to society from implementing opportunity.	
3		Significant benefits to society from implementing opportunity.	
Economic Benefits: Benefits to local regional and global economies from implementing opportunity.			Weight = 3
0		No development of local/regional/global economies	
1		Minimal development of local/regional/global economies	
2		Moderate development of local/regional/global economies	
3		Significant impact local/regional/global economies	
Financial Incentives: Impact on financial viability from implementing opportunity.			Weight = 3
0		No rate of return and/or no cost avoidance.	
1		Minimal rate of return and/or minimal cost avoidance.	
2		Moderate rate of return and/or moderate cost avoidance.	
3		High rate of return and/or high cost avoidance.	
Personnel Availability and Capacity: Availability of personnel to implement opportunity.			Weight = 2
0		No personnel available to implement opportunity.	
1		Minimal personnel available to implement opportunity or significant training is required for existing personnel.	
2		Partial personnel available to implement opportunity or moderate training is required for existing personnel.	
3		Significant personnel available to implement opportunity or minimial training is required is required for existing personnel.	

Table 4.2: Ranking Criteria for Opportunities

Criteria Scoring Guide		Weight
Technical Feasibility: Availability of technology resources to implement opportunity.		Weight = 1
0	No resources available to implement opportunity.	
1	Emerging resources available to implement opportunity.	
2	Resources available to implement opportunity.	
3	Proven resources available to implement opportunity.	
Stakeholder Concerns: Stakeholder perspectives regarding sustainability.		Weight = 2
0	Stakeholders are not concerned with opportunity, or do not perceive any benefit.	
1	Stakeholder concerns minimal, or only one stakeholder moderately concerned with issue.	
2	Considerable stakeholder concern, or multiple stakeholders moderately concerned with issue.	
3	Issue of great concern to most stakeholders.	
Regulatory Requirement: Current federal, state, local requirements, voluntary programs and/or mandate applies		Weight = 1
0	No regulatory requirements, mandates or voluntary programs apply.	
1	Voluntary programs and/or mandates exist, or future legislation anticipated.	
2	Pending approval by legislators; regulatory interpretation; organization's selected path to achieve a regulatory requirement.	
3	Regulated or noncompliance condition. Actual or possible enforcement action.	
Contribution to Established Objectives		Weight = 3
0	The opportunity will not contribute to the acheivement of an established objective	
1	The opportunity will contribute to the acheivement of one established objective	
2	The opportunity will contribute to the acheivement of two or three established objectives	
3	The opportunity will contribute to the acheivement of more than three established objectives	
Timeframe for Realizing Benefits		Weight = 1
0	Benefits will be realized greater than 5 years from current time	
1	Benefits will be realized greater than 1 year from current time	
2	Benefits will be realized within 1 year from current time	
3	Benefits will be realized immediately	

Implementation Plan

Building on the sustainability goals, vision and guiding principles as well as the assessment and identification and ranking of opportunities, the City of Asheville can pursue the following activities to prioritize and implement opportunities. A template that may be used to further organize specific details of the implementation plan has been provided to the Office of Sustainability. This template will assist the City to layout specific actions, set a schedule and determine the roles and responsibilities of each stakeholder in achieving each action.

Selection of Opportunities and Recommendations

The Office of Sustainability should present the opportunities and recommendations to the City Manager and the Department Directors for discussion. The selection of opportunities for implementation will be based on the current and projected status of the City's budget, external partnerships and funding sources, emerging City activities, stakeholder input, contribution toward achieving the sustainability goals, and the rating scores. This selection should be done on at least an annual schedule, since as previously mentioned, the opportunities for implementation are dynamic. A template that may be used to facilitate selection of opportunities has been provided to the Office of Sustainability. This template organizes the opportunities relevant to each sustainability goal and displays the ranking scores to facilitate group discussion and selection of the recommendation.

Establishment of Metrics and Targets for the Sustainability Goals

Across the U.S., there is a marked increase in commitments from local governments to execute quantifiable actions toward sustainability and climate protection. Many local governments have already developed frameworks, while others are seeking a framework that can be adapted to reflect local conditions. These frameworks offer a vast diversity in the overarching structure and focus, making it very difficult to compare the progress of one locality to another and reducing the opportunity to leverage change and share lessons learned. While frameworks may contain commonalities in terms of verbiage used and apparent themes addressed, these terms and themes do not share common definitions, leading to additional potential confusion and lost opportunities for collaboration.

