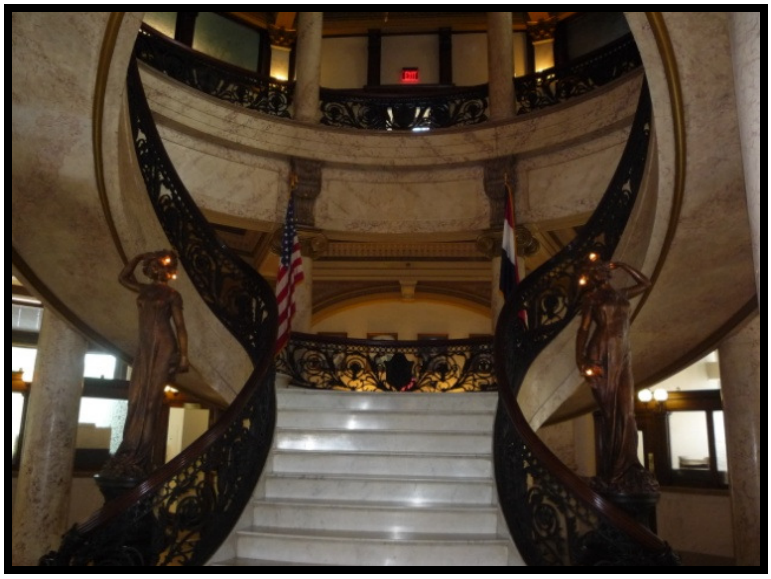
DETAILED ENERGY STUDY

Report

University City Municipal Buildings
University City, MO



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Prepared by

Allen&Hoshall
engineering since 1915

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EXECUTIVE SUMMARY

The purpose of this energy study is to provide the city with energy conservation measures (ECMs) to reduce energy use in their municipal buildings. Allen & Hoshall performed an on-site audit in September of 2011 to determine potential recommendations for reducing energy and water consumption at the following facilities:

Annex (Police/Fire/Print Shop)
Trinity Building
Heman Park Community Center
Heman Park Pool
Central Garage
Heman Park Tennis Court, Restroom and Pavilion
Transfer Station and MRF
Public Works Sign Shop
Park Maintenance Facility
Golf Club House
Golf Maintenance Facility
Golf Range Shack
Fire House #2
City Hall
Centennial Commons Recreation Center

The report includes existing condition descriptions, utility bill analysis, ECM descriptions, energy savings, implementation costs, and description and cost estimate of measurement and verification for the proposed ECMs. Each ECM description will summarize the existing conditions related to the recommended ECM. The ECM description will also provide information regarding what is required for implementation. The appendix includes ECM calculations and other support information. Detailed ECM calculations include electrical consumption, electrical demand, natural gas consumptions, water consumption, and system maintenance savings where appropriate.

The energy conservation measures were separated into five categories: Lighting, HVAC controls, Water Conservation Improvements, HVAC Improvements, and Architectural Improvements. This report identifies ECM's in all categories except Water Conservation and Architectural. Water Conservation improvements are not feasible due to a large percentage of existing fixtures being low consumption and many of the buildings having to high of a fixture to occupant ratio. Architecturally the buildings that are fully conditioned were reasonably well insulated and the existing windows were double pane. Lighting ECMs included lighting fixture replacements, lighting fixture retrofits, and lighting system automated controls. Energy Management ECMs consisted of installing programmable thermostats in the Central Garage and installing plug load occupancy sensors in the City Hall and Annex. HVAC Improvements ECMs included replacement of inefficient HVAC equipment with high efficiency type equipment and the replacement of energy inefficient motors The projected energy savings for all ECMs are shown in the Saving Summary of the report.

Utility bills were provided by the city for 2010 and 2011. The utility usage for 2010 was analyzed with information gained from the site visit to estimate the percentage of the utility bills serving different uses. Graphs of electrical consumption, electrical demand, natural gas consumption, and water consumption are also provided to represent how the utility bills vary throughout the year. The utility bills for 2011 were omitted from this information as the year is not yet complete and having a partial year would skew the findings. This information can be found in each facility description.

There are three recommendations that do not require any renovation work and therefore are not given a separate ECM. The first is to install a city policy to regulate space temperature setpoints for municipal buildings. This would help reduce energy use in buildings where more sophisticated control systems would not be economically feasible and would not require any capital expenditures. See Table 1 Recommended Space Temperature Setpoints below.

Recommended Space Temp. Set Points				
Mode	Cooling		Heating	
Occupancy	Occ.	Unocc.	Occ.	Unocc.
Office	74°F	80°F	70°F	60°F
Shops	-	-	65°F	55°F

Table 1 Recommended Space Temperature Setpoints

The second recommendation is for the city to track the utility usage for each building. The current usage should be compared to the previous year's usage as well as a five year average usage. This would allow the city to notice any significant changes in usage and allow an investigation to be performed in an effort to control and minimize utility usage.

The third recommendation would be to investigate obtaining LEED Existing Buildings: Operations & Maintenance certification. This certification involves chemical use, recycling, maintenance, and system upgrades. This would assure the building is operated efficiently, maintains a excellent working conditions, and minimize the buildings negative impacts on the environment. The most applicable buildings are City Hall, Annex, Fire Station #2, and the Centennial Commons Recreation Center. Allen & Hoshall is capable of assisting with the city with assessing the modifications that would be necessary and the process of applying for LEED certifications.

INCENTIVES SUMMARY

When it comes to energy saving measures in the current economic and political climate, many utilities and government organizations offer incentives to encourage businesses to implement more efficient building systems. These incentives typically come in the form of tax deductions, tax refunds, or up-front funds to offset initial capital costs. As part of this study, potential candidates that could potentially provide incentives were explored.

University City's electric utility is Ameren Missouri. Their Energy Efficiency Incentive Programs closed on August 31, 2011. Future incentives from Ameren Missouri are uncertain. It is suggested to subscribe to their monthly electronic newsletter (http://www.ameren.com/sites/aue/Pages/home.aspx) for updates.

The Missouri Department of Natural Resources Division of Energy has an Energy Revolving Fund providing low-interest loans to governments for energy efficiency improvements. However, their offerings for 2011 have not been released. Nor is there any information available for 2012.

The Department of Energy currently offers a tax deduction incentive program known as the CBTD (Commerical Buildings Tax Deduction), which was created by the Energy Policy Act of 2005. In order to receive this deduction, a certified individual (professional engineer) will survey the building and determine the current lighting power density (LPD). The lighting power density is the sum of all fixture loads divided by the building square footage. This power density is compared to the ASHRAE 2001 90.1 guidelines concerning lighting power densities for different facility types. If the building's calculated LPD is 25-40% below the ASHRAE 90.1 standard, then the building is eligible for a tax deduction that ranges from $0.30-$0.60/sq.ft. This incentive requires that the lighting project be completed by January, 1 2014. Based on the data gathered from this report, the Annex, City Hall, Golf Course Pro Shop & Maintenance Facility, and the Central Garage are all potential candidates. However, all of the buildings listed that are government owned and that do not pay taxes will not receive the deduction. Instead, the principle designer of the lighting system will be eligible for the deduction.

SAVINGS SUMMARY

University City		Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
		KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
ECM-1.1	Lighting Retrofit (Annex)	58,934	17	12	-	-	$4,037	$0	$0	$0	$4,037	$0	$64,736	16.0
ECM-1.2	Lighting Retrofit (City Hall)	12,081	6	12	-	-	$828	$0	$0	$0	$828	$0	$21,723	23.5
ECM-1.3	Lighting Retrofit (Community Center)	5,502	4	12	-	-	$377	$0	$0	$0	$377	$0	$2,249	5.3
ECM-1.4	Lighting Retrofit (Fire Station #2)	5,448	-	12	-	-	$373	$0	$0	$0	$373	$0	$5,829	14.4
ECM-1.5	Lighting Retrofit (Golf Course)	1,277	1	12	-	-	$87	$0	$0	$0	$87	$0	$1,847	18.5
ECM-1.6	Lighting Retrofit (Public Works)	39,387	9	12	-	-	$2,698	$0	$0	$0	$2,698	$0	$31,692	8.8
ECM-1.7	Lighting Retrofit (Recreation Center)	27,897	12	12	-	-	$1,911	$0	$0	$0	$1,911	$0	$42,681	20.8
ECM-1.8	Lighting Retrofit (Trinity Building)	1,226	6	12	-	-	$84	$0	$0	$0	$84	$0	$9,371	111.6
ECM-2.1	Install Programable T-stats Central Garage	27,671	3	12	-	-	$1,895	$0	$0	$0	$1,895	$0	$227	0.1
ECM-2.2	Install Plug Load Occupancy Sensors City Hall	16,527	0	-	-	-	$1,132	$0	$0	$0	$1,132	$0	$8,081	7.6
ECM-2.3	Install Plug Load Occupancy Sensors Annex	19,016	0	-	-	-	$1,303	$0	$0	$0	$1,303	$0	$11,019	9.7
ECM-4.1	Unit Replacement Annex	55,706	11	12	-	2,173	$3,816	$0	$0	$7,040	$10,856	$0	$101,983	9.5
ECM-4.2	Pump Motor Replacement Heman Park Pool	15,709	5	4	-	-	$1,076	$0	$0	$0	$1,076	$0	$5,845	5.4
ECM-4.3	Unit Replacement Central Garage	23,643	8	12	-	-	$1,620	$0	$0	$0	$1,620	$903	$19,718	7.8
TOTAL		310,022	81	12	-	-	$21,237	-	-	-	$28,276	$903	$327,002	11.2

Table 2 Savings Summary

MEASUREMENT AND VERIFICATION SUMMARY

Measurement and Verification (M&V) for this project should be based upon the guidelines developed by the Department of Energy Federal Energy Management Program (FEMP). The FEMP M&V Guidelines outlines four different processes (Option A,B,C,D) that can be utilized to develop a M&V procedure. The type of process selected depends upon the ECM type and current available metering information. Due to the size of this project it is recommended that the cost of M&V be kept to a minimum.

The lighting ECM's will have a baseline and post-project energy usage calculated based upon the actual measurement process based on Option A. The calculated energy savings

of the M&V process will be compared to the estimated energy savings in the audit for both electrical demand (kW) and consumption (kWh).

The control ECMs should not be subject to M&V directly. The thermostat ECMs will be measured in conjunction with the unit replacement. M&V is not applicable to the plug load occupancy sensors.

The unit replacement ECMs will have a baseline and post-project energy usage calculated based upon the actual measurement process based on Option B. The calculated energy savings of the M&V process will be compared to the estimated energy savings in the audit for both electrical demand (kW) and consumption (kWh). The pump motor replacement at Heman Park Pool should not be subject to M&V as the only variable is the operation hours of the pool which are not subject to modification.

The semi-annual M&V report summary will include the proposed and actual kW savings, kWh savings, and energy cost savings for each ECM. The report will also include corrective actions that need to be taken to maximize savings. The M&V period should be 1 year. The cost for M&V is generally in a range of 3% to 6% of the construction costs. However, if a limited number of ECMs is implemented the costs on a percentage base can increase significantly.

ENVIRONMENTAL IMPACT

Along with the energy savings, 423,588 lbs of Greenhouse gases and other pollutants will be averted. For a complete breakdown see Table 3 Greenhouse Gases and Other Pollutants below.

Greenhouse Gasses and Other Pollutants									
Annual Electricity Saved (kWh):	**310,022**								
Pollutant:	CO_2*	NO_x*	SO_2*	Hg*	PM10*	PM2.5	VOC	CO	Sub-total (Electric)
Emission Factor (lb/kWh):	1.333	0.002258	0.005852	3.01E-08	0.024799	0.000139	0.000022	0.000147	
Lbs of Pollutant Saved:	413,260	700	1,814	0.01	7,688	43	7	46	423,558

Pollutant:	Greenhouse Gases (CO_2)	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Toxic Metals (Hg)	PM10	PM2.5	Nitrous Oxides (N_2O)	Volatile Organic Compounds (VOC)	Carbon Monoxide (CO)	Total
Total Lbs of Pollutant Saved:	413,261	700	1,814	0	7,688	0	43	7	46	423,558

Table 3 Greenhouse Gases and Other Pollutants

FACILITY DESCRIPTIONS

Annex

Building Description

This facility is a three story building originally built in 1903 located at 6801 Delmar Blvd. It is approximately 49,000 ft² and has received various renovations over the years. It currently houses the Police Station, Fire House, and Print Shop. The majority of this building is in operation 24-7 and has approximately 141 full time staff.

HVAC Description

The Annex is served by multiple types of mechanical systems. The Police Dispatch, Detectives Offices, and Fire Bunks are served by rooftop units. The Police Dispatch unit newer unit with electric heat. The Fire Bunks unit is also a newer unit but has gas heat. The unit serving the Detectives Office is an older unit and also has gas heat.

There are also several split system units that serve the Office, Fire Chief/Kitchen, Fire Office/EOC, Police Offices, Locker Rooms, and Service Support. All of the units have steam heating coils with the exception of the units serving the Locker Rooms and Service Support, which have gas heat. Also on the steam system are three heaters serving the fire truck bay. Steam is provided from the adjacent Trinity Building.

The Server Room, Telephone Room, and Basement Jail Cells are served by Water-Source units. The water for these units are provided directly from the domestic water service then passes through the unit to the sewer. This causes a large amount of fresh water usage.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	20%
Miscellaneous:	22%
AHU Fans & Pumps:	15%
Cooling:	42%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	59%
Domestic water:	41%
Totals:	100%

The total utility cost for the Annex in 2010 was $82,565.02 . It should be noted that a portion of the heat for this building comes from the steam boilers in the adjacent Trinity building and the Annex provides the City Hall with hot water. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

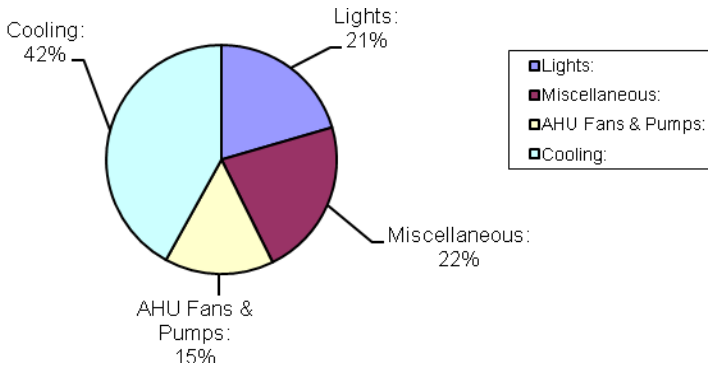

Figure 1 Electrical Usage Breakdown - Annex

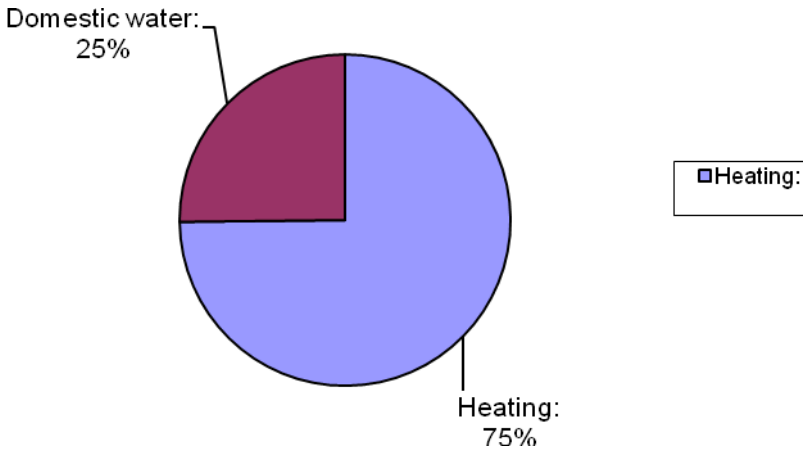

Figure 2 Natural Gas Usage Breakdown - Annex

Utility Bill Analysis For ANNEX (Police / Fire / Print Shop)														
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Electricity Demand	Electricity Demand Cost	Electricity Demand Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(kW)	($)	($/kW)	(CCF)	($)	($/ccf)	(Gal.)	($)	($/kGal)		
January-10	45,360	$ 1,761.90	$ 0.03884	100	$ 140.00	$ 1.40	7236	$ 5,540.14	$ 0.77	546,750	$ 1,518.87	$ 2.78	1009	0
February-10	40,080	$ 1,595.98	$ 0.03982	100	$ 140.00	$ 1.40	6537	$ 5,027.73	$ 0.77	546,750	$ 1,518.87	$ 2.78	820	0
March-10	40,800	$ 1,642.80	$ 0.04026	100	$ 140.00	$ 1.40	4678	$ 3,677.88	$ 0.79	457,250	$ 1,841.13	$ 4.03	350	15
April-10	48,720	$ 1,656.77	$ 0.03401	144	$ 201.60	$ 1.40	2544	$ 2,135.04	$ 0.84	457,250	$ 1,841.13	$ 4.03	39	166
May-10	49,680	$ 3,275.53	$ 0.06593	124	$ 469.85	$ 3.79	464	$ 429.78	$ 0.93	457,250	$ 1,841.13	$ 4.03	20	277
June-10	75,120	$ 4,547.34	$ 0.06053	136	$ 527.82	$ 3.87	101	$ 137.45	$ 1.36	588,500	$ 1,756.08	$ 2.98	0	623
July-10	73,200	$ 4,809.37	$ 0.06570	138	$ 573.53	$ 4.15	92	$ 130.40	$ 1.42	588,500	$ 1,756.08	$ 2.98	0	706
August-10	70,800	$ 4,796.76	$ 0.06775	147	$ 609.64	$ 4.15	66	$ 110.00	$ 1.67	588,500	$ 1,756.08	$ 2.98	0	695
September-10	64,080	$ 2,764.54	$ 0.04314	128	$ 196.66	$ 1.54	87	$ 131.03	$ 1.51	674,750	$ 2,152.45	$ 3.19	4	353
October-10	45,600	$ 2,052.59	$ 0.04501	107	$ 164.78	$ 1.54	91	$ 138.13	$ 1.52	674,750	$ 2,152.45	$ 3.19	66	132
November-10	48,720	$ 2,080.77	$ 0.04271	100	$ 154.00	$ 1.54	2307	$ 1,980.64	$ 0.86	674,750	$ 2,152.45	$ 3.19	336	9
December-10	45,600	$ 1,943.62	$ 0.04262	100	$ 154.00	$ 1.54	5762	$ 4,443.29	$ 0.77	626,000	$ 1,996.94	$ 3.19	912	0
Totals:	647,760	$32,927.97	$ 0.05083	1,424	$3,471.88	$ 2.44	29,965	$ 23,881.51	$ 0.80	6,881,000	$22,283.66	$ 3.24		

Electric Consumption Rate:	$0.05083 /kWh
Electric Demand Rate	$2.44 /kW
Natural Gas Consumption Rate	$0.80 /ccf

Annual Cost/Sq.ft - Electricity:	$0.743 /sqft
Annual Cost/Sq.ft - Gas.:	$0.487 /sqft
Annual Cost/Sq.ft - Total:	$1.230 /sqft

Table 4 Utility Bill Analysis - Annex

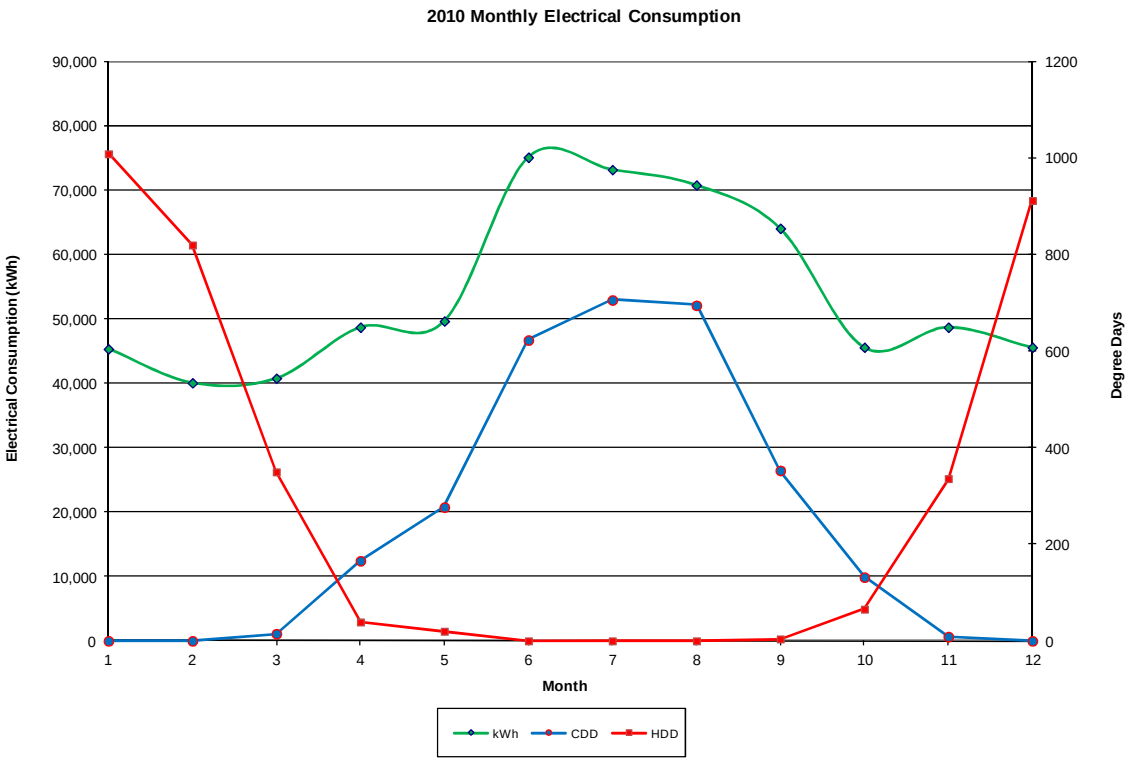

Figure 3 Monthly Electrical Consumption - Annex

Figure 3 Monthly Electrical Consumption - Annex details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This slight discrepancy could be due the timing of the electric billing cycle.

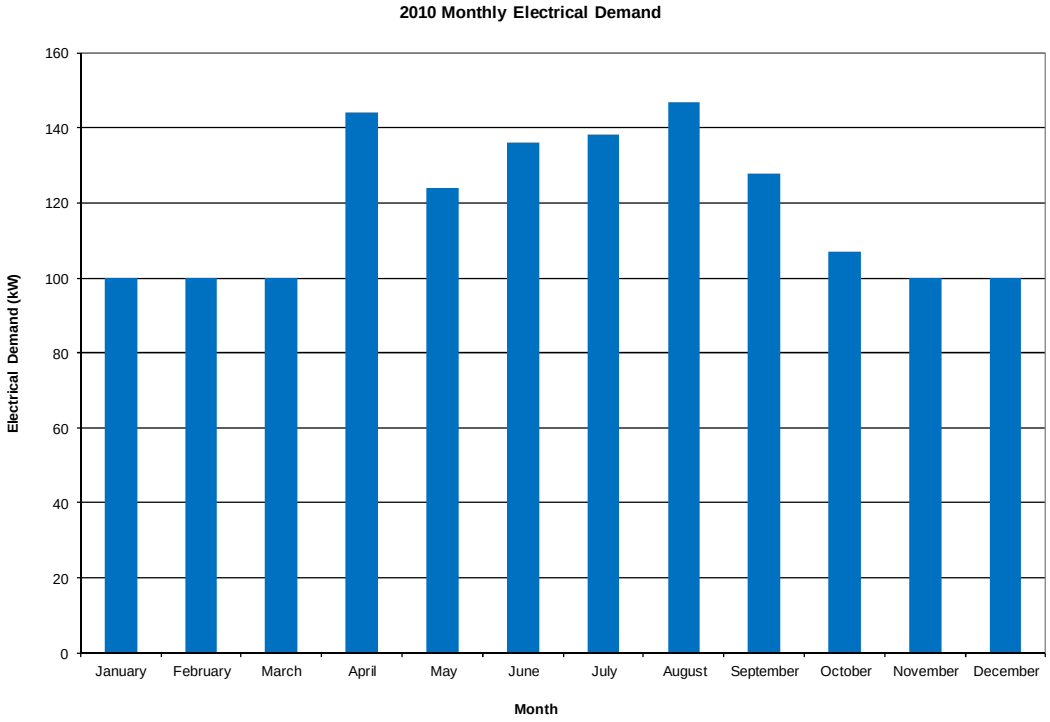

Figure 4 Monthly Electrical Demand - Annex

Figure 4 Monthly Electrical Demand - Annex suggests the same conclusions as the electric consumption graph. The peak months correspond to the higher cooling load required during the summer season.

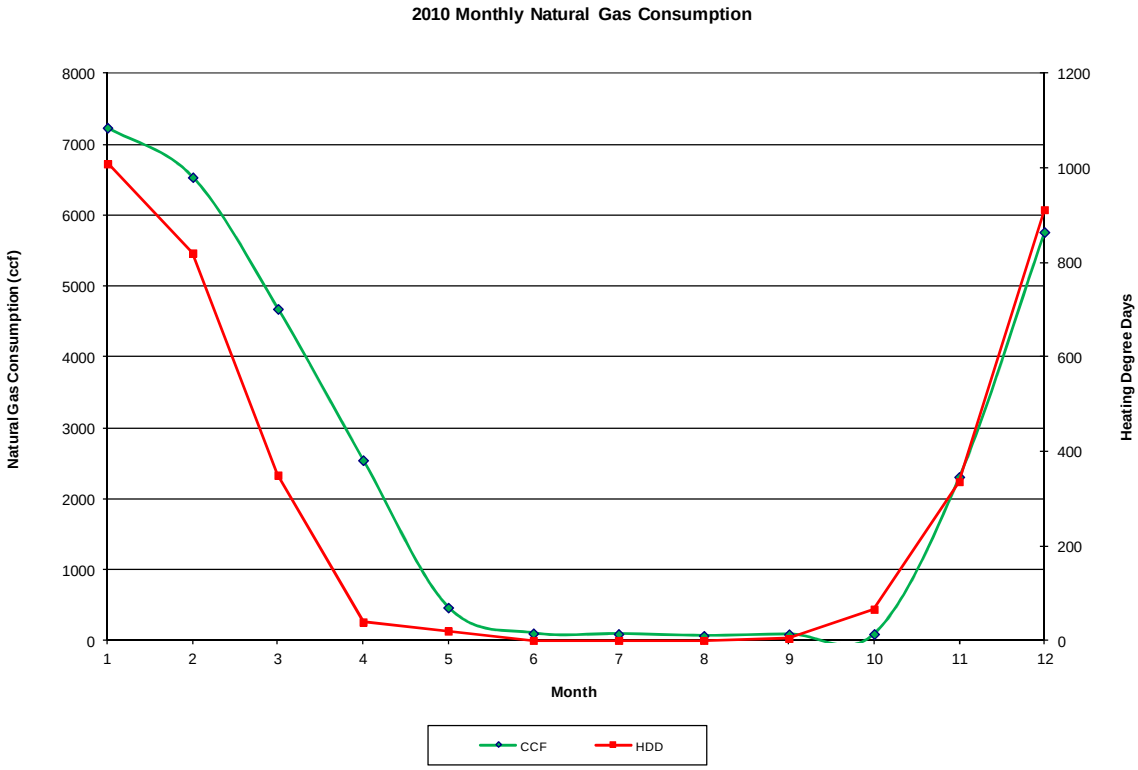

Figure 5 Monthly Natural Gas Consumption - Annex

Figure 5 Monthly Natural Gas Consumption - Annex details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

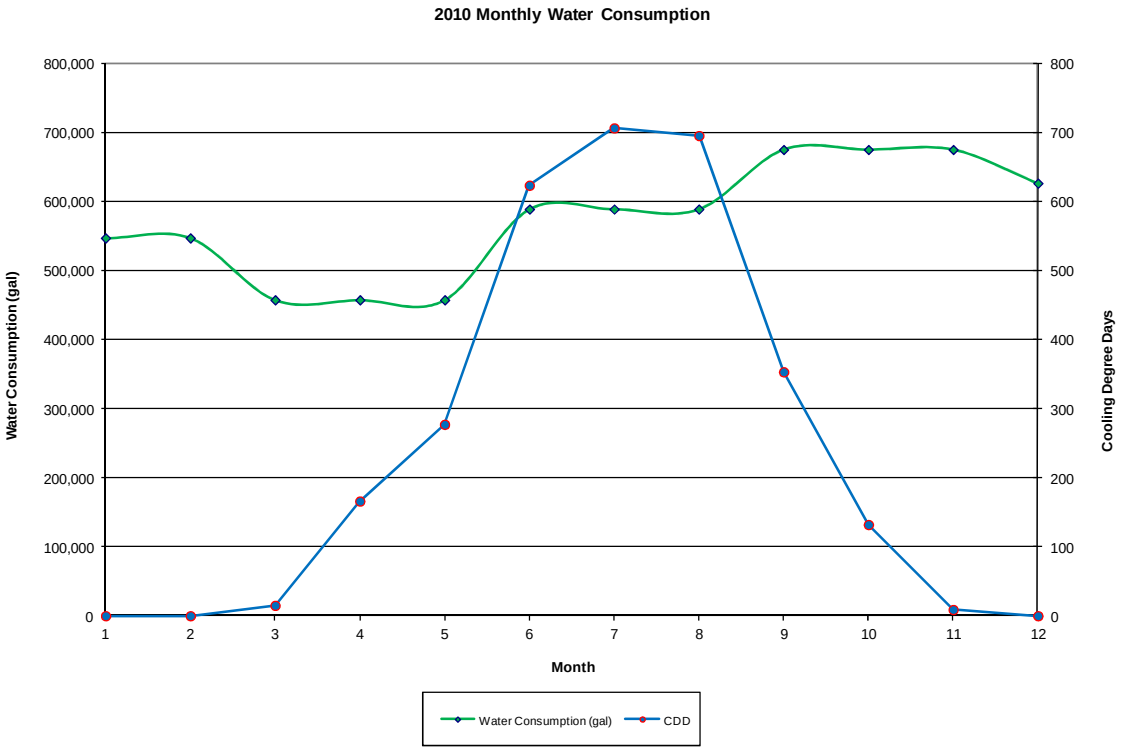

Figure 6 Monthly Water Consumption - Annex

Figure 6 Monthly Water Consumption - Annex details the water consumption. The water consumption is relatively flat due to the limited use of water for HVAC systems. Where water is used for HVAC systems it is used for computer room type areas that require cooling much of the year and is not as dependant on weather.

Trinity Building

Building Description

This building is a three story building of approximately 16,000 ft² built in 1939 as a library. This building is unoccupied a majority of the year. Much of the space is storage, a few small offices that are used for fair planning. When it is occupied its hours are 8am-5pm Monday through Friday and there are only a few employees.

HVAC Description

Cooling is provided by several window air-conditioners. During the audit the building was empty and was being kept warmer than an occupied building would normally be. Even with minimal conditioning humidity did not appear to be a problem. Heat was provided by steam radiators along the exterior of the building.

Two seven year old steam boilers are located in the basement and each have a capacity of 2,650 lbs/hr. These boilers provide steam to the Trinity building as well as the adjacent City Hall and Annex buildings. At the time of the audit the boilers were open awaiting yearly state inspection. The boilers were in excellent condition. It should be noted that the entire steam distribution system in all three buildings was in excellent shape. It would be difficult to find system losses while the system is not operational, however the system appeared to be well maintained and any significant system losses would not be expected.

Utility Summary

Electrical and gas bills were not available for the Trinity Building. The total utility cost for water at the Trinity Building in 2010 was $886.48 for the past 12 months.

Utility Bill Analysis For Trinity Building					
Period End	Water Consumption (Gal.)	Water Cost ($)	Water Rate ($/kGal)	HDD	CDD
January-10	0	$ -	$ -	1009	0
February-10	0	$ -	$ -	820	0
March-10	36,000	$ 100.01	$ 2.78	350	15
April-10	36,000	$ 100.01	$ 2.78	39	166
May-10	36,000	$ 100.01	$ 2.78	20	277
June-10	26,500	$ 79.85	$ 3.01	0	623
July-10	26,500	$ 79.85	$ 3.01	0	706
August-10	26,500	$ 79.85	$ 3.01	0	695
September-10	30,750	$ 98.09	$ 3.19	4	353
October-10	30,750	$ 98.09	$ 3.19	66	132
November-10	30,750	$ 98.09	$ 3.19	336	9
December-10	16,500	$ 52.64	$ 3.19	912	0
Totals:	296,250	$ 886.48	$ 2.99		

Table 5 Utility Bill Analysis - Trinity Building

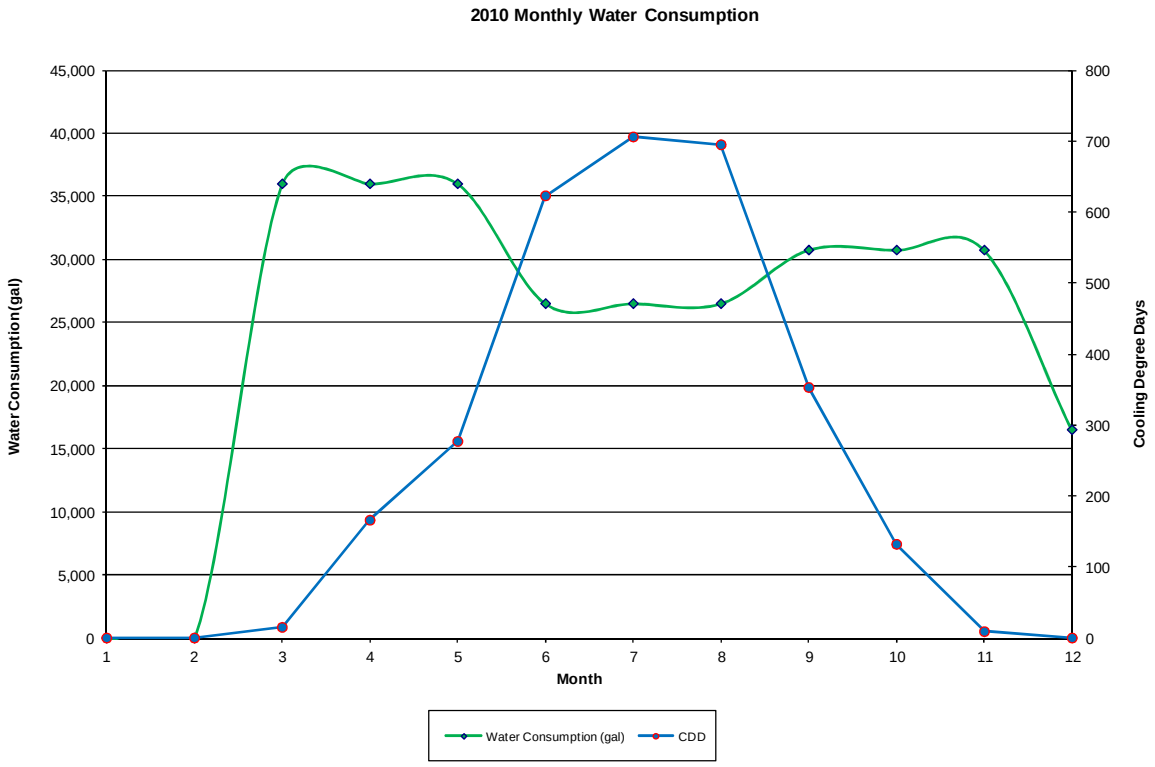

Figure 7 Monthly Water Consumption - Trinity Building

Figure 7 Monthly Water Consumption - Trinity Buildingdetails the water consumption. The water consumption is relatively flat due to no usage of water for HVAC systems. The fluctuations are attributed entirely to building occupancy.

Heman Park Community Center

Building Description

This building is a one story 9,100 square foot facility originally built in 1958. There is one office off the main entry room with the rest of the building divided into two large multi-purpose rooms. Each of which has a kitchen. The building is currently used 8am-5pm Monday through Thursday and as reserved Friday through Sunday. There is one full-time employee and an estimated thirty senior citizens occupying one of the multi-purpose rooms on the day of the audit. There was some uncertainty about the future use of the building as moving the senior citizens to another location.

HVAC Description

The building is conditioned by two packaged units with gas heat located on grade at the rear of the building in a fenced enclosure. There is also one split system to supplement the packaged units cooling capabilities.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	15%
Miscellaneous:	6%
AHU Fans & Pumps:	31%
Cooling:	48%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	89%
Domestic water:	11%
Totals:	100%

The total utility cost for the Heman Park Community Center in 2010 was $19,663.78. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

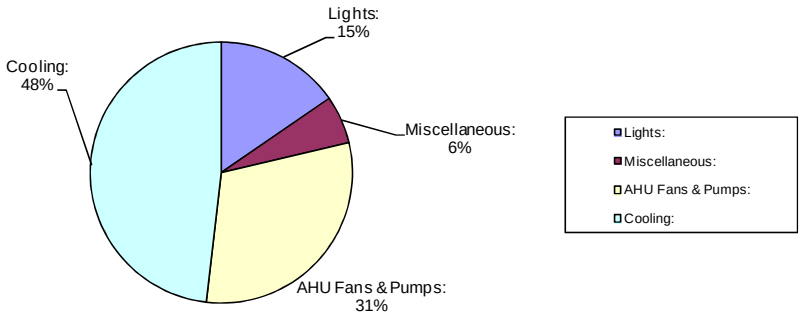

Figure 8 Electrical Usage Breakdown - Heman Park Community Center

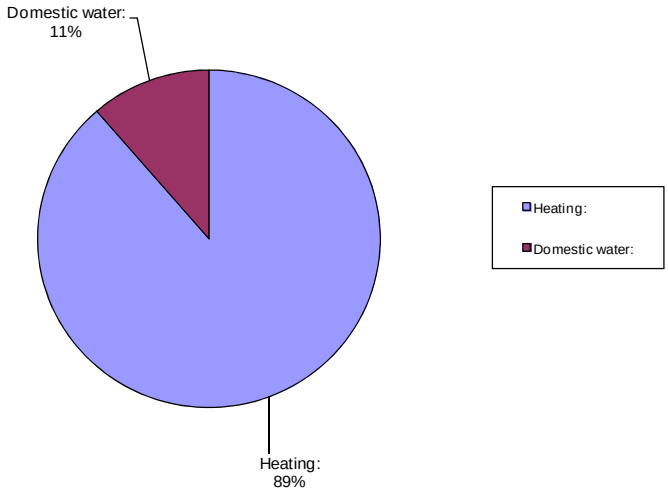

Figure 9 Natural Gas Usage Breakdown - Heman Park Community Center

Utility Bill Analysis For Heman Park Community Center											
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(CCF)	($)	($/ccf)	(Gal.)	($)	$/kGal)		
January-10	9,610	$ 588.13	$ 0.06120	1,682	$ 1,451.85	$ 0.86	16,000	$ 44.45	$ 2.78	1009	0
February-10	10,560	$ 646.27	$ 0.06120	1,343	$ 1,203.49	$ 0.90	16,000	$ 44.45	$ 2.78	820	0
March-10	8,230	$ 503.68	$ 0.06120	813	$ 817.02	$ 1.00	12,750	$ 35.41	$ 2.78	350	15
April-10	10,090	$ 617.51	$ 0.06120	225	$ 287.22	$ 1.28	12,750	$ 35.41	$ 2.78	39	166
May-10	11,240	$ 922.80	$ 0.08210	103	$ 117.95	$ 1.15	12,750	$ 35.41	$ 2.78	20	277
June-10	25,350	$ 2,136.13	$ 0.08427	99	$ 114.62	$ 1.16	20,750	$ 61.92	$ 2.98	0	623
July-10	22,780	$ 2,095.76	$ 0.09200	86	$ 104.30	$ 1.21	20,750	$ 61.92	$ 2.98	0	706
August-10	22,470	$ 2,067.24	$ 0.09200	79	$ 98.67	$ 1.25	20,750	$ 61.92	$ 2.98	0	695
September-10	17,700	$ 1,076.92	$ 0.06084	84	$ 106.58	$ 1.27	19,500	$ 62.21	$ 3.19	4	353
October-10	10,100	$ 748.14	$ 0.07407	134	$ 150.12	$ 1.12	19,500	$ 62.21	$ 3.19	66	132
November-10	8,560	$ 637.16	$ 0.07443	457	$ 571.06	$ 1.25	19,500	$ 62.21	$ 3.19	336	9
December-10	10,230	$ 753.77	$ 0.07368	1,358	$ 1,231.22	$ 0.91	15,250	$ 48.65	$ 3.19	912	0
Totals:	166,920	$ 12,793.51	$ 0.07664	6,463	$ 6,254.10	$ 0.97	206,250	$ 616.17	$ 2.99		

Electric Consumption Rate: $0.07664 /kWh
Natural Gas Consumption Rate: $0.97 /ccf

Annual Cost/Sq.ft - Electricity: $1.406 /sqft
Annual Cost/Sq.ft - Gas.: $0.687 /sqft
Annual Cost/Sq.ft - Total: $2.093 /sqft

Table 6 Utility Bill Analysis - Heman Park Community Center

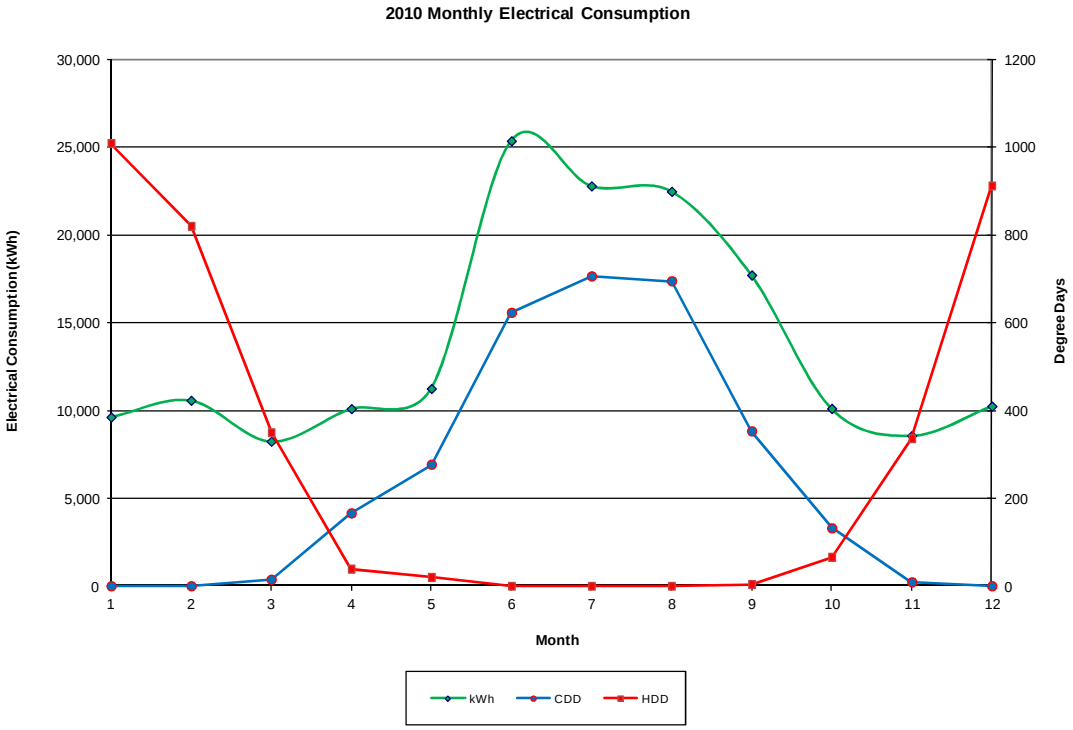

Figure 10 Monthly Electrical Consumption - Heman Park Community Center

Figure 10 Monthly Electrical Consumption - Heman Park Community Center details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This slight discrepancy could be due the timing of the electric billing cycle.

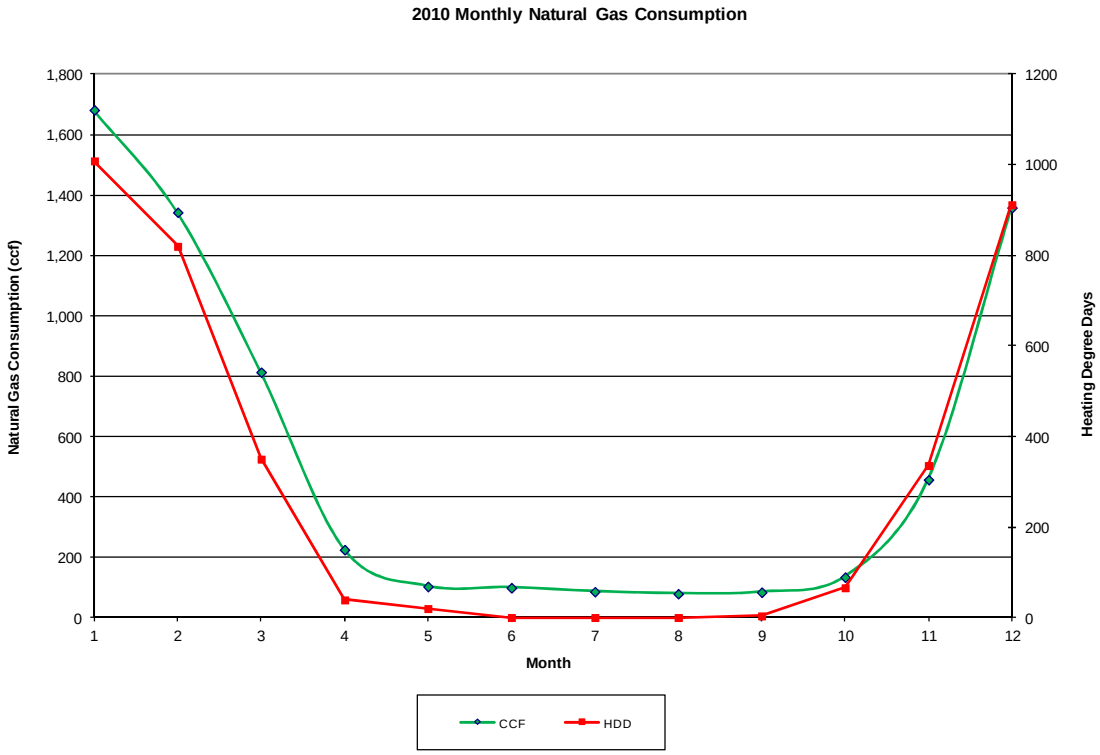

Figure 11 Monthly Natural Gas Consumption - Heman Park Community Center

Figure 11 Monthly Natural Gas Consumption - Heman Park Community Center details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January. The baseline consumption comes from the gas water heater and the pilot lights on the stoves. It is our understanding that the stoves are used very infrequently. Money could be saved if it is feasible to shut off these pilot lights.

