Carbon Footprint Report

Village of Howard, Wisconsin

An inventory of greenhouse gas emissions and air pollutants emissions from Howard government operations.

Written by Jennifer Pollitt, 2009-2010 L.E. O'Connor Fellow

2006-2008

NOTE: This copy does not have CACP reports attached. To view the reports, please contact Jennifer at jpollitt@villageofhoward.com .

Acknowledgements

In June 2009, the Village Board passed Resolution 2009-29 adopting the Wisconsin Office of Energy Independence 25x25 goals. Governor Doyle initiated the 25x25 Plan. Adoption of the resolution signified the Village's commitment to generating 25% of its electricity and 25% of its transportation fuels from renewable sources by 2025.

In August 2009, the Village Board passed Resolution 2009-28, thereby joining ICLEI– Local Governments for Sustainability. Membership to ICLEI provided free access to the Clean Air Climate Protection (CACP) software allowing Village staff to calculate the carbon footprint data presented in this report.

The following Village of Howard staff should be recognized for their input and cooperation in determining emission levels for the various sectors:

Bob Bartelt: Assistant Village Administrator- Public Works

Mitchell DeBauche: Village Accountant

Barb Hoppe: Clerk/Typist- Public Works

Many thanks to the following organizations for their support and cooperative assistance throughout the calculation and analysis of this report:

Agri-Partners Co-Op (Progressive Farmers)

ICLEI-Local Governments for Sustainability

Wisconsin Public Service

City of Traverse City, Michigan

City of Northfield, Minnesota

City of Clayton, Missouri

City of Creve Coeur, Missouri

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Abbreviations

CACP: Clean Air Cool Climate carbon footprint calculation software

CO_2e: Carbon Dioxide Equivalents (cumulative GHG unit equivalent)

GHG: Greenhouse Gas

ICLEI: International Council for Local Environmental Initiatives

LGOP: Local Government Operations Protocol

CO_2: Carbon Dioxide

CH_4: Methane

N_2O: Nitrous Oxide

NO_x: Mono-Nitrogen Oxides

SO_x: Sulfur Oxides

CO: Carbon Monoxide

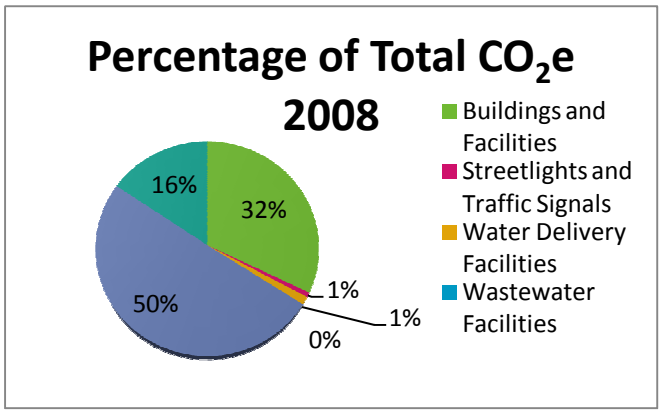
VOC: Volatile Organic Compounds

PM10/2.5: two forms of particulates

Executive Summary

Six major sectors of governmental operations were examined in calculating a carbon footprint: Buildings & Facilities, Streetlights & Traffic Signals, Water Delivery Facilities, Wastewater Facilities, Vehicle Fleet, and Employee Commute. The contribution of each sector to government emissions is shown below.

Three main metrics present the footprint of the Village operations: CO_2e, Energy, and Costs. CO_2e (carbon dioxide equivalents) are presented in tons and basically provide a framework to convert all greenhouse gases into a single, comparable unit as each gas has a different level of impact on the environment. Energy units are presented in MMBtu (Million British thermal units). Costs are determined by what the Village pays for greenhouse gas emitting sources. Fuel costs paid by employees for their commute, for example, are not included in this analysis.



