LEVEL II ENERGY AUDIT

SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
5735 47th Avenue
Sacramento, California 95824

DLR Group
1050 20th Street, Suite 250
Sacramento, California 95962

PREPARED BY:
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EMG PROJECT #:

136988.19R000-062.268

DATE OF REPORT:

November 4, 2019

ONSITE DATE:

August 5–6, 2019

ZERO NET ENERGY ASHRAE LEVEL II AUDIT

ROSEMONT HIGH SCHOOL

9594 Kiefer Boulevard

Sacramento, California 95827

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Certification

EMG has completed an Energy Audit of Rosemont High School located at 9594 Kiefer Boulevard in Sacramento, California 95827. EMG visited the site on August 5–6, 2019.

The assessment was performed at the Client's request using methods and procedures consistent with ASHRAE Level II Energy Audit and using methods and procedures as outlined in EMG's Proposal.

This report has been prepared for and is exclusively for the use and benefit of the Client identified on the cover page of this report. The purpose for which this report shall be used shall be limited to the use as stated in the contract between the client and EMG.

This report, or any of the information contained therein, is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of EMG. Any reuse or distribution without such consent shall be at the client's or recipient's sole risk, without liability to EMG.

Estimated installation costs are based on EMG's experience on similar projects and industry standard cost estimating tools including *RS Means and Whitestone CostLab*. In developing the installed costs, EMG also considered the area correction factors for labor rates for Sacramento, California 95827. Since actual installed costs may vary widely for particular installation based on labor & material rates at time of installation, EMG does not guarantee installed cost estimates and shall in no event be liable should actual installed costs vary from the estimated costs herein. We strongly encourage the owner to confirm these cost estimates independently. EMG does not guarantee the costs savings estimated in this report. EMG shall in no event be liable should the actual energy savings vary from the savings estimated herein.

EMG certifies that EMG has no undisclosed interest in the subject property and that EMG's employment and compensation are not contingent upon the findings or estimated costs to remedy any deficiencies due to deferred maintenance and any noted component or system replacements.

Any questions regarding this report should be directed to Kaustubh Anil Chabukswar at 800.733.0660, ext. 7512.

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Project Manager

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Technical Report Reviewer for
Kaustubh Anil Chabukswar, CEM CRM
Program Manager

1. Executive Summary

The purpose of this Energy Audit is to provide Sacramento City Unified School District and Rosemont High School with a baseline of energy usage and the relative energy efficiency of the facility and specific recommendations for Energy Conservation Measures. Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Federal & Utility grants towards energy conservation, support performance contracting, justify a municipal bond funded improvement program, or as a basis for replacement of equipment or systems.

Bldg. #	Structures Assessed	Building Type	EMG Calculated Area (SF)	Estimated Occupancy
1	Administration (A)	School Building	12,210	60-80
2	Announcer Booth (K)	School Building	476	5-10
3	Classrooms (B)	School Building	39,122	200-250
4	Classrooms (E)	School Building	39,122	200-250
5	Classrooms and Library (c)	School Building	56,180	300-400
6	Classrooms, Auditorium and Theatre (J)	School Building	44,990	200-250
7	Gymnasium and Cafeteria (F/G)	Gymnasium	67,050	300-400
8	Pool Building (H)	School Building	1,900	5-15

The study included a review of the building's construction features, historical energy and water consumption and costs, review of the building envelope, HVAC equipment, heat distribution systems, lighting, and the building's operational and maintenance practices.

1.1. Energy Conservation Measures

EMG has identified six Energy Conservation Measures (ECMs) for this property. The savings for each measure is calculated using standard engineering methods followed in the industry, and detailed calculations for ECM are provided in Appendix for reference. A 10% discount in energy savings was applied to account for the interactive effects amongst the ECMs. In addition to the consideration of the interactive effects, EMG has applied a 15% contingency to the implementation costs to account for potential cost overruns during the implementation of the ECMs.

The following table summarizes the recommended ECMs in terms of description, investment cost, energy consumption reduction, and cost savings.

Summary of Financial Information for Recommended Non-Renewable Energy Conservation Measures

Item	Estimate
Net Initial ECM Investment *(Current Dollars Only)*	$254,466 *(In Current Dollars)*
Estimated Annual Cost Savings *(Current Dollars Only)*	$39,095 *(In Current Dollars)*
ECM Effective Payback	6.51 years
Estimated Annual Energy Savings	7.87%
Estimated Annual Energy Utility Cost Savings *(Excluding Water)*	9.24%

Item	Estimate
Estimated Annual Water Cost Saving	0.44%

Solar Photovoltaic (Pv) Screening For Rosemont High School

Solar Rooftop Photovoltaic Analysis		
Estimated Number of Panels	1,294	
Estimated KW Rating	408	KW
Potential Annual kWh Produced	615,244	kWh
% of Current Electricity Uses	28.7%	
Financial Summary		
Investment Cost	$1,426,250	
Estimated Energy Cost Savings	$78,739	
Payback without Incentives	18.1	Years
Incentive Payback but without SRECs	11.0	Years
Payback with All Incentives	11.0	Years

Key Metrics to Benchmark the Subject Property's Energy Usage Profile

- Building Site Energy Use Intensity - The sum of the total site energy use in thousands of Btu per unit of gross building area. Site energy accounts for all energy consumed at the building location only not the energy consumed during generation and transmission of the energy to the site.
- Building Source Energy Use Intensity – The sum of the total source energy use in thousands of Btu per unit of gross building area. Source energy is the energy consumed during generation and transmission in supplying the energy to your site.
- Building Cost Intensity - This metric is the sum of all energy use costs in dollars per unit of gross building area.
- Greenhouse Gas Emissions - Although there are numerous gases that are classified as contributors to the total for Greenhouse Emissions, the scope of this energy audit focuses on carbon dioxide (CO_2). Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement).