ICLEI – Local Governments for Sustainability, the U.S. Green Building Council, and the Center for American Progress have established a partnership to develop the STAR Community Index, a national consensus-based framework for improving the livability and sustainability of U.S. communities. The benchmarking and recognition tool is inspired by the success of the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ developed by USGBC, and is being developed by a steering committee that includes leadership from Asheville's Office of Sustainability.

Sustainability can be measured through a variety of both quantitative and qualitative indicators and performance metrics. Quantitative methods are the most common and easily measured. Qualitative measures are subjective and

harder to define; they refer to, among other things, the overall well-being of an area and its health and vitality.

Metrics should be developed for the near-term opportunities and recommendations selected, based on metrics identified in Section 3. These should be aligned with common metrics used by local governments across the country, including but not limited to the following:

- Ecosystems, water resources, air quality, waste, and conservation measures;
- Land use, transportation, parks and open space;
- Energy consumption, GHG emissions, renewable energy sources, and green buildings;
- Economic development of clean technologies, green jobs, local commerce and food;
- Employment opportunities in green jobs;
- School systems, arts and cultural opportunities, and civic engagement;
- Community health and wellness, access to healthcare, and public safety; and
- Affordability and social equality.[1]

[1] ICLEI –Local Governments for Sustainability. "Star Community Index." Accessed: www.icleiusa.org/programs/sustainability/star-community-index.

The STAR Community Index should be completed in 2011. When the STAR Community Index is fully developed, Asheville should consider utilizing this national model for measuring success.

Meaningful and achievable targets should also be set for each sustainability goal. For each metric, the baseline value for the City of Asheville will be determined, if it was not evaluated as part of the assessment (Section 2). In addition, a benchmarking study may be conducted to evaluate targets that have been set by local municipalities similar to the City of Asheville. Stakeholder input will also be considered along with the baseline and benchmarking data to set appropriate targets. A template for recording metrics and targets for each sustainability goal has been provided to the Office of Sustainability.

Development of Action Plans and Monitoring Plans

Actions Plans should be developed prior to the implementation of the selected opportunities and recommendations. The Action Plans will be used to streamline resources and foster interdepartmental coordination. The following information should be recorded in the Action Plans, a template for which has been provided to the Office of Sustainability.

- Action items
- Priority
- Persons responsible for implementation
- Deliverables

- Resource needs (personnel and financial)
- Schedule and milestones
- Status

Every Action Plan should have an accompanying Monitoring Plans, which establish a protocol to ensure that progress is measured at an appropriate frequency and that the correct information is collected on a consistent basis. A template that may be used as the basis of a Monitoring Plan has been provided to the Office of Sustainability. The Monitoring Plan template facilitates the recording of data, including those responsible for collecting the information.

Organization

Carrying out the implementation of the selected opportunities will require the participation of individuals and organizations across Asheville's management and in the community. As discussed in Section 1, the management process used to establish initial goals, carry out an assesment, and identify opportunities, is a continual process that allows for updates, revisions, and new priorities as the City moves forward. As such, the organizational structure used in the development of this plan can be continued and expanded for use in implementation. An organizational structure that engages the different levels of every department is proposed in **Figure 4-1**. The specific roles, responsibilities and accountabilities are defined below.

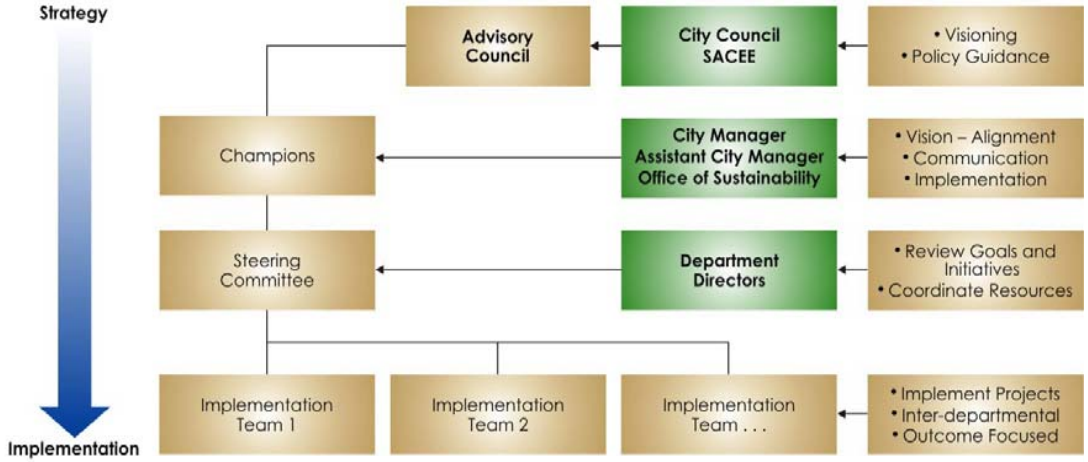


Figure 4.1 - ***Organizational structure for implementation of sustainability program***

Champions

Representatives from the City of Asheville, including the City Manager, Assistant City Manager and the Office of Sustainability, were identified to champion the sustainability development and implementation efforts. The Champions work to ensure that the sustainability program addresses operational sustainability issues across the breadth of the Asheville's operations.

Advisory Council

For Asheville's sustainability program, the City Council serves as the Advisory Council. In addition, SACEE also functions as the Advisory Council in a lesser capacity. The Advisory Council provides input to the Champions in establishing priorities that are consistent with Asheville's goals and aligned with the overall business strategy. The Advisory Council reviews progress on sustainability performance improvement activities and provides recommendations to the Champions and top management on activities to further

enhance the organization's sustainability performance. In addition, the Advisory Council may solicit sustainability concepts and/or technologies that are appropriate for consideration.

Steering Committee

The Steering Committee is comprised of the Department Directors staff members and is responsible for the synchronization and systematization of the various activities that are undertaken to achieve continual sustainability performance improvement. Because much of an organization's internal sustainability performance improvement will be achieved through the work of multiple departments, the Steering Committee works to streamline resources and facilitate cross-departmental coordination.

Implementation Teams

Implementation of sustainability performance improvement activities will require engagement of staff throughout Asheville's organization. Implementation Teams will be formed for each focus area and will be comprised of staff from various departments that are interested in helping to work on a specific improvement opportunity. The Implementation Teams will be assembled for a specified duration (typically several months) as required to achieve the sustainability objectives. The results of the work of each team will be summarized for the Steering Committee and communicated through appropriate communications channels.

Management Practices

To integrate the City's sustainability vision and guiding principles into existing decision-making processes and operational procedures, the following actions are currently being considered:

- Develop performance metrics for Department Directors for achievement of sustainability goals and tie to their annual performance reviews;
- Develop a Balanced Scorecard to monitor the City's progress in improving sustainability performance;
- Work with vendors to develop a list of available environmentally preferable products, including cost differentials, and set up an accounting system to track the annual expenditures on these products and services;
- Commit to publishing an annual Sustainability Report that outlines progress in improving sustainability performance;
- Conduct quarterly progress meetings with Department Directors, specifically to discuss progress on sustainability initiatives; and
- Apply for national, state and local competitive grants to support the selected sustainability initiatives.

Communication

The Office of Sustainability should develop and adopt a Communication Plan to inform both internal and external stakeholders of the activities and progress related to the City's sustainability program. Components of the Communication

Plan may include the publication of an annual Sustainability Report, quarterly progress meetings with the Department Directors and SACEE and a blog on the City's website. The communication plan should be based on the City's internal reporting protocol, as appropriate.

Continued Program Development

The management systems approach presented in the Plan encourages a continual reassessment of goals and emphasizes consistent monitoring of performance and communication of results to create a feedback loop for continual improvement of sustainability performance. As a product of and a representation of the management system for the City's sustainability program, the Plan itself is intended to be a continuously evolving document. It is critical to update and re-evaluate the opportunities presented in the Plan on a regular basis to maintain relevancy as a tool for furthering the sustainability program. Additionally, similar to other City plans, like the comprehensive plan *Asheville 2025*, a thorough reassessment of the Plan should be conducted periodically. The landscape of City operations, partnerships, funding opportunities, priorities, and even goals is and should be viewed as dynamic, and accordingly, the Plan will require in-depth updates.

The Plan should also be considered as a "launching pad" for further planning activities. For example, as an outgrowth of continued partnership centered on community sustainability, the City's Plan could be expanded to include assessment of and recommendations for County operations and the community at-large. The Plan could also be expanded to address climate change adaptation strategies which, similar to the mitigation-focused strategies in this Plan, require an interdisciplinary approach to develop solutions for multiple sectors in the greater Asheville community, including but not limited to: energy management, land use planning, water resources management, ecosystem management, environmental compliance, transportation and goods movement, public services, public health, economic development, capital investment and asset management, and emergency response. In short, community sustainability is a diverse topic, requiring broad partnerships and multiple solution sets. This Plan can and should be a catalyst for continuous evolution towards a more sustainable, resilient Asheville.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