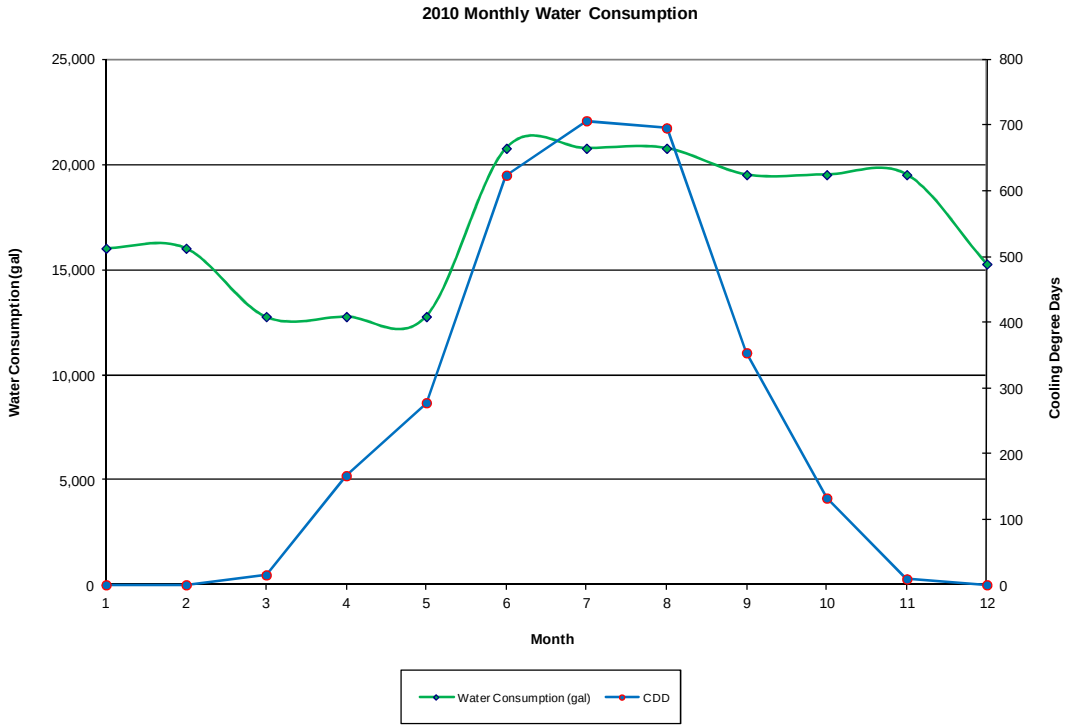

Figure 12 Monthly Water Consumption - Heman Park Community Center

Figure 12 Monthly Water Consumption - Heman Park Community Center details the water consumption. Water Consumption at Heman Park Community Center varies entirely with occupant usage as no water is used for HVAC.

Heman Park Pool

Building Description

This pool facility is 2,800 ft² and was built in 1933. The building consists of equipment rooms for the filtration equipment, a large breezeway, locker room for the lifeguards, and a small office. Outside are two pools, on large main pool and a smaller kiddies' pool. There are approximately ten employees during the swim season which runs from late May to early September and is open from 6am through 8 pm.

HVAC Description

The only conditioned space is the small office. It has one small window air-conditioner.

Utility Summary

Utility Usage Breakdown

Estimated Natural Gas Consumption

Heating:	0%
Domestic water:	100%
Totals:	100%

Overall, the total utility cost for the Heman Park Pool is $473.42 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel. Electric and water bills were not available. It appears that these are combined with the adjacent Centennial Commons.

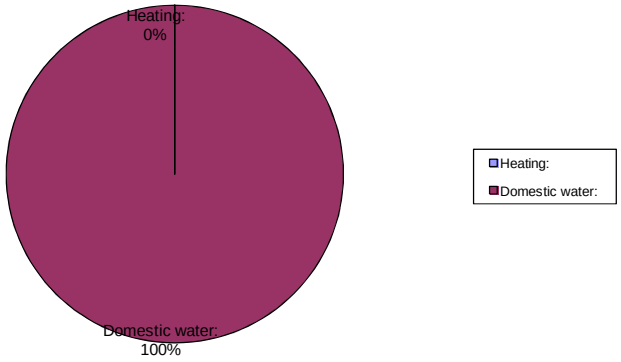

Figure 13 Natural Gas Usage Breakdown - Heman Park Pool

Utility Bill Analysis For Heman Park Pool					
Period End	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	HDD	CDD
	(CCF)	($)	($/ccf)		
January-10	0	$ 21.54	$ -	1009	0
February-10	0	$ 21.54	$ -	820	0
March-10	0	$ 21.54	$ -	350	15
April-10	0	$ 21.81	$ -	39	166
May-10	1	$ 22.79	$ 22.79	20	277
June-10	59	$ 69.32	$ 1.17	0	623
July-10	69	$ 77.27	$ 1.12	0	706
August-10	41	$ 55.14	$ 1.34	0	695
September-10	41	$ 56.78	$ 1.38	4	353
October-10	16	$ 38.39	$ 2.40	66	132
November-10	13	$ 41.80	$ 3.22	336	9
December-10	0	$ 25.50	$ -	912	0
Totals:	240	$ 473.42	$ 1.97		

Natural Gas Consumption Rate:	$	1.97	/ccf
Annual Cost/Sq.ft - Gas.:	$	0.17	/sqft
Annual Cost/Sq.ft - Total:	$	0.17	/sqft

Table 7 Utility Bill Analysis - Heman Park Pool

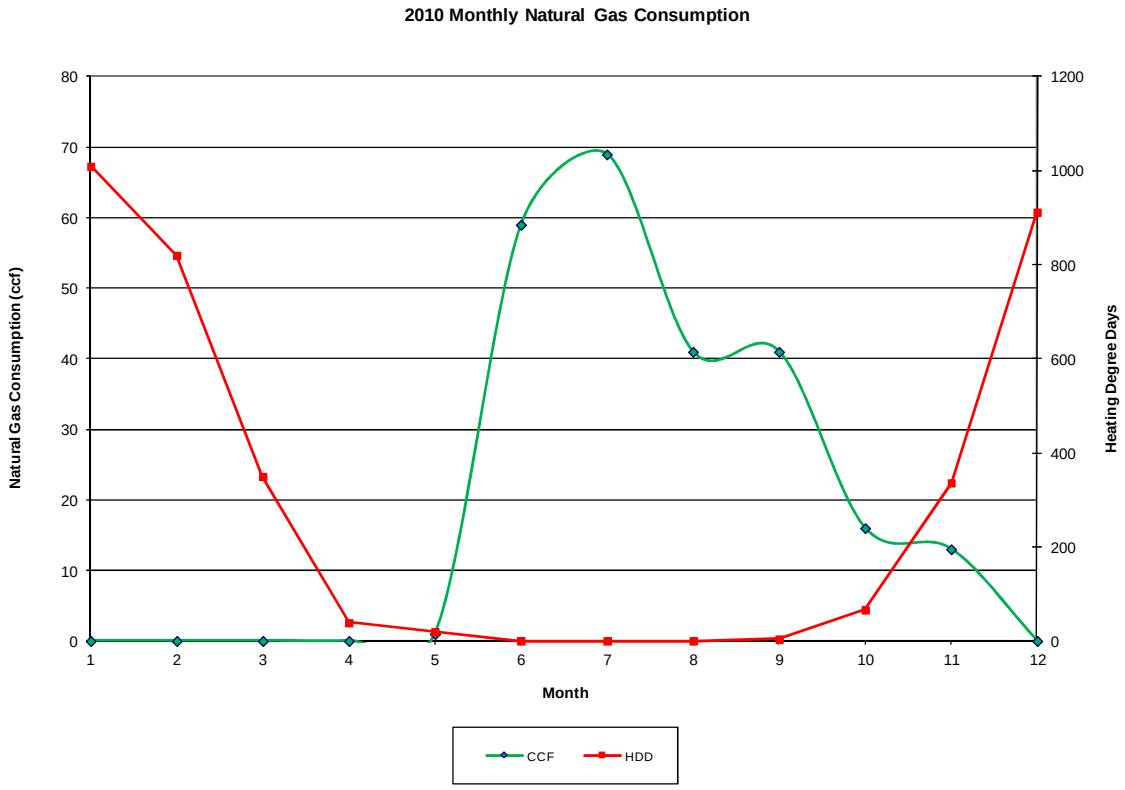

Figure 14 Monthly Natural Gas Consumption - Heman Park Pool

Figure 14 Monthly Natural Gas Consumption - Heman Park Pool details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas usage peaks during the summer when the pool is in use, and drops off in the winter. This is due to hot water usage and the lack of heated space.

Central Garage

Building Description

The Central Garage is the vehicle maintenance facility for city vehicles, is 14,000 ft² and was built in 1970. The main office at the front of the building is approximately 620 ft². There is also an office and break room in the shop that is approximately 460 ft ². The remainder of the building is shop space. There are six full time employees and the operating hours are 6:30am-5pm Monday through Friday and 8am-Noon on Saturday.

HVAC Description

The main office and the office in the shop are conditioned by a 2.5-ton and a 3-ton split systems, respectively. The condensing unit for the main office has been replaced but the indoor unit was not. Staff reported continuing maintenance issues with this unit and the offices it served were being conditioned by window air conditioners. The shop area was heated by both gas fired low-intensity infrared heaters and gas fired unit heaters.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	40%
Miscellaneous:	37%
AHU Fans & Pumps:	5%
Cooling:	18%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	83%
Domestic water:	17%
Totals:	100%

Overall, the total utility cost for the Central Garage is $20,335.03 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

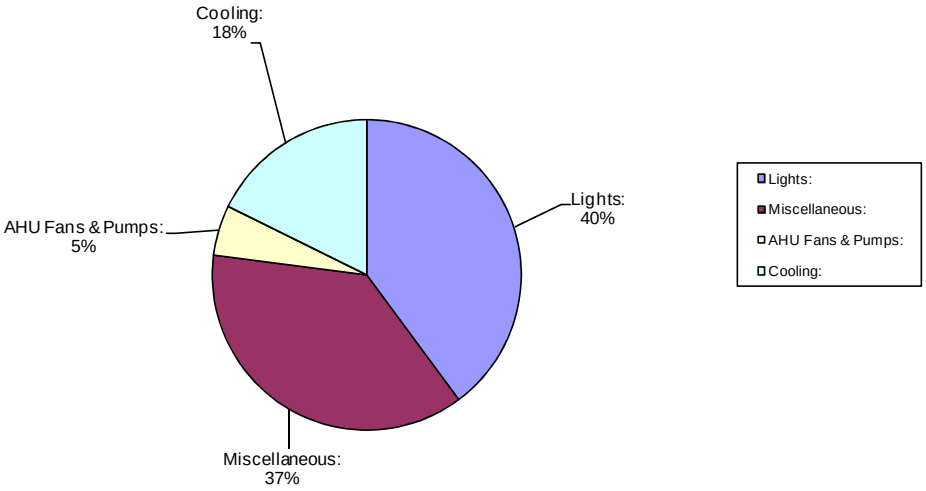

Figure 15 Electrical Usage Breakdown - Central Garage

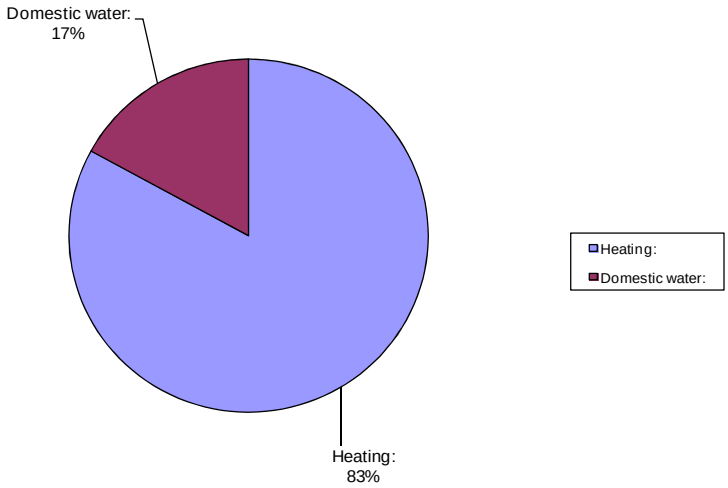

Figure 16 Natural Gas Usage Breakdown - Central Garage

Utility Bill Analysis For Central Garage											
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(CCF)	($)	($/ccf)	(Gal.)	($)			
January-10	5,734	$ 288.50	$ 0.05031	6,048	$ 4,638.71	$ 0.77	14,750	$40.98	$2.78	1009	0
February-10	5,672	$ 286.31	$ 0.05048	5,360	$ 4,132.70	$ 0.77	14,750	$40.98	$2.78	820	0
March-10	3,472	$ 208.43	$ 0.06003	3,677	$ 2,905.41	$ 0.79	15,000	$41.67	$2.78	350	15
April-10	2,518	$ 170.81	$ 0.06784	893	$ 878.30	$ 0.98	15,000	$41.67	$2.78	39	166
May-10	2,050	$ 185.02	$ 0.09025	77	$ 97.08	$ 1.26	15,000	$41.67	$2.78	20	277
June-10	2,913	$ 262.59	$ 0.09014	23	$ 53.51	$ 2.33	14,750	$44.01	$2.98	0	623
July-10	2,804	$ 276.58	$ 0.09864	19	$ 50.33	$ 2.65	14,750	$44.01	$2.98	0	706
August-10	2,744	$ 271.06	$ 0.09878	17	$ 48.75	$ 2.87	14,750	$44.01	$2.98	0	695
September-10	2,780	$ 201.72	$ 0.07256	20	$ 54.18	$ 2.71	15,500	$49.45	$3.19	4	353
October-10	2,520	$ 191.42	$ 0.07596	25	$ 60.95	$ 2.44	15,500	$49.45	$3.19	66	132
November-10	3,180	$ 217.56	$ 0.06842	503	$ 619.72	$ 1.23	15,500	$49.45	$3.19	336	9
December-10	5,360	$ 303.88	$ 0.05669	4,361	$ 3,392.32	$ 0.78	16,250	$51.84	$3.19	912	0
Totals:	41,747	$ 2,863.88	$ 0.06860	21,023	$ 16,931.96	$ 0.81	181,500	$539.19	$2.97		

Electric Consumption Rate: $0.06860 /kWh
Natural Gas Consumption Rate $0.81 /ccf

Annual Cost/Sq.ft - Electricity: $0.205 /sqft
Annual Cost/Sq.ft - Gas.: $1.209 /sqft
Annual Cost/Sq.ft - Total: $1.414 /sqft

Table 8 Utility Bill Analysis - Central Garage

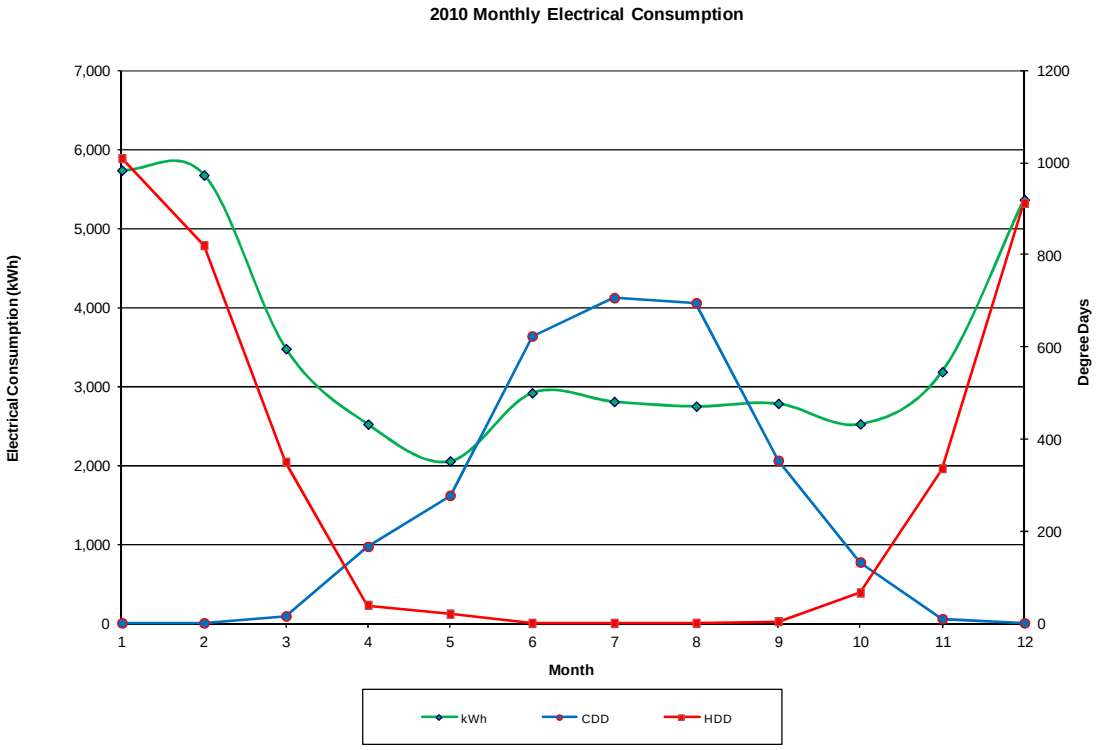

Figure 17 Monthly Electrical Consumption - Central Garage

Figure 17 Monthly Electrical Consumption - Central Garage details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This slight discrepancy could be due the timing of the electric billing cycle.

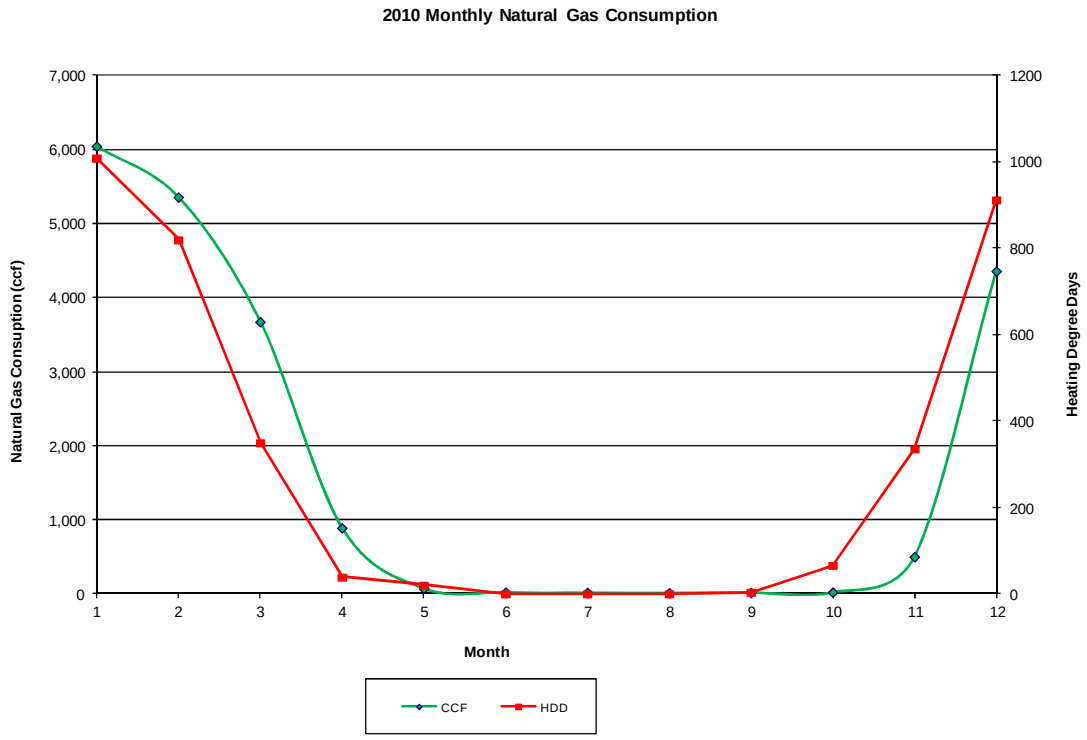

Figure 18 Monthly Natural Gas Consumption - Central Garage

Figure 18 Monthly Natural Gas Consumption - Central Garage details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

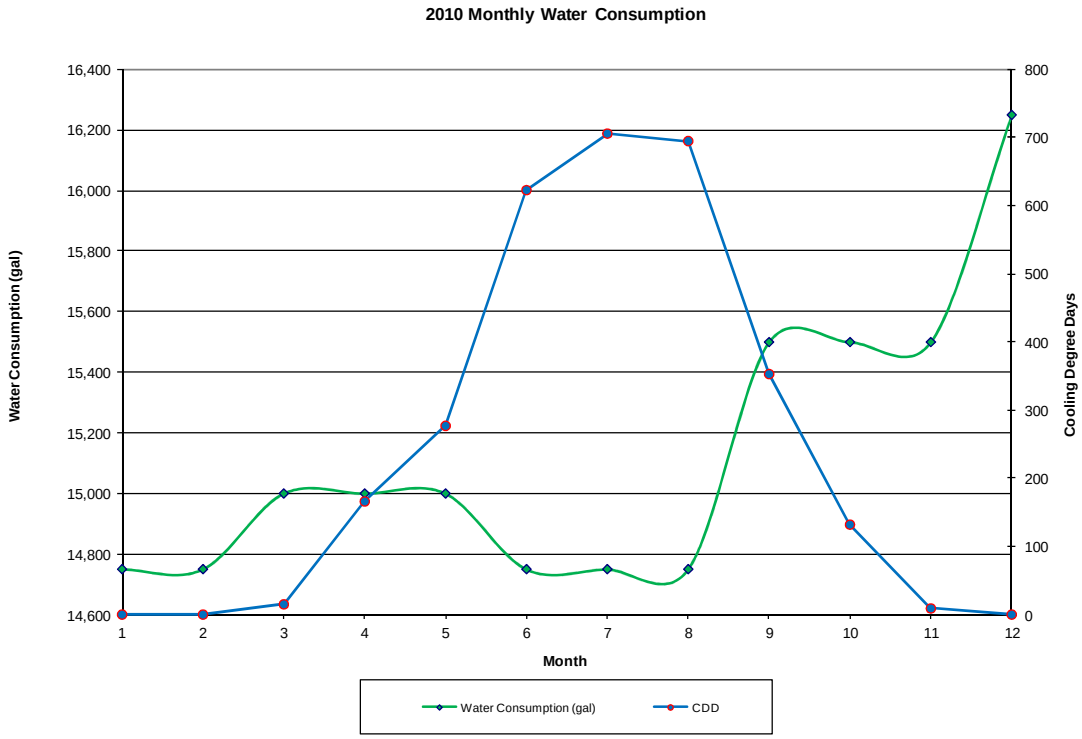

Figure 19 Monthly Water Consumption - Central Garage

Figure 19 Monthly Water Consumption - Central Garage details the water consumption. Water is not used for the Central Garage HVAC. Usage fluctuations is based solely on occupant usage.

Heman Park Tennis court, Restroom, and Pavilion

Building Description

This recreation area has approximately 850 ft² of covered facilities with no conditioned spaces. Staff noted that a renovation had been completed recently and any renovations to the tennis courts would likely draw complaints from the users. It was decided by public works staff that an audit of this facility was unnecessary.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	100%
Miscellaneous:	0%
AHU Fans & Pumps:	0%
Cooling:	0%
Totals:	100%

Overall, the total utility cost for the Heman Park Tennis Court, Restroom and Pavilion is $2,510.50 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

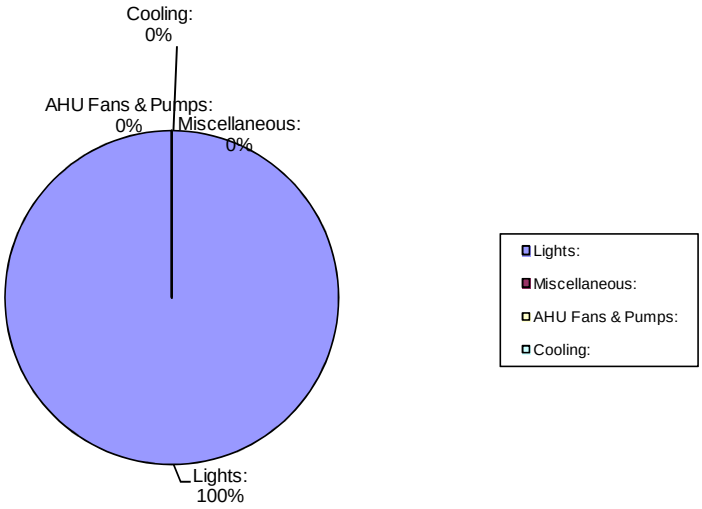

Figure 20 Electricity Usage Breakdown - Heman Park Tennis Court, Restroom and Pavilion

Utility Bill Analysis For Heman Park Tennis Court, Restroom, and Pavilion					
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	HDD	CDD
	(kWh)	($)	($/kWh)		
January-10	1,300	$ 87.59	$ 0.06738	1009	0
February-10	521	$ 39.92	$ 0.07662	820	0
March-10	2,714	$ 174.13	$ 0.06416	350	15
April-10	3,183	$ 193.59	$ 0.06082	39	166
May-10	2,269	$ 146.89	$ 0.06474	20	277
June-10	3,369	$ 284.62	$ 0.08448	0	623
July-10	3,018	$ 281.79	$ 0.09337	0	706
August-10	3,388	$ 321.03	$ 0.09476	0	695
September-10	3,729	$ 352.40	$ 0.09450	4	353
October-10	3,864	$ 228.14	$ 0.05904	66	132
November-10	3,884	$ 228.93	$ 0.05894	336	9
December-10	2,433	$ 171.47	$ 0.07048	912	0
Totals:	33,672	$ 2,510.50	$ 0.07456		

Electric Consumption Rate: $0.07456 /kWh

Annual Cost/Sq.ft - Electricity: $2.954 /sqft
Annual Cost/Sq.ft - Total: $2.954 /sqft

Table 9 Utility Bill Analysis - Heman Park Tennis Court, Restroom and Pavilion

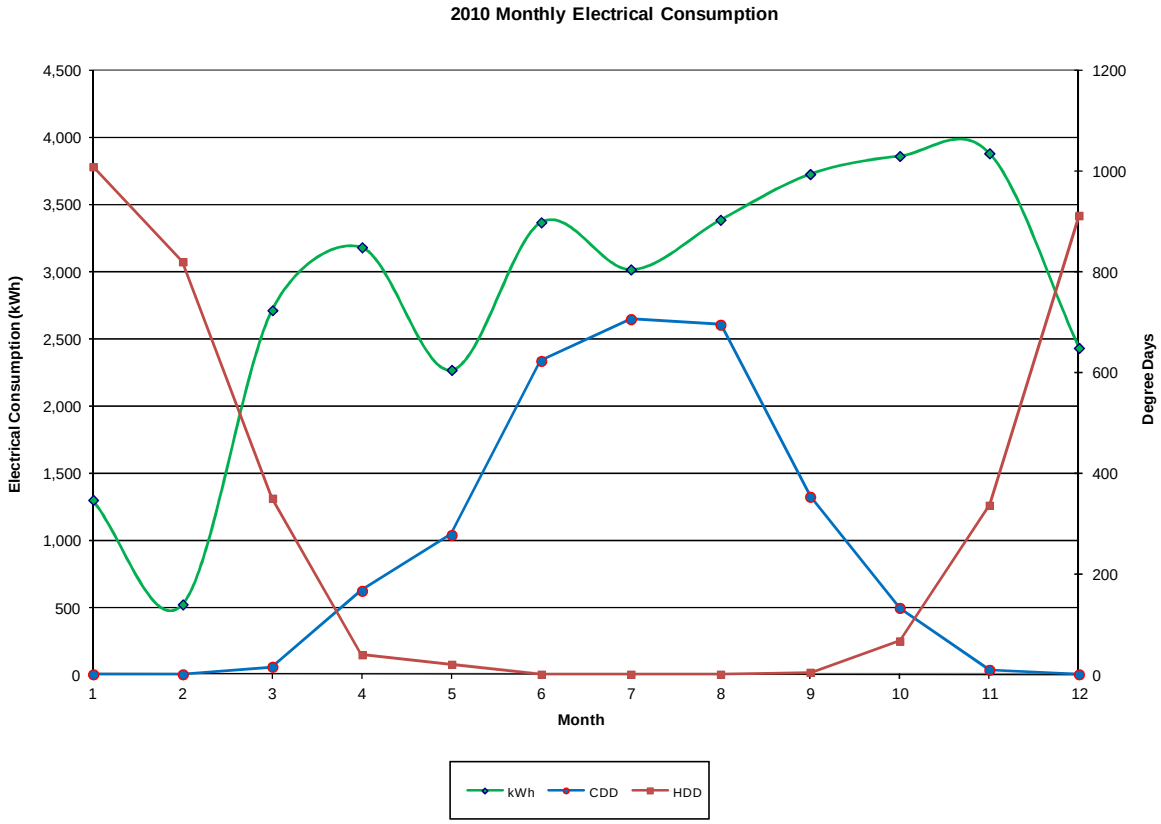

Figure 21 Monthly Electrical Consumption - Heman Park Tennis Court, Restroom and Pavilion

Figure 21 Monthly Electrical Consumption - Heman Park Tennis Court, Restroom and Pavilion details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. This buildings is not conditioned. All electrical use is lighting and will vary with the lighting usage.

Transfer Station and MRF

Building Description

The Transfer Station is a 9,600 ft² facility built in 1969 to transfer garbage from the route trucks to larger trucks for delivery to the landfill. The building also has a recyclables sorting machine that is no longer in use. There is also open space where other miscellaneous work is performed. There are eleven full time employees and the operating hours are 6:30am-5pm Monday through Friday and 8am-Noon on Saturday.

HVAC Description

The majority of this facility is heated only. This is provided by a 900 MBH direct fired unit. There is also a small office/break room that appears to be unoccupied that is conditioned by a PTAC unit that is inoperable. The MRF is a small shack there the route trucks unload that is conditioned by a small window unit and heated by a small electric wall heater.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	44%
Miscellaneous:	29%
AHU Fans & Pumps:	27%
Cooling:	0%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	100%
Domestic water:	0%
Totals:	100%

Overall, the total utility cost for the Transfer Station and MRF is $4,385.35 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

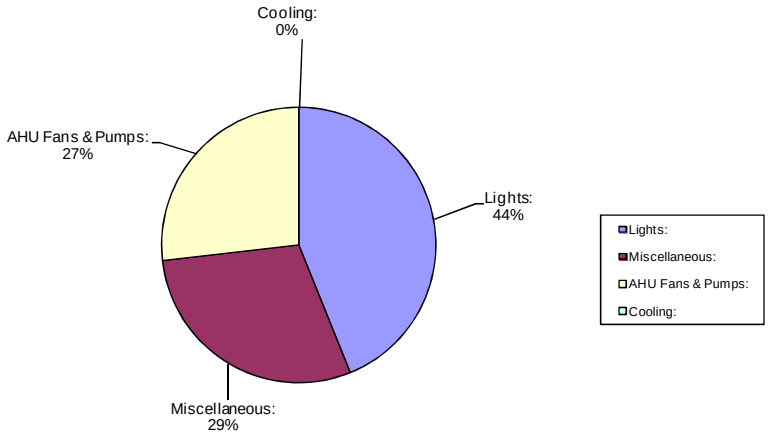

Figure 22 Electricity Usage Breakdown - Transfer Station and MRF

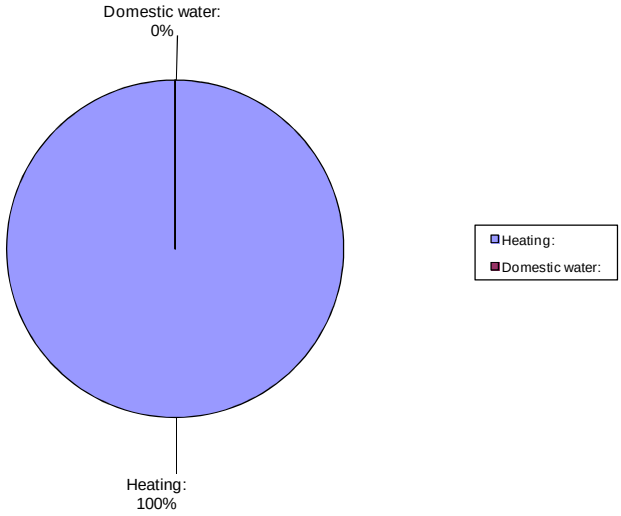

Figure 23 Natural Gas Usage Breakdown - Transfer Station and MRF

Utility Bill Analysis For Transfer Station & MRF											
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(CCF)	($)	($/ccf)	(Gal.)	($)			
January-10	934	$ 65.19	$ 0.06980	1,091	$ 829.49	$ 0.76	4,250	$ 11.81	$2.78	1009	0
February-10	937	$ 65.37	$ 0.06977	988	$ 755.25	$ 0.76	4,250	$ 11.81	$2.78	820	0
March-10	660	$ 48.42	$ 0.07336	611	$ 486.12	$ 0.80	4,250	$ 11.81	$2.78	350	15
April-10	589	$ 44.08	$ 0.07484	87	$ 112.65	$ 1.29	4,250	$ 11.81	$2.78	39	166
May-10	532	$ 51.71	$ 0.09720	27	$ 43.83	$ 1.62	4,250	$ 11.81	$2.78	20	277
June-10	845	$ 79.51	$ 0.09409	7	$ 27.65	$ 3.95	4,250	$ 12.68	$2.98	0	623
July-10	784	$ 81.46	$ 0.10390	8	$ 28.45	$ 3.56	4,250	$ 12.68	$2.98	0	706
August-10	740	$ 77.41	$ 0.10461	7	$ 27.65	$ 3.95	4,250	$ 12.68	$2.98	0	695
September-10	718	$ 58.58	$ 0.08159	7	$ 29.50	$ 4.21	5,250	$ 16.75	$3.19	4	353
October-10	627	$ 52.34	$ 0.08348	13	$ 35.94	$ 2.76	5,250	$ 16.75	$3.19	66	132
November-10	771	$ 62.22	$ 0.08070	480	$ 393.88	$ 0.82	5,250	$ 16.75	$3.19	336	9
December-10	938	$ 73.68	$ 0.07855	899	$ 685.30	$ 0.76	7,000	$ 22.33	$3.19	912	0
Totals:	9,075	$ 759.97	$ 0.08374	4,225	$ 3,455.71	$ 0.82	56,750	$169.67	$2.99		

Electric Consumption Rate: $0.08374 /kWh
Natural Gas Consumption Rate: $0.82 /ccf

Annual Cost/Sq.ft - Electricity: $0.079 /sqft
Annual Cost/Sq.ft - Gas.: $0.360 /sqft
Annual Cost/Sq.ft - Total: $0.439 /sqft

Table 10 Utility Bill Analysis - Transfer Station and MRF

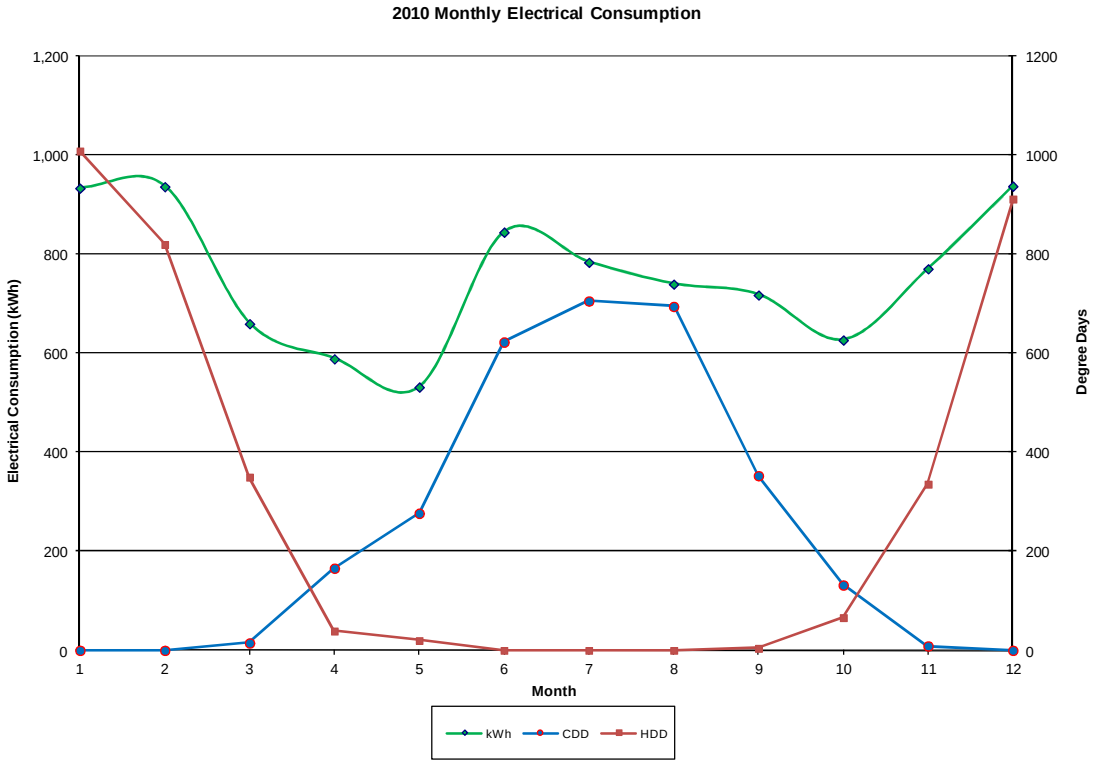

Figure 24 Monthly Electrical Consumption - Transfer Station and MRF

Figure 24 Monthly Electrical Consumption - Transfer Station and MRF details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in February due to some electric heat, increased light usage due to shorter daylight hours, and the lack of cooling.

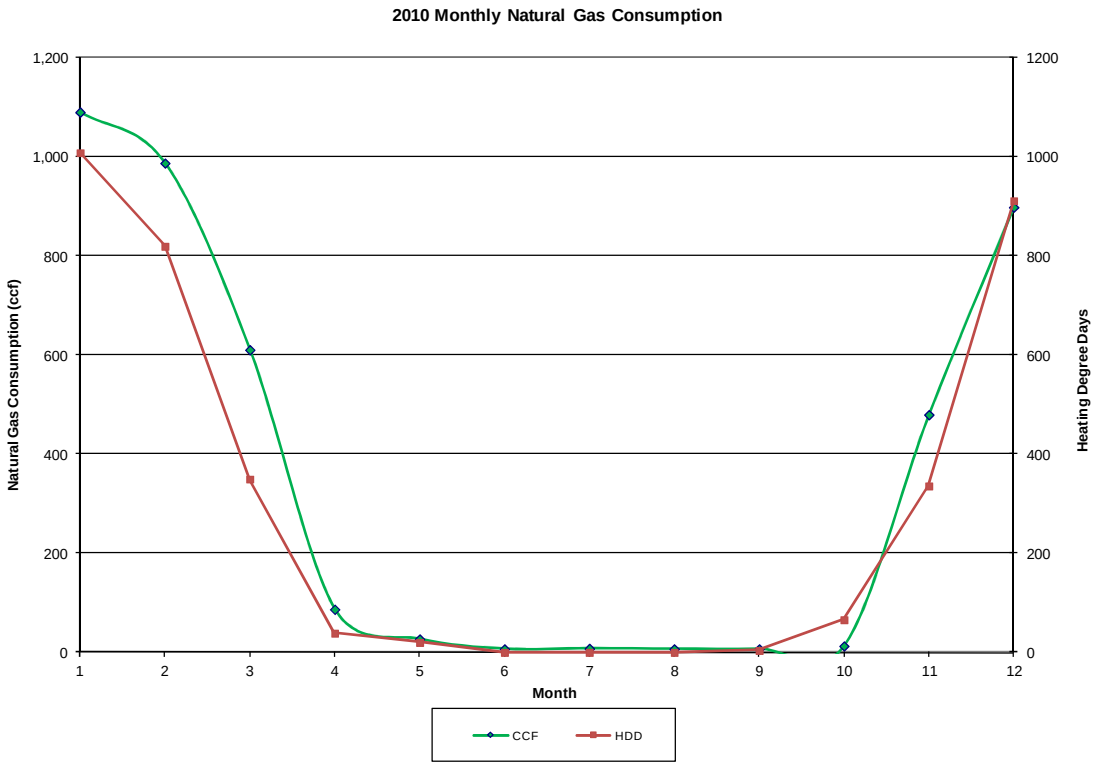

Figure 25 Monthly Gas Consumption - Transfer Station and MRF

Figure 25 Monthly Gas Consumption - Transfer Station and MRF details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

Public Works Sign Shop

Building Description

This building is 1,900 ft² and was built in 1970. It is set up to produce signage. There is one full time employee and the official operating hours are 6:30am-5pm Monday through Friday and 8am-Noon on Saturday. The building was unoccupied during the site visit and staff noted that the occupancy varies.

HVAC Description

The sign shop is heated only by two gas fired unit heaters. The window air conditioner was not connected to a power supply.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	42%
Miscellaneous:	47%
AHU Fans & Pumps:	11%
Cooling:	0%
Totals:	100%

Natural gas consumption data was not available for the Public Works Sign Shop.

Overall, the total utility cost for the Public Works Sign Shop is $8,202.82 for the past 12 months, excluding gas and water usage. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

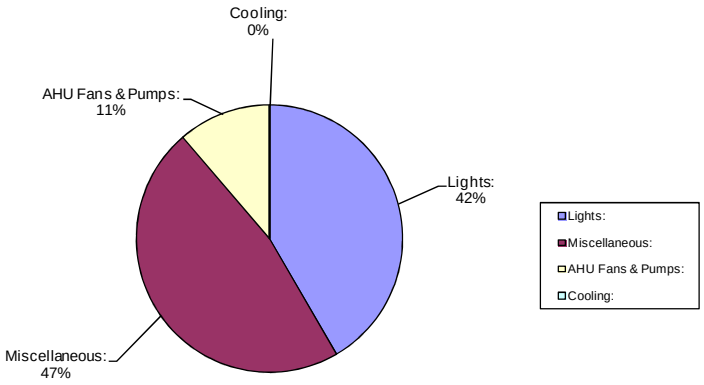

Figure 26 Electricity Usage Breakdown - Public Works Sign Shop

Utility Bill Analysis For Public Works Sign Shop					
Period End	Electricity Consumption (kWh)	Electricity Cost ($)	Electricity Consumption Rate ($/kWh)	HDD	CDD
January-10	8,819	$ 530.22	$ 0.06012	1009	0
February-10	8,507	$ 519.17	$ 0.06103	820	0
March-10	7,908	$ 497.97	$ 0.06297	350	15
April-10	7,508	$ 476.20	$ 0.06343	39	166
May-10	7,818	$ 658.57	$ 0.08424	20	277
June-10	11,685	$ 1,001.76	$ 0.08573	0	623
July-10	12,080	$ 1,129.97	$ 0.09354	0	706
August-10	11,547	$ 1,080.93	$ 0.09361	0	695
September-10	9,940	$ 629.97	$ 0.06338	4	353
October-10	7,405	$ 526.59	$ 0.07111	66	132
November-10	8,283	$ 564.35	$ 0.06813	336	9
December-10	8,858	$ 587.12	$ 0.06628	912	0
Totals:	110,358	$ 8,202.82	$ 0.07433		

Electric Consumption Rate: $0.07433 /kWh

Annual Cost/Sq.ft - Electricity: $4.317 /sqft
Annual Cost/Sq.ft - Total: $4.317 /sqft

Table 11 Utility Bill Analysis - Public Works Sign Shop

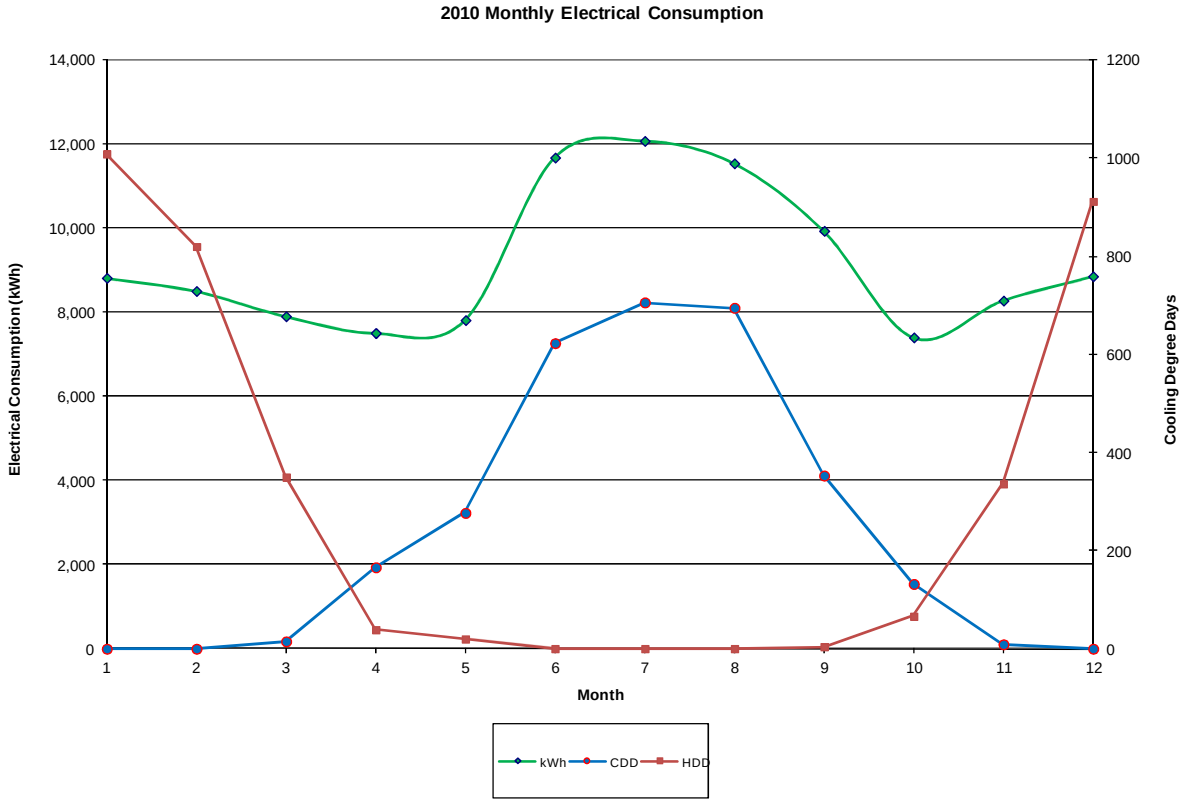

Figure 27 Monthly Electrical Consumption - Public Works Sign Shop

Figure 27 Monthly Electrical Consumption - Public Works Sign Shop details the electric consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption and the cooling degree days peak in July.