Site Energy Use Intensity (Eui)	Rating
Current Site Energy Use Intensity (EUI)	50 kBtu/ft^2
Post ECM Site Energy Use Intensity (EUI)	46 kBtu/ft^2
Source Energy Use Intensity (Eui)	**Rating**
Current Source Energy Use Intensity (EUI)	117 kBtu/ft^2
Post ECM Source Energy Use Intensity (EUI)	106 kBtu/ft^2
Building Cost Intensity (Bci)	**Rating**
Current Building Cost Intensity	$1.29/ft^2
Post ECM Building Cost Intensity	$1.17/ft^2

Summary of the Greenhouse Gas Reductions from Recommended Non-Renewable Energy Conservation Measures

The following table provides a summary of the projected Greenhouse Gas Emissions reductions as a result of the recommended Energy Conservation Measures:

Greenhouse Gas Emissions Reduction	
Estimated Annual Thermal Energy Reduction	1,036 MMbtu
Total CO_2 Emissions Reduced	87.30 $MtCO_2$/Yr
Total Cars Off the Road (Equivalent)*	16
Total Acres of Pine Trees Planted (Equivalent)*	20

**Equivalent reductions per DOE emissions calculation algorithms*

Zero Net Energy Analysis for Renewable and Non-Renewable Recommended Measures

Zero Net Energy Analysis	
Building Annual Net Energy Consumption	13,153,494 kBtu
Total Annual Energy Savings for Non-Renewable Energy Measures	1,035,562 kBtu
Total Annual Energy Savings from Renewable Energy Measures	2,099,213 kBtu
Total Annual Energy Savings	3,134,775 kBtu
Net Energy Consumption from Grid Post Implementation	10,018,719 kBtu
% Energy Reduction (Annual Energy-Net Energy) / (Annual Energy)	24%

Energy Conservation Measures Screening:

EMG screens ECMs using two financial methodologies. ECMs which are considered financially viable must meet both criteria.

1. Simple Payback Period –The number of years required for the cumulative value of energy or water cost savings less future non-fuel or non-water costs to equal the investment costs of the building energy or water system, without consideration of discount rates. ECMs with a payback period greater than the Expected Useful Life (EUL) of the project are not typically recommended, as the cost of the project will not be recovered during the lifespan of the equipment. These ECMs are recommended for implementation during future system replacement. At that time, replacement may be evaluated based on the premium cost of installing energy efficient equipment.

$$Simple\ Payback = \frac{Initial\ Cost}{Annual\ Savings}$$

2. Savings-to-Investment Ratio (SIR) – The savings-to-investment ratio is the ratio of the present value savings to the present value costs of an energy or water conservation measure. The numerator of the ratio is the present value over the estimated useful life (EUL) of net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure. It is recommended that energy efficiency recommendations should be based on a calculated SIR, with larger SIRs receiving a higher priority. A project is typically only recommended if SIR is greater than or equal to 1.0, unless other factors outweigh the financial benefit.

$$SIR = \frac{Present\ Value\ (Annual\ Savings, i\%, EUL)}{Initial\ Cost}$$

List of Recommended Energy Conservation Measures For Rosemont High School

ECM #	Description of ECM	Projected Initial Investment	Estimated Annual Energy Savings		Estimated Annual Water Savings	Estimated Cost Savings	Estimated Annual O&M Savings	Total Estimated Annual Cost Savings	Simple Payback	S.I.R.	Life Cycle Savings	Expected Useful Life (EUL)
			Natural Gas	Electricity								
		$	Therms	kWh	kgal	$	$	$	Years		$	Years
No/Low Cost Recommendations												
1	Install Low Flow Faucet Aerators Location: Restrooms And Classrooms	$564	309	0	32	$513	$0	$513	1.10	7.77	$3,815	10.00
Totals for No/Low Cost Items		**$564**	**309**	**0**	**32**	**$513**	**$0**	**$513**	**1.10**			
Capital Cost Recommendations												
1	Install Low Flow Shower Heads Location: Restrooms And Locker Rooms	$1,268	1,021	0	90	$1,607	$0	$1,607	0.79	10.81	$12,444	10.00
2	Install On-Demand Ventilation on Air Handlers Location: Rooftop Package Units (25-50 Tons) - Gymnasium	$7,264	1,854	1,032	0	$2,129	$106	$2,236	3.25	2.63	$11,805	10.00
3	Upgrade Building Lighting to LED and Install Automatic Lighting Controls Location: Building Interior And Exterior	$166,652	0	205,013	0	$26,238	$8,000	$34,237	4.87	2.45	$242,071	15.00
4	Install Variable Frequency Drives (VFD) Location: Gym/ Cafeteria Rtu	$28,108	0	25,339	0	$3,243	$0	$3,243	8.67	1.38	$10,605	15.00
5	Install Variable Frequency Drives (VFD) Location: Gym/ Cafeteria Rtu	$17,419	0	12,523	0	$1,603	$0	$1,603	10.87	1.10	$1,713	15.00
Total For Capital Cost		**$220,711**	**2,875**	**243,907**	**90**	**$34,820**	**$8,106**	**$42,926**	**5.14**			
	Interactive Savings Discount @ 10%		-318	-24,391	-12	-$3,533	-$811	-$4,344				
	Total Contingency Expenses @ 15%	$33,191										
Total for Improvements		**$254,466**	**2,866**	**219,516**	**110**	**$31,800**	**$7,296**	**$39,095**	**6.51**			

In addition to the above measures, EMG has identified the following measure(s) but has not recommended as they fail to meet the above-mentioned financial criteria of SIR>1.0. Thus, EMG has classified the measure(s) as recommended for consideration.