A 2006 inventory was calculated for use as the baseline year for all inventories going forward. 2007 and 2008 inventories were also conducted as data was readily available. The broadly summarized results from the three year inventory are presented below:

Performance Metric	2006	2007	2008	Next Steps:
CO_2e (tons)	3,524	1,042	1,070	-2009 analysis -set future targets -amend action plan
Energy (MMBTU)	25,549	22,593	18,714	
Costs	$669,646	$647,023	$665,049	

Greenhouse gas emissions through ICLEI's CACP software have been completed across the country. While each community has internal and external factors affecting their emissions, the most comparable municipalities' emissions are presented below:

City, State	Population	Baseline Year	CO_2e (tons)	Energy (MMBtu)	Costs	Notes
Creve Coeur, MO	16,759	2005	3,973	34,079	$476,049	-less snowfall
Clayton, MO	16,076	2006	5,465	34,298	$568,369	-no water delivery/wastewater facilities/employee commute

Northfield, Minnesota's inventory will be included when it becomes available.

It is important to note that comparisons with other communities do not show the true effect of Howard's emissions. The Village of Howard should focus on decreasing its own emissions at a level it deems appropriate. The Village Go Green Save Green Taskforce will manage these emission levels and inventories to ensure progress is made towards Governor Doyle's 25x25 plan.

Background and Methodology

Purpose

Upon signing onto the 25x25 plan and joining ICLEI, the Village of Howard's Go Green Save Green Taskforce decided to calculate the Village's carbon footprint in order to better track and achieve target goals. The Village's Energy Action Plan, available on the Village website[1], would be better enhanced by a Carbon Footprint monitoring mechanism. The main theme in the Village Energy Action Plan is decreasing costs and/or usage by 25% by 2020 using 2006 as a baseline. As inventory years are submitted into the CACP software, the Village will continue to track environmental impact and cost savings to help meet these goals.

As the Local Government Operations Protocol (LGOP) defines, there are five key benefits to performing a Greenhouse Gas inventory at the municipal level. Those are[2]:

1) Risk Management- helps municipalities manage climate risk
2) Addressing Inefficiencies- helps municipalities be redesigned, improved, innovative, and more efficient with resources
3) Readiness for a Carbon Constrained Future- helps municipalities "prepare for and respond to the potential impact of new regulations"
4) Recognition as an Environmental Leader- helps promote and publicize "environmental stewardship"
5) Stakeholder Education- helps municipal decision-makers have an understanding of current and future impacts

Greenhouse gas inventory reports provide an educational framework for leaders, citizens, and businesses to learn about their community's impact on the environment. This Carbon Footprint Report adheres to LGOP's GHG Accounting and Reporting Principles to the best of Village staff's availability. The principles are: Relevance, Completeness, Consistency, Transparency, and Accuracy[3].

Tracking Software

Membership to ICLEI- Local Governments for Sustainability gave the Village of Howard free access to the Clean Air Climate Protection (CACP) software. A new version of the CACP software (CACP 2009) was released in April 2009 to harmonize the calculation models offered by various environmental agencies. CACP 2009 incorporates the Local Government Operations Protocol (LGOP) - a reputable standard for local government operations inventories. In adherence with LGOP, three scopes were used to classify data in the analysis:

[1] www.villageofhoward.com
[2] Local Government Operations Protocol Version 1.0. September 2008. Page 4.
[3] Local Government Operations Protocol Version 1.0. September 2008. Page 9-10.

-Scope 1: Direct emissions produced by Village operations
-Scope 2: Indirect emissions from electricity consumption
-Scope 3: Other indirect emissions such as contracted services and employee commute emissions

CACP software allows municipalities to track the carbon footprint of government operations as well as the community as a whole. This report will present the findings of carbon emissions produced by government operations only. The Village of Howard hopes to perform a community analysis soon in order to achieve ICLEI's Milestone 1 award. Milestone 1 requires "completion of a comprehensive GHG emissions inventory including both community and municipal operations."

Settings

The findings of this report present the carbon footprint for Village operations in the years 2006 through 2008. 2006 was chosen as the base year of analysis due to the availability of accurate records for all stationary sources. Actions by the Go Green Save Green Task Force in 2008 produced energy-efficient results that would blur the true "before" picture. Because employee commute data was not collected in 2006, 2009 data was used as an assumed estimate for these sources. Other mobile sources such as municipal fleet were actual 2006 figures. From 2009 onward, current records will be maintained for future inventory calculations.

Greenhouse Gases and Air Pollutants

There are six greenhouse gases as regulated under the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4), Mono-Nitrogen Oxides (NO_x), Sulfur Oxides (SO_x), Carbon Monoxide (CO), Volatile Organic Compounds (VOC), and two forms of particulates (PM10 and PM2.5). For example, when any NO_x and VOCs react in sunlight, they produce smog- a common sign of air pollution. The CACP software provides emissions for each of these gases as well as their cumulative total.

The cumulative total is known as carbon dioxide equivalents- a unit that can "allow GHGs to be compared on a common basis (i.e. on the ability of each GHG to trap heat in the atmosphere)"[4]. Carbon Dioxide Equivalents are abbreviated as CO_2e in this report. CACP reports also provide MMBtu (million British thermal units or therms) data- or the number of million units of energy emitted by the input sources.

Sectors

Emissions and costs were reported by sector in the CACP software. Many categories included in the software were not applicable to the Village of Howard including port facilities, airport facilities, transit fleet, electric power, and solid waste facilities. The Village compost center was not included in this analysis as accurate GHG formulas are not yet available, according to LGOP. The sectors utilized in this baseline analysis are:

[4] Local Government Operations Protocol Version 1.0. September 2008. Page 11.

1. Buildings and Facilities
2. Streetlights and Traffic Signals
3. Water Delivery Services
4. Wastewater Facilities
5. Vehicle Fleet
6. Employee Commute

Most reports and analyses created using inventory data will be reported by sector. Therefore it is necessary to declare the entities included in each major sector[5]:

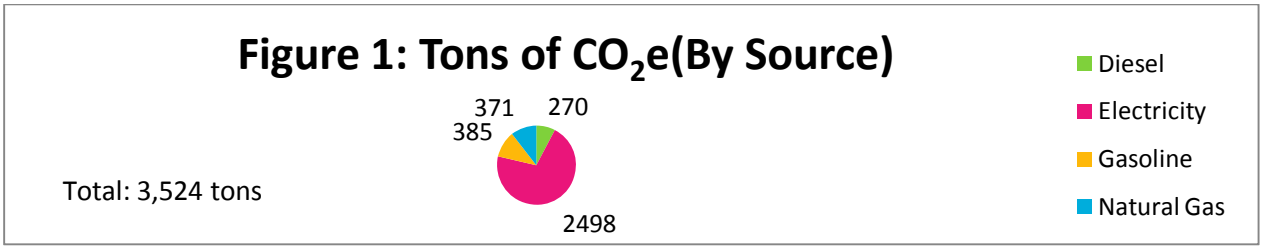
Buildings and Facilities	Water Delivery Facilities	Wastewater Facilities
Fire Station 2	Brookfield Booster	Lakeview/Woodale Lift Station
Golf Course Club House	Cornell Well #3	Lineville Lift Station
Golf Course Maintenance	Evergreen Booster Pump	Memorial Lift Station
Maywood Garage	Evergreen Well	Omnova
Meadowbrook Park Pavilion	Golf Course Pump House	Sanimax
Public Works Building	Maywood Building	
Sports Complex Concessions	Miltown Rd. Unit B	
Village Hall	Shawano Booster	
	Shawano Booster Pump	
	Sports Complex Well	
	Woodale PRV Station	

It is important to note that the Howard-Suamico School District, Howard Public Library, and other governmental agencies such as the Department of Natural Resources, Brown County, and the State of Wisconsin were not included in the Government Operations analysis as they are not directly operated by the Village of Howard organization.

2006 Baseline Government Operations Emissions Inventory

Greenhouse Gas and Air Pollutants Summary

In 2006, 25,549 million units of energy (MMBtu) were consumed by the Village of Howard. Figure 1 shows that 3,524 tons of carbon dioxide equivalents were emitted from Village of Howard government operations as well as 123 pounds of Nitrous Oxide and 169 pounds of methane. These emissions cost the Village of Howard $669,646.



[5] Each facility name is taken from Wisconsin Public Service Account name.

Electricity consumption contributed the most to the Government footprint at 71% of carbon dioxide equivalent emissions. In 2006 the Village spent $470, 649 on purchased electricity. Gasoline and natural gas produced 10.9% and 10.5% of carbon dioxide equivalent emissions respectively. The Village of Howard paid $536,347 in utility (electricity and natural gas) costs in 2006. The average household spends $1,900 per year on utilities. Therefore, the Village pays enough in utility costs to subsidize over 282 homes. Fuel costs to the Village totaled at $133,299.

Sector Analyses

Buildings and Facilities

Of all Village buildings, the two primary business centers produce the most emissions: Village Hall and Public Works. All Village buildings emissions are categorized as Scope 2: indirect emissions from purchased electricity. In 2006, Village buildings consumed over 703,000 kWh of electricity. Village building GHG emissions are as follows:

Buildings and Facilities	CO_2 (tons)	N_2O (lbs)	CH_4 (lbs)	CO_2e (tons)
Fire Station 2	**41**	**1**	**5**	**43**
Golf Club House	**121**	**3**	**9**	**121**
Golf Course Maintenance	**31**	**1**	**3**	**31**
Maywood Garage	**25**	**0**	**4**	**25**
Meadowbrook Park Pavilion	**3**	**0**	**0**	**3**
Public Works	**274**	**5**	**30**	**275**
Sports Complex Concessions	**33**	**1**	**1**	**33**
Village Hall	**364**	**8**	**28**	**366**

Because electricity consumption is Scope 2 and natural gas consumption is Scope 1, total energy usage was separated for all buildings and facilities. Emission and costs should also be analyzed by scope:

Buildings and Facilities		CO_2	N_2O	CH_4	CO_2e	Costs
Scope 1	Natural Gas	353	1	67	354	$62,196
Scope 2	Electricity	541	18	13	544	$56,994

Streetlights and Traffic Signals

This sector accounted for $262,656 of Village electricity costs. 92.5% of the sector costs were due to Village streetlights. Because the streetlights are owned and maintained by Wisconsin Public Service, the Village of Howard only pays for usage.

Water Delivery Facilities

Over 1,800 tons of carbon dioxide equivalents were produced by water delivery services in 2006. Utility costs totaled over $150,000. In 2006, water delivery services contributed the most to

the Village's carbon footprint. Over 1,000 carbon dioxide equivalents were emitted from Cornell Well #3. The cost for this well was double the utility costs for the Village Hall. The Evergreen Well also has substantial GHG emissions, totaling three times more than the emissions produced by the Village Green golf course clubhouse. In 2006, the Village of Howard was still responsible for supplying its own water to residents. This resulted in very high energy and consumption costs.

Wastewater Facilities

The Lakeview/Woodale Lift Station is the most expensive and largest carbon dioxide equivalent producer of all Village lift stations. Cumulatively speaking, the Village wastewater facilities emit 17 tons of carbon dioxide equivalents while consuming 77 million units of energy.

Vehicle Fleet

All Village vehicles (both diesel and gasoline) produced 484 tons of carbon dioxide equivalents in 2006. Nearly 22,000 gallons of gasoline and just over 24,000 gallons of diesel were consumed by Howard fleet vehicles. Village vehicles can be broadly categorized as:

1. Police squad cars
2. Fire trucks
3. Engineering, Parks, and Village Hall vehicles
4. Public Works light trucks
5. Public Works heavy-duty vehicles

In 2006, the Village owned and maintained 78 vehicles in its fleet.

Employee Commute

Employee Commute data was unavailable for the year 2006. Therefore, 2009 employee data was used to get a general estimate of the total commute by Howard employees. Data will be collected annually in future inventory years. Employees were grouped into the following general departments:

1. Crossing guards
2. Engineering
3. Forestry
4. Golf Course
5. Parks
6. Public Works
7. Village Hall
8. Water/Sewer

Of these departments, Parks employees had the longest commutes with 49 tons of carbon dioxide equivalents emitted in one year. They are the largest department with 47 employees. Water/Sewer employees had the least emissions but have only four employees. For all village employees, the average distance from work to home was only 6.43 miles. There are very few (only 9 of 113) employees living more than 15 miles from their respective Village facility.

Time Series Analysis of Government Operations Emissions Inventory- 2006 through 2008

2007 and 2008 Summary

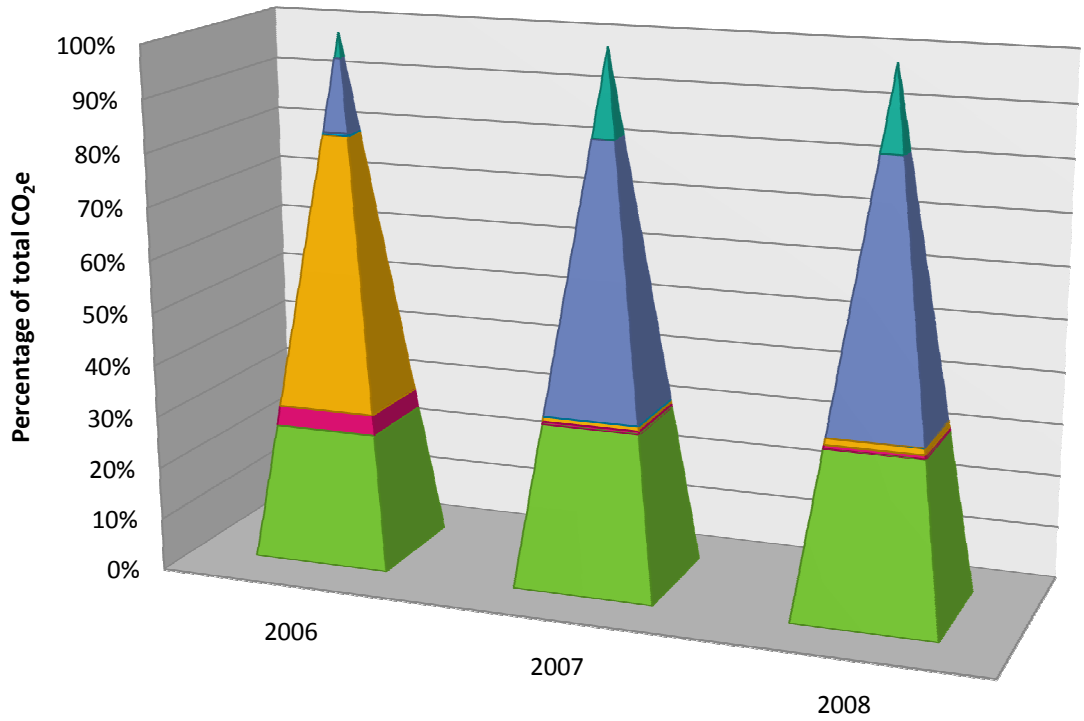
In 2007, the Village emitted 1,042 tons of carbon dioxide equivalents. 22,593 million units of energy were consumed. In 2007, Village utility costs equaled $511,216. $647,023 was spent on greenhouse gas sources.

The Village of Howard emitted 1,070 tons of carbon dioxide equivalents in 2008. To do so, government operations caused the consumption of 18,714 million units of energy. Utility costs to the Village totaled $449,121 in 2008. All GHG sources cost the Village $665,049.

In 2008, the Village of Howard's government operations produced 69% less carbon dioxide equivalents than in 2006. Despite increased vehicle fleet emissions, the decrease of Buildings & Facilities, Streetlights & Traffic Signals, Water Delivery Services, and Wastewater Facilities produced the 2,454.4 ton reduction in carbon dioxide equivalents. The Village also saw a reduction in utility costs in 2008, spending nearly $87,226 less than in 2006.

Sector Analysis

The distribution of carbon dioxide equivalents emitted by sector varied between 2006 and 2008. The dispersion can be seen in Figure 3 on the following page:



	2006	2007	2008
Employee Commute	4.90%	16.50%	15.80%
Vehicle Fleet	13.70%	50.90%	50.30%
Wastewater Facilities	0.50%	0%	0%
Water Delivery Facilities	51.60%	1%	1.20%
Streetlights and Traffic Signals	3.80%	0.50%	1%
Buildings and Facilities	25.50%	31.00%	32.00%

Vehicle Fleet

The Vehicle Fleet sector caused significantly more carbon equivalent emissions in 2007 and 2008, resulting in 54.8 more tons of CO_2e in 2008. This is most likely due to the harsh winter that occurred in 2007 and 2008. In 2006, for example, the statewide average snowfall was 36.8 inches[6]. In 2007, it nearly doubled at 64.4 inches. Such a dramatic increase in snowfall creates more usage in snowplows, salt trucks, and other machinery to ensure public safety throughout the Village right-

[6] Data from WI State Climatology Office: Statewide Average Snowfall: www.aos.wisc.edu/~sco/clim-history/division/4700-S.html

of-ways. The increased vehicle-miles and addition of five vehicles over the 3 year period resulted in the following fuel usage:

	2006	2007	2008
Gasoline- # of gallons used	21,436	22,550	22,143
Diesel- # of gallons used	24, 099	27,583	29,567
Vehicle Fleet- CO_2e emitted	484 tons	530 tons	538 tons
# of Vehicles in Village Fleet	78	81	83
WI Average Snowfall	36.8 inches	64.4 inches	Data not yet available.

Water Delivery Facilities

Cornell Well #3 and the Evergreen Well were the highest kWh users in 2006. These wells were used to supply water to the Village but were frequently over the limit for radium. After analyzing costs of treating water for radium, the Village decided to purchase their water from Manitowoc Public Utilities. The Village operated wells were deemed as "back up wells" and therefore use a minimal amount of electricity and are used in emergency situations only. This change in water source had a very significant impact on Village costs and emissions regarding water delivery facilities.

Streetlights and Traffic Signals

The only significant increase in kWh usage by streetlights and signals was Meadowbrook Park. The lights at Meadowbrook Park consumed over 800 kWh in 2006. By 2008 kWh consumption had increased to over 15,000. The increase in consumption is a result of the renovation of the Meadowbrook Park Shelter. This pavilion is rented out very frequently for private parties and events. In 2008, an LED street sign was installed at the Woodman's site. Both Woodman Drive and Dousman Street signs are LED lit. This is the only LED street sign currently in the Village of Howard.

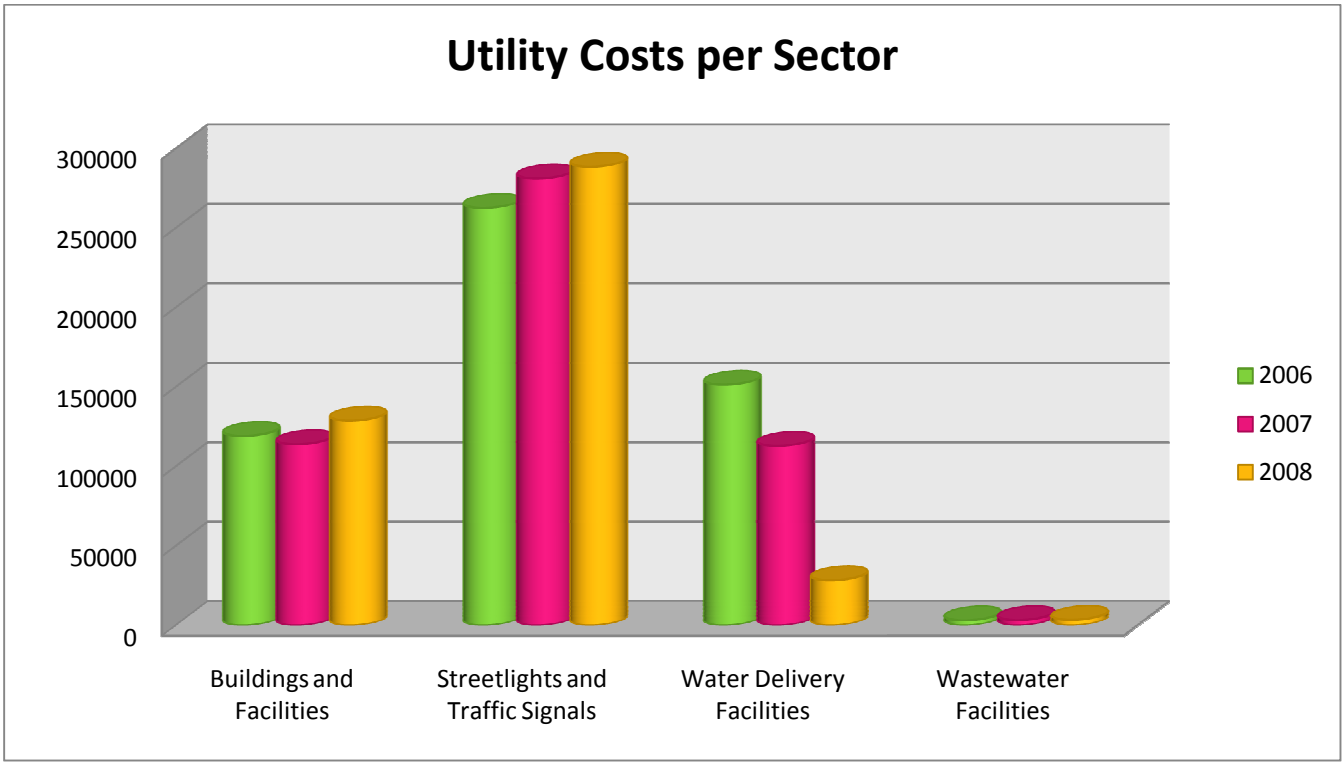
Refrigerants

"Refrigerants" is the newest sector in the CACP software. Refrigerant leakage is usually minimal but can contain harmful hydro fluorocarbon (HFC) compounds. The Village of Howard uses refrigerants in air conditioners, chillers, and refrigerators. In the Village's HVAC system, the refrigerant R-22 is used. The Village utilized 50 pounds of R-22 in 2007 and 15 pounds in 2008. However, as LGOP states, R-22 (or Freon) is "classified as [an] ozone depleting substance (ODS) and [is] being phased out under the Montreal Protocol…they are not classified as greenhouse gas emissions under the Kyoto Protocol because they are already being phased out… Freon should not

be included in your emissions report[7]." For this reason, the use of R-22 was not included in the analysis conducted via the CACP software.

Sector Conclusion

Costs for Buildings & Facilities and Streetlights & Traffic Signals increased from 2006 to 2008. Water Delivery Facilities costs decreased due to the contract with Manitowoc Public Utilities. Wastewater facility costs remained consistent at just over $3,000 throughout the three year period.



Greenhouse Gas Summary

The change from supplying water internally to partnering with Manitowoc has significantly impacted the Village's greenhouse gas emissions. From 2006 to 2008, Streetlights & Traffic Signals, Water Delivery Facilities, and Wastewater Facilities decreased by over 94%. Buildings & Facilities decreased 61%, Vehicle Fleet emissions increased 11% and Employee Commute's emissions decreased by .02%.

In 2008, Village operations emissions were reduced by 70% since the baseline year. Emissions in 2008 were 3% more than the year prior (2007). A more appropriate conclusion can be derived from the change in emissions from 2007 to 2008:

[7] Local Government Operations Protocol Version 1.0. September 2008. Page 53. (Box 6.4)

Sector	Percentage Change (2007 to 2008)
Buildings and Facilities	+6%
Streetlights and Traffic Signals	+36%
Water Delivery Facilities	+22%
Wastewater Facilities	0%
Vehicle Fleet	+2%
Employee Commute	-1%
Total	***+3%***

Air Pollutant Analysis

From 2006 to 2008, all air pollutant emissions have decreased. There was no PM25 output as refrigerant usage was not included in this analysis. Again, removing the 2006 outlier data can give a more accurate approach in the Village's recent performance.

Air Pollutant	% change from 2006-2008	% change from 2007-2008
NO_x	-50%	+5%
SO_x	-99%	+3%
CO	-5%	-2%
VOC	-6%	-2%
PM10	-81%	+6%

2009 Improvements and Future Analysis

Go Green Save Green Taskforce

In 2008, the Go Green Save Green (GGSG) Taskforce was created to find initiatives that will have a positive environmental impact and lower Village costs. The Annual Report for the GGSG taskforce is available on the Village website[8]. Projects implemented through GGSG efforts include installing motion-detecting sensors for all lighting and regulating temperature settings for heating and cooling of all Village buildings.

Focus on Energy Collaboration

In March 2009 a Focus on Energy (FOE) Energy Advisor conducted an Energy Audit of all Village-owned buildings. The advisor recommended key temperature settings and other adjustments to the existing HVAC systems. Many of the advisor's suggestions were executed, however some required replacement of equipment. The Village has been putting aside money annually since 2008 for the replacement of various HVAC system units.

Office of Energy Independence Collaboration

[8] www.villageofhoward.com

In September 2009, the Village Board approved becoming registered as an Energy Independent (EI) Community with the WI State Office of Energy Independence. Adoption of the 25x25 goals was a prerequisite to becoming an EI Community. By mid-November of 2009, the Village will have applied for up to $225,000 in funding from the Energy Efficiency and Conservation Block Grant administered through the Office of Energy Independence. If the Village is awarded EECBG funding, it will be used towards Village building retrofits including the HVAC system, energy-efficient lighting, and insulation. Again, if the EECBG grant is awarded, all projects will be completed in 2010, offering another appropriate benchmark for greenhouse gas emission analysis.

Future Analysis

In early 2010, when all 2009 data is available, an emissions inventory will be conducted. After all four years have been analyzed, the CACP software will be utilized to set forecasts and targets for future emission benchmarks.

Current projects that will be affecting future GHG inventories include:

- In 2009, the Village purchased two police vehicles. One was designated to use only E-85 gasoline while the other uses unleaded fuel. The pilot program will compare cost savings and efficiency.
- In 2009, the Village approved the purchase of three LED streetlights to be installed on Howard Boulevard. These lights will be metered separately to evaluate their energy and cost savings.

All greenhouse gas inventories to date will be summarized by these overall performance metrics:

Performance Metric	2006	2007	2008	Next Steps:
CO_2e (tons)	3,524	1,042	1,070	-2009 analysis -set future targets -amend action plan
Energy (MMBTU)	25,549	22,593	18,714	
Costs	$669,646	$647,023	$665,049	

Recommendations for the Go Green Save Green Taskforce

1) The Go Green Save Green Taskforce should focus on fleet and building/facility improvements to improve government operation sustainability.
2) To comply with the 25x25 plan, renewable energy sources should be investigated by the Go Green Save Green Taskforce. The Office of Energy Independence should serve as a main resource in this research.

Respectfully Submitted,

Jennifer Pollitt

2009-2010 L.E. O'Connor Fellow
October 1, 2009