Susan Combs
Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

City of Laredo

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Laredo, Texas 78040

Prepared by:

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JULY 2012

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SECO
State Energy Conservation Office

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Local Government Energy Management Program
City of Laredo
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Laredo, TX 78040
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1.0 EXECUTIVE SUMMARY

City of Laredo, now referred to as the City, requested that Texas Energy Engineering Services, Inc. (TEESI) perform a Preliminary Energy Assessment (PEA) of their facilities. This report documents that analysis.

This service is provided at no cost to the City through the Local Government Energy Management and Technical Assistance Program as administered by the Texas Comptroller of Public Accounts, State Energy Conservation Office (SECO). This program promotes and encourages an active partnership between SECO and Texas local governments for the purpose of planning, funding, and implementing energy saving measures, which will ultimately reduce the City's annual energy costs.

The annual cost savings, implementation cost estimate and simple payback for all building energy retrofit projects identified in this preliminary analysis are summarized below. Individual building projects are summarized in Section 10.0 of this report.

Est. Implementation Cost Estimate:	$2,930,550
Est. Annual Energy Saving (MMBTU/Yr):	11,218
Est. Annual Greenhouse Gas Emissions Reduction (Metric Tons CO_2e/Yr):	1,983
Est. Annual Energy Cost Savings:	$292,600
Simple Payback (Yrs):	10.0

A follow-up visit to the City will be scheduled to address any questions pertaining to this report, or any other aspect of this program.

SECO is committed to providing whatever assistance the City may require in planning, funding and implementing the recommendations of this report. The City is encouraged to direct any questions or concerns to either of the following contact persons:

SECO / Mr. Stephen Ross
(512) 463-1770

TEESI / Saleem Khan
(512) 328-2533

2.0 FACILITY DESCRIPTIONS

This section provides a brief description of the facilities surveyed. The purpose of the onsite survey was to evaluate the major energy consuming equipment in each facility (i.e. Lighting, HVAC, and Controls Equipment). A description of each facility is provided below.

Buildings:	Civic Center
Stories:	Single story
Area (estimated):	54,540 SF
Bldg. Components:	Brick building, built-up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts
HVAC:	Water-cooled chilled water system and hot water boiler system
Controls:	Trane Tracer Summit *(Note: Civic center is undergoing repairs and improvements to chiller and controls system)*

Buildings:	City Hall
Stories:	Three story
Area (estimated):	41,112 SF
Bldg. Components:	Brick building, pitched roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts
HVAC:	Air-cooled chilled water system with multi-zone air handling units, electric heat
Controls:	Mechanical timers

Buildings:	City Hall Annex
Stories:	Single story
Area (estimated):	51,980 SF
Bldg. Components:	Brick building, built up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts T8 fluorescent fixtures with electronic ballasts High Intensity Discharge (HID) fixtures in garage area
HVAC:	Packaged Rooftop Units with electric heat
Controls:	Trane Tracker

Buildings:	Utilities Building
Stories:	Single story
Area (estimated):	20,496 SF
Bldg. Components:	Brick building, pitched metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Split-DX units with electric heat
Controls:	Programmable thermostats

Buildings:	Transit Building
Stories:	Five story
Area (estimated):	115,024 SF
Bldg. Components:	Brick building, built up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts T8 fluorescent fixtures with electronic ballasts
HVAC:	Air-cooled chilled water system, multi-zone air handling units, electric heat
Controls:	Carrier Comfort View control system

Buildings:	Public Works
Stories:	Single story
Area (estimated):	17,636 SF
Bldg. Components:	Brick building, pitched metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Split-DX units with electric heat
Controls:	Standard thermostats

Buildings:	Public Works Warehouse
Stories:	Single story
Area (estimated):	26,160 SF
Bldg. Components:	Metal building, pitched metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts High Intensity Discharge (HID) fixtures
HVAC:	Split-DX unit with electric heat
Controls:	Standard thermostat

Buildings:	Police Station
Stories:	Two story
Area (estimated):	59,850 SF
Bldg. Components:	Brick building, pitched metal roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts
HVAC:	Split-DX units with electric heat
Controls:	Trane Tracer Program, Standard thermostats

Buildings:	Police Station Annex
Stories:	Single story
Area (estimated):	16,592 SF
Bldg. Components:	Concrete building, built-up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts
HVAC:	Split-DX units with electric heat
Controls:	Standard thermostats

Buildings:	Laredo Public Library
Stories:	Two story
Area (estimated):	58,063 SF
Bldg. Components:	Brick building, pitched roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Aircooled Chilled Water System with electric heat
Controls:	Carrier Comfort Network (DOS based)

Buildings:	Entertainment Arena
Stories:	Two story
Area (estimated):	138,073 SF
Bldg. Components:	Concrete building, built-up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts T8 fluorescent fixtures with electronic ballasts High Intensity Discharge (HID) fixtures
HVAC:	Water-cooled chilled water System, ice based thermal storage system
Controls:	Siemens control system

Buildings:	Airport
Stories:	Two story
Area (estimated):	79,186 SF
Bldg. Components:	Concrete building, metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts High Intensity Discharge (HID) fixtures in passenger area
HVAC:	Air-cooled Chilled Water System, ice based thermal storage system (not currently in use), variable air volume (VAV) boxes, electric heat
Controls:	Johnson Controls Metasys system

Buildings:	Municipal Court
Stories:	Single story
Area (estimated):	18,288 SF
Bldg. Components:	Brick building, built up roof, slab on grade
Typical Lighting Fixtures:	T12 fluorescent fixtures with magnetic ballasts T8 fluorescent fixtures with electronic ballasts
HVAC:	Split-DX units with electric heat
Controls:	Trane Tracker system

Zacate Creek Wastewater Treatment Plant (WWTP)

The City of Laredo operates several Wastewater Treatment Plants (WWTPs) with the Zacate Creek Plant having the largest treatment capacity. Zacate Creek WWTP has a permitted daily flow of 14 MGD, an average daily flow of 9.96 MGD with a maximum-recorded daily flow of 11.365 MGD within the last two (2) years. Zacate Creek WWTP must meet a daily effluent quality of 20 mg/l BOD_5, 20 mg/l TSS, and a 126 E.coli coliform per 100 ml.

Treatment processes for Zacate WWTP consists of a head-works with two (2) flow channels, one (1) bar screen with a 5-HP motor, one (1) auger with a 2-HP motor. Flow from the head-works is then split 60% to east and west aerations basins, and 40% to the contact aeration basin. Flow from head-works then enters two (2) separate grit chambers, one (1) utilizing a single 10-HP pump to increase flow to the east and west aeration basins. Flow from the grit chambers is processed through the east and west aeration basins and contact aeration basin. Air is provided to east and west aeration basins by one (1) 250-HP blower supplying both basins, and one (1) 75-HP blower supplying additional air to the west aeration basin only. Both east and west aeration basins utilize fine bubble diffusers for aeration. Air is supplied to contact aeration basin by two (2) 250-HP blowers. Contact aeration basin utilizes coarse bubble diffusers for aeration. East and west aeration basin flow enters a lift station where it is then pumped by four (4) float level controlled 75-HP submersible pumps to the north and south secondary clarifiers. Contact aeration basin flow is conveyed to the north and south bio-clarifiers by gravity.

Return Activated Sludge (RAS) from north and south bio-clarifiers enters RAS pump station No.1 where RAS is pumped to north re-aeration basin by three (3) 35-HP pumps. Of these three (3) pumps, one (1) is on manual operation and runs continuously, one (1) is on automatic operations and only runs when required, and one is just on standby mode. Only two (2) of these pumps operate at a time. RAS from north and south secondary clarifiers enters RAS pump station No.2 where RAS is then pumped to north re-aeration basin by one (1) VFD controlled 35-HP pump.

Mixed liquor suspended solids in north re-aeration basin is gravity fed to south re-aeration for further treatment before being returned to the East / West Aeration Basin, and Contact Aeration Basin, or being wasted to waste activated sludge (WAS) tank. WAS is then pumped to Southside WWTP by two (2) VFD controlled 40-HP pumps.

North Re-Aeration basin uses one (1) 2-HP mixer and aeration is being supplied by one (1) 15-HP blower using coarse bubble diffusers. South re-aeration basin uses two (2) 2-HP mixers and aeration is being provided by two (2) 15-HP blowers using coarse bubble diffusers.

North and south secondary clarifiers and north and south bio-clarifiers utilize 0.5-HP center drive units with gear reducers.

3.0 ENERGY CONSUMPTION AND PERFORMANCE

This section outlines energy consumption & performance for City buildings, water treatment plants and wastewater treatment plants.

BUILDINGS:

A site survey was conducted at several of the City's facilities. The buildings surveyed comprised a total gross area of approximately 697,000 square feet.

Annual electric and natural gas invoices for the buildings surveyed were $1,335,464 for the 12-month period ending October 2011. A summary of annual utility costs is provided in **Appendix C**, Base Year Consumption History.

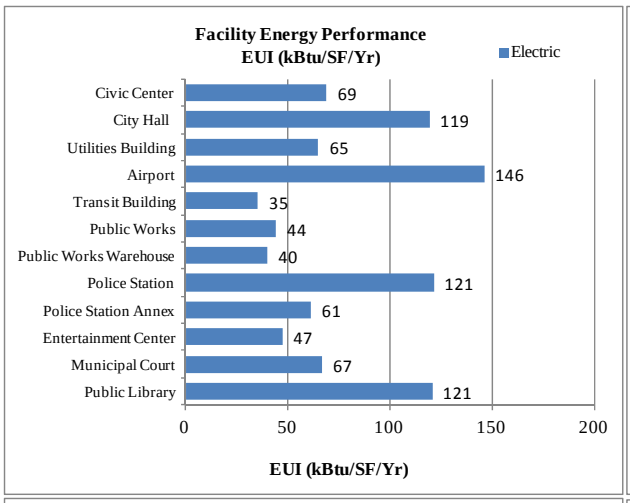
To help the City evaluate the overall energy performance of its facilities TEESI has calculated their Energy Utilization Index (EUI) and Energy Cost Index (ECI). The EUI represents a facility's annual energy usage per square foot; it is measured as thousand BTU's per square foot per year (kBTU/SF/Year). Similarly, ECI is measured as cost per square foot per year ($/SF/Year). The EUI and ECI performance for selected facilities are listed below:

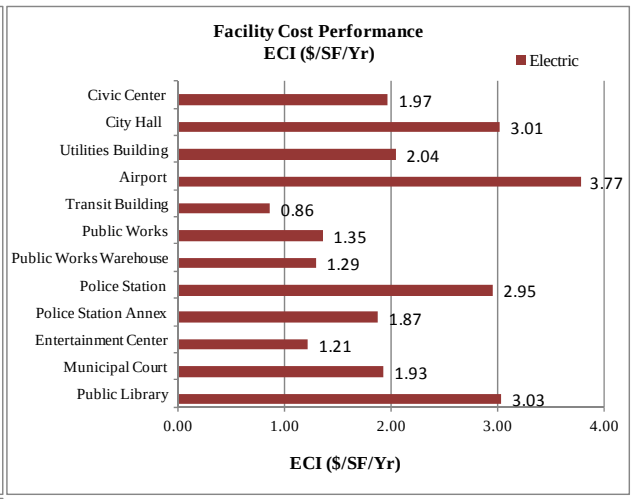
Energy Cost and Consumption Benchmarks														
		Electric				Natural Gas				Total	Total	EUI	ECI	
	Building	kWh/Yr	MMBTU/Yr	kWh/SF	$Cost/Yr	MCF/Yr	MMBTU/Yr	MCF/kSF	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
1	Civic Center	1,101,076	3,758	20.19	107,191	106	109	1.94	923	108,114	3,867	71	1.98	54,540
2	City Hall	1,438,272	4,909	34.98	123,852	0	0	0.00	0	123,852	4,909	119	3.01	41,112
3	City Hall Annex*	213,840	730	4.11	20,512	0	0	0.00	0	20,512	730	-	-	51,980
4	Utilities Building	390,144	1,332	19.04	41,746	0	0	0.00	0	41,746	1,332	65	2.04	20,496
5	Airport	3,390,480	11,572	42.82	298,870	0	0	0.00	0	298,870	11,572	146	3.77	79,186
6	Transit Building	1,192,640	4,070	10.37	98,839	0	0	0.00	0	98,839	4,070	35	0.86	115,024
7	Public Works	228,480	780	12.96	23,864	0	0	0.00	0	23,864	780	44	1.35	17,636
8	Public Works Warehouse	306,048	1,045	11.70	33,700	0	0	0.00	0	33,700	1,045	40	1.29	26,160
9	Police Station	2,129,760	7,269	35.58	176,395	0	0	0.00	0	176,395	7,269	121	2.95	59,850
10	Police Station Annex	297,120	1,014	17.91	31,055	0	0	0.00	0	31,055	1,014	61	1.87	16,592
11	Entertainment Center	1,910,100	6,519	13.83	167,456	0	0	0.00	0	167,456	6,519	47	1.21	138,073
12	Municipal Court	356,720	1,217	19.51	35,208	0	0	0.00	0	35,208	1,217	67	1.93	18,288
13	Public Library	2,052,756	7,006	35.35	175,852	0	0	0.00	0	175,852	7,006	121	3.03	58,063
		kWh/Yr	MMBTU/Yr	kWh/SF	$Cost/Yr	MCF/Yr	MMBTU/Yr	MCF/kSF	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
		15,007,436	51,220	21.53	1,334,541	106	109	0.00	923	1,335,464	51,329	74	1.92	697,000

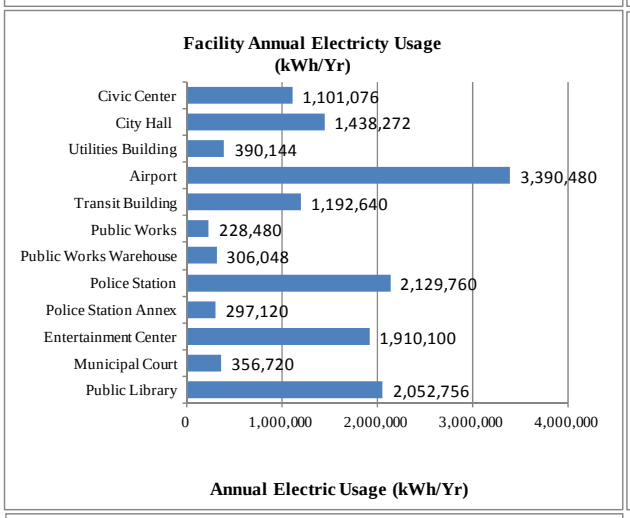
*City Hall Annex has been occupied by City staff for 4 months of this billing period. Data only includes July 2011 - October 2011.

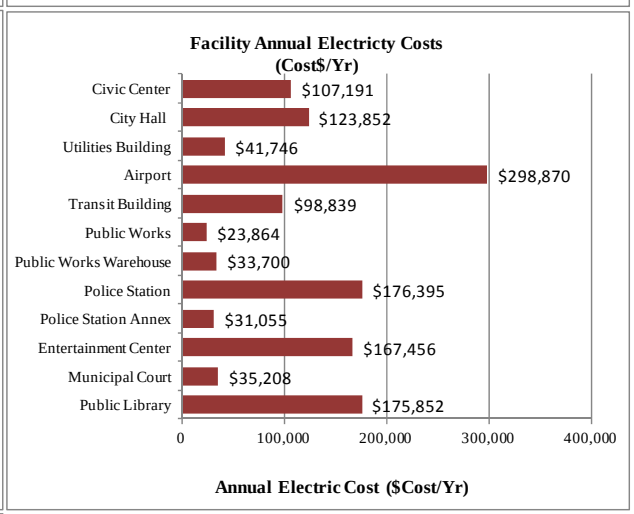
The EUI and ECI of each facility help the City evaluate its overall energy performance. In addition, the City's EUIs were compared to TEESI's database of local government facilities. **Appendix D** shows how these facilities compared to other local government facilities in Texas.

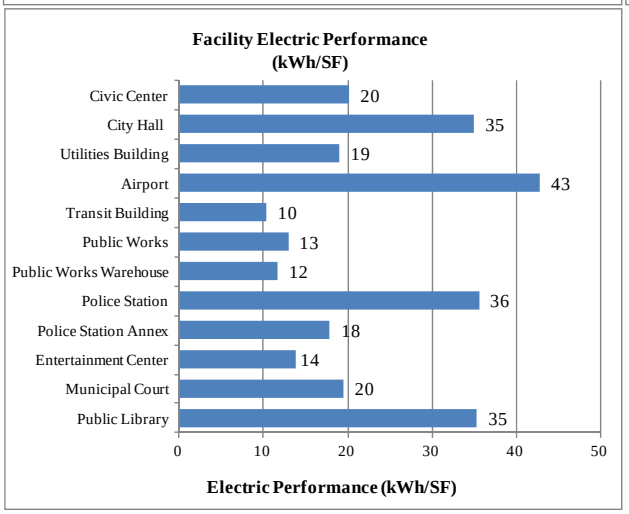
The following charts summarize the data presented in the previous table. See **Appendix C** for further detail.



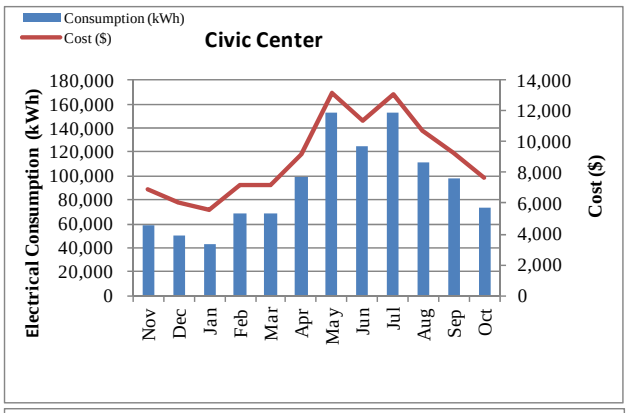


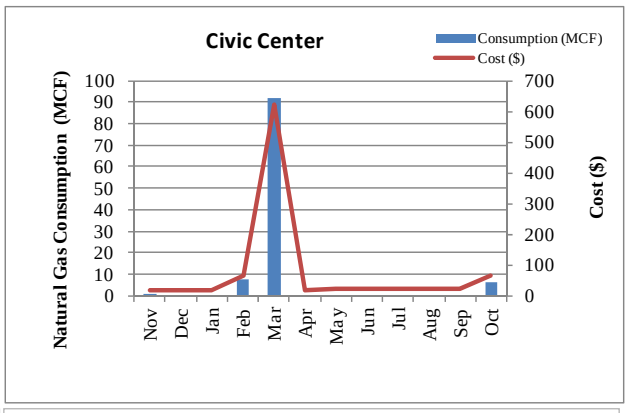


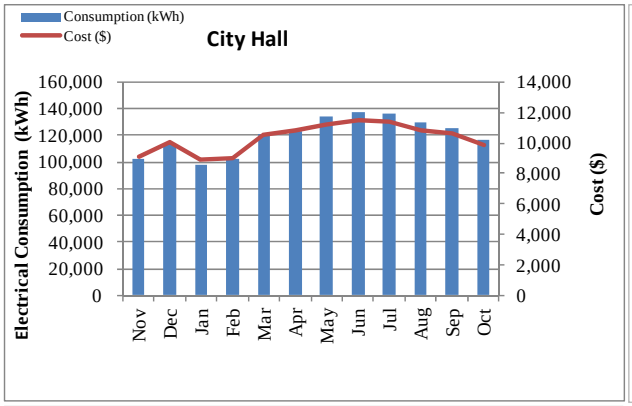




The following charts summarize each facility's monthly utility data. See **Appendix C** for further detail.







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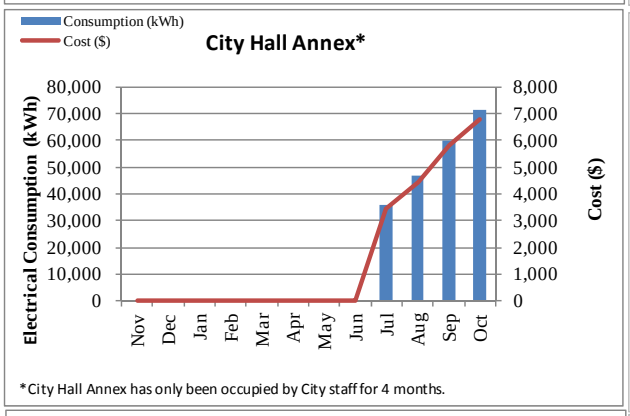

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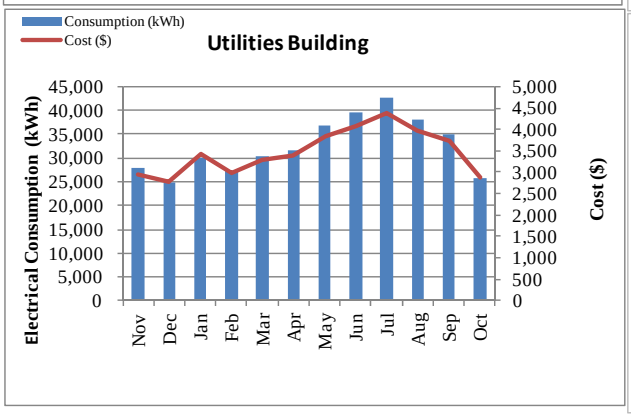

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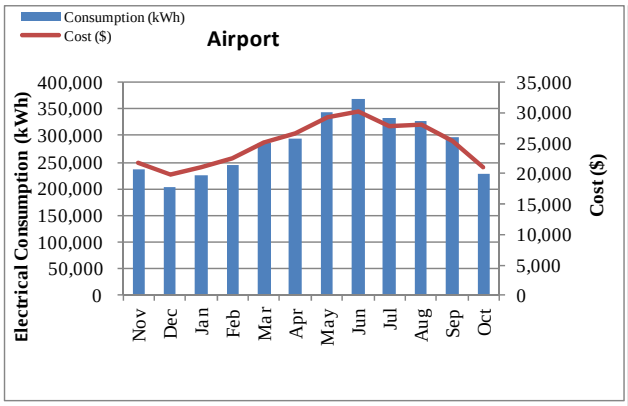

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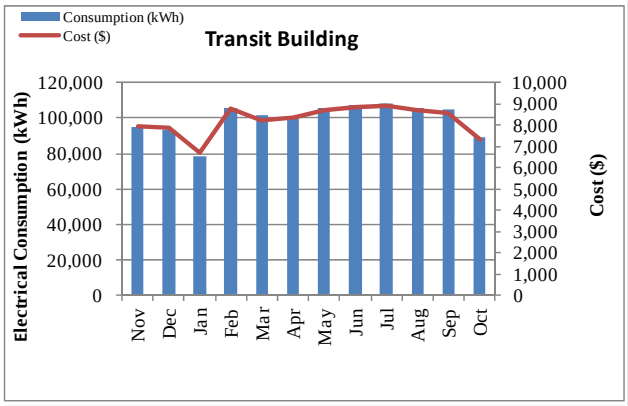

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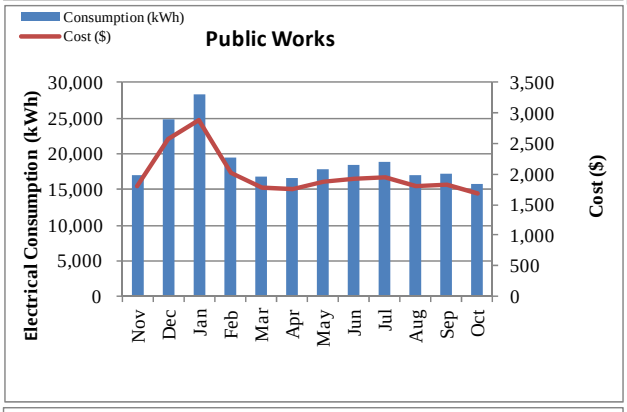

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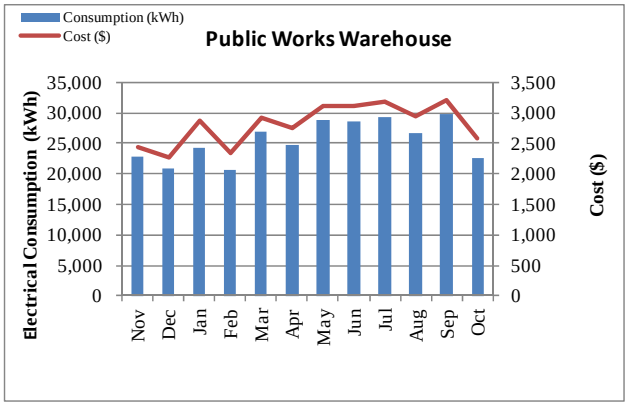

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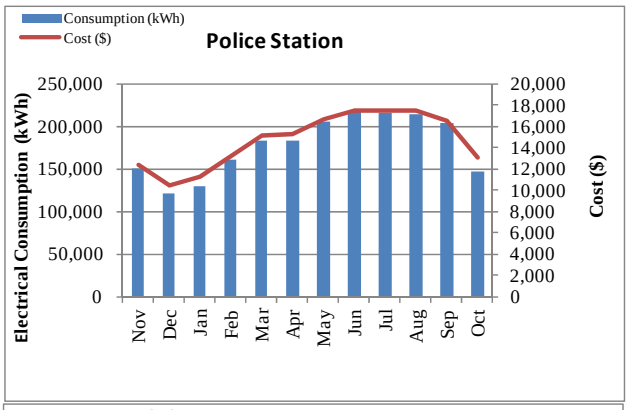

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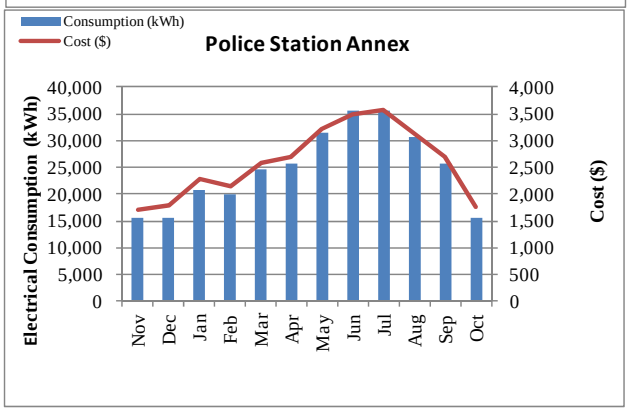

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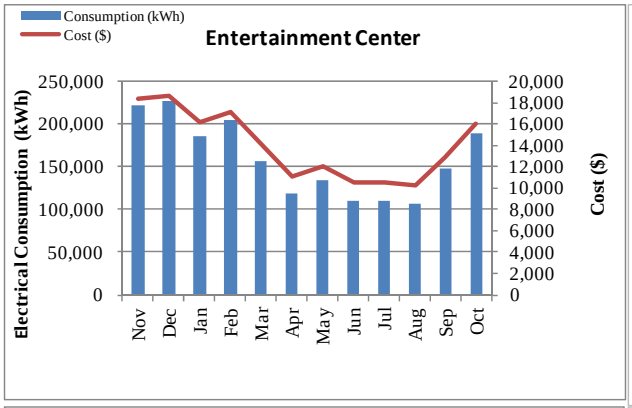

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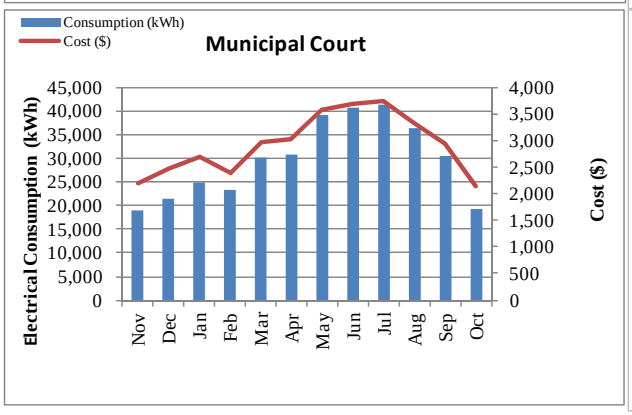

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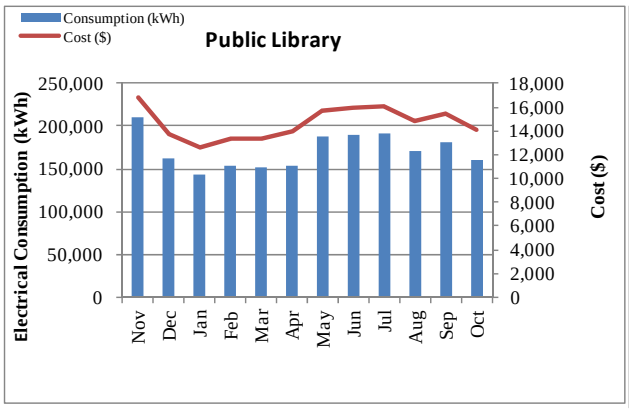


NATURAL GAS N/A

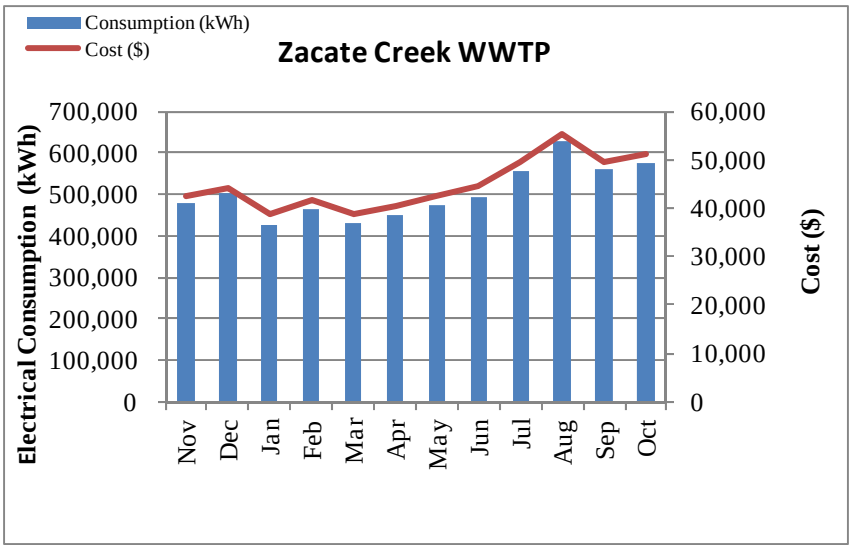
WASTEWATER TREATMENT PLANT:

A site survey was also conducted at the City's Zacate Creek Wastewater Treatment Plant (WWTP). To help the City evaluate the overall energy performance of its wastewater treatment plant, TEESI has calculated its Energy Utilization Index (EUI) and Energy Cost Index (ECI). The EUI was calculated based on the facility's annual energy usage per annual average effluent flow; it is measured as thousand BTUs per gallons per day per year (kBTU/GPD/Year). Similarly, ECI is measured as cost per million gallons per day per year ($/MGD/Year). The EUI and ECI performance for the wastewater treatment plant is listed below.

WWTP - Energy Cost and Consumption Benchmarks							
	Electric[1]			Design Capacity (MGD)	Average Effluent Flow (MGD)	EUI[3]	ECI[4]
	kWh/Yr	kBtu/Yr[2]	$Cost/Yr			kBtu/GPD/Yr	$/MGD/Yr
Zacate Creek WWTP	6,048,000	20,635,776	$539,123	14.0	9.96	2.1	$54,129

1. Electric consumption for WWTP is based on electric meters serving the main processing facility and does not account for other usage (i.e. lift stations, irrigation, etc.) which may be metered separately.
2. Electric consumption conversion based on 3.412 kBtu/kWh.
3. Energy Use Index (EUI) calculated based annual kBtu divided by the Average Effluent Flow in gallons per day (GPD).
4. Energy Cost Index (ECI) calculated based on annual energy cost divided by the Average Effluent Flow in million gallons per day (MGD).

Below is the monthly usage and cost profile for the WWTP facility listed above.



4.0 ENERGY STAR PORTFOLIO MANAGER

The City's energy baseline can be developed using ENERGY STAR's Portfolio Manager. One of the primary reasons for using ENERGY STAR Portfolio Manager is its ability to normalize the City's baseline according to several key factors (i.e. Weather, Square Feet, Hours of Operation, Number of Computers, etc.). It is also a free online resource available to all registered users, and is a user-friendly web-based tool.

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). ENERGY STAR has developed Portfolio Manager, an innovative online energy management tool, designed to help organizations track and assess energy and water consumption of their facilities. Portfolio Manager helps organizations set investment priorities, identify under-performing facilities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

Portfolio Manger is also an energy performance benchmarking tool. Portfolio Manager rates a facility's energy performance on a scale of 1–100 relative to similar buildings and WWTPs nationwide. The rating system based on a statistically representative model utilizing a national survey conducted by the Department of Energy's Energy Information Administration. This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), conducted every four years gathers data on building characteristics and energy use from thousands of buildings across the United States. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of all similar facilities nationwide, while a rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

In addition, Portfolio Manager is used to generate a Statement of Energy Performance (SEP) for each facility, summarizing key energy information such as site and source energy intensity, greenhouse gas emission, energy reduction targets and energy cost. The Statement of Energy Performance is required for applying for ENERGY STAR Recognition from EPA/DOE, and can help in satisfying LEED for Existing Buildings (LEED-EB) requirements. For example, one of the requirements to receive ENERGY STAR Recognition is to achieve a minimum CBECS rating of **75**. A requirement to receive LEED-EB certification is an ENERGY STAR rating of **69**.

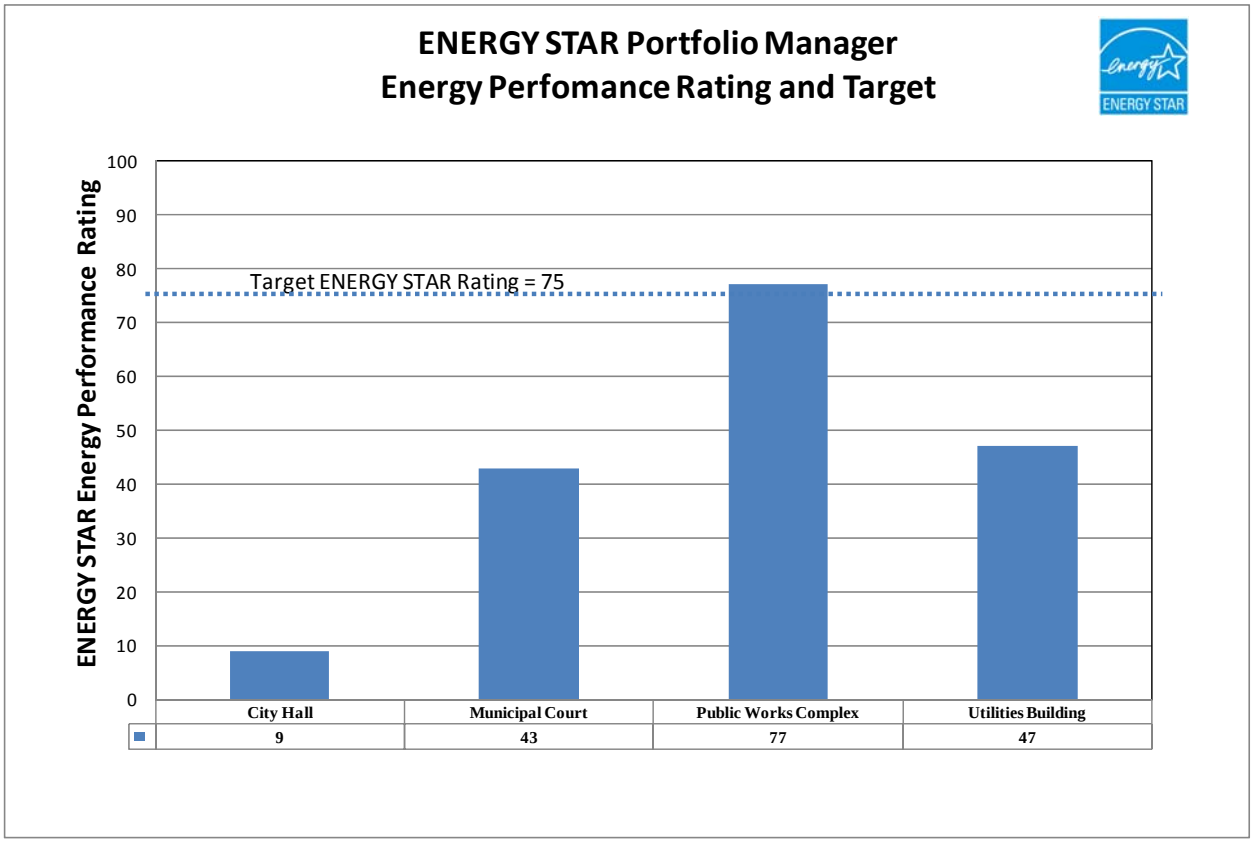
Some facility types are not able to receive an ENERGY STAR rating (at the time of this report, ENERGY STAR Portfolio Manager does not rate libraries, police stations, airports, civic centers, entertainment centers). In addition, wastewater treatment plants must have greater than 30 mg/l of average influent biological demand (BOD5) in order to receive a rating. However, Portfolio Manager can still serve as a valuable tool for the city in tracking utility consumption and setting targets for performance of the City's facilities, including the water and wastewater treatment plants.

To develop the City's baseline, 12 months of utility consumption, cost data, and Building Space Use information will be required. The table below is a sample of the Building Space Use data required by Portfolio Manager to generate the Energy Performance Rating. These inputs are critical and can significantly influence how Portfolio Manager computes the ENERGY STAR Rating. Many of these key inputs may vary over time and could influence the rating. **If an ENERGY STAR Label is pursued, these key inputs will need to be verified and certified by a qualified professional. Verification of this information is required when submitting the Statement of Energy Performance for ENERGY STAR's review.**

ENERGY STAR Portfolio Manager Example Space Use Data

Facility Type: Office	
• 12 Months of Utility Data • Gross Floor Area • Weekly Operating Hours • Workers on Main Shift	• Percent Cooled • Percent Heated • # of PCs

The ENERGY STAR ratings for each building eligible for a rating is listed in the table below, with some default values used for space use data. It is recommended the City update these to correct values in order to achieve an appropriate ENERGY STAR rating. The target for facilities is a rating of 75 to qualify for ENERGY STAR.



A benefit of using ENERGY STAR's Portfolio Manager is its ability to set goals for energy performance. It allows an energy performance target to be set and calculates the estimated savings per year to reach the goal. With a performance target of 75 and 69 set, the estimated yearly savings for each eligible facility is indicated below.

	ENERGY STAR Rating			ENERGY STAR Rating Target			ENERGY STAR Rating Target		
	EXISTING RATING			TARGET RATING = 69			TARGET RATING = 75		
Facility	Current ENERGY STAR Rating	Current Utility Cost $/SF/yr	Greenhouse Gas Emissions ($MtCO_2e/yr$) / ($kgCO_2e/ft^2/yr$)	Target Utility Cost $/SF/yr	Potential Target Savings $/yr	Greenhouse Gas Emissions (MtCO2e/yr) / (kgCO2e/ft2/yr)	Target Utility Cost $/SF/yr	Potential Target Savings $/yr	Greenhouse Gas Emissions (MtCO2e/yr) / (kgCO2e/ft2/yr)
City Hall	9	$3.01	820 / 20	$1.42	$65,642	385 / 9	$1.30	$70,596	355 / 9
Municipal Court	43	$1.93	203 / 11	$1.44	$8,802	152 / 8	$1.33	$10,915	140 / 8
Public Works Complex	77	$1.35	130 / 7	-	-	-	-	-	-
Utilities Building	47	$2.04	223 / 11	$1.59	$9,184	174 / 9	$1.47	$11,689	160 / 8

TEESI will provide the City with a training session regarding operating and maintaining the City's facilities in ENERGY STAR Portfolio Manager at time of delivery of this report. Please refer to **Appendix H** for reference materials of the basic operation of Portfolio Manager, including topics to be reviewed during the training session.

5.0 ENERGY ACCOUNTING

UTILITY PROVIDERS

Just Energy and AEP provide electric service to the City, and CenterPoint Energy provides natural gas service.

MONITORING AND TRACKING

Currently, the City does not have an energy tracking software or spreadsheet in place. An effective energy tracking system is an essential tool by which an energy management program's activities are monitored. The system should be centralized and available for all engaged staff members to use in verifying progress toward established targets and milestones.

The City should consider consolidating the tracking and recording of all the City's utility accounts (i.e., Electricity, Natural Gas, Propane, Water, etc.) into an electronic spreadsheet similar to the chart shown on the following page. Along with total utility costs ($), utility consumption should be recorded as well (i.e., kWh, MCF, gallons, etc.). The City can use this data to track utility consumption patterns and budget utility expenses. **Preferably, the City should also consider an electronic database such as ENERGY STAR Portfolio Manager, which will provide a means of storing and tracking utility information. For more information on ENERGY STAR Portfolio Manager, please see Section 4.0.** Having this historical data improves the City's awareness of their energy performance and will help in tracking their energy reduction goals.

The steps below are essential for an effective energy management tracking system:

1. Perform regular updates. An effective system requires current and comprehensive data. Monthly updates should be strongly encouraged.

2. Conduct periodic reviews. Such reviews should focus on progress made, problems encountered, and potential rewards.

3. Identify necessary corrective actions. This step is essential for identifying if a specific activity is not meeting its expected performance and is in need of review.

In addition, having this historical utility data would facilitate **House** and **Senate Bill(s)** reporting requirements. Please see Section 6.0 for additional information regarding these requirements.

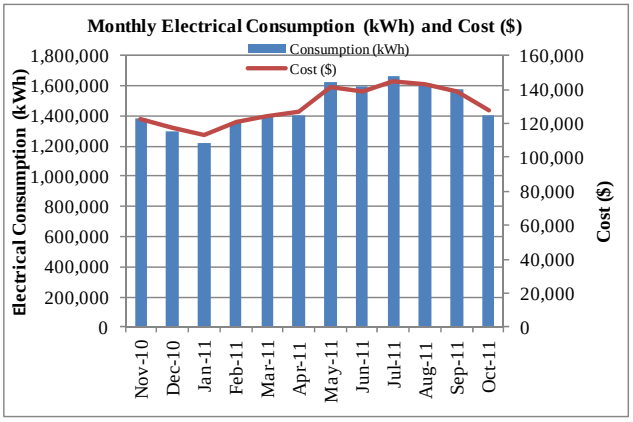
Furthermore, below is a sample format the City can customize to help summarize their overall utility usage and costs.

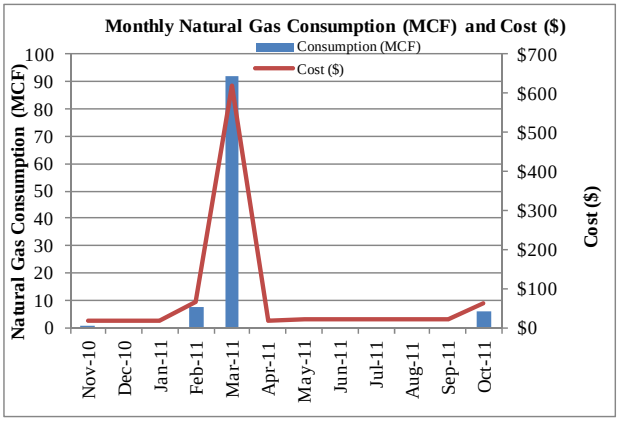
The data presented below is a summation of the data provided by the City. This data below includes only selected utility accounts and is for reference purposes only and does not represent the City's total utility data. See **Appendix C** for further detail regarding each utility account represented in the table below.

City of Laredo - Sample Utility Input Form

MONTH	ELECTRICITY			NATURAL GAS		
	KWH	COST $	Avg. Rate $/KWH	MCF	COST $	Avg. Rate $/MCF
Nov-10	1,384,560	122,755	$0.0887	0	$19	-
Dec-10	1,296,046	117,749	$0.0909	0	$16	-
Jan-11	1,219,020	113,327	$0.0930	0	$16	-
Feb-11	1,355,962	121,309	$0.0895	8	$65	$8.7
Mar-11	1,390,033	124,462	$0.0895	92	$621	$6.7
Apr-11	1,403,054	126,787	$0.0904	0	$17	-
May-11	1,628,583	141,435	$0.0868	0	$21	-
Jun-11	1,598,214	138,949	$0.0869	0	$21	-
Jul-11	1,661,511	144,388	$0.0869	0	$21	-
Aug-11	1,614,775	143,014	$0.0886	0	$21	-
Sep-11	1,578,795	138,883	$0.0880	0	$21	-
Oct-11	1,402,835	127,513	$0.0909	6	$64	$10.6
Total	17,533,388	$1,560,572	$0.0890	106	$923	$8.7

Gross Building Area:	697,000	SF





6.0 ENERGY LEGISLATION OVERVIEW

In 2007, the 80th Texas Legislature passed Senate Bill 12 (**SB12**) which among other things extended the timeline set by Senate Bill 5 (**SB5**). SB5, commonly referred to as the Texas Emissions Reduction Plan, was adopted in 2001 by the 77th Texas Legislature to comply with the federal Clean Air Act standards. Also in 2007, the 80th Texas Legislature passed House Bill 3693 (**HB3693**) which amended provisions of several codes relating primarily to energy efficiency.

Following are key requirements established by the above energy legislation:

Establish a goal of reducing electric consumption by five percent (5%) each state fiscal year for six (6) years, beginning on September 1, 2007.

Record electric, water, and natural gas utility services (consumption and cost) in an electronic repository. The recorded information shall be on a publicly accessible Internet Web site with an interface designed for ease of navigation if available, or at another publicly accessible location.

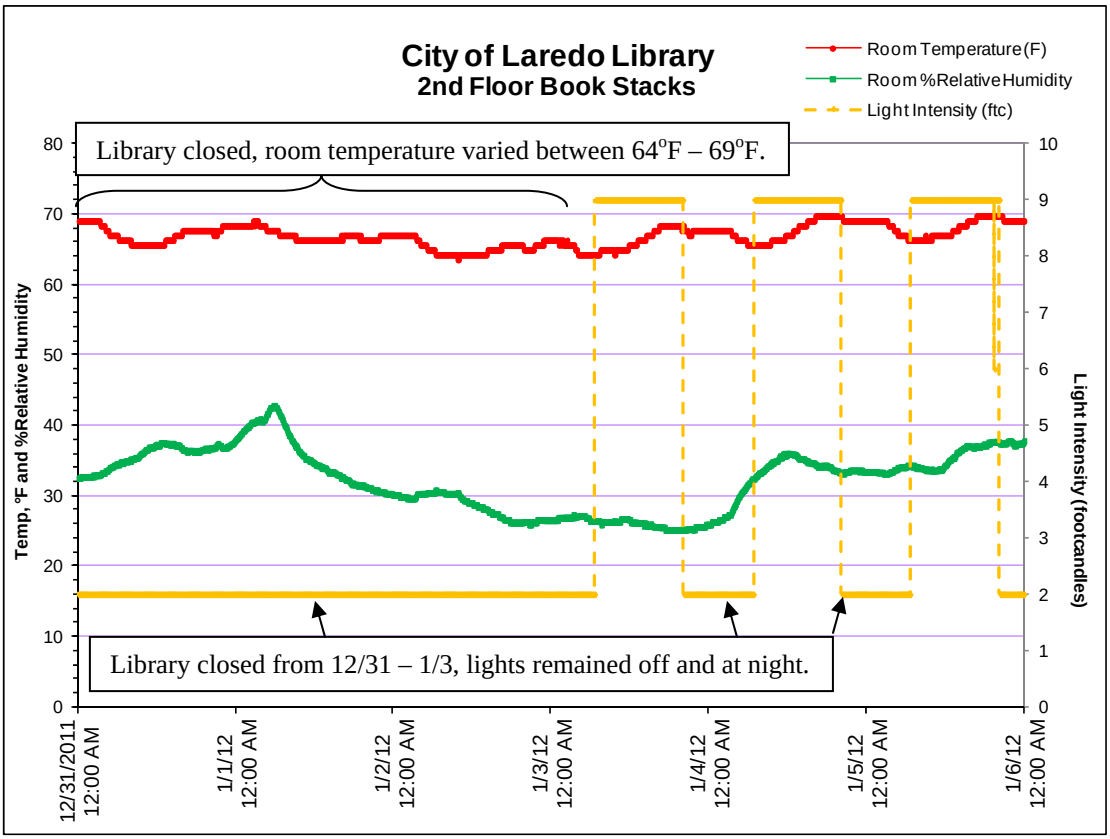
Energ-efficient light bulbs for buildings, requires an institution to purchase commercially available light bulbs using the lowest wattages for the required illumination levels.

Installation of energy saving devices in Vending Machines with non-perishable food products.

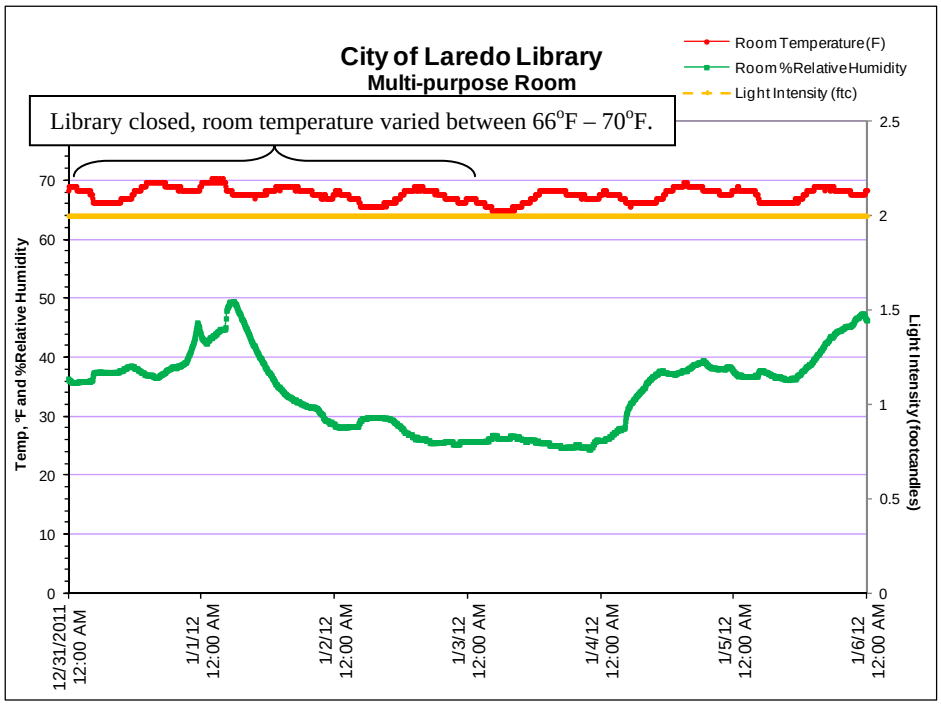
A summary description of SB 12 and HB 3693 is available in Appendix A. Further detail regarding each bill can be found in the Texas Legislature website (http://www.capitol.state.tx.us/Home.aspx).

7.0 DATA LOGGERS FOR INDOOR CONDITIONS

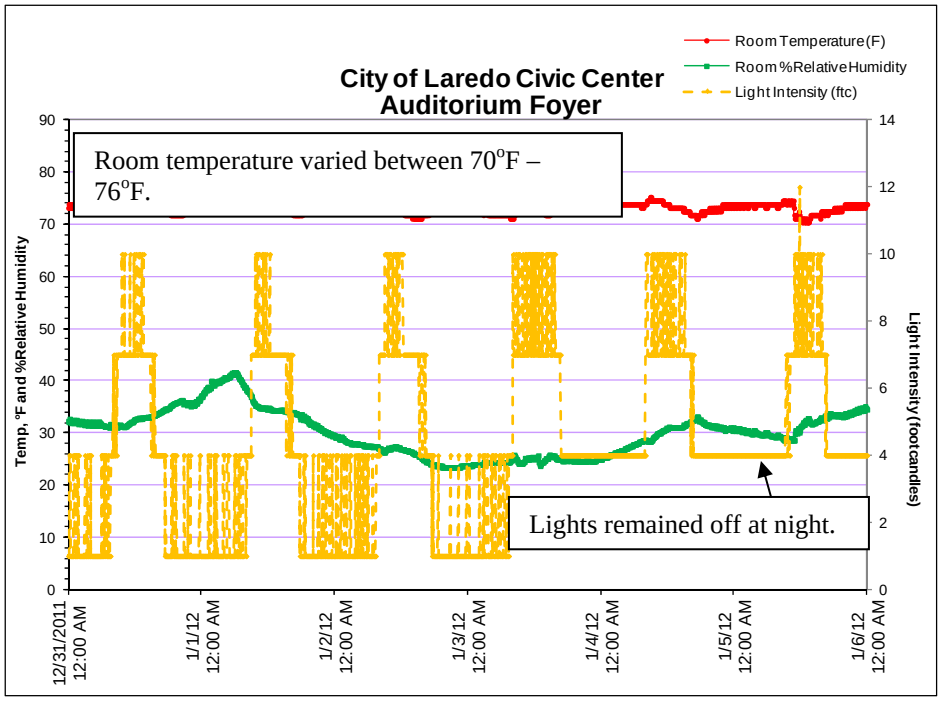
During the preliminary walkthrough, data-logging equipment was deployed at the Library and Civic Center to take snapshot readings of the indoor conditions. The data-logging equipment recorded the room's indoor temperature, indoor relative humidity and light intensity conditions for a short duration. While this information only provides a brief sample of the indoor conditions, this information is helpful in providing a general understanding of a facility's HVAC and lighting system operations. Below are example charts illustrating the results of the logging data.



Comments: Lights remained off during the holidays when the Library was closed. Once the Library re-opened after the holidays, lights came on around 7 a.m. and remained on until 8 p.m daily. While the Library was closed for the holidays, it appears the heating temperature setpoint was maintained.



Comments: Lights most likely remained off during the holidays as well as normal operating hours. While the Library was closed for the holidays, it appears the heating temperature setpoint was maintained.



Comments: It appears the heating setpoint was maintained all day for this time period (ranged from 70°F – 76°F). Lights came on around 9 a.m. each day and were turned off around 5 p.m.

8.0 RECOMMENDED MAINTENANCE & OPERATING PROCEDURES

Sound Maintenance and Operation procedures significantly improve annual utility costs, equipment life, and occupant comfort. Generally, maintenance and operation procedural improvements can be made with existing staff and budgetary levels. Below are typical maintenance and operations procedures that have energy savings benefits. Please note that some of the recommendations noted below are currently being practiced by the City. With this in mind, the following maintenance and operation procedures should be encouraged/continued to ensure sustainable energy savings.

M&O Recommendations - Buildings

PUBLICIZE ENERGY CONSERVATION

Promote energy awareness at regular staff meetings, on bulletin boards, and through organizational publications. Publicize energy cost reports showing uptrends and downtrends.

MANAGE SMALL ELECTRICAL EQUIPMENT LOADS

Small electrical equipment loads consists of small appliances/devices such as portable heaters, microwaves, small refrigerators, coffee makers, stereos, cell phone chargers, desk lamps, etc. The City should establish a goal to reduce the number of small appliances and to limit their usage. For example, the use of small space heaters should be discouraged; hence, all space heating should be accomplished by the City's main heating system. In addition, many small devices such as radios, printers, and phone chargers can consume energy while not in use. To limit this "stand-by" power usage these devices should be unplugged or plugged into a power strip that can act as a central "turn off" point while not in use. With an effective energy awareness campaign to encourage participation, managing small electrical loads can achieve considerable energy savings.

ESTABLISH HVAC UNIT SERVICE SCHEDULES

Document schedules and review requirements for replacing filters, cleaning condensers, and cleaning evaporators. Include particulars such as filter sizes, crew scheduling, contract availability if needed, etc. Replace filters with standard efficiency pleated units. Generally, appropriate service frequencies are as follows -- filters: monthly; condensers: annually; evaporators: 5 years.

PRE-IDENTIFY PREMIUM EFFICIENCY MOTOR (PEM) REPLACEMENTS

Pre-identify supply sources and PEM stock numbers for all HVAC fan and pump motors so that as failures occur, replacement with PEM units can take place on a routine basis. As funding allows, pre-stock PEM replacements according to anticipated demand, i.e., motors in service more than 10 years, motors in stressful service, and at least one motor of each size and type that is in service at numerous locations.

IMPROVE CONTROL OF INTERIOR & EXTERIOR LIGHTING

Establish procedures to monitor use of lighting at times and places of possible/probable unnecessary use: Offices at lunchtime, maintenance shops, closets, exterior and parking lots during daylight hours, etc. Encouraging staff (i.e. Custodial, maintenance) to participate in the City's efforts to limit unnecessary lighting use would help improve this effort.

Example 1 – Day Lighting Opportunity: The picture below is a good example of a day lighting opportunity at the City Hall Annex. The buildings' windows placed along the wall help bring in sufficient natural light to illuminate the space during operating hours. The City should consider reducing the amount of artificial lighting in areas where sufficient natural light is available.

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Effective operation and maintenance of equipment is one of the most cost effective ways to achieve reliability, safety, and efficiency. Failing to maintain equipment can cause significant energy waste and severely decrease the life of equipment. Substantial savings can result from good operation and maintenance procedures. In addition, such procedures require little time and cost to implement. Examples of typical maintenance checklists for common equipment are provided in **Appendix E**. These checklists from the Federal Energy Management Program (FEMP), a branch of the Department of Energy (DOE), are based on industry standards and should supplement, not replace those provided by the manufacturer.

CONTROL OUTSIDE AIR INFILTRATION

Conduct periodic inspections of door and window weather-stripping, and schedule repairs when needed. Additionally, make sure doors and windows are closed during operation of HVAC systems (heating or cooling). Unintended outside air contributes to higher energy consumption and increases occupant discomfort.

REPLACE INCANDESCENT LAMPS WITH COMPACT FLUORESCENTS

Replace existing incandescent lamps with compact fluorescent lamps as they burn out. Compact fluorescents use 50 to 75 percent less wattage for the same light output, with ten times the operating life of incandescents.

ENERGY STAR POWER MANAGEMENT

ENERGY STAR Power Management Program promotes placing monitors and computers (CPU, hard drive, etc.) into a low-power "sleep mode" after a period of inactivity. The estimated annual savings can range from $25 to $75 per computer. ENERGY STAR recommends setting computers to enter system standby or hibernate after 30 to 60 minutes of inactivity. Simply touching the mouse or keyboard "wakes" the computer and monitor in seconds. Activating sleep features saves energy, money, and helps protect the environment.

INSTALL ENERGY SAVING DEVICES ON VENDING MACHINE

Install energy saving devices on vending machines with non-perishable food items to reduce the equipment power usage. These devices shut the vending machines down during unoccupied periods. There are several commercially available devices that can be easily installed on existing vending machines. These devices typical have a motion sensor which powers down the equipment after periods of inactivity. For example if the motion sensor does not sense activity within 15 minutes the device will shutdown the vending machine and turn on once motion is sensed. These devices range in price from $100 to $250 and have a typical annual savings of $20 to $150 per vending machine.

HAIL GUARDS ON HVAC UNITS

When an HVAC unit is replaced the City should ensure the new unit be specified with hail guards. The hail guards protect the condensing unit's heat exchanger coils from hail damage. Damage to the condensing unit heat exchangers reduces the efficiency of the units. It is recommended if any existing unit(s) have damaged condensing coil fins the condensing fins should be straightened using a fin comb. The following image is of a chiller at the Transit Building with fin damage.

MAINTAIN INSULATION ON SPLIT DX UNIT REFRIGERANT LINES

During the site visit, worn insulation was noted on Split DX unit refrigerant lines at the Municipal Court Building, as depicted in the following picture. It is recommended these lines be checked periodically and the insulation be maintained and replaced where necessary to eliminate unnecessary energy losses and condensation damage. The black foam insulation (commercially called "elastomeric insulation") that is commonly used on such lines should not be exposed to sunlight unless coated with a UV barrier and/or covered with an aluminum jacket or aluminized

tape made for the purpose. Only the vapor suction line (larger, cold line) needs insulation; the smaller (liquid) line should remain bare.

EXTERIOR SECURITY AND SITE LIGHTING RETROFIT

Some areas in the City utilize High Intensity Discharge (HID) fixtures for exterior lighting. It is recommended that the City replace the existing HID fixtures with a combination of Pulse Start Metal Halide (MH), Light-Emitting Diode (LED), Induction and Compact Fluorescent (CFL) fixtures suitable for the applications. Care should be used when developing a retrofit/replacement strategy so that minimum security lighting levels are not sacrificed when the retrofit is complete. Therefore, lighting levels should be calculated to determine if the post-retrofit levels are acceptable. In addition, compatibility with existing ballasts, local codes and other requirements must be verified prior to retrofitting. Nevertheless, if suitable for the application, switching to lower wattage lamps with greater lumen maintenance can have sustainable energy savings with minimal impact. The following table lists several retrofit possibilities.

SECURITY/SITE LIGHTING RETROFIT STRATEGY

Existing Fixture	Existing Example Lamp Type and Wattage	Retrofit Scope	Retrofit Lamp Type and Wattage
Pole Light (*)	400W HID	Lamp/Ballast Replacement	320W MH
Pole Light, Short (*)	250W HID	Lamp/Ballast Replacement	200W MH
Security Wall Pack	150W/175W HID	LED Security Wall Pack Fixture Replacement	56W LED
Security Wall Pack, Low	70 HID	LED Security Wall Pack Fixture Replacement	26W LED
Security Wall Pack, Flood	250 HID	Lamp/Ballast Replacement	200W MH
Surface Mount	150W/175W HID	LED Surface Mount Fixture Replacement	56W LED
Recessed	70 HID	Lamp Replacement with CFL	50W CFL
Incandescent Wall	100W Incandescent	Lamp Replacement with CFL	26W CFL

(*) Replacing outdoor MH fixtures with LED and/or Induction fixtures is increasingly cost effective as more choices become available at lower prices. Check pricing at decision time.

M&O Recommendations – Water & Wastewater Treatment Plants

The following are general design and maintenance and operations recommendations that may improve energy performance for water system and wastewater treatment facilities.

UTILIZE HIGH EFFICIENCY PUMPS AND MOTORS

When replacing pumping units, procure high efficiency pumps and motors. Energy savings could account for 10-15% difference when compared to existing units.

EVALUATE PIPE SIZING WITHIN SERVICE AREA TO REDUCE FRICTION LOSSES

Performing a water distribution system analysis can recommend the most efficient piping size for the service area. Constructing non-restrictive piping would reduce system head requirements and save power.

ADD VARIABLE FREQUENCY DRIVE (VFD) CAPABILITY TO HIGH SERVICE PUMP STATIONS

A VFD controlled pump station could serve as an alternative system pressure control to enable elevated storage to be taken out of service for painting or repairs.

ADD VFD OR "SOFT-START" TO PUMPING UNITS 50 HP AND GREATER

A soft-start feature would reduce start-up amperage surcharge saving money when rate structures take start-up amperage draw into account.

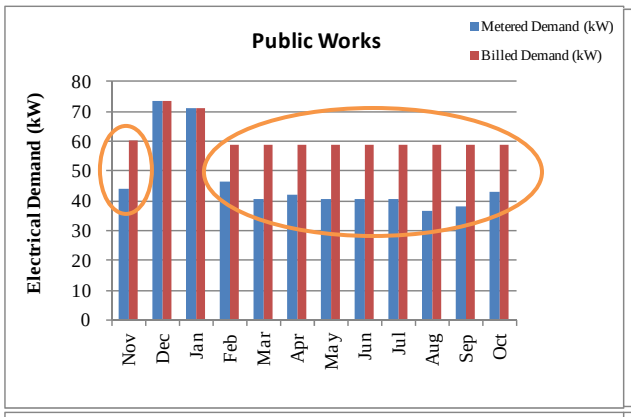
CONTROL DISSOLVED OXYGEN LEVEL IN WWTP

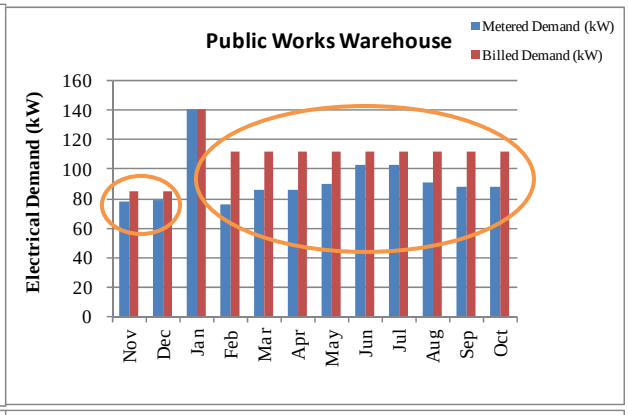
Reducing aeration to maintain dissolved oxygen levels of 2.0 mg/l or less could reduce power draw. Variable Frequency Drive, dual speed motors, or simply operating fewer units to maintain minimum dissolved oxygen levels will save power.

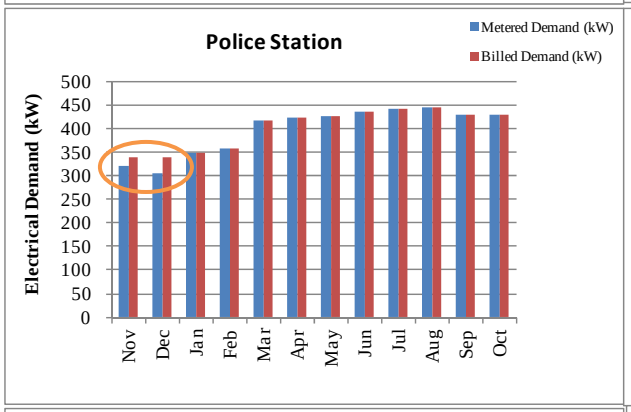
9.0 ELECTRICAL DEMAND & POWER FACTOR ANALYSIS

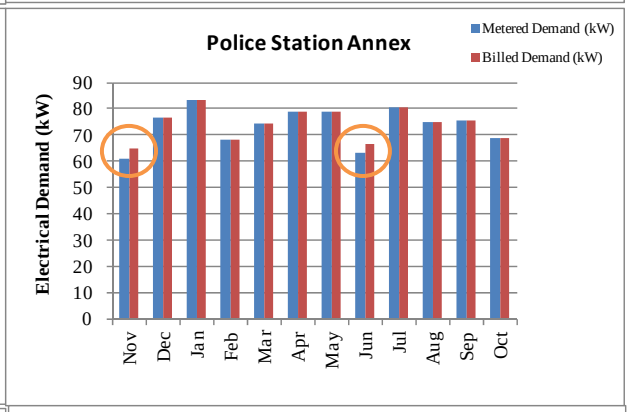
Demand (kW) charges stem from a facility's peak power draw during a billing period, as opposed to consumption (kWh) charges, which total the energy usage over this period. The facilities analyzed in this report include electric meters that record demand.

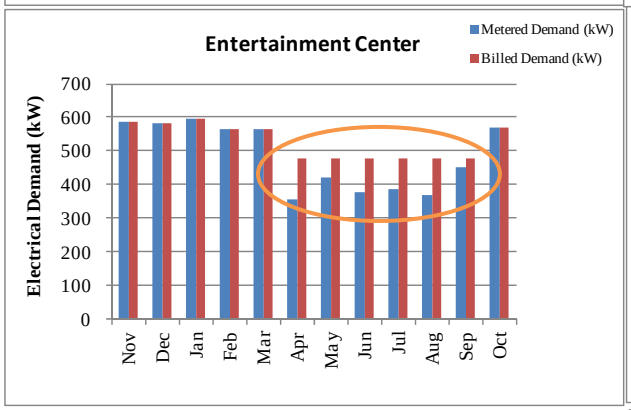
The City's energy data (billed and metered demand, power factor, consumption and costs) was made available. The plots below shows the metered and billed demand over a 12-month period for several of the City's facilities. A ratchet clause is in place, which sets the minimum demand billed for a month as 80% of the maximum demand established in the preceding 11 months. Notice periods of low metered demand where billed demand does not decrease. This is due to the demand ratchet. While the City is being metered at a lower kW, 80% of the peak demand is the amount billed.

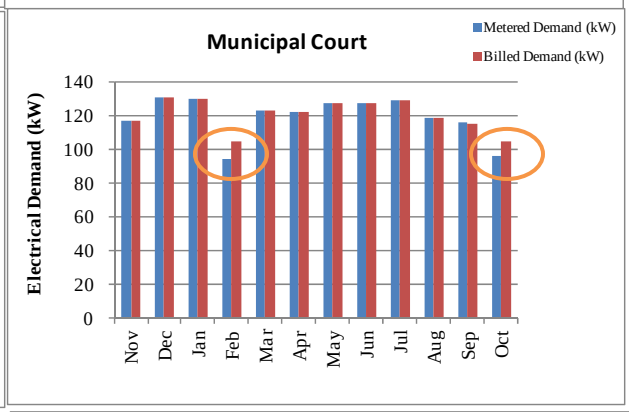

Public Works
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 10 20 30 40 50 60 70 80
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct

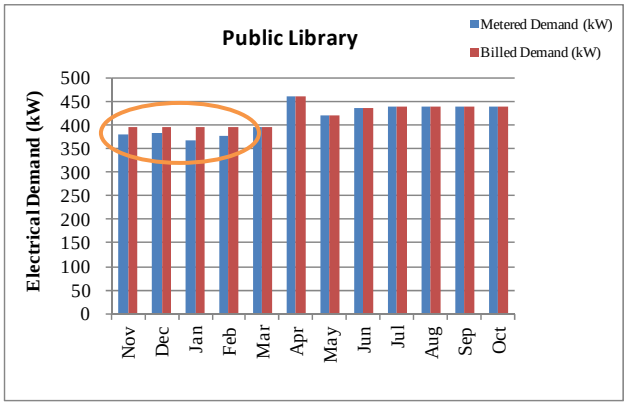

Public Works Warehouse
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 20 40 60 80 100 120 140 160
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct

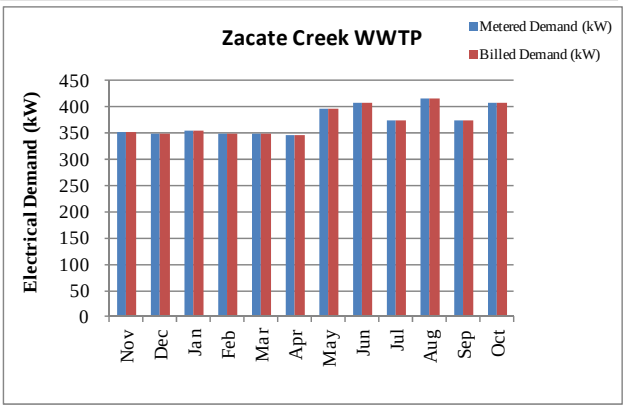

Police Station
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 50 100 150 200 250 300 350 400 450 500
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct


Police Station Annex
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 10 20 30 40 50 60 70 80 90
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct


Entertainment Center
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 100 200 300 400 500 600 700
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct


Municipal Court
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 20 40 60 80 100 120 140
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct

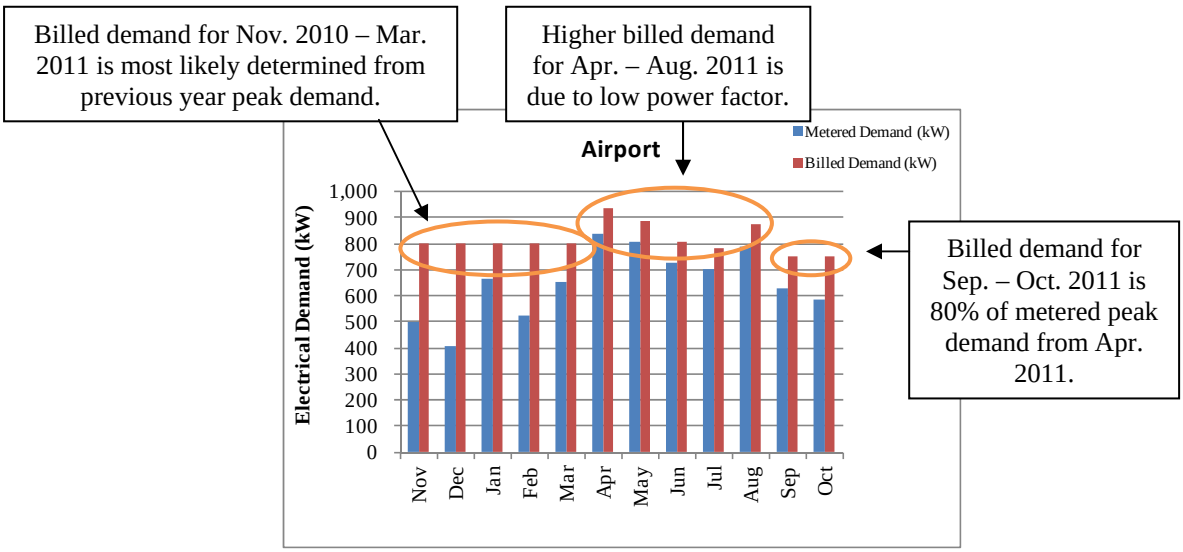

Public Library
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 50 100 150 200 250 300 350 400 450 500
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct


Zacate Creek WWTP
Metered Demand (kW)
Billed Demand (kW)
Electrical Demand (kW)
0 50 100 150 200 250 300 350 400 450
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct

Some general recommendations for reducing demand in a building include:

- Following up with the utility provider to gain a better understanding of the rate structures used and its impacts on operating costs.
- Staggering HVAC equipment start up utilizing control systems.
- Installing motion sensors for lighting control to prevent unnecessary lighting on at once (see Section 10.0).
- Increasing temperature setpoints in the summer and decreasing them in the winter to reduce unit cycle times.

AEP also currently bills customers for low power factor where appropriate meters have been installed. This is presently reflected on the billed demand portion of the utility bill. If the power factor during the peak interval is less than 95 percent, the billed demand is multiplied by 95 percent, and then divided by the lower power factor. This would result in increased cost for the facility. The plot below shows the monthly metered demand and billed demand for the Airport. The billed demand is consistently higher than the metered demand throughout the year. This is due to a combination of the ratchet clause (described above) and low power factor. The City is charged the greater value between ratcheted billed demand and low power factor penalty each month.



One method of improving power factor is installing power factor correction capacitors. *For information on improving power factor, see section 10.0.*

10.0 UTILITY COST REDUCTION MEASURES (UCRMs)

Utility cost reduction measure projects identified during the preliminary analysis are detailed below. Project cost estimates include complete design and construction management services.

T12 TO T8 FLUORESCENT LIGHTING RETROFIT

The City has a combination of T8 and T12 Fluorescent fixtures. It is recommended the City replace the existing T12 fluorescent lamps and magnetic ballasts with high efficiency T-8 fluorescent lamps and electronic ballasts. Typical four-foot, two-lamp magnetic ballast fixtures require 80 watts, while electronic ballasts and T-8 lamps in the same fixture configuration require only 50 watts. The table below indicates the facilities where T-12 fluorescent lamps were observed during the preliminary walkthrough. The cost and savings noted below are based on preliminary observations of the facilities. Exact cost, quantities, and lamp types can be identified through a detailed energy audit. In addition, a detailed lighting design calculation will help ensure the appropriate lighting replacement is selected. For example, a detailed design calculation may identify areas that could operate with fewer lamps per fixtures or with low-wattage T8 lamps while still maintaining adequate lighting levels.

T12 TO T8 FLUORESCENT LIGHTING RETROFIT				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
Civic Center	$34,600	$6,300	221	5.5
City Hall	$34,700	$7,700	305	4.5
City Hall Annex	$11,000	$1,800	64	6.1
Transit Building	$14,600	$2,200	91	6.6
Police Station	$50,600	$12,700	523	4.0
Police Station Annex	$14,000	$2,800	91	5.0
Municipal Court	$7,700	$1,700	59	4.5
TOTAL	**$167,200**	**$35,200**	**1,354**	**4.8**

REPLACE EXISTING T8 FLUORESCENT LAMPS WITH LOWER WATTAGE LAMPS

Low-wattage T8 fluorescent lamps are available in 30, 28 and 25-watt versions. The City should consider replacing existing 32-watt T8 Fluorescent lamps with lower wattage lamps in most cases. However, lower wattage T8 lamps produce a little less light, so it is important to verify by calculation beforehand that recommended lighting levels will be maintained. Lighting levels should be measured prior to and after lamp replacement. In addition, compatibility with existing ballasts, local codes and other requirements must be verified prior to retrofitting. Nevertheless, if suitable for the application, switching to lower wattage T8 lamps will have sustainable energy savings with minimal impact. For example, replacing a 32-watt T8 lamp with a 28-watt T8 lamp will reduce energy use by about 12% while dropping the lighting level only about 4%.

The estimated costs and savings noted below are based on replacement of existing 32-watt T8 lamps and do not account for ballast replacements (if existing are incompatible) or reduced lamp counts (if existing lighting levels are above recommended levels). Estimates are based on a preliminary walkthrough of the facilities. A detailed lighting analysis will be required to determine exact cost, quantities and configuration to maximize the energy savings and lighting performance. The cost and savings calculations below are based on 48" F28T8, extended life linear fluorescent lamps. Lamp recycling is included in the cost estimates.

LOW WATTAGE T8 FLUORESCENT LIGHTING RETROFIT				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
City Hall Annex	$3,000	$500	18	6.0
Utilities Building	$4,800	$1,000	32	4.8
Airport	$9,300	$1,900	74	4.9
Transit Building	$4,000	$600	25	6.7
Public Works	$4,100	$700	23	5.9
Entertainment Center	$16,200	$3,200	125	5.1
Municipal Court	$2,100	$500	17	4.2
Public Library	$13,600	$2,700	108	5.0
TOTAL	**$57,100**	**$11,100**	**420**	**5.1**

Note: If in detailed analysis it is determined that current ballasts are not compatible with new lower wattage T8 lamps, an alternative option would be to replace lamps with 25 watt lamps and install new, more efficient ballasts.

REPLACE HID LIGHTING WITH FLUORESCENT LIGHTING

Several City facilities utilize High Intensity Discharge (HID) light fixtures. It is recommended that the City replace the existing HID fixtures with fluorescent fixtures suitable for high bay applications. Fluorescent fixtures offer improved control, reduce energy consumption and improve lighting levels. Unlike HID fixtures which have long warm-up times and even longer re-strike times, fluorescent fixtures can be switched off and on at will. This allows them to operate fewer hours, saving energy and extending lamp life. *For the Entertainment Center, it is recommended to replace the fixtures with Arcticlite fixtures or an equivalent suitable for ice arenas.* The cost and savings estimates below are based on preliminary observations and analysis.

HID TO FLUORESCENT LIGHTING RETROFIT				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
City Hall Annex	$19,600	$2,500	89	7.8
Transit Building	$20,200	$4,000	165	5.1
Public Works Warehouse	$13,200	$1,400	43	9.4
Entertainment Center	$172,000	$17,200	669	10.0
TOTAL	**$225,000**	**$25,100**	**966**	**9.0**

INSTALL OCCUPANCY SENSORS FOR INDOOR LIGHTING CONTROL

It is recommended the City consider installing occupancy sensors to improve control of interior lighting. Occupancy sensors will help ensure lights are only on when the space is occupied. The following table below provides an estimated cost and energy savings for the installation of these types of sensors. Please note this estimation is based on a preliminary assessment exact sensor location, technology (Infrared, Ultrasonic, and Dual Technology) and quantity can be determined during a detailed energy assessment or design phase. In general, enclosed areas with intermittent use, are typically good candidates for occupancy sensors (i.e. administration offices, conference rooms, break rooms, etc.).

MOTION SENSOR INSTALLATION				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
City Hall	$15,000	$2,600	103	5.8
City Hall Annex	$4,400	$700	25	6.3
Utilities Building	$900	$200	6	4.5
Airport	$4,200	$700	27	6.0
Transit Building	$4,000	$700	29	5.7
Public Works	$5,300	$900	29	5.9
Police Station	$7,300	$1,300	54	5.6
Police Station Annex	$2,200	$400	13	5.5
Entertainment Center	$4,000	$600	23	6.7
Municipal Court	$2,200	$400	14	5.5
Public Library	$2,600	$500	20	5.2
TOTAL	**$52,100**	**$9,000**	**343**	**5.8**

ENERGY MANAGEMENT SYSTEM (EMS)

Upgrade to Direct Digital Control (DDC) Energy Management System (EMS) to provide optimum scheduling and precise temperature supervision for the HVAC systems throughout each facility listed in the table below. The EMS will minimize the run time of the units while maintaining comfort throughout the facility. Additionally, EMS can remotely diagnose and document HVAC maintenance problems. Upgrading to an EMS will improve control and performance. The EMS systems proposed in the estimation below will have basic functions such as remote access capabilities, multiple scheduling, space temperature reset, optimum start/stop features. *In addition, when upgrading controls for the Library, it is recommended to install a variable frequency drive (VFD) and associated controls on the chilled water (CHW) pump, which presently operates at constant volume.* The constant flow arrangement will be converted to variable primary flow. The VFD will reduce the energy consumption of the pump by maintaining precise control of CHW requirements to the air handler coils. This ECRM requires installation of appropriate VFD, differential pressure transducer and integration into EMS. For this measure to work effectively, replace all three way controls valves at the air handlers with two way except for one or two valves at each floor to ensure minimum flow through chiller. The table below summarizes the estimated cost and saving for these projects.

ENERGY MANAGEMENT SYSTEM (EMS)				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
City Hall	$115,700	$8,600	341	13.5
Airport	$140,400	$11,200	434	12.5
Transit Building	$33,300	$3,700	152	9.0
Public Library	$91,500	$12,200	486	7.5
TOTAL	**$382,100**	**$36,000**	**1,422**	**10.6**

COMMISSION (Cx) HVAC SYSTEMS

Detailed HVAC & Control system commissioning in an existing building involves analysis of existing systems to ensure compliance with original set-up/design conditions and, where feasible, analyzing the design to adjust operating parameters to enhance comfort and reduce energy consumption. Overall, the goal of commissioning is to deliver a system that operates optimally, meets the needs of the building owner and occupants, and is understood by the facility operators. To reach this goal it is necessary for the commissioning process to provide documentation and verification of the performance of all building equipment and systems. For the process to work successfully it is equally important to have good communications between all participants (owners, operators, and the commissioning agent) and to keep all parties involved and informed of all pertinent decisions. For general information on Commissioning, please refer to Appendix G.

HVAC Retro-commissioning (RCx) involves the optimization of an existing building's energy usage through testing and documentation. Typically, this procedure will review and improve a building's energy consumption levels by investigating staff and occupant observations as well as optimizing building systems to meet or surpass the original design goals. This process is especially appropriate for buildings that have not been commissioned recently.

Preliminary examination (utility data review, discussion with staff, EMS review, and walkthrough) of the City facilities indicate potential for energy cost savings primarily in the HVAC systems operations. *The Civic Center is currently undergoing a digital controls upgrade, and would greatly benefit by implementing a full scale Retro-commissioning program once controls systems are in place. In addition, a prerequisite of a commissioning program at the City Hall would be an Energy Management System upgrade, as described above.* These programs ensure the optimization of HVAC systems for the building's existing conditions, works to improve the building air quality, increase comfort levels, and resolve any operating problems. The Commissioning program requires collaborative efforts between the commissioning engineers and the facility staff, and is an ongoing process that continues to both commission the building as well as train the facility staff.

The cost and savings estimates presented here are for a comprehensive commissioning program. The project implementation duration is typically 10 to 12 months. The following estimates are based on a preliminary walkthrough, available utility data analysis, and discussion with staff. The project, if authorized, would normally be accomplished by an organization/firm with engineers specializing in enhanced commissioning techniques and project implementation. The table below summarizes the implementation costs, annual savings, and payback for a comprehensive commissioning program at each campus. *Note: The table below includes an estimated budget for deferred maintenance items. The deferred maintenance budget is for repair items that the Owner needs to address (such as sensor replacement, damper repair, etc.) that may be identified by the commissioning team.*

BUILDING COMMISSIONING (Cx)				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
Civic Center	$43,100	$9,600	336	4.5
City Hall	$37,500	$7,500	297	5.0
Airport	$77,600	$25,900	1,003	3.0
Deferred Maintenance/Repair Costs	$15,800	-	-	-
TOTAL	**$174,000**	**$43,000**	**1,636**	**4.0**

INSTALL NETWORKED THERMOSTATS

Install web-based networked thermostats to provide improved control of the air-conditioning systems throughout the facilities listed in the table on the following page. Installing web-based networked thermostats will allow for multiple schedule routines and allow remote scheduling. The thermostats would be connected to the City's network and can be controlled and monitored from a central location.

NETWORKED THERMOSTATS				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
Utilities Building	$1,200	$300	10	4.0
Public Works	$3,000	$900	29	3.3
Public Works Warehouse	$500	$100	3	5.0
Police Station	$10,000	$1,700	70	5.9
Police Station Annex	$2,000	$300	10	6.7
TOTAL	**$15,500**	**$3,000**	**112**	**5.2**

CHILLER SYSTEM REPLACEMENT

There are two (2) air-cooled chillers at the Library. One of the 15 year old existing air-cooled chillers is currently in operation. It is recommended to replace the air-cooled chiller (170 tons) with a high efficiency unit. Estimated cost and savings for this project is listed below. See section 11.0 for the replacement recommendation for the chiller not currently in service.

CHILLER REPLACEMENT				
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
Public Library	$306,000	$17,000	677	18.0
TOTAL	**$306,000**	**$17,000**	**677**	**18.0**

INSTALL POWER FACTOR CORRECTION CAPACITOR

Install a capacitor bank at the electrical service entrance or particular loads at the following location listed below. The City is currently charged for low power factor where appropriate meters have been installed, and installing a capacitor will condition the power and reduce additional costs. Capacitor banks vary in cost with the size required, which is dependent on the facility's electrical demand and the amount of power factor correction elected. If the source of low power factor is a few large motors that always have the same low power factors, it may be most cost effective to connect the capacitors to the system between the motor starter and the load, so that the correction is only applied to the system while the offending motors are enabled. The following estimated implementation cost refers to installing a capacitor at the electrical service entrance, and is based off preliminary utility data review. Detailed analysis would determine actual size of capacitor. *It is recommended the City review power factor for other facilities to determine any potential benefit for additional power factor correction.*

INSTALL CAPACITOR			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Simple Payback (years)**
Airport	$12,000	$1,200	10.0
TOTAL	**$12,000**	**$1,200**	**10.0**

REPLACE COARSE BUBBLE DIFFUSERS WITH FINE BUBBLE DIFFUSERS – NORTH SOUTH RE-AERATION BASINS AND CONTACT AERATION BASINS

Replace the existing coarse bubble diffusers with fine bubble diffusers in the activated sludge treatment basins. This retrofit could save up to 40% of the total power consumption of the activated sludge process, and increase treatment efficiency.

REPLACE COARSE BUBBLE DIFFUSERS WITH FINE BUBBLE				
Facility	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
Zacate Creek WWTP (*)	$1,400,000	$112,000	4,287	12.5
TOTAL	**$1,400,000**	**$112,000**	**4,287**	**12.5**

The following table summarizes the implementation costs, annual savings and simple payback for the above projects:

SUMMARY OF ENERGY COST REDUCTION MEASURES				
Project Description	**Estimated Implementation Cost**	**Estimated Annual Savings ($/yr)**	**Estimated Annual MMBTU Savings (MMBTU/yr)**	**Simple Payback (years)**
T12 TO T8 FLUORESCENT LIGHTING RETROFIT	$167,200	$35,200	1,354	4.8
LOW WATTAGE T8 FLUORESCENT LIGHTING RETROFIT	$57,100	$11,100	420	5.1
HID TO FLUORESCENT LIGHTING RETROFIT	$225,000	$25,100	966	9.0
MOTION SENSOR INSTALLATION	$52,100	$9,000	343	5.8
ENERGY MANAGEMENT SYSTEM (EMS)	$382,100	$36,000	1,422	10.6
BUILDING COMMISSIONING (Cx)	$174,000	$43,000	1,636	4.0
NETWORKED THERMOSTATS	$15,500	$3,000	112	5.2
CHILLER REPLACEMENT	$306,000	$17,000	677	18.0
INSTALL CAPACITOR	$12,000	$1,200	-	10.0
REPLACE COARSE BUBBLE DIFFUSERS WITH FINE BUBBLE (*)	$1,400,000	$112,000	4,287	12.5
CONTINGENCY/ESCALATION	$139,550	-	-	-
TOTAL:	**$2,930,550**	**$292,600**	**11,218**	**10.0**

The above projects implementation costs and annual savings are estimated based on a preliminary examination of the facilities. Furthermore, maintenance cost savings are not included in this preliminary energy assessment. Final costs will be determined from detailed building assessments, engineering calculations, and contractor estimates.

Project design (drawings and specifications), if authorized, would normally be accomplished by professional engineers. Project acquisition (competitive bidding) would be in accordance with City requirements, and construction management would be provided by the engineering group who prepared the drawings and specifications.

(*) Note: *The City may potentially decommission Zacate Creek WWTP in the next few years. It is only recommended the City consider this retrofit if it plans to utilize the plant for a period longer than the estimated payback. Without the WWTP retrofit project, the total 'Estimated Implementation Cost' for all projects would be $1,502,280, the total 'Estimated Annual Savings' per year would be $180,600, and the overall 'Simple Payback' would be 8.3 years.*

11.0 FACILITY IMPROVEMENT MEASURES

This section is intended to describe the Facility Improvement Measures (FIMs) that have energy savings opportunities but cannot be justified solely based on the potential energy savings alone. The following is a capital improvement project recommended for the City.

REPLACE HVAC SYSTEMS NEARING END OF USEFUL LIFE

The City has several HVAC systems nearing the end of their useful life. Replacing these systems with new high efficiency units will have energy savings and help reduce maintenance costs. The HVAC systems nearing the end of their useful life are listed below. Additional facility assessment is recommended for these projects.

Police Station: (27) Split-DX systems totaling approximately 324 tons, average age of 17 years

Civic Center: (8) Chilled water air handling units, average age of 47 years

City Hall: (7) Chilled water air handling units, average age of 21 years

Transit Building: (7) Chilled water air handling units, average age of 16 years

Public Library: (11) Chilled water air handling units, average age of 16 years. (1) air-cooled chilled water system (not currently in operation) of 170 tons, age of 15 years.

12.0 ENERGY MANAGEMENT POLICY

By requesting this study, the City has demonstrated interest in taking a more aggressive approach to energy management. In order to establish an effective Energy Management Program it should have support from top management. An Energy Management Policy adopted by the City sends a strong signal that energy management is an institutional priority. A formal Energy Management Policy can be as simple as a two-page document that clearly states the City's energy management objectives. The policy should cover items such as:

- who is accountable for energy management
- what your energy savings targets are
- how you will monitor, review and report on progress
- staffing and training to support the policy
- criteria for energy management investment
- working energy efficiency into new capital investments

Along with a clear energy **policy,** an energy management **plan** should be developed to ensure sustained energy savings. The energy management plan is a document that details roles, responsibilities, and objectives. Following are key items that should be included in an energy management plan:

1. ESTABLISH ROUTINE ENERGY TRACKING AND REPORTING PROCEDURES
   Establishing a procedure to monitor energy usage and cost will help identify energy use patterns. The data will also help determine the effectiveness of the Energy Management Program.

2. ESTABLISH AN ENERGY MANAGEMENT STEERING COMMITTEE
   The Energy Management Steering Committee will include representatives from the City. The steering committee will serve as a review board to evaluate all energy management recommendations before adoption and implementation. The steering committee will meet quarterly or semiannually to review the City's energy cost and consumption. Regular meetings will ensure the City's goals are being met prior to the end of the year.

3. PROMOTE ENERGY AWARENESS
   The energy management steering committee members shall establish a program to publicize the City's energy goals and progress on a quarterly or semiannually basis. Continuous promotion of the City's goals will ensure the sustainability of the energy management program and help achieve further energy savings.

4. ESTABLISH ACCEPTABLE EQUIPMENT PARAMETERS
   Establish a City-wide uniform temperature set point for all HVAC units. Having a standard setpoint will help keep HVAC runtimes to a minimum. The following are some suggested temperature settings, *however, the City will need to monitor and ensure that other building parameters (humidity levels etc.) are within acceptable limits.* In addition, areas with special equipment (MDF/IDF, server rooms, etc.) or materials (wood flooring, paper storage, etc.) shall be maintained at the equipment supplier's recommended settings and settings appropriate to the material.

Occupied Cooling Temperature Setpoint:
Admin Areas 74 F (+/- 2 F)

Unoccupied Cooling Temperature Setpoint:
Admin Areas 85 F

Occupied Heating Temperature Setpoint:
Admin Areas 68 F (+/- 1 F)

Unoccupied Heating Temperature Setpoint:
Admin Areas 55 F

5. DISALLOW OR DISCOURAGE PERSONAL APPLIANCES

Establish a policy that prohibits use of personal appliances by City staff, such as mini refrigerators and space heaters. Alternatively, establish disincentives such as a periodic fee for use of such appliances. Collected fees could be used for energy awareness and management in other areas.

6. NEW BUILDING AND CONSTRUCTION

Ensure proper maintenance and operation of energy using equipment in new buildings by required adequate documentation of all systems and control strategies, specifying minimum content of M&O manuals; specifying contractor requirements for cleaning and adjusting equipment prior to occupancy; specifying on-site vendor training for M&O staff; and requiring as-built drawings.

7. ESTABLISH A WATER MANAGEMENT PROGRAM

Along with saving energy the City should establish a program to reduce water consumption. The following conservation measures should be employed.

a. Investigate the use of water conserving faucets, showerheads, and toilets in all new and existing facilities.
b. Utilize water-pervious materials such as gravel, crushed stone, open paving blocks or previous paving blocks for walkways and patios to minimize runoff and increase infiltration.
c. Employ Xeriscaping, using native plants that are well suited to the local climate, that are drought-tolerant and do not require supplemental irrigation.
d. Utilize drip irrigation systems for watering plants in beds and gardens.
e. Install controls to prevent irrigation when the soil is wet from rainfall.
f. Establish a routine check of water consuming equipment for leaks and repair equipment immediately.

13.0 FUNDING OPTIONS FOR CAPITAL ENERGY PROJECTS

Institutional organizations have traditionally tapped bond money, maintenance dollars, or federal grants to fund energy-efficient equipment change outs or additions such as energy-efficient lighting systems, high efficiency air conditioning units, and computerized energy management control systems. Today, a broader range of funding options are available. A number of these are listed below.

Texas LoanSTAR Program

The LoanSTAR (Saving Taxes and Resources) Program, which is administered by the State Energy Conservation Office, finances energy-efficient building retrofits at a low interest rate (typically 3 percent). The program's revolving loan mechanism allows borrowers to repay loans through the stream of cost savings realized from the projects. Projects financed by LoanSTAR must have an average simple payback of ten years or less and must be analyzed in an Energy Assessment Report by a Professional Engineer. Upon final loan execution, the City proceeds to implement funded projects through the traditional bid/specification process. Contact: Eddy Trevino (512/463-1876).

Internal Financing

Improvements can be paid for by direct allocations of revenues from an organization's currently available operating or capital funds (bond programs). The use of internal financing normally requires the inclusion and approval of energy-efficiency projects within an organization's annual operating and capital budget-setting process. Often, small projects with high rate of return can be scheduled for implementation during the budget year for which they are approved. Large projects can be scheduled for implementation over the full time period during which the capital budget is in place. Budget constraints, competition among alternative investments, and the need for higher rates of return can significantly limit the number of internally financed energy-efficiency improvements.

Private Lending Institutions or Leasing Corporations

Banks, leasing corporations, and other private lenders have become increasingly interested in the energy efficiency market. The financing vehicle frequently used by these entities is a municipal lease. Structured like a simple loan, a municipal leasing agreement is usually a lease-purchase arrangement. Ownership of the financed equipment passes to the City at the beginning of the lease, and the lessor retains a security interest in the purchase until the loan is paid off. A typical lease covers the total cost of the equipment and may include installation costs. At the end of the contract period the lessee pays a nominal amount, usually a dollar, for title to the equipment.

Performance Contracting with an Energy Service Company

Through this arrangement, an energy service company (ESCO) uses third party financing to implement a comprehensive package of energy management retrofits for a facility. This turnkey service includes an initial assessment by the contractor to determine the energy-saving potential for a facility, design work for identified projects, purchase and installation of equipment, and overall project management. The ESCO guarantees that the cost savings generated by the projects will, at a minimum, cover the annual payment due to the ESCO over the term of the contract.

Utility Sponsored Energy Efficiency Incentive Programs

Many of the State's utilities offer energy efficiency incentive programs to offset a portion of the upfront cost associated with energy efficiency measures. The program requirements and incentives range from utility to utility. For example, CenterPoint Energy provides incentives for efficiency measures such as installation of high efficiency equipment, lighting upgrades, and building commissioning. These energy efficiency programs' incentives typically cover $0.06/kWh and $175/kW of verifiable energy and demand reductions, respectively. For further information, contact your utility provider to determine what programs are available in your area.

14.0 ANALYST IDENTIFICATION

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(512) 328-2533

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Bryan Simler, EIT

APPENDICES

APPENDIX A

ENERGY LEGISLATION
(SB12 AND HB3693)

How to comply with SB12 & HB 3693

What you need to know about Texas Senate Bill 12

The passage of Senate Bill 12 (SB12) by the 80th Texas Legislature signified the continuance of Senate Bill 5 (SB5), the 77th Texas Legislature's sweeping approach in 2001 to clean air and encourage energy efficiency in Texas. SB12 was enacted on September 1, 2007 and was crafted to continue to assist the state and its political jurisdictions to conform to the standards set forth in the Federal Clean Air Act. The bill contains energy-efficiency strategies intended to decrease energy consumption while improving air quality.

All political subdivisions in the 41 non-attainment or near non-attainment counties in Texas are required to:

*1) Adopt a goal to reduce electric consumption by 5 percent each year for six years, beginning September 1, 2007**

2) Implement all cost-effective energy-efficiency measures to reduce electric consumption by existing facilities. (Cost effectiveness is interpreted by this legislation to provide a 20 year return on investment.)

3) Report annually to the State Energy Conservation Office (SECO) on the entity's progress, efforts and consumption data.

*Note: The recommended baseline data for those reporting entities will consist of the jurisdiction's 2006 energy consumption for its facilities and based on the State Fiscal Year (September 1, 2006 to August 31, 2007).

What you need to know about Texas House Bill 3693

The passage of House Bill 3693 (HB3693) by the 80th Texas Legislature is intended to provide additional provisions for energy-efficiency in Texas. Adopted with an effective date of September 1, 2007, HB 3693 is an additional mechanism by which the state can encourage energy-efficiency through various means for School Citys, State Facilities and Political Jurisdictions in Texas.

HB 3693 includes the following state-wide mandates that apply differently according to the nature and origin of the entity:

Record, Report and Display Consumption Data
All Political Subdivisions, School Citys and State-Funded Institutes of Higher Education, are mandated to record and report the entity's metered resource consumption usage data for electricity, natural gas and water on a publically accessible internet page.
Note: The format, content and display of this information are determined by the entity or subdivision providing this information.

Energy Efficient Light Bulbs
All School Citys and State-Funded Institutes of Higher Education shall purchase and use energy-efficient light bulbs in education and housing facilities.

Who must comply?
The provisions in this bill will apply to entities including: Cities and Counties; School Citys; Institutes of Higher Education; State Facilities and Buildings.

How do you define energy-efficiency measures?

Energy-efficiency measures are defined as any facility modifications or changes in operations that reduce energy consumption. Energy-efficiency is a strategy that has the potential to conserve resources, save money** and better the quality of our air. They provide immediate savings and add minimal costs to your project budget.

Examples of energy-efficiency measures include:

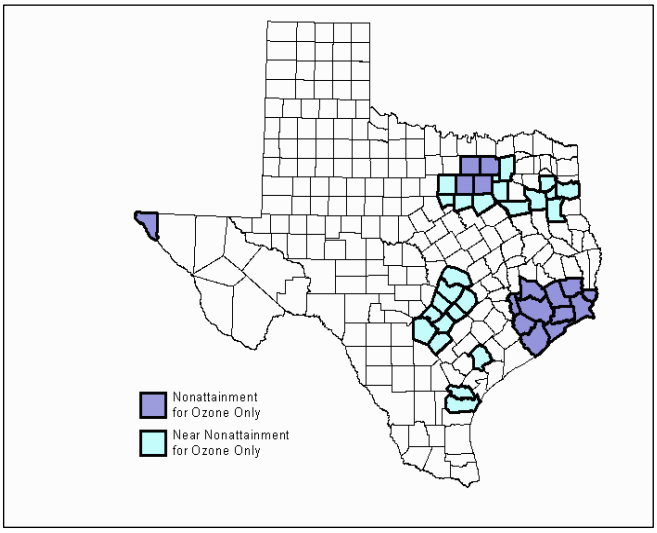
• installation of insulation and high-efficiency windows and doors • modifications or replacement of HVAC systems, lighting fixtures and electrical systems • installation of automatic energy control systems • installation of energy recovery systems or renewable energy generation equipment • building commissioning • development of energy efficient procurement specifications • employee awareness campaigns

***SECO's Preliminary Energy Assessment (PEA) program is an excellent resource for uncovering those energy-efficiency measures that can benefit your organization.*

What counties are affected?

All political jurisdictions located in the following Non-attainment and affected counties:

Bastrop Bexar Brazoria Caldwell Chambers Collin
Comal Dallas Denton El Paso Ellis Fort Bend
Galveston Gregg Guadalupe Hardin Harris Harrison
Hays Henderson Hood Hunt Jefferson Johnson
Kaufman Liberty Montgomery Nueces Orange Parker
Rockwall Rusk San Patricio Smith Tarrant Travis
Upshur Victoria Waller Williamson Wilson



What assistance is available for affected areas?

The Texas Energy Partnership is a partner with Energy Star©, who partners across the nation with the goal of improving building performance, reducing air emissions through reduced energy demand, and enhancing the quality of life through energy-efficiency and renewable energy technologies.

To assist jurisdictions, the Texas Energy Partnership will:

- Present workshops and training seminars in partnership with private industry on a range of topics that include energy services, financing, building technologies and energy performance rating and benchmarking

- Prepare information packages – containing flyers, documents and national lab reports about energy services, management tools and national, state and industry resources that will help communities throughout the region

- Launch an electronic newsletter to provide continuous updates and develop additional information packages as needed

Please contact Stephen Ross at 512-463-1770 for more information.

SECO Program Contact Information

LoanSTAR;
Preliminary Energy Assessments:
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Eddy.Trevino@cpa.state.tx.us

Schools & Local Govt. Partnership Program:
Stephen Ross - 512-463-1770
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Engineering (Codes / Standards):
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Energy / Housing
Partnership Programs:
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Alternate Fuels / Transportation:
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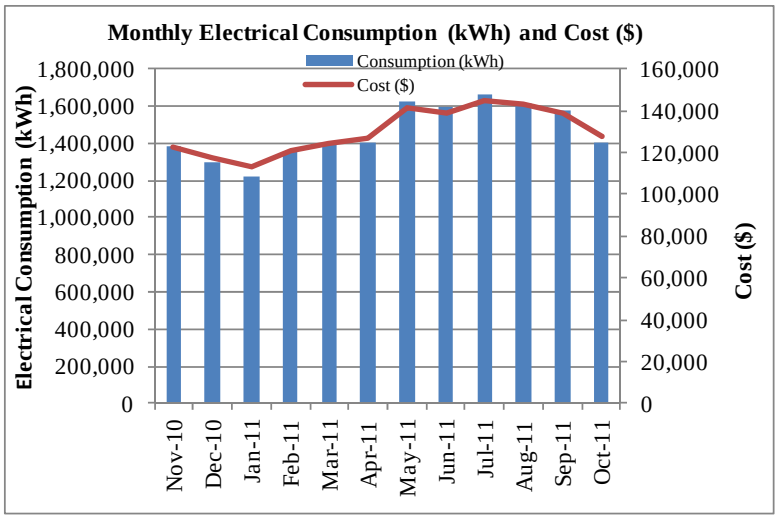
APPENDIX B

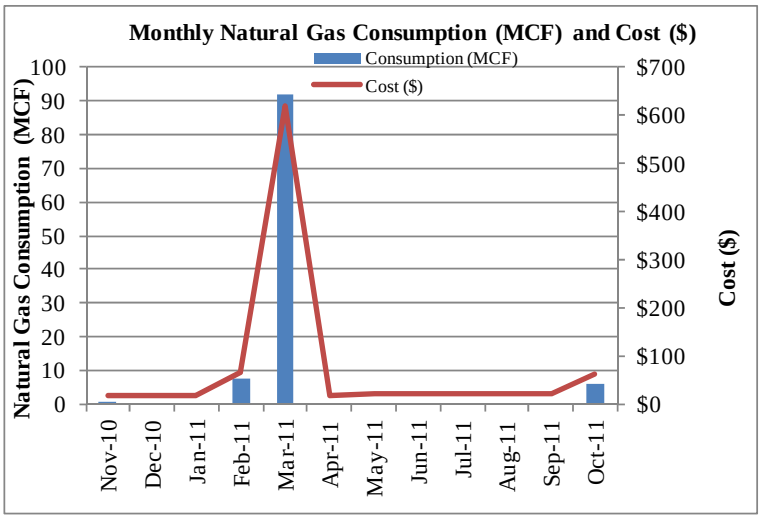
SAMPLE UTILITY DATA REPORTING FORM

City of Laredo - Sample Utility Input Form

MONTH	ELECTRICITY			NATURAL GAS		
	KWH	COST $	Avg. Rate $/KWH	MCF	COST $	Avg. Rate $/MCF
Nov-10	1,384,560	122,755	$0.0887	0	$19	-
Dec-10	1,296,046	117,749	$0.0909	0	$16	-
Jan-11	1,219,020	113,327	$0.0930	0	$16	-
Feb-11	1,355,962	121,309	$0.0895	8	$65	$8.7
Mar-11	1,390,033	124,462	$0.0895	92	$621	$6.7
Apr-11	1,403,054	126,787	$0.0904	0	$17	-
May-11	1,628,583	141,435	$0.0868	0	$21	-
Jun-11	1,598,214	138,949	$0.0869	0	$21	-
Jul-11	1,661,511	144,388	$0.0869	0	$21	-
Aug-11	1,614,775	143,014	$0.0886	0	$21	-
Sep-11	1,578,795	138,883	$0.0880	0	$21	-
Oct-11	1,402,835	127,513	$0.0909	6	$64	$10.6
Total	17,533,388	$1,560,572	$0.0890	106	$923	$8.7

Gross Building Area:	697,000	SF





APPENDIX C

BASE YEAR CONSUMPTION HISTORY

Energy Cost and Consumption Benchmarks														
		Electric				Natural Gas				Total	Total	EUI	ECI	
	Building	kWh/Yr	MMBTU/Yr	kWh/SF	$Cost/Yr	MCF/Yr	MMBTU/Yr	MCF/kSF	$Cost/Yr	$Cost/Yr	MMBTU/Y	kBTU/SF/Y	$/SF/Yr	SF
1	Civic Center	1,101,076	3,758	20.19	107,191	106	109	1.94	923	108,114	3,867	71	1.98	54,540
2	City Hall	1,438,272	4,909	34.98	123,852	0	0	0.00	0	123,852	4,909	119	3.01	41,112
3	City Hall Annex*	213,840	730	4.11	20,512	0	0	0.00	0	20,512	730	-	-	51,980
4	Utilities Building	390,144	1,332	19.04	41,746	0	0	0.00	0	41,746	1,332	65	2.04	20,496
5	Airport	3,390,480	11,572	42.82	298,870	0	0	0.00	0	298,870	11,572	146	3.77	79,186
6	Transit Building	1,192,640	4,070	10.37	98,839	0	0	0.00	0	98,839	4,070	35	0.86	115,024
7	Public Works	228,480	780	12.96	23,864	0	0	0.00	0	23,864	780	44	1.35	17,636
8	Public Works Warehouse	306,048	1,045	11.70	33,700	0	0	0.00	0	33,700	1,045	40	1.29	26,160
9	Police Station	2,129,760	7,269	35.58	176,395	0	0	0.00	0	176,395	7,269	121	2.95	59,850
10	Police Station Annex	297,120	1,014	17.91	31,055	0	0	0.00	0	31,055	1,014	61	1.87	16,592
11	Entertainment Center	1,910,100	6,519	13.83	167,456	0	0	0.00	0	167,456	6,519	47	1.21	138,073
12	Municipal Court	356,720	1,217	19.51	35,208	0	0	0.00	0	35,208	1,217	67	1.93	18,288
13	Public Library	2,052,756	7,006	35.35	175,852	0	0	0.00	0	175,852	7,006	121	3.03	58,063
		kWh/Yr	MMBTU/Yr	kWh/SF	$Cost/Yr	MCF/Yr	MMBTU/Yr	MCF/kSF	$Cost/Yr	$Cost/Yr	MMBTU/Y	kBTU/SF/Y	$/SF/Yr	SF
		15,007,436	51,220	21.53	1,334,541	106	109	0.00	923	1,335,464	51,329	74	1.92	697,000

*City Hall Annex has been occupied by City staff for 4 months of this billing period. Data only includes July 2011 - October 2011.

WWTP - Energy Cost and Consumption Benchmarks							
	Electric[1]			Design Capacity (MGD)	Average Effluent Flow (MGD)	EUI[3]	ECI[4]
	kWh/Yr	kBtu/Yr[2]	$Cost/Yr			kBtu/GPD/Yr	$/MGD/Yr
Zacate Creek WWTP	6,048,000	20,635,776	$539,123	14.0	9.96	2.1	$54,129

1. Electric consumption for WWTP is based on electric meters serving the main processing facility and does not account for other usage (i.e. lift stations, irrigation, etc.) which may be metered separately.
2. Electric consumption conversion based on 3.412 kBtu/kWh.
3. Energy Use Index (EUI) calculated based annual kBtu divided by the Average Effluent Flow in gallons per day (GPD).
4. Energy Cost Index (ECI) calculated based on annual energy cost divided by the Average Effluent Flow in million gallons per day (MGD).

District: City of Laredo

ACCOUNT# 10032789400254860 10032789416476901 Electric

2955493 Gas

BUILDING: Civic Center

FLOOR AREA: 54,540 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	58,937		420		6,900	0	19
Dec	2010	50,743		364		6,058	0	16
Jan	2011	42,693		364		5,530	0	16
Feb	2011	68,547		364		7,175	8	65
Mar	2011	68,374		364		7,158	92	621
Apr	2011	98,743		379		9,194	0	17
May	2011	153,440		450		13,129	0	21
Jun	2011	124,411		464		11,391	0	21
Jul	2011	152,948		440		13,030	0	21
Aug	2011	110,880		497		10,710	0	21
Sep	2011	97,920		399		9,233	0	21
Oct	2011	73,440		399		7,684	6	64
TOTAL		1,101,076				107,191	105.9	923

Annual Total Energy Cost = 108,114 $/year

Total KWH/yr x 0.003413 = 3,757.97 MMBTU/year

Total MCF/yr x 1.03 = 109.08 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 3,867 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 71 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.98 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789400535111 Electric

Gas

BUILDING: City Hall

FLOOR AREA: 41,112 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	102,336		297		9,123	0	0
Dec	2010	113,472		316		10,023	0	0
Jan	2011	97,920		292		8,879	0	0
Feb	2011	102,144		264		8,974	0	0
Mar	2011	120,576		328		10,579	0	0
Apr	2011	123,456		331		10,777	0	0
May	2011	133,632		306		11,245	0	0
Jun	2011	137,088		304		11,450	0	0
Jul	2011	136,320		302		11,390	0	0
Aug	2011	129,984		284		10,872	0	0
Sep	2011	125,184		300		10,676	0	0
Oct	2011	116,160		264		9,864	0	0
TOTAL		1,438,272				123,852	0.0	0

Annual Total Energy Cost = 123,852 $/year

Total KWH/yr x 0.003413 = 4,908.82 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 4,909 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 119 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 3.01 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789478557579 Electric

Gas

BUILDING: City Hall Annex* FLOOR AREA: 51,980 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	0		0		0	0	0
Dec	2010	0		0		0	0	0
Jan	2011	0		0		0	0	0
Feb	2011	0		0		0	0	0
Mar	2011	0		0		0	0	0
Apr	2011	0		0		0	0	0
May	2011	0		0		0	0	0
Jun	2011	0		0		0	0	0
Jul	2011	36,000		148		3,475	0	0
Aug	2011	46,800		168		4,424	0	0
Sep	2011	59,760		234		5,812	0	0
Oct	2011	71,280		264		6,801	0	0
TOTAL		213,840				20,512	0.0	0

*City Hall Annex has been occupied by City staff for 4 months of this billing period. Data only includes July 2011 - October 2011.

Annual Total Energy Cost = 20,512 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 14 kBTU/SF/year

Total KWH/yr x 0.003413 = 729.84 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 730 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 0.39 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789454918391 Electric

Gas

BUILDING: Utilities Building

FLOOR AREA: 20,496 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	27,840		98		2,957	0	0
Dec	2010	24,768		118		2,791	0	0
Jan	2011	29,952		148		3,415	0	0
Feb	2011	27,264		119		2,988	0	0
Mar	2011	30,528		119		3,299	0	0
Apr	2011	31,680		119		3,401	0	0
May	2011	36,864		119		3,853	0	0
Jun	2011	39,552		119		4,092	0	0
Jul	2011	42,624		119		4,369	0	0
Aug	2011	38,016		119		3,980	0	0
Sep	2011	35,136		119		3,719	0	0
Oct	2011	25,920		119		2,883	0	0
TOTAL		390,144				41,746	0.0	0

Annual Total Energy Cost = 41,746 $/year

Total KWH/yr x 0.003413 = 1,331.56 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 1,332 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 65 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 2.04 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789467536060 Electric

Gas

BUILDING: Airport

FLOOR AREA: 79,186 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	237,600		801		21,776	0	0
Dec	2010	204,480		801		19,853	0	0
Jan	2011	224,640		801		21,139	0	0
Feb	2011	244,080		801		22,407	0	0
Mar	2011	287,280		801		25,145	0	0
Apr	2011	294,480		935		26,510	0	0
May	2011	344,160		889		29,320	0	0
Jun	2011	367,920		805		30,258	0	0
Jul	2011	333,360		780		27,900	0	0
Aug	2011	326,880		874		28,126	0	0
Sep	2011	298,080		748		25,452	0	0
Oct	2011	227,520		748		20,984	0	0
TOTAL		3,390,480		9786		298,870	0.0	0

Annual Total Energy Cost = 298,870 $/year

Total KWH/yr x 0.003413 = 11,571.71 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 11,572 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 146 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 3.77 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789497934011 Electric

Gas

BUILDING: Transit Building

FLOOR AREA: 115,024 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	94,720		229		7,957	0	0
Dec	2010	93,040		227		7,839	0	0
Jan	2011	78,080		204		6,697	0	0
Feb	2011	105,760		236		8,749	0	0
Mar	2011	101,360		209		8,237	0	0
Apr	2011	99,520		235		8,347	0	0
May	2011	105,280		235		8,705	0	0
Jun	2011	107,040		241		8,864	0	0
Jul	2011	108,480		234		8,894	0	0
Aug	2011	105,600		233		8,704	0	0
Sep	2011	104,640		220		8,534	0	0
Oct	2011	89,120		193		7,312	0	0
TOTAL		1,192,640		2695		98,839	0.0	0

Annual Total Energy Cost = 98,839 $/year

Total KWH/yr x 0.003413 = 4,070.48 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 4,070 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 35 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 0.86 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789439411280 Electric

Gas

BUILDING: Public Works

FLOOR AREA: 17,636 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	17,088		60		1,797	0	0
Dec	2010	24,768		73		2,563	0	0
Jan	2011	28,416		71		2,886	0	0
Feb	2011	19,584		59		2,030	0	0
Mar	2011	16,896		59		1,783	0	0
Apr	2011	16,512		59		1,751	0	0
May	2011	17,856		59		1,866	0	0
Jun	2011	18,432		59		1,917	0	0
Jul	2011	18,816		59		1,950	0	0
Aug	2011	17,088		59		1,803	0	0
Sep	2011	17,280		59		1,822	0	0
Oct	2011	15,744		59		1,696	0	0
TOTAL		228,480		732		23,864	0.0	0

Annual Total Energy Cost = 23,864 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 44 kBTU/SF/year

Total KWH/yr x 0.003413 = 779.80 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 780 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.35 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789443706381 Electric

Gas

BUILDING: Public Works Warehouse

FLOOR AREA: 26,160 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	22,848		85		2,442	0	0
Dec	2010	20,928		85		2,277	0	0
Jan	2011	24,192		140		2,866	0	0
Feb	2011	20,544		112		2,351	0	0
Mar	2011	26,880		112		2,926	0	0
Apr	2011	24,768		112		2,741	0	0
May	2011	28,800		112		3,101	0	0
Jun	2011	28,608		112		3,107	0	0
Jul	2011	29,376		112		3,174	0	0
Aug	2011	26,688		112		2,937	0	0
Sep	2011	29,760		112		3,204	0	0
Oct	2011	22,656		112		2,574	0	0
TOTAL		306,048		1320		33,700	0.0	0

Annual Total Energy Cost = 33,700 $/year

Total KWH/yr x 0.003413 = 1,044.54 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 1,045 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 40 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.29 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789439063121 Electric

Gas

BUILDING: Police Station

FLOOR AREA: 59,850 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	149,760		339		12,349	0	0
Dec	2010	120,960		339		10,499	0	0
Jan	2011	130,320		347		11,218	0	0
Feb	2011	160,560		356		13,255	0	0
Mar	2011	182,880		415		15,176	0	0
Apr	2011	182,880		423		15,245	0	0
May	2011	205,200		428		16,683	0	0
Jun	2011	216,720		436		17,486	0	0
Jul	2011	216,000		442		17,490	0	0
Aug	2011	214,560		444		17,410	0	0
Sep	2011	203,040		431		16,570	0	0
Oct	2011	146,880		431		13,015	0	0
TOTAL		2,129,760		4832		176,395	0.0	0

Annual Total Energy Cost = 176,395 $/year

Total KWH/yr x 0.003413 = 7,268.87 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 7,269 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 121 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 2.95 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789441390012 Electric

Gas

BUILDING: Police Station Annex

FLOOR AREA: 16,592 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	15,680		65		1,719	0	0
Dec	2010	15,680		77		1,784	0	0
Jan	2011	20,800		84		2,279	0	0
Feb	2011	20,000		68		2,137	0	0
Mar	2011	24,640		75		2,580	0	0
Apr	2011	25,600		79		2,687	0	0
May	2011	31,520		79		3,206	0	0
Jun	2011	35,680		67		3,503	0	0
Jul	2011	35,520		80		3,566	0	0
Aug	2011	30,720		75		3,137	0	0
Sep	2011	25,600		76		2,687	0	0
Oct	2011	15,680		69		1,771	0	0
TOTAL		297,120		892		31,055	0.0	0

Annual Total Energy Cost = 31,055 $/year

Total KWH/yr x 0.003413 = 1,014.07 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 1,014 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 61 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.87 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789481362716 Electric

Gas

BUILDING: Entertainment Center

FLOOR AREA: 138,073 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	222,000		589		18,399	0	0
Dec	2010	226,800		584		18,623	0	0
Jan	2011	186,000		595		16,121	0	0
Feb	2011	204,000		565		17,064	0	0
Mar	2011	156,900		564		14,072	0	0
Apr	2011	118,800		476		11,059	0	0
May	2011	133,200		476		11,963	0	0
Jun	2011	110,100		476		10,501	0	0
Jul	2011	109,500		476		10,463	0	0
Aug	2011	106,800		476		10,274	0	0
Sep	2011	147,300		476		12,838	0	0
Oct	2011	188,700		568		16,079	0	0
TOTAL		1,910,100		6323		167,456	0.0	0

Annual Total Energy Cost = 167,456 $/year

Total KWH/yr x 0.003413 = 6,519.17 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 6,519 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 47 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.21 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789452719718 Electric

Gas

BUILDING: Municipal Court

FLOOR AREA: 18,288 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	18,880		116		2,202	0	0
Dec	2010	21,360		131		2,483	0	0
Jan	2011	24,960		130		2,706	0	0
Feb	2011	23,440		105		2,387	0	0
Mar	2011	30,000		123		2,977	0	0
Apr	2011	30,800		122		3,023	0	0
May	2011	39,040		127		3,585	0	0
Jun	2011	40,720		127		3,691	0	0
Jul	2011	41,440		129		3,754	0	0
Aug	2011	36,400		118		3,340	0	0
Sep	2011	30,320		116		2,932	0	0
Oct	2011	19,360		105		2,130	0	0
TOTAL		356,720		1450		35,208	0.0	0

Annual Total Energy Cost = 35,208 $/year

Total KWH/yr x 0.003413 = 1,217.49 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 1,217 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 67 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.93 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789496424580 10032789426193910 Electric

Gas

BUILDING: Public Library

FLOOR AREA: 58,063 estimated

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	210,279		395		16,866	0	0
Dec	2010	161,319		395		13,768	0	0
Jan	2011	142,887		395		12,583	0	0
Feb	2011	153,831		395		13,335	0	0
Mar	2011	152,487		395		13,282	0	0
Apr	2011	153,447		462		13,918	0	0
May	2011	188,007		421		15,744	0	0
Jun	2011	189,159		435		15,938	0	0
Jul	2011	191,079		440		16,099	0	0
Aug	2011	170,151		440		14,777	0	0
Sep	2011	180,519		440		15,433	0	0
Oct	2011	159,591		440		14,108	0	0
TOTAL		2,052,756		5054		175,852	0.0	0

Annual Total Energy Cost = 175,852 $/year

Total KWH/yr x 0.003413 = 7,006.06 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 7,006 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 121 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 3.03 $/SF/year

Electric Utility: AEP/Just Energy

Gas Utility: N/A

District: City of Laredo

ACCOUNT# 10032789409660210 10032789459443080 Electric

Gas

BUILDING: Zacate Creek WWTP

FLOOR AREA:

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
Nov	2010	480,192		788		42,373	0	0
Dec	2010	503,424		785		44,302	0	0
Jan	2011	427,584		792		38,624	0	0
Feb	2011	464,448		785		41,609	0	0
Mar	2011	432,192		780		38,987	0	0
Apr	2011	450,816		776		40,479	0	0
May	2011	474,048		788		42,363	0	0
Jun	2011	493,824		977		44,604	0	0
Jul	2011	557,376		922		49,541	0	0
Aug	2011	629,376		951		55,405	0	0
Sep	2011	559,104		924		49,656	0	0
Oct	2011	575,616		981		51,181	0	0
TOTAL		6,048,000		10249		539,123	0.0	0

Annual Total Energy Cost = 539,123 $/year

Total KWH/yr x 0.003413 = 20,641.82 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x_____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 20,642 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = #DIV/0! kBTU/SF/year

Energy Cost Index:

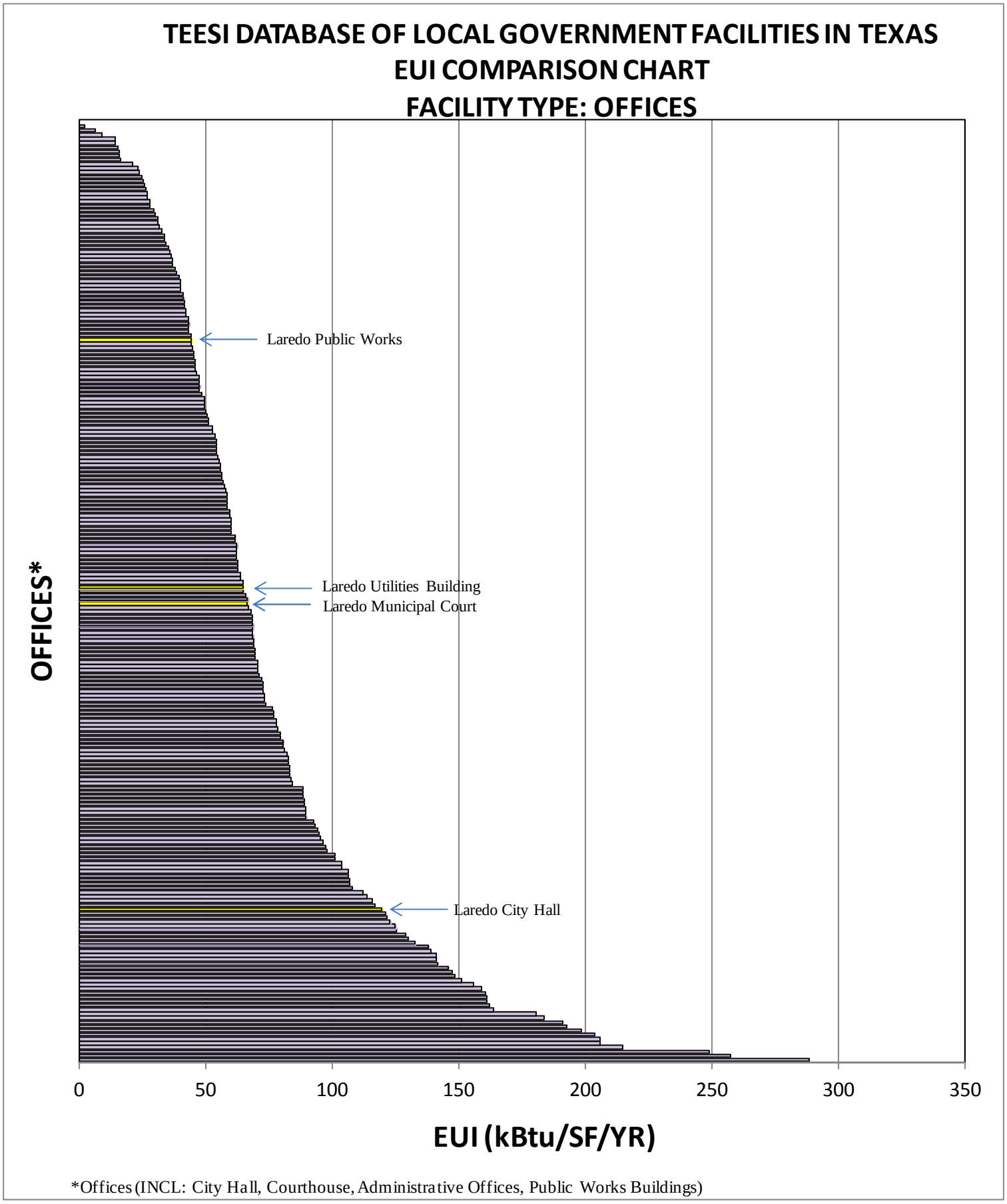
Total Energy Cost/Yr ÷ Total Area (SF) = #DIV/0! $/SF/year

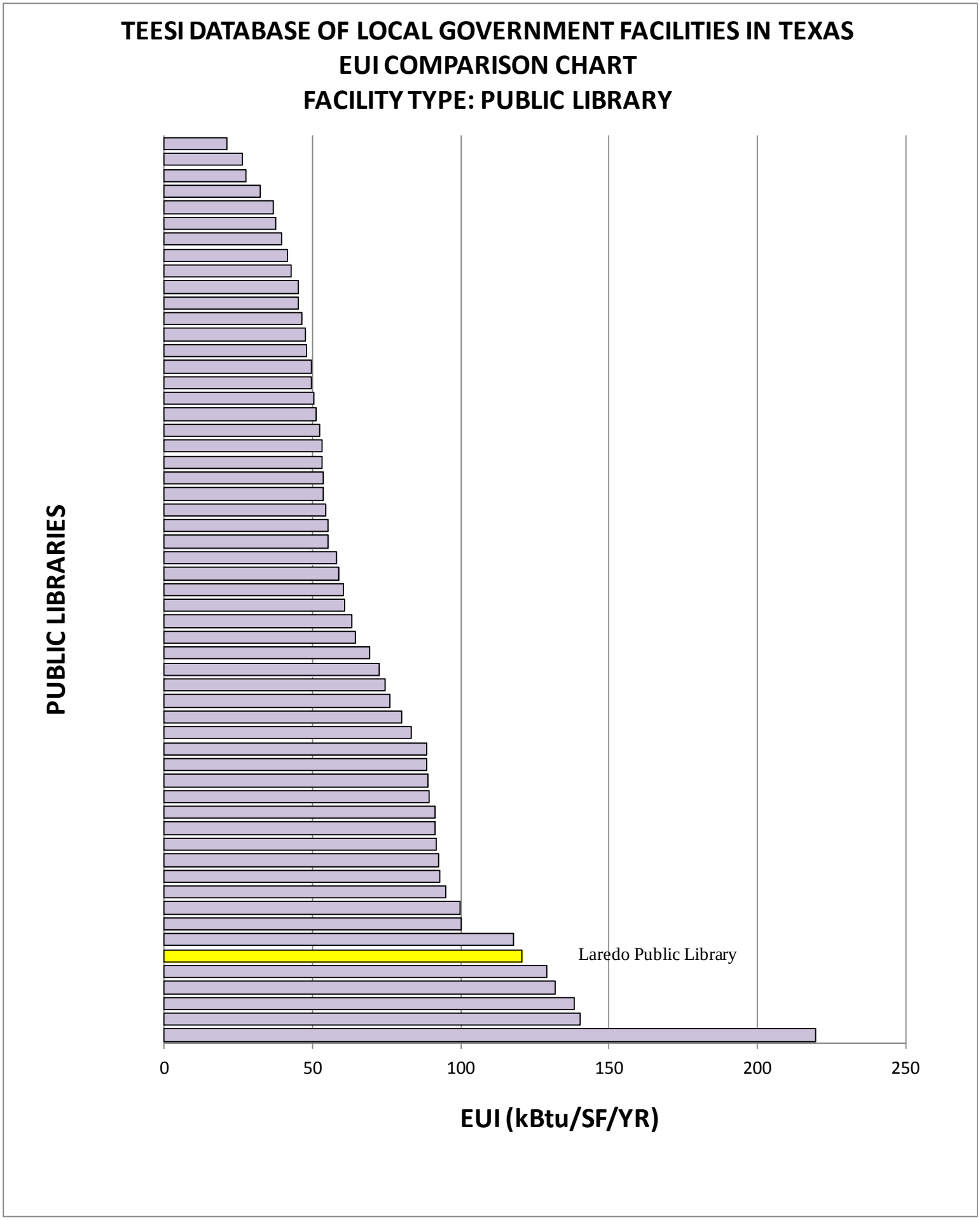
Electric Utility: AEP/Just Energy

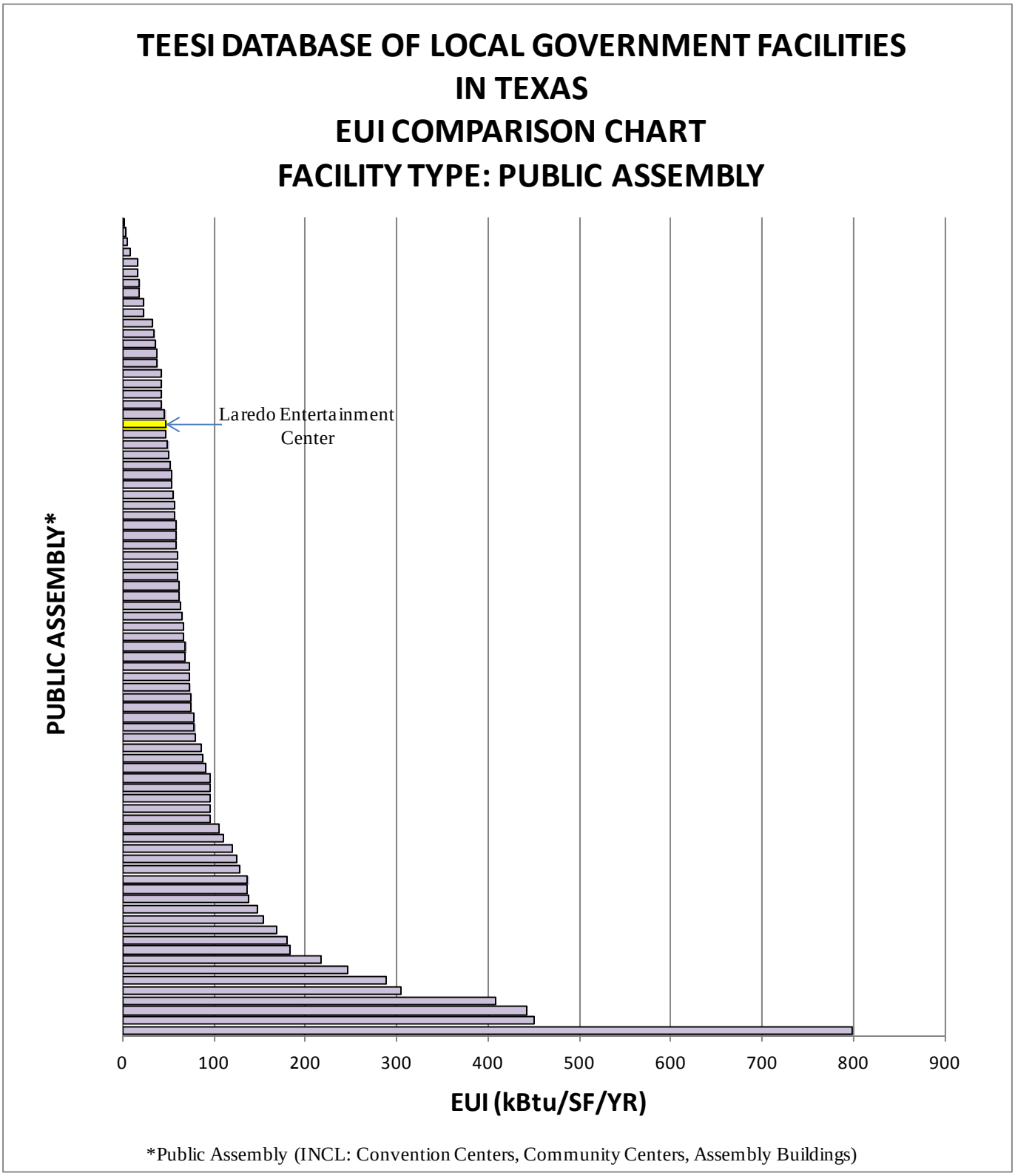
Gas Utility: N/A

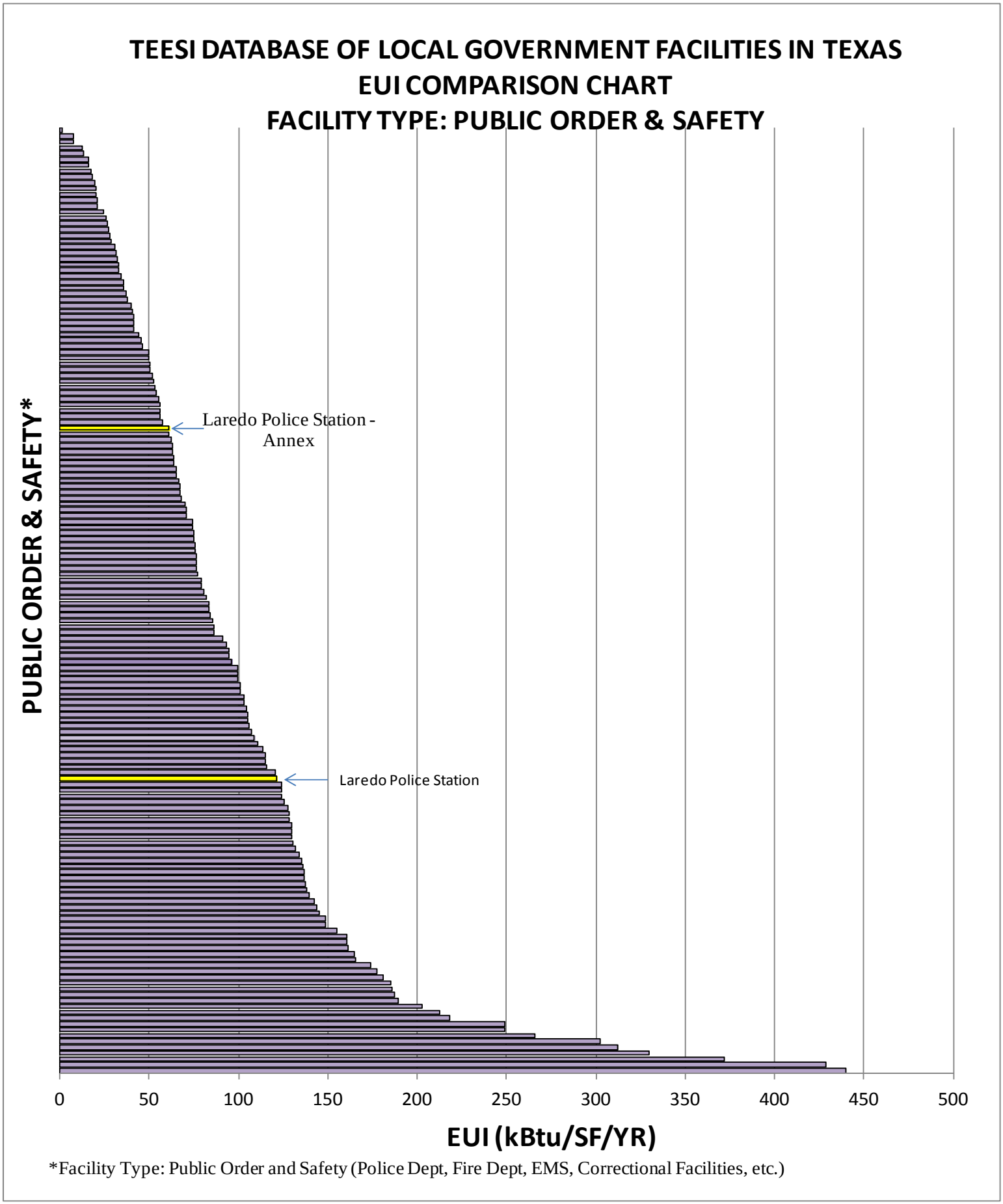
APPENDIX D

ENERGY PERFORMANCE COMPARISON CHARTS

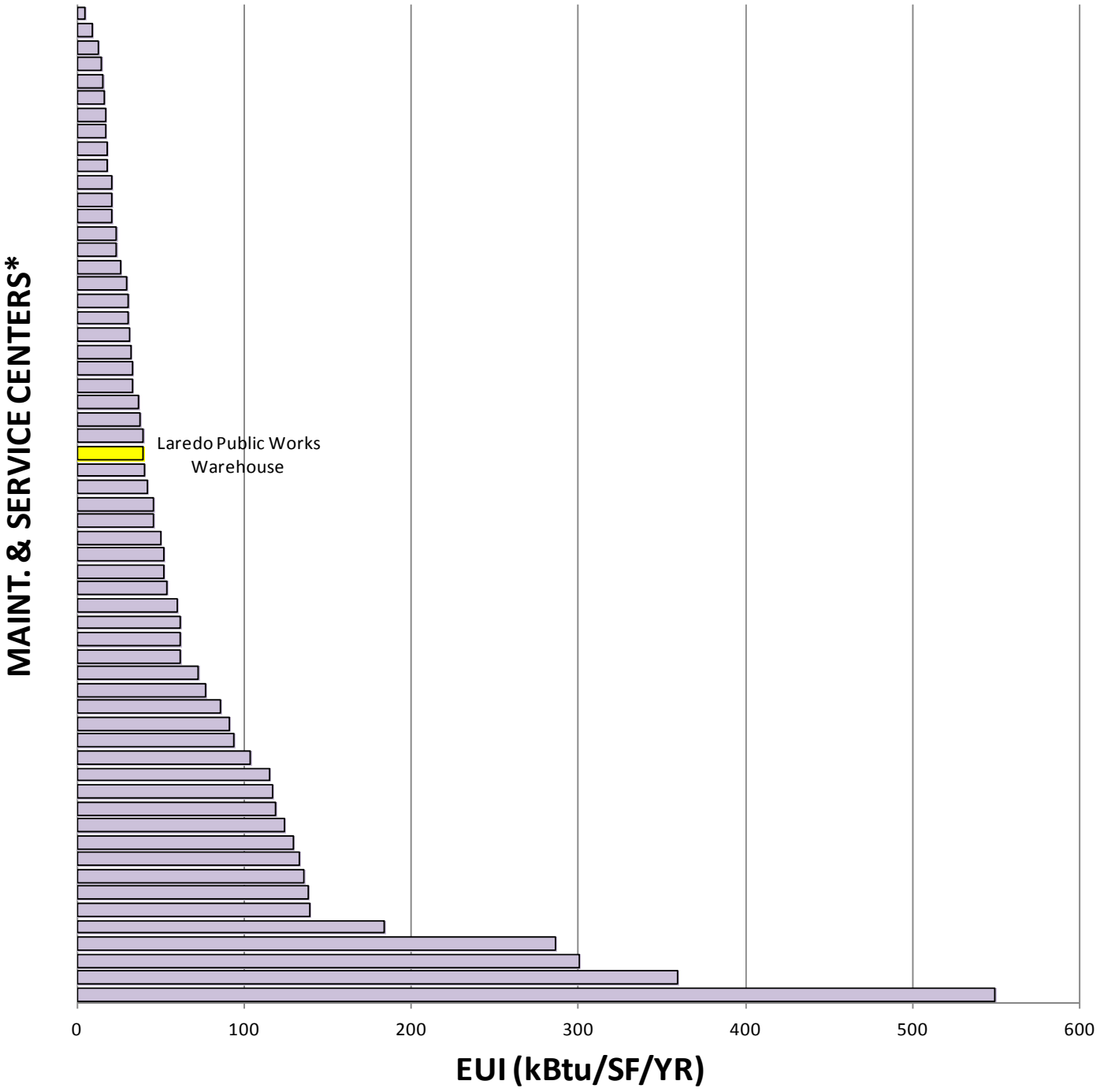

TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: OFFICES
OFFICES*
Laredo Public Works
Laredo Utilities Building
Laredo Municipal Court
Laredo City Hall
0
50
100
150
200
250
300
350
EUI (kBtu/SF/YR)
*Offices (INCL: City Hall, Courthouse, Administrative Offices, Public Works Buildings)


TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: PUBLIC LIBRARY
PUBLIC LIBRARIES
Laredo Public Library
0
50
100
150
200
250
EUI (kBtu/SF/YR)

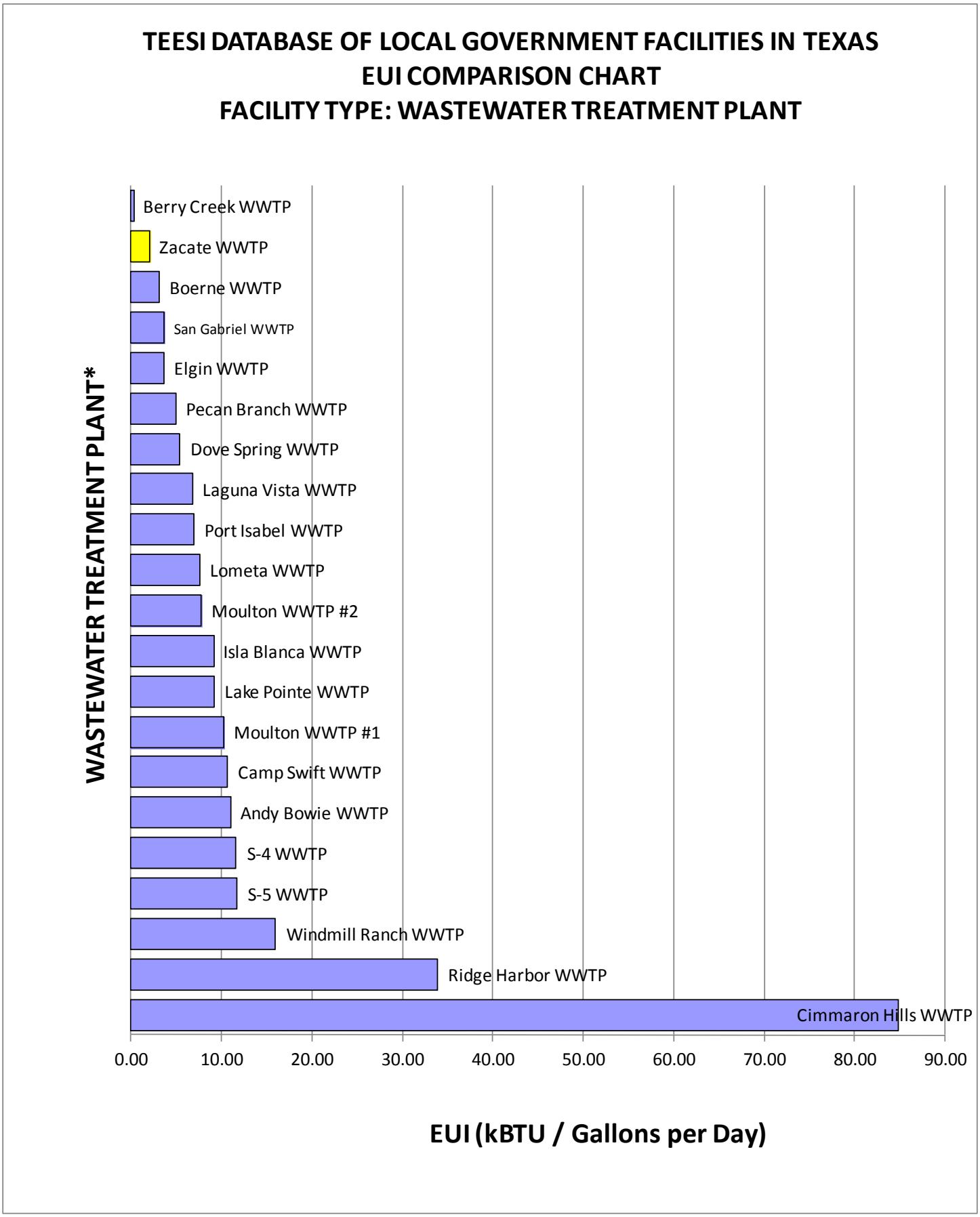

TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES
IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: PUBLIC ASSEMBLY
Laredo Entertainment Center
PUBLIC ASSEMBLY*
0
100
200
300
400
500
600
700
800
900
EUI (kBtu/SF/YR)
*Public Assembly (INCL: Convention Centers, Community Centers, Assembly Buildings)


TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: PUBLIC ORDER & SAFETY
PUBLIC ORDER & SAFETY*
Laredo Police Station - Annex
Laredo Police Station
0
50
100
150
200
250
300
350
400
450
500
EUI (kBtu/SF/YR)
*Facility Type: Public Order and Safety (Police Dept, Fire Dept, EMS, Correctional Facilities, etc.)

TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: MAINT. & SERVICE CENTER



*Maint. And Service Centers (Service Center, Maint Bldg, Warehouses, etc)


TEESI DATABASE OF LOCAL GOVERNMENT FACILITIES IN TEXAS
EUI COMPARISON CHART
FACILITY TYPE: WASTEWATER TREATMENT PLANT
WASTEWATER TREATMENT PLANT*
Berry Creek WWTP
Zacate WWTP
Boerne WWTP
San Gabriel WWTP
Elgin WWTP
Pecan Branch WWTP
Dove Spring WWTP
Laguna Vista WWTP
Port Isabel WWTP
Lometa WWTP
Moulton WWTP #2
Isla Blanca WWTP
Lake Pointe WWTP
Moulton WWTP #1
Camp Swift WWTP
Andy Bowie WWTP
S-4 WWTP
S-5 WWTP
Windmill Ranch WWTP
Ridge Harbor WWTP
Cimmaron Hills WWTP
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
EUI (kBTU / Gallons per Day)

APPENDIX E

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Boilers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Boiler use/sequencing	Turn off/sequence unnecessary boilers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Follow manufacturer's recommended procedures in lubricating all components	Compare temperatures with tests performed after annual cleaning	X			
Check steam pressure	Is variation in steam pressure as expected under different loads? Wet steam may be produced if the pressure drops too fast	X			
Check unstable water level	Unstable levels can be a sign of contaminates in feedwater, overloading of boiler, equipment malfunction	X			
Check burner	Check for proper control and cleanliness	X			
Check motor condition temperatures	Check for proper function	X			
Check air temperatures in boiler room	Temperatures should not exceed or drop below design limits	X			
Boiler blowdown	Verify the bottom, surface and water column blow downs are occurring and are effective	X			
Boiler logs	Keep daily logs on: • Type and amount of fuel used • Flue gas temperature • Makeup water volume • Steam pressure, temperature, and amount generated Look for variations as a method of fault detection	X			
Check oil filter assemblies	Check and clean/replace oil filters and strainers	X			
Inspect oil heaters	Check to ensure that oil is at proper temperature prior to burning	X			
Check boiler water treatment	Confirm water treatment system is functioning properly	X			
Check flue gas temperatures and composition	Measure flue gas composition and temperatures at selected firing positions - recommended O2% and CO2% Fuel / O2 % / CO2% Natural gas / 1.5 / 10 No. 2 fuel oil / 2.0 / 11.5 No. 6 fuel oil / 2.5 / 12.5 Note: percentages may vary due to fuel composition variations		X		

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Check all relief valves	Check for leaks		X		
Check water level control	Stop feedwater pump and allow control to stop fuel flow to burner. Do not allow water level to drop below recommended level.		X		
Check pilot and burner assemblies	Clean pilot and burner following manufacturer's guidelines. Examine for mineral or corrosion buildup.		X		
Check boiler operating characteristics	Stop fuel flow and observe flame failure. Start boiler and observe characteristics of flame.		X		
Inspect system for water/ steam leaks and leakage opportunities	Look for: leaks, defective valves and traps, corroded piping, condition of insulation		X		
Inspect all linkages on combustion air dampers and fuel valves	Check for proper setting and tightness		X		
Inspect boiler for air leaks	Check damper seals		X		
Check blowdown and water treatment procedures	Determine if blowdown is adequate to prevent solids buildup			X	
Flue gases	Measure and compare last month's readings flue gas composition over entire firing range			X	
Combustion air supply	Check combustion air inlet to boiler room and boiler to make sure openings are adequate and clean			X	
Check fuel system	Check pressure gauge, pumps, filters and transfer lines. Clean filters as required.			X	
Check belts and packing glands	Check belts for proper tension. Check packing glands for compression leakage.			X	
Check for air leaks	Check for air leaks around access openings and flame scanner assembly.			X	
Check all blower belts	Check for tightness and minimum slippage.			X	
Check all gaskets	Check gaskets for tight sealing, replace if do not provide tight seal			X	
Inspect boiler insulation	Inspect all boiler insulation and casings for hot spots			X	
Steam control valves	Calibrate steam control valves as specified by manufacturer			X	
Pressure reducing/regulating valves	Check for proper operation			X	

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Perform water quality test	Check water quality for proper chemical balance			X	
Clean waterside surfaces	Follow manufacturer's recommendation on cleaning and preparing waterside surfaces				X
Clean fireside	Follow manufacturer's recommendation on cleaning and preparing fireside surfaces				X
Inspect and repair refractories on fireside	Use recommended material and procedures				X
Relief valve	Remove and recondition or replace				X
Feedwater system	Clean and recondition feedwater pumps. Clean condensate receivers and deaeration system				X
Fuel system	Clean and recondition system pumps, filters, pilot, oil preheaters, oil storage tanks, etc.				X
Electrical systems	Clean all electrical terminals. Check electronic controls and replace any defective parts.				X
Hydraulic and pneumatic valves	Check operation and repair as necessary				X
Flue gases	Make adjustments to give optimal flue gas composition. Record composition, firing position, and temperature.				X
Eddy current test	As required, conduct eddy current test to assess tube wall thickness				X

Chillers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Chiller use/sequencing	Turn off/sequence unnecessary chillers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check setpoints	Check all setpoints for proper setting and function	X			
Evaporator and condenser coil fouling	Assess evaporator and condenser coil fouling as required		X		
Compressor motor temperature	Check temperature per manufacturer's specifications		X		
Perform water quality test	Check water quality for proper chemical balance		X		
Leak testing	Conduct leak testing on all compressor fittings, oil pump joints and fittings, and relief valves		X		
Check all insulation	Check insulation for condition and appropriateness		X		
Control operation	Verify proper control function including: • Hot gas bypass • Liquid injection		X		
Check vane control settings	Check settings per manufacturer's specification			X	
Verify motor load limit control	Check settings per manufacturer's specification			X	
Verify load balance operation	Check settings per manufacturer's specification			X	
Check chilled water reset settings and function	Check settings per manufacturer's specification			X	
Check chiller lockout setpoint	Check settings per manufacturer's specification				X
Clean condenser tubes	Clean tubes at least annually as part of shutdown procedure				X

Building Controls Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Verify control schedules	Verify in control software that schedules are accurate for season, occupancy, etc.	X			
Verify setpoints	Verify in control software that setpoints are accurate for season, occupancy, etc.	X			
Time clocks	Reset after every power outage	X			
Check all gauges	Check all gauges to make sure readings are as expected		X		
Control tubing (pneumatic system)	Check all control tubing for leaks		X		
Check outside air volumes	Calculated the amount of outside air introduced and compare to requirements		X		
Check setpoints	Check setpoints and review rational for setting		X		
Check schedules	Check schedules and review rational for setting		X		
Check deadbands	Assure that all deadbands are accurate and the only simultaneous heating and cooling is by design		X		
Check sensors	Conduct thorough check of all sensors - temperature, pressure, humidity, flow, etc. - for expected values			X	
Time clocks	Check for accuracy and clean			X	
Calibrate sensors	Calibrate all sensors: temperature, pressure, humidity, flow, etc.				X

Pumps Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Pump use/sequencing	Turn off/sequence unnecessary pumps	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor/pump alignment	Aligning the pump/motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all pump mountings			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X

Fans Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
System use/sequencing	Turn off/sequence unnecessary equipment	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Observe belts	Verify proper belt tension and alignment			X	
Inspect pulley wheels	Clean and lubricate where required			X	
Inspect dampers	Confirm proper and complete closure control; outside air dampers should be airtight when closed			X	
Observe actuator/linkage control	Verify operation, clean, lubricate, adjust as needed			X	
Check fan blades	Validate proper rotation and clean when necessary			X	
Filters	Check for gaps, replace when dirty - monthly			X	
Check for air quality anomalies	Inspect for moisture/growth on walls, ceilings, carpets, and in/outside of duct-work. Check for musty smells and listen to complaints.			X	
Check wiring	Verify all electrical connections are tight				X
Inspect ductwork	Check and refasten loose connections, repair all leaks				X
Coils	Confirm that filters have kept clean, clean as necessary				X
Insulation	Inspect, repair, replace all compromised duct insulation				X

Electric Motors Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Motor use/sequencing	Turn off/sequence unnecessary motors	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Motor condition	Check the condition of the motor through temperature or vibration analysis and compare to baseline values		X		
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor alignment	Aligning the motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all motor mountings			X	
Check terminal tightness	Tighten connection terminals as necessary			X	
Cleaning	Remove dust and dirt from motor to facilitate cooling			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X
Check for balanced three-phase power	Unbalanced power can shorten the motor life through excessive heat build up				X
Check for over-voltage or under-voltage conditions	Over- or under-voltage situations can shorten the motor life through excessive heat build up				X

APPENDIX F

LOANSTAR INFORMATION

Texas LoanSTAR Program

FACTS ABOUT LoanSTAR

The State of Texas LoanSTAR (Saving Taxes and Resources) Program finances energy efficient facility up-grades for state agencies, public schools, institutions of higher education, local governments, municipalities, and hospitals. The program's revolving loan mechanism allows participants to borrow money and repay all project costs through the stream of **cost savings** produced.

ELIGIBLE PROJECTS

Up-grades financed through the program include, but are not limited to, (1) energy efficient lighting systems; (2) high efficiency heating, ventilation and air conditioning systems; (3) energy management systems; (4) boiler efficiency improvements; (5) energy recovery systems; (6) building shell improvements; and (7) load management projects. The prospective borrower hires a Professional Engineer to analyze the potential energy efficient projects that will be submitted for funding through the Loan STAR Program. All engineering costs are covered under the program.

PROGRAM REQUIREMENTS

Once the projects are analyzed and the prospective borrower agrees with the recommended projects, the engineer prepares an Energy Assessment Report (EAR) with the project descriptions and calculations. The EAR must be prepared according to the LoanSTAR Technical Guidelines. The EAR is reviewed and approved by the State Energy Conservation Office (SECO) technical staff before project financing is authorized. Projects financed by LoanSTAR must have an average simple payback of ten years or less. Borrowers do, however, have the option of buying down paybacks to meet the composite ten-year limit.

To ensure up-grade projects are designed and constructed according to the EAR, SECO performs a review of the design documents at the 50% and 100% completion phases. On-site construction monitoring is also performed at the 50% and 100% completion phases.

SAVINGS VERIFICATION

To ensure that the Borrower is achieving the estimated energy savings, monitoring and verification is required for all LoanSTAR funded projects. The level of monitoring and verifications may range from utility bill analysis to individual system or whole building metering depending on the size and type of retrofit projects. If whole building metering is required, metering and monitoring cost can be rolled into the loan.

For additional information regarding the
LoanSTAR program, please contact:

Eddy Trevino
SECO, LoanSTAR Program Manager
(512) 463-1876

APPENDIX G

BUILDING COMMISSIONING INFORMATION

BUILDING COMMISSIONING GENERAL INFORMATION

Commissioning is common in all types of building systems, including heating, ventilating, and air-conditioning (HVAC), lighting, electric, and safety controls such as fire protection and security.

Commissioning is available in many forms, the first of which is new construction commissioning. This type aims to construct a facility that obtains the performance and operation requirements of its occupants and owner, and begins during the pre-design portion of the project. If it is comprehensive commissioning, the process starts with the criteria for the facility's functionality, and constantly verifies this in all parts of the facility's creation, including design, construction, and building operation. Construction phase commissioning occurs when the Owner does not include commissioning requirements in the original design, and begins when construction is already underway.

The second form is existing building commissioning, which is identified by two types. Retro-commissioning involves buildings that have never before been commissioned, and involves documenting methods to improve the building's systems and reach the original design intentions. It is an involved process starting with obtaining utility bills, talking to the building's occupants, performing diagnostic tests on the building, and preparing the information for the owner. The second type is re-commissioning, which is different from retro-commissioning in that the building's systems have previously had commissioning performed at some point, whether in the design or construction phases. However, it is similar to retro-commissioning because it arises from system performance problems or inadequacies.

A more specific form of HVAC systems commissioning for existing building is Continuous Commissioning® (CC®). Unlike the other forms, Continuous Commissioning ensures the optimization of HVAC systems for the building's existing conditions. It also works to improve the building air quality, increase comfort levels, and resolve any operating problems. When implemented, Continuous Commissioning can decrease energy usage by 20% on average[1]. It is a joint effort between the commissioning engineers and the facility staff, and is an ongoing process that continues to both commission the building as well as train the facility staff.

All of these forms of commissioning can be used to meet several of the requirements under the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. The LEED rating system considers building commissioning to be an essential step towards sustainability. This is evident by the fact that many of the LEED rating systems (LEED-EB, LEED-NC, etc) require building commissioning as a pre-requisite.

The scope of commissioning can involve a wide range of building systems, selectable by the building owner. Mechanical systems including HVAC systems, plumbing, piping, boilers, heaters, and valves can be commissioned. Electrical systems such as lighting, transformers, and lighting control is often included, as well as other systems like fire safety, security, and standby power systems.

The costs of commissioning to the owner vary between forms, as well as from building to building. The cost per square foot (SF) of the facility to be commissioned may vary from $.40/SF to $2.00/SF. However, for typical new construction or renovation projects, the following lists the commissioning costs as percentages of each system cost.

- 2% to 3% of mechanical cost for Mechanical Systems (HVAC and controls)[2]

[1] *Continuous Commissioning Guidebook for Federal Energy Managers* (Energy Systems Laboratory at Texas A&M University)
[2] Wilkison, R. (2000) Establishing Commissioning Fees, ASHRAE Journal 42 (4): 41-47

- 1% to 2% of electrical cost for Electrical Systems[3]
- 0.5% to 1.5% of construction cost for HVAC, controls, and light electrical

There are many benefits to commissioning for the designer, the building's owner, and its occupants.

- HVAC systems simultaneously operate adequately, resulting in less expense during construction and after occupancy. Satisfied occupants also lead to increased productivity.
- Commissioning reviews decrease errors in the design phase, which ultimately reduces callbacks for the engineer.
- More efficient scheduling and design coordination reduce construction errors for the contractor, and thus reduces cost and keeps the project on schedule.
- Documentation helps prevent assumptions made during design, which reduces unnecessary expenditures.

Selecting a commissioning service provider is a vital step in the process. First, the provider should be a certified commissioning professional by an industry accepted certification body (see sample certification bodies below). Next, the owner makes a formal request of the provider's qualifications in commissioning. An independent, third party commissioning provider is mostly recommended because they can objectively perform the work using practical experience. Other requirements for the provider include documentation, communication, and organization skills. This ensures the commissioning process is performed effectively. In addition, the earlier the commissioning authority can be implemented into the facility's construction or design, the more effective the process will be.

END

[3] PECI, 2000. The National Conference of Building Commissioning Proceedings, Portland Energy Conservation Inc. OR.

APPENDIX H

ENERGY STAR PORTFOLIO MANAGER REFERENCE MATERIAL

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INTRODUCTION TO ENERGY STAR PORTFOLIO MANAGER

An entity's energy baseline can be developed using ENERGY STAR's Portfolio Manager. One of the primary reasons for using ENERGY STAR Portfolio Manager is its ability to normalize the baseline according to several key factors (i.e. Weather, Square Feet, Hours of Operation, Number of Computers, etc.). It is also a free online resource available to all registered users, and is a user-friendly web-based tool.

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). ENERGY STAR has developed Portfolio Manager, an innovative online energy management tool, designed to help organizations track and assess energy and water consumption of their facilities. Portfolio Manager helps organizations set investment priorities, identify under-performing facilities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

Portfolio Manger is also an energy performance benchmarking tool. Portfolio Manager rates a facility's energy performance on a scale of 1–100 relative to similar buildings and WWTPs nationwide. The rating system based on a statistically representative model utilizing a national survey conducted by the Department of Energy's Energy Information Administration. This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), conducted every four years gathers data on building characteristics and energy use from thousands of buildings across the United States. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of all similar facilities nationwide, while a rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

In addition, Portfolio Manager is used to generate a Statement of Energy Performance (SEP) for each facility, summarizing key energy information such as site and source energy intensity, greenhouse gas emission, energy reduction targets and energy cost. The Statement of Energy Performance is required for applying for ENERGY STAR Recognition from EPA/DOE. If ENERGY STAR recognition is pursued, the SEP will need to be verified and certified by a qualified professional.

Some facility types are not able to receive an ENERGY STAR rating. However, Portfolio Manager can still serve as a valuable tool for in tracking utility consumption and setting targets for performance of these facilities.

To develop an entity's baseline, 12 months of utility consumption, cost data, and Building Space Use information is required. The following is reference materials that explain how to input this information as well as perform other basic tasks within Portfolio Manager. For further information, please visit ENERGY STAR'S Portfolio Manager at:

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

LOGGING IN TO PORTFOLIO MANAGER

Log in to Portfolio Manager with user name and password. This will bring the user to the My Portfolio page, which includes a summary of the user's facilities.

Website: https://www.energystar.gov/istar/pmpam/

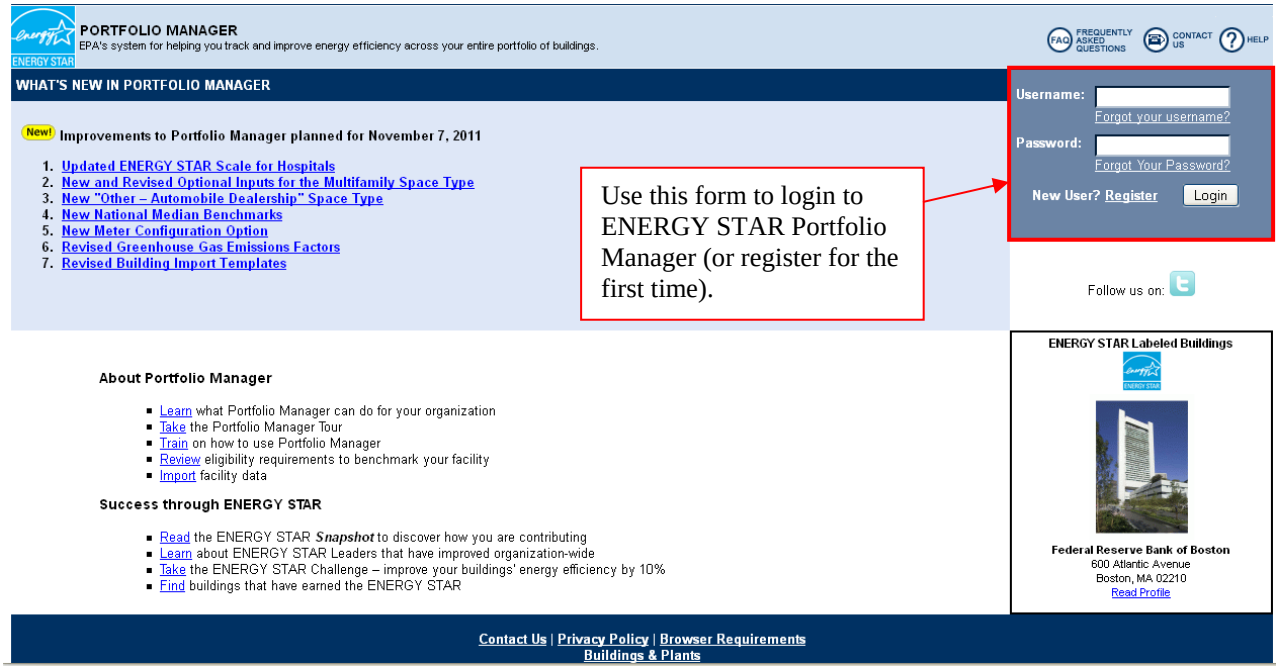


Figure 1: ENERGY STAR Portfolio Manager Homepage

ADDING A FACILITY/PROPERTY

If a facility does not already exist in Portfolio Manager, the user can use the 'Add a Property' link to create an entry in Portfolio Manager for that single facility.

Click the '*Add a Property*' selection located near the top of the main 'My Portfolio' page, as seen in Figure 2.

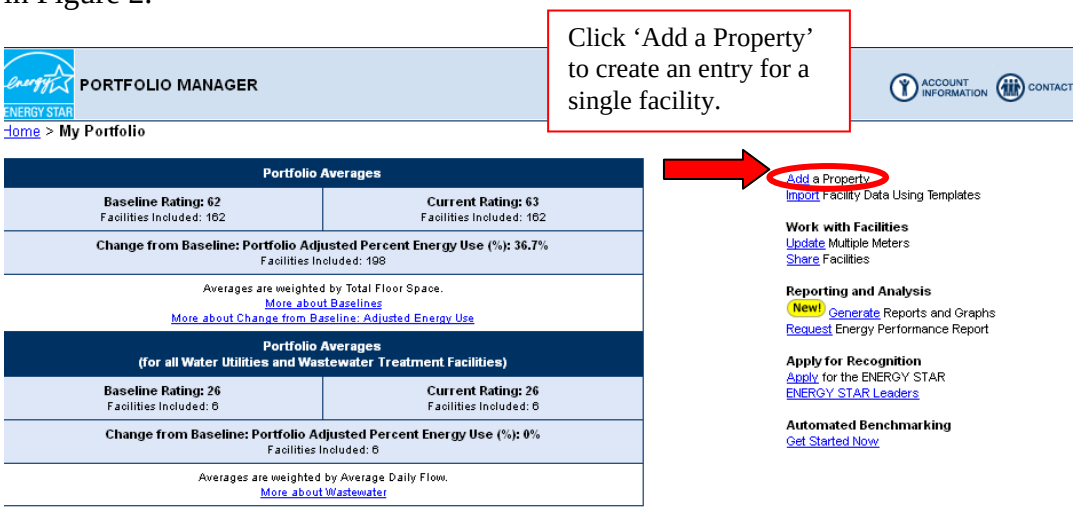


Figure 2: My Portfolio main page

In Figure 3 below, check the type of property (i.e. a single facility, wastewater treatment plant, etc.) and enter basic information about the property, including facility name, facility details, and address. Click **SAVE** when completed.

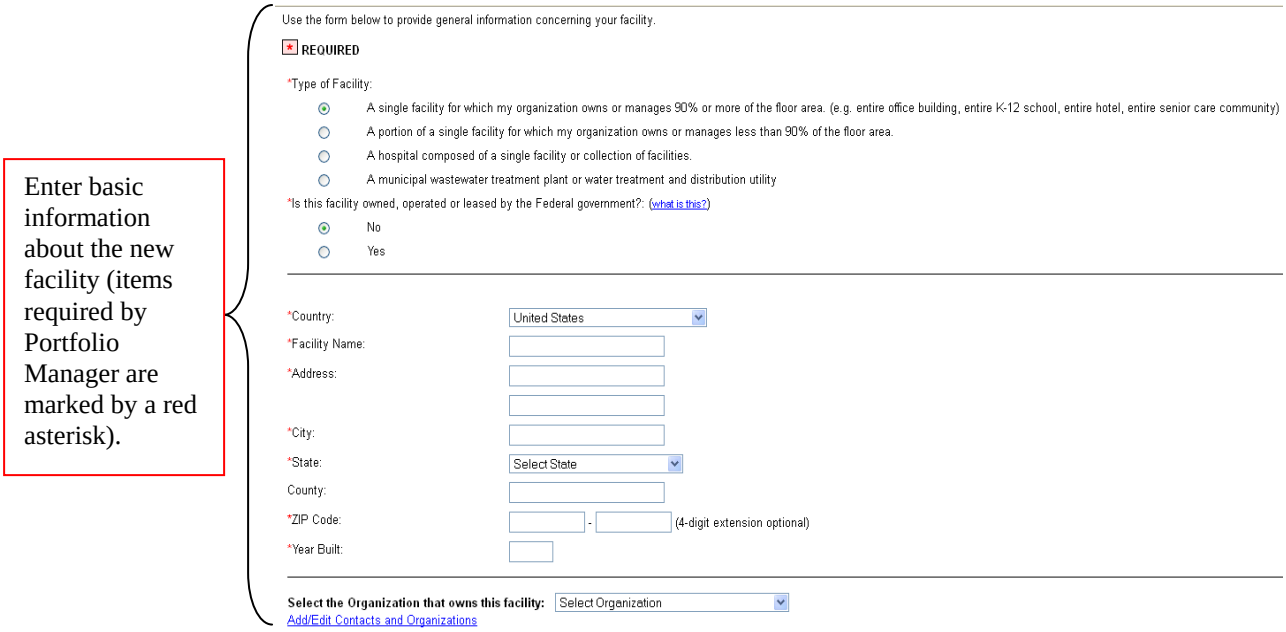


Figure 3: General Facility Information

Appendix H-4

ADDING/EDITING SPACES

From the Facility page, scroll to the 'Space Use' tab (as seen in Figure 4 below) and click 'Add Space.'

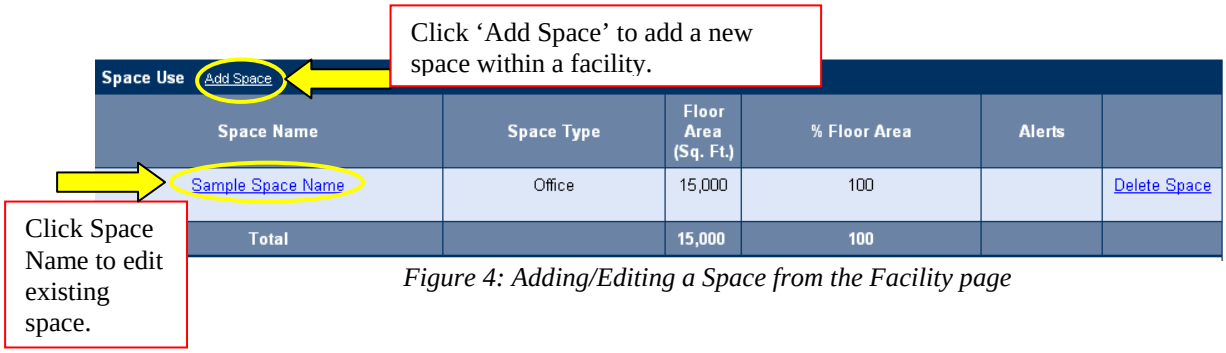


Figure 4: Adding/Editing a Space from the Facility page

After clicking 'Add Space', Portfolio Manager will prompt the user to enter the Space Details, as seen below in Figure 5. They must be entered in correctly and accurately in order to be eligible for ENERGY STAR recognition. If ENERGY STAR recognition is not a primary goal, or if precise attribute values are initially unknown, default values may be used temporarily. These values can be edited at **any** time from the Facility main page (Figure 4) by clicking the assigned space name.

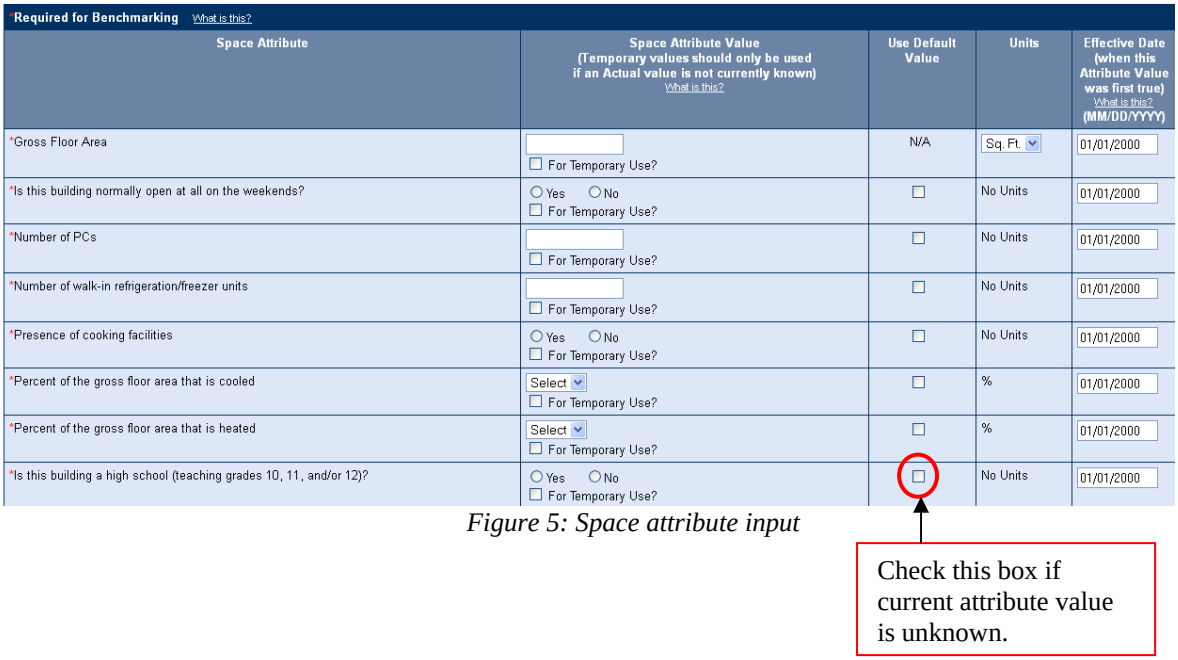


Figure 5: Space attribute input

Appendix H-5

ADDING/EDITING ENERGY METERS

From the Facility page, scroll to the 'Energy Meters' section and click 'Add Meter' (as seen in Figure 6). To edit an existing meter, click the meter name, as shown below.

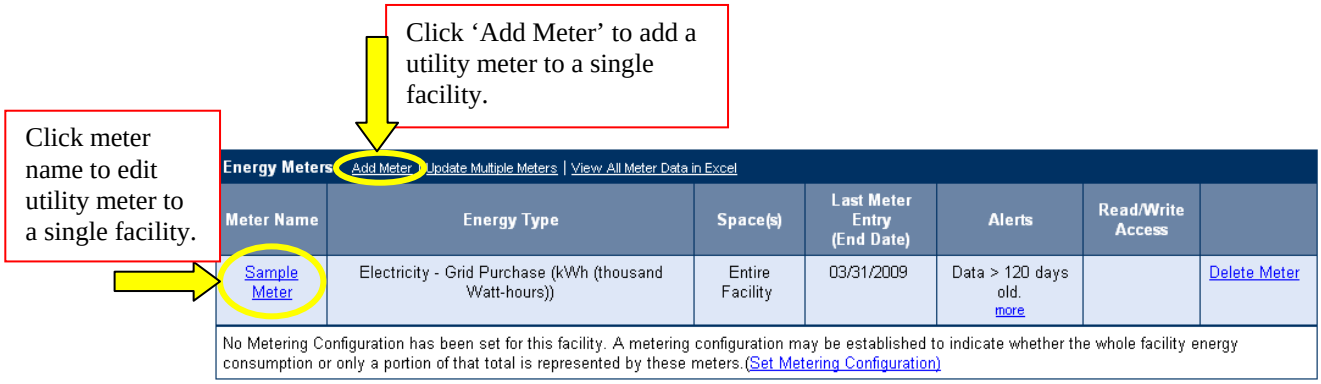


Figure 6: Adding an Energy Meter from the Facility page

Select the number of entries (in months) to add to the energy meter, input the start date of the data to be entered (form the facility utility bill) and click **CONTINUE**.

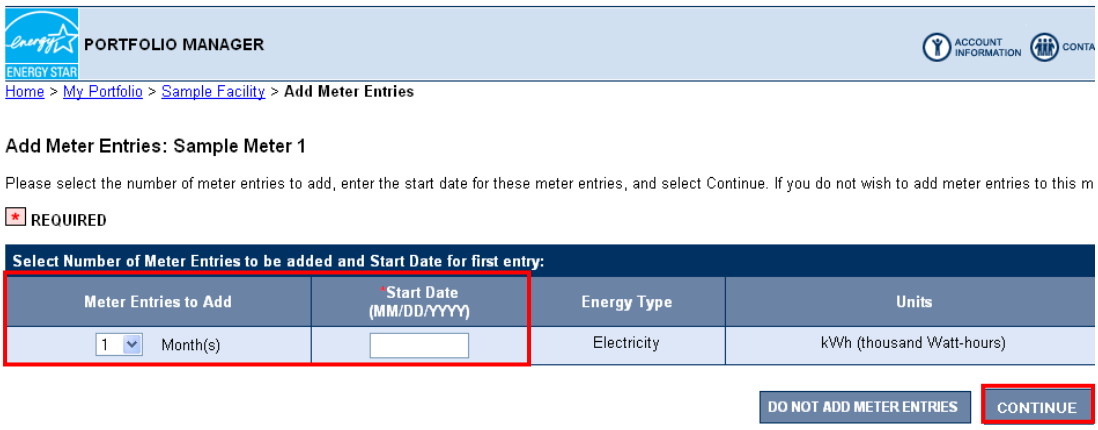


Figure 7: Configuring meter entries

Appendix H-6

Figure 9 shows a sample utility bill. Use this information to input monthly energy data (including start and end dates, energy use and cost), and click **SAVE** (see Figure 8).

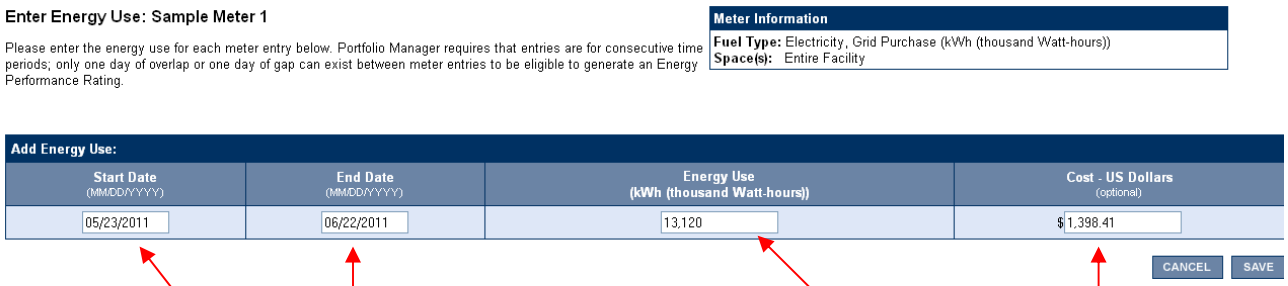


Figure 8: Entering energy data

Enter correct billing period from the monthly utility bill.

Enter monthly energy use data from utility bill.

Enter monthly cost data from utility bill.

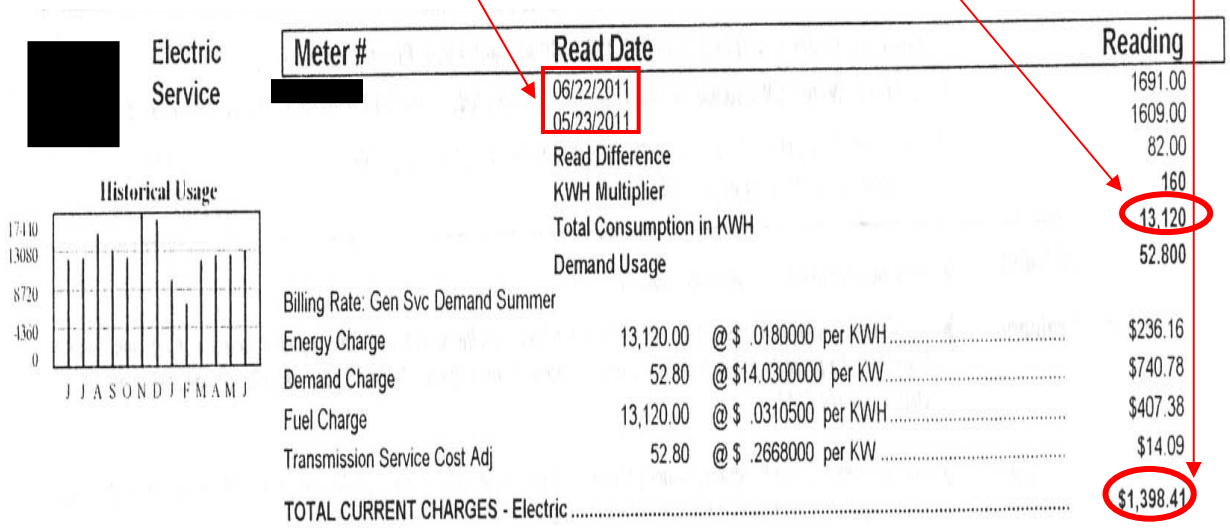


Figure 9: Sample facility utility bill

Appendix H-7

GENERATING A STATEMENT OF ENERGY PERFORMANCE

A Statement of Energy Performance (SEP) is a required document in applying for ENERGY STAR recognition. It can also be used for purposes other than applying for ENERGY STAR, such as formalizing information regarding a facility's energy performance or energy and environmental performance impacts.

Near the top of the Facility page, click 'Generate a Statement of Energy Performance', as shown below.

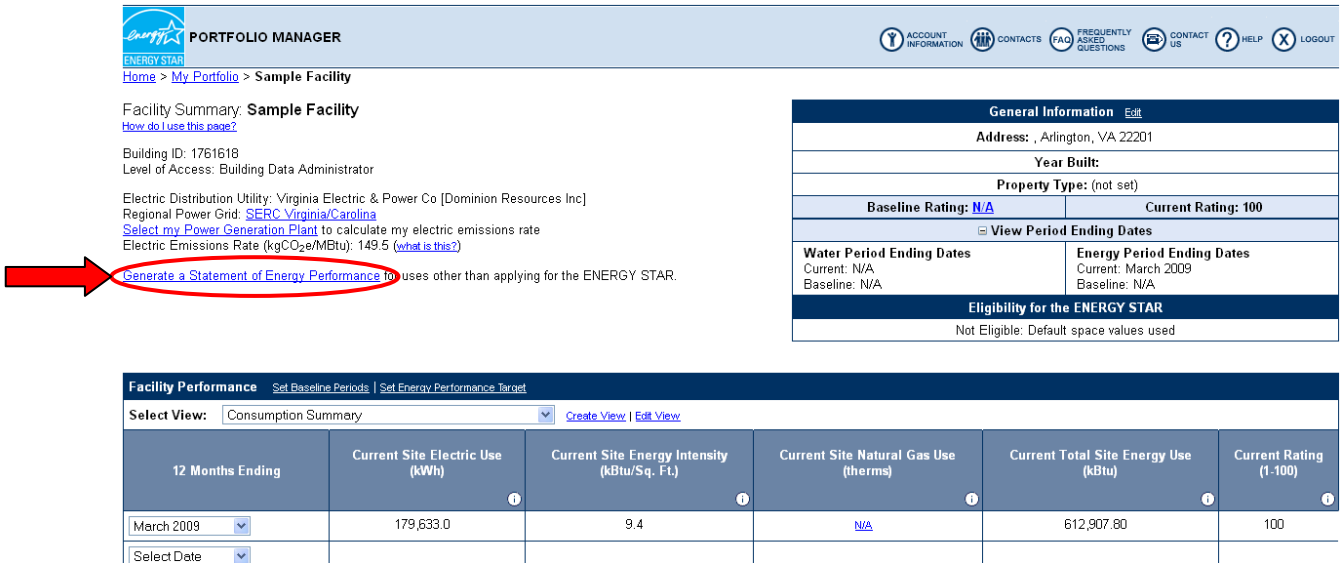


Figure 10: Generating a Statement of Energy Performance from the Facility page

Select reporting options for SEP as shown below, and click **GENERATE REPORT**.

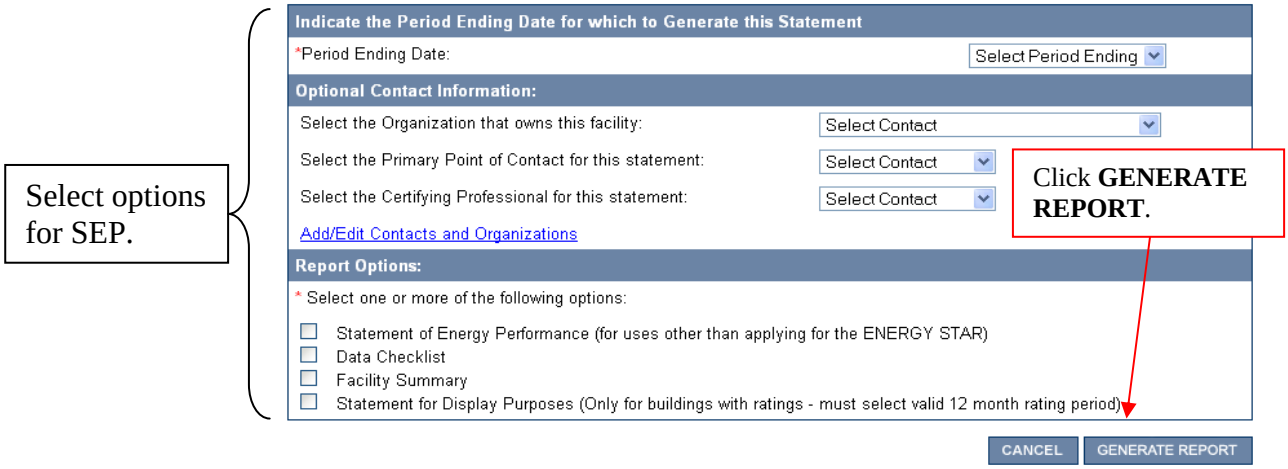


Figure 11: Setting up Statement of Energy Performance

SETTING ENERGY PERFORMANCE BASELINES AND TARGETS

An energy 'Baseline Period' for a facility is a 12-month period of complete energy data that can be compared to a facility's current energy performance. To set a baseline period for a particular facility, click 'Set Baseline Periods' on the main facility page (as shown below).

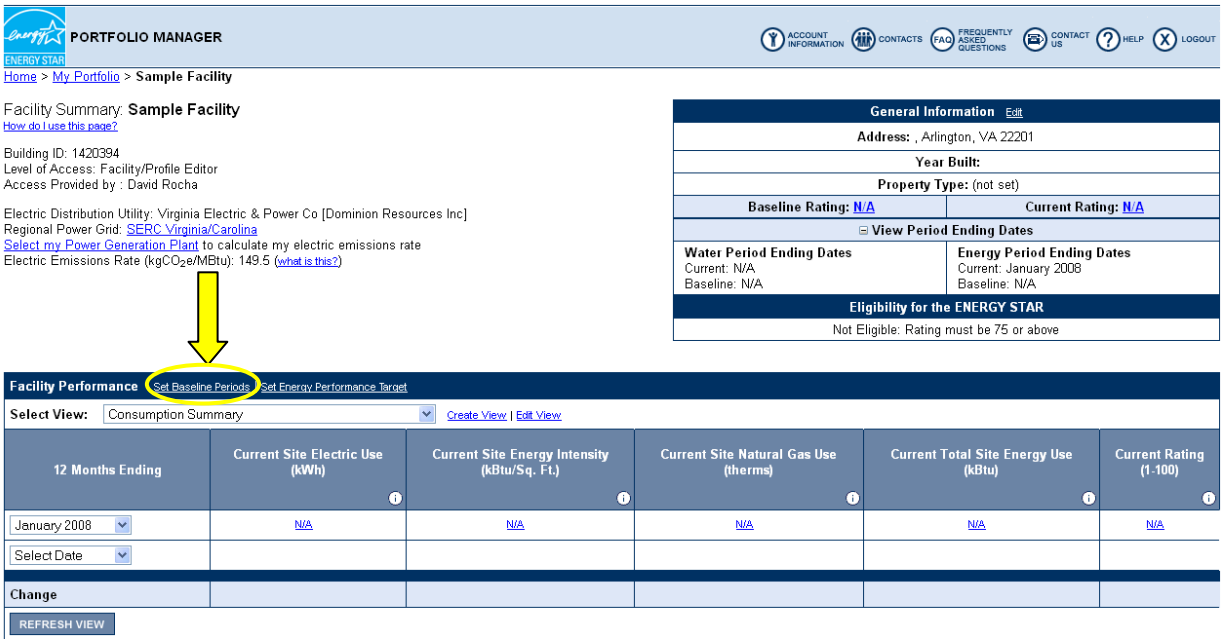


Figure 12: Setting a baseline period for a single facility from the Facility page

Use the drop down menus to select an Energy Baseline Period to compare with the current period. Then click **SAVE**. This will establish the baseline period for the facility. This period can be changed as necessary.

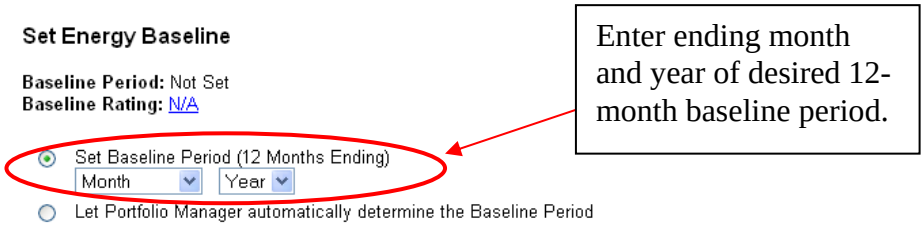


Figure 13: Setting a baseline period for a single facility

Setting an Energy Performance Target for a single facility allows the user to select a desired energy use reduction goal. It can also provide the user with the amount of total energy use reduction required to obtain a particular ENERGY STAR rating. To set an Energy Performance Target for a particular facility, click 'Set Energy Performance Target' on the main facility page (as shown below).

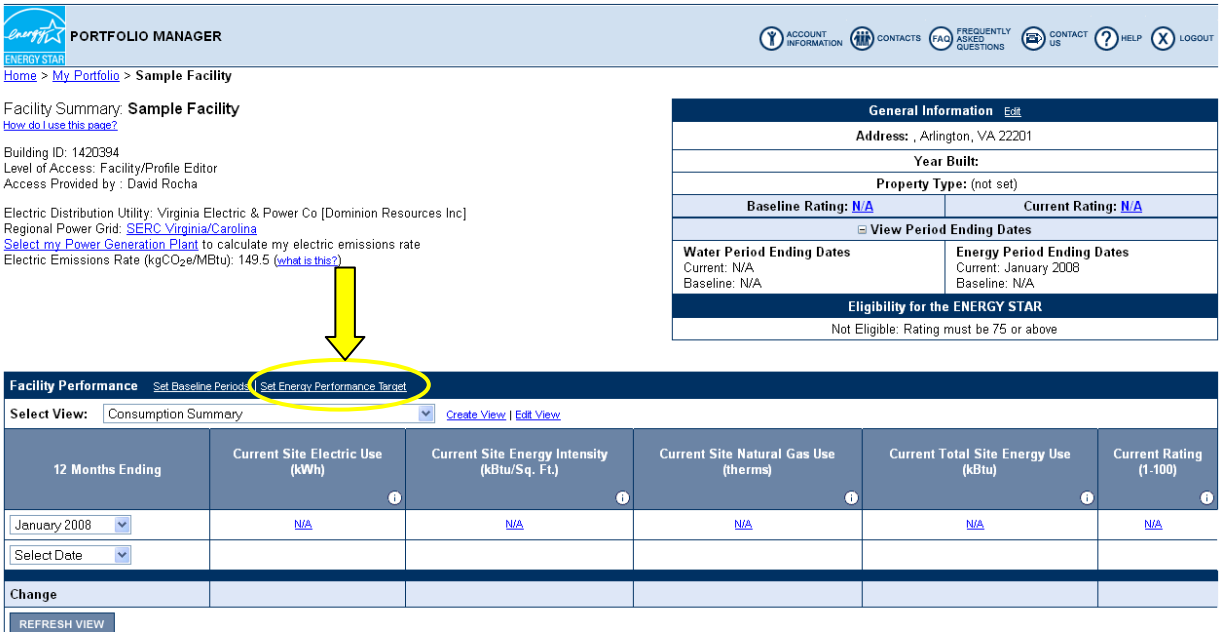


Figure 14: Setting an Energy Performance Target for a single facility from the Facility page

The user can choose one of two methods to set an energy performance target: by ENERGY STAR rating or target reduction (%). Click the desired method, and specify a desired target (as seen below). Click **RECALCULATE** to view the 'Target Energy Use' and 'Energy Cost Savings' results set by the target, and click **SAVE** to keep the current target and return to the Facility page.

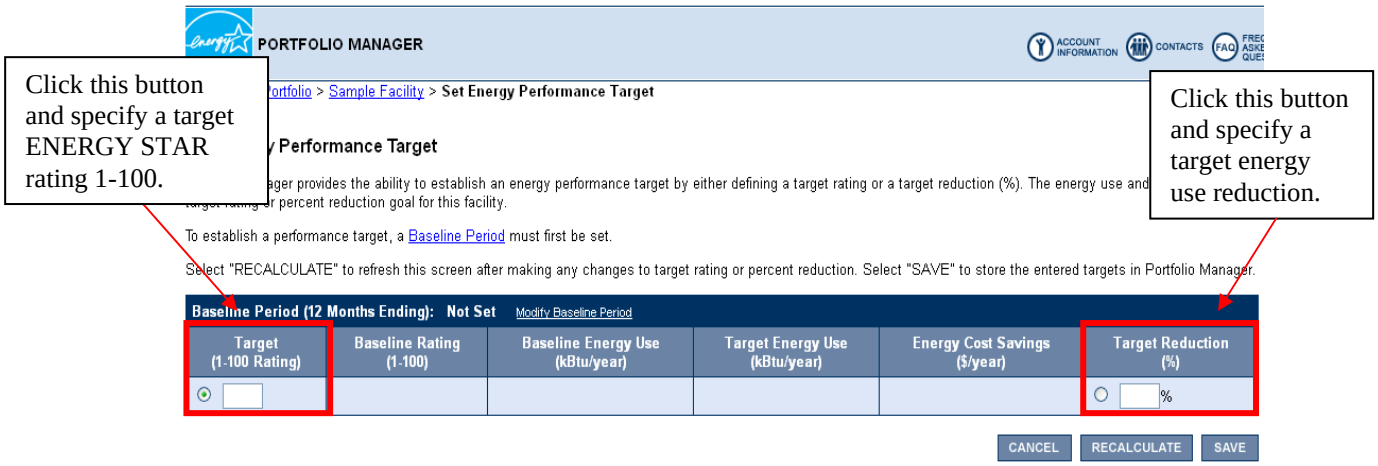


Figure 15: Setting an Energy Performance Target for a single facility

DELETING A FACILITY, SPACE, OR METER

Deleting a facility from Portfolio Manager will delete *everything* associated with that particular facility, including general information (address, year built, type of facility), any spaces designated within the facility, and any Energy/Water meters. To delete a facility, click 'Delete this Facility from Portfolio Manager' on the Main Facility Page, as shown in Figure 16 below.

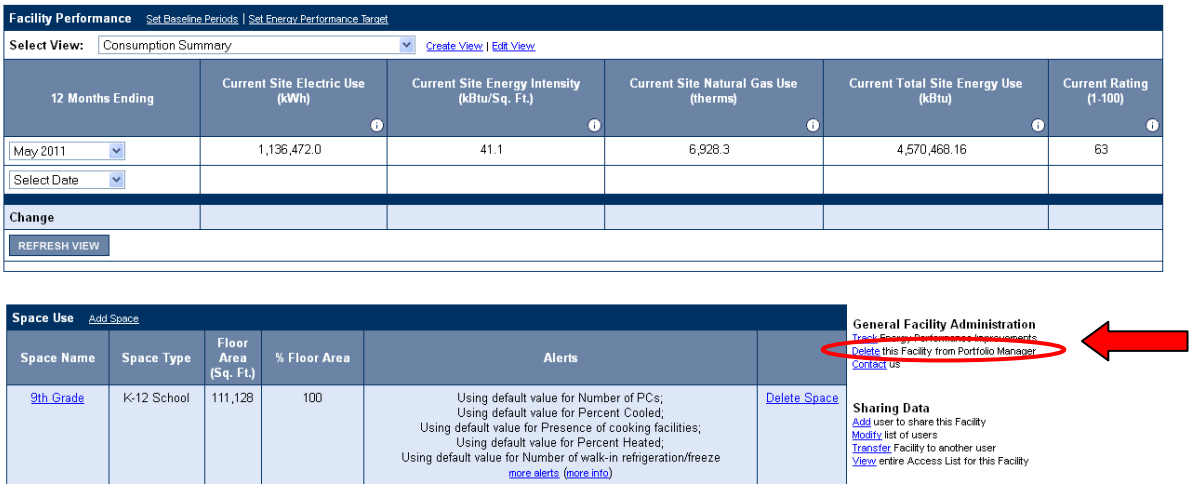


Figure 16: Deleting a facility from the Facility page

Deleting a space from within a facility will remove that single space from the Main Facility page, including any space attribute data associated with the space. To delete a single space from a facility, click 'Delete Space' on the corresponding space from the Main Facility page, as shown in Figure 17 below.

Deleting a meter from a facility will remove *any* data associated with the meter, including energy consumption and cost data. To delete a meter from a facility, click 'Delete Meter' on the corresponding meter form the Main Facility page, as shown below.

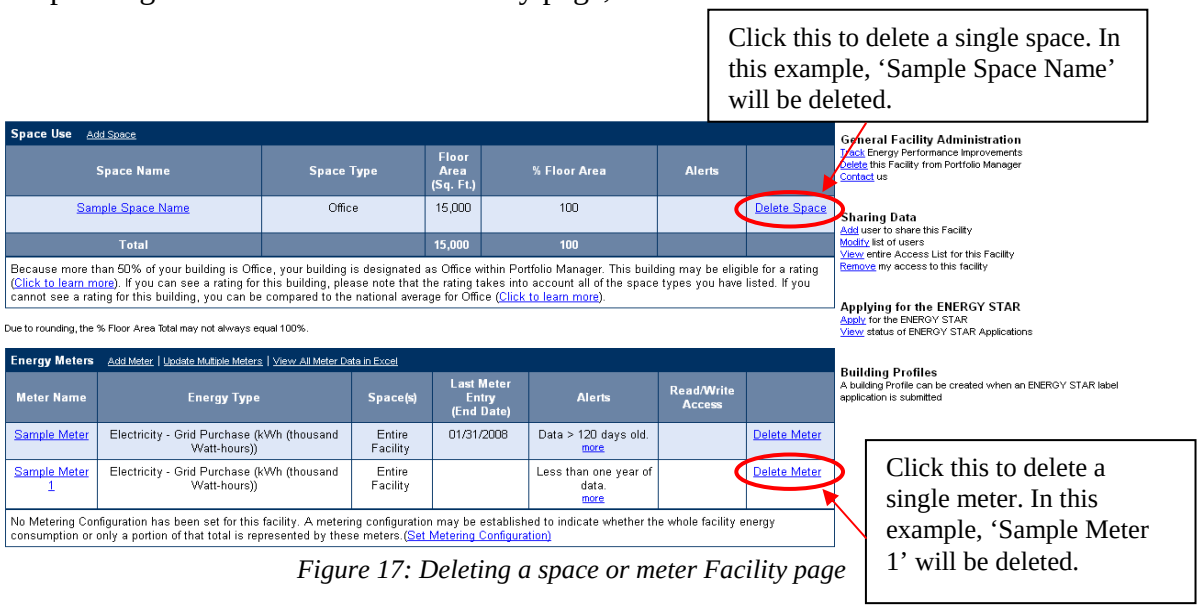


Figure 17: Deleting a space or meter Facility page

Appendix H-11

VIDEO TUTORIAL AND ONLINE HELP

ENERGY STAR provides Step-by-Step video tutorials for benchmarking using Portfolio Manager. These videos can be found at the following link:

http://www.energystar.gov/ia/business/benchmarking_training/benchmarking.html

In addition, ENERGY STAR provides a detailed 'HELP' section online, as seen in Figure 18.

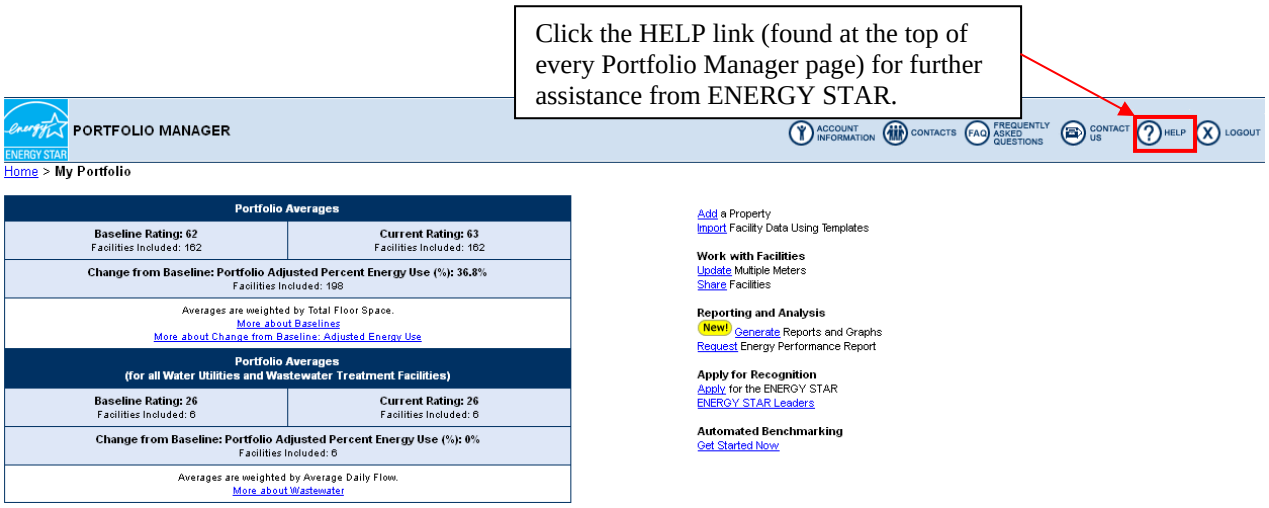


Figure 18: ENERGY STAR Portfolio Manager Help Section

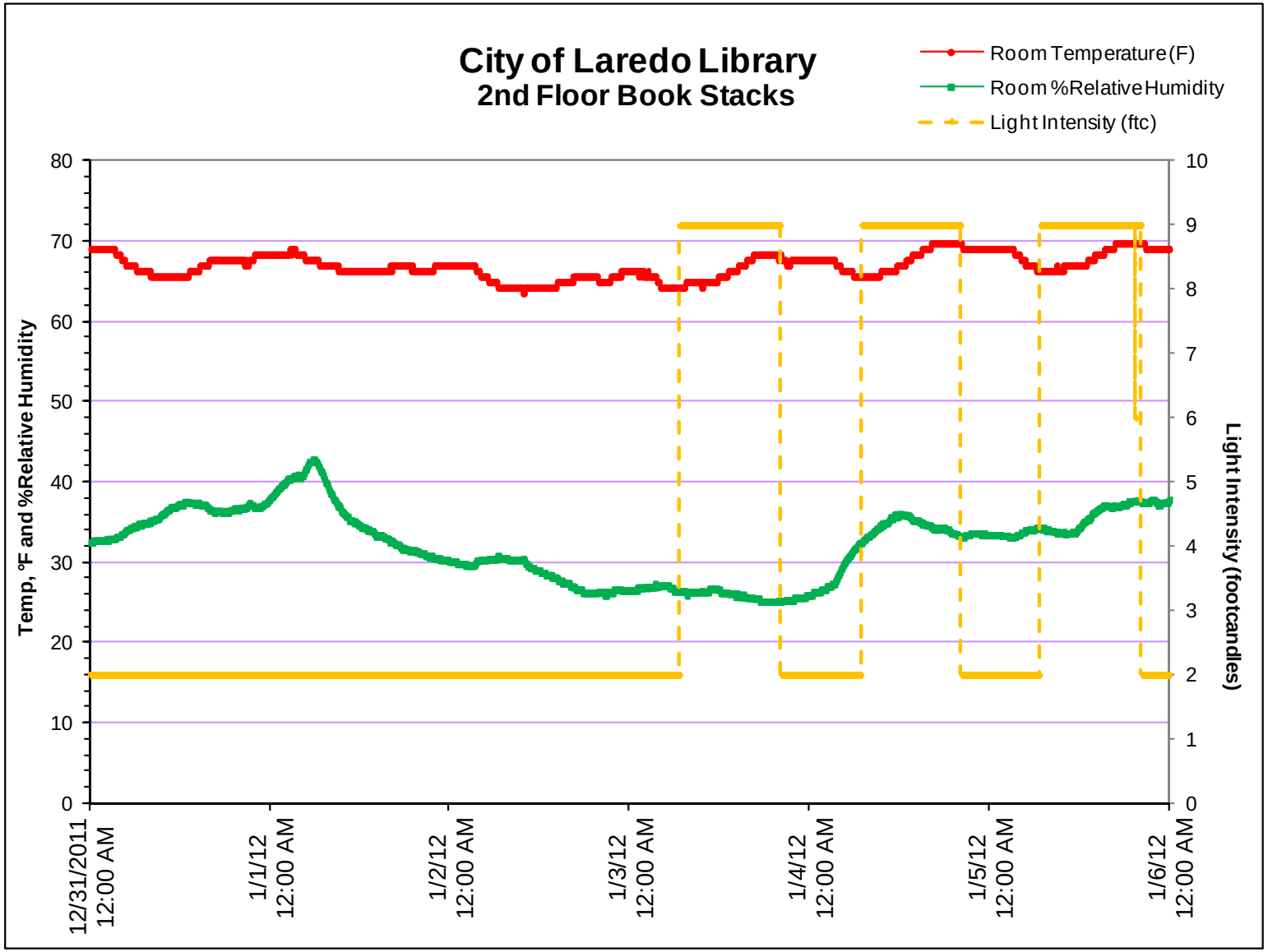
It can also be found at the following link:

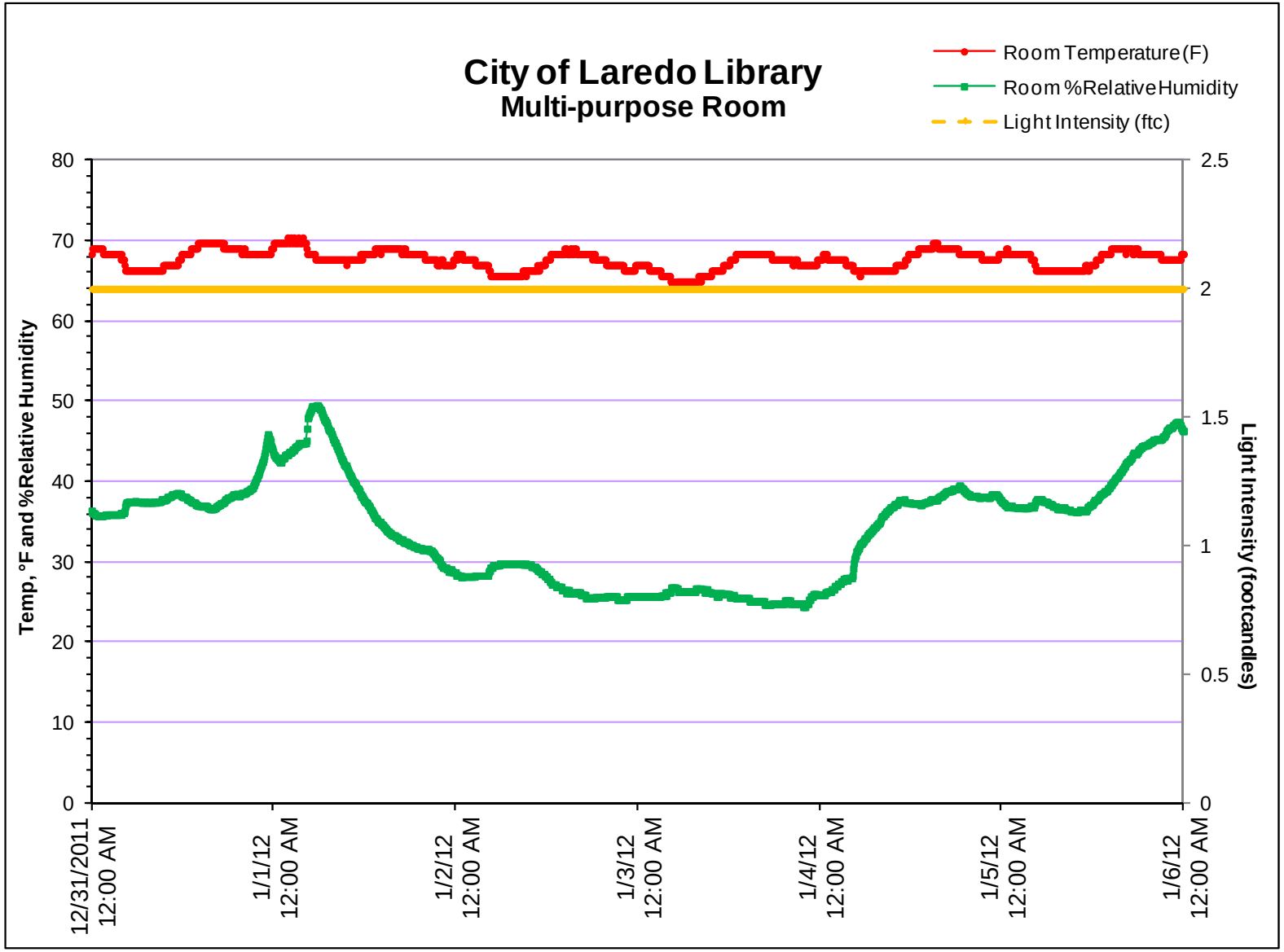
https://www.energystar.gov/istar/pmpam/help/portfolio_manager_online_help.htm

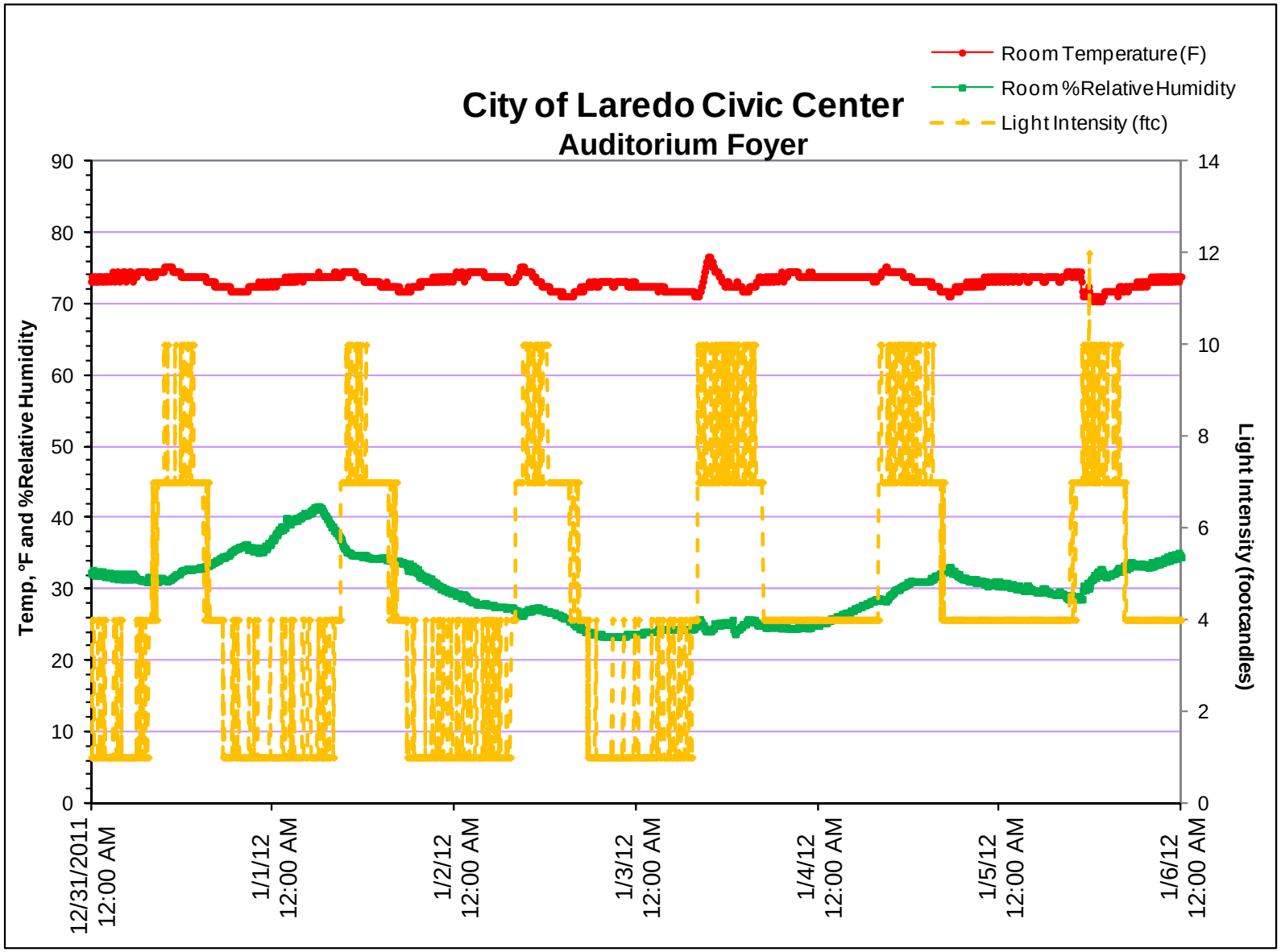
The information found in this section provides a wealth of information regarding operation of Portfolio Manager, including a glossary of terms, step-by-step tutorials, instructions for applying for ENERGY STAR recognition, and managing user accounts. It also includes a 'Search' function, which allows the user to locate applicable Help topics.

APPENDIX I

DATA LOGGER GRAPHS AND LOCATIONS


City of Laredo Library
2nd Floor Book Stacks
Room Temperature (F)
Room %Relative Humidity
Light Intensity (ftc)
Temp, °F and %Relative Humidity
Light Intensity (footcandles)
80
70
60
50
40
30
20
10
0
10
9
8
7
6
5
4
3
2
1
0
12/31/2011 12:00 AM
1/1/12 12:00 AM
1/2/12 12:00 AM
1/3/12 12:00 AM
1/4/12 12:00 AM
1/5/12 12:00 AM
1/6/12 12:00 AM


City of Laredo Library
Multi-purpose Room
Room Temperature (F)
Room %Relative Humidity
Light Intensity (ftc)
Temp, °F and %Relative Humidity
Light Intensity (footcandles)
80
70
60
50
40
30
20
10
0
2.5
2
1.5
1
0.5
0
12/31/2011 12:00 AM
1/1/12 12:00 AM
1/2/12 12:00 AM
1/3/12 12:00 AM
1/4/12 12:00 AM
1/5/12 12:00 AM
1/6/12 12:00 AM


City of Laredo Civic Center
Auditorium Foyer
Room Temperature (F)
Room %Relative Humidity
Light Intensity (ftc)
Temp, °F and %Relative Humidity
Light Intensity (footcandles)
90
80
70
60
50
40
30
20
10
0
14
12
10
8
6
4
2
0
12/31/2011 12:00 AM
1/1/12 12:00 AM
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1/3/12 12:00 AM
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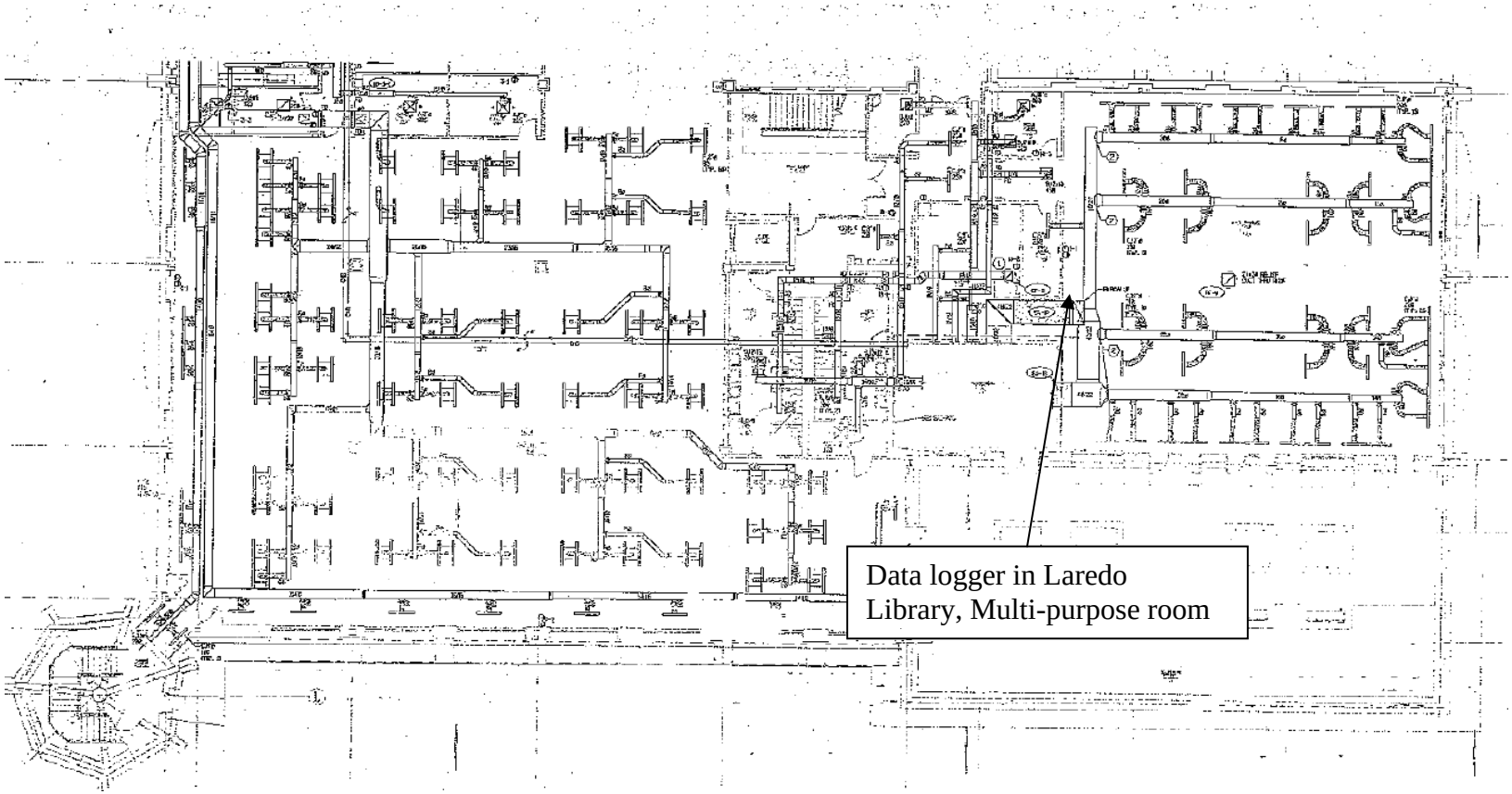
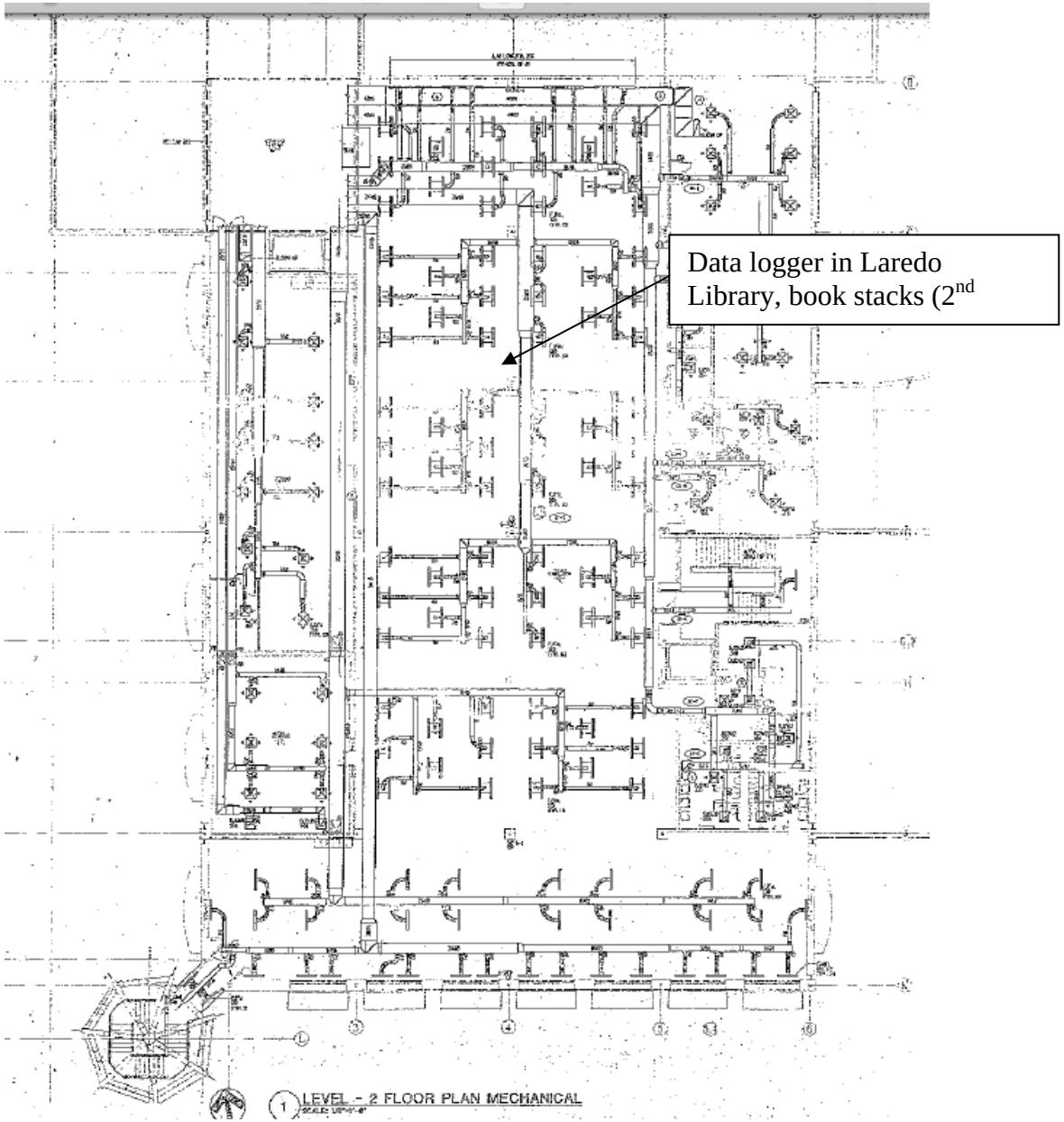
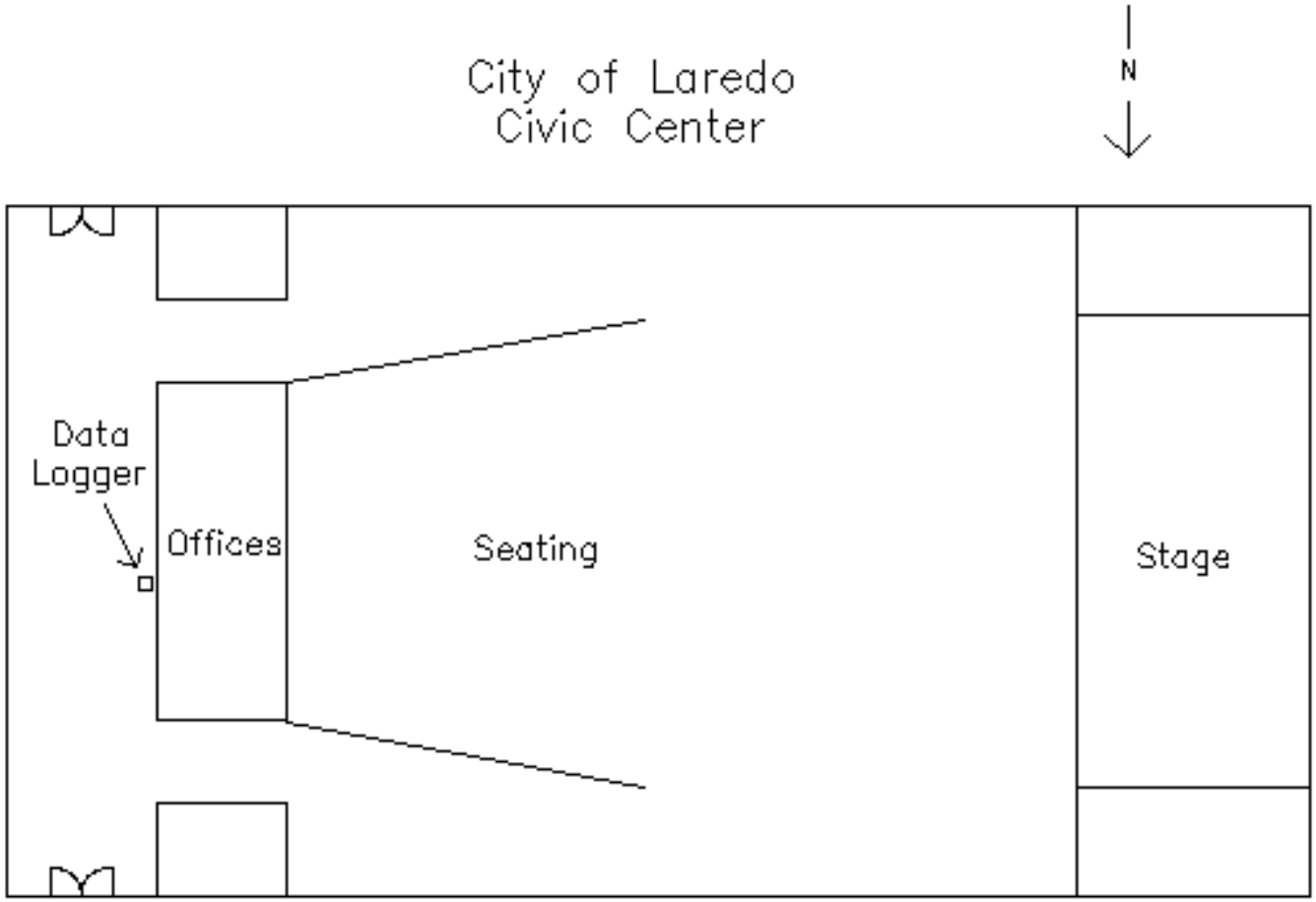
1/6/12 12:00 AM



City of Laredo Library: First floor plan



City of Laredo Library: Second floor plan



City of Laredo Civic Center floor plan (not to scale)

APPENDIX J

REQUEST FOR ENERGY ASSISTANCE

State Energy Conservation Office

Local Governments and Municipalities

Preliminary Energy Assessment Service Agreement

Investing in our communities through improved energy efficiency in public buildings is a win-win opportunity for our communities and the state. Energy-efficient buildings reduce energy costs, increase available capital, spur economic growth, and improve working and living environments. The Preliminary Energy Assessment Service provides a viable strategy to achieve these goals.

Description of the Service

The State Energy Conservation Office (SECO) will analyze electric, gas and other utility data and work with City of Laredo, hereinafter referred to as Partner, to identify energy cost-savings potential. To achieve this potential, SECO and Partner have agreed to work together to complete an energy assessment of mutually selected facilities.

SECO agrees to provide this service at no cost to the Partner with the understanding that the Partner is ready and willing to consider implementing the energy savings recommendations.

Principles of the Agreement

Specific responsibilities of the Partner and SECO in this agreement are listed below.

- ✓ Partner will select a contact person to work with SECO and its designated contractor to establish an Energy Policy and set realistic energy efficiency goals.
- ✓ SECO's contractor will go on site to provide walk through assessments of selected facilities. SECO will provide a report which identifies no cost/low cost recommendations, Capital Retrofit Projects, and potential sources of funding. Portions of this report may be posted on the SECO website.
- ✓ Partner will schedule a time for SECO's contractor to make a presentation of the assessment findings key decision makers.

Acceptance of Agreement

This agreement should be signed by your organization's chief executive officer or other upper management staff.

Signature: _____ Date: 6/7/11

Name (Mr./Ms./Dr.) Mr. Carlos Villarreal Title: City Manager

Organization: City of Laredo Phone: 956-791-7302

Street Address: 1110 Houston St. Fax: 956-791-7498

Mailing Address: 1110 Houston St E-Mail: cvillarrea@ci.laredo.tx.us

County: Webb

Contact Information:

Name (Mr./Ms./Dr.): Mr. John Porter Title: Assistant Director of Environmental Svs.

Phone: 956-794-1653 Fax: 956-727-7944

E-Mail: jporter@ci.laredo.tx.us County: Webb

Please sign and mail or fax to: Stephen Ross, **Local Governments and Municipalities** Program Administrator, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. Phone: 512-463-1770. **Fax 512-475-2569.**