List of Recommended For Consideration Energy Conservation Measures For Rosemont High School

ECM #	Description of ECM	Initial Investment	Annual Energy Savings		Annual Water Savings	Cost Savings	Estimated Annual O&M Savings	Total Estimated Annual Cost Savings	Payback	S.I.R.	Life Cycle Savings	Expected Useful Life (EUL)
		$	Natural Gas	Electricity	kgal	$	$	$	Years		$	Years
1	Replace Existing Water Heater With New Energy Efficient Units Location: Throughout	$79,882	4,793	1,135	0	$5,309	$0	$5,309	15.05	0.91	-$6,869	18.00
2	Replace Inefficient Furnace and Air Conditioning System Location: Throughout	$475,509	13,253	39,970	40	$19,392	$582	$19,974	23.81	0.62	-$178,345	20.00
3	Install Low Flow Tankless Restroom Fixtures Location: Restrooms	$53,857	0	0	0	$2,806	$0	$2,806	19.20	0.62	-$20,362	15.00
Total for Improvements		**$79,882**	**4,793**	**1,135**	**0**	**$5,309**	**$0**	**$5,309**	**15.05**			

2. Introduction

The purpose of this Energy Audit is to provide Rosemont High School and Sacramento City Unified School District with a baseline of energy usage, the relative energy efficiency of the facility, and specific recommendations for Energy Conservation Measures. Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Federal and Utility grants towards energy conservation, as well as support performance contracting, justify a municipal bond-funded improvement program, or as a basis for replacement of equipment or systems.

The energy audit consisted of an onsite visual assessment to determine current conditions, itemize the energy consuming equipment (i.e. Boilers, Make-Up Air Units, DWH equipment); review lighting systems both exterior and interior; and review efficiency of all such equipment. The study also included interviews and consultation with operational and maintenance personnel. The following is a summary of the tasks and reporting that make up the Energy Audit portion of the report.

The following is a summary of the tasks and reporting that make up the Energy Audit portion of the report.

ENERGY AND WATER USING EQUIPMENT

- EMG has surveyed the common areas, office areas, rooms, maintenance facilities and mechanical rooms to document utility-related equipment, including heating systems, cooling systems, air handling systems and lighting systems.

BUILDING ENVELOPE

- EMG has reviewed the characteristics and conditions of the building envelope, checking insulation values and conditions. This review also includes an inspection of the condition of walls, windows, doors, roof areas, insulation and special use areas

RECOMMENDATIONS FOR ENERGY SAVINGS OPPORTUNITIES

- Based on the information gathered during the on site assessment, the utility rates, as well as recent consumption data and engineering analysis, EMG has identified opportunities to save energy and provide probable construction costs, projected energy/utility savings and provide a simple payback analysis.

ANALYSIS OF ENERGY CONSUMPTION

- Based on the information gathered during the on-site assessment, EMG has conducted an analysis of the energy usage of all equipment, and identified which equipment is using the most energy and what equipment upgrades may be necessary. As a result, equipment upgrades, or replacements are identified that may provide a reasonable return on the investment and improve maintenance reliability.

ENERGY AUDIT PROCESS

- Interviewing staff and review plans and past upgrades
- Performing an energy audit for each use type
- Performing a preliminary evaluation of the utility system
- Analyzing findings, utilizing ECM cost-benefit worksheets
- Making preliminary recommendations for system energy improvements and measures
- Estimating initial cost and changes in operating and maintenance costs based on implementation of energy efficiency measures
- Ranking recommended cost measures, based on the criticality of the project and the largest payback

REPORTING

The EMG Energy Audit Report includes:

- A comprehensive study identifying all applicable Energy Conservation Measures (ECMs) and priorities, based on initial cost and payback
- A narrative discussion of building systems/components considered and a discussion of energy improvement options;
- A summary of ECMs including initial costs and simple paybacks, based on current utility rates and expected annual savings.

3. Facility Overview and Existing Conditions

3.1. Building Occupancy and Point of Contact

Facility Schedule	
Hours of Operations / Week	40
Operational Weeks / Year	37
Estimated Facility Occupancy	1500
% of Male Occupants	50%

Point Of Contact	
Point of Contact Name	Mike Vega
Point of Contact Title	Plant manager
Point of Contact – Contact Number	916.842.0670

3.2. Building Heating, Ventilating and Air-Conditioning (HVAC)

Description:

Heating and cooling to buildings A, B, C, E, F/G and J is provided primarily by packaged rooftop units with energy recovery wheel and utilizing natural gas for heating. Buildings B, C and E are also served by central split system AC units with natural gas furnaces. Buildings A, B, C, F/G and J are supplementary served by ductless split systems. 4x make-up air units serve building F/G.

The Mechanical Equipment Schedule in Appendix contains a summary of the HVAC Equipment at the property.