Park Maintenance Facility

Building Description

This building is a 6,300 ft² building built in 1970. The majority of the facility is a workshop and storage area with a 285 ft² office. There are two full time employees and the operating hours are 6:30am-5pm Monday through Friday and 8am-Noon on Saturday. However the occupancy varies depending on how many of the crew has come in from the field. During the site visit there were approximately 10 employees.

HVAC Description

The shop area of the building is heated only by four gas fired unit heaters and one gas fired furnace. The office is cooled by a window air conditioner unit.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	48%
Miscellaneous:	42%
AHU Fans & Pumps:	7%
Cooling:	4%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	88%
Domestic water:	12%
Totals:	100%

Overall, the total utility cost for the Park Maintenance Facility is $5,230.31 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

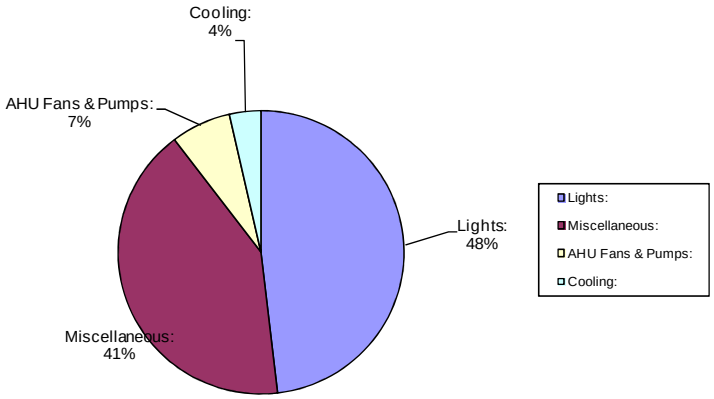

Figure 28 Electricity Usage Breakdown - Park Maintenance Facility

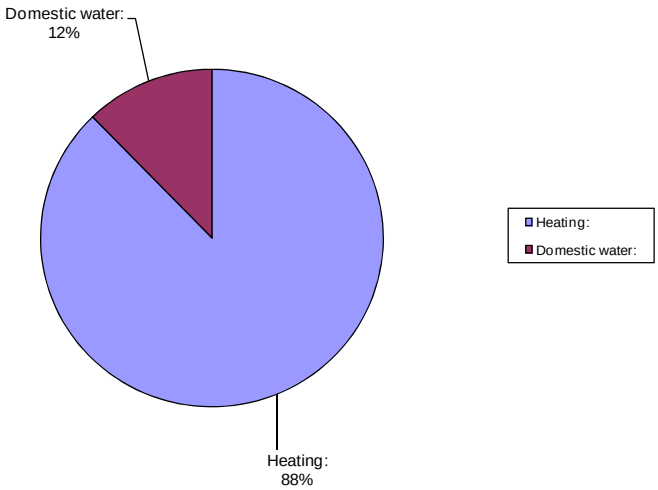

Figure 29 Natural Gas Usage Breakdown - Park Maintenance Facility

Utility Bill Analysis For Park Maintenance Facility											
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(CCF)	($)	($/ccf)	(Gal.)	($)	($/kGal)		
January-10	75	$ 12.62	$ 0.16827	1,419	$ 1,259.00	$ 0.89	4750	$13.20	$2.78	1009	0
February-10	69	$ 12.25	$ 0.17754	1,250	$ 1,135.65	$ 0.91	4750	$13.20	$2.78	820	0
March-10	64	$ 11.95	$ 0.18672	651	$ 698.84	$ 1.07	6000	$16.67	$2.78	350	15
April-10	118	$ 15.25	$ 0.12924	195	$ 253.34	$ 1.30	6000	$16.67	$2.78	39	166
May-10	149	$ 20.26	$ 0.13597	59	$ 82.56	$ 1.40	6000	$16.67	$2.78	20	277
June-10	235	$ 28.11	$ 0.11962	30	$ 59.14	$ 1.97	14000	$41.78	$2.98	0	623
July-10	205	$ 28.19	$ 0.13751	0	$ 35.02	$ -	14000	$41.78	$2.98	0	706
August-10	179	$ 25.80	$ 0.14413	37	$ 64.86	$ 1.75	14000	$41.78	$2.98	0	695
September-10	212	$ 23.87	$ 0.11259	40	$ 70.02	$ 1.75	9500	$30.31	$3.19	4	353
October-10	188	$ 22.23	$ 0.11824	39	$ 72.48	$ 1.86	9500	$30.31	$3.19	66	132
November-10	167	$ 20.79	$ 0.12449	99	$ 155.48	$ 1.57	9500	$30.31	$3.19	336	9
December-10	92	$ 15.64	$ 0.17000	756	$ 799.13	$ 1.06	4750	$15.15	$3.19	912	0
Totals:	1,753	$ 236.96	$ 0.13517	4,575	$ 4,685.52	$ 1.02	102,750	$307.83	$3.00		

Electric Consumption Rate: $ 0.14 /kWh
Natural Gas Consumption Rate: $ 1.02 /ccf

Annual Cost/Sq.ft - Electricity: $0.038 /sqft
Annual Cost/Sq.ft - Gas.: $0.744 /sqft
Annual Cost/Sq.ft - Total: $0.781 /sqft

Table 12 Utility Bill Analysis - Park Maintenance Facility

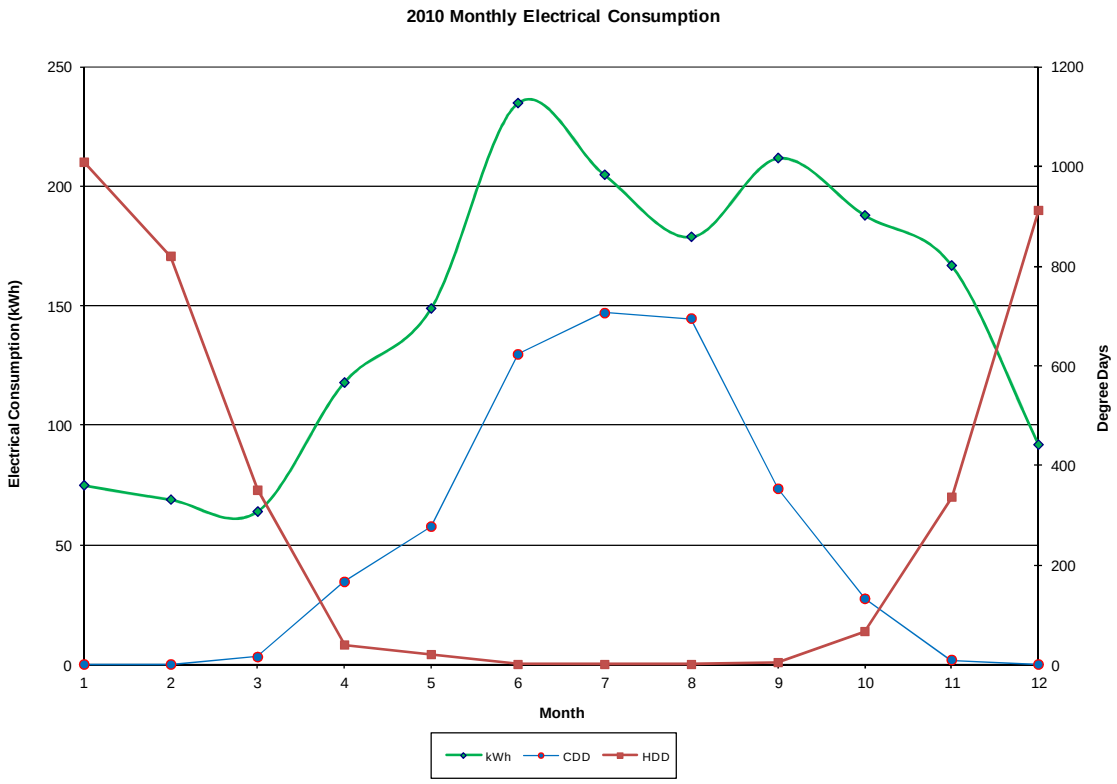

Figure 30 Monthly Electricity Consumption - Park Maintenance Facility

Figure 30 Monthly Electricity Consumption - Park Maintenance Facility details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This discrepancy could be due to the timing of the billing cycle.

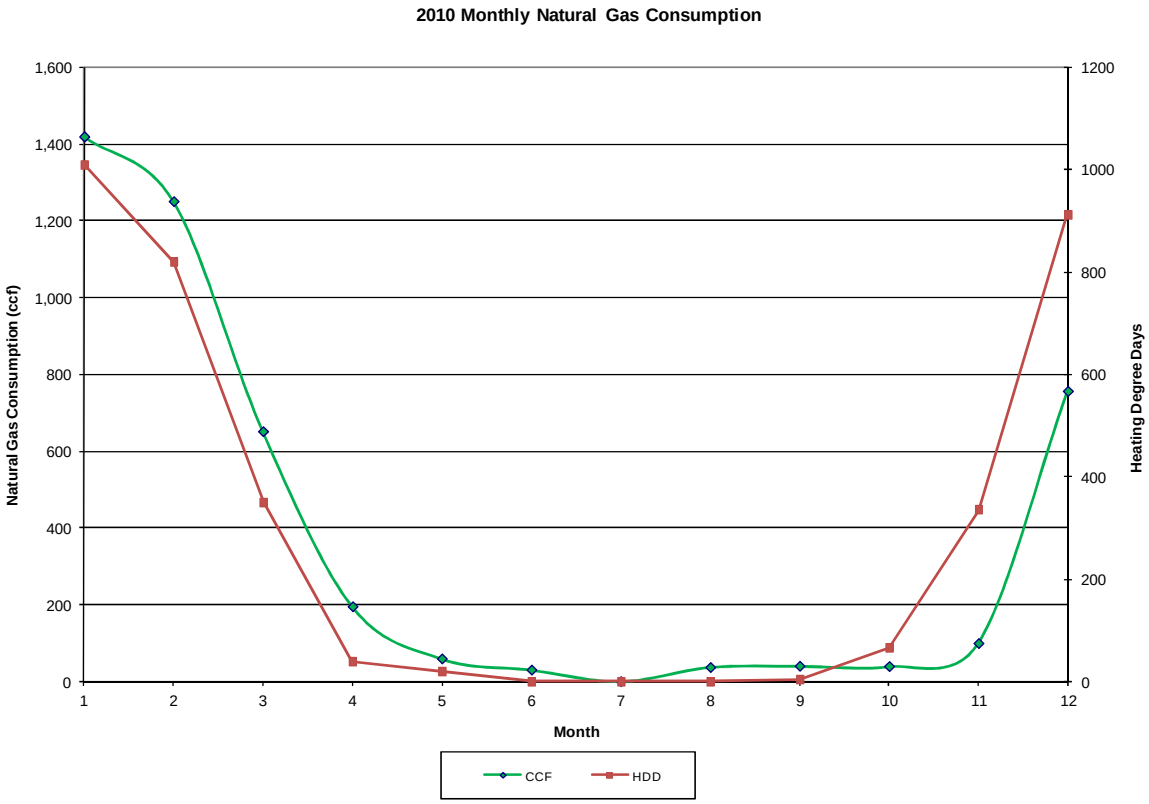

Figure 31 Monthly Natural Gas Consumption - Park Maintenance Facility

Figure 31 Monthly Natural Gas Consumption - Park Maintenance Facility details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

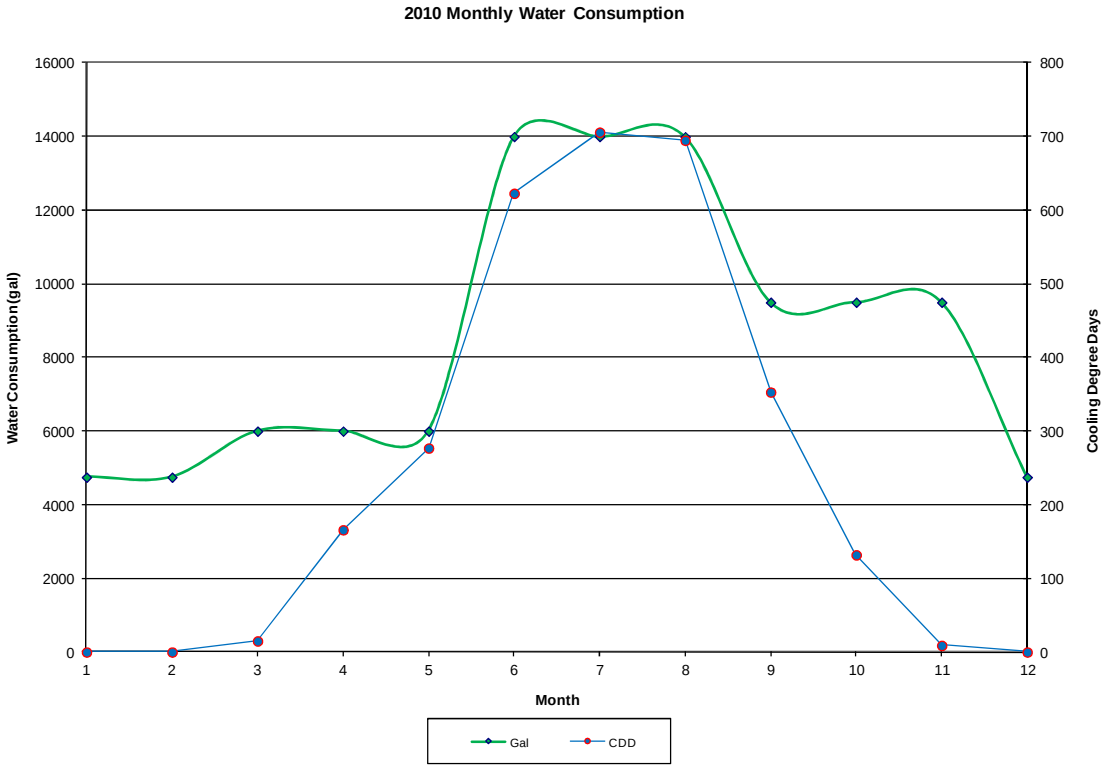

Figure 32 Monthly Water Consumption - Park Maintenance Facility

Figure 32 Monthly Water Consumption - Park Maintenance Facility details the water consumption for the Park Maintenance Facility. Although all water usage is due to occupants there is a corresponding rise in water usage during the hotter months. This is likely due to increased work load during that time of year.

Golf Course

Building Description

The Golf Course consists of three buildings; Club House, Maintenance Facility, and Range Shack. The Club House is a two story facility that is 3,500 ft² and was built in 1935. The basement of the club house is approximately half the size of the ground floor and is mainly a storage and equipment room. The ground floor is divided between the pro shop with a small office and a snack area. There is one full-time employee and the operating hours are 6am-8:30pm seven days a week.

The Golf Range Shack is 850 ft² and was built in 2009. Its only function is to house the ball dispensing machine for the driving range. This building in not occupied except to service the machine.

The Golf Maintenance Facility is 1,600 ft² and was built in 1960. There is a small office located in this building with the remainder of being a storage and workshop for the maintenance equipment.

HVAC Description

The Club House is served by two split systems. One 2.5-ton and one 5-ton. Both are less than five years old and in good condition. The Range Shack is not conditioned. The office in the Maintenance Facility is conditioned with a window air conditioner. A portion of the building is unconditioned storage while the shop is heated only by a 100-MBH gas fired unit heater.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	17%
Miscellaneous:	37%
AHU Fans & Pumps:	10%
Cooling:	36%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	34%
Domestic water:	66%
Totals:	100%

Overall, the total utility cost for the Golf Course is $18,461.40 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

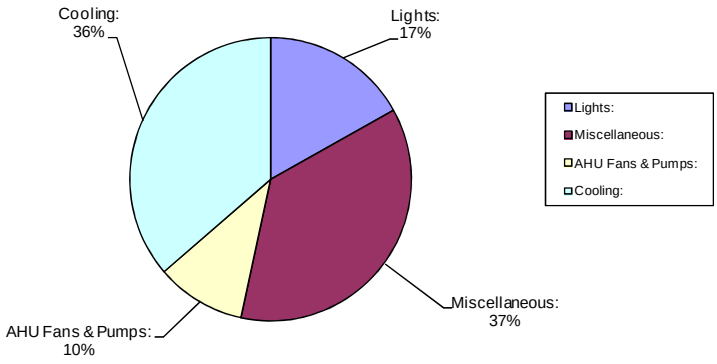

Figure 33 Electricity Usage Breakdown - Golf Course

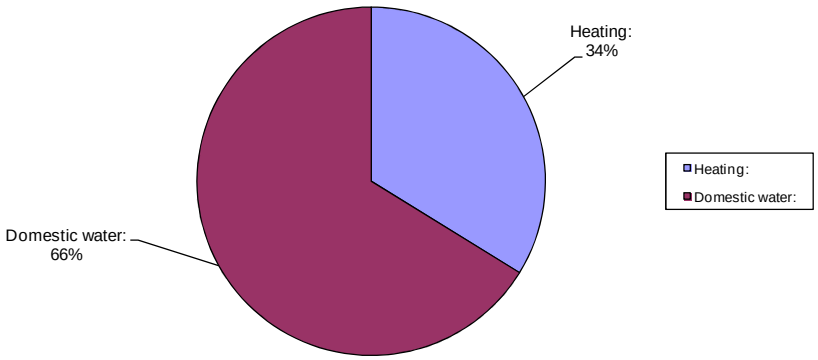

Figure 34 Natural Gas Consumption - Golf Course

Utility Bill Analysis For the Golf Course											
Period End	Electricity Consumption (kWh)	Electricity Cost ($)	Electricity Consumption Rate ($/kWh)	Natural Gas Consumption (CCF)	Natural Gas Cost ($)	Gas Consumption Rate ($/ccf)	Water Consumption (Gal.)	Water Cost ($)	Water Rate ($/kGal)	HDD	CDD
January-10	3,960	$ 258.42	$ 0.06526	758	$ 641.59	$ 0.85	5,250	$ 14.58	$ 2.78	1009	0
February-10	3,684	$ 241.52	$ 0.06556	575	$ 510.45	$ 0.89	5,250	$ 14.58	$ 2.78	820	0
March-10	3,713	$ 243.29	$ 0.06552	381	$ 371.96	$ 0.98	139,750	$ 388.22	$ 2.78	350	15
April-10	4,344	$ 268.46	$ 0.06180	109	$ 172.94	$ 1.59	139,750	$ 388.22	$ 2.78	39	166
May-10	4,632	$ 381.28	$ 0.08231	42	$ 77.94	$ 1.86	139,750	$ 388.22	$ 2.78	20	277
June-10	8,071	$ 696.38	$ 0.08628	38	$ 74.66	$ 1.96	254,750	$ 762.51	$ 2.99	0	623
July-10	7,929	$ 745.91	$ 0.09407	32	$ 69.88	$ 2.18	254,750	$ 762.51	$ 2.99	0	706
August-10	6,649	$ 630.37	$ 0.09481	22	$ 61.83	$ 2.81	254,750	$ 762.51	$ 2.99	0	695
September-10	5,433	$ 378.95	$ 0.06975	24	$ 67.08	$ 2.80	791,000	$ 2,523.29	$ 3.19	4	353
October-10	3,798	$ 279.20	$ 0.07351	28	$ 73.54	$ 2.63	791,000	$ 2,523.29	$ 3.19	66	132
November-10	3,589	$ 264.87	$ 0.07380	101	$ 170.92	$ 1.69	791,000	$ 2,523.29	$ 3.19	336	9
December-10	4,053	$ 296.70	$ 0.07321	421	$ 400.94	$ 0.95	9,750	$ 31.10	$ 3.19	912	0
Totals:	59,855	$ 4,685.35	$ 0.07828	2,531	$ 2,693.73	$ 1.06	3,576,750	$11,082.32	$ 3.10		

Electric Consumption Rate: $0.07828 /kWh
Natural Gas Consumption Rate: $1.06 /ccf

Annual Cost/Sq.ft - Electricity: $0.787 /sqft
Annual Cost/Sq.ft - Gas.: $0.453 /sqft
Annual Cost/Sq.ft - Total: $1.240 /sqft

Table 13 Utility Bill Analysis - Golf Course

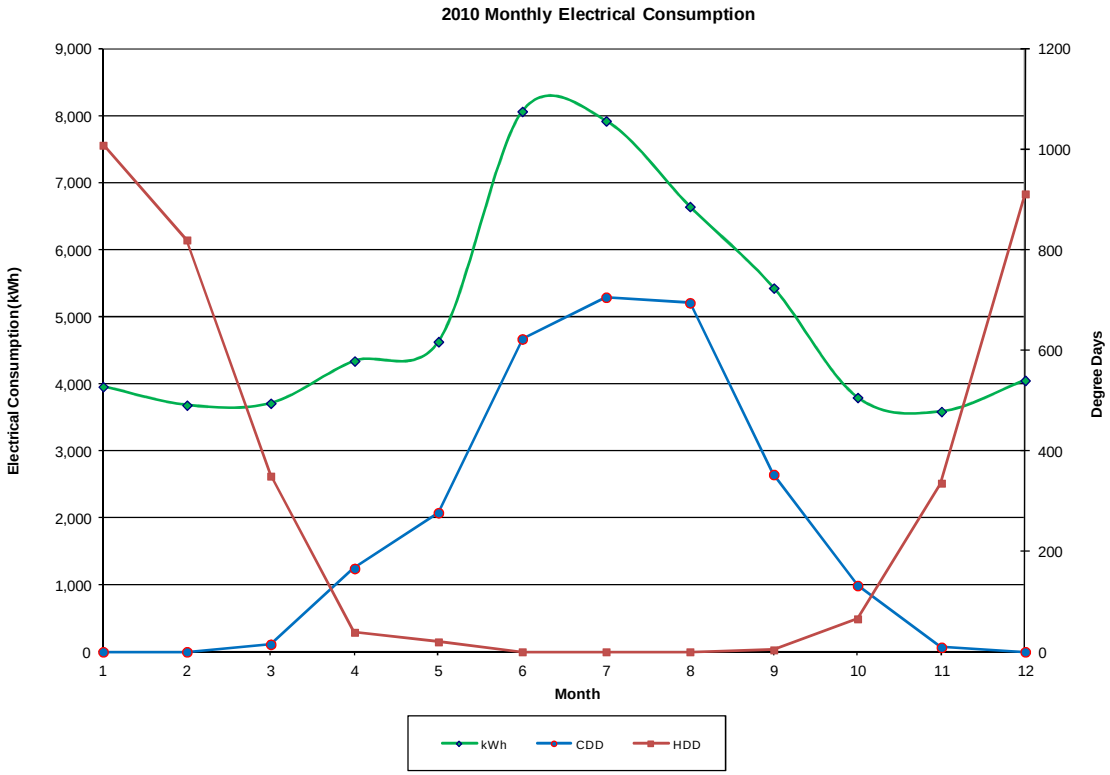

Figure 35 Monthly Electrical Consumption - Golf Course

Figure 35 Monthly Electrical Consumption - Golf Course details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This discrepancy could be due to the timing of the billing cycle.

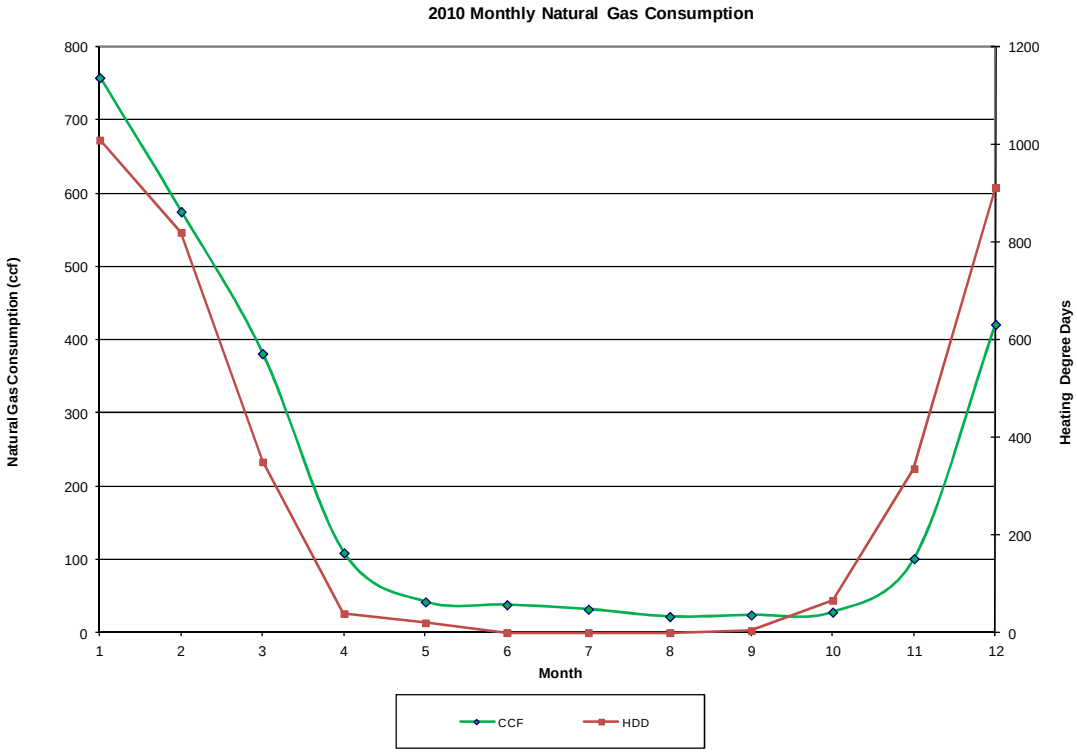

Figure 36 Monthly Natural Gas Consumption - Golf Course

Figure 36 Monthly Natural Gas Consumption - Golf Course details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

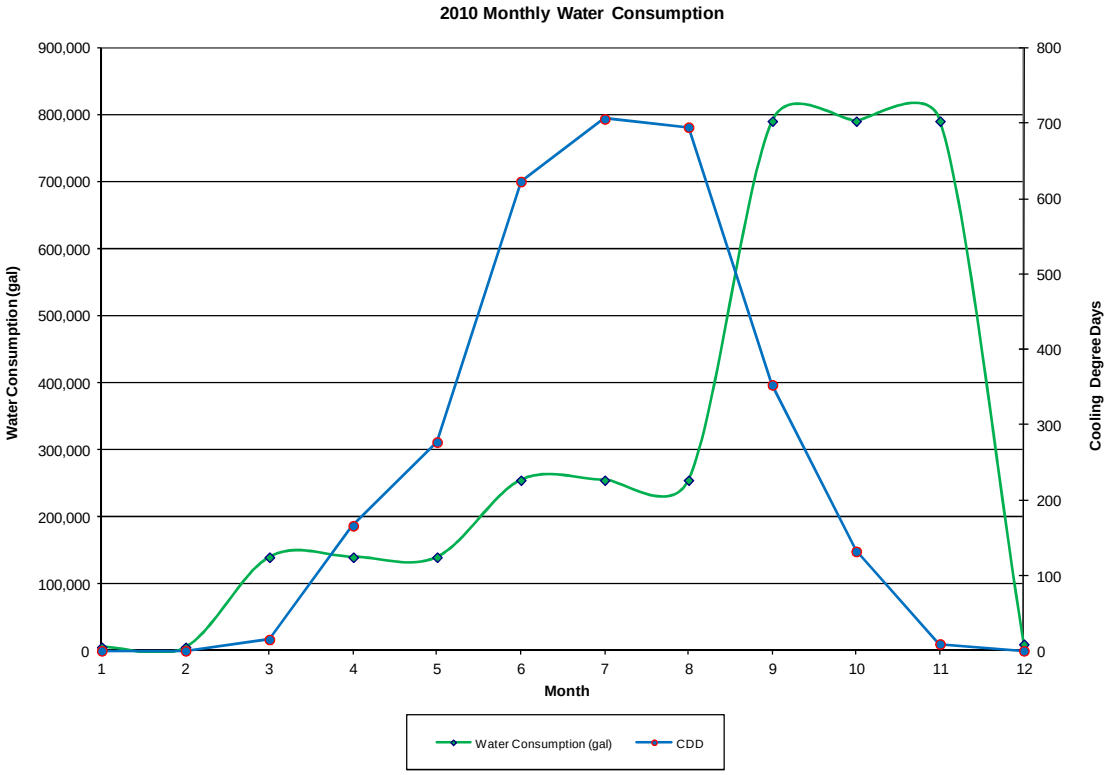

Figure 37 Monthly Water Consumption - Golf Course

Figure 37 Monthly Water Consumption - Golf Course details the water consumption for the Golf Course. Water is not used for HVAC and therefore should not follow the cooling degree days. The peak late in the year is likely due to maintenance or a leak.

Fire Station #2

Building Description

Fire Station #2 is 10,800 ft² was originally built in 1939. It received a major renovation and addition in 2006. On the first floor are the truck bays, kitchen, dining room, and entertainment room. The second floor contains the bunk rooms, exercise room, and a training room. There are sixteen full time employees divided into three shifts and the building is occupied continuously.

HVAC Description

The entire HVAC system was replaced during the 2006 renovation with new high efficiency equipment. The truck bays are heated only by four gas fired unit heaters. The reminder of the building is conditioned by five split systems totaling 23-tons. The units on the second floor were equipped with humidifiers.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	17%
Miscellaneous:	5%
AHU Fans & Pumps:	10%
Cooling:	34%
Heating:	34%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	68%
Domestic water:	32%
Totals:	100%

Overall, the total utility cost for Fire Station #2 is $12,422.62 for the past 12 months. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

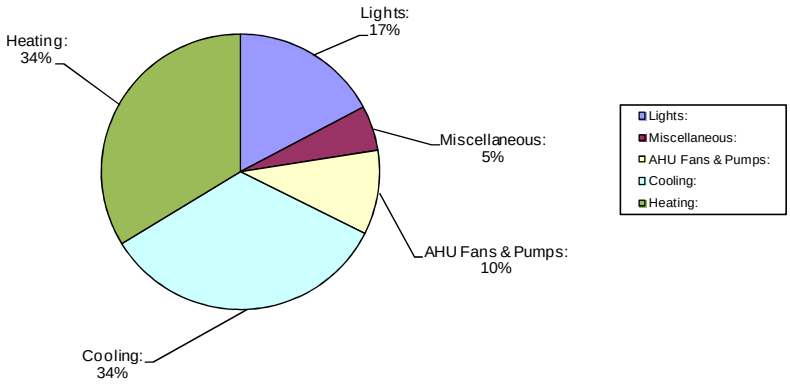

Figure 38 Electricity Usage Breakdown - Fire Station #2

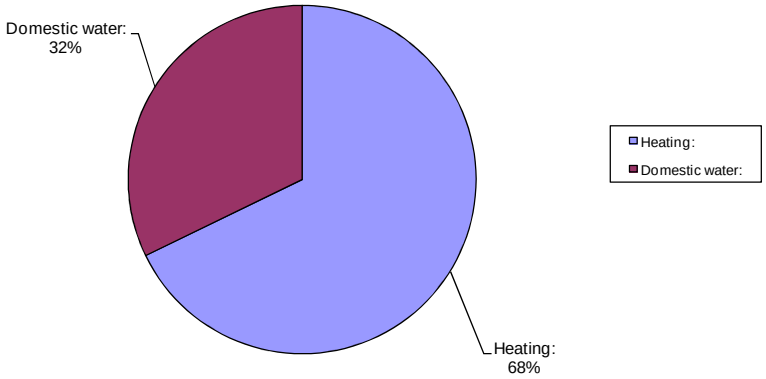

Figure 39 Natural Gas Usage Breakdown - Fire Station #2

Utility Bill Analysis For Fire Station #2											
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(CCF)	($)	($/ccf)	(Gal.)	($)	($/kGal)		
January-10	11,020	$ 624.32	$ 0.05665	1,091	$ 1,020.48	$ 0.94	13,750	$38.20	$2.78	1009	0
February-10	10,330	$ 599.89	$ 0.05807	804	$ 810.44	$ 1.01	13,750	$38.20	$2.78	820	0
March-10	8,350	$ 527.73	$ 0.06320	433	$ 517.78	$ 1.20	15,000	$41.67	$2.78	350	15
April-10	8,990	$ 552.45	$ 0.06145	145	$ 197.30	$ 1.36	15,000	$41.67	$2.78	39	166
May-10	8,330	$ 700.60	$ 0.08411	55	$ 79.31	$ 1.44	15,000	$41.67	$2.78	20	277
June-10	11,670	$ 1,004.17	$ 0.08605	37	$ 64.70	$ 1.75	15,500	$46.25	$2.98	0	623
July-10	11,550	$ 1,081.21	$ 0.09361	36	$ 63.98	$ 1.78	15,500	$46.25	$2.98	0	706
August-10	11,540	$ 1,080.29	$ 0.09361	33	$ 61.61	$ 1.87	15,500	$46.25	$2.98	0	695
September-10	8,620	$ 609.94	$ 0.07076	38	$ 68.82	$ 1.81	14,250	$45.46	$3.19	4	353
October-10	5,800	$ 416.49	$ 0.07181	44	$ 60.86	$ 1.38	14,250	$45.46	$3.19	66	132
November-10	6,470	$ 462.45	$ 0.07148	154	$ 161.83	$ 1.05	14,250	$45.46	$3.19	336	9
December-10	8,610	$ 609.26	$ 0.07076	671	$ 524.71	$ 0.78	14,250	$45.46	$3.19	912	0
Totals:	111,280	$ 8,268.80	$ 0.07431	3,541	$ 3,631.82	$ 1.03	176,000	$522.00	$2.97		

Electric Consumption Rate: $0.07431 /kWh
Natural Gas Consumption Rate: $1.03 /ccf

Annual Cost/Sq.ft - Electricity: $0.766 /sqft
Annual Cost/Sq.ft - Gas.: $0.336 /sqft
Annual Cost/Sq.ft - Total: $1.102 /sqft

Table 14 Utility Bill Analysis - Fire Station #2

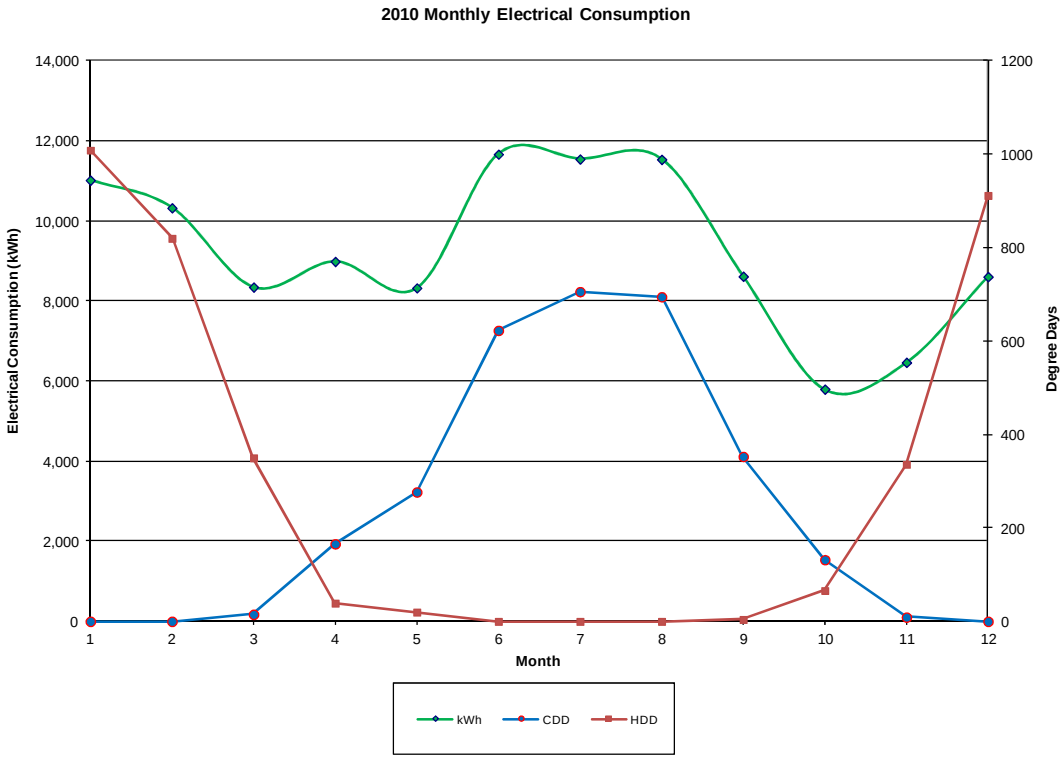

Figure 40 Monthly Electrical Consumption - Fire Station #2

Figure 40 Monthly Electrical Consumption - Fire Station #2 details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks when the CDDs are the highest. There is also a second peak in the winter moths attributed to a portion of the building having electric heat.

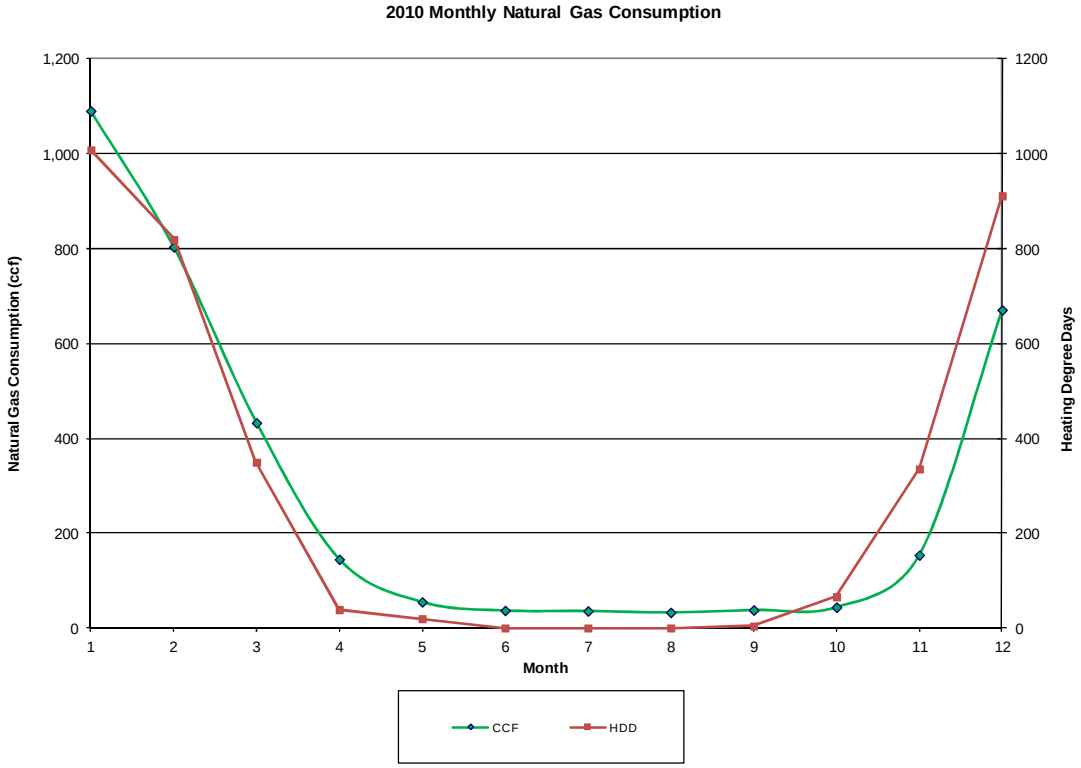

Figure 41 Monthly Natural Gas Consumption - Fire Station #2

Figure 41 Monthly Natural Gas Consumption - Fire Station #2 details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

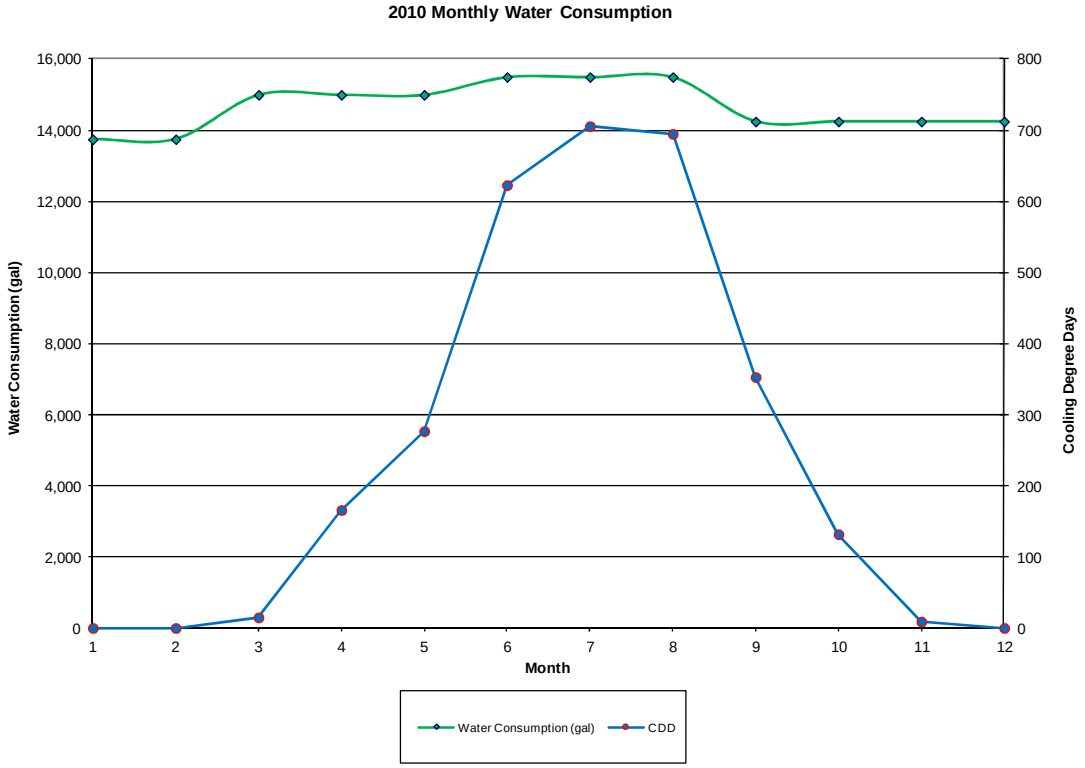

Figure 42 Monthly Water Consumption - Fire Station #2

Figure 42 Monthly Water Consumption - Fire Station #2 details the water consumption for Fire Station #2. There is a slight peak in summer however, water is not used for cooling. The water use increases approximately 10% during the summer. This can be attributed to occupants using more water during the hotter portion of the year.

City Hall

Building Description

City Hall is a six story building of 39,900 ft² originally built in 1903. It was completely renovated in 2005 and became LEED certified in 2008. The basement is largely storage and mechanical space while the first through fourth floors are office space. The sixth floor is the council chambers and courtroom. There are 55 full time employees and is operated from 7am-5pm Monday through Friday.

HVAC Description

The entire HVAC system was replaced during the latest renovation in 2005. The system consists of water-source heat pumps (WSHP) with a cooling tower outside for heat rejection. In the basement there are two building loop pumps (one backup) to provide water to the WSHPs and two condenser water loop pumps (one backup) to circulate water through the cooling tower and the plate and frame heat exchanger where heat is transferred from the building loop to the condenser water loop. There is also a shell and tube heat exchanger that transfers heat from the central steam loop to the building loop during the winter. The steam is provided by the boilers in the basement of the adjacent Trinity Building. The system is controlled by a modern DDC system with night set back.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	14%
Miscellaneous:	18%
AHU Fans & Pumps:	34%
Cooling:	35%
Totals:	100%

Overall, the total utility cost for City Hall is $27,975.71 for the past 12 months. It should be noted that water is supplied form the adjacent Annex building and that heating is provided by steam from the adjacent Trinity building. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

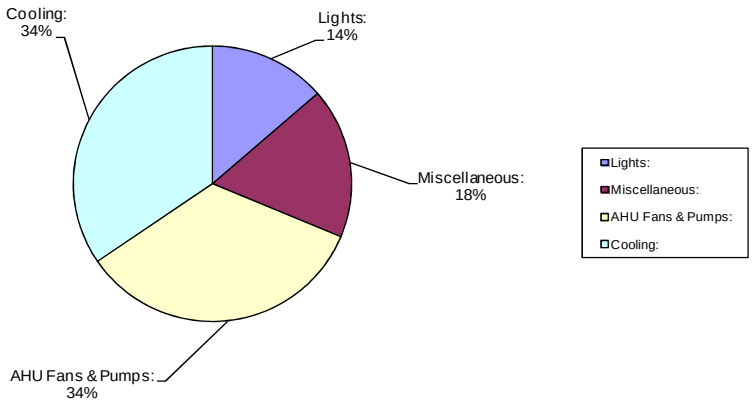

Figure 43 Electricity Usage Breakdown - City Hall

Utility Bill Analysis For City Hall								
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Electricity Demand	Electricity Demand Cost	Electricity Demand Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(kW)	($)	($/kW)		
January-10	46,400	$ 1,858.08	$ 0.04004	130	$ 182.14	$ 1.40	1009	0
February-10	39,680	$ 1,633.57	$ 0.04117	124	$ 174.02	$ 1.40	820	0
March-10	30,240	$ 1,335.45	$ 0.04416	100	$ 140.00	$ 1.40	350	15
April-10	28,480	$ 1,227.18	$ 0.04309	125	$ 174.72	$ 1.40	39	166
May-10	29,280	$ 2,069.65	$ 0.07068	100	$ 378.00	$ 3.78	20	277
June-10	42,880	$ 2,776.49	$ 0.06475	100	$ 387.25	$ 3.87	0	623
July-10	41,920	$ 3,111.20	$ 0.07422	112	$ 463.56	$ 4.15	0	706
August-10	40,640	$ 2,902.28	$ 0.07141	100	$ 415.00	$ 4.15	0	695
September-10	37,440	$ 1,791.11	$ 0.04784	114	$ 174.94	$ 1.54	4	353
October-10	27,680	$ 1,266.32	$ 0.04575	100	$ 154.00	$ 1.54	66	132
November-10	34,080	$ 1,598.75	$ 0.04691	100	$ 154.00	$ 1.54	336	9
December-10	38,880	$ 1,760.91	$ 0.04529	125	$ 193.12	$ 1.54	912	0
Totals:	437,600	$23,330.99	$ 0.05332	1,330	$ 2,990.75	$ 2.25		

Electric Consumption Rate: $0.05332 /kWh
Electric Demand Rate $2.25 /kW

Annual Cost/Sq.ft - Electricity: $0.660 /sqft
Annual Cost/Sq.ft - Total: $0.660 /sqft

Table 15 Utility Bill Analysis - City Hall

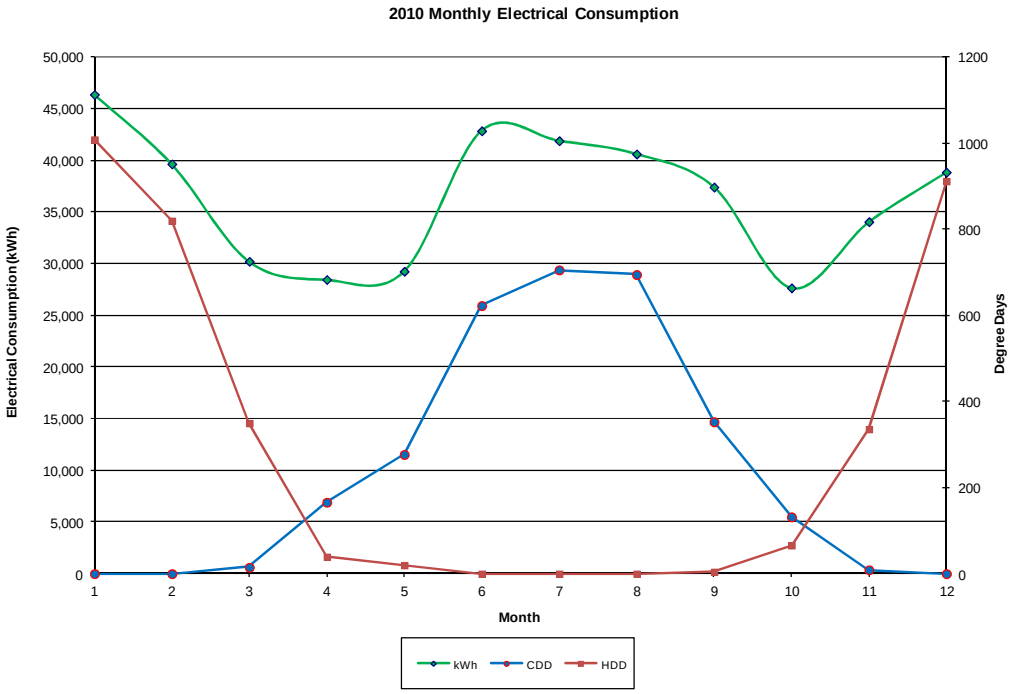

Figure 44 Monthly Electrical Consumption - City Hall

Figure 44 Monthly Electrical Consumption - City Hall details the electrical consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in June and the cooling degree days peak in July. This discrepancy could be due to the timing of the billing cycle. The winter peak is due to the compressors in the WSHPs running in the winter even though the hot water loop is heated with steam from a nearby building. Part of the winter increase could also be due to increased light usage since there is a day lighting controls to limit lighting usage when sun light is sufficient. Therefore, lighting usage would rise during the winter when daylight hours are shorter.

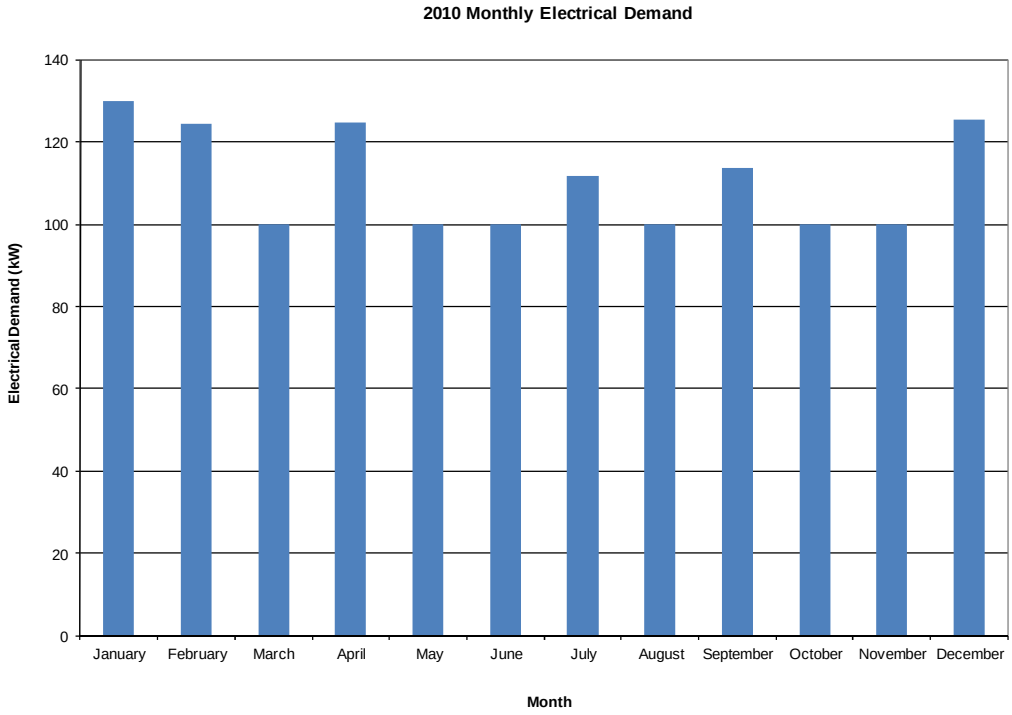

Figure 45 Monthly Electrical Demand - City Hall

Figure 45 Monthly Electrical Demand - City Hall, which shows the monthly electrical demand, suggests the same conclusions as the electric consumption graph. The electric usage for the City Hall is fairly constant.

Centennial Commons Recreation Center

Building Description

This facility is a 67,000 ft² recreation facility built in 2005 adjacent to the Heman Pool. The building contains a basketball court, weight room, cardio rooms, and an indoor soccer field. The building has five full time employees but a highly variable number of occupants. The facility is open from 5:30am-10pm Monday through Friday, 8am-8pm Saturday, and 10am-6pm Sunday.

HVAC Description

The facility is conditioned by two large rooftop units, one for the basketball court and one for the exercise area. There is an energy recovery ventilator preconditioning the outside air to the rooftop unit serving the exercise spaces. These units are controlled with a modern DDC control system with night setback. The indoor soccer field is heated by gas fired forced air furnace set up for recirculation and 100% outside air.

Utility Summary

Utility Usage Breakdown

Estimated Electric Consumption

Lights:	28%
Miscellaneous:	28%
AHU Fans & Pumps:	15%
Cooling:	29%
Totals:	100%

Estimated Natural Gas Consumption

Heating:	95%
Domestic water:	5%
Totals:	100%

Overall, the total utility cost for the Centennial Commons Recreation Center is $102,275.67 for the past 12 months. It appears from the bills that the adjacent Heman Park Pool is on the same water meter. The large spike in the June through August water bill is most likely attributed to refilling the pool for the summer season. Due to water billing once a quarter and the exact meter reading date would explain the lag time for it to show on the bill. The breakdown for each item was calculated based upon the existing equipment and the operating hours from facility personnel.

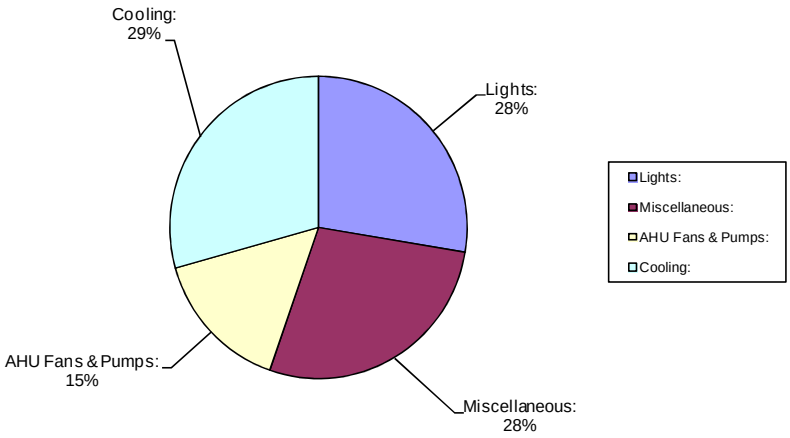

Figure 46 Electricity Usage Breakdown - Centennial Commons Recreation Center

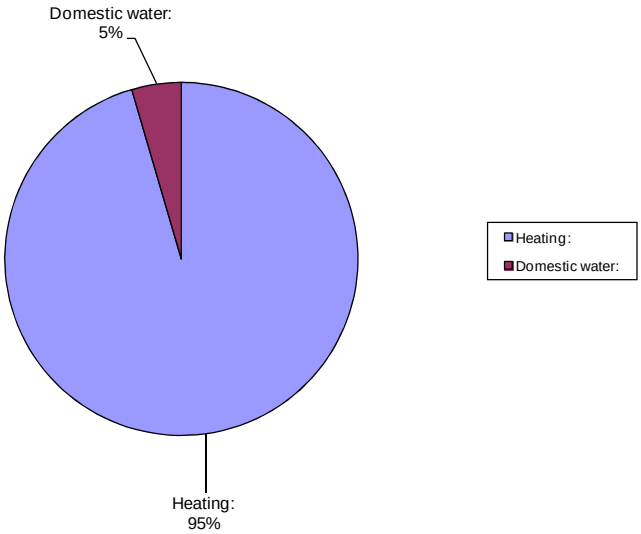

Figure 47 Natural Gas Usage Breakdown - Centennial Commons Recreation Center

Utility Bill Analysis For Centennial Commons Recreation Center													
Period End	Electricity Consumption	Electricity Cost	Electricity Consumption Rate	Electricity Demand	Electricity Demand Cost	Electricity Demand Rate	Natural Gas Consumption	Natural Gas Cost	Gas Consumption Rate	Water Consumption	Water Cost	Water Rate	HDD	CDD
	(kWh)	($)	($/kWh)	(kW)	($)	($)	(CCF)	($)	($/ccf)	(Gal.)	($)	($/kGal)		
January-10	118,560	$ 4,458.19	$ 0.03760	195	$ 273.28	$ 1.40	3,380	$ 2,691.30	$ 0.80	40,000	$111.12	$2.78	1009	0
February-10	97,920	$ 3,778.94	$ 0.03859	181	$ 253.96	$ 1.40	2,882	$ 2,325.60	$ 0.81	40,000	$111.12	$2.78	820	0
March-10	90,840	$ 3,527.39	$ 0.03883	173	$ 241.92	$ 1.40	1,577	$ 1,374.08	$ 0.87	76,250	$211.82	$2.78	350	15
April-10	79,080	$ 3,157.48	$ 0.03993	169	$ 235.90	$ 1.40	381	$ 461.40	$ 1.21	76,250	$211.82	$2.78	39	166
May-10	77,160	$ 3,033.74	$ 0.03932	155	$ 216.44	$ 1.40	240	$ 228.35	$ 0.95	76,250	$211.82	$2.78	20	277
June-10	125,040	$ 7,872.00	$ 0.06296	276	$1,041.39	$ 3.78	2	$ 36.60	$ 18.30	1,344,250	$4,011.24	$2.98	0	623
July-10	156,240	$10,490.08	$ 0.06714	330	$1,349.15	$ 4.09	1	$ 35.82	$ 35.82	1,344,250	$4,011.24	$2.98	0	706
August-10	168,840	$11,225.02	$ 0.06648	331	$1,372.82	$ 4.15	2	$ 36.60	$ 18.30	1,344,250	$4,011.24	$2.98	0	695
September-10	138,480	$10,105.54	$ 0.07297	353	$1,466.20	$ 4.15	1	$ 38.57	$ 38.57	400,250	$1,276.80	$3.19	4	353
October-10	82,080	$ 3,413.12	$ 0.04158	282	$ 433.66	$ 1.54	53	$ 83.92	$ 1.58	400,250	$1,276.80	$3.19	66	132
November-10	85,800	$ 3,588.76	$ 0.04183	259	$ 399.17	$ 1.54	192	$ 263.50	$ 1.37	400,250	$1,276.80	$3.19	336	9
December-10	93,120	$ 3,818.86	$ 0.04101	261	$ 401.79	$ 1.54	2,040	$ 1,722.82	$ 0.84	31,500	$100.49	$3.19	912	0
Totals:	1,313,160	$68,469.12	$ 0.05214	2,964	$7,685.68	$ 2.59	10,751	$ 9,298.56	$ 0.86	5,573,750	$16,822.31	$3.02		

Electric Consumption Rate: $0.05214 /kWh
Electric Demand Rate $2.59318 /kW
Natural Gas Consumption Rat $0.86 /ccf

Annual Cost/Sq.ft - Electricity: $1.137 /sqft
Annual Cost/Sq.ft - Gas.: $0.139 /sqft
Annual Cost/Sq.ft - Total: $1.275 /sqft

Table 16 Utility Bill Analysis - Centennial Commons Recreation Center

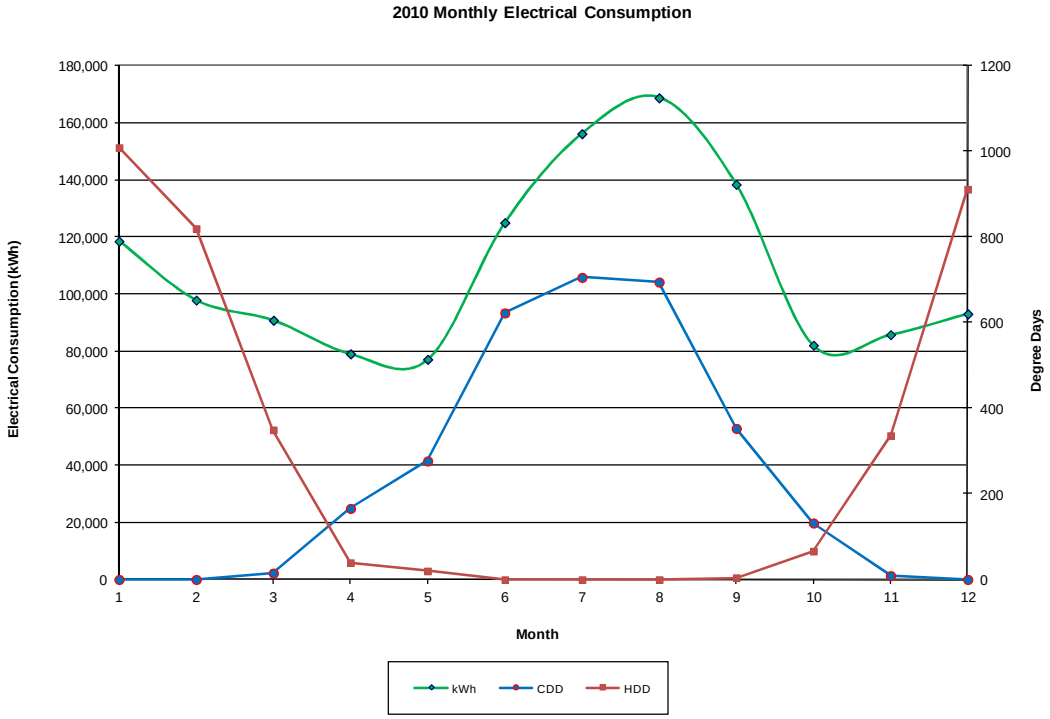

Figure 48 Monthly Electrical Consumption - Centennial Commons Recreation Center

Figure 48 Monthly Electrical Consumption - Centennial Commons Recreation Center details the electric consumption and each month's corresponding heating and cooling degree days. Cooling degree days (CDD) are a measure of the severity of the cooling requirements in a given locality; the more cooling degree days, the hotter the summer. Based on the graph, the electrical consumption peaks in August and the cooling degree days peak in July. This discrepancy could be due to the timing of the billing cycle.

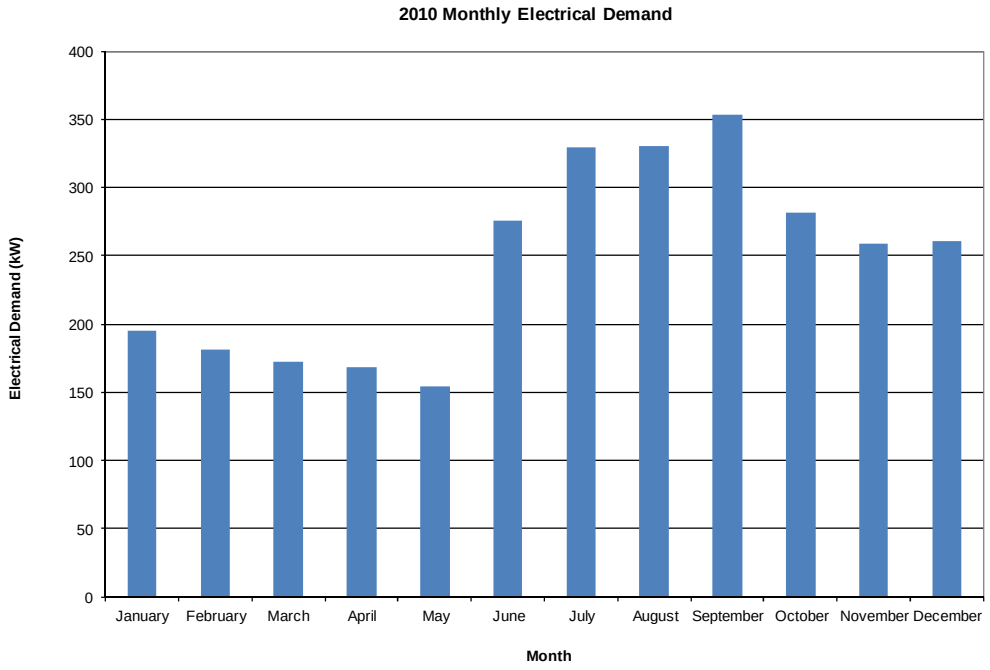

Figure 49 Monthly Electrical Demand - Centennial Commons Recreation Center

Figure 49 Monthly Electrical Demand - Centennial Commons Recreation Center, which shows the monthly electric demand, suggests the same conclusions as the electric consumption graph. The peak months correspond to the higher cooling load required during the summer season.

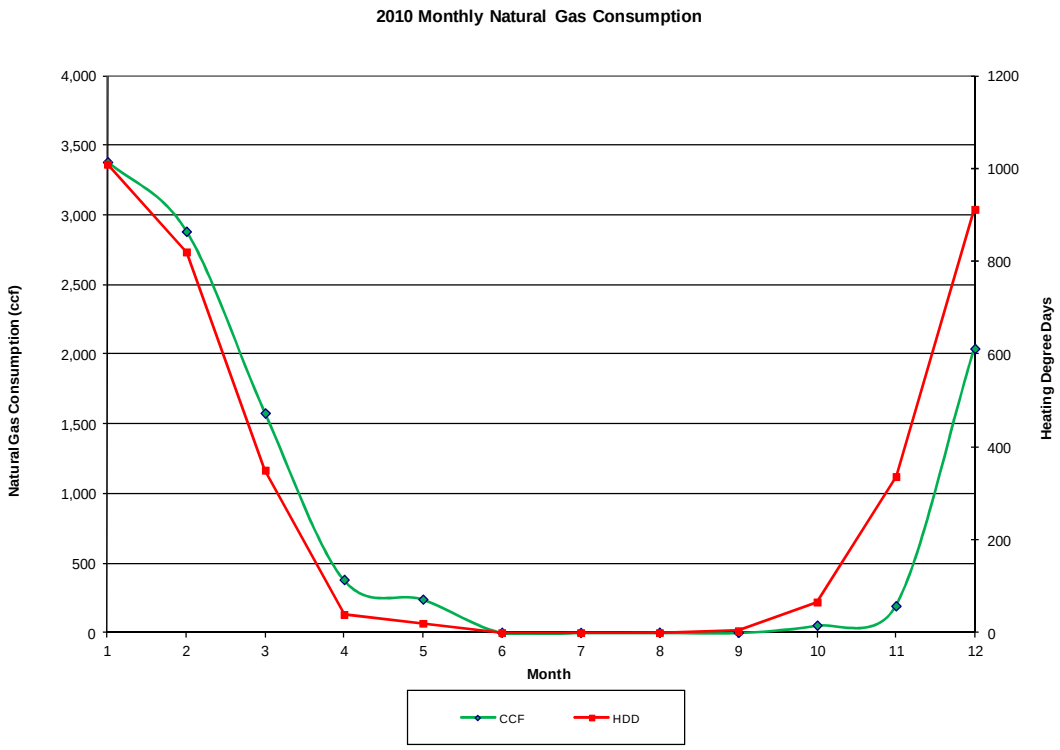

Figure 50 Monthly Natural Gas Consumption - Centennial Commons Recreation Center

Figure 50 Monthly Natural Gas Consumption - Centennial Commons Recreation Center details the natural gas consumption and each month's corresponding heating degree days. Heating degree days (HDD) are a measure of the severity of the heating requirements in a given locality; the more heating degree days, the cooler the winter. Based on the graph, the gas consumption and the heating degree days peak in January.

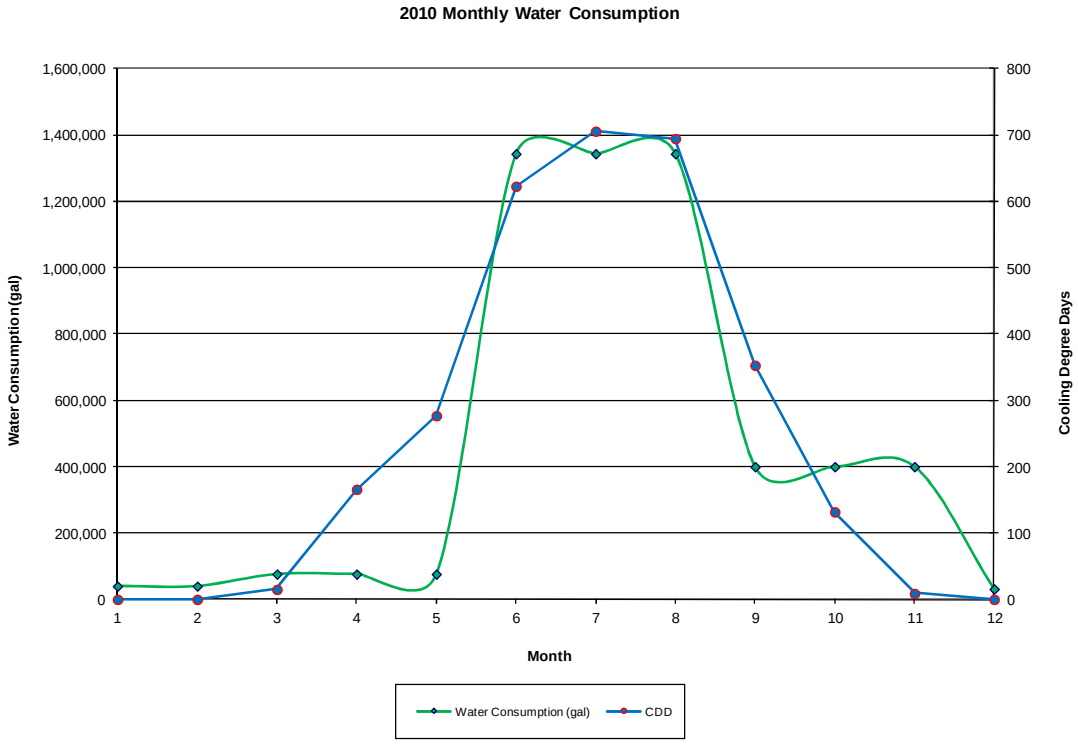

Figure 51 Monthly Water Consumption - Centennial Commons Recreation Center

Figure 51 Monthly Water Consumption - Centennial Commons Recreation Center details the water consumption. It appears from the meter that the Heman Park Pool that is adjacent to the Centennial Commons Recreation Center is on the same meter which would explain the large spike in water usage during the summer.

1.0 LIGHTING IMPROVEMENTS

ECM-1.1: Lighting Retrofit (Annex)

Existing Conditions

The University City Annex building houses the police station and one of the city's fire stations. These facilites are in operation 24/7. The lighting systems in the Annex consist exclusively of outdated linear fluorescents, high-pressure sodium low bays, halogen floods, and incandescent exit signs. All of these fixtures can be replaced or retrofitted to increase their performance, reduce energy consumption, and decrease fixture maintenance. Although the facilites are in use all day, many areas of the building do not have the lights on. This limits the practicality of installing lighting controls and retrofitting fixtures with the expectation of a reasonable payback in all portions of the building. For optimal return on investment, only the fixtures with reasonable paybacks should be considered for retrofit or replacement. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
58,934	17	12	-	-	$4,037	$0	$0	$0	$4,037	$0	$64,736	16.0

Table 17 Savings Summary - ECM-1.1 Lighting Retrofit (Annex)

Physical Changes

To the occupant, there will be some visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice several changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Annex facility, and the individual recommendations therein:

Police Station – Basement - Corridor

Energy Saving Opportunity:

- (15) 1x4, 2-lamp T12 recessed cove strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (15) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – Basement – Break Room

Energy Saving Opportunity:

- (5) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (5) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2x2, 2 U-lamp T12 recessed troffer. Fixture utilizes a standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 60 hours/week. Re-lamp with (1) 2, 31W T8 U-lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.
- (1) 2-lamp 60W incandescent surface round. Average foot candle reading for this fixture is 4-7 fc. Fixture operates 1 hour/week. Re-lamp with (2) 13W compact fluorescent, screw type lamps.

Police Station – Basement – Fire Chief's Office

Energy Saving Opportunity:

- (10) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 40-50 fc. Fixtures operate 60 hours/week. Re-lamp with (10) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – Basement - Corridor

Energy Saving Opportunity:

- (10) 26W compact fluorescent, triple, twin tube recessed can. Average foot candle reading for these fixtures is 4-7 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.

- (3) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (3) LED Exit Sign.

Police Station – Basement – E.O.C. Room

Energy Saving Opportunity:

- (1) 26W compact fluorescent, triple, twin tube recessed can. Average foot candle reading for this fixture is 4-7 fc. Fixture operates 10 hours/week. There are no recommendations, fixture is to remain.
- (1) 1x2, 2-lamp T12 wall mount. Fixture utilizes a standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 10 hours/week. Re-lamp with (1) 2,17W 2' T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.
- (27) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 10 hours/week. Re-lamp with (27) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (2) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 168 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – Basement – E.O.C. Kitchen
Energy Saving Opportunity:

- (1) 2-lamp T12 strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 5 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – Basement – E.O.C. Mechanical Room

Energy Saving Opportunity:

- (2) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (2) 52W exposed incandescent. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 13W compact fluorescent, screw type lamps.

Police Station – Basement – E.O.C.

Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Police Station – Basement – E.O.C. Communications Room

Energy Saving Opportunity:

- (3) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (3) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – E.O.C. Storeroom

Energy Saving Opportunity:

- (5) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (5) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – E.O.C. Restroom

Energy Saving Opportunity:

- (2) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – Shooting Range

Energy Saving Opportunity:

- (6) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 10-12 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain.
- (5) 52W exposed incandescent. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 5 hours/week. Re-lamp with (5) 13W compact fluorescent, screw type lamps.

Police Station – Basement – Shooting Range File Room

Energy Saving Opportunity:

- (4) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – Files

Energy Saving Opportunity:

- (2) 1x8, 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 2, 59W, 8' T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – Corridor

Energy Saving Opportunity:

- (2) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 2 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – Basement – Closet

Energy Saving Opportunity:

- (1) 52W exposed incandescent. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/week. Re-lamp with (1) 13W compact fluorescent, screw type lamp.

Police Station – Basement – Weapons Storage

Energy Saving Opportunity:

- (4) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 5 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – Basement – Bike Storage

Energy Saving Opportunity:

- (14) 100W exposed incandescent. Average foot candle reading for these fixtures is 2-4 fc. Fixtures operate 1 hour/week. Re-lamp with (14) 26W compact fluorescent, screw type lamps.

Police Station – Basement – Stairs

Energy Saving Opportunity:

- (2) 2-lamp 60W incandescent surface mount. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 5 hours/week. Re-lamp with (2) 13W compact fluorescent, screw type lamps.

Police Station – 1st Floor – Print Shop

Energy Saving Opportunity:

- (6) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 50-55 fc. Fixtures operate 40 hours/week. Re-lamp with (6) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Police Dispatch

Energy Saving Opportunity:

- (21) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 50-55 fc. Fixtures operate 60 hours/week. Re-lamp with (21) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (10) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 50-55 fc. Fixtures operate 168 hours/week. Re-lamp with (10) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 1st Floor – Entry Corridor

Energy Saving Opportunity:

- (8) 1x4, 1-lamp T12 wall strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (8) 1, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – Basement – Men's Cells

Energy Saving Opportunity:

- (1) 2-lamp T12, 3' strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 84 hours/week. Re-lamp with (1) 2, 25W, 3' T8 lamps and high-efficiency, electronic ballast.
- (2) 1x4, 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 84 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (2) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 10-12 fc. Fixtures operate 84 hours/week. There are no recommendations, fixtures are to remain.
- (1) 1x4, 2-lamp T12 wall-mounted strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 84

hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast.

Police Station – Basement – Stairs

Energy Saving Opportunity:

- (1) 1x1, 60W incandescent surface mount. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 84 hours/week. Re-lamp with (1) 13W compact fluorescent, screw type lamp.

Police Station – 1st Floor – Private Offices

Energy Saving Opportunity:

- (12) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 45-50 fc. Fixtures operate 60 hours/week. Re-lamp with (12) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 1st Floor – Conference Room

Energy Saving Opportunity:

- (4) 2x4, 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 45-50 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Men's Locker Room
Energy Saving Opportunity:

- (6) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (6) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 1st Floor – Women's Locker Room

Energy Saving Opportunity:

- (4) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Mechanical Storage

Energy Saving Opportunity:

- (3) 100W exposed incandescent. Average foot candle reading for these fixtures is 2-4 fc. Fixtures operate 1 hour/week. Re-lamp with (3) 26W compact fluorescent, screw type lamps.

Police Station – 1st Floor – Offices

Energy Saving Opportunity:

- (9) 1x4, 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 12-15 fc. Fixtures operate 60 hours/week. Re-lamp with (9) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 1st Floor – Cell Entry

Energy Saving Opportunity:

- (6) 2x4, 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 50-55 fc. Fixtures operate 60 hours/week. Re-lamp with (6) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (2) 40W recessed incandescent can. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 9W compact fluorescent, screw type lamps.

Police Station – 1st Floor – Hall
Energy Saving Opportunity:

- (1) 1x1, 2-lamp 60W recessed incandescent square. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 168 hours/week. Re-lamp with (1) 2, 13W compact fluorescent, screw type lamp.
- (1) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Police Station – 1st Floor – Men's Restroom

Energy Saving Opportunity:

- (4) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Women's Restroom

Energy Saving Opportunity:

- (4) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2-lamp 60W incandescent vanity. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 60 hours/week. Re-lamp with (1) 2, 13W compact fluorescent, screw type lamp.

Police Station – 1st Floor – Entry

Energy Saving Opportunity:

- (9) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.
- (1) 2x4, 4-lamp T12 recessed volumetric. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 45-55 fc. Fixture operates 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Field Ops
Energy Saving Opportunity:

- (2) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 45-55 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 50-70 fc. Fixture operates 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2x2, 2 U-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 60 hours/week. Re-lamp with (1) 2, 31W T8 U-lamps and high-efficiency, electronic ballast. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 1st Floor – Traffic

Energy Saving Opportunity:

- (3) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60

hours/week. Re-lamp with (3) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

- (4) 1x4, 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-20 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Offices

Energy Saving Opportunity:

- (17) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (17) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (5) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 5 hours/week. Re-lamp with (5) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 2nd Floor – Hall
Energy Saving Opportunity:

- (1) 2-lamp T12 strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 60 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Interrogation Room

Energy Saving Opportunity:

- (6) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 10 hours/week. Re-lamp with (6) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 2nd Floor – Men's Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Women's Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Entry

Energy Saving Opportunity:

- (6) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 168 hours/week. Re-lamp with (6) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Narcotics Evidence Room

Energy Saving Opportunity:

- (8) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 10 hours/week. Re-lamp with (8) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 2nd Floor – Entry

Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Police Station – 2nd Floor – Homicide Evidence Room

Energy Saving Opportunity:

- (4) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 45-55 fc. Fixtures operate 10 hours/week. Re-lamp with (4) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 2nd Floor – Lobby

Energy Saving Opportunity:

- (5) 1x2, 2-lamp T12 wall mount. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 60

hours/week. Re-lamp with (5) 2,17W 2' T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 3rd Floor – Offices

Energy Saving Opportunity:

- (17) 2x4, 4-lamp T12 recessed volumetric. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-50 fc. Fixtures operate 60 hours/week. Re-lamp with (17) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Police Station – 3rd Floor – Mechanical Room

Energy Saving Opportunity:

- (4) 2x4, 2-lamp T12 parabolic strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-20 fc. Fixtures operate 2 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – 3rd Floor – Offices
Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Police Station – 3rd Floor – Stairs

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T12 parabolic strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Police Station – 3rd Floor – Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 50-60 fc. Fixture operates 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixtures to be controlled by dual-technology occupancy sensor.

Police Station – 3rd Floor – Elevator Lobby

Energy Saving Opportunity:

- (1) 2x2, 2 U-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 60 hours/week. Re-lamp with (1) 2, 31W T8 U-lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Police Station – Exterior Entry

Energy Saving Opportunity:

- (2) 1x1, 60W incandescent surface square. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 84 hours/week. Re-lamp with (2) 9W compact fluorescent, screw type lamps.

Fire Station – 1st Floor – Apparatus Bay

Energy Saving Opportunity:

- (6) 400W, High-Pressure Sodium low bay. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 60hours/week. Fixtures to be demolished and replaced with (7) 4-lamp T5HO High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixture.
- (1) 250W, Mercury Vapor wall mount. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 60 hours/week. Fixture to be demolished.
- (3) 2-lamp T8 strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-25 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.

Fire Station – 1st Floor – Office

Energy Saving Opportunity:

- (4) 1x4, 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-20 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station – 1st Floor – Stairs

Energy Saving Opportunity:

- (1) 100W exposed incandescent. Average foot candle reading for this fixture is 1-2 fc. Fixture operates 1 hour/week. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

Fire Station – 1st Floor – MechanicalRoom

Energy Saving Opportunity:

- (2) 100W exposed incandescent. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 26W compact fluorescent, screw type lamps.

Fire Station – 1st Floor – Corridor

Energy Saving Opportunity:

- (1) 2-lamp, 60W incandescent surface square. Average foot candle reading for this fixture is 1-2 fc. Fixture operates 1 hour/week. Re-lamp with (1) 2, 13W compact fluorescent, screw type lamps.

Fire Station – 1st Floor – Store Room
Energy Saving Opportunity:

- (4) 100W exposed incandescent. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 1 hour/week. Re-lamp with (4) 26W compact fluorescent, screw type lamps.

Fire Station – 1st Floor – Kitchen

Energy Saving Opportunity:

- (2) 2-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-25 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 1-lamp, 3' T8 strip. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 60 hours/week. There are no recommendations, fixture is to remain.

Fire Station – 1st Floor – Break Room

Energy Saving Opportunity:

- (2) 4-lamp 13W CFL Ceiling Fan. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-10 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.

Fire Station – 2nd Floor – Restroom

Energy Saving Opportunity:

- (2) 1x1, 60W incandescent recessed square. Average foot candle reading for these fixtures is 10-12 fc. Fixtures operate 20 hours/week. Re-lamp with (2) 9W compact fluorescent, screw type lamps.

Fire Station – 2nd Floor – Showers

Energy Saving Opportunity:

- (2) 60W recessed incandescent can. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 20 hours/week. Re-lamp with (2) 13W compact fluorescent, screw type lamps.

Fire Station – 2nd Floor – Sleep Area

Energy Saving Opportunity:

- (9) 1x2, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 80 hours/week. Re-lamp with (9) 2,17W 2' T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Fire Station – 2nd Floor – Weight Room

Energy Saving Opportunity:

- (8) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 20 hours/week. Re-lamp with (8) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station – 2nd Floor – Media Room

Energy Saving Opportunity:

- (4) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 10 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station – 2nd Floor – Restroom

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T12 surface vanity. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 40-45 fc. Fixtures operate 80 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 30-35 fc. Fixture operates 80 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Fire Station – 2nd Floor – Storage

Energy Saving Opportunity:

- (1) 90W exposed incandescent. Average foot candle reading for this fixture is 2-5 fc. Fixture operates 1 hour/week. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

Fire Station – 2nd Floor – Sleep Room
Energy Saving Opportunity:

- (1) 4-lamp 52W incandescent ceiling fan. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 5 hours/week. Re-lamp with (1) 4, 13W compact fluorescent, screw type lamps.

Fire Station – 2nd Floor – Stairs

Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.
- (2) 2-lamp T12 wall strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 10 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (1) 1-lamp T12 wall strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 80 hours/week. Re-lamp with (1) 1, 28W T8 lamps and high-efficiency, electronic ballast.

ECM-1.2: Lighting Retrofit (City Hall)

Existing Conditions

The University City, City Hall building houses the mayor's office, finance department, engineering services, permits, administration, and the courthouse. The building recently underwent a substantial energy efficiency renovation in 2006. The building's lights are now controlled by a time clock that turns the lights on at 6:30 AM and turns them off at 11:30 PM, Monday through Friday. The lighting systems in City Hall consist primarily of T8 linear fluorescents, compact fluorescents, halogen track lights, and LED exit signs. The remaining T12, magnetically-ballasted fixtures, and incandescent lamps can be retrofitted to bring the building's lighting system fully up-to-date. There are also select areas and offices where occupancy sensing, lighting controls should be installed. This will save energy by turning off the lights in unoccupied spaces before the occupant arrives and after the occupant leaves the space each day. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
12,081	6	12	-	-	$828	$0	$0	$0	$828	$0	$21,723	23.5

Table 18 Savings Summary - ECM-1.2 Lighting Retrofit (City Hall)

Physical Changes

To the occupant, there will be minimal visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City, City Hall building and the individual recommendations therein:

City Hall - Elevator

Energy Saving Opportunity:

- (6) MR16 20W Halogen Can. Average foot candle reading for these fixtures is 5-8 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.

City Hall – 5th Floor - Courtroom

Energy Saving Opportunity:

- (21) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 8 hours/week. There are no recommendations, fixtures are to remain.
- (6) 26W CFL Decorative Wall Torch. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 8 hours/week. There are no recommendations, fixtures are to remain.
- (16) 2-lamp T8 cove strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 8 hours/week. There are no recommendations, fixtures are to remain.
- (3) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (3) LED Exit Sign.

City Hall – 5th Floor – Courtroom Storage

Energy Saving Opportunity:

- (2) 2-lamp T8 strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.

City Hall – 5th Floor - Courtroom

Energy Saving Opportunity:

- (1) 16-lamp 40W incandescent decorative chandelier. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 8 hours/week. Re-lamp with (16) 13W compact fluorescent, screw type lamps.

- (1) 9-lamp, 13W CFL Decorative Chandelier. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 8 hours/week. There are no recommendations, fixtures are to remain.

City Hall – 5th Floor - Elevator Lobby

Energy Saving Opportunity:

- (1) 100W exposed incandescent pendant. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 8 hours/week. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

City Hall – 5th Floor - Penthouse

Energy Saving Opportunity:

- (8) 13W Exposed CFL Screw-Type Lamp. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.
- (4) 2-lamp T8 strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.

City Hall – 4th Floor – Women's Restroom

Energy Saving Opportunity:

- (3) 2-lamp T8 vanity strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-30 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 13W CFL Wall Sconce. Average foot candle reading for this fixture is 5-6 fc. Fixture operates 85 hours/week. There are no recommendations, fixture is to remain.

City Hall – 4th Floor - Elevator Lobby

Energy Saving Opportunity:

- (1) 2-lamp, 13W Decorative CFL Wall Sconce. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/week. There are no recommendations, fixture is to remain.

City Hall – 4th Floor – Engineering Offices

Energy Saving Opportunity:

- (21) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 60 hours/week. Re-lamp with (21) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (9) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 20 hours/week. Re-lamp with (9) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (19) 2x4, 4-lamp, 25W T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 90-105 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.
- (5) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (5) LED Exit Sign.

City Hall – 4th Floor – Engineering Office Conference Room

Energy Saving Opportunity:

- (6) 2-lamp T12 above ceiling strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 5-10 fc. Fixtures operate 5 hours/week. Re-lamp with (6) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (1) 4-lamp, 13W CFL Ceiling Fan. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 5 hours/week. There are no recommendations, fixture is to remain.

City Hall – 4th Floor – Engineering Office File Room

Energy Saving Opportunity:

- (3) 3-lamp, T8 pendant wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 50-60 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain.

City Hall – 4th Floor – Engineering Office File Room Corridor

Energy Saving Opportunity:

- (1) 2-lamp, 75W T12 8’ parabolic pendant. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 5 hours/week. Re-lamp with (1) 2, 59W, 8’ T8 lamps and high-efficiency, electronic ballast.

City Hall – 3rd Floor – Men's Restroom

Energy Saving Opportunity:

- (3) 2-lamp T8 vanity strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-30 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 13W CFL Wall Sconce. Average foot candle reading for this fixture is 5-6 fc. Fixture operates 85 hours/week. There are no recommendations, fixture is to remain.

City Hall – 3rd Floor – Elevator Lobby

Energy Saving Opportunity:

- (1) 2-lamp, 13W Decorative CFL Wall Sconce. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 85 hour/week. There are no recommendations, fixture is to remain.
- (1) Incandescent Exit Sign. Fixture operates 168 hours/week. Replace with new (1) LED Exit Sign.

City Hall – 3rd Floor – Private Offices

Energy Saving Opportunity:

- (17) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.
- (19) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 10 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

City Hall – 3rd Floor – Storage Vault

Energy Saving Opportunity:

- (1) 90W exposed incandescent pendant. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/week. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

City Hall – 3rd Floor – Conference Room

Energy Saving Opportunity:

- (6) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 40

hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 3rd Floor – Open Offices

Energy Saving Opportunity:

- (27) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

City Hall – 3rd Floor – Private Offices

Energy Saving Opportunity:

- (1) 3-lamp, 60W incandescent ceiling fan. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 60 hours/week. Re-lamp with (3) 13W compact fluorescent, screw type lamps.

City Hall – 3rd Floor – Open Offices
Energy Saving Opportunity:

- (1) LED Exit Sign. Fixture operates 168 hours/week. There are no recommendations, fixture is to remain.

City Hall – 3rd Floor – Private Offices

Energy Saving Opportunity:

- (3) 1-lamp 22W Circline Ceiling Fan. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 2 hours/week. There are no recommendations, fixtures are to remain.
- (2) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (10) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 35-40 fc. Fixtures operate 5 hours/week. Re-lamp with (10) 4, 25W T8 lamps and high-efficiency, electronic ballasts.

City Hall – 2nd Floor – Women's Restroom

Energy Saving Opportunity:

- (3) 2-lamp T8 vanity strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-30 fc. Fixtures operate 85 hours/week. There are no

recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

- (1) 13W CFL Wall Sconce. Average foot candle reading for this fixture is 5-6 fc. Fixture operates 85 hours/week. There are no recommendations, fixture is to remain.

City Hall – 2nd Floor – Elevator Lobby

Energy Saving Opportunity:

- (1) 2-lamp, 13W Decorative CFL Wall Sconce. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/week. There are no recommendations, fixture is to remain.

City Hall – 2nd Floor – Center Rotunda

Energy Saving Opportunity:

- (8) 9W CFL 4-lamp decorative torches. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.
- (2) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (1) 12-lamp, 25W Incandescent Decorative Chandelier. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.
- (1) 14-lamp, 25W Incandescent Decorative Chandelier. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.

City Hall – 2nd Floor – City Clerk

Energy Saving Opportunity:

- (5) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (2) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 2nd Floor – Mayor

Energy Saving Opportunity:

- (2) 90W exposed incandescent pendant. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/week. Re-lamp with (2) 26W compact fluorescent, screw type lamps.
- (9) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.
- (4) 40W incandescent wall torches. Average foot candle reading for these fixtures is 8-10 fc. Fixtures operate 60 hours/week. Re-lamp with (4) 9W compact fluorescent, screw type lamps.
- (2) 2-lamp T5 task strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 3-7 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 2nd Floor – Mayor's Restroom

Energy Saving Opportunity:

- (8) 13W CFL 3-lamp decorative torches. Average foot candle reading for these fixtures is 5-10 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.
- (1) 52W exposed incandescent. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/week. Re-lamp with (1) 13W compact fluorescent, screw type lamps.

City Hall – 2nd Floor – Mayor's Fireplace

Energy Saving Opportunity:

- (1) 4-lamp 60W decorative incandescent surface mount. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 1 hour/week. Re-lamp with (1) 13W compact fluorescent, screw type lamps.

City Hall – 2nd Floor – Administrative Office 7

Energy Saving Opportunity:

- (6) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 2nd Floor – Administrative Office 8

Energy Saving Opportunity:

- (6) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 2nd Floor – Storage Closets

Energy Saving Opportunity:

- (3) 60W exposed incandescent pendant. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/week. Re-lamp with (3) 13W compact fluorescent, screw type lamps.

City Hall – 2nd Floor – Conference Room
Energy Saving Opportunity:

- (3) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 30-40 fc. Fixtures operate 10 hours/week. Re-lamp with (3) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (2) 2-lamp T8 vanity strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-30 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.

City Hall – 1st Floor – Men's Restroom

Energy Saving Opportunity:

- (3) 2-lamp T8 vanity strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-30 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 13W CFL Wall Sconce. Average foot candle reading for this fixture is 5-6 fc. Fixture operates 85 hours/week. There are no recommendations, fixture is to remain.

City Hall – 1st Floor – Elevator Lobby

Energy Saving Opportunity:

- (1) 2-lamp, 60W decorative incandescent wall sconce. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 1 hour/week. Re-lamp with (2) 13W compact fluorescent, screw type lamps.

City Hall – 1st Floor – Lobby

Energy Saving Opportunity:

- (36) 2-lamp, 13W CFL decorative torches. Average foot candle reading for these fixtures is 8-10 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.
- (4) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (7) 15W Incandescent statue lights. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.
- (4) 5-lamp, Decorative Incandescent Candleabra. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.

City Hall – 1st Floor – Offices

Energy Saving Opportunity:

- (42) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

City Hall – 1st Floor – Vault Closet

Energy Saving Opportunity:

- (3) 90W exposed incandescent pendant. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/week. Re-lamp with (3) 26W compact fluorescent, screw type lamps.
- (1) 13W CFL Exposed Lamp. Average foot candle reading for this fixture is 5-6 fc. Fixture operates 1 hour/week. There are no recommendations, fixture is to remain.

City Hall – 1st Floor – Offices

Energy Saving Opportunity:

- (4) 1x4, 2-lamp T8 direct/indirect pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

City Hall – 1st Floor – Sink Closet

Energy Saving Opportunity:

- (3) 52W exposed incandescent pendant. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/week. Re-lamp with (3) 13W compact fluorescent, screw type lamps.

City Hall – Basement - Stairs

Energy Saving Opportunity:

- (11) MR16, 50W Halogen Track Light. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 85 hours/week. There are no recommendations, fixtures are to remain.
- (2) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (1) Incandescent Exit Sign. Fixture operates 168 hours/week. Replace with new (1) LED Exit Sign.
- (8) 13W CFL wall sconce. Average foot candle reading for these fixtures is 5-6 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

City Hall – Basement - Shops

Energy Saving Opportunity:

- (2) 2-lamp T8 damp-location strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixture is to remain.

City Hall – Basement – Mechanical Room

Energy Saving Opportunity:

- (2) 2-lamp T8 damp-location pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 2 hours/week. There are no recommendations, fixtures are to remain.

City Hall – Basement – Electrical Room

Energy Saving Opportunity:

- (2) 2-lamp T8 damp-location pendant. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 2 hours/week. There are no recommendations, fixtures are to remain.

City Hall – Basement – Closet

Energy Saving Opportunity:

- (9) 90W exposed incandescent pendant. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 1 hour/week. Re-lamp with (9) 26W compact fluorescent, screw type lamps.

City Hall – Basement – File Room

Energy Saving Opportunity:

- (7) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 2 hours/week. Re-lamp with (7) 4, 25W T8 lamps and high-efficiency, electronic ballasts.
- (6) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 2 hours/week. Re-lamp with (6) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

City Hall – Basement – Shops

Energy Saving Opportunity:

- (2) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (8) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60 hours/week. Re-lamp with (8) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

ECM-1.3: Lighting Retrofit (Community Center)

Existing Conditions

The University City Community Center is now in use as a senior citizen's center. The building is occupied for a limited number of hours each week. The lighting systems in the community center consist primarily of T8 and T12 linear fluorescents, compact fluorescents, exposed incandescents and incandescent exit signs. The T12, magnetically-ballasted fixtures, and incandescent lamps can be retrofitted to modernize the building's lighting system. There are also select areas and offices where occupancy sensing, lighting controls should be installed. This will save energy by turning off the lights in unoccupied spaces that are accidentally left on after the occupant leaves the space. Unfortunately, due to the limited number of fixture burn hours, these upgrades do not offer a reasonable, financial payback. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
5,502	4	12	-	-	$377	$0	$0	$0	$377	$0	$2,249	5.3

Table 19 Savings Summary - ECM 1.3 Lighting Retrofit (Community Center)

Physical Changes

To the occupant, there will be slight visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Community Center building and the individual recommendations therein:

Community Center – Conference Room / Stage

Energy Saving Opportunity:

- (4) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 20 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.
- (16) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 10 hours/month. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (16) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 1-30 fc. Fixtures operate 2 hours/week. There are no recommendations, fixtures are to remain.
- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Community Center – Store Room

Energy Saving Opportunity:

- (7) 100W recessed incandescent square. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 1 hour/week. Re-lamp with (7) 26W compact fluorescent, screw type lamps.
- (1) 200W exposed incandescent. Average foot candle reading for this fixture is 7-9 fc. Fixture operates 2 hour/week. Re-lamp with (1) 59W compact fluorescent, screw type lamps.

Community Center – Kitchen

Energy Saving Opportunity:

- (3) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (3) LED Exit Sign.
- (8) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 5 hours/month. Re-lamp with (8) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Community Center – Hall

Energy Saving Opportunity:

- (2) 2-lamp, 60W incandescent surface round. Average foot candle reading for this fixture is 7-9 fc. Fixture operates 20 hours/week. Re-lamp with (4) 13W compact fluorescent, screw type lamps.

Community Center – Men's Restroom

Energy Saving Opportunity:

- (4) 2-lamp, 60W recessed incandescent square. Average foot candle reading for this fixture is 7-9 fc. Fixture operates 20 hours/week. Re-lamp with (8) 13W compact fluorescent, screw type lamps.

Community Center – Women's Restroom

Energy Saving Opportunity:

- (4) 2-lamp, 60W recessed incandescent square. Average foot candle reading for this fixture is 7-9 fc. Fixture operates 20 hours/week. Re-lamp with (8) 13W compact fluorescent, screw type lamps.

Community Center – Janitor's Closet
Energy Saving Opportunity:

- (1) 100W exposed incandescent. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 1 hour/month. Re-lamp with (1) 26W compact fluorescent, screw type lamps.

Community Center – Dining Hall

Energy Saving Opportunity:

- (20) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-25 fc. Fixtures operate 20 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

Community Center – Mechanical Room

Energy Saving Opportunity:

- (3) 200W exposed incandescent. Average foot candle reading for these fixtures is 7-9 fc. Fixtures operate 1 hour/month. Re-lamp with (3) 59W compact fluorescent, screw type lamps.

Community Center – Office / Storage

Energy Saving Opportunity:

- (1) 200W exposed incandescent. Average foot candle reading for this fixture is 7-9 fc. Fixture operates 1 hour/month. Re-lamp with (1) 59W compact fluorescent, screw type lamp.
- (1) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 5 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixture to be controlled by dual-technology occupancy sensor.
- (2) 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 40-45 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Community Center – Dining Hall

Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.
- (16) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 1-30 fc. Fixtures operate 1 hour/month. There are no recommendations, fixtures are to remain.

Community Center – Entry

Energy Saving Opportunity:

- (3) PAR38 23W CFL Flood. Average foot candle reading for these fixtures is 1-30 fc. Fixtures operate 2 hours/week. There are no recommendations, fixtures are to remain.
- (1) PAR38 Halogen Flood. Average foot candle reading for this fixture is 1-30 fc. Fixture operates 2 hours/month. There are no recommendations, fixture is to remain.

Community Center – Office

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 20 hours/month. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 5 hours/month. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

ECM-1.4: Lighting Retrofit (Fire Station #2)

Existing Conditions

The University City Fire Station #2 is a combination of a building constructed in the 1930s, and an addition that occurred a few years ago. The lighting system in the building consist is completely modernized and there are no recommendations for retrofits other than the ceiling fans with incandescent lamps. Occupancy sensors are present in many areas, but should be installed in the sleep rooms for further energy savings.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
5,448	-	-	-	-	$373	$0	$0	$0	$373	$0	$5,829	14.4

Table 20 Savings Summary - ECM-1.4 Lighting Retrofit (Fire Station #2)

Physical Changes

To the occupant, there will be no noticeable visible changes.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Fire Station #2 building and the individual recommendations therein:

Fire Station #2 – 1st Floor – Movie Room

Energy Saving Opportunity:

- (4) 2x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 13-15 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (2) 4-lamp 60W incandescent ceiling fan. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 1 hour/week. Re-lamp with (8) 13W compact fluorescent, screw type lamps.

Fire Station #2 – 1st Floor – Corridor

Energy Saving Opportunity:

- (3) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (3) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 1st Floor – Kitchen

Energy Saving Opportunity:

- (1) 2x4, 8-lamp T8 surface wrap. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 55-60 fc. Fixture operates 60 hours/week. There are no recommendations, fixture is to remain. Fixture to be controlled by dual-technology occupancy sensor.
- (3) 2-lamp, 13W Quad CFL recessed can. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 1st Floor – Office Dispatch

Energy Saving Opportunity:

- (3) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 1st Floor – Garage

Energy Saving Opportunity:

- (4) 2-lamp T8 strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 15-25 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 1st Floor – Apparatus Bay

Energy Saving Opportunity:

- (15) 2-lamp T8 caged strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 13-15 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.
- (26) 2-lamp T8 caged strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 13-15 fc. Fixtures operate 10 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

Fire Station #2 – 1st Floor – Electrical Room

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T8 surface strip. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 22-25 fc. Fixture operates 2 hours/week. There are no recommendations, fixture is to remain.

Fire Station #2 – 1st Floor – Janitor's Closet

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T8 surface strip. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 22-25 fc. Fixture operates 2 hours/week. There are no recommendations, fixture is to remain.
- (1) 1x4, 1-lamp T8 surface strip. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 22-25 fc. Fixture operates 2 hours/week. There are no recommendations, fixture is to remain.

Fire Station #2 – 1st Floor – Apparatus Bay

Energy Saving Opportunity:

- (3) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 1st Floor – Apparatus Bay Stairs

Energy Saving Opportunity:

- (3) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 168 hours/week. There are no recommendations, fixturea are to remain.

Fire Station #2 – 1st Floor – Storage

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T8 surface strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 2 hours/week. There are no recommendations, fixturea are to remain.

Fire Station #2 – 1st Floor – Restroom

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T8 wall strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 5 hours/week. There are no recommendations, fixturea are to remain.

Fire Station #2 – 1st Floor – Outside

Energy Saving Opportunity:

- (1) 100W HID Wall Pack. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 84 hours/week. There are no recommendations, fixturea are to remain.

Fire Station #2 – 2nd Floor – Stairs

Energy Saving Opportunity:

- (2) 2-lamp, 26W CFL surface round. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 2nd Floor – Corridors

Energy Saving Opportunity:

- (5) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (5) 26W CFL step light. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 2nd Floor – Mechanical Room

Energy Saving Opportunity:

- (1) 2-lamp, 26W CFL surface round. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 2 hours/week. There are no recommendations, fixture is to remain.

Fire Station #2 – 2nd Floor – Corridors

Energy Saving Opportunity:

- (11) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 10 hours/week. There are no recommendations, fixturea are to remain.

Fire Station #2 – 2nd Floor – Restrooms

Energy Saving Opportunity:

- (3) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (3) 1x4, 2-lamp T8 vanity. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.
- (3) 26W CFL surface round shower light. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 2nd Floor – Bedrooms

Energy Saving Opportunity:

- (14) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 5 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.

Fire Station #2 – 2nd Floor – Closet

Energy Saving Opportunity:

- (2) 1x4, 1-lamp T8 surface strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 2nd Floor – Laundry

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 15 hours/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 2nd Floor – Mechanical Room / Janitor's Closet

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 1 hour/week. There are no recommendations, fixtures are to remain.

Fire Station #2 – 2nd Floor – Conference Briefing Room

Energy Saving Opportunity:

- (11) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 30-35 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Fire Station #2 – 2nd Floor – Weight Room

Energy Saving Opportunity:

- (3) 1x4, 2-lamp T8 surface wrap. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 22-25 fc. Fixtures operate 1 hour/week. There

are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

ECM-1.5: Lighting Retrofit (Golf Course)

Existing Conditions

The University City Golf Course audit focuses on two main buildings: the pro shop and the maintenance garage. The pro shop is occupied approximately 15 hours per day. There are several outdated T12 fixtures in use in the building. These should all be retrofitted with T8 lamps and high-efficiency, electronic ballasts for a substantial payback. These fixtures should also be controlled by dual-technology occupancy sensors to further increase savings by reducing burn hours. The maintenance garage has the same recommendations as well as replacing exposed incandescent lamps with compact fluorescents. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
1,277	1	12	-	-	$87	$0	$0	$0	$87	$0	$1,847	18.5

Table 21 Savings Summary - ECM-1.5 Lighting Retrofit (Golf Course)

Physical Changes

To the occupant, there will be slight visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Golf Course building and the individual recommendations therein:

Golf Course – Pro Shop

Energy Saving Opportunity:

- (4) 1x4, 2-lamp T12 wall-mounted strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 105 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (8) R40 Halogen Flood Track Light. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 105 hours/month. There are no recommendations, fixtures are to remain.
- (8) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 80-100 fc. Fixtures operate 105 hours/week. Re-lamp with (8) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (1) 2x4, 4-lamp T8 surface wrap. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 60-80 fc. Fixture operates 105 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Golf Course – Pro Shop - Office

Energy Saving Opportunity:

- (1) 1x4, 4-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 35-40 fc. Fixtures operate 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixture to be controlled by dual-technology occupancy sensor.

Golf Course – Pro Shop – Men's Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 60 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixture to be controlled by dual-technology occupancy sensor.

Golf Course – Pro Shop – Women's Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 10 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixture to be controlled by dual-technology occupancy sensor.

Golf Course – Pro Shop – Stairs

Energy Saving Opportunity:

- (4) 100W recessed incandescent square. Average foot candle reading for these fixtures is 5-7 fc. Fixtures operate 5 hours/week. Re-lamp with (4) 26W compact fluorescent, screw type lamps.

Golf Course – Pro Shop – Basement

Energy Saving Opportunity:

- (1) 2-lamp T12 strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 5 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast.

Golf Course – Pro Shop – Kitchen

Energy Saving Opportunity:

- (1) 2-lamp T12 strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 5 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast.
- (1) 100W incandescent globe. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 5 hours/week. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

Golf Course – Pro Shop – Ball Shack

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T8 surface wrap. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 12-15 fc. Fixture operates 20 hours/week. There are no recommendations, fixtures are to remain.

Golf Course – Grounds Maintenance Building - Storage

Energy Saving Opportunity:

- (1) 100W incandescent globe. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 2 hours/year. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

Golf Course – Grounds Maintenance Building - Garage

Energy Saving Opportunity:

- (1) 60W incandescent globe. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 60 hours/week. Re-lamp with (1) 13W compact fluorescent, screw type lamp.
- (5) 60W incandescent globe. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 2 hours/year. Re-lamp with (5) 13W compact fluorescent, screw type lamp.
- (2) 13W Exposed CFL screw type lamp. Average foot candle reading for these fixtures is 3-5 fc. Fixtures operate 60 hours/week. There are no recommendations, fixtures are to remain.
- (5) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 120 hours/week. Re-lamp with (5) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Golf Course – Grounds Maintenance Building – Garage Office

Energy Saving Opportunity:

- (2) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 55-60 fc. Fixtures operate 60 hours/week. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Golf Course – Grounds Maintenance Building – Exterior
Energy Saving Opportunity:

- (2) PAR38 Halogen Flood. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 10 hours/week. There are no recommendations, fixture is to remain.

ECM-1.6: Lighting Retrofit (Public Works)

Existing Conditions

The University City Public Works site consists of several buildings: the central garage, recycling center, sign shop, and grounds maintenance storage and shops. All of these buildings use antiquated T12 strips and recessed troffers with magnetic ballast. All of these fixtures should be retrofitted with T8 lamps and low-power, electronic ballasts. The garage fixtures should be replaced with high-bay, T8 fixtures that will drastically increase light levels, while reducing the total numbers of fixtures and saving significant energy. These fixtures will be equipped with integral occupancy sensors to further increase energy savings. Other upgraded fixtures should also be controlled by new, dual-technology, occupancy sensors for a reduction in burn hours. Although many of these upgrades offer a slightly less than ideal payback, the improvements in light quality and worker productivity make these upgrades a wise investment. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
39,387	9	12	-	-	$2,698	$0	$0	$0	$2,698	$0	$31,692	8.8

Table 22 Savings Summary - ECM-1.6 Lighting Retrofit (Public Works)

Physical Changes

To the occupant, there will be slight visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Central Garage building and the individual recommendations therein:

Central Garage – Vehicle Workshop

Energy Saving Opportunity:

- (41) 1x8, 2-lamp 75W T12 surface strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-25 fc. Fixtures operate 55 hours/week. Fixtures to be demolished and replaced with (25) 4-lamp T8 High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.
- (13) 1x4, 2-lamp T12 surface strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-25 fc. Fixtures operate 55 hours/week. Fixtures to be demolished and replaced with (7) 4-lamp T8 High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.
- (4) 1x4, 2-lamp T12 pendant industrial task. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-25 fc. Fixtures operate 55 hours/week. Re-lamp with (4) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Central Garage – High-Bay Garage

Energy Saving Opportunity:

- (21) 1x8, 2-lamp 75W T12 surface strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 40-60 fc. Fixtures operate 55 hours/week. Fixtures to be demolished and replaced with (8) 4-lamp T5HO High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.
- (3) 1x4, 2-lamp T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 55 hours/week. All fixtures to be demolished.

Central Garage – Garage

Energy Saving Opportunity:

- (1) Incandescent Exit Sign. Fixture operates 168 hours/week. Replace with new (1) LED Exit Sign.

Central Garage – Tool/Compressor Room

Energy Saving Opportunity:

- (1) 1x8, 2-lamp 75W T12 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-12 fc. Fixture operates 55 hours/week. Re-lamp with (1) 2, 59W 8', T8 lamps and high-efficiency, electronic ballasts. Fixture to be controlled by dual-technology occupancy sensor.

Central Garage – Parts Supply Room

Energy Saving Opportunity:

- (5) 1x4, 2-lamp T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-22 fc. Fixtures operate 55 hours/week. Re-lamp with (5) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (2) 1x4, 1-lamp T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 18-20 fc. Fixtures operate 55 hours/week. Re-lamp with (2) 1, 28W T8 lamp and high-efficiency, electronic ballast. Fixtures to be controlled by dual-technology occupancy sensor.

Central Garage – Print Room

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 25-30 fc. Fixture operates 55 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Central Garage – Offices

Energy Saving Opportunity:

- (2) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 55 hours/week. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.
- (3) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-20 fc. Fixtures operate 55 hours/week. Re-lamp with (3) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Central Garage – Break Room

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T12 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 55 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Central Garage – Men's Locker & Restroom

Energy Saving Opportunity:

- (14) 1x4, 2-lamp T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 55 hours/week. Re-lamp with (14) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.
- (1) 1x4, 2-lamp T8 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 55 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.
- (1) 1x4, 1-lamp T12 vanity strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-12 fc. Fixture operates 55 hours/week. Re-lamp with (1) 1, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.
- (2) 1x4, 2-lamp T8 strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixture operates 55 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensor.

Central Garage – Offices
Energy Saving Opportunity:

- (15) 1x4, 2-lamp T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 15-20 fc. Fixtures operate 55 hours/week. Re-lamp with (15) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Central Garage – Women's Restroom

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T12 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 55 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Central Garage – Fuel Station

Energy Saving Opportunity:

- (2) 175W Metal Halide Class 1, Division 1 surface mount. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 8-10 fc. Fixtures operate 84 hours/week. There are no recommendations, fixtures are to remain.

Materials Recycling Facility - Storage

Energy Saving Opportunity:

- (6) 1x4, 2-lamp T8 surface strip. Fixture utilizes electronic ballast. Average foot candle reading for this fixture is 20-22 fc. Fixture operates 40 hours/week. There are no recommendations, fixtures are to remain. Fixtures to be controlled by dual-technology occupancy sensors.
- (10) 1x4, 2-lamp T12 surface strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-22 fc. Fixtures operate 40 hours/week. Re-lamp with (10) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensors.

Materials Recycling Facility - Break

Energy Saving Opportunity:

- (3) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 20-30 fc. Fixtures operate 2 hours/week. Re-lamp with (3) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures to be controlled by dual-technology occupancy sensor.

Materials Recycling Facility - Restroom

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 40 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Materials Recycling Facility – Janitor's Closet

Energy Saving Opportunity:

- (1) 1x4, 2-lamp T8 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 25-30 fc. Fixture operates 40 hours/week. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixture to be controlled by dual-technology occupancy sensor.

Materials Recycling Facility – Storage

Energy Saving Opportunity:

- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Materials Recycling Facility – Trash Sorting

Energy Saving Opportunity:

- (3) 100W Metal Halide Wall Flood. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 3-7 fc. Fixtures operate 84 hours/week. There are no recommendations, fixtures are to remain.
- (2) 150W High-Pressure Sodium Wall Pack. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 4-7 fc. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Materials Recycling Facility – Break Shack

Energy Saving Opportunity:

- (2) 1x4, 2-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 10-20 fc. Fixtures operate 2 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Parks Storage and Shops - Storage

Energy Saving Opportunity:

- (19) 1x4, 2-lamp T12 pendant strip. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 11-15 fc. Fixtures operate 168 hours/week. Re-lamp with (19) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensors.
- (1) 1x4, 4-lamp T12 pendant strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 21-25 fc. Fixture operates 168 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture shall be controlled by dual-technology occupancy sensor.

Parks Storage and Shops – Break Area
Energy Saving Opportunity:

- (27) 1x4, 2-lamp T12 pendant strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 20-22 fc. Fixture operates 168 hours/week. Re-lamp with (27) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensors.

- (1) 2x4, 4-lamp T12 pendant strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 21-25 fc. Fixture operates 168 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensor.

Parks Storage and Shops - Storage

Energy Saving Opportunity:

- (5) 26W CFL Pendant Globe. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 4-6 fc. Fixtures operate 50 hours/week. There are no recommendations, fixtures are to remain.

Parks Storage and Shops – Back Garage

Energy Saving Opportunity:

- (6) 1x4, 2-lamp T12 pendant strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 168 hours/week. Re-lamp with (6) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensor.

Parks Storage and Shops – Machine Shop

Energy Saving Opportunity:

- (20) 1x4, 2-lamp T12 pendant strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 15-20 fc. Fixture operates 168 hours/week. Re-lamp with (20) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensors.

Parks Storage and Shops – Entry Hall

Energy Saving Opportunity:

- (3) 1x4, 2-lamp T12 surface wrap. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 23-25 fc. Fixture operates 50 hours/week. Re-lamp with (3) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensor.

Parks Storage and Shops – Locker
Energy Saving Opportunity:

- (3) 1x4, 2-lamp T12 surface wrap. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 23-25 fc. Fixture operates 50 hours/week. Re-lamp with (3) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensor.
- (2) 1x8, 2-lamp 75W T12 industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 40-50 fc. Fixtures

operate 50 hours/week. Re-lamp with (2) 2, 59W 8', T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.

Parks Storage and Shops – Restroom

Energy Saving Opportunity:

- (2) 100W exposed incandescent pendant. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 50 hours/year. Re-lamp with (2) 26W compact fluorescent, screw type lamp.
- (1) 2-lamp 60W incandescent vanity. Average foot candle reading for this fixture is 9-11 fc. Fixture operates 50 hours/year. Re-lamp with (2) 13W compact fluorescent, screw type lamp.

Parks Storage and Shops – Office

Energy Saving Opportunity:

- (3) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 90-110 fc. Fixtures operate 50 hours/week. Fixtures shall be demolished and replaced with 2-lamp, T8 recessed volumetric fixtures with high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.
- (3) 2-lamp T12 strip above lay-in lens. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 50 hours/week. Re-lamp with (3) 2, 28W T8 lamps and high-efficiency, electronic ballast. Fixtures shall be controlled by dual-technology occupancy sensor.

Lawn Equipment Storage - Garage

Energy Saving Opportunity:

- (4) PAR38 Halogen Flood. Average foot candle reading for these fixtures is 5-10 fc. Fixtures operate 5 hours/month. There are no recommendations, fixtures are to remain.
- (1) 26W Exposed CFL. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 4-6 fc. Fixture operates 5 hours/month. There are no recommendations, fixture is to remain.
- (1) 1x4, 1-lamp T12 surface strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 5 hours/month. Re-lamp with (1) 1, 28W T8 lamp and high-efficiency, electronic ballast.

Sign Shop - Storage

Energy Saving Opportunity:

- (20) 1x4, 2-lamp T12 surface industrial strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-25 fc. Fixtures operate 45 hours/week. Fixtures to be demolished and replaced with (8) 4-lamp T8 High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.

Sign Shop - Office

Energy Saving Opportunity:

- (1) 1x8, 2-lamp 75W T12 industrial strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-25 fc. Fixture operates 45 hours/week. Re-lamp with (1) 2, 59W 8', T8 lamps and high-efficiency, electronic ballast. Fixture shall be controlled by dual-technology occupancy sensor.

Sign Shop - Restroom

Energy Saving Opportunity:

- (1) 1x4, 1-lamp T12 industrial strip. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 45 hours/week. Re-lamp with (1) 1, 28W T8 lamp and high-efficiency, electronic ballast. Fixture shall be controlled by dual-technology occupancy sensor.

Sign Shop - Storage

Energy Saving Opportunity:

- (1) Incandescent Exit Sign. Fixture operates 168 hours/week. Replace with new (1) LED Exit Sign.

ECM-1.7: Lighting Retrofit (Recreation Center)

Existing Conditions

The University City Recreation Center houses a gym, basketball court, indoor soccer field, offices, and a pool. Many portions of the gym were added in in the mid-2000s and do not require any upgrades. The basketball court and indoor soccer field currently use metal halide high-bay fixtures for illumination. By replacing these T5HO high-bay fixtures, the overall number of fixtures will be significantly reduced, the lighting will improve, energy will be saved, and controllability and safety will be increased due to “instant on” technology. These fixtures shall be installed with integral occupancy sensors to avoid wasted burn hours when the areas are not in use. The weight rooms as well as the pool house still use T12 lamps with magnetic ballasts. These should be retrofitted with T8 lamps and high-efficiency, electronic ballasts to save energy and improve all aspects of the existing fixtures. Controls should also be implemented in these areas to reduce unnecessary burn time. Unfortunately, most of the suggested upgrades are for quality and productivity as well as increased control; but they do not offer a reasonable payback in most cases. All enclosed fixtures that are to remain should have their lenses cleaned and wiped down, as the photometrics and lumen output have been severely compromised due to dust collection and the presence of foreign matter in most cases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
27,897	12	12	-	-	$1,911	$0	$0	$0	$1,911	$0	$42,681	20.8

Table 23 Savings Summary - ECM-1.7 Lighting Retrofit (Recreation Center)

Physical Changes

To the occupant, there will be moderate visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Recreation Center building and the individual recommendations therein:

Recreation Center – Weight Room

Energy Saving Opportunity:

- (22) 2x4, 4-lamp T8 recessed troffer. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 45-50 fc. Fixtures operate 103 hours/week. There are no recommendations, fixtures are to remain. Fixtures shall be controlled by dual-technology occupancy sensors.
- (2) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.
- (8) PAR38 CFL Flood. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 103 hours/week. There are no recommendations, fixtures are to remain.

Recreation Center – Restroom Corridor

Energy Saving Opportunity:

- (2) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 35-40 fc. Fixtures operate 103 hours/week. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.
- (1) 2x4, 4-lamp T12 recessed troffer. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 20-25 fc. Fixture operates 103 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast. Fixture shall be controlled by dual-technology occupancy sensor.

Recreation Center – Men's Restroom

Energy Saving Opportunity:

- (3) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 103 hours/week. Re-lamp with (3) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.

Recreation Center – Women's Restroom

Energy Saving Opportunity:

- (5) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 103

hours/week. Re-lamp with (5) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.

Recreation Center – Rock Wall

Energy Saving Opportunity:

- (4) 250W, Metal Halide low bay. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 5-12 fc. Fixtures operate 103 hours/week. Fixtures to be demolished and replaced with (4) 4-lamp T5HO High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.

Recreation Center – Indoor Soccer

Energy Saving Opportunity:

- (11) 250W, Metal Halide low bay. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 1-16 fc. Fixtures operate 103 hours/week. Fixtures to be demolished and replaced with (21) 4-lamp T5HO High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.
- (32) 250W, Metal Halide low bay. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 1-16 fc. Fixtures operate 10 hours/week. Fixtures to be demolished.
- (4) LED Exit Sign. Fixtures operate 168 hours/week. There are no recommendations, fixtures are to remain.

Recreation Center – Basketball Court

Energy Saving Opportunity:

- (20) 250W, Metal Halide low bay. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 8-10 fc. Fixtures operate 103 hours/week. Fixtures to be demolished and replaced with (15) 4-lamp T5HO High-bays, with electronic ballasts. Fixtures to be controlled by integrated occupancy sensors in fixtures.

Recreation Center – Pool Entry

Energy Saving Opportunity:

- (10) 26W CFL Recessed Can. Fixture utilizes standard, magnetic ballast. Average foot candle reading for this fixture is 4-6 fc. Fixture operates 2 hours/week. There are no recommendations, fixture is to remain.

Recreation Center – Pool House

Energy Saving Opportunity:

- (3) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (3) LED Exit Sign.
- (59) 1-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 11-13 fc. Fixtures operate 66 hours/week. Re-lamp with (59) 1, 28W T8 lamp and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensors.
- (17) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 66 hours/week. Re-lamp with (17) 2, 28W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensors.
- (7) 2-lamp T12 strip. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 20-25 fc. Fixtures operate 5 hours/week. Re-lamp with (7) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (4) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 66 hours/week. Re-lamp with (4) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixtures shall be controlled by dual-technology occupancy sensor.

Recreation Center – Pool Electrical / Pump Room
Energy Saving Opportunity:

- (11) 2-lamp T8 damp-location strip. Fixtures utilize electronic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 66 hours/week. There are no recommendations, fixtures are to remain. Fixtures shall be controlled by dual-technology occupancy sensors.

Recreation Center – Pool Office

Energy Saving Opportunity:

- (1) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 35-40 fc. Fixtures operate 60 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballasts. Fixture shall be controlled by dual-technology occupancy sensor.

Recreation Center – Pool Storage

Energy Saving Opportunity:

- (1) 100W exposed incandescent pendant. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/year. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

ECM-1.8: Lighting Retrofit (Trinity Building)

Existing Conditions

The University City Trinity Building was a former library that is now used for storage. The building is rarely occupied, thus no upgrades will offer a reasonable payback. Therefore, there are no recommendations for the Trinity Building although there are potential upgrades listed if payback was not a factor or the building occupancy increases.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
1,226	6	12	-	-	$84	$0	$0	$0	$84	$0	$9,371	111.6

Table 24 Savings Summary - ECM-1.8 Lighting Retrofit (Trinity Building)

Physical Changes

To the occupant, there will be moderate visible changes. With current lamp technology and fixture design, occupants will notice more appropriate light levels with greater uniformity and increased color rendering in the selected retrofit areas. All suggested retrofit and replacement applications meet or exceed existing light levels for the applicable area. The maintenance staff will also notice slight changes. As a result of changing incandescents to compact fluorescents, there will be a lower frequency of lamp replacements. Elimination of fixtures that are in poor operational condition, due to age or environmental degradation, will result in a safer work environment for the entire staff. Other positive changes include the removal of out-dated or obsolete technology, as well as a moderate amount of electrical savings for the facility.

Interface with Agency Equipment

Contractor shall provide all labor and material to inspect, test, and adjust the lighting and the electrical control systems affecting the given spaces to ensure the new lighting systems fulfill existing requirements, while offering a reduction in consumption, especially during peak hours.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with fixture replacement and retrofit, but will be strictly limited to the given area and the panel breakers involved. All work shall be coordinated with the administration and the maintenance staff.

Environmental Impacts

There are minimal environmental drawbacks and numerous benefits associated with the suggested retrofitting and replacement of the lighting in the areas outlined. The new lamps and fixtures will consume less energy, resulting in decreased demand from the reactor processes involved in power production. The new fluorescent lamps are far lower in mercury content, which is beneficial concerning disposal. The only negative impact is from the disposal of the existing lamps and fixtures, but this is negligible when compared to the positives. See Table 3 Greenhouse Gases and Other Pollutants

Salvage and Disposal

Existing equipment in operational condition shall be given to University City as requested. All remaining equipment will be removed and disposed of properly by the electrical contractor.

Individual Recommendations Per Location

The following is a summary of the individual floors and areas of the University City Trinity Building and the individual recommendations therein:

Trinity Building – 1st Floor - Storage

Energy Saving Opportunity:

- (11) 2x4, 4-lamp T12 surface wrap. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 20 hours/year. Re-lamp with (11) 4, 25W T8 lamps and high-efficiency, electronic ballasts.
- (3) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (3) LED Exit Sign.

Trinity Building – 1st Floor - Offices

Energy Saving Opportunity:

- (2) 2x4, 4-lamp T12 recessed troffer. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 25-30 fc. Fixtures operate 10 hours/year. Re-lamp with (2) 4, 25W T8 lamps and high-efficiency, electronic ballasts.

Trinity Building – 1st Floor - Kitchen

Energy Saving Opportunity:

- (1) 2-lamp T12 strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 10-15 fc. Fixture operates 10 hours/year. Re-lamp with (1) 2, 28W T8 lamps and high-efficiency, electronic ballast.

Trinity Building – 1st Floor – Stage / Mechanical

Energy Saving Opportunity:

- (15) 90W exposed incandescent pendant. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 5 hours/year. Re-lamp with (15) 26W compact fluorescent, screw type lamps.

Trinity Building – 1st Floor – Stairs

Energy Saving Opportunity:

- (2) 26W CFL Pendant. Fixtures utilize standard, magnetic ballasts. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 40 hours/week. There are no recommendations, fixtures are to remain.

Trinity Building – 1st Floor – Men's Restroom

Energy Saving Opportunity:

- (1) 90W exposed incandescent pendant. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 5 hours/year. Re-lamp with (1) 26W compact fluorescent, screw type lamp.

Trinity Building – 1st Floor – Women's Restroom

Energy Saving Opportunity:

- (1) 90W exposed incandescent pendant. Average foot candle reading for this fixture is 2-3 fc. Fixture operates 5 hours/year. Re-lamp with (1) 26W compact fluorescent, screw type lamp.
- (1) 1x4, 1-lamp T12 wall strip. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 5-10 fc. Fixture operates 40 hours/week. Re-lamp with (1) 1, 28W T8 lamp and high-efficiency, electronic ballast.

Trinity Building – 1st Floor – Storage

Energy Saving Opportunity:

- (4) 100W exposed incandescent. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/year. Re-lamp with (4) 26W compact fluorescent, screw type lamps.

Trinity Building – 2nd Floor – Hall

Energy Saving Opportunity:

- (1) 2-lamp, 40W recessed incandescent square. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/year. Re-lamp with (2) 9W compact fluorescent, screw type lamp.

Trinity Building – 2nd Floor – Storage

Energy Saving Opportunity:

- (18) 60W exposed incandescent. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/year. Re-lamp with (18) 13W compact fluorescent, screw type lamps.

Trinity Building – 2nd Floor – Stairs

Energy Saving Opportunity:

- (2) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 1-2 fc. Fixtures operate 20 hours/week. Re-lamp with (2) 2, 28W T8 lamps and high-efficiency, electronic ballasts.
- (1) 4-lamp T12 surface wrap. Fixture utilizes standard magnetic ballast. Average foot candle reading for this fixture is 1-2 fc. Fixture operates 20 hours/week. Re-lamp with (1) 4, 25W T8 lamps and high-efficiency, electronic ballast.

Trinity Building – 2nd Floor – Storage

Energy Saving Opportunity:

- (1) Incandescent Exit Sign. Fixture operates 168 hours/week. Replace with new (1) LED Exit Sign.
- (39) 34W exposed incandescent. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/year. Re-lamp with (39) 9W compact fluorescent, screw type lamp.
- (5) 2-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 10-15 fc. Fixtures operate 20 hours/week. Re-lamp with (5) 2, 28W T8 lamps and high-efficiency, electronic ballasts.

Trinity Building – 2nd Floor – Old Library

Energy Saving Opportunity:

- (9) 4-lamp T12 surface wrap. Fixtures utilize standard magnetic ballasts. Average foot candle reading for these fixtures is 5-10 fc. Fixtures operate 60 hours/year. Re-lamp with (9) 4, 25W T8 lamps and high-efficiency, electronic ballasts.
- (2) Incandescent Exit Sign. Fixtures operate 168 hours/week. Replace with new (2) LED Exit Sign.

Trinity Building – 2nd Floor – Stairs

Energy Saving Opportunity:

- (2) 5-lamp, Decorative Incandescent Candleabra. Average foot candle reading for these fixtures is 2-3 fc. Fixtures operate 1 hour/month. There are no recommendations, fixtures are to remain.

Trinity Building – 2nd Floor – Entry

Energy Saving Opportunity:

- (1) 2-lamp, 40W decorative incandescent surface mount. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/month. Re-lamp with (2) 13W compact fluorescent, screw type lamp.

Trinity Building – 3rd Floor – Storage

Energy Saving Opportunity:

- (19) 34W exposed incandescent. Average foot candle reading for this fixture is 3-5 fc. Fixture operates 1 hour/year. Re-lamp with (19) 9W compact fluorescent, screw type lamp.

2.0 ENERGY MANAGEMENT SYSTEM / CONTROL IMPROVEMENTS

ECM-2.1: Install Programmable Tstats & Locking Covers - Central Garage (Assumes ECM-4.3 Implemented)

The Central Garage offices are conditioned by two split systems as described in the HVAC description. These units are controlled by standard thermostats. The set points for these spaces can be modified to reduce energy use.

This ECM recommends the installation of new programmable thermostats with locking covers to control the unit. See
Table 25 Office Set Point Schedule - Central Garage below for space temperature setpoints.

Existing Space Temp. Set Points		
Mode	**Occupied**	**Unoccupied**
Hours	**0630-1700**	**1700-0630**
Cooling	72°F	72°F
Heating	72°F	72°F

Recommended Space Temp. Set Points		
Mode	**Occupied**	**Unoccupied**
Hours	**0630-1700**	**1700-0630**
Cooling	74°F	80°F
Heating	70°F	60°F

Table 25 Office Set Point Schedule - Central Garage

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
27,671	3	12	-	0	$1,895	$0	$0	$0	$1,895	$0	$227	0.1

Table 26 Savings Summary - ECM-2.1 Office Setpoint Schedule (Central Garage)

Physical Changes

To the occupant, there will be virtually no visible changes.

Interface with Agency Equipment

Contractor will provide all labor and material to inspect, test, and adjust the mechanical and control systems affecting the given spaces to ensure the HVAC systems are performing in a manner to adequately condition the spaces served.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some time when the space temperatures may fluctuate as the system operation is tested.. These will be coordinated with the facility administration.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. Please see Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

There is no equipment that will be removed.

ECM-2.2: Install Plug Load Occupancy Sensors - City Hall

The City Hall has workstations using various office appliances. These spaces have a total of approximately fifty-five (55) computers that can be retrofitted with a plug load occupancy sensor. The plug load sensor will turn off accessory plug loads (not the computer itself) which includes the associated monitor, personal printers, and task lighting that are used approximately 12 hours a day, however most remain on the majority of the day.

This ECM recommends the installation of a plug load occupancy sensor power strip that will reduce energy consumption by turning plug loads on and off based on occupancy.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
16,527	-	-	-	0	$1,132	$0	$0	$0	$1,132	$0	$8,081	7.6

Table 27 Savings Summary - ECM-2.2 Install Plug Load Occupancy Sensors (City Hall)

Physical Changes

To the occupant, there will be virtually no visible changes. The worker will have to be educated on how the plug load occupancy sensor works in order to understand how it may affect them during the workday. For instance, if the worker leaves for lunch and the occupancy sensor will shut off outlets that are connected after the present time delay expires. When the worker returns they will notice that as they approach their desk, the equipment connected to the power strip will turn on.

Interface with Agency Equipment

The facility manager should coordinate which workstations will be allowed to have the plug load occupancy sensor power strip installed on.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be minimal downtime associated with each plug load occupancy sensor power strip installation. These will be coordinated with the facility administration.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. By reducing the plug loads associated with unoccupied workstation energy will be conserved. Please see Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

There is no equipment that will be removed.

ECM-2.3: Install Plug Load Occupancy Sensors - Annex

The Annex has workstations using various office appliances. These spaces have a total of approximately seventy-five (75) computers that can be retrofitted with a plug load occupancy sensor. The plug load sensor will turn off accessory plug loads (not the computer itself) which includes the associated monitor, personal printers, and task lighting that are used approximately 12 hours a day, however most remain on the majority of the day.

This ECM recommends the installation of a plug load occupancy sensor power strip that will reduce energy consumption by turning plug loads on and off based on occupancy.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
19,016	-	-	-	-	$1,303	$0	$0	$0	$1,303	$0	$11,019	9.7

Table 28 Savings Summary - ECM-2.3 Install Plug Load Occupancy Sensors (Annex)

Physical Changes

To the occupant, there will be virtually no visible changes. The worker will have to be educated on how the plug load occupancy sensor works in order to understand how it may affect them during the workday. For instance, if the worker leaves for lunch and the occupancy sensor will shut off outlets that are connected after the present time delay expires. When the worker returns they will notice that as they approach their desk, the equipment connected to the power strip will turn on.

Interface with Agency Equipment

The facility manager should coordinate which workstations will be allowed to have the plug load occupancy sensor power strip installed on.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be minimal downtime associated with each plug load occupancy sensor power strip installation. These will be coordinated with the facility administration.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. By reducing the plug loads associated with unoccupied workstation energy will be conserved. Please see Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

There is no equipment that will be removed.

4.0 HEATING, VENTILATING, & AIR CONDITIONING IMPROVEMENTS

ECM-4.1: Unit Replacement – Annex

The Annex is conditioned by multiple systems as was previously detailed in the HVAC description. There are several pieces of equipment that are nearing the end of their useful life and consume higher quantities of energy than newer equipment. Also the water source units consume large quantities of domestic water.

This ECM recommends replacing the condensing unit, cooling coil, and refrigerant lines for the existing split systems. The existing gas furnace or steam coils for these units would remain. This ECM also recommends replacing the water source units with new split systems. The units serving the server and telephone room would not require heat while the unit serving the basement cells shall be a heat pump unit. The new split system units shall have a higher cooling efficiency EER rating ranging from 12.0 and a higher heating efficiency COP of 3.5. The new heat pump unit will still have supplemental auxiliary electric heat; but this would only occur when the heat pump could not maintain set temperature. New equipment shall be installed in the same location as existing equipment. SeeTable 29 Existing HVAC Recommended Replacement Schedule - Annex. It should be noted that cooling would not be possible below 0°F ambient for the computer room and telephone room. Design temperature for this area is 2°F, however there can be times when ambient temperatures are below this. Also, the cost estimate does not include any code issues that may arise.

Existing HVAC Recommended Replacement Schedule						
Area Served	**Unit Type**	**Quantity**	**SA cfm**	**Tons**	**Clg type**	**Htg Type**
Detectives	DX/Gas RTU	1	2,000	5.0	DX	Gas
Office	DX/Gas Split	1	1,200	3.0	DX	Gas
Fire Chief/Kitchen	DX/Steam Split	1	1,200	3.0	DX	Steam
Server Rm	Vert. Water Source	1	1,200	3.0	WS	WSHP
Telephone Rm	Horiz. Water Source	1	1,200	3.0	WS	WSHP
Basement Cells	Vert. Water Source	1	1,200	3.0	WS	WSHP

Table 29 Existing HVAC Recommended Replacement Schedule - Annex

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
55,706	11	12	-	2,173	$3,816	$0	$0	$7,040	$10,856	$0	$101,983	9.5

Table 30 Savings Summary - ECM-4.1 Unit Replacement Annex

Physical Changes

To the occupant, there will be virtually no visible changes. In many locations where the system has not been operating effectively, building occupants will now have a more comfortable working environment.

Interface with Agency Equipment

Contractor will provide all labor and material to inspect, test, and adjust the mechanical and control systems affecting the given spaces to ensure the HVAC systems are performing in a manner to adequately condition the spaces served.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with each unit replacement. Any electricity curtailment will be limited to an individual breaker serving an air handler or other HVAC equipment. In some instances, a sub panel may be momentarily interrupted. These will be coordinated with the facility manager.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. By increasing the efficiency of the equipment, cooling and heating energy will be conserved. Please see Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

Existing equipment is not believed to hold any salvage value. It will be removed and disposed of properly.

ECM-4.2: Pump Motor Replacement – Heman Park Pool

There are two pumps located in a mechanical room at Heman Park Pool to serve the main filtration system. Each of these pumps has a 40 hp motor. One has been replaced recently while the other is an older less efficient model.

This ECM recommends replacing the older pump motor with a new 40 hp motor The new motor with a minimum efficiency of 93%.

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
15,709	5	4	-	-	$1,076	$0	$0	$0	$1,076	$0	$5,845	5.4

Table 31 Savings Summary - ECM-4.2 Pump Motor Replacement (Heman Park Pool)

Physical Changes

To the occupant, there will be virtually no visible changes. The equipment will operate at the same level of performance.

Interface with Agency Equipment

Contractor will provide all labor and material to inspect, test, and adjust the mechanical and control systems affecting the given pumps to ensure the systems are performing as near to the original design as possible.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with each motor replacement. Any electricity curtailment will be limited to an individual breaker serving the HVAC equipment. In some instances, a sub panel may be momentarily interrupted. These will be coordinated with the facility manager.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. By increasing the efficiency of the equipment fan energy will be conserved. See Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

Existing equipment is not believed to hold any salvage value. It will be removed and disposed of properly.

ECM-4.3: Unit Replacement – Central Garage (Assumes ECM-2.1 Implemented)

The central Garage has two office areas that are conditioned by split systems. The condensing unit and indoor unit for the office in the shop is older and can be replaced with a newer unit. The indoor unit serving the front office has been replaced while the condensing unit is original. This system is not functioning properly and needs to be replaced. This would allow the window units to be removed.

This ECM recommends replacing these units with heat pumps and units of the same configuration. The new split system units with capacities of 5-tons or lesser shall have a higher cooling efficiency EER rating ranging from 13.5 and a higher heating efficiency COP of 4.0. The new heat pump will still have supplemental auxiliary electric heat; however, the electric heat would only be used when the heat pump could not maintain set temperature. New equipment shall be in the same location as existing equipment. SeeTable 32 Existing HVAC Recommended Replacement Schedule - Central Garage.

Existing HVAC Recommended Replacement Schedule						
Area Served	**Unit Type**	**Quantity**	**SA cfm**	**Tons**	**Clg type**	**Htg Type**
Front Office	DX/Elec Split	1	1,000	2.5	DX	Elec
Shop Office	DX/Elec Split	1	1,200	3.0	DX	Elec

Table 32 Existing HVAC Recommended Replacement Schedule - Central Garage

Savings Summary

Energy Consumption Savings					Energy Cost Savings				Total Energy Savings	Avoided Maint. Savings	Capital Cost	SPB
KWh	KW	Months	Steam klbs	Water kgal	KWh	KW	Steam	Water				
23,643	8	12	-	-	$1,620	$0	$0	$0	$1,620	$903	$19,718	7.8

Table 33 Savings Summary - ECM-4.3 Existing HVAC Replacement - Central Garage

Physical Changes

To the occupant, there will be virtually no visible changes. The equipment will operate at the same level of performance.

Interface with Agency Equipment

Contractor will provide all labor and material to inspect, test, and adjust the mechanical and control systems affecting the given spaces to ensure the HVAC systems are performing in a manner to adequately condition the spaces served.

Utility Interruptions and Site Coordination

There will be no significant utility interruptions. There will be some downtime associated with each motor replacement. Any electricity curtailment will be limited to an individual breaker serving the HVAC equipment. In some instances, a sub panel may be momentarily interrupted. These will be coordinated with the facility manager.

Environmental Impacts

The environmental impact from this project will only be positive. By reducing electrical consumption, pollution from power generating plants will also be reduced. By increasing the efficiency of the equipment fan energy will be conserved. Please see Table 3 Greenhouse Gases and Other Pollutants.

Salvage and Disposal

Existing equipment is not believed to hold any salvage value. It will be removed and disposed of properly.

Appendix A

Lighting Improvements Calculations (Annex) – ECM-1.1

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - Basement - Corridor	1x4, 2L T12 recessed cove strip w/standard ballast	15	73	1095	3416.4	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	15	51	765	330	3120	1,029.60	61.64	37	45	2	1,260	20.44
Police Station - Basement - Break Room	2x4, 4L T12 recessed troffer w/standard ballast	5	144	720	2246.4	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	290	3120	904.80	54.17	42	50	2	470	8.68
Police Station - Basement - Break Room	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	1	73	73	227.76	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	13	3120	40.56	2.43	37	45	2	84	34.59
Police Station - Basement - Break Room	2-lamp 60W Incandescent Surface Round	1	120	120	6.24	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	52	4.89	0.29	5	15	1	21	71.76
Police Station - Basement - Fire Chief's Office	2x4, 4L T12 recessed troffer w/standard ballast	10	144	1440	4492.8	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	10	86	860	580	3120	1,809.60	108.34	42	50	2	940	8.68
Police Station - Basement - Corridor	26W TTT CFL Recessed Can	10	26	260	811.2	Do Nothing - Fixture To Remain	10	26	260	0	3120	0.00	0.00					
Police Station - Basement - Corridor	Incandescent Exit Sign	3	20	60	525.6	Replace with LED Exit Sign	3	3	9	51	8760	446.76	26.75	55	65	5	375	14.02
Police Station - Basement - E.O.C. Room	26W TTT CFL Recessed Can	1	26	26	13.52	Do Nothing - Fixture To Remain	1	26	26	0	520	0.00	0.00					
Police Station - Basement - E.O.C. Room	1x2, 2L T12 wall mount w/standard ballast	1	48	48	24.96	Re-lamp w/2 17W T8 lamps w/high-efficiency, electronic ballast	1	34	34	14	520	7.28	0.44	37	45	2	84	192.73
Police Station - Basement - E.O.C. Room	1x4, 2L T12 surface wrap w/standard ballast	27	73	1971	1024.92	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	27	51	1377	594	520	308.88	18.49	37	45	2	2,268	122.64

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - Basement - E.O.C. Room	1x4, 2L T12 surface wrap w/standard ballast	2	73	146	1278.96	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	8760	385.44	23.08	37	45	2	168	7.28
Police Station - Basement - E.O.C. Kitchen	2L T12 strip w/standard ballast	1	73	73	18.98	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	260	5.72	0.34	37	45	2	84	245.29
Police Station - Basement - E.O.C. Mechanical Room	2L T12 strip w/standard ballast	2	73	146	7.592	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	52	2.29	0.14	37	45	2	168	1226.43
Police Station - Basement - E.O.C. Mechanical Room	52W Exposed Incandescent	2	52	104	5.408	Re-lamp w/13W compact fluorescent screw-type lamps	2	13	26	78	52	4.06	0.24	5	15	1	42	172.96
Police Station - Basement - E.O.C.	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Police Station - Basement - E.O.C.Communications Room	2L T12 strip w/standard ballast	3	73	219	11.388	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	66	52	3.43	0.21	37	45	2	252	1226.43
Police Station - Basement - E.O.C.Storeroom	2L T12 surface wrap w/standard ballast	5	73	365	18.98	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	5	51	255	110	52	5.72	0.34	37	45	2	420	1226.43
Police Station - Basement - E.O.C.Restroom	2L T12 surface wrap w/standard ballast	2	73	146	7.592	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	52	2.29	0.14	37	45	2	168	1226.43
Police Station - Basement - Shooting Range	PAR 38 Halogen Flood	6	75	450	117	Do Nothing - Fixture To Remain	6	75	450	0	260	0.00	0.00					
Police Station - Basement - Shooting Range	52W Exposed Incandescent	5	52	260	67.6	Re-lamp w/13W compact fluorescent screw-type lamps	5	13	65	195	260	50.70	3.04	5	15	1	105	34.59

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - Basement - Shooting Range File Room	2L T12 strip w/standard ballast	4	73	292	15.184	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	52	4.58	0.27	37	45	2	336	1226.43
Police Station - Basement - Files	1x8, 2L 75W T12 strip w/standard ballast	2	158	316	16.432	Re-lamp w/2 59W T8 8' lamps w/high-efficiency, electronic ballast	2	112	224	92	52	4.78	0.29	37	45	2	168	586.56
Police Station - Basement - Corridor	2L T12 strip w/standard ballast	2	73	146	15.184	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	104	4.58	0.27	37	45	2	168	613.22
Police Station - Basement - Closet	52W Exposed Incandescent	1	52	52	2.704	Re-lamp w/13W compact fluorescent screw-type lamps	1	13	13	39	52	2.03	0.12	5	15	1	21	172.96
Police Station - Basement - Weapons Storage	2L T12 strip w/standard ballast	4	73	292	75.92	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	260	22.88	1.37	37	45	2	336	245.29
Police Station - Basement - Bike Storage	100W Exposed Incandescent	14	100	1400	72.8	Re-lamp w/26W compact fluorescent screw-type lamps	14	26	364	1036	52	53.87	3.23	5	15	1	294	91.15
Police Station - Basement - Stairs	2-lamp 60W Incandescent Surface	2	120	240	62.4	Re-lamp w/2 13W compact fluorescent screw-type lamps	2	26	52	188	260	48.88	2.93	10	25	1	72	24.60
Police Station - 1st Floor - Print Shop	2x4, 4L T12 recessed troffer w/standard ballast	6	144	864	1797.12	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	348	2080	723.84	43.34	42	50	2	564	13.01
Police Station - 1st Floor - Police Dispatch	2x4, 4L T12 recessed volumetric w/standard ballast	21	144	3024	9434.88	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	21	86	1806	1218	3120	3,800.16	227.52	42	50	2	1,974	8.68
Police Station - 1st Floor - Police Dispatch	2x4, 4L T12 recessed volumetric w/standard ballast	10	144	1440	12614.4	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	10	86	860	580	8760	5,080.80	304.19	42	50	2	940	3.09

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 1st Floor - Entry Corridor	1x4, 1L T12 wall strip w/standard ballast	8	42	336	1048.32	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	8	26	208	128	3120	399.36	23.91	37	45	2	672	28.11
Police Station - Basement - Men's Cells	2L 3', T12 strip w/standard ballast	1	65	65	284.7	Re-lamp w/2 3', 25W T8 lamps w/high-efficiency, electronic ballast	1	45	45	20	4380	87.60	5.24	37	45	2	84	16.02
Police Station - Basement - Men's Cells	1x4, 2L T12 strip w/standard ballast	2	73	146	639.48	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	4380	192.72	11.54	37	45	2	168	14.56
Police Station - Basement - Men's Cells	PAR 38 Halogen Flood	2	75	150	657	Do Nothing - Fixture To Remain	2	75	150	0	4380	0.00	0.00					
Police Station - Basement - Men's Cells	1x4, 2L T12 wall-mounted strip w/standard ballast	1	73	73	319.74	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	4380	96.36	5.77	37	45	2	84	14.56
Police Station - Basement - Stairs	1x1, 60W Incandescent Surface	1	60	60	262.8	Re-lamp w/1 13W compact fluorescent screw-type lamps	1	13	13	47	4380	205.86	12.32	5	15	1	21	1.70
Police Station - 1st Floor - Private Offices	2x4, 4L T12 recessed volumetric w/standard ballast	12	144	1728	5391.36	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	12	86	1032	696	3120	2,171.52	130.01	42	50	2	1,128	8.68
Police Station - 1st Floor - Conference Room	2x4, 2L T12 recessed troffer w/standard ballast	4	73	292	911.04	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	3120	274.56	16.44	37	45	2	336	20.44
Police Station - 1st Floor - Men's Locker Room	2x4, 4L T12 recessed troffer w/standard ballast	6	144	864	2695.68	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	348	3120	1,085.76	65.00	42	50	2	564	8.68
Police Station - 1st Floor - Women's Locker Room	2x4, 4L T12 recessed troffer w/standard ballast	4	144	576	1797.12	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	232	3120	723.84	43.34	42	50	2	376	8.68

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 1st Floor - Mechanical Storage	100W Exposed Incandescent	3	100	300	15.6	Re-lamp w/26W compact fluorescent screw-type lamps	3	26	78	222	52	11.54	0.69	5	15	1	63	91.15
Police Station - 1st Floor - Offices	1x4, 2L T12 recessed troffer w/standard ballast	9	73	657	2049.84	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	9	51	459	198	3120	617.76	36.99	37	45	2	756	20.44
Police Station - 1st Floor - Cell Entry	2x4, 2L T12 recessed troffer w/standard ballast	6	73	438	1366.56	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	132	3120	411.84	24.66	37	45	2	504	20.44
Police Station - 1st Floor - Cell Entry	40W Recessed Incandescent Can	2	40	80	249.6	Re-lamp w/9W compact fluorescent screw-type lamps	2	9	18	62	3120	193.44	11.58	5	15	1	42	3.63
Police Station - 1st Floor - Hall	1x1, 2-lamp 60W Recessed Incandescent Square	1	120	120	1051.2	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	8760	823.44	49.30	10	25	1	36	0.73
Police Station - 1st Floor - Hall	PAR 38 Halogen Flood	1	75	75	657	Do Nothing - Fixture To Remain	1	75	75	0	8760	0.00	0.00					
Police Station - 1st Floor - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	4	144	576	1797.12	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	232	3120	723.84	43.34	42	50	2	376	8.68
Police Station - 1st Floor - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	4	144	576	1797.12	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	232	3120	723.84	43.34	42	50	2	376	8.68
Police Station - 1st Floor - Women's Restroom	2-lamp 60W Incandescent Vanity	1	120	120	374.4	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	3120	293.28	17.56	10	25	1	36	2.05
Police Station - 1st Floor - Entry	PAR 38 Halogen Flood Cans	9	75	675	2106	Do Nothing - Fixture To Remain	9	75	675	0	3120	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 1st Floor - Entry	2x4, 4L T12 recessed volumetric w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	10.83	42	50	2	94	8.68
Police Station - 1st Floor - Field Ops	2x4, 4L T12 recessed volumetric w/standard ballast	2	144	288	898.56	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	116	3120	361.92	21.67	42	50	2	188	8.68
Police Station - 1st Floor - Field Ops	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	10.83	42	50	2	94	8.68
Police Station - 1st Floor - Field Ops	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	1	73	73	227.76	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	13	3120	40.56	2.43	37	45	2	84	34.59
Police Station - 1st Floor - Traffic	2x4, 4L T12 recessed troffer w/standard ballast	3	144	432	1347.84	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	174	3120	542.88	32.50	42	50	2	282	8.68
Police Station - 1st Floor - Traffic	1x4, 2L T12 recessed troffer w/standard ballast	4	73	292	911.04	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	3120	274.56	16.44	37	45	2	336	20.44
Police Station - 2nd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	17	144	2448	7637.76	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	17	86	1462	986	3120	3,076.32	184.18	42	50	2	1,598	8.68
Police Station - 2nd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	5	144	720	187.2	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	290	260	75.40	4.51	42	50	2	470	104.12
Police Station - 2nd Floor - Hall	2L T12 strip w/standard ballast	1	73	73	227.76	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	3120	68.64	4.11	37	45	2	84	20.44
Police Station - 2nd Floor - Interrogation Room	2x4, 4L T12 recessed troffer w/standard ballast	6	144	864	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	348	520	180.96	10.83	42	50	2	564	52.06

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 2nd Floor - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	10.83	42	50	2	94	8.68
Police Station - 2nd Floor - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	10.83	42	50	2	94	8.68
Police Station - 2nd Floor - Entry	2L T12 strip w/standard ballast	6	73	438	3836.88	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	132	8760	1,156.32	69.23	37	45	2	504	7.28
Police Station - 2nd Floor - Narcotics Evidence Room	2L T12 strip w/standard ballast	8	73	584	303.68	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	176	520	91.52	5.48	37	45	2	672	122.64
Police Station - 2nd Floor - Entry	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Police Station - 2nd Floor - Homicide Evidence Room	2x4, 4L T12 recessed volumetric w/standard ballast	4	144	576	299.52	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	232	520	120.64	7.22	42	50	2	376	52.06
Police Station - 2nd Floor - Lobby	1x2, 2L T12 pendant strip w/standard ballast	5	48	240	748.8	Re-lamp w/2 17W T8 lamps w/high-efficiency, electronic ballast	5	34	170	70	3120	218.40	13.08	37	45	2	420	32.12
Police Station - 3rd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	17	144	2448	7637.76	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	17	86	1462	986	3120	3,076.32	184.18	42	50	2	1,598	8.68
Police Station - 3rd Floor - Mechanical Room	2x4, 2L T12 parabolic strip w/standard ballast	4	73	292	30.368	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	104	9.15	0.55	37	45	2	336	613.22
Police Station - 3rd Floor - Offices	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 3rd Floor - Stairs	1x4, 2L T12 surface wrap w/standard ballast	2	73	146	455.52	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	0	0	146	3120	455.52	27.27	37	45	2	168	6.16
Police Station - 3rd Floor - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	10.83	42	50	2	94	8.68
Police Station - 3rd Floor - Elevator Lobby	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	1	73	73	227.76	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	13	3120	40.56	2.43	37	45	2	84	34.59
Police Station - Exterior Entry	1x1, 60W Incandescent Surface Square	2	60	120	525.6	Re-lamp w/ 13W compact fluorescent screw-type lamps	2	13	26	94	4380	411.72	24.65	5	15	1	42	1.70
Fire Station - 1st Floor - Apparatus Bay	400W, High-Pressure Sodium Low Bay w/standard ballast	6	460	2760	12088.8	T5HO High Bay w/electronic ballast and integral occupancy sensor	7	258	1806	954	4380	4,178.52	250.17	313	73	25	2,877	11.50
Fire Station - 1st Floor - Apparatus Bay	250W, Mercury Vapor Wall Mount w/standard ballast	1	295	295	1292.1	Fixture to be Removed	1	0	0	295	4380	1,292.10	77.36	0	25	25	50	0.65
Fire Station - 1st Floor - Apparatus Bay	2L T8 strip w/electronic ballast	3	59	177	552.24	Do Nothing - Fixture To Remain	3	59	177	0	3120	0.00	0.00					
Fire Station - 1st Floor - Office	1x4, 2L T12 recessed troffer w/standard ballast	4	73	292	911.04	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	3120	274.56	16.44	37	45	2	336	20.44
Fire Station - 1st Floor - Stairs	100W Incandescent Pendant	1	100	100	5.2	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	52	3.85	0.23	5	15	1	21	91.15
Fire Station - 1st Floor - Mechanical Room	100W Exposed Incandescent	2	100	200	10.4	Re-lamp w/26W compact fluorescent screw-type lamps	2	26	52	148	52	7.70	0.46	5	15	1	42	91.15

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station - 1st Floor - Corridor	2-lamp 60W Incandescent Surface Square	1	120	120	6.24	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	52	4.89	0.29	10	25	1	36	123.02
Fire Station - 1st Floor - Store Room	100W Exposed Incandescent	4	100	400	20.8	Re-lamp w/26W compact fluorescent screw-type lamps	4	26	104	296	52	15.39	0.92	5	15	1	84	91.15
Fire Station - 1st Floor - Kitchen	2L T12 strip w/standard ballast	2	73	146	455.52	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	3120	137.28	8.22	37	45	2	168	20.44
Fire Station - 1st Floor - Kitchen	1L 3' T8 strip w/electronic ballast	1	24	24	74.88	Do Nothing - Fixture To Remain	1	24	24	0	3120	0.00	0.00					
Fire Station - 1st Floor - Break Room	4-lamp 13W CFL Ceiling Fan	2	52	104	324.48	Do Nothing - Fixture To Remain	2	52	104	0	3120	0.00	0.00					
Fire Station - 2nd Floor - Restroom	1x1, 60W Incandescent Recessed Square	2	60	120	124.8	Re-lamp w/ 13W compact fluorescent screw-type lamps	2	13	26	94	1040	97.76	5.85	5	15	1	42	7.18
Fire Station - 2nd Floor - Showers	60W Incandescent Recessed Can	2	60	120	124.8	Re-lamp w/ 13W compact fluorescent screw-type lamps	2	13	26	94	1040	97.76	5.85	5	15	1	42	7.18
Fire Station - 2nd Floor - Sleep Area	1x2, 2L T12 surface wrap w/standard ballast	9	42	378	1572.48	Re-lamp w/2 17W, 2' T8 lamps w/high-efficiency, electronic ballast	9	26	234	144	4160	599.04	35.86	37	45	2	756	21.08
Fire Station - 2nd Floor - Weight Room	1x4, 2L T12 surface wrap w/standard ballast	8	73	584	607.36	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	176	1040	183.04	10.96	37	45	2	672	61.32
Fire Station - 2nd Floor - Media Room	1x4, 2L T12 surface wrap w/standard ballast	4	73	292	151.84	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	520	45.76	2.74	37	45	2	336	122.64

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station - 2nd Floor - Restroom	1x4, 2L T12 surface vanity w/standard ballast	2	73	146	607.36	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	4160	183.04	10.96	37	45	2	168	15.33
Fire Station - 2nd Floor - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	599.04	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	4160	241.28	14.45	42	50	2	94	6.51
Fire Station - 2nd Floor - Storage	90W Exposed Incandescent	1	90	90	4.68	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	64	52	3.33	0.20	5	20	1	26	130.49
Fire Station - 2nd Floor - Sleep Room	4-lamp 52W Incandescent Ceiling Fan	1	208	208	54.08	Re-lamp w/4 13W compact fluorescent screw-type lamps	1	52	52	156	260	40.56	2.43	20	25	4	49	20.18
Fire Station - 2nd Floor - Stairs	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Fire Station - 2nd Floor - Stairs	2L T12 wall strip w/standard ballast	2	42	84	43.68	Re-lamp w/2 28 T8 lamps w/high-efficiency, electronic ballast	2	26	52	32	520	16.64	1.00	37	45	2	168	168.63
Fire Station - 2nd Floor - Stairs	1L T12 wall strip w/standard ballast	1	42	42	174.72	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	16	4160	66.56	3.98	37	45	2	84	21.08

Fixture ECM Totals (Continued):

	Lighting Retrofit:	Controls Totals:	Total
Total Annual Demand Savings (kW):	17	-	17
Total Energy Consumption Savings (kWh/yr)	43,582	15,353	58,934
Total Energy Savings / Year ($)	$2,609	$919	$3,528
Total Cost of Material and Labor ($)	$32,731	$11,154	$43,885
St. Louis Price Adjustment ($)	$33,582	$11,444	$45,026
Total Tax, Overhead & Profit, and Contingency ($)	$11,754	$4,005	$15,759
Total Installed Cost ($)	$45,336	$15,449	$60,785
Total Simple Payback (Years)	17.38	16.81	17.23

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - Basement - Corridor	1x4, 2L T12 recessed cove strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	15	51	765	4	780	596.70	35.72	90	53	572	16.01
Police Station - Basement - Break Room	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	1	780	335.40	20.08	90	53	143	7.12
Police Station - Basement - Break Room	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	1	780	46.80	2.80	90	53	143	51.04
Police Station - Basement - Fire Chief's Office	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	10	86	860	4	780	670.80	40.16	90	53	572	14.24
Police Station - Basement - E.O.C. Room	1x2, 2L T12 wall mount w/standard ballast	Re-lamp w/2 17W T8 lamps w/high-efficiency, electronic ballast	1	34	34	1	130	4.42	0.26	90	53	143	540.39
Police Station - Basement - E.O.C. Room	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	27	51	1377	2	130	179.01	10.72	90	53	286	26.69
Police Station - Basement - E.O.C. Room	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	1	2190	223.38	13.37	90	53	143	10.69
Police Station - Basement - E.O.C. Kitchen	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	65	3.32	0.20	90	53	143	720.52
Police Station - Basement - Weapons Storage	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	65	13.26	0.79	90	53	143	180.13
Police Station - 1st Floor - Print Shop	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	1	520	268.32	16.06	90	53	143	8.90

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 1st Floor - Police Dispatch	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	21	86	1806	3	780	1408.68	84.34	90	53	429	5.09
Police Station - 1st Floor - Police Dispatch	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	10	86	860	2	2190	1883.40	112.76	90	53	286	2.54
Police Station - 1st Floor - Entry Corridor	1x4, 1L T12 wall strip w/standard ballast	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	8	26	208	2	780	162.24	9.71	90	53	286	29.44
Police Station - 1st Floor - Private Offices	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	12	86	1032	3	780	804.96	48.19	90	53	429	8.90
Police Station - 1st Floor - Conference Room	2x4, 2L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	780	159.12	9.53	90	53	143	15.01
Police Station - 1st Floor - Men's Locker Room	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	2	780	402.48	24.10	90	53	286	11.87
Police Station - 1st Floor - Women's Locker Room	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	1	780	268.32	16.06	90	53	143	8.90
Police Station - 1st Floor - Offices	1x4, 2L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	9	51	459	3	780	358.02	21.43	90	53	429	20.01
Police Station - 1st Floor - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	1	780	268.32	16.06	90	53	143	8.90
Police Station - 1st Floor - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	1	780	268.32	16.06	90	53	143	8.90

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 1st Floor - Entry	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.02	90	53	143	35.61
Police Station - 1st Floor - Field Ops	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	1	780	134.16	8.03	90	53	143	17.80
Police Station - 1st Floor - Field Ops	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.02	90	53	143	35.61
Police Station - 1st Floor - Field Ops	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	1	780	46.80	2.80	90	53	143	51.04
Police Station - 1st Floor - Traffic	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	1	780	201.24	12.05	90	53	143	11.87
Police Station - 1st Floor - Traffic	1x4, 2L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	780	159.12	9.53	90	53	143	15.01
Police Station - 2nd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	17	86	1462	5	780	1140.36	68.27	90	53	715	10.47
Police Station - 2nd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	2	65	27.95	1.67	90	53	286	170.91
Police Station - 2nd Floor - Hall	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	780	39.78	2.38	90	53	143	60.04
Police Station - 2nd Floor - Interrogation Room	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	6	86	516	2	130	67.08	4.02	90	53	286	71.21

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Police Station - 2nd Floor - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.02	90	53	143	35.61
Police Station - 2nd Floor - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.02	90	53	143	35.61
Police Station - 2nd Floor - Entry	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	2	2190	670.14	40.12	90	53	286	7.13
Police Station - 2nd Floor - Narcotics Evidence Room	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	2	130	53.04	3.18	90	53	286	90.06
Police Station - 2nd Floor - Homicide Evidence Room	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	1	130	44.72	2.68	90	53	143	53.41
Police Station - 2nd Floor - Lobby	1x2, 2L T12 pendant strip w/standard ballast	Re-lamp w/2 17W T8 lamps w/high-efficiency, electronic ballast	5	34	170	2	780	132.60	7.94	90	53	286	36.03
Police Station - 3rd Floor - Offices	2x4, 4L T12 recessed volumetric w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	17	86	1462	5	780	1140.36	68.27	90	53	715	10.47
Police Station - 3rd Floor - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.02	90	53	143	35.61
Police Station - 3rd Floor - Elevator Lobby	2x2, 2 U-lamp T12 recessed troffer w/standard ballast	Re-lamp w/2 31W T8 U-lamps w/high-efficiency, electronic ballast	1	60	60	1	780	46.80	2.80	90	53	143	51.04
Fire Station - 1st Floor - Apparatus Bay	400W, High-Pressure Sodium Low Bay w/standard ballast	Replace with 4-lamp T5HO High Bay w/electronic ballast and integral occupancy sensor	7	258	1806	7	1095	1977.57	118.40	0	0	0	0.00

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station - 1st Floor - Office	1x4, 2L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	780	159.12	9.53	90	53	143	15.01
Fire Station - 1st Floor - Kitchen	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	1	780	79.56	4.76	90	53	143	30.02
Fire Station - 2nd Floor - Sleep Area	1x2, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 17W, 2' T8 lamps w/high-efficiency, electronic ballast	9	26	234	4	1040	243.36	14.57	90	53	572	39.26
Fire Station - 2nd Floor - Weight Room	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	1	260	106.08	6.35	90	53	143	22.52
Fire Station - 2nd Floor - Media Room	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	130	26.52	1.59	90	53	143	90.06
Fire Station - 2nd Floor - Restroom	1x4, 2L T12 surface vanity w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	1	1040	106.08	6.35	90	53	143	22.52
Fire Station - 2nd Floor - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	1040	89.44	5.35	90	53	143	26.71

Appendix B

Lighting Improvements Calculations (City Hall) – ECM-1.2

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - Elevator	MR16 20W Halogen Can	6	20	120	530.4	Do Nothing - Fixture To Remain	6	20	120	0	4420	0.00	0.00					
City Hall - 5th Floor - Courtroom	PAR 38 Halogen Flood	21	75	1575	655.2	Do Nothing - Fixture To Remain	21	75	1575	0	416	0.00	0.00					
City Hall - 5th Floor - Courtroom	26W CFL Decorative Wall Torch	6	26	156	64.896	Do Nothing - Fixture To Remain	6	26	156	0	416	0.00	0.00					
City Hall - 5th Floor - Courtroom	2L T8 cove strip w/electronic ballast	16	59	944	392.704	Do Nothing - Fixture To Remain	16	59	944	0	416	0.00	0.00					
City Hall - 5th Floor - Courtroom	Incandescent Exit Sign	3	20	60	525.6	Replace with LED Exit Sign	3	3	9	51	8760	446.76	22.34	55	65	5	375	16.79
City Hall - 5th Floor - Courtroom Storage	2L T8 strip w/electronic ballast	2	59	118	6.136	Do Nothing - Fixture To Remain	2	59	118	0	52	0.00	0.00					
City Hall - 5th Floor - Courtroom	Decorative Chandelier (40W Incandescent Lamps)	16	40	640	266.24	Re-lamp w/13W compact fluorescent screw-type lamps	16	13	208	432	416	179.71	8.99	5	15	1	336	37.39
City Hall - 5th Floor - Courtroom	Decorative Chandelier (13W Compact Fluorescent Lamps)	9	13	117	48.672	Do Nothing - Fixture To Remain	9	13	117	0	416	0.00	0.00					
City Hall - 5th Floor - Elevator Lobby	100W Exposed Incandescent Pendant	1	100	100	41.6	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	416	30.78	1.54	5	15	1	21	13.64
City Hall - 5th Floor - Penthouse	13W Exposed CFL Screw Type Lamp	8	13	104	5.408	Do Nothing - Fixture To Remain	8	13	104	0	52	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 5th Floor - Penthouse	2L T8 strip w/electronic ballast	4	59	236	12.272	Do Nothing - Fixture To Remain	4	59	236	0	52	0.00	0.00					
City Hall - 4th Floor - Women's Restroom	2L T8 vanity strip w/electronic ballast	3	59	177	782.34	Do Nothing - Fixture To Remain	3	59	177	0	4420	0.00	0.00					
City Hall - 4th Floor - Women's Restroom	13W CFL Wall Sconce	1	13	13	57.46	Do Nothing - Fixture To Remain	1	13	13	0	4420	0.00	0.00					
City Hall - 4th Floor - Elevator Lobby	2-lamp 13W CFL Decorative Wall Sconce	1	26	26	0	Do Nothing - Fixture To Remain	1	26	26	0	0	0.00	0.00					
City Hall - 4th Floor - Engineering Offices	2x4, 4L T12 recessed troffer w/standard ballast	21	144	3024	9434.88	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	21	86	1806	1218	3120	3,800.16	190.01	42	50	2	1,974	10.39
City Hall - 4th Floor - Engineering Offices	2x4, 4L T12 recessed troffer w/standard ballast	9	144	1296	1347.84	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	9	86	774	522	1040	542.88	27.14	42	50	2	846	31.17
City Hall - 4th Floor - Engineering Offices	2x4, 4L, 25W T8 recessed troffer w/electronic ballast	19	86	1634	5098.08	Do Nothing - Fixture To Remain	19	86	1634	0	3120	0.00	0.00					
City Hall - 4th Floor - Engineering Offices	Incandescent Exit Sign	5	20	100	876	Replace with LED Exit Sign	5	3	15	85	8760	744.6	37.23	55	65	5	625	16.79
City Hall - 4th Floor - Engineering Office Conference Room	2L T12 above ceiling strip w/standard ballast	6	73	438	113.88	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	132	260	34.32	1.72	37	45	2	504	293.71
City Hall - 4th Floor - Engineering Office Conference Room	4-lamp 13W CFL Ceiling Fan	1	52	52	13.52	Do Nothing - Fixture To Remain	1	52	52	0	260	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 4th Floor - Engineering Office File Room	3L T8 pendant wrap w/electronic ballast	3	87	261	67.86	Do Nothing - Fixture To Remain	3	87	261	0	260	0.00	0.00					
City Hall - 4th Floor - Engineering Office File Room Corridor	2L 75W T12 8' parabolic pendant w/standard ballast	1	158	158	41.08	Re-lamp w/2 59W T8 8' lamps w/high-efficiency, electronic ballast	1	112	112	46	260	11.96	0.60	37	45	2	84	140.47
City Hall - 3rd Floor - Men's Restroom	2L T8 vanity strip w/electronic ballast	3	59	177	782.34	Do Nothing - Fixture To Remain	3	59	177	0	4420	0.00	0.00					
City Hall - 3rd Floor - Men's Restroom	13W CFL Wall Sconce	1	13	13	57.46	Do Nothing - Fixture To Remain	1	13	13	0	4420	0.00	0.00					
City Hall - 3rd Floor - Elevator Lobby	2-lamp 13W CFL Decorative Wall Sconce	1	26	26	114.92	Do Nothing - Fixture To Remain	1	26	26	0	4420	0.00	0.00					
City Hall - 3rd Floor - Elevator Lobby	Incandescent Exit Sign	1	20	20	175.2	Replace with LED Exit Sign	1	3	3	17	8760	148.92	7.45	55	65	5	125	16.79
City Hall - 3rd Floor - Private Offices	1x4, 2L T8 D/I pendant w/electronic ballast	17	59	1003	3129.36	Do Nothing - Fixture To Remain	17	59	1003	0	3120	0.00	0.00					
City Hall - 3rd Floor - Private Offices	1x4, 2L T8 D/I pendant w/electronic ballast	19	59	1121	582.92	Do Nothing - Fixture To Remain	19	59	1121	0	520	0.00	0.00					
City Hall - 3rd Floor - Storage Vault	90W Exposed Incandescent Pendant	1	90	90	4.68	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	64	52	3.33	0.17	5	15	1	21	126.20
City Hall - 3rd Floor - Conference Room	1x4, 2L T8 D/I pendant w/electronic ballast	6	59	354	736.32	Do Nothing - Fixture To Remain	6	59	354	0	2080	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 3rd Floor - Open Offices	1x4, 2L T8 D/I pendant w/electronic ballast	27	59	1593	4970.16	Do Nothing - Fixture To Remain	27	59	1593	0	3120	0.00	0.00					
City Hall - 3rd Floor - Private Offices	3-lamp 60W Incandescent Ceiling Fan	1	180	180	561.6	Re-lamp w/3 13W compact fluorescent screw-type lamps	1	39	39	141	3120	439.92	22.00	15	25	1	41	1.86
City Hall - 3rd Floor - Open Offices	LED Exit Sign	1	3	3	26.28	Do Nothing - Fixture To Remain	1	3	3	0	8760	0.00	0.00					
City Hall - 3rd Floor - Private Offices	1-lamp 22W Circline Ceiling Fan	3	24	72	7.488	Do Nothing - Fixture To Remain	3	24	72	0	104	0.00	0.00					
City Hall - 3rd Floor - Private Offices	LED Exit Sign	2	3	6	52.56	Do Nothing - Fixture To Remain	2	3	6	0	8760	0.00	0.00					
City Hall - 3rd Floor - Private Offices	2x4, 4L, 32W T8 recessed troffer w/electronic ballast	10	114	1140	296.4	Re-lamp w/4 25W T8 lamps	10	86	860	280	260	72.80	4.65	12	20	2	340	73.05
City Hall - 2nd Floor - Women's Restroom	2L T8 vanity strip w/electronic ballast	3	59	177	782.34	Do Nothing - Fixture To Remain	3	59	177	0	4420	0.00	0.00					
City Hall - 2nd Floor - Women's Restroom	13W CFL Wall Sconce	1	13	13	57.46	Do Nothing - Fixture To Remain	1	13	13	0	4420	0.00	0.00					
City Hall - 2nd Floor - Elevator Lobby	2-lamp 13W CFL Decorative Wall Sconce	1	26	26	0	Do Nothing - Fixture To Remain	1	26	26	0	0	0.00	0.00					
City Hall - 2nd Floor - Center Rotunda	9W CFL 4-lamp decorative torches	8	9	72	318.24	Do Nothing - Fixture To Remain	8	9	72	0	4420	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 2nd Floor - Center Rotunda	LED Exit Sign	2	3	6	52.56	Do Nothing - Fixture To Remain	2	3	6	0	8760	0.00	0.00					
City Hall - 2nd Floor - Center Rotunda	Decorative Chandelier (25W Incandescent Lamps)	12	25	300	1326	Do Nothing - Fixture To Remain	12	25	300	0	4420	0.00	0.00					
City Hall - 2nd Floor - Center Rotunda	Decorative Chandelier (25W Incandescent Candelabra Lamps)	14	25	350	1547	Do Nothing - Fixture To Remain	14	25	350	0	4420	0.00	0.00					
City Hall - 2nd Floor - City Clerk	1x4, 2L T8 D/I pendant w/electronic ballast	5	59	295	920.4	Do Nothing - Fixture To Remain	5	59	295	0	3120	0.00	0.00					
City Hall - 2nd Floor - City Clerk	2x4, 4L T12 recessed troffer w/standard ballast	2	144	288	898.56	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	116	3120	361.92	23.14	42	50	2	188	8.13
City Hall - 2nd Floor - Mayor	90W Exposed Incandescent	2	90	180	9.36	Re-lamp w/26W compact fluorescent screw-type lamps	2	26	52	128	52	6.66	0.43	5	15	1	42	98.70
City Hall - 2nd Floor - Mayor	PAR 38 Halogen Can	9	75	675	2106	Do Nothing - Fixture To Remain	9	75	675	0	3120	0.00	0.00					
City Hall - 2nd Floor - Mayor	40W Incandescent Wall Torches	4	40	160	499.2	Re-lamp w/9W compact fluorescent screw-type lamps	4	9	36	124	3120	386.88	24.73	5	15	1	84	3.40
City Hall - 2nd Floor - Mayor	2L T5 task light strips w/electronic ballast	2	53	106	330.72	Do Nothing - Fixture To Remain	2	53	106	0	3120	0.00	0.00					
City Hall - 2nd Floor - Mayor's Restroom	13W CFL 3-lamp decorative torches	8	26	208	10.816	Do Nothing - Fixture To Remain	8	26	208	0	52	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 2nd Floor - Mayor's Restroom	52W Exposed Incandescent	1	52	52	2.704	Re-lamp w/13W compact fluorescent screw-type lamps	1	13	13	39	52	2.03	0.13	5	15	1	21	161.97
City Hall - 2nd Floor - Mayor's Fireplace	4-lamp Decorative 60W Incandescent Surface Mount	1	240	240	12.48	Re-lamp w/13W compact fluorescent screw-type lamps	1	52	52	188	52	9.78	0.62	5	15	1	21	33.60
City Hall - 2nd Floor - Administrative Office 7	1x4, 2L T8 D/I pendant w/electronic ballast	6	59	354	1104.48	Do Nothing - Fixture To Remain	6	59	354	0	3120	0.00	0.00					
City Hall - 2nd Floor - Administrative Office 8	1x4, 2L T8 D/I pendant w/electronic ballast	6	59	354	1104.48	Do Nothing - Fixture To Remain	6	59	354	0	3120	0.00	0.00					
City Hall - 2nd Floor - Storage Closets	60W Exposed Incandescent	3	60	180	9.36	Re-lamp w/13W compact fluorescent screw-type lamps	3	13	39	141	52	7.33	0.47	5	15	1	63	134.40
City Hall - 2nd Floor - Conference Room	2x4, 4L, 32W T8 recessed troffer w/electronic ballast	3	114	342	177.84	Re-lamp w/4 25W T8 lamps	3	86	258	84	520	43.68	2.79	12	20	2	102	36.53
City Hall - 2nd Floor - Conference Room	2L T8 vanity w/electronic ballast	2	59	118	6.136	Do Nothing - Fixture To Remain	2	59	118	0	52	0.00	0.00					
City Hall - 1st Floor - Men's Restroom	2L T8 vanity strip w/electronic ballast	3	59	177	782.34	Do Nothing - Fixture To Remain	3	59	177	0	4420	0.00	0.00					
City Hall - 1st Floor - Men's Restroom	13W CFL Wall Sconce	1	13	13	57.46	Do Nothing - Fixture To Remain	1	13	13	0	4420	0.00	0.00					
City Hall - 1st Floor - Elevator Lobby	2-lamp 60W Decorative Wall Sconce	1	120	120	6.24	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	52	4.89	0.31	5	15	1	21	67.20

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 1st Floor - Lobby	13W CFL 2-lamp decorative torches	36	26	936	4137.12	Do Nothing - Fixture To Remain	36	26	936	0	4420	0.00	0.00					
City Hall - 1st Floor - Lobby	LED Exit Sign	4	3	12	105.12	Do Nothing - Fixture To Remain	4	3	12	0	8760	0.00	0.00					
City Hall - 1st Floor - Lobby	15W Incandescent Statue Lights	7	15	105	464.1	Do Nothing - Fixture To Remain	7	15	105	0	4420	0.00	0.00					
City Hall - 1st Floor - Lobby	5-lamp Decorative Candelabra (25W Incandescent Candelabra Lamps)	4	125	500	2210	Do Nothing - Fixture To Remain	4	125	500	0	4420	0.00	0.00					
City Hall - 1st Floor - Offices	1x4, 2L T8 D/I pendant w/electronic ballast	42	59	2478	7731.36	Do Nothing - Fixture To Remain	42	59	2478	0	3120	0.00	0.00					
City Hall - 1st Floor - Vault Closet	90W Exposed Incandescent	3	90	270	14.04	Re-lamp w/26W compact fluorescent screw-type lamps	3	26	78	192	52	9.98	0.64	5	15	1	63	98.70
City Hall - 1st Floor - Vault Closet	13W CFL Exposed Lamp	1	13	13	0.676	Do Nothing - Fixture To Remain	1	13	13	0	52	0.00	0.00					
City Hall - 1st Floor - Offices	1x4, 2L T8 D/I pendant w/electronic ballast	4	59	236	736.32	Do Nothing - Fixture To Remain	4	59	236	0	3120	0.00	0.00					
City Hall - 1st Floor - Sink Closet	52W Exposed Incandescent	3	52	156	8.112	Re-lamp w/13W compact fluorescent screw-type lamps	3	13	39	117	52	6.08	0.39	5	20	1	78	200.54
City Hall - Basement - Stairs	50W MR16 Track Light	11	50	550	2431	Do Nothing - Fixture To Remain	11	50	550	0	4420	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - Basement - Stairs	LED Exit Sign	2	3	6	52.56	Do Nothing - Fixture To Remain	2	3	6	0	8760	0.00	0.00					
City Hall - Basement - Stairs	Incandescent Exit Sign	1	20	20	175.2	Replace with LED Exit Sign	1	3	3	17	8760	148.92	9.52	55	65	5	125	13.13
City Hall - Basement - Stairs	13W CFL Wall Sconce	8	13	104	911.04	Do Nothing - Fixture To Remain	8	13	104	0	8760	0.00	0.00					
City Hall - Basement - Shops	2L T8 damp-location pendant w/electronic ballast	2	59	118	368.16	Do Nothing - Fixture To Remain	2	59	118	0	3120	0.00	0.00					
City Hall - Basement - Shops	LED Exit Sign	1	3	3	26.28	Do Nothing - Fixture To Remain	1	3	3	0	8760	0.00	0.00					
City Hall - Basement - Mechanical Room	2L T8 damp-location pendant w/electronic ballast	2	59	118	12.272	Do Nothing - Fixture To Remain	2	59	118	0	104	0.00	0.00					
City Hall - Basement - Electrical Room	2L T8 damp-location pendant w/electronic ballast	2	59	118	12.272	Do Nothing - Fixture To Remain	2	59	118	0	104	0.00	0.00					
City Hall - Basement - Closet	90W Exposed Incandescent	9	90	810	42.12	Re-lamp w/26W compact fluorescent screw-type lamps	9	26	234	576	52	29.95	1.91	5	15	1	189	98.70
City Hall - Basement - File Room	2x4, 4L T12 recessed troffer w/standard ballast	7	144	1008	104.832	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	7	86	602	406	104	42.22	2.70	42	50	2	658	243.76
City Hall - Basement - File Room	2L T12 strip w/standard ballast	6	73	438	45.552	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	132	104	13.73	0.88	37	45	2	504	574.27

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - Basement - Shops	2L T12 surface wrap w/standard ballast	2	73	146	455.52	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	3120	137.28	8.78	37	45	2	168	19.14
City Hall - Basement - Shops	2L T12 industrial strip w/standard ballast	8	73	584	1822.08	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	176	3120	549.12	35.11	37	45	2	672	19.14

	Lighting Retrofit:	Controls Totals:	Total
Total Annual Demand Savings (kW):	6	-	6
Total Energy Consumption Savings (kWh/yr)	8,217	3,864	12,081
Total Energy Savings / Year ($)	$436	$247	$683
Total Cost of Material and Labor ($)	$8,291	$6,435	$14,726
St. Louis Price Adjustment ($)	$8,507	$6,602	$15,109
Total Tax, Overhead & Profit, and Contingency ($)	$2,977	$2,311	$5,288
Total Installed Cost ($)	$11,484	$8,913	$20,397
Total Simple Payback (Years)	26.32	36.08	29.85

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 4th Floor - Women's Restroom	2L T8 vanity strip w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	442	78.23	5.00	90	53	143	28.59
City Hall - 4th Floor - Engineering Offices	2x4, 2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	21	86	1806	5	312	563.47	36.02	90	53	715	19.85
City Hall - 4th Floor - Engineering Offices	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	9	86	774	2	104	80.50	5.15	90	53	286	55.58
City Hall - 4th Floor - Engineering Offices	2x4, 4L, 25W T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	19	86	1634	4	312	509.81	32.59	90	53	572	17.55
City Hall - 3rd Floor - Men's Restroom	2L T8 vanity strip w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	442	78.23	5.00	90	53	143	28.59
City Hall - 3rd Floor - Private Offices	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	17	59	1003	4	312	312.94	20.01	90	53	572	28.59
City Hall - 3rd Floor - Private Offices	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	19	59	1121	4	52	58.29	3.73	90	53	572	153.49
City Hall - 3rd Floor - Conference Room	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	6	59	354	1	208	73.63	4.71	90	53	143	30.38
City Hall - 3rd Floor - Open Offices	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	27	59	1593	4	312	497.02	31.77	90	53	572	18.00
City Hall - 2nd Floor - Women's Restroom	2L T8 vanity strip w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	442	78.23	5.00	90	53	143	28.59

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - 2nd Floor - City Clerk	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	5	59	295	1	312	92.04	5.88	90	53	143	24.30
City Hall - 2nd Floor - City Clerk	2x4, 2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	1	312	53.66	3.43	90	53	143	41.68
City Hall - 2nd Floor - Mayor	2L T5 task light strips w/electronic ballast	Do Nothing - Fixture To Remain	2	53	106	1	312	33.07	2.11	90	53	143	67.63
City Hall - 2nd Floor - Administrative Office 7	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	6	59	354	1	312	110.45	7.06	90	53	143	20.25
City Hall - 2nd Floor - Administrative Office 8	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	6	59	354	1	312	110.45	7.06	90	53	143	20.25
City Hall - 2nd Floor - Conference Room	2x4, 4L, 32W T8 recessed troffer w/electronic ballast	Re-lamp w/4 25W T8 lamps	3	86	258	1	52	13.42	0.86	90	53	143	166.73
City Hall - 1st Floor - Men's Restroom	2L T8 vanity strip w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	442	78.23	5.00	90	53	143	28.59
City Hall - 1st Floor - Offices	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	42	59	2478	6	312	773.14	49.43	90	53	858	17.36
City Hall - 1st Floor - Offices	1x4, 2L T8 D/I pendant w/electronic ballast	Do Nothing - Fixture To Remain	4	59	236	1	312	73.63	4.71	90	53	143	30.38
City Hall - Basement - Shops	2L T8 damp-location pendant w/electronic ballast	Do Nothing - Fixture To Remain	2	59	118	1	312	36.82	2.35	90	53	143	60.76

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
City Hall - Basement - Shops	2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	1	312	31.82	2.03	90	53	143	70.29
City Hall - Basement - Shops	2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	8	51	408	2	312	127.30	8.14	90	53	286	35.14

Appendix C

Lighting Improvements Calculations (Community Center)– ECM-1.3

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Community Center - Conference Room / Stage	2x4, 4L T8 recessed troffer w/electronic ballast	4	114	456	474.24	Do Nothing - Fixture To Remain	4	86	344	112	1040	116.48	5.82					
Community Center - Conference Room / Stage	2x4, 4L T8 recessed troffer w/electronic ballast	16	114	1824	218.88	Do Nothing - Fixture To Remain	16	86	1376	448	120	53.76	2.69					
Community Center - Conference Room / Stage	PAR 38 Halogen Flood	16	75	1200	124.8	Do Nothing - Fixture To Remain	16	75	1200	0	104	0.00	0.00					
Community Center - Conference Room / Stage	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Community Center - Store Room	100W Recessed Incandescent Square	7	100	700	72.8	Re-lamp w/26W compact fluorescent screw-type lamps	7	26	182	518	104	53.87	3.23	5	15	1	147	45.58
Community Center - Store Room	200W Exposed Incandescent	1	200	200	20.8	Re-lamp w/59W compact fluorescent screw-type lamps	1	59	59	141	104	14.66	0.88	10	25	1	36	41.01
Community Center - Kitchen	Incandescent Exit Sign	3	20	60	525.6	Replace with LED Exit Sign	3	3	9	51	8760	446.76	26.75	55	65	5	375	14.02
Community Center - Kitchen	2x4, 4L T12 recessed troffer w/standard ballast	8	144	1152	69.12	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	8	86	688	464	60	27.84	1.67	42	50	2	752	451.17
Community Center - Hall	2-lamp 60W Incandescent Surface Round	2	120	240	249.6	Re-lamp w/2 13W compact fluorescent screw-type lamps	2	26	52	188	1040	195.52	11.71	5	15	1	42	3.59
Community Center - Men's Restroom	2-lamp 60W Recessed Incandescent Square	4	120	480	499.2	Re-lamp w/2 13W compact fluorescent screw-type lamps	4	26	104	376	1040	391.04	23.41	5	15	1	84	3.59

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Community Center - Women's Restroom	2-lamp 60W Recessed Incandescent Square	4	120	480	499.2	Re-lamp w/2 13W compact fluorescent screw-type lamps	4	26	104	376	1040	391.04	23.41	5	15	1	84	3.59
Community Center - Janitor's Closet	1-lamp 100W Exposed Incandescent	1	100	100	1.2	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	12	0.89	0.05	5	15	1	21	395.00
Community Center - Dining Hall	2x4, 4L T8 recessed troffer w/electronic ballast	20	114	2280	2371.2	Do Nothing - Fixture To Remain	20	114	2280	0	1040	0.00	0.00					
Community Center - Mechanical Room	200W Exposed Incandescent	3	200	600	7.2	Re-lamp w/59W compact fluorescent screw-type lamps	3	59	177	423	12	5.08	0.30	10	25	1	108	355.38
Community Center - Office / Storage	200W Exposed Incandescent	1	200	200	52	Re-lamp w/59W compact fluorescent screw-type lamps	1	59	59	141	260	36.66	2.19	10	25	1	36	16.40
Community Center - Office / Storage	2L T12 strip w/standard ballast	1	73	73	18.98	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	260	5.72	0.34	37	45	2	84	245.29
Community Center - Office / Storage	2L T8 surface wrap w/electronic ballast	2	59	118	30.68	Do Nothing - Fixture To Remain	2	59	118	0	260	0.00	0.00					
Community Center - Dining Hall	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Community Center - Dining Hall	PAR38 Halogen Flood	16	75	1200	14.4	Do Nothing - Fixture To Remain	16	75	1200	0	12	0.00	0.00					
Community Center - Entry	PAR38 23W CFL	3	23	69	7.176	Do Nothing - Fixture To Remain	3	23	69	0	104	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Community Center - Entry	PAR38 Halogen Flood	1	75	75	7.8	Do Nothing - Fixture To Remain	1	75	75	0	104	0.00	0.00					
Community Center - Office	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	149.76	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	1040	60.32	3.61	42	50	2	94	26.03
Community Center - Office	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	37.44	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	260	15.08	0.90	42	50	2	94	104.12

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	4	-	4
Total Energy Consumption Savings (kWh/yr)	2,410	3,091	5,502
Total Energy Savings / Year ($)	$143	$185	$328
Total Cost of Material and Labor ($)	$2,457	$1,716	$4,173
St. Louis Price Adjustment ($)	$2,521	$1,761	$4,281
Total Tax, Overhead & Profit, and Contingency ($)	$882	$616	$1,499
Total Installed Cost ($)	$3,403	$2,377	$5,780
Total Simple Payback (Years)	23.86	12.84	17.64

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Community Center - Conference Room / Stage	2x4, 4L T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	4	86	344	1	1040	357.76	21.42	90	53	143	6.68
Community Center - Conference Room / Stage	2x4, 4L T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	16	86	1376	1	120	165.12	9.89	90	53	143	14.47
Community Center - Kitchen	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	8	86	688	2	60	41.28	2.47	90	53	286	115.72
Community Center - Dining Hall	2x4, 4L T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	20	114	2280	4	1040	2371.20	141.96	90	53	572	4.03
Community Center - Office / Storage	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	260	13.26	0.79	90	53	143	180.13
Community Center - Office / Storage	2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	2	59	118	1	260	30.68	1.84	90	53	143	77.85
Community Center - Office	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	1040	89.44	5.35	90	53	143	26.71
Community Center - Office	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	260	22.36	1.34	90	53	143	106.82

Appendix D

Lighting Improvements Calculations (Fire Station #2)– ECM-1.4

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 1st Floor- Movie Room	2x4, 2L T8 surface wrap w/electronic ballast	4	59	236	61.36	Do Nothing - Fixture To Remain	4	59	236	0	260	0.00	0.00					
Fire Station #2 - 1st Floor- Movie Room	4-lamp 60W Incandescent Ceiling Fan	2	240	480	24.96	Re-lamp w/4 13W compact fluorescent screw-type lamps	2	52	104	376	52	19.55	0.98	20	25	1	92	94.11
Fire Station #2 - 1st Floor- Corridor	LED Exit Sign	3	3	9	78.84	Do Nothing - Fixture To Remain	3	3	9	0	8760	0.00	0.00					
Fire Station #2 - 1st Floor- Corridor	1x4, 2L T8 surface wrap w/electronic ballast	3	59	177	552.24	Do Nothing - Fixture To Remain	3	59	177	0	3120	0.00	0.00					
Fire Station #2 - 1st Floor- Kitchen	2x4, 8L T8 surface wrap w/electronic ballast	1	236	236	736.32	Do Nothing - Fixture To Remain	1	236	236	0	3120	0.00	0.00					
Fire Station #2 - 1st Floor- Kitchen	2-lamp 13W Quad CFL Recessed Can	3	26	78	243.36	Do Nothing - Fixture To Remain	3	26	78	0	3120	0.00	0.00					
Fire Station #2 - 1st Floor- Office Dispatch	2x4, 4L T8 recessed troffer w/electronic ballast	3	114	342	1067.04	Do Nothing - Fixture To Remain	3	114	342	0	3120	0.00	0.00					
Fire Station #2 - 1st Floor- Garage	2L T8 strip w/electronic ballast	4	59	236	61.36	Do Nothing - Fixture To Remain	4	59	236	0	260	0.00	0.00					
Fire Station #2 - 1st Floor- Apparatus Bay	2L T8 caged strip w/electronic ballast	15	59	885	7752.6	Do Nothing - Fixture To Remain	15	59	885	0	8760	0.00	0.00					
Fire Station #2 - 1st Floor- Apparatus Bay	2L T8 caged strip w/electronic ballast	26	59	1534	797.68	Do Nothing - Fixture To Remain	26	59	1534	0	520	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 1st Floor- Electrical Room	1x4, 2L T8 surface strip w/electronic ballast	1	59	59	6.136	Do Nothing - Fixture To Remain	1	59	59	0	104	0.00	0.00					
Fire Station #2 - 1st Floor- Janitor's Closet	1x4, 2L T8 surface strip w/electronic ballast	1	59	59	6.136	Do Nothing - Fixture To Remain	1	59	59	0	104	0.00	0.00					
Fire Station #2 - 1st Floor- Janitor's Closet	1x4, 1L T8 surface strip w/electronic ballast	1	30	30	3.12	Do Nothing - Fixture To Remain	1	30	30	0	104	0.00	0.00					
Fire Station #2 - 1st Floor- Apparatus Bay	LED Exit Sign	3	3	9	78.84	Do Nothing - Fixture To Remain	3	3	9	0	8760	0.00	0.00					
Fire Station #2 - 1st Floor- Apparatus Bay Stairs	1x4, 2L T8 surface wrap w/electronic ballast	3	59	177	1550.52	Do Nothing - Fixture To Remain	3	59	177	0	8760	0.00	0.00					
Fire Station #2 - 1st Floor- Storage	1x4, 2L T8 surface strip w/electronic ballast	2	59	118	12.272	Do Nothing - Fixture To Remain	2	59	118	0	104	0.00	0.00					
Fire Station #2 - 1st Floor- Restroom	1x4, 2L T8 wall strip w/electronic ballast	1	59	59	15.34	Do Nothing - Fixture To Remain	1	59	59	0	260	0.00	0.00					
Fire Station #2 - 1st Floor- Outside	100W Wall Pack HID	1	129	129	565.02	Do Nothing - Fixture To Remain	1	129	129	0	4380	0.00	0.00					
Fire Station #2 - 2nd Floor- Stairs	2-lamp 26W CFL Surface Round	2	52	104	911.04	Do Nothing - Fixture To Remain	2	52	104	0	8760	0.00	0.00					
Fire Station #2 - 2nd Floor- Corridors	LED Exit Sign	5	3	15	131.4	Do Nothing - Fixture To Remain	5	3	15	0	8760	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 2nd Floor- Corridors	26W CFL Step Lights	5	26	130	1138.8	Do Nothing - Fixture To Remain	5	26	130	0	8760	0.00	0.00					
Fire Station #2 - 2nd Floor- Mechanical Room	2-lamp 26W CFL Surface Round	1	52	52	5.408	Do Nothing - Fixture To Remain	1	52	52	0	104	0.00	0.00					
Fire Station #2 - 2nd Floor- Corridors	1x4, 2L T8 surface wrap w/electronic ballast	11	59	649	337.48	Do Nothing - Fixture To Remain	11	59	649	0	520	0.00	0.00					
Fire Station #2 - 2nd Floor- Restroom	1x4, 2L T8 surface wrap w/electronic ballast	3	59	177	46.02	Do Nothing - Fixture To Remain	3	59	177	0	260	0.00	0.00					
Fire Station #2 - 2nd Floor- Restroom	1x4, 2L T8 vanity w/electronic ballast	3	59	177	46.02	Do Nothing - Fixture To Remain	3	59	177	0	260	0.00	0.00					
Fire Station #2 - 2nd Floor- Restroom	26W CFL Surface Round Shower Light	3	26	78	20.28	Do Nothing - Fixture To Remain	3	26	78	0	260	0.00	0.00					
Fire Station #2 - 2nd Floor- Bedrooms	1x4, 2L T8 surface wrap w/electronic ballast	14	59	826	214.76	Do Nothing - Fixture To Remain	14	59	826	0	260	0.00	0.00					
Fire Station #2 - 2nd Floor- Closet	1x4, 1L T8 surface strip w/electronic ballast	2	30	60	3.12	Do Nothing - Fixture To Remain	2	30	60	0	52	0.00	0.00					
Fire Station #2 - 2nd Floor- Laundry	1x4, 2L T8 surface wrap w/electronic ballast	2	59	118	92.04	Do Nothing - Fixture To Remain	2	59	118	0	780	0.00	0.00					
Fire Station #2 - 2nd Floor- Mechanical Room / Janitor's Closet	1x4, 2L T8 surface wrap w/electronic ballast	2	59	118	6.136	Do Nothing - Fixture To Remain	2	59	118	0	52	0.00	0.00					

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 2nd Floor- Conference Briefing Room	2x4, 4L T8 recessed troffer w/electronic ballast	11	114	1254	3912.48	Do Nothing - Fixture To Remain	11	114	1254	0	3120	0.00	0.00					
Fire Station #2 - 2nd Floor- Weight Room	1x4, 2L T8 surface wrap w/electronic ballast	3	59	177	9.204	Do Nothing - Fixture To Remain	3	59	177	0	52	0.00	0.00					

	Lighting Retrofits:	Controls Totals:	Total
Total Annual Demand Savings (kW):	0	-	0
Total Energy Consumption Savings (kWh/yr)	20	5,428	5,448
Total Energy Savings / Year ($)	$1	$347	$348
Total Cost of Material and Labor ($)	$92	$3,575	$3,667
St. Louis Price Adjustment ($)	$94	$3,668	$3,762
Total Tax, Overhead & Profit, and Contingency ($)	$33	$1,284	$1,317
Total Installed Cost ($)	$127	$4,952	$5,079
Total Simple Payback (Years)	130.35	14.27	14.60

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 1st Floor- Movie Room	2x4, 2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	4	59	236	1	52	12.27	0.78	90	53	143	182.27
Fire Station #2 - 1st Floor- Corridor	1x4, 2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	624	110.45	7.06	90	53	143	20.25
Fire Station #2 - 1st Floor- Kitchen	2x4, 8L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	1	236	236	1	624	147.26	9.41	90	53	143	15.19
Fire Station #2 - 1st Floor- Kitchen	2-lamp 13W Quad CFL Recessed Can	Do Nothing - Fixture To Remain	3	26	78	1	624	48.67	3.11	90	53	143	45.96
Fire Station #2 - 1st Floor- Office Dispatch	2x4, 4L T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	3	114	342	1	624	213.41	13.64	90	53	143	10.48
Fire Station #2 - 1st Floor- Apparatus Bay	2L T8 caged strip w/electronic ballast	Do Nothing - Fixture To Remain	15	59	885	3	4380	3876.30	247.81	90	53	429	1.73
Fire Station #2 - 1st Floor- Apparatus Bay	2L T8 caged strip w/electronic ballast	Do Nothing - Fixture To Remain	26	59	1534	4	104	159.54	10.20	90	53	572	56.08
Fire Station #2 - 2nd Floor- Restroom	1x4, 2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	52	9.20	0.59	90	53	143	243.03
Fire Station #2 - 2nd Floor- Restroom	1x4, 2L T8 vanity w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	52	9.20	0.59	90	53	143	243.03
Fire Station #2 - 2nd Floor- Restroom	26W CFL Surface Round Shower Light	Do Nothing - Fixture To Remain	3	26	78	1	52	4.06	0.26	90	53	143	551.48

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Fire Station #2 - 2nd Floor- Bedrooms	1x4, 2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	14	59	826	7	52	42.95	2.75	90	53	1001	364.54
Fire Station #2 - 2nd Floor- Closet	1x4, 1L T8 surface strip w/electronic ballast	Do Nothing - Fixture To Remain	2	30	60	1	52	3.12	0.20	90	53	143	716.93
Fire Station #2 - 2nd Floor- Conference Briefing Room	2x4, 4L T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	11	114	1254	1	624	782.50	50.02	90	53	143	2.86
Fire Station #2 - 2nd Floor- Weight Room	1x4, 2L T8 surface wrap w/electronic ballast	Do Nothing - Fixture To Remain	3	59	177	1	52	9.20	0.59	90	53	143	243.03

Appendix E

Lighting Improvements Calculations (Golf Course)– ECM-1.5

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Golf Course - Pro Shop	1x4, 2L T12 wall-mounted strip w/standard ballast	4	73	292	1594.32	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	5460	480.48	37.12	37	45	2	336	9.05
Golf Course - Pro Shop	R40 Flood Track Light	8	40	320	1747.2	Do Nothing - Fixture To Remain	8	40	320	0	5460	0.00	0.00					
Golf Course - Pro Shop	2x4, 4L T8 recessed troffer w/electronic ballast	8	114	912	4979.52	Re-lamp w/4 25W T8 lamps	8	86	688	224	5460	1,223.04	94.49	12	25	4	328	3.47
Golf Course - Pro Shop	2x4, 4L T8 surface wrap w/electronic ballast	1	114	114	622.44	Re-lamp w/4 25W T8 lamps	1	86	86	28	5460	152.88	11.81	12	25	4	41	3.47
Golf Course - Pro Shop - Office	1x4, 4L T12 surface wrap w/standard ballast	1	114	114	355.68	Re-lamp w/4 25W T8 lamps	1	86	86	28	3120	87.36	6.75	12	25	4	41	6.07
Golf Course - Pro Shop - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	449.28	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	93	3120	290.16	22.42	37	45	2	84	3.75
Golf Course - Pro Shop - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	74.88	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	93	520	48.36	3.74	37	45	2	84	22.48
Golf Course - Pro Shop - Stairs	100W Exposed Incandescent	4	100	400	104	Re-lamp w/26W compact fluorescent screw-type lamps	4	26	104	296	260	76.96	5.95	5	15	1	84	14.13
Golf Course - Pro Shop - Basement	2L T12 strip w/standard ballast	1	73	73	18.98	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	260	5.72	0.44	37	45	2	84	190.08
Golf Course - Pro Shop - Kitchen	2L T12 strip w/standard ballast	1	73	73	18.98	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	260	5.72	0.44	37	45	2	84	190.08

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Golf Course - Pro Shop - Kitchen	100W Incandescent Globe	1	100	100	26	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	260	19.24	1.49	5	15	1	21	14.13
Golf Course - Ball Shack	1x4, 2L T8 surface wrap w/electronic ballast	1	59	59	61.36	Do Nothing - Fixture To Remain	1	59	59	0	1040	0.00	0.00					

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	1	-	1
Total Energy Consumption Savings	2,390	1,448	3,838
Total Energy Savings / Year ($)	$185	$112	$297
Total Cost of Material and Labor ($)	$1,187	$858	$2,045
St. Louis Price Adjustment ($)	$1,218	$880	$2,098
Total Tax, Overhead & Profit, and	$426	$308	$734
Total Installed Cost ($)	$1,644	$1,188	$2,833
Total Simple Payback (Years)	8.90	10.62	9.55

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Golf Course - Pro Shop	1x4, 2L T12 wall-mounted strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	1	1365	278.46	21.51	90	53	143	6.65
Golf Course - Pro Shop	2x4, 4L T8 recessed troffer w/electronic ballast	Re-lamp w/4 25W T8 lamps	8	86	688	1	1365	939.12	72.56	90	53	143	1.97
Golf Course - Pro Shop	2x4, 4L T8 surface wrap w/electronic ballast	Re-lamp w/4 25W T8 lamps	1	86	86	1	1365	117.39	9.07	90	53	143	15.77
Golf Course - Pro Shop - Office	1x4, 4L T12 surface wrap w/standard ballast	Re-lamp w/4 25W T8 lamps	1	86	86	1	780	67.08	5.18	90	53	143	27.59
Golf Course - Pro Shop - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	780	39.78	3.07	90	53	143	46.53
Golf Course - Pro Shop - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	130	6.63	0.51	90	53	143	279.17

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Golf Course - Grounds Maintenance Building - Storage	100W Exposed Incandescent	1	100	100	0.2	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	2	0.15	0.01	5	15	1	21	1698.49
Golf Course - Grounds Maintenance Building - Garage	60W Exposed Incandescent	1	60	60	187.2	Re-lamp w/13W compact fluorescent screw-type lamps	1	13	13	47	3120	146.64	12.25	5	15	1	21	1.71
Golf Course - Grounds Maintenance Building - Garage	60W Exposed Incandescent	5	60	300	0.6	Re-lamp w/13W compact fluorescent screw-type lamps	5	13	65	235	2	0.47	0.04	5	15	1	105	2674.22
Golf Course - Grounds Maintenance Building - Garage	13W Exposed CFL Screw Type	2	13	26	81.12	Do Nothing - Fixture To Remain	2	13	26	0	3120	0.00	0.00					
Golf Course - Grounds Maintenance Building - Garage	2L T12 strip w/standard ballast	5	73	365	2277.6	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	5	51	255	110	6240	686.40	57.34	37	45	2	420	7.32
Golf Course - Grounds Maintenance Building - Garage Office	2x4, 4L T8 surface wrap w/electronic ballast	2	114	228	711.36	Re-lamp w/4 25W T8 lamps	2	86	172	56	3120	174.72	14.60	12	25	4	82	5.62
Golf Course - Grounds Maintenance Building - Exterior	PAR38 Flood on motion sensor	2	75	150	78	Do Nothing - Fixture To Remain	2	75	150	0	520	0.00	0.00					

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	1	-	1
Total Energy Consumption Savings (kWh/yr)	1,008	268	1,277
Total Energy Savings / Year ($)	$84	$22	$107
Total Cost of Material and Labor ($)	$649	$143	$792
St. Louis Price Adjustment ($)	$666	$147	$813
Total Tax, Overhead & Profit, and Contingency ($)	$233	$51	$284
Total Installed Cost ($)	$899	$198	$1,097
Total Simple Payback (Years)	10.67	8.84	10.29

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Golf Course - Grounds Maintenance Building - Garage Office	2x4, 4L T8 surface wrap w/electronic ballast	Re-lamp w/4 25W T8 lamps	2	86	172	1	1560	268.32	22.42	90	53	143	6.38

Appendix F

Lighting Improvements Calculations (Public Works)– ECM-1.6

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Central Garage - Vehicle Workshop	1x8, 2L 75W T12 surface strip w/standard ballast	41	158	6478	18527.08	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	25	114	2850	3628	2860	10,376.08	711.80	278	73	25	9,400	13.21
Central Garage - Vehicle Workshop	1x4, 2L T12 surface strip w/standard ballast	13	73	949	2714.14	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	7	114	798	151	2860	431.86	29.63	278	73	25	2,632	88.84
Central Garage - Vehicle Workshop	1x4, 2L T12 pendant industrial task w/standard ballast	4	73	292	835.12	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	4	51	204	88	2860	251.68	17.27	37	45	2	336	19.46
Central Garage - High-Bay Garage	1x8, 2L 75W T12 industrial strip w/standard ballast	21	158	3318	9489.48	Replace with 4-lamp T5HO High Bay w/electronic ballast and integral occupancy sensor	8	258	2064	1254	2860	3,586.44	246.03	313	73	25	3,288	13.36
Central Garage - High-Bay Garage	1x4, 2L T12 industrial strip w/standard ballast	3	73	219	626.34	Fixtures to be Demolished	3	0	0	219	2860	626.34	42.97	0	25	5	90	2.09
Central Garage - Garage	Incandescent Exit Sign	1	20	20	175.2	Replace with LED Exit Sign	1	3	3	17	8760	148.92	10.22	55	65	5	125	12.24
Central Garage - Tool/Compressor Room	1x8, 2L 75W T12 industrial strip w/standard ballast	1	158	158	451.88	Re-lamp w/2 59W T8 8' lamps w/high-efficiency, electronic ballast	1	112	112	46	2860	131.56	9.03	37	45	2	84	9.31
Central Garage - Parts Supply Room	1x4, 2L T12 industrial strip w/standard ballast	5	73	365	1043.9	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	5	51	255	110	2860	314.60	21.58	37	45	2	420	19.46
Central Garage - Parts Supply Room	1x4, 1L T12 industrial strip w/standard ballast	2	42	84	240.24	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	2	26	52	32	2860	91.52	6.28	35	42	2	158	25.17
Central Garage - Print Room	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	411.84	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	2860	165.88	11.38	42	50	2	94	8.26

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Central Garage - Offices	2x4, 4L T12 surface wrap w/standard ballast	2	144	288	823.68	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	116	2860	331.76	22.76	42	50	2	188	8.26
Central Garage - Offices	1x4, 2L T12 surface wrap w/standard ballast	3	73	219	626.34	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	66	2860	188.76	12.95	37	45	2	252	19.46
Central Garage - Break Room	1x4, 2L T12 industrial strip w/standard ballast	1	73	73	208.78	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	2860	62.92	4.32	37	45	2	84	19.46
Central Garage - Men's Locker & Restroom	1x4, 2L T12 industrial strip w/standard ballast	14	73	1022	2922.92	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	14	51	714	308	2860	880.88	60.43	37	45	2	1,176	19.46
Central Garage - Men's Locker & Restroom	1x4, 2L T8 industrial strip w/standard ballast	1	69	69	197.34	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	18	2860	51.48	3.53	37	45	2	84	23.79
Central Garage - Men's Locker & Restroom	1x4, 1L T12 vanity strip w/standard ballast	1	42	42	120.12	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	16	2860	45.76	3.14	35	42	2	79	25.17
Central Garage - Men's Locker & Restroom	1x4, 2L T8 strip w/electronic ballast	2	59	118	337.48	Do Nothing - Fixture To Remain	2	59	118	0	2860	0.00	0.00					
Central Garage - Offices	1x4, 2L T12 industrial strip w/standard ballast	15	73	1095	3131.7	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	15	51	765	330	2860	943.80	64.74	37	45	2	1,260	19.46
Central Garage - Women's Restroom	1x4, 2L T12 industrial strip w/standard ballast	1	73	73	208.78	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	2860	62.92	4.32	37	45	2	84	19.46
Central Garage - Fuel Station	175W Metal Halide Class 1, surface mount with standard ballast	4	213	852	3731.76	Do Nothing - Fixture To Remain	4	213	852	0	4380	0.00	0.00					

Fixture ECM Totals (Continued):

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	7	-	7
Total Energy Consumption Savings (kWh/yr)	18,693	5,290	23,983
Total Energy Savings / Year ($)	$1,282	$317	$1,599
Total Cost of Material and Labor ($)	$19,834	$2,145	$21,979
St. Louis Price Adjustment ($)	$20,350	$2,201	$22,550
Total Tax, Overhead & Profit, and Contingency ($)	$7,122	$770	$7,893
Total Installed Cost ($)	$27,472	$2,971	$30,443
Total Simple Payback (Years)	21.42	9.38	19.04

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Central Garage - Vehicle Workshop	1x8, 2L 75W T12 surface strip w/standard ballast	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	25	114	2850	25	572	1630.20	97.60	0	0	0	0.00
Central Garage - Vehicle Workshop	1x4, 2L T12 surface strip w/standard ballast	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	7	114	798	7	572	456.46	27.33	0	0	0	0.00
Central Garage - High-Bay Garage	1x8, 2L 75W T12 industrial strip w/standard ballast	Replace with 4-lamp T5HO High Bay w/electronic ballast and integral occupancy sensor	8	258	2064	8	572	1180.61	70.68	0	0	0	0.00
Central Garage - Tool/Compressor Room	1x8, 2L 75W T12 industrial strip w/standard ballast	Re-lamp w/2 59W T8 8' lamps w/high-efficiency, electronic ballast	1	112	112	1	1430	160.16	9.59	90	53	143	14.91
Central Garage - Parts Supply Room	1x4, 2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	5	51	255	1	1144	291.72	17.47	90	53	143	8.19
Central Garage - Parts Supply Room	1x4, 1L T12 industrial strip w/standard ballast	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	2	26	52	1	1144	59.49	3.56	90	53	143	40.15
Central Garage - Print Room	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	572	49.19	2.95	90	53	143	48.55
Central Garage - Offices	2x4, 4L T12 surface wrap w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	1	572	98.38	5.89	90	53	143	24.28
Central Garage - Offices	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	1	572	87.52	5.24	90	53	143	27.29
Central Garage - Break Room	1x4, 2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	572	29.17	1.75	90	53	143	81.88

Controls Totals (Continued):

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Central Garage - Men's Locker & Restroom	1x4, 2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	14	51	714	2	858	612.61	36.68	90	53	286	7.80
Central Garage - Men's Locker & Restroom	1x4, 2L T8 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	858	43.76	2.62	90	53	143	54.58
Central Garage - Men's Locker & Restroom	1x4, 1L T12 vanity strip w/standard ballast	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	1	858	22.31	1.34	90	53	143	107.07
Central Garage - Men's Locker & Restroom	1x4, 2L T8 strip w/electronic ballast	Do Nothing - Fixture To Remain	2	59	118	0	858	101.24	6.06	90	53	0	0.00
Central Garage - Offices	1x4, 2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	15	51	765	3	572	437.58	26.20	90	53	429	16.38
Central Garage - Women's Restroom	1x4, 2L T12 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	572	29.17	1.75	90	53	143	81.88

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Materials Recycling Facility - Storage	1x4, 2L T8 surface strip w/electronic ballast	6	59	354	736.32	Do Nothing - Fixture To Remain	6	59	354	0	2080	0.00	0.00					
Materials Recycling Facility - Storage	1x4, 2L T12 surface strip w/standard ballast	10	73	730	1518.4	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	10	51	510	220	2080	457.60	31.39	37	45	2	840	26.76
Materials Recycling Facility - Break	2x4, 4L T12 recessed troffer w/standard ballast	3	144	432	44.928	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	174	104	18.10	1.24	42	50	2	282	227.17
Materials Recycling Facility - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	299.52	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	2080	120.64	8.28	42	50	2	94	11.36
Materials Recycling Facility - Janitor's Closet	1x4, 2L T8 industrial strip w/standard ballast	1	69	69	143.52	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	18	2080	37.44	2.57	37	45	2	84	32.71
Materials Recycling Facility - Storage	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	20.43	55	65	5	250	12.24
Materials Recycling Facility - Trash Sorting	100W Metal Halide Wall Flood w/standard ballast	3	125	375	1642.5	Do Nothing - Fixture To Remain	3	125	375	0	4380	0.00	0.00					
Materials Recycling Facility - Trash Sorting	150W High-Pressure Sodium Wall Pack w/standard ballast	2	188	376	3293.76	Do Nothing - Fixture To Remain	2	188	376	0	8760	0.00	0.00					
Materials Recycling Facility - Break Shack	1x4, 2L T12 surface wrap w/standard ballast	2	73	146	15.184	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	104	4.58	0.31	37	45	2	168	535.18

Fixture ECM Totals:

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	1	-	1
Total Energy Consumption Savings (kWh/yr)	936	422	1,358
Total Energy Savings / Year ($)	$64	$25	$89
Total Cost of Material and Labor ($)	$1,718	$1,001	$2,719
St. Louis Price Adjustment ($)	$1,763	$1,027	$2,790
Total Tax, Overhead & Profit, and Contingency	$617	$359	$976
Total Installed Cost ($)	$2,380	$1,386	$3,766
Total Simple Payback (Years)	37.05	54.91	42.09

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Materials Recycling Facility - Storage	1x4, 2L T8 surface strip w/electronic ballast	Do Nothing - Fixture To Remain	6	59	354	2	416	147.26	8.82	90	53	286	32.44
Materials Recycling Facility - Storage	1x4, 2L T12 surface strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	10	51	510	2	416	212.16	12.70	90	53	286	22.52
Materials Recycling Facility - Break	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	1	21	5.37	0.32	90	53	143	445.09
Materials Recycling Facility - Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	416	35.78	2.14	90	53	143	66.76
Materials Recycling Facility - Janitor's Closet	1x4, 2L T8 industrial strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	1	416	21.22	1.27	90	53	143	112.58

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Park Storage and Shops - Storage	1x4, 2L T12 pendant strip w/standard ballast	19	73	1387	12150.12	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	19	51	969	418	8760	3,661.68	251.19	37	45	2	1,596	6.35
Park Storage and Shops - Storage	1x4, 4L T12 pendant strip w/standard ballast	1	144	144	1261.44	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	8760	508.08	34.85	42	50	2	94	2.70
Park Storage and Shops - Break Area	1x4, 2L T12 pendant strip w/standard ballast	27	73	1971	17265.96	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	27	51	1377	594	8760	5,203.44	356.96	37	45	2	2,268	6.35
Park Storage and Shops - Break Area	2x4, 4L T12 pendant strip w/standard ballast	1	144	144	1261.44	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	8760	508.08	34.85	42	50	2	94	2.70
Park Storage and Shops - Storage	26W CFL Pendant Globe	5	26	130	338	Do Nothing - Fixture To Remain	5	26	130	0	2600	0.00	0.00					
Park Storage and Shops - Back Garage	1x4, 2L T12 pendant strip w/standard ballast	6	73	438	3836.88	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	132	8760	1,156.32	79.32	37	45	2	504	6.35
Park Storage and Shops - Machine Shop	1x4, 2L T12 pendant strip w/standard ballast	20	73	1460	12789.6	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	20	51	1020	440	8760	3,854.40	264.41	37	45	2	1,680	6.35
Park Storage and Shops - Entry Hall	1x4, 2L T12 surface wrap w/standard ballast	3	73	219	569.4	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	66	2600	171.60	11.77	37	45	2	252	21.41
Park Storage and Shops - Locker	1x4, 2L T12 surface wrap w/standard ballast	3	73	219	569.4	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	66	2600	171.60	11.77	37	45	2	252	21.41
Park Storage and Shops - Locker	1x8, 2L 75W T12 surface wrap w/standard ballast	2	158	316	821.6	Re-lamp w/2 59W 8', T8 lamps w/high-efficiency, electronic ballast	2	112	224	92	2600	239.20	16.41	40	52	2	188	11.46

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Park Storage and Shops - Restroom	100W Exposed Incandescent Pendant	2	100	200	520	Re-lamp w/26W compact fluorescent screw-type lamps	2	26	52	148	2600	384.80	19.24	5	15	1	42	2.18
Park Storage and Shops - Restroom	2-lamp 60W Incandescent Vanity	1	120	120	312	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	2600	244.40	12.22	10	20	1	31	2.54
Park Storage and Shops - Office	2x4, 4L T8 recessed troffer w/electronic ballast	3	114	342	889.2	Provide new 2-lamp T8 recessed volumetric w/high-efficiency electronic ballast	3	59	177	165	2600	429.00	29.43	125	55	10	570	19.37
Park Storage and Shops - Office	2L T12 strip above lay-in lens w/standard ballast	3	73	219	569.4	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	66	2600	171.60	11.77	37	45	2	252	21.41

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	2	-	2
Total Energy Consumption Savings (kWh/yr)	16,704	17,284	33,988
Total Energy Savings / Year ($)	$1,134	$1,035	$2,169
Total Cost of Material and Labor ($)	$7,823	$1,573	$9,396
St. Louis Price Adjustment ($)	$8,026	$1,614	$9,640
Total Tax, Overhead & Profit, and	$2,809	$565	$3,374
Total Installed Cost ($)	$10,836	$2,179	$13,014
Total Simple Payback (Years)	9.55	2.11	6.00

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Park Storage and Shops - Storage	1x4, 2L T12 pendant strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	19	51	969	2	4380	4244.22	254.10	90	53	286	1.13
Park Storage and Shops - Storage	1x4, 4L T12 pendant strip w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	0	4380	376.68	22.55	90	53	0	0.00
Park Storage and Shops - Break Area	1x4, 2L T12 pendant strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	27	51	1377	2	4380	6031.26	361.09	90	53	286	0.79
Park Storage and Shops - Break Area	2x4, 4L T12 pendant strip w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	0	4380	376.68	22.55	90	53	0	0.00
Park Storage and Shops - Back Garage	1x4, 2L T12 pendant strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	6	51	306	1	4380	1340.28	80.24	90	53	143	1.78
Park Storage and Shops - Machine Shop	1x4, 2L T12 pendant strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	20	51	1020	2	4380	4467.60	267.48	90	53	286	1.07
Park Storage and Shops - Entry Hall	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	1	520	79.56	4.76	90	53	143	30.02
Park Storage and Shops - Locker	1x4, 2L T12 surface wrap w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	1	520	79.56	4.76	90	53	143	30.02
Park Storage and Shops - Locker	1x8, 2L 75W T12 surface wrap w/standard ballast	Re-lamp w/2 59W 8', T8 lamps w/high-efficiency, electronic ballast	2	112	224	0	520	116.48	6.97	90	53	0	0.00
Park Storage and Shops - Office	2x4, 4L T8 recessed troffer w/electronic ballast	Provide new 2-lamp T8 recessed volumetric w/high-efficiency electronic ballast	3	59	177	1	520	92.04	5.51	90	53	143	25.95
Park Storage and Shops - Office	2L T12 strip above lay-in lens w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	3	51	153	1	520	79.56	4.76	90	53	143	30.02

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Lawn Equipment Storage - Garage	PAR 38 Halogen Flood	4	75	300	18	Do Nothing - Fixture To Remain	4	75	300	0	60	0.00	0.00					
Lawn Equipment Storage - Garage	26W Exposed CFL	1	26	26	1.56	Do Nothing - Fixture To Remain	1	26	26	0	60	0.00	0.00					
Lawn Equipment Storage - Garage	1x4, 1L T12 surface strip w/standard ballast	1	42	42	2.52	28W T8 lamp w/high-efficiency, electronic	1	26	26	16	60	0.96	0.07	35	42	2	79	1199.59

	Lighting Retrofit:
Total Annual Demand Savings	0
Total Energy Consumption	1
Total Energy Savings / Year ($)	$0
Total Cost of Material and	$79
St. Louis Price Adjustment ($)	$81
Total Tax, Overhead & Profit,	$28
Total Installed Cost ($)	$109
Total Simple Payback (Years)	1661.55

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Sign Shop - Storage	1x4, 2L T12 surface industrial strip w/standard ballast	20	73	1460	3416.4	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	8	114	912	548	2340	1,282.32	87.97	278	73	25	3,008	34.19
Sign Shop - Office	1x8, 2L 75W T12 industrial strip w/standard ballast	1	158	158	369.72	Re-lamp w/2 59W 8', T8 lamps w/high-efficiency, electronic ballast	1	112	112	46	2340	107.64	7.38	40	52	2	94	12.73
Sign Shop - Restroom	1x4, 1L T12 industrial strip w/standard ballast	1	42	42	98.28	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	16	2340	37.44	2.57	35	42	2	79	30.76
Sign Shop - Storage	Incandescent Exit Sign	1	20	20	175.2	Replace with LED Exit Sign	1	3	3	17	8760	148.92	10.22	55	65	5	125	12.24

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	1	-	1
Total Energy Consumption Savings (kWh/yr)	1,576	2,457	4,033
Total Energy Savings / Year ($)	$108	$147	$255
Total Cost of Material and Labor ($)	$3,306	$286	$3,592
St. Louis Price Adjustment ($)	$3,392	$293	$3,685
Total Tax, Overhead & Profit, and Contingency ($)	$1,187	$103	$1,290
Total Installed Cost ($)	$4,579	$396	$4,975
Total Simple Payback (Years)	42.35	2.69	19.49

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Sign Shop - Storage	1x4, 2L T12 surface industrial strip w/standard ballast	Replace with 4-lamp T8 High Bay w/electronic ballast and integral occupancy sensor	8	114	912	8	2340	2134.08	127.77	0	0	0	0.00
Sign Shop - Office	1x8, 2L 75W T12 industrial strip w/standard ballast	Re-lamp w/2 59W 8', T8 lamps w/high-efficiency, electronic ballast	1	112	112	1	2340	262.08	15.69	90	53	143	9.11
Sign Shop - Restroom	1x4, 1L T12 industrial strip w/standard ballast	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	1	2340	60.84	3.64	90	53	143	39.26

Appendix G

Lighting Improvements Calculations (Recreation Center)– ECM-1.7

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Recreation Center - Weight Room	2x4, 4L, T8 recessed troffer w/electronic ballast	22	114	2508	13432.848	Do Nothing - Fixture To Remain	22	114	2508	0	5356	0.00	0.00					
Recreation Center - Weight Room	LED Exit Sign	2	3	6	52.56	Do Nothing - Fixture To Remain	2	3	6	0	8760	0.00	0.00					
Recreation Center - Weight Room	23W CFL PAR38 Recessed Can	8	23	184	985.504	Do Nothing - Fixture To Remain	8	23	184	0	5356	0.00	0.00					
Recreation Center - Restroom Corridor	2x4, 4L T12 surface wrap w/standard ballast	2	144	288	1542.528	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	116	5356	621.30	31.06	42	50	2	188	6.05
Recreation Center - Restroom Corridor	2x4, 4L T12 recessed troffer w/standard ballast	1	144	144	771.264	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	5356	310.65	15.53	42	50	2	94	6.05
Recreation Center - Restroom Corridor	1x4, 2L T12 recessed troffer w/standard ballast	1	73	73	390.988	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	5356	117.83	5.89	37	45	2	84	14.26
Recreation Center - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	3	144	432	2313.792	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	174	5356	931.94	46.60	42	50	2	282	6.05
Recreation Center - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	5	144	720	3856.32	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	290	5356	1,553.24	77.66	42	50	2	470	6.05
Recreation Center - Rock Wall	250W, Metal Halide Low Bay w/standard ballast	4	295	1180	6320.08	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	4	258	1032	148	5356	792.69	47.46	313	123	25	1,844	38.86
Recreation Center - Indoor Soccer	250W, Metal Halide Low Bay w/standard ballast	11	295	3245	17380.22	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	21	258	5418	-2173	5356	-11,638.59	-696.80	313	123	25	9,681	-13.89

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Recreation Center - Indoor Soccer	250W, Metal Halide Low Bay w/standard ballast	32	295	9440	4908.8	All fixtures shall be removed	0	0	0	9440	520	4,908.80	293.89	0	0	0	0	0.00
Recreation Center - Indoor Soccer	LED Exit Sign	4	3	12	105.12	Do Nothing - Fixture To Remain	4	3	12	0	8760	0.00	0.00					
Recreation Center - Basketball Court	250W, Metal Halide Indirect Round w/standard ballast	20	295	5900	31600.4	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	15	258	3870	2030	5356	10,872.68	650.95	313	73	25	6,165	9.47

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	10	-	10
Total Energy Consumption Savings (kWh/yr)	8,471	11,757	20,228
Total Energy Savings / Year ($)	$472	$752	$1,224
Total Cost of Material and Labor ($)	$18,808	$858	$19,666
St. Louis Price Adjustment ($)	$19,297	$880	$20,177
Total Tax, Overhead & Profit, and Contingency ($)	$6,754	$308	$7,062
Total Installed Cost ($)	$26,051	$1,188	$27,239
Total Simple Payback (Years)	55.16	1.58	22.26

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Recreation Center - Weight Room	2x4, 4L, T8 recessed troffer w/electronic ballast	Do Nothing - Fixture To Remain	22	114	2508	3	536	1343.28	85.88	90	53	429	5.00
Recreation Center - Restroom Corridor	2x4, 4L T12 surface wrap w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	1	536	92.12	5.89	90	53	143	24.28
Recreation Center - Restroom Corridor	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	0	536	46.06	2.94	90	53	0	0.00
Recreation Center - Restroom Corridor	1x4, 2L T12 recessed troffer w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	0	536	27.32	1.75	90	53	0	0.00
Recreation Center - Men's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	3	86	258	1	536	138.18	8.83	90	53	143	16.19
Recreation Center - Women's Restroom	2x4, 4L T12 recessed troffer w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	5	86	430	1	536	230.31	14.72	90	53	143	9.71
Recreation Center - Rock Wall	250W, Metal Halide Low Bay w/standard ballast	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	4	258	1032	4	536	552.74	35.34	0	0	0	0.00
Recreation Center - Indoor Soccer	250W, Metal Halide Low Bay w/standard ballast	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	21	258	5418	21	1339	7254.70	463.79	0	0	0	0.00
Recreation Center - Basketball Court	250W, Metal Halide Indirect Round w/standard ballast	Replace with 4-lamp T5HO High Bay w/electronic ballast, cage and integral occupancy sensor	15	258	3870	15	536	2072.77	132.51	0	0	0	0.00

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Recreation Center - Pool Entry	26W CFL Recessed Can	10	26	260	27.04	Do Nothing - Fixture To Remain	10	26	260	0	104	0.00	0.00					
Recreation Center - Pool House	Incandescent Exit Sign	3	20	60	525.6	Replace with LED Exit Sign	3	3	9	51	8760	446.76	22.34	55	65	5	375	16.79
Recreation Center - Pool House	1L T12 strip w/standard ballast	59	42	2478	8504.496	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	59	26	1534	944	3432	3,239.81	161.99	37	45	2	4,956	30.59
Recreation Center - Pool House	2L T12 strip w/standard ballast	17	73	1241	4259.112	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	17	51	867	374	3432	1,283.57	64.18	37	45	2	1,428	22.25
Recreation Center - Pool House	2L T12 strip w/standard ballast	7	73	511	132.86	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	7	51	357	154	260	40.04	2.00	37	45	2	588	293.71
Recreation Center - Pool House	2x4, 4L T12 surface wrap w/standard ballast	4	144	576	1976.832	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	232	3432	796.22	39.81	42	50	2	376	9.44
Recreation Center - Electrical / Pump Room	2L T8 damp-location strip w/electronic ballast	11	59	649	2227.368	Do Nothing - Fixture To Remain	11	59	649	0	3432	0.00	0.00					
Recreation Center - Office	2x4, 4L T12 surface wrap w/standard ballast	1	144	144	449.28	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	3120	180.96	9.05	42	50	2	94	10.39
Recreation Center - Storage	100W Exposed Incandescent Pendant	1	100	100	5.2	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	74	52	3.85	0.19	5	15	1	21	109.15

Fixture ECM Totals:

	Lighting Retrofit:	Controls Totals:	Total:
Total Annual Demand Savings (kW):	2	-	2
Total Energy Consumption Savings (kWh/yr)	5,991	1,677	7,669
Total Energy Savings / Year ($)	$300	$107	$407
Total Cost of Material and Labor ($)	$7,838	$1,430	$9,268
St. Louis Price Adjustment ($)	$8,042	$1,467	$9,509
Total Tax, Overhead & Profit, and Contingency ($)	$2,815	$514	$3,328
Total Installed Cost ($)	$10,856	$1,981	$12,837
Total Simple Payback (Years)	36.24	18.47	31.56

Controls Totals:

Location	Existing Fixture	Proposed Fixture	Proposed Qty.	Input Watts Saved / Fixture (W)	Proposed Wattage (W)	Proposed Control Qty.	Avg. Hours Saved / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Recreation Center - Pool House	1L T12 strip w/standard ballast	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	59	26	1534	4	343	526.47	33.66	90	53	572	16.99
Recreation Center - Pool House	2L T12 strip w/standard ballast	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	17	51	867	2	343	297.55	19.02	90	53	286	15.03
Recreation Center - Pool House	2x4, 4L T12 surface wrap w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	4	86	344	1	343	118.06	7.55	90	53	143	18.95
Recreation Center - Electrical / Pump Room	2L T8 damp-location strip w/electronic ballast	Do Nothing - Fixture To Remain	11	59	649	2	1030	668.21	42.72	90	53	286	6.69
Recreation Center - Office	2x4, 4L T12 surface wrap w/standard ballast	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	1	780	67.08	4.29	90	53	143	33.35

Appendix H

Lighting Improvements Calculations (Trinity Building)– ECM-1.8

Fixture ECM Totals:

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Trinity Building - 1st Floor - Storage	2x4, 4L T12 surface wrap w/standard ballast	11	144	1584	31.68	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	11	86	946	638	20	12.76	0.76	42	50	2	1,034	1353.51
Trinity Building - 1st Floor - Storage	Incandescent Exit Sign	3	20	60	525.6	Replace with LED Exit Sign	3	3	9	51	8760	446.76	26.75	55	65	5	375	14.02
Trinity Building - 1st Floor - Offices	2x4, 4L T12 recessed troffer w/standard ballast	2	144	288	2.88	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	2	86	172	116	10	1.16	0.07	42	50	2	188	2707.01
Trinity Building - 1st Floor - Kitchen	2L T12 strip w/standard ballast	1	73	73	0.73	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	10	0.22	0.01	37	45	2	84	6377.45
Trinity Building - 1st Floor - Stage / Mechanical	90W Exposed Incandescent	15	90	1350	6.75	Re-lamp w/26W compact fluorescent screw-type lamps	15	26	390	960	5	4.80	0.29	5	15	1	315	1096.12
Trinity Building - 1st Floor - Stairs	26W TTT CFL Pendant	2	26	52	108.16	Do Nothing - Fixture To Remain	2	26	52	0	2080	0.00	0.00					
Trinity Building - 1st Floor - Men's Restroom	90W Exposed Incandescent	1	90	90	0.45	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	64	5	0.32	0.02	5	15	1	21	1096.12
Trinity Building - 1st Floor - Women's Restroom	90W Exposed Incandescent	1	90	90	0.45	Re-lamp w/26W compact fluorescent screw-type lamps	1	26	26	64	5	0.32	0.02	5	15	1	21	1096.12
Trinity Building - 1st Floor - Women's Restroom	1x4, 1L T12 wall strip w/standard ballast	1	42	42	87.36	Re-lamp w/1 28W T8 lamp w/high-efficiency, electronic ballast	1	26	26	16	2080	33.28	1.99	37	45	2	84	42.16
Trinity Building - 1st Floor - Storage	100W Exposed Incandescent	4	100	400	0.4	Re-lamp w/26W compact fluorescent screw-type lamps	4	26	104	296	1	0.30	0.02	5	15	1	84	4740.00

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Trinity Building - 1st Floor - Hall	2-lamp 40W Recessed Incandescent Square	1	80	80	0.08	Re-lamp w/2 9W compact fluorescent screw-type lamps	1	18	18	62	1	0.06	0.00	5	15	1	21	5657.42
Trinity Building - 1st Floor - Storage	60W Exposed Incandescent	18	60	1080	1.08	Re-lamp w/13W compact fluorescent screw-type lamps	18	13	234	846	1	0.85	0.05	5	15	1	378	7462.98
Trinity Building - 2nd Floor - Stairs	2L T12 wall strip w/standard ballast	1	73	73	75.92	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	1	51	51	22	1040	22.88	1.37	37	45	2	84	61.32
Trinity Building - 2nd Floor - Storage	60W Exposed Incandescent	18	60	1080	1.08	Re-lamp w/13W compact fluorescent screw-type lamps	18	13	234	846	1	0.85	0.05	5	15	1	378	7462.98
Trinity Building - 2nd Floor - Stairs	2L T12 surface wrap w/standard ballast	2	73	146	151.84	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	2	51	102	44	1040	45.76	2.74	37	45	2	168	61.32
Trinity Building - 2nd Floor - Stairs	4L T12 surface wrap w/standard ballast	1	144	144	149.76	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	1	86	86	58	1040	60.32	3.61	42	50	2	94	26.03
Trinity Building - 2nd Floor - Storage	Incandescent Exit Sign	1	20	20	175.2	Replace with LED Exit Sign	1	3	3	17	8760	148.92	8.92	55	65	5	125	14.02
Trinity Building - 2nd Floor - Storage	34W Exposed Incandescent	39	34	1326	1.326	Re-lamp w/ 9W compact fluorescent screw-type lamps	39	9	351	975	1	0.98	0.06	5	15	1	819	14030.40
Trinity Building - 2nd Floor - Storage	2L T12 strip w/standard ballast	5	73	365	379.6	Re-lamp w/2 28W T8 lamps w/high-efficiency, electronic ballast	5	51	255	110	1040	114.40	6.85	37	45	2	420	61.32
Trinity Building - 2nd Floor - Old Library	4L T12 surface wrap w/standard ballast	9	144	1296	77.76	Re-lamp w/4 25W T8 lamps w/high-efficiency, electronic ballast	9	86	774	522	60	31.32	1.88	42	50	2	846	451.17

Fixture ECM Totals (Continued):

Location	Existing Fixture	Existing Qty.	Input Watts / Fixture (W)	Existing Wattage (W)	kWh Existing (kWh)	Proposed Fixture	Proposed Qty.	Input Watts / Fixture (W)	Proposed Wattage (W)	Energy Savings (W)	Avg. Hours / Year	kWh Savings / Year (kWh)	Energy Savings / Year ($)	Unit Material Cost ($)	Unit Labor Cost ($)	Unit Disposal Cost ($)	Total Cost ($)	Simple Payback (Yr.)
Trinity Building - 2nd Floor - Old Library	Incandescent Exit Sign	2	20	40	350.4	Replace with LED Exit Sign	2	3	6	34	8760	297.84	17.83	55	65	5	250	14.02
Trinity Building - 2nd Floor - Stairs	5-lamp Decorative Candelabra (25W Incandescent Candelabra Lamps)	2	25	100	442	Do Nothing - Fixture To Remain	2	25	100	0	12	0.00	0.00					
Trinity Building - 2nd Floor - Entry	2-lamp 40W Decorative Incandescent Surface Mount	1	120	120	1.44	Re-lamp w/2 13W compact fluorescent screw-type lamps	1	26	26	94	12	1.13	0.07	10	25	1	36	533.07
Trinity Building - 3rd Floor - Storage	34W Exposed Incandescent	19	34	646	0.646	Re-lamp w/ 9W compact fluorescent screw-type lamps	19	9	171	475	1	0.48	0.03	5	15	1	399	14030.40

	Lighting Retrofit:
Total Annual Demand Savings (kW):	6
Total Energy Consumption Savings (kWh/yr)	1,226
Total Energy Savings / Year ($)	$73
Total Cost of Material and Labor ($)	$6,224
St. Louis Price Adjustment ($)	$6,386
Total Tax, Overhead & Profit, and Contingency ($)	$2,235
Total Installed Cost ($)	$8,621
Total Simple Payback (Years)	117.48

Appendix I

Energy Management / Control Improvements– ECM-2

ECM-2.2: Install Progrmable Tstats & Locking Covers - Central Garage:

Cooling - Electrical Consumption

Existing Cooling Electrical Consumption:

Front Office	2.5	tons	x	1868	FLH	x	1.70	kW/ton	=	7,941	kWh/yr
Shop Office	3.0	tons	x	1868	FLH	x	1.40	kW/ton	=	7,847	kWh/yr
Total Existing Cooling Electrical Consumption:									=	15,788	kWh/yr

Recommended Cooling Electrical Consumption:

Front Office	2.5	tons	x	1502	FLH	x	0.08	kW/ton	=	300	kWh/yr
Shop Office	3.0	tons	x	1502	FLH	x	0.08	kW/ton	=	361	kWh/yr
Total Recommended Cooling Electrical Consumption:									=	661	kWh/yr
Total Cooling Electrical Consumption Savings:									=	15,127	kWh/yr

Cooling - Electrical Demand Savings

Existing Cooling Electrical Demand:

Front Office	2.5	tons	x	70%	Dem. Diversity	x	1.70	kW/ton	=	3.0	kW/mo
Shop Office	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Total Existing Cooling Electrical Demand:									=	5.9	kW/mo

Recommended Cooling Electrical Demand:

Front Office	2.5	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.1	kW/mo
Shop Office	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Total Recommended Cooling Electrical Demand:									=	0.3	kW/mo
Total Monthly Cooling Electrical Demand Savings:									=	5.6	kW/mo
Assumes 7 months per year usage:											

Heating - Electrical Consumption

Existing Heating Electrical Consumption:

Front Office	25,000	Btu/hr	÷	72	ºF	x	146,380	hr- ºF	x	0.292	kW/kBtu	=	14,841	kWh/yr
Shop Office	30,000	Btu/hr	÷	72	ºF	x	146,380	hr- ºF	x	0.292	kW/kBtu	=	17,810	kWh/yr
Total Existing Heating Electrical Consumption:												=	32,651	kWh/yr

Recommended Heating Electrical Consumption:

Front Office	25,000	Btu/hr	÷	72	ºF	x	117,923	hr- ºF	÷	0.170	kW/kBtu	=	6,961	kWh/yr
Shop Office	30,000	Btu/hr	÷	72	ºF	x	117,923	hr- ºF	÷	0.170	kW/kBtu	=	8,353	kWh/yr
Total Recommended Heating Electrical Consumption:												=	15,314	kWh/yr
Total Heating Electrical Consumption Savings:												=	17,337	kWh/yr

Heating - Electrical Demand

Existing Heating Electrical Demand:

Front Office	25,000	Btu/hr	x	80%	Dem. Div.	x	0.292	kW/kBtu	=	5.8 kW/mo
Shop Office	30,000	Btu/hr	x	80%	Dem. Div.	x	0.292	kW/kBtu	=	7.0 kW/mo
Total Existing Heating Electrical Demand:									=	5.8 kW/mo

Recommended Heating Electrical Demand:

Front Office	25,000	Btu/hr	x	80%	Dem. Div.	÷	0.170	kW/kBtu	=	3.4 kW/mo
Shop Office	30,000	Btu/hr	x	80%	Dem. Div.	÷	0.170	kW/kBtu	=	4.1 kW/mo
Total Recommended Heating Electrical Demand:									=	3.4 kW/mo
Total Heating Electrical Demand Savings:									=	2.4 kW/mo
Assumes 5 months per year usage:										

ECM-2.2: Install Progrmable Tstats & Locking Covers - Central Garage (Continued):

Supply Fan Motors - Electrical Consumption

Existing Supply Fan Motor Electrical Consumption:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	7,586	hrs/yr	=	1,603	kWh/yr
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	7,586	hrs/yr	=	2,138	kWh/yr
Total Existing Supply Fan Motor Electrical Consumption:															=	3,741	kWh/yr

Recommended Supply Fan Motor Electrical Consumption:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	6,502	hrs/yr	=	1,108	kWh/yr
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	6,502	hrs/yr	=	1,478	kWh/yr
Total Recommended Supply Fan Motor Electrical Consumption:															=	2,586	kWh/yr
Total Supply Fan Motor Electrical Consumption Savings:															=	1,155	kWh/yr

Supply Fan Motors - Electrical Demand

Existing Supply Fan Motor Electrical Demand:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Total Existing Supply Fan Motor Electrical Demand:															=	0.4	kW/mo

Recommended Supply Fan Motor Electrical Demand:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	80%	Dem. Div.	=	0.1	kw/mo
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Total Recommended Supply Fan Motor Electrical Demand:															=	0.3	kW/mo
Total Supply Fan Motor Electrical Demand Savings:															=	0.1	kW/mo

Assumes 12 months per year usage:

ECM-2.2: Install Plug Load Occupancy Sensors - City Hall:

Office Equipment - Electrcial Consumption

Existing Electrical Consumption:

Accessories	In-Use (24 hrs/day * 7 days/wk)	55	Qty.	x	40	Accessory Watts/desktop *	x	24 hrs/day x 7 days/wk	=	19,282,032	Watts	÷ 1,000 W/kW	=	19,282 kWh/yr
Total Existing Electrical Consumption:													=	19,282 kWh/yr

Recommended Electrical Consumption:

Accessories	In-Use (12 hrs/day * 5 days/wk)	55	Qty.	x	40	Accessory Watts/desktop *	x	8 hrs/day x 5 days/wk	=	4,590,960	Watts	÷ 1,000 W/kW	=	4,591 kWh/yr
Total Recommended Electrical Consumption:													=	4,591 kWh/yr

Total Electrcial Consumption Savings:	=	14,691 kWh/yr

ECM-2.3: Install Plug Load Occupancy Sensors - Annex:

Office Equipment - Electrcial Consumption

Existing Electrical Consumption:

Accessories	In-Use (24 hrs/day * 7 days/wk)	75	Qty.	x	40	Accessory Watts/desktop *	x	24 hrs/day x 7 days/wk	=	26,293,680	Watts	÷ 1,000 W/kW	=	26,294 kWh/yr
Total Existing Electrical Consumption:													=	26,294 kWh/yr

Recommended Electrical Consumption:

Accessories	In-Use (12 hrs/day * 5 days/wk)	75	Qty.	x	40	Accessory Watts/desktop *	x	12 hrs/day x 5 days/wk	=	9,390,600	Watts	÷ 1,000 W/kW	=	9,391 kWh/yr
Total Recommended Electrical Consumption:													=	9,391 kWh/yr

Total Electrcial Consumption Savings:	=	16,903 kWh/yr

Appendix J

Heating, Ventilation, & Air Conditioning Improvements – ECM-4

ECM-4.1: Unit Replacement - Annex:

Cooling - Electrical Consumption

Existing Cooling Electrical Consumption:

Detectives	5.0	tons	x	2012	FLH	x	1.40	kW/ton	=	14,083	kWh/yr
Office	3.0	tons	x	2012	FLH	x	1.40	kW/ton	=	8,450	kWh/yr
Fire Chief/Kitchen	3.0	tons	x	2012	FLH	x	1.40	kW/ton	=	8,450	kWh/yr
Server Rm	3.0	tons	x	2012	FLH	x	1.40	kW/ton	=	8,450	kWh/yr
Telephone Rm	3.0	tons	x	2012	FLH	x	1.40	kW/ton	=	8,450	kWh/yr
Basement Cells	3.0	tons	x	2012	FLH	x	1.40	kW/ton	=	8,450	kWh/yr
Total Existing Cooling Electrical Consumption:									=	56,332	kWh/yr

Recommended Cooling Electrical Consumption:

Detectives	5.0	tons	x	2012	FLH	x	0.08	kW/ton	=	805	kWh/yr
Office	3.0	tons	x	2012	FLH	x	0.08	kW/ton	=	483	kWh/yr
Fire Chief/Kitchen	3.0	tons	x	2012	FLH	x	0.08	kW/ton	=	483	kWh/yr
Server Rm	3.0	tons	x	2012	FLH	x	0.08	kW/ton	=	483	kWh/yr
Telephone Rm	3.0	tons	x	2012	FLH	x	0.08	kW/ton	=	483	kWh/yr
Basement Cells	3.0	tons	x	2012	FLH	x	0.08	kW/ton	=	483	kWh/yr
Total Recommended Cooling Electrical Consumption:									=	3,219	kWh/yr
Total Cooling Electrical Consumption Savings:									=	53,113	kWh/yr

Cooling - Electrical Demand Savings

Existing Cooling Electrical Demand:

Detectives	5.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	4.9	kW/mo
Office	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Fire Chief/Kitchen	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Server Rm	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Telephone Rm	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Basement Cells	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Total Existing Cooling Electrical Demand:									=	19.6	kW/mo

Recommended Cooling Electrical Demand:

Detectives	5.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.3	kW/mo
Office	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Fire Chief/Kitchen	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Server Rm	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Telephone Rm	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Basement Cells	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Total Recommended Cooling Electrical Demand:									=	1.1	kW/mo
Total Monthly Cooling Electrical Demand Savings:									=	18.5	kW/mo

Heating - Electrical Consumption

Existing Heating Electrical Consumption:

Basement Cells	30,000	Btu/hr	÷	72	ºF	x	146,380	hr- ºF	x	0.213	kW/kBtu	=	12,961	kWh/yr
Total Existing Heating Electrical Consumption:												=	12,961	kWh/yr

Recommended Heating Electrical Consumption:

Detectives	30,000	Btu/hr	÷	72	ºF	x	146,380	hr- ºF	÷	0.170	kW/kBtu	=	10,369	kWh/yr
Total Recommended Heating Electrical Consumption:												=	10,369	kWh/yr

ECM-4.1: Unit Replacement - Annex (Continued):

Heating - Electrical Demand

Existing Heating Electrical Demand:

Basement Cells	30,000	Btu/hr	x	80%	Dem. Div.	x	0.213	kW/kBtu	=	5.1	kW/mo
Total Existing Heating Electrical Demand:									=	5.1	kW/mo

Recommended Heating Electrical Demand:

Detectives	30,000	Btu/hr	x	80%	Dem. Div.	÷	0.170	kW/kBtu	=	4.1	kW/mo
Total Recommended Heating Electrical Demand:									=	4.1	kW/mo
Total Heating Electrical Demand Savings:									=	1.0	kW/mo

Water-Source Heat Pump Water Consumption

Existing WSHP Consumption:

Server Rm	3	tons	x	12,000	Btu/ton	=	36,000	Btu	÷	500	÷	12	°F△T	=	6	GPM	=	360	GPH	x	2012	FLH	=	724.27	kgal
Telephone Rm	3	tons	x	12,000	Btu/ton	=	36,000	Btu	÷	500	÷	12	°F△T	=	6	GPM	=	360	GPH	x	2012	FLH	=	724.27	kgal
Basement Cells	3	tons	x	12,000	Btu/ton	=	36,000	Btu	÷	500	÷	12	°F△T	=	6	GPM	=	360	GPH	x	2012	FLH	=	724.27	kgal
Total Existing WSHP Water Consumption Savings:																								2,172.82	kgal

Avoided Maintenance Costs

Assume HVAC System Replacement is avoided maintenance.
Assume replacement happens in 1 years.
Assume estimated life of new equipment is 15 years.

Future Value of:	$10,675	(F/P	4.00%	1)	=	$11,102
Annual Value of:	$11,102	(A/P	4.00%	15)	=	$999

ECM-4.2: Pump Motor Replacement - Heman Park Pool:

Pump Motors - Electrical Consumption

Existing Pump Motor Electrical Consumption:

Main Pool Filtration	40	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	2,400	hrs/yr	=	81,165	kWh/yr
Total Existing Pump Motor Electrical Consumption:															=	81,165	kWh/yr

Recommended Pump Motor Electrical Consumption:

Main Pool Filtration	40	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	2,400	hrs/yr	=	65,455	kWh/yr
Total Recommended Pump Motor Electrical Consumption:															=	65,455	kWh/yr
Total Pump Motor Electrical Consumption Savings:															=	15,709	kWh/yr

Pump Motors - Electrical Demand

Existing Pump Motor Electrical Demand:

Main Pool Filtration	40	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	80%	Dem. Div.	=	27.1	kw/mo
Total Existing Pump Motor Electrical Demand:															=	27.1	kW/mo

Recommended Pump Motor Electrical Demand:

Main Pool Filtration	40	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	80%	Dem. Div.	=	21.8	kw/mo
Total Recommended Pump Motor Electrical Demand:															=	21.8	kW/mo
Total Pump Motor Electrical Demand Savings:															=	5.2	kW/mo

Avoided Maintenance Costs

Assume HVAC System Replacement is avoided maintenance.
Assume replacement happens in 5 years.
Assume estimated life of new equipment is 15 years.

Future Value of:	$6,550	(F/P	4.00%	5)	=	$7,969
Annual Value of:	$7,969	(A/P	4.00%	15)	=	$717

ECM-4.3: Unit Replacement - Central Garage:

Cooling - Electrical Consumption

Existing Cooling Electrical Consumption:

Front Office	2.5	tons	x	1868	FLH	x	1.70	kW/ton	=	7,941	kWh/yr
Shop Office	3.0	tons	x	1868	FLH	x	1.40	kW/ton	=	7,847	kWh/yr
Total Existing Cooling Electrical Consumption:									=	15,788	kWh/yr

Recommended Cooling Electrical Consumption:

Front Office	2.5	tons	x	1868	FLH	x	0.08	kW/ton	=	374	kWh/yr
Shop Office	3.0	tons	x	1868	FLH	x	0.08	kW/ton	=	448	kWh/yr
Total Recommended Cooling Electrical Consumption:									=	822	kWh/yr
Total Cooling Electrical Consumption Savings:									=	14,966	kWh/yr

Cooling - Electrical Demand Savings

Existing Cooling Electrical Demand:

Front Office	2.5	tons	x	70%	Dem. Diversity	x	1.70	kW/ton	=	3.0	kW/mo
Shop Office	3.0	tons	x	70%	Dem. Diversity	x	1.40	kW/ton	=	2.9	kW/mo
Total Existing Cooling Electrical Demand:									=	5.9	kW/mo

Recommended Cooling Electrical Demand:

Front Office	2.5	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.1	kW/mo
Shop Office	3.0	tons	x	70%	Dem. Diversity	x	0.08	kW/ton	=	0.2	kW/mo
Total Recommended Cooling Electrical Demand:									=	0.3	kW/mo
Total Monthly Cooling Electrical Demand Savings:									=	5.6	kW/mo

Heating - Electrical Consumption

Existing Heating Electrical Consumption:

Front Office	25,000	Btu/hr	÷	72	°F	x	146,380	hr- °F	x	0.292	kW/kBtu	=	14,841	kWh/yr
Shop Office	30,000	Btu/hr	÷	72	°F	x	146,380	hr- °F	x	0.292	kW/kBtu	=	17,810	kWh/yr
Total Existing Heating Electrical Consumption:												=	32,651	kWh/yr

Recommended Heating Electrical Consumption:

Front Office	25,000	Btu/hr	÷	72	°F	x	146,380	hr- °F	÷	0.170	kW/kBtu	=	8,640	kWh/yr
Shop Office	30,000	Btu/hr	÷	72	°F	x	146,380	hr- °F	÷	0.170	kW/kBtu	=	10,369	kWh/yr
Total Recommended Heating Electrical Consumption:												=	19,009	kWh/yr
Total Heating Electrical Consumption Savings:												=	13,642	kWh/yr

Heating - Electrical Demand

Existing Heating Electrical Demand:

Front Office	25,000	Btu/hr	x	80%	Dem. Div.	x	0.292	kW/kBtu	=	5.8	kW/mo
Shop Office	30,000	Btu/hr	x	80%	Dem. Div.	x	0.292	kW/kBtu	=	7.0	kW/mo
Total Existing Heating Electrical Demand:									=	5.8	kW/mo

Recommended Heating Electrical Demand:

Front Office	25,000	Btu/hr	x	80%	Dem. Div.	÷	0.170	kW/kBtu	=	3.4	kW/mo
Shop Office	30,000	Btu/hr	x	80%	Dem. Div.	÷	0.170	kW/kBtu	=	4.1	kW/mo
Total Recommended Heating Electrical Demand:									=	3.4	kW/mo
Total Heating Electrical Demand Savings:									=	2.4	kW/mo

ECM-4.3: Unit Replacement - Central Garage (Continued):

Supply Fan Motors - Electrical Consumption

Existing Supply Fan Motor Electrical Consumption:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	2,400	hrs/yr	=	507	kWh/yr
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	2,400	hrs/yr	=	676	kWh/yr
Total Existing Supply Fan Motor Electrical Consumption:															=	1,184	kWh/yr

Recommended Supply Fan Motor Electrical Consumption:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	2,400	hrs/yr	=	409	kWh/yr
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	2,400	hrs/yr	=	545	kWh/yr
Total Recommended Supply Fan Motor Electrical Consumption:															=	955	kWh/yr
Total Supply Fan Motor Electrical Consumption Savings:															=	229	kWh/yr

Supply Fan Motors - Electrical Demand

Existing Supply Fan Motor Electrical Demand:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	75%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Total Existing Supply Fan Motor Electrical Demand:															=	0.4	kW/mo

Recommended Supply Fan Motor Electrical Demand:

Front Office	0.25	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	80%	Dem. Div.	=	0.1	kw/mo
Shop Office	0.33	hp	x	0.746	kW/bhp	x	0.85	bhp/hp	÷	93%	Motor Eff.	x	80%	Dem. Div.	=	0.2	kw/mo
Total Recommended Supply Fan Motor Electrical Demand:															=	0.3	kW/mo
Total Supply Fan Motor Electrical Demand Savings:															=	0.1	kW/mo

Avoided Maintenance Costs

Assume HVAC System Replacement is avoided maintenance.
Assume replacement happens in 1 years.
Assume estimated life of new equipment is 15 years.

Future Value of:	$10,675	(F/P	4.00%	1)	=	$11,102
Annual Value of:	$11,102	(A/P	4.00%	15)	=	$999

Appendix K

Mechanical Inventory

Mechanical Equipment Inventory

Elevation:	Quantity:	Area Served:	Type:	Manufacturer:	Model #:	Serial #:	Capacity:	Fan HP:	RLA:	FLA:	Voltage:	Phase:	Condition:	Date of Manufacture:	Notes:
Annex															
3rd / Roof	1	Office	DX/Gas Split	Carrier	38TKB036	0600E09480	3-tons	-	15.3	-	208	3	Fair	2000	
Roof	1	Detectives	DX/Gas RTU	York	D4CG060	NHBM060332	5-tons	1	16.7	2.6	208	3	Poor	1989	
Roof	1	Fire Bunks	DX/Gas RTU	Carrier	58TDJ016	5004F1973	15-tons	4	2@25.6	10.5	208	3	Good	2004	Has Economizer
3rd / Roof	1	Office	DX/Gas Split	Carrier	38VE004	B954678	3-tons	-	17.8	-	208	3	Poor	1986	
1st	3	Fire Truck Bay	Steam UH	-	-	-	-	-	-	-	-	-	-	-	
Basement/Grade	1	Fire Chief/Kitchen	DX/Steam Split	Carrier	38CKB036	2096E06509	3-tons	-	15.7	-	208	1	Poor	1996	
Grade	1	Police Offices	CU	Carrier	24ABB360	0809E0964	5-tons	-	26.4	-	208	1	Good	2009	
Grade	1	Police Offices	CU	Carrier	24ABR360	0206E19627	5-tons	-	25.3	-	208	1	Good	2006	
Grade	1	Fire Office/EOC	CU	Carrier	38AUZ16A065A	0910U03949	13-tons	1	2@25	-	208	1	Good	2008	
1st	1	Fire Office/EOC	AHU (DX/Steam)	Carrier	40RM-016	3806U24297	13-tons	4	-	10.6	208	3	Good	2006	Has Economizer
1st	1	Server Rm	Vert. Water Source CRU	Kold-wave	-	-	-	-	-	-	-	-	Fair	-	Uses domestic water in a single pass-through
1st	1	Telephone Rm	Horiz. Water Source CRU	Carrier	50HQ033511	x200781	3-tons	-	13.8	2.5	208	3	Fair	-	Uses domestic water in a single pass-through
Basement	1	Firing Range	Gas Heat Horz. AHU	Applied Air	DFS-15 hrs	76-DFS-229 F01321	378,00 BTUH	1	-	-	208	3	Good	-	Heating Only
Basement	1	Cells	Vert. Water Source CRU	Kold-wave	3RC31D12	-	3-tons	1/2	18	2.86	208	3	Poor	-	Uses domestic water in a single pass-through
1st	1	Police Offices	AHU (DX/Gas)	Carrier	40RM012	3806U24391	10-tons	3	-	5.8	208	3	Good	2006	
1st	1	Locker Rooms	Split System (DX/Gas)	Carrier	38BRC030	2100E21912	2.5-tons	-	15	-	208	3	Fair	2000	
2nd	1	Service Support	Split System (DX/Gas)	Comfort Maker	AA1BJ036	4994E05577	3-tons	-	16.1	-	208	3	Poor	2000	
Roof	1	Police Dispatch	RTU (DX/Elec)	Carrier	50TFF006	1407G10298	5-tons	-	16	5.2	208	3	Good	2007	
City Hall															
Basement	1	Condensate	Duplex condensate pump	B&G	23CBE22-20	QE1672-SA0590904	22 gpm	1/2	-	19.2	115	1	Good	2005	
Basement	2	Cooling Tower	End Suction Pump	B&G	1510 3AC BF 6.5	-	311 gpm @ 31 ft	5	-	-	208	3	Good	2005	
Basement	2	Bldg. Condenser Water	End Suction Pump	B&G	1510 3BC BF 8.125	-	311 @ 60 ft	10	-	-	208	3	Good	2005	
Grade	1	Condenser Water	Cooling Tower	Evapco	ICT 4-612	-	-	-	-	-	-	-	Good	2005	Induced Draft Counter Flow with VFD
Basement	1	Condenser Water	Plate & Frame Heat Exchanger	ITT - B&G	BY5409	953899-03	296 GPM	-	-	-	-	-	Good	2005	
Basement	1	Conderser Water	Shell & Tube Heat Exchanger	B&G	BQSU10 2+2	-	296 GPM	-	-	-	-	-	Good	2005	
Various	40	Conditioned Space	Water Source Heat Pumps	Trane	GEH/GEC	-	100 tons total	-	-	-	115	1	Good	2005	
Herman Park Pool															
1st	1	Pool Office	WAC	Zenith	-	-	1-ton	-	-	-	-	-	Fair	-	
1st	1	Main Pool	Pump Motor	Emerson	T661	-	-	40	-	-	460	3	Good	-	93% Eff.
1st	1	Main Pool	Pump Motor	-	-	-	-	40	-	-	460	3	Poor	-	Near the end of its useful life
1st	1	Kid Pool	Pump Motor	Marathon Elec	-	-	-	7 1/2	-	-	-	-	Good	New	87.50%
1st	1	Kid Pool	Pump Motor	Magnetek	H492	-	-	3/4	-	-	-	-	Fair	-	3450 RPM
1st	1	Domestic Hot Water	Natural Gas Fired Water Heater	A. O. Smith	BTR 154 104	ML990886210	154 MBH	-	-	-	-	-	Good	-	149 Gal/hr recovery
Centennial Commons															
1st	2	Domestic Hot Water	Electric Water Heater	State	CSB12027SFEB	J05M007606	119 Gal / 27 kW	-	-	-	460	3	Good	2005	
1st	3	Indoor Soccer Field	Gas Fired Forced Air Furnace	Reznor	-	-	-	-	-	-	-	-	-	-	
Roof	1	Exercise Area	RTU Cooling Only (RTU-1)	Trane	TCD600	-	50-tons	-	-	-	460	3	Good	2005	
1st	1	RTU-1	Energy Recovery Ventilator	SEMCO	FB-7500TS	-	5600 CFM	-	-	-	460	3	Good	2005	
Roof	1	Gymnasium	RTU (DX/Gas)	Trane	YCD480	-	40-ton	-	-	-	460	3	Good	2005	
Roof	9	Varies	Exhaust Fan	Cook	Varies	-	-	Fractional	-	-	Varies	-	Good	2005	
Fire House #2															
1st	1	Domestic Hot Water	Gas Water Heater	A.O.Smith	BTH 199 970	MD040013130	100 Gal / 200 MBH	-	-	-	120	1	Good	2004	
1st	?	Truck Bays	Gas Unit Heater	Reznor	-	-	-	-	-	-	-	-	-	-	
2nd	1	Workout Room	PTAC	Carrier	-	-	1-ton	-	-	-	-	-	Good	2005	
Roof	6	-	Exhaust Fans	-	-	-	-	-	-	-	-	-	-	-	
Roof	1	Training Room	Split DX / Elec	Lennox	XC21-060-230-02	5806C09081	5-ton	-	25.7	-	208	1	Good	2006	Humidifier
Roof	1	South Bedrooms	Split DX / Elec	Lennox	XC21-060-230-02	5806B44235	5-ton	-	25.7	-	208	1	Good	2006	Humidifier
Roof	1	North Bedrooms	Split DX / Elec	Lennox	XC21-060-230-02	5806C09077	5-ton	-	25.7	-	208	1	Good	2006	Humidifier
Roof	1	-	Exhaust Fan	Cook	012012 GI 12X12GI AL	180S884444	-	-	-	-	-	-	Good	2006	
Roof	1	-	Exhaust Fan	Cook	024024 GR 24x24 GI AL	180S884444	-	-	-	-	-	-	Good	2006	
Grade	1	1st Floor	Split DX / Elec	Lennox	XC21-036-130-02	5806A47736	3-ton	-	16.7	-	208	1	Good	2006	
Grade	1	1st Floor	Split DX / Elec	Lennox	XC21-060-230-02	5806C09070	5-ton	-	25.7	-	208	1	Good	2006	

Mechanical Equipment Inventory

Elevation:	Quantity:	Area Served:	Type:	Manufacturer:	Model #:	Serial #:	Capacity:	Fan HP:	RLA:	FLA:	Voltage:	Phase:	Condition:	Date of Manufacture:	Notes:
Herman Park C. C.															
1st	1	Storage	Electric Unite Heater	Qmark	MUH-03-2	07-88-322	2-2/3 kW	-	-	-	208	1	Good	-	
1st	1	Domestic Hot Water	Gas Water Heater	A. O. Smith	FSG 75	GM96-3403752	230 gal / 75 MBH	-	-	-	-	-	Good	-	
Grade	1	Conditioned Space	PKU (DX/Gas)	Carrier	48LJD024	-	20-tons	5	-	-	-	-	Fair	-	242 MBH
Grade	1	Conditioned Space	PKU (DX/Gas)	American Std.	YCH181	928100451D	15-ton	3	29.5/17.6	10.6	308	3	Good	2009	High Efficiency
Grade	1	Conditioned Space	Split	Carrier	38EN036320	-	3-ton	-	21	-	208	3	Poor	1987	
Central Garage															
Basement	1	Front Office	Vertical Fan Coil Unit (DX)	Bryant	FA4ANF030	0697A12546	2.5-ton	1/4	-	1.8	208/230	1	Poor	2006	Maintenance Issue, Offices have window units
Roof	1	Front Office	CU	Carrier	38CKC030	2497E07006	2.5-ton	-	14.8	-	208/230	1	Poor	1997	Maintenance Issue, Offices have window units
Mezznine	1	Shop Office	Horizontal Fan Coil Unit (DX)	Bryant	FA4NF036	1497A10931	3-ton	1/3	-	2.4	208/230	1	Poor	1997	
Roof	1	Shop Office	CU	Carrier	38CKC036	1697F11812	3-ton	-	15	-	208/230	1	Poor	1997	
1st	10	Shop	Infrared Heater	Re-verber-ray	DTH S __-100	-	100 MBH	-	-	-	-	-	Good	-	
1st	2	Shop	Gas Unit Heater	Reznor	-	-	-	-	-	-	-	-	Fair	-	
1st	1	Shop	Gas Unit Heater	Sterling	-	-	-	-	-	-	-	-	Fair	-	
1st	3	Front Office	Window Air Conditioner	Various	-	-	3-ton total	-	-	-	-	-	Fair	-	
Transfer Station															
1st	1	Office	PTAC	-	-	-	1-ton	-	-	-	-	-	Poor	-	inoperable
1st	1	Building Heat	Direct Fired MAU	AbsolutAire	AA-3U	14261	8000 CFM/ 900 MBH	7 1/2	-	23	230	3	Fair	-	99.7% eff.
2nd	1	MRF Shack	WAC	-	-	-	1-ton	-	-	-	-	-	Fair	-	
2nd	1	MRF Shack	Elec. Wall Heater	-	-	-	1.5 kW	-	-	-	-	-	Fair	-	
Sign Shop															
1st	1	Sign Shop	Gas Unit Heater	Reznor	-	-	-	-	-	-	-	-	Fair	-	
1st	1	Sign Shop	Gas Unit Heater	Bryant	-	-	-	-	-	-	-	-	Fair	-	
Golf Course															
1st	1	Club House	Vertical Fan Coil Unit	Carrier	FX4CNF030	3606A69849	2.5-ton	1/3	-	2.8	208/230	1	Good	2006	
Basement	1	Snack Bar	Vertical Fan Coil Unit (DX/Gas)	Carrier	CNPVP6024A	3806X25447	5-ton	-	-	-	208/230	1	Good	2006	
Grade	1	Snack Bar	CU	Carrier	24ACA360A300	0407E23612	5-ton	-	26.4	-	208/230	1	Good	2007	
Roof	1	Club House	CU	Carrier	24ACA330A300	1306E36180	2.5-ton	-	12.8	-	208/230	1	Good	2006	
Golf Maintenance															
1st	2	Shop	Gas Unit Heater	Dayton	3E228A	C8842301	65 MBH	-	-	-	120	1	Good	1988	
1st	1	Office	Window Air Conditioner	LG	-	-	1-ton	-	-	-	120	1	Good	-	
Trinity															
Basement	2	Steam System	Steam Boiler	Aldrich	HF-2650	04F-1620	2650 lbs/hr	2	-	6.4	208	3	Good	2004	
1st Florr	5	Building	Window Air Conditioner	-	-	-	1-ton	1/4	-	-	-	-	Fair	-	
Park Maintenance															
1st	1	Shop	Gas Unit Heater	Reznor	F50	-	50 MBH Input	-	-	-	115	1	Good	1989	
1st	1	Shop	Gas Unit Heater	Dayton	3E243D	-	150 MBH Input	-	-	-	115	1	Good	2008	
1st	1	Shop	Horiz. Gas Furnace	Lennox	GS6-130	-	130 MBH Input	-	-	-	-	-	Good	-	80% eff.
1st	1	Office	Window Air Conditioner	-	-	-	1-ton	-	-	-	115	1	Fair	-	
1st	1	Shop	Gas Unit Heater	-	-	-	50 MBH Input	-	-	-	115	1	Good	-	
1st	1	Shop	Gas Unit Heater	-	-	-	100 MBH	-	-	-	115	1	Good	-	

Appendix L

Cost Estimate

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Annex	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.1: Lighting Retrofit		

	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
Item Description	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**LS**	**60785.11**	**$60,785**	**0.00**	**$0**	**1.00**	**$60,785**
TOTAL Lighting				**$60,785**		**$0**		**$60,785**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (5%)								
TOTAL								**$60,785**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
City Hall	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.2: Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**LS**	**20396.98**	**$20,397**	**0.00**	**$0**	**1.00**	**$20,397**
							1.25	
TOTAL Lighting				**$20,397**		**$0**		**$20,397**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (5%)								
TOTAL								**$20,397**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Community Center	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.3: Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**LS**	**5780.02**	**$5,780**	**0.00**	**$0**	**1.00**	**$5,780**
TOTAL Lighting				**$5,780**		**$0**		**$5,780**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (5%)								
TOTAL								**$5,780**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Fire Station #2	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.4: Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**EA**	**5079.16**	**$5,079**	**12.50**	**$13**	**1.00**	**$5,092**
TOTAL Electrical				**$5,079**		**$13**		**$5,092**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (15%)								
TOTAL								**$5,092**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Golf Course	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.5 Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**EA**	**1097.00**	**$1,097**	**12.50**	**$13**	**1.00**	**$1,109**
TOTAL Electrical				**$1,097**		**$13**		**$1,109**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (15%)								
TOTAL								**$1,109**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Public Works	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.6 Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**EA**	**29757.85**	**$29,758**	**12.50**	**$13**	**1.00**	**$29,770**
TOTAL Electrical				**$29,758**		**$13**		**$29,770**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (15%)								
TOTAL								**$29,770**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Recreation Center	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.7 Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**EA**	**40076.48**	**$40,076**	**12.50**	**$13**	**1.00**	**$40,089**
TOTAL Electrical				**$40,076**		**$13**		**$40,089**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (15%)								
TOTAL								**$40,089**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Trinity Building	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-1.8 Lighting Retrofit		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
Lighting								
Lighting Retrofit	**1**	**EA**	**8620.86**	**$8,621**	**12.50**	**$13**	**1.00**	**$8,633**
TOTAL Electrical				**$8,621**		**$13**		**$8,633**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**
Sub-total								
Tax (Material @ 9.5%)								
Overhead & Profit (20%)								
Contingency (15%)								
TOTAL								**$8,633**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Central Garage	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-2.1: Install Programable T-stats & Locking Cover		

	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
Item Description	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
MECHANICAL								
Install Programable T-stat & Locking Cover	**1**	**EA**	**120.00**	**$120**	**40.00**	**$40**	**1.00**	**$160**
TOTAL MECHANICAL				**$120**		**$40**		**$160**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$160**
Tax (Material @ 9.5%)								**$11**
Overhead & Profit (20%)								**$32**
Contingency (15%)								**$24**
TOTAL								**$227**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
City Hall	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-2.2: Install Plug Load Occupancy Sensors		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
MECHANICAL								
Install Plug Load Occupancy Sensors	**55**	**EA**	**90.00**	**$4,950**	**12.50**	**$688**	**1.00**	**$5,638**
TOTAL MECHANICAL				**$4,950**		**$688**		**$5,638**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$5,638**
Tax (Material @ 9.5%)								**$470**
Overhead & Profit (20%)								**$1,128**
Contingency (15%)								**$846**
TOTAL								**$8,081**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Annex	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-2.3: Install Plug Load Occupancy Sensors		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
TOTAL DEMOLITION				**$0**		**$0**		**$0**
MECHANICAL								
Install Plug Load Occupancy Sensors	**75**	**EA**	**90.00**	**$6,750**	**12.50**	**$938**	**1.00**	**$7,688**
TOTAL MECHANICAL				**$6,750**		**$938**		**$7,688**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$7,688**
Tax (Material @ 9.5%)								**$641**
Overhead & Profit (20%)								**$1,538**
Contingency (15%)								**$1,153**
TOTAL								**$11,019**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Annex	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-4.1: Unit Replacement		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
Demo 5-ton Condensing Unit and Evaporator Coil	**1**	**EA**	**0.00**	**$0**	**700.00**	**$700**	**1.25**	**$875**
Demo 3-ton Condensing Unit and Evaporator Coil	**2**	**EA**	**0.00**	**$0**	**700.00**	**$1,400**	**1.25**	**$1,750**
Demo 3-ton WSHP	**3**	**EA**	**0.00**	**$0**	**830.00**	**$2,490**	**1.25**	**$3,113**
TOTAL DEMOLITION				**$0**		**$4,590**		**$5,738**
MECHANICAL								
Install 5-ton Condensing Unit & Evaporator Coil	**1**	**EA**	**3450.00**	**$3,450**	**1499.00**	**$1,499**	**1.25**	**$6,186**
Install 3-ton Condensing Unit & Evaporator Coil	**2**	**EA**	**2310.00**	**$4,620**	**772.00**	**$1,544**	**1.25**	**$7,705**
Install 3-ton Computer Room Unit with remote Condenser	**2**	**EA**	**16100.00**	**$32,200**	**1500.00**	**$3,000**	**1.25**	**$44,000**
Install 3-ton Split System HP	**1**	**EA**	**3635.00**	**$3,635**	**822.00**	**$822**	**1.25**	**$5,571**
TOTAL MECHANICAL				**$43,905**		**$6,865**		**$63,463**
ELECTRICAL								
Electrical Connection								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$69,200**
Tax (Material @ 9.5%)								**$4,171**
Overhead & Profit (20%)								**$13,840**
Contingency (15%)								**$10,380**
TOTAL								**$97,591**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Heman Park Pool	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-4.2: Pump Motor Replacement		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
Remove Pump Motor	**1**	**EA**	**0.00**	**$0**	**150.00**	**$150**	**1.25**	**$188**
TOTAL DEMOLITION				**$0**		**$150**		**$188**
MECHANICAL								
Install 40 hp pump motor	**1**	**EA**	**2400.00**	**$2,400**	**201.00**	**$201**	**1.25**	**$3,251**
TOTAL MECHANICAL	**1**			**$2,400**		**$201**		**$3,251**
ELECTRICAL								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$3,439**
Tax (Material @ 9.5%)								**$228**
Overhead & Profit (20%)								**$688**
Contingency (15%)								**$516**
TOTAL								**$4,870**

ESTIMATE OF PROBABLE COST

Project Name	Status of Design	Date
University City Municipal Buildings DES		**2/21/2012**
Building	Estimated by	Last Modified:
Central Garage	**ALLEN & HOSHALL**	**2/21/2012**
Project Number		
ECM-4.3: Unit Replacement		

Item Description	Quantity		Material/Equip. Cost		Labor Cost		Engineering Est	
	Number	Unit	Unit Cost	Total	Unit Cost	Total	Escalation	Total
DEMOLITION								
Remove 2.5-ton Split System	**1**	**EA**	**0.00**	**$0**		**$0**	**1.25**	**$0**
Remove 3-ton Split System	**1**	**EA**	**0.00**	**$0**		**$0**	**1.25**	**$0**
TOTAL DEMOLITION				**$0**		**$0**		**$0**
MECHANICAL								
Install 2.5-ton HP Split System	**1**	**EA**	**3875.00**	**$3,875**	**81.00**	**$614**	**1.25**	**$5,611**
Install 3-ton HP Split System	**1**	**EA**	**4375.00**	**$4,375**	**520.00**	**$812**	**1.25**	**$6,484**
TOTAL MECHANICAL				**$8,250**		**$1,426**		**$12,095**
ELECTRICAL								
Electrical Connection								
TOTAL ELECTRICAL				**$0**		**$0**		**$0**

Sub-total								**$12,095**
Tax (Material @ 9.5%)								**$784**
Overhead & Profit (20%)								**$2,419**
Contingency (20%)								**$2,419**
TOTAL								**$17,717**