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Tech Memo 1

To:	Julie Smith	Topic:	Baseline Data Analysis and EECS Project Selection
CC:		Project:	McKinney EECBG/EECS
From:	Kevin Shepherd	Client:	City of McKinney, TX
Date:	25 November, 2009	Status:	Workshop # 2 Completed

PREPARATION OF MCKINNEY EECS

1.0 INTRODUCTION

This Technical Memo summarizes the tasks performed and the decisions made at the City of McKinney EECBG Kick-Off Meeting and Follow-Up Workshop. These tasks included:

- Conduct an EECBG/EECS kick-off meeting with City staff members to establish a preliminary working list of, as well as establish baseline definitions for, potential projects to be included in the City's EECS document
- Collect and evaluate municipal electricity, natural gas, fuel use (gasoline and diesel), and water use in order to establish baselines for current City energy use (electric and natural gas), fuel use, and water use
- Determine corresponding greenhouse gas (GHG) baselines for current City energy and fuel use
- Conduct a Follow-Up Workshop with City staff members in order to prioritize the potential projects under consideration for inclusion in the EECS

2.0 KICK-OFF MEETING SUMMARY

The kick-off meeting was conducted on Wednesday, October 28, 2009, at City of McKinney Council Chambers. The objectives of the kick-off meeting were the following:

- To provide an overview of the EECBG Program requirements
- To identify City of McKinney projects that align with the EECBG Program list of eligible activities
- To discuss the merits of each potential project in small group break-out sessions
- To make a preliminary selection of projects to be included in the EECS document
- To define the baseline for each selected project in order to guide data collection and baseline definition tasks

At the conclusion of the meeting, seven projects were mentioned for funding consideration under the EECBG Program. These potential projects have been categorized according to the appropriate EECBG eligible activity in Table 2.1 below. Note that EECBG eligible activities for which no potential project was selected are also included in Table 2.1.

In addition to aligning each of the seven projects with an EECBG eligible activity, the potential of each project to significantly reduce energy use, both electric and gas, fuel use, and greenhouse gas emissions was

also assessed. If a project has a positive impact on any of these overall strategies it is indicated by a 'Y' (for Yes) in Table 2.2 below.

TABLE 2.1 - Alignment of Potential EECS Projects with EECBG Eligible Activities

OVERVIEW STRATEGY	EECBG ELIGIBLE ACTIVITIES (12)	KICK-OFF MEETING: SELECTED PROJECTS (7)
ENERGY: DEMAND SIDE MANAGEMENT	*Energy Efficiency and Conservation Programs for Buildings and Facilities*	None
	Residential and Commercial Building Energy Audits	None
	Energy Efficiency Retrofits	**Building and facility energy efficiency**
		Water pumping and distribution efficiency
	Financial Incentive Programs	None
	Technical Consulting Services	None
	Building Codes and Inspections	None
ENERGY: SOURCES, RENEWABLE	*Renewable Energy Technologies on Government Buildings*	**Alternative energy projects for city building(s)**
	Energy Distribution Technologies	None
GHGs	*Reduction of Methane and Greenhouse Gases*	**Farmer's market**
		Urban forest
FUEL USE	*Development and Implementation of Transportation Programs*	**Velo web (bike lane commuting network)**
	Traffic Signals and Street Lighting	**Street lighting and signage (on select thoroughfares)**
WASTE	*Material Conservation Programs*	None

TABLE 2.2 - EECS Project Impact Matrix

PROJECT	EECBG Eligible Activity	Electric Power	Gas	Fuel	GHGs
Building Energy Eff.	Y	Y	Y	-	Y
Water Efficiency	Y	Y	-	-	Y
Alternative Energy	Y	Y	Y	-	Y
Farmer's Market	Y	-	-	-	Y
Urban Forest	Y	Y	-	-	Y
Velo Web	Y	-	-	Y	Y
Street Lighting	Y	Y	-	-	Y

3.0 CURRENT MUNICIPAL ENERGY USE AND BASELINES

The objective of the work performed after the Kick-Off Meeting was to review municipal energy use data in order to establish baselines for annual electric and gas consumption for city owned and leased buildings and facilities. A baseline is defined as a starting point or initial set of data to be used for measuring future progress toward achieving energy efficiency goals. For all cities in Texas that are located in non-attainment counties, establishing a baseline performance period is important, because in 2007 the Texas Legislature passed Senate Bill 12 (SB 12) setting annual energy conservation goals to reduce electric consumption by 5% each year over six years beginning September 1, 2007, for non-attainment counties and municipalities. Thus, the energy use baseline period to comply with SB 12 should be September 1, 2006, through August 31, 2007 (or calendar year 2007), and annual energy use data for subsequent years should be compared with data for this twelve-month period.

3.1 Data Acquisition and Analysis

In order to establish a municipal energy use baseline for buildings and facilities and to determine which of the EECBG Program eligible activities shall be included in the EECS plan, an inventory of city owned and leased buildings and facilities with monthly electric and gas consumption was provided by City staff. The electric consumption data provided included years 2008 and 2009. Gas consumption data provided also included years 2008 and 2009. The intent of the inventory of every city-owned and city-leased building and facility (e.g., water treatment plants, athletic fields, parks, etc.) was to collect the following information:

- Name
- Address
- Department
- Type of building (e.g., office, assembly, library, etc.)
- Gross floor area of building
- Age of building or year built
- Normal operating hours per week
- Number of full-time employees or occupants
- Electricity use per month for the last 3 years
- Gas use per month for the last 3 years
- Water use per month for the last 3 years

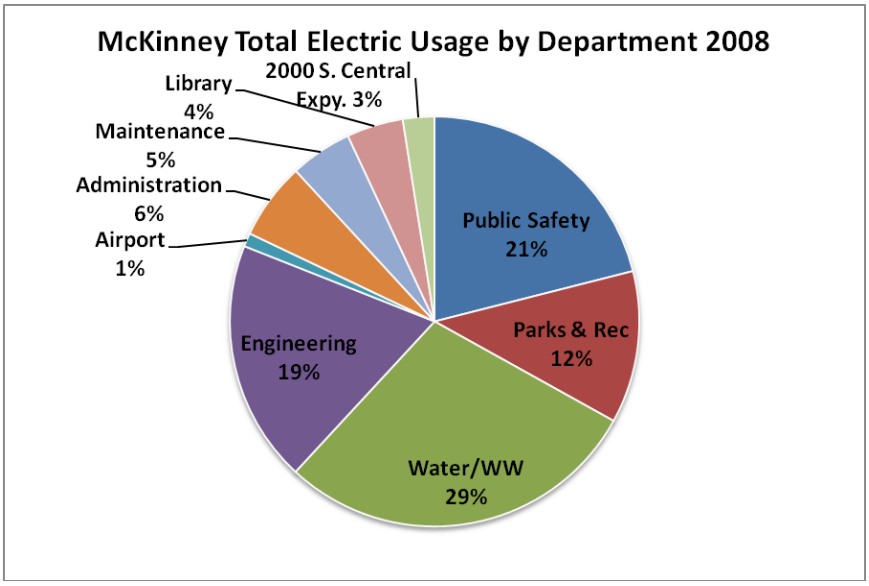
Analysis of the annual electric and gas consumption data provided the following energy use baselines:

- Total on-site annual electric and gas consumption for all owned and leased municipal buildings and facilities
- Total on-site annual electric and gas consumption broken out by department
- Annual on-site electric and gas use for all buildings and facilities within selected municipal departments
- Annual on-site electric and gas use for selected building types (e.g., office buildings) across city departments
- Annual energy use intensity (EUI) data for selected buildings compatible for goal-setting and benchmarking purposes with both DOE/ EIA *Commercial Buildings Energy Consumption Survey* (CBECS) and *EnergyStar Portfolio Manager*

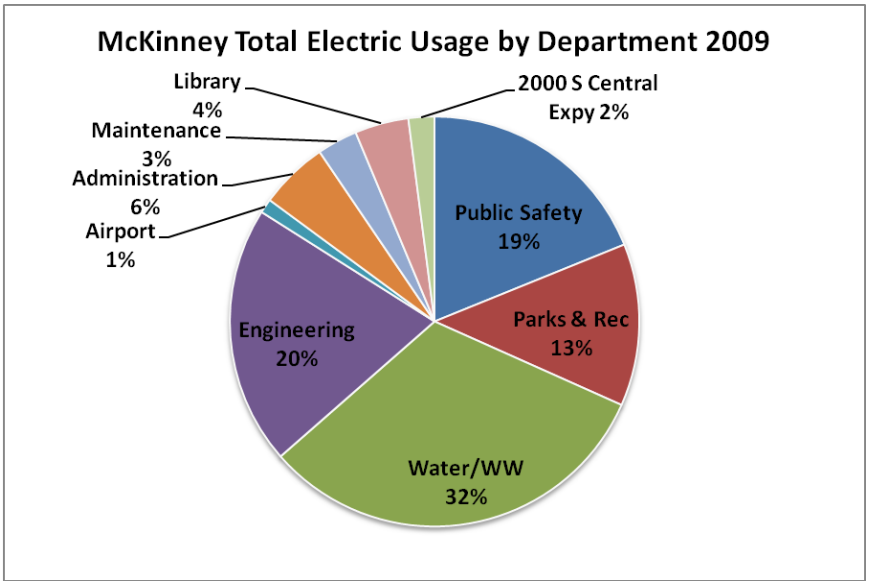
3.2 Results

3.2.1 ANNUAL ON-SITE ELECTRICITY CONSUMPTION

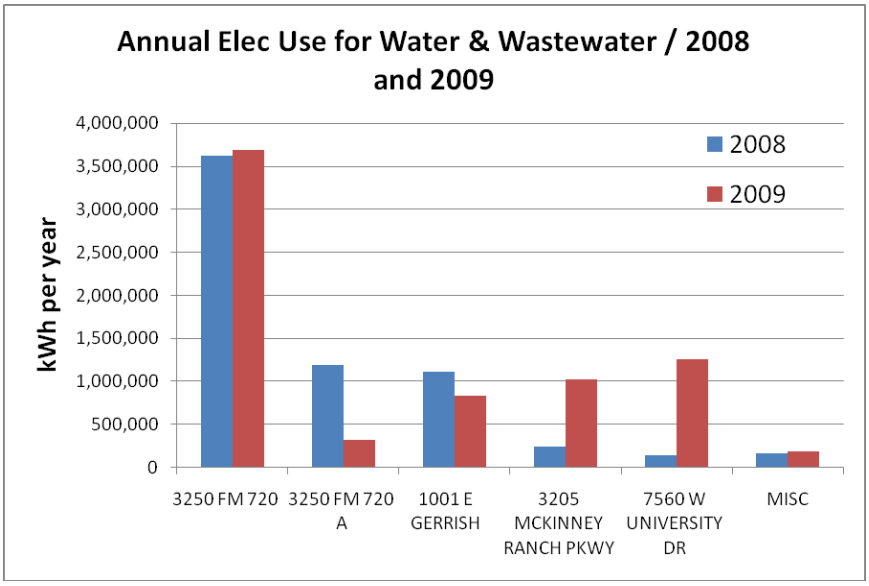
For 2008, by municipal department, the largest users annually of electric power are Water and Wastewater (29%), Public Safety which includes Fire and Police (21%), Engineering which is primarily street lighting (19%) and Parks and Rec including 2000 S. Central Expy (15%).



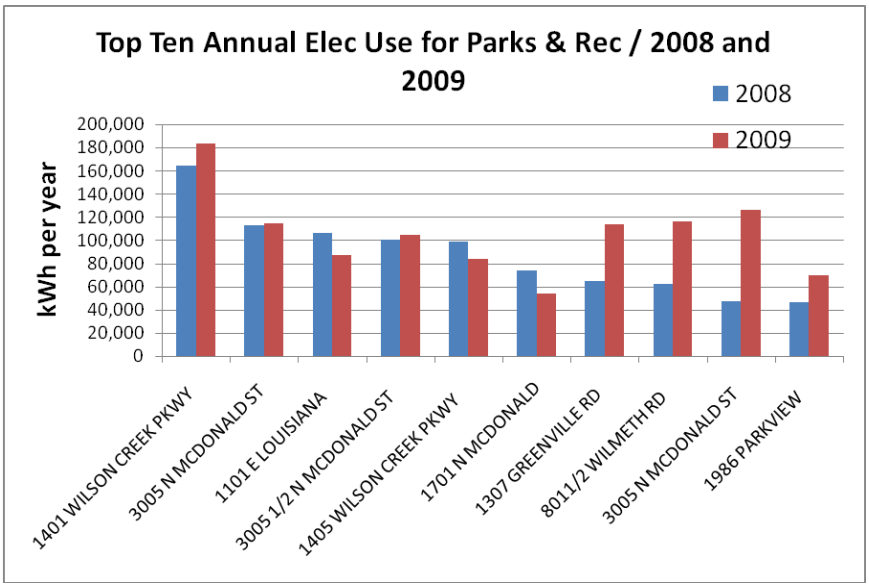
For 2009, by municipal department, the largest users annually of electric power are the same as 2008. They are Water and Wastewater (32%), Public Safety which includes Fire and Police (19%), Engineering which is primarily street lighting (20%) and Parks and Rec including 2000 S. Central Expy (15%).



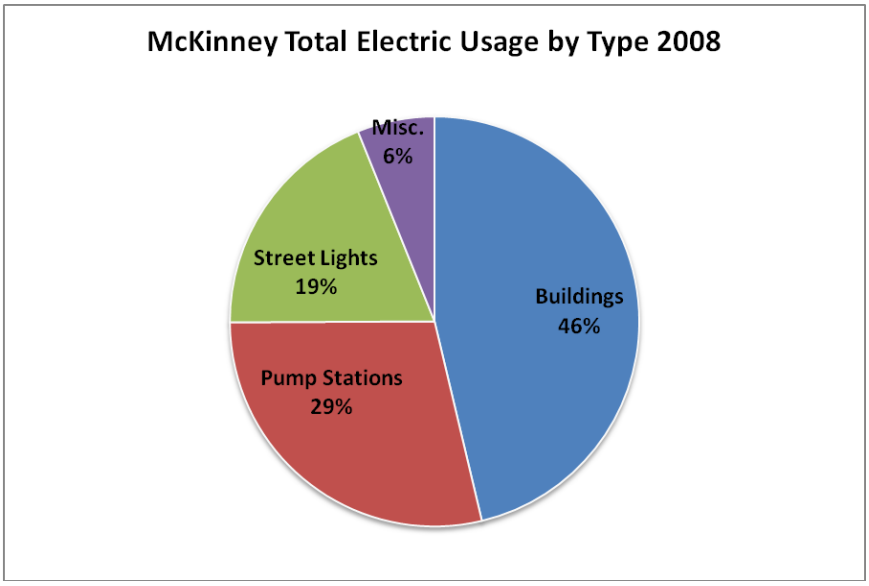
Annual electric energy consumption for buildings and facilities within the Water/Wastewater department, indicated by street address, is shown below for 2008 and 2009.



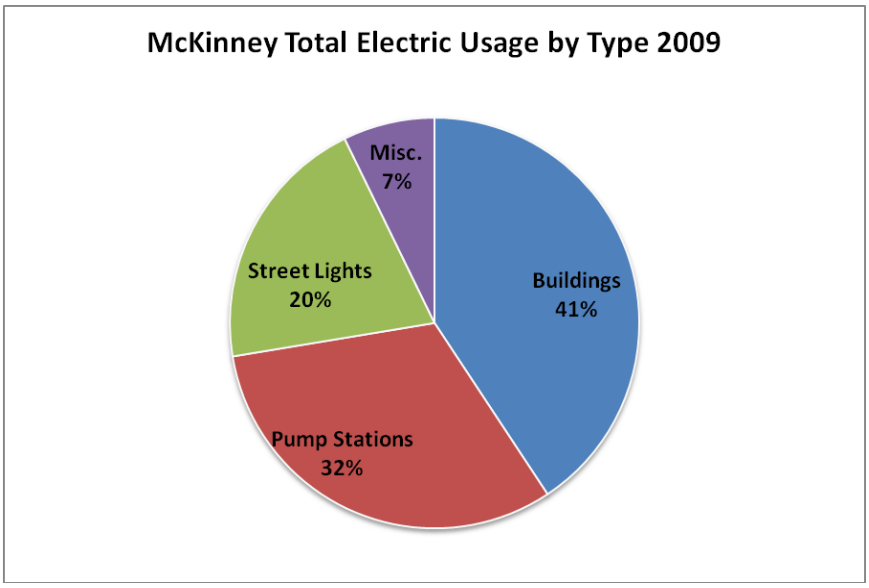
Annual electric energy consumption for buildings and facilities within the Parks and Rec department, indicated by street address, is shown below for 2008 and 2009.



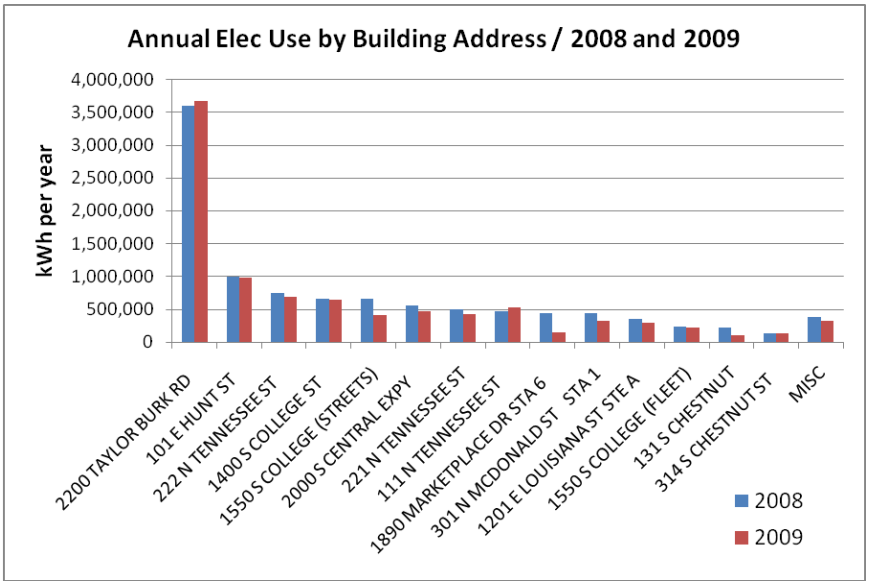
For 2008, examining electric energy use by usage type across all municipal departments, the largest users annually of electric power are buildings (46%), pump stations (29%), and street lighting (19%).



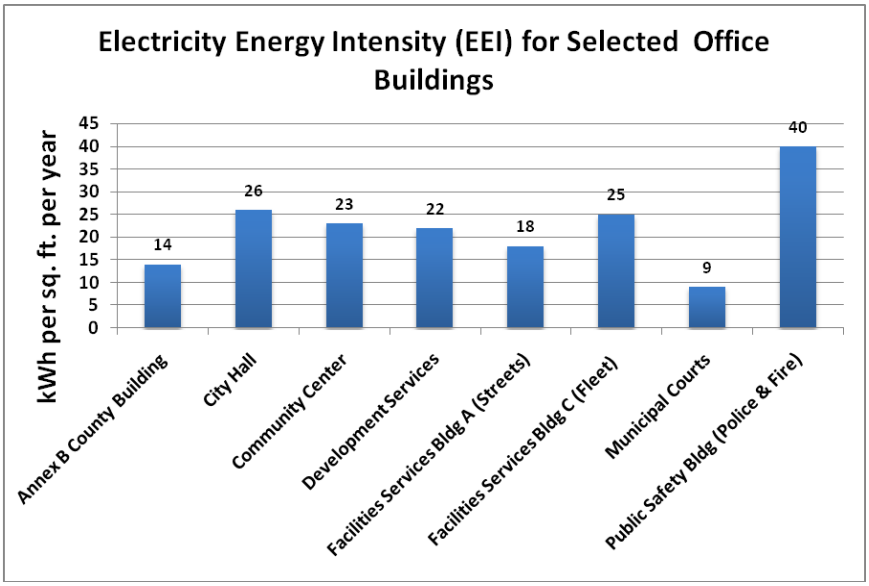
For 2009, examining electric energy use by usage type across all municipal departments, the largest users annually of electric power are buildings (41%), pump stations (32%), and street lighting (20%).



By removing data for all non-buildings—water, wastewater, engineering street lighting, and miscellaneous—a chart of annual electric use for buildings only across all departments can be generated. For 2008 and 2009, the largest building users annually of electric power are shown below. The top five largest electric energy users are 2200 Taylor Burk Rd. followed by 101 Hunt St., 222 N. Tennessee St., 1400 S. College St., and 1550 S. College St.

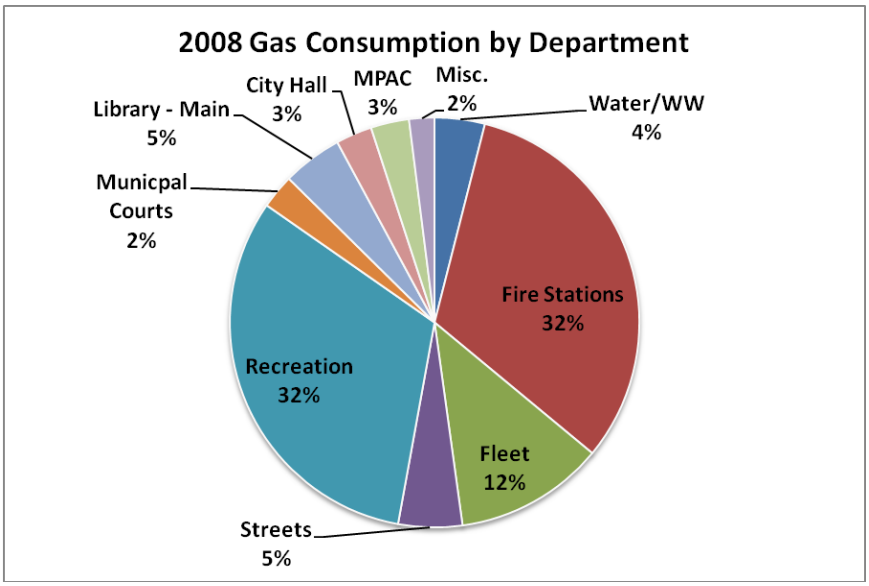


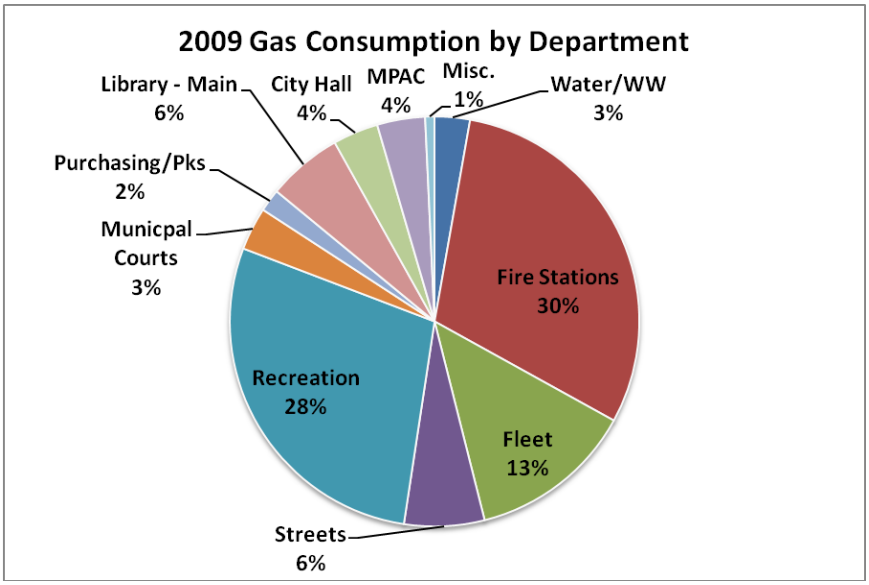
In order to compare the annual electric use of these buildings with a national database of average annual electric use for office buildings in the same climate zone, the electric energy intensity (EEI) of each building was calculated. EEI is the amount of electricity used in a building per square foot per year and is a more accurate indicator of the energy efficiency level (or lack thereof) of a building than simple total annual energy use. The average EEI for office buildings in the same climate zone as McKinney is approximately 19 kWh per square foot per year. As shown in the bar chart below, some of the buildings included in the baseline task exceed this benchmark while others are below it.



3.2.2 ANNUAL GAS CONSUMPTION

Charts for the average annual gas consumption for the years 2008 and 2009 indicate that Fire Stations and Recreation facilities are the largest consumers of natural gas, each accounting for approximately 30% of annual gas use for both years. Fleet facilities are the third largest user of gas at a range of 12–13% each year.





4.0 CURRENT MUNICIPAL FLEET VEHICLE FUEL USE AND BASELINES

4.1 Data Acquisition and Analysis

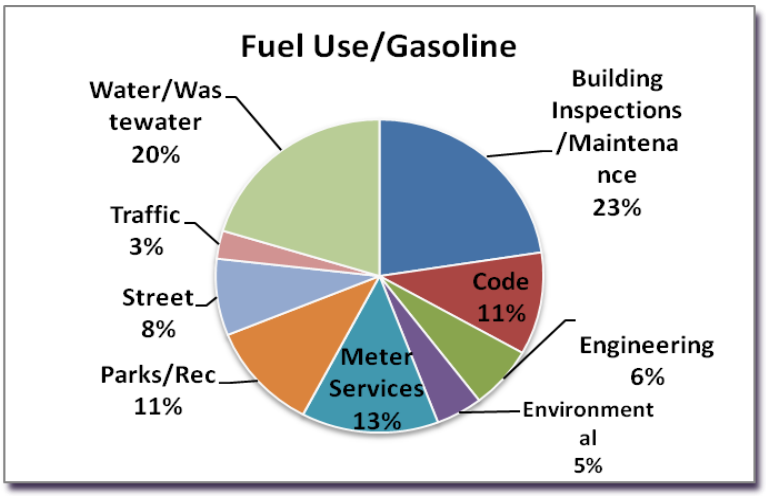
Vehicles are major contributors of local and regional GHGs. In order to create a plan to reduce GHGs and to improve fleet efficiency, it is important to have a baseline of existing fuel consumption conditions. In order to establish a municipal fuel use baseline for fleet vehicles, an inventory of city owned and operated fleet vehicles was provided by City staff. The intent of the inventory was to collect the following information:

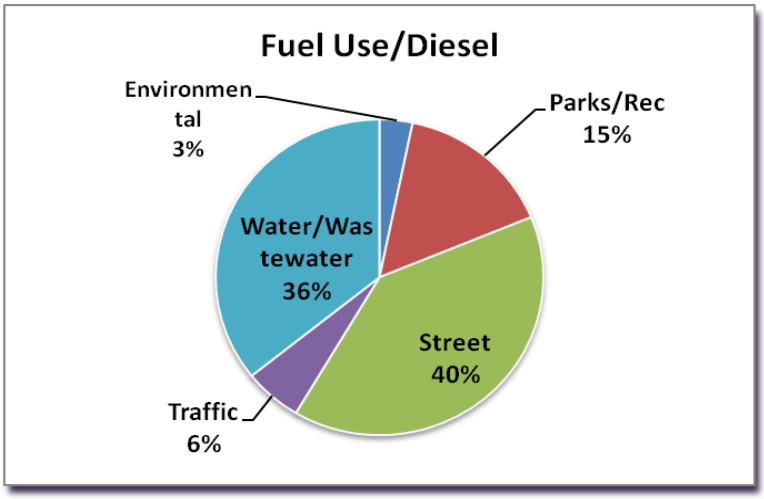
- Vehicle type (compact car, light truck, etc.)
- Vehicle model year
- Current total miles to date (odometer reading)
- Approximate number of hours used per week
- Typical number of passengers per trip in addition to driver, if any
- Vehicle miles travelled per month for most recent 3 years
- Gasoline fuel use for each vehicle per month for most recent 3 years
- Diesel fuel use for each vehicle per month for most recent 3 years
- Other fuel use for each vehicle per month for most recent 3 years

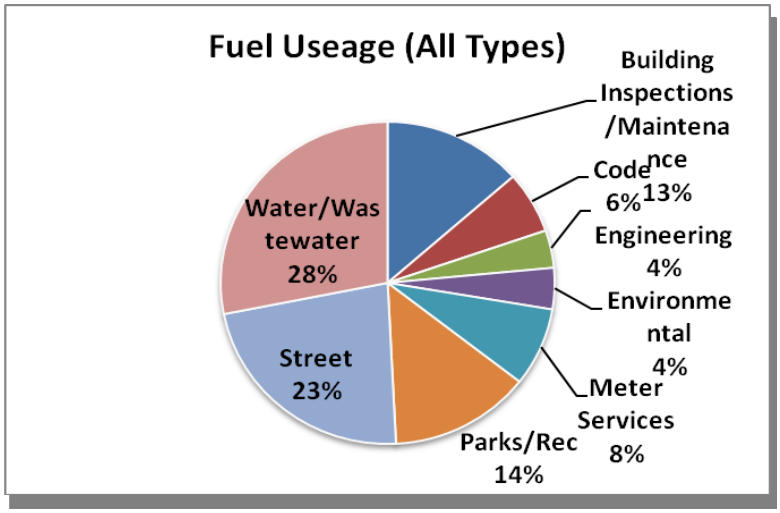
Data included vehicle types (e.g. light trucks, heavy trucks), number, mileage and fuel consumption for 2009. It was assumed that light fleet vehicles consumed unleaded fuel while heavy vehicles consumed diesel fuel. Data were received for hybrid electric vehicles (HEVs) as well. Fuel consumption data for unleaded fuel, diesel fuel, and CNG were totaled and averaged both monthly and annually; these totals were used to provide baseline results for the past two years.

4.2 Results

The gasoline and diesel fuel use charts indicate the main distribution of fuel use by department. The largest users of gasoline are Building Inspections, Water/Wastewater, Meter Services, Code, and Parks and Rec. The largest users of diesel fuel are Streets, Water/Wastewater, and Parks and Rec. The largest users all fuels combined are Water/Wastewater, Streets, Parks & Rec and Building Inspections.

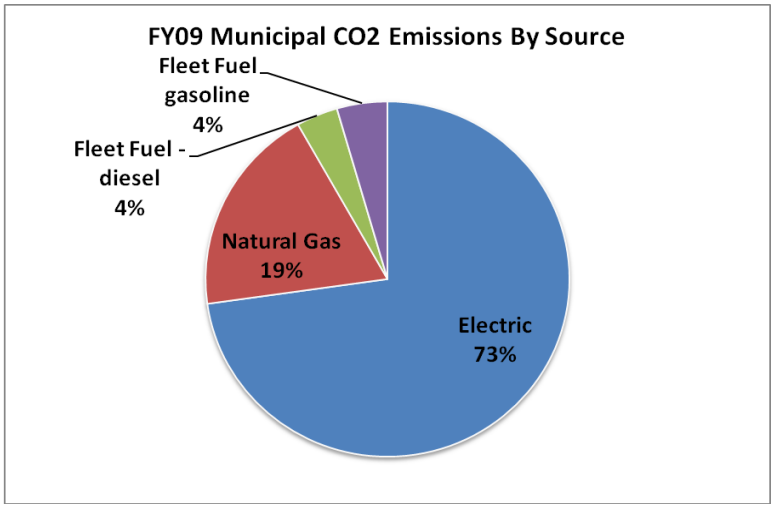



Fuel Use/Diesel
Environmental 3%
Parks/Rec 15%
Water/Wastewater 36%
Street 40%
Traffic 6%


Fuel Useage (All Types)
Building Inspections /Maintenance 13%
Code 6%
Engineering 4%
Environmental 4%
Meter Services 8%
Parks/Rec 14%
Street 23%
Water/Wastewater 28%

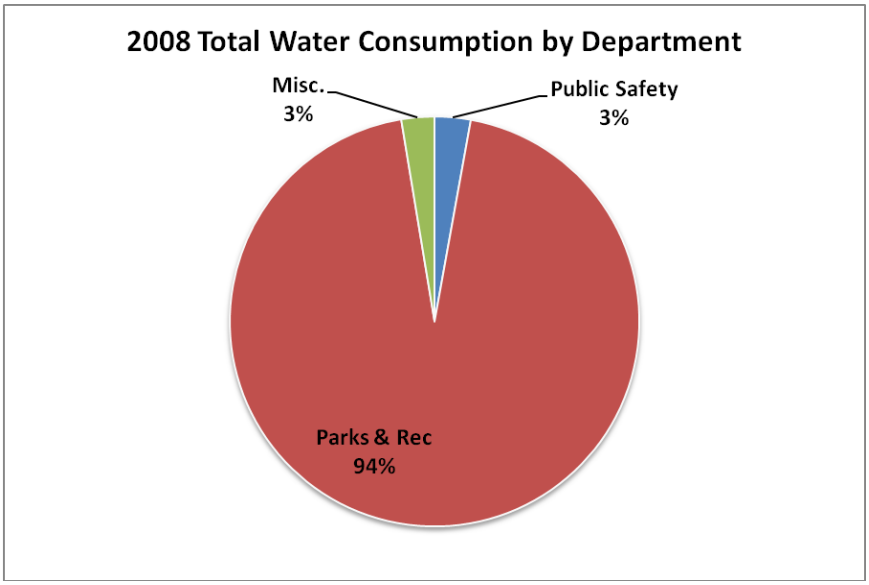
5.0 PRELIMINARY GHG EMISSIONS BASELINE

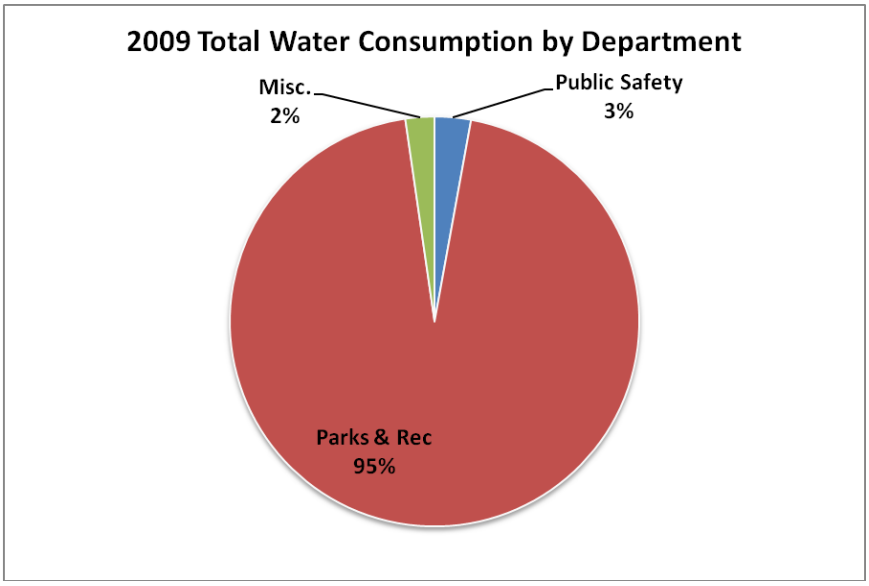
Based on the annual data for municipal electric power use, natural gas use, and fleet vehicle fuel use, the distribution of greenhouse gas emissions among these three energy sources was established. The chart below indicates that electric power use accounts for a vast majority, almost three-quarters, of municipal GHG emissions. Natural gas use accounts for the second largest amount, and the combination of gasoline and diesel fuel for fleet vehicles accounts for the remainder.

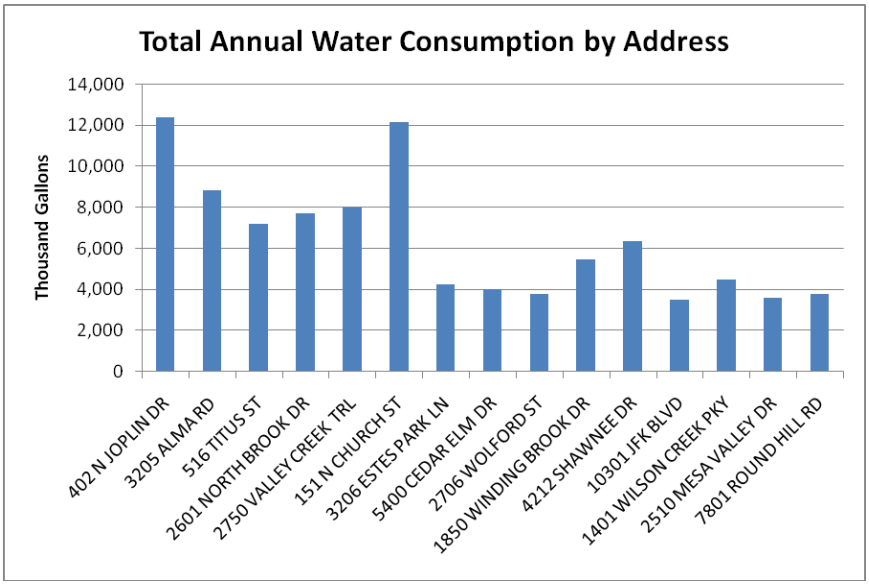


6.0 BUILDING AND FACILITY ANNUAL WATER USE AND BASELINES

Analysis of water consumption data for 2008 and 2009 revealed that the Parks & Rec Department was the single biggest consumer of all City departments in each of the two years. The third chart below indicates the largest users of water for 2008 and 2009 (a combined total) by street address within the Parks and Rec Dept. Six addresses appear to account for a large majority of Parks & Rec annual water use.




2009 Total Water Consumption by Department
Misc.
2%
Public Safety
3%
Parks & Rec
95%


Total Annual Water Consumption by Address
Thousand Gallons
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
402 N JOPLIN DR
3205 ALMA RD
516 TITUS ST
2601 NORTH BROOK DR
2750 VALLEY CREEK TRL
151 N CHURCH ST
3206 ESTES PARK LN
5400 CEDAR ELM DR
2706 WOLFORD ST
1850 WINDING BROOK DR
4212 SHAWNEE DR
10301 JFK BLVD
1401 WILSON CREEK PKY
2510 MESA VALLEY DR
7801 ROUND HILL RD

7.0 PROJECT PRIORITIZATION WORKSHOP SUMMARY

The follow-up workshop was conducted with staff on Wednesday, November 18, 2009, at City of McKinney Council Chambers. The objectives of the meeting were the following:

- To provide an overview of the energy, fuel, GHG emissions, and water baselines
- To have a second round of discussions on the merits of each potential EECS project
- To make a final selection of projects to be included in the EECS document

At the conclusion of the meeting, eight projects were mentioned for funding consideration under the EECBG Program. The farmer's market project was removed from the list, and a comprehensive community sustainability plan, water conservation education and marketing, and Environmental Coordinator position were added. The high visibility renewable energy demonstration project(s) for city building(s) was also added. The final list of eight projects, their alignment with EECBG eligible activities, and a preliminary cost estimate (if known) are presented in Table 7.1 below.

TABLE 7.1 - Final EECS Projects

EECBG ELIGIBLE ACTIVITIES	EECS FINAL PROJECT LIST	ESTIMATED COST
Energy Efficiency Retrofits	1 Building and facility energy efficiency	$109,000
Technical Consulting Services	2 Water conservation education and marketing	$82,500
	3 Community sustainability plan	$120,000
	4 Environmental Coordinator	$120,000
Renewable Energy Technologies on Government Buildings	5 High visibility demonstration renewable energy project(s) for city building(s)	$200,000
Reduction of Methane and Greenhouse Gases	6 Urban forest study	$50,000
Development and Implementation of Transportation Programs	7 Velo web comprehensive study (bike lane commuting network)	$200,000
Traffic Signals and Street Lighting	8 Street lighting and signage (on select thoroughfares)	$90,000