Building Central Heating System	
Primary Heating System	Rooftop Packaged Units
Secondary Heating System	Central Split Gas Fired Furnace
Hydronic Distribution System	Not Applicable
Primary Heating Fuel	Natural Gas
Heating Mode Set-point	69 °F
Heating Mode- Set-back Temperature	53 °F

Building Cooling System	
Primary Cooling System	Packaged Units
Secondary Cooling System	Central Split System Condensing units

Building Cooling System	
Hydronic Distribution System	Not Applicable
Cooling Mode Set-point	73 °F
Cooling Mode- Set-back Temperature	93 °F

Air Distribution System	
Building Ventilation	Roof-top Exhaust Fans
On-Demand Ventilation System in Use?	No
Energy Recovery Wheel / Enthalpy Wheel Exhaust Fans	Yes

Domestic Hot Water System	
Primary Domestic Water Fuel	Natural Gas

3.3. Lighting

Description:

The lighting in the school building primarily consists of T8 linear fluorescent lamp fixtures in classrooms and hallways. The fixtures were observed to be operating on bi-level mode in the classrooms. The exterior lights were primarily High Intensity Discharge (HID) fixtures.

The detailed lighting schedule and the proposed LED alternative is provided in Appendix.

4. Utility Analysis

Establishing the energy baseline begins with an analysis of the utility cost and consumption of the building. Utilizing the historical energy data and local weather information, we evaluate the existing utility consumption and assign it to the various end-uses throughout the buildings. The Historical Data Analysis breaks down utilities by consumption, cost and annual profile.

This data is analyzed, using standard engineering assumptions and practices. The analysis serves the following functions:

- Allows our engineers to benchmark the energy and water consumption of the facilities against consumption of efficient buildings of similar construction, use and occupancy.
- Generates the historical and current unit costs for energy and water
- Provides an indication of how well changes in energy consumption correlate to changes in weather.
- Reveals potential opportunities for energy consumption and/or cost reduction. For example, the analysis may indicate that there is excessive, simultaneous heating and cooling, which may mean that there is an opportunity to improve the control of the heating and cooling systems.

By performing this analysis and leveraging our experience, our engineers prioritize buildings and pinpoint systems for additional investigation during the site visit, thereby maximizing the benefit of their time spent on-site and minimizing time and effort by the customer's personnel.

Based upon the utility information provided about the Sacramento City Unified School District, the following energy rates are utilized in determining existing and proposed energy costs.

Utility Rates used for Cost Analysis

Electricity (Blended Rate)	Natural Gas	Water / Sewer
$0.13 /kWh	$1.08 /therm	$5.64 /kGal

The data analyzed provides the following information: 1) breakdown of utilities by consumption, 2) cost and annual profile, 3) baseline consumption in terms of energy/utility at the facility, 4) the Energy Use Index, or Btu/sq ft, and cost/sq ft. For multiple water meters, the utility data is combined to illustrate annual consumption for each utility type.

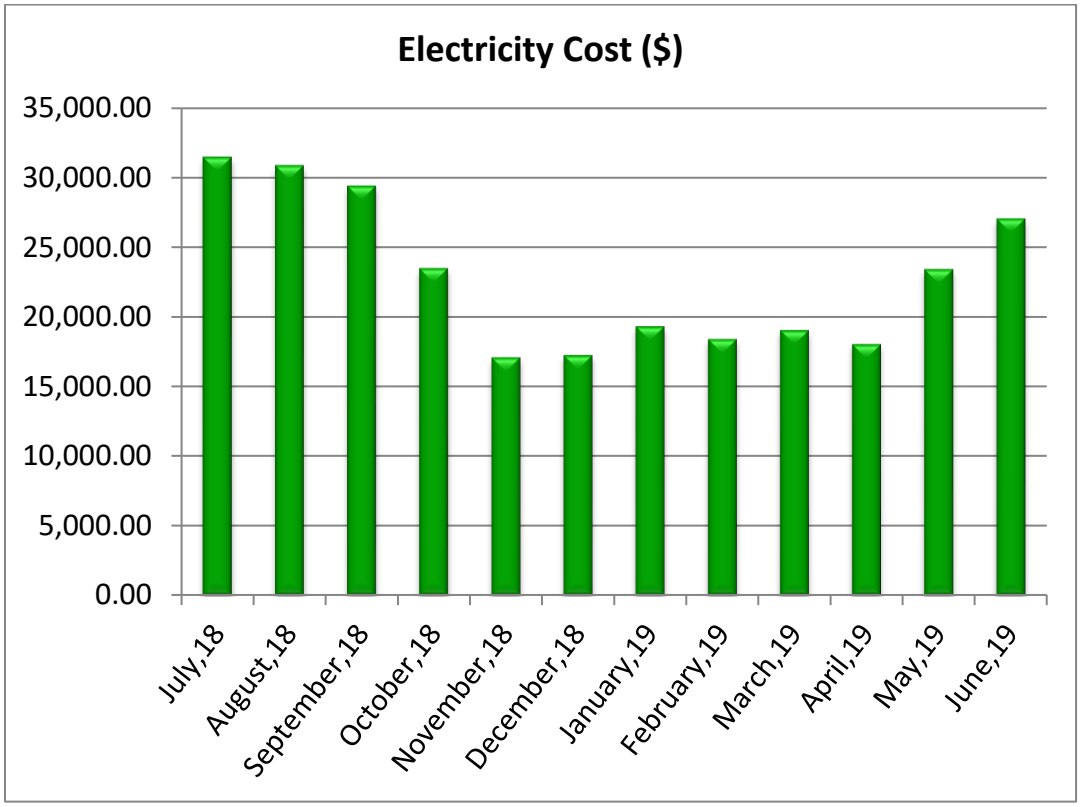
4.1. Electricity

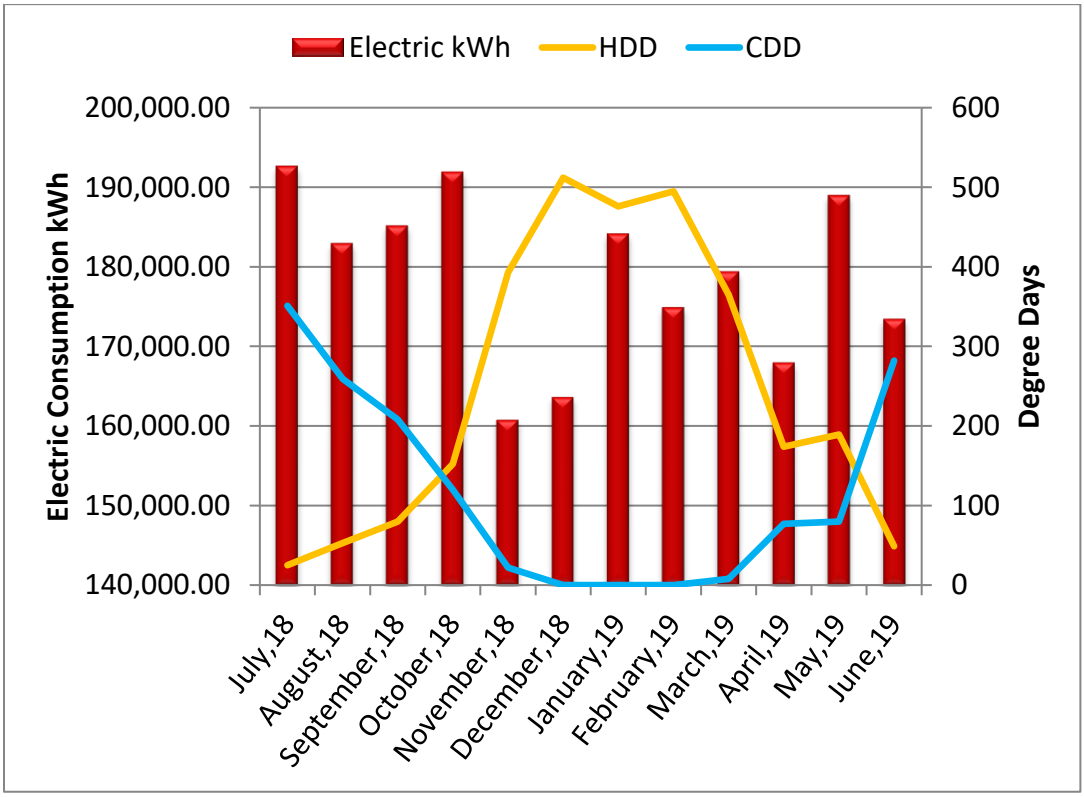
SMUD satisfies the electricity requirements for the facility. The primary end uses for electric utility compromises of lighting, cooling, office/school equipment, and appliances in the break room.

The table below provides the electric use for the period of twelve continuous months.

Electric Consumption and Cost Data

Billing Month	Consumption (Kwh)	Unit Cost/Kwh	Total Cost
July,18	192,619.05	0.16	31,459.12
August,18	182,923.12	0.17	30,854.03
September,18	185,129.52	0.16	29,376.51
October,18	191,911.57	0.12	23,475.40
November,18	160,760.48	0.11	17,071.56
December,18	163,607.25	0.11	17,228.32
January,19	184,123.56	0.10	19,294.37
February,19	174,896.24	0.11	18,375.01
March,19	179,379.83	0.11	19,026.07
April,19	167,960.00	0.11	18,010.83
May,19	188,948.34	0.12	23,396.06
June,19	173,430.91	0.16	27,037.15
Total/average	**2,145,689.88**	**0.13**	**274,604.43**


Electricity Cost ($)
35,000.00
30,000.00
25,000.00
20,000.00
15,000.00
10,000.00
5,000.00
0.00
July,18
August,18
September,18
October,18
November,18
December,18
January,19
February,19
March,19
April,19
May,19
June,19


Electric kWh
HDD
CDD
Electric Consumption kWh
200,000.00
190,000.00
180,000.00
170,000.00
160,000.00
150,000.00
140,000.00
Degree Days
600
500
400
300
200
100
0
July,18
August,18
September,18
October,18
November,18
December,18
January,19
February,19
March,19
April,19
May,19
June,19

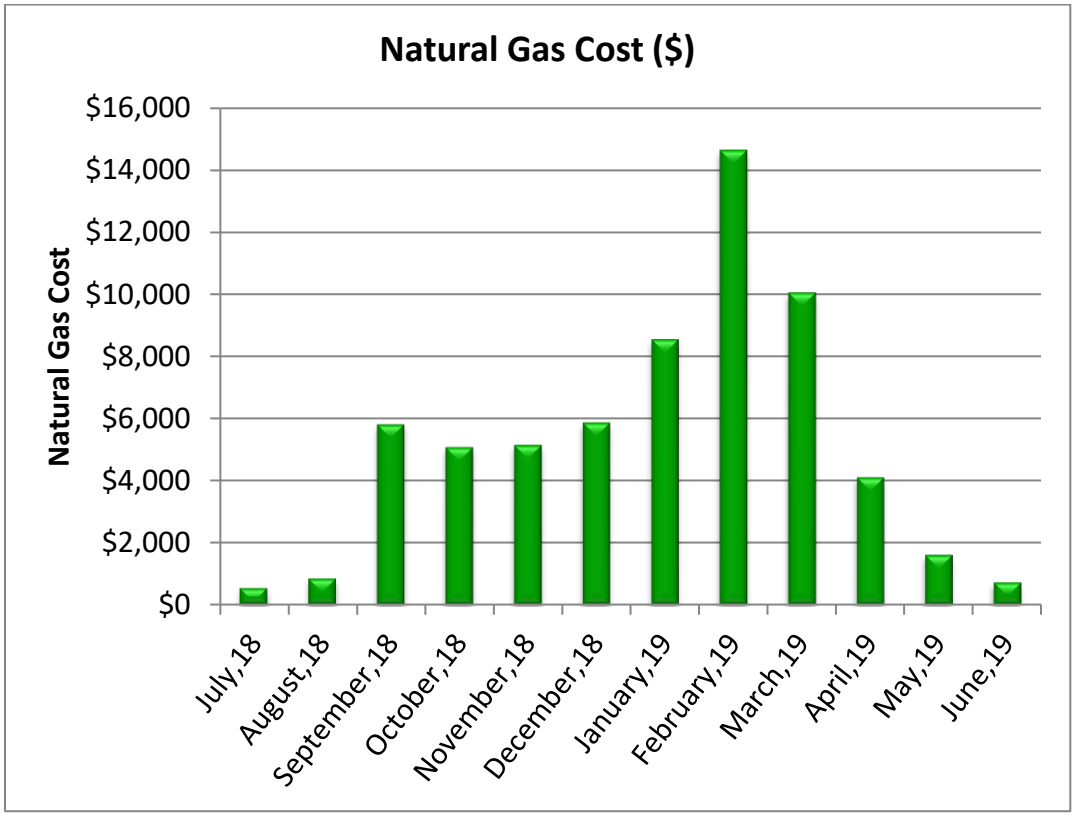
4.2. Natural Gas

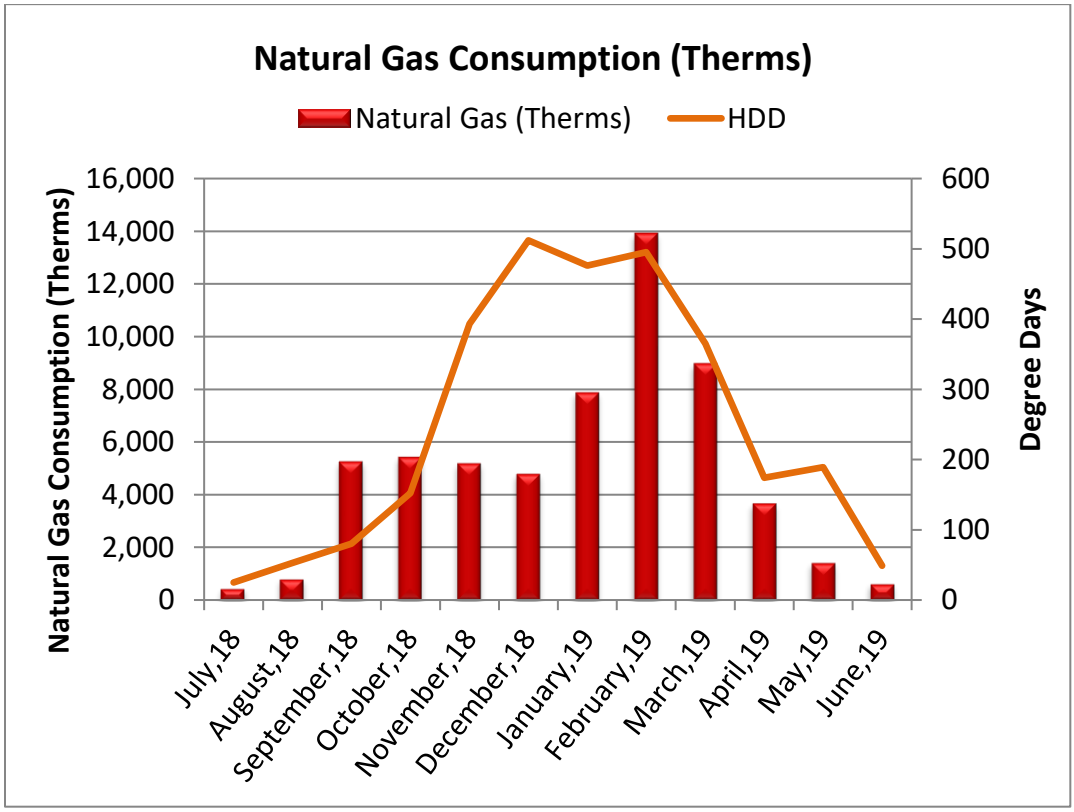
PGE satisfies the natural gas requirements of the facility. The primary end use of natural gas is for building heating, domestic water heating, and cooking in the cafeteria.

The analysis of the 12 months of consumption is provided below.

Natural Gas Consumption and Cost Data

Billing Month	Consumption (Therms)	Unit Cost/Therm	Total Cost
July,18	428	$1.22	$520
August,18	788	$1.06	$833
September,18	5,255	$1.10	$5,799
October,18	5,431	$0.93	$5,059
November,18	5,193	$0.99	$5,135
December,18	4,793	$1.22	$5,861
January,19	7,869	$1.08	$8,535
February,19	13,910	$1.05	$14,635
March,19	8,977	$1.12	$10,046
April,19	3,664	$1.12	$4,097
May,19	1,412	$1.13	$1,596
June,19	603	$1.18	$714
Total/average	**58,324**	**$1.08**	**$62,830**


Natural Gas Cost ($)
Natural Gas Cost
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
July,18
August,18
September,18
October,18
November,18
December,18
January,19
February,19
March,19
April,19
May,19
June,19


Natural Gas Consumption (Therms)
Natural Gas (Therms)
HDD
Natural Gas Consumption (Therms)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
600
500
400
300
200
100
0
Degree Days
July,18
August,18
September,18
October,18
November,18
December,18
January,19
February,19
March,19
April,19
May,19
June,19

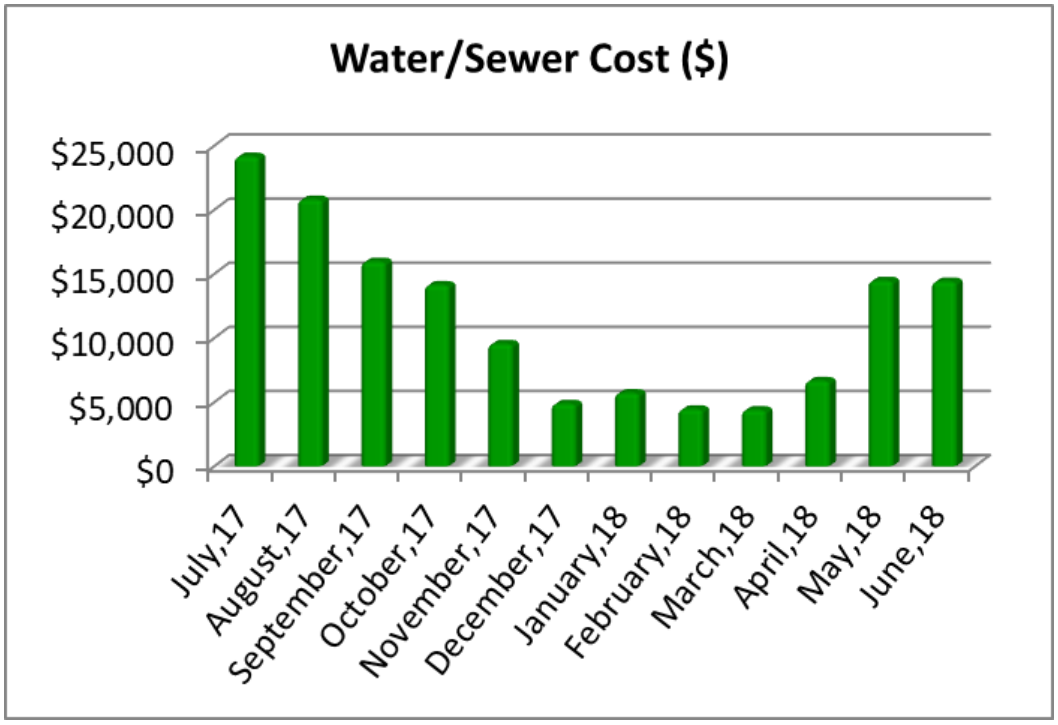
4.3. Water and Sewer

The City of Sacramento satisfies the water requirements for the facility. The primary end use of water is the plumbing fixtures such as staff showers, water closets, and lavatories. The table below provides the twelve continuous months' worth of consumption and cost for water in kGal for the facility.

Note: The utility bills for July 2017 - June 2018 was used instead of July 2018 - June 2019 due to unknown fluctuation in consumption data for the latter.

Water and Sewer Consumption and Cost Data

Billing Month	Consumption (Kgal)	Unit Cost/Kgal	Total Cost
July,17	0	0	$24,165
August,17	185	$112.26	$20,812
September,17	2,649	$6.03	$15,966
October,17	2,256	$6.27	$14,147
November,17	1,358	$7.04	$9,556
December,17	74	$65.92	$4,882
January,18	527	$10.86	$5,722
February,18	2,258	$1.97	$4,458
March,18	10,205	$0.43	$4,397
April,18	705	$9.47	$6,671
May,18	2,262	$6.40	$14,481
June,18	2,276	$6.33	$14,415
Total	24,755	$5.64	$139,672


Water/Sewer Cost ($)
$25,000
$20,000
$15,000
$10,000
$5,000
$0
July,17
August,17
September,17
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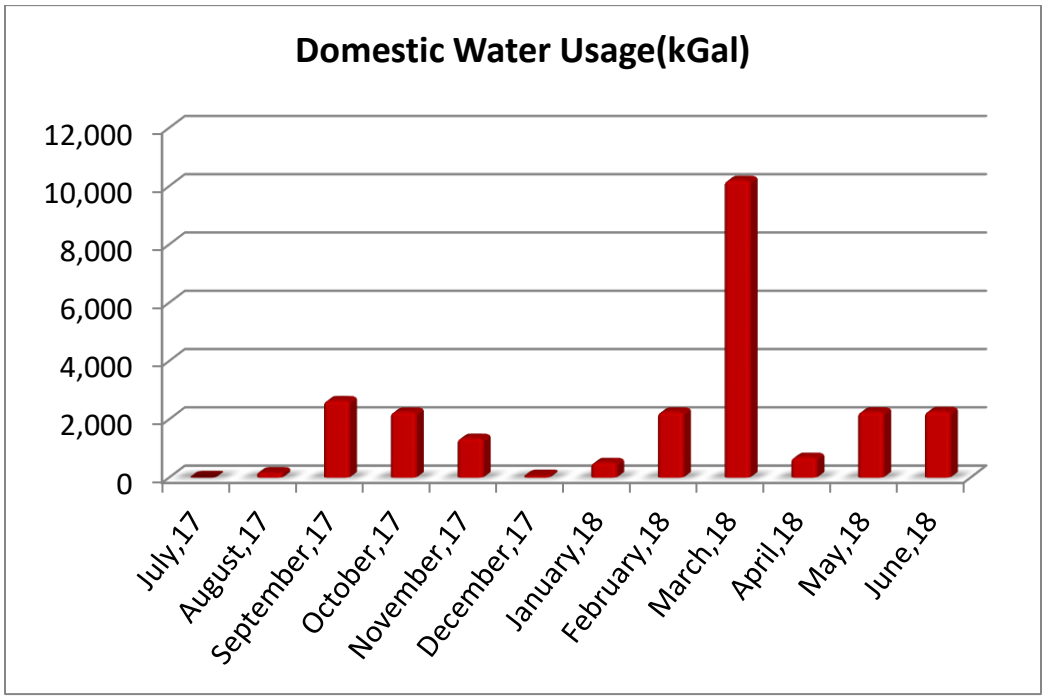
December,17
January,18
February,18
March,18
April,18
May,18
June,18


Domestic Water Usage(kGal)
12,000
10,000
8,000
6,000
4,000
2,000
0
July,17
August,17
September,17
October,17
November,17
December,17
January,18
February,18
March,18
April,18
May,18
June,18

5. Renewable Energy Discussions

5.1. Rooftop Solar Photovoltaic Feasibility

Solar Energy Feasibility

A photovoltaic array is a linked collection of photovoltaic modules, which are in turn made of multiple interconnected solar cells. The cells convert solar energy into direct current electricity via the photovoltaic effect. The power that one module can produce is seldom enough to meet requirements of a home or a business, so the modules are linked together to form an array. Most PV arrays use an inverter to convert the DC power produced by the modules into alternating current that can plug into the existing infrastructure to power lights, motors, and other loads. The modules in a PV array are usually first connected in series to obtain the desired voltage; the individual strings are then connected in parallel to allow the system to produce more current. Solar arrays are typically measured by the peak electrical power they produce, in watts, kilowatts, or even megawatts.

When determining if a site is suitable for a solar application, two basic considerations must be evaluated:

- At minimum, the sun should shine upon the solar collectors from 9 AM to 3 PM. If less, the application may still be worthwhile, but the benefit will be less.
- The array should face south and be free of any shading from buildings, trees, rooftop equipment, etc. If the array is not facing directly south, there will be a penalty in transfer efficiency, reducing the overall efficiency of the system.

Solar PV Questionnaire	Response
Does the property have a south, east, or west facing roof or available land of more than 250 square feet per required Solar Array Panel?	Yes
Is the area free from any shading such as trees, buildings, equipment etc throughout the whole day?	Yes
Can the panels be mounted at an incline of roughly 25-45 degrees? (equal to latitude of property)	Yes
Is the property in an area with acceptable average monthly sunlight levels?	Yes
Has the roofing been replaced within the past 3-5 years?	No
Is the roof structure sufficient to hold solar panels?	Additional Study Required
Is the property located in a state eligible for net metering?	Yes

A solar feasibility analysis of the site has resulted in the building containing more than sufficient amount of roof area for solar electricity generation. The analysis through the use of National Renewable Energy Laboratory's solar photovoltaic software assisted in calculating the potential electricity generated from the allocated land and roof area set for solar photovoltaic installment. The allocated roof area was through looking at the roof and surrounding areas at a bird's eye view. Also detailed in the report are incentives and rebates that can potentially bring down the installation cost of the ECMs and result in a higher return on investment and quicker payback period.

The approach taken in the solar photovoltaic (PV) roof analysis begins with surveying the roof and determine areas on the roof where solar PV panels can potentially be installed.

1) Conducting a preliminary sizing of solar PV panels on the roofs and on the ground and its potential electricity production for its first year of installment using the National Renewable Energy Laboratory (NREL) PV WATTS Version 2 Software.

2) Calculate energy and cost savings for the site as a sole proprietor of the system capable of collecting state, local, and federal tax credits and incentives and interconnecting and selling the renewable energy electrical production to the building.

Solar Rooftop Photovoltaic Analysis		
Estimated Number of Panels	1,294	
Estimated KW Rating	408	KW
Potential Annual kWh Produced	615,244	kWh
% of Current Electricity Uses	28.7%	
Financial Summary		
Investment Cost	$1,426,250	
Estimated Energy Cost Savings	$78,739	
Payback without Incentives	18.1	Years
Incentive Payback but without SRECs	11.0	Years
Payback with All Incentives	11.0	Years

A photovoltaic array is a linked collection of photovoltaic modules, which are in turn made of multiple interconnected solar cells. The cells convert solar energy into direct current. Modules of cells are linked together to form an array. Most PV arrays use an inverter to convert the DC power produced by the modules into alternating current that can connect to existing AC infrastructure to power lights, motors, and other loads.

Cost of production has fallen years with increasing demand and through production and technological advances. The cost dropped from $8–10/watt in 1996 to $4–7/watt in 2006. The market is diversifying with new types of panels suited to unique installation methods including stick on sheets and PV spray coating. The solar PV cost used in the analysis was set at $7.0/Watt which includes design, construction, administration, and installation and maintenance cost throughout the life of the solar panels.

One breakthrough for PV is “Net Metering”. When more PV electric power is generated than is consumed on site, the electric service meter reverses to “sell” the excess power directly back onto the power grid. The economics of PV for commercial industrial installations become attractive when coupled with incentives from Federal and state agencies, as well utility companies.

A kilowatt-hour costing $0.15 might be valued at $0.30 when produced by PV and sent to the grid. The economics of PV for commercial industrial installations become attractive when coupled with incentives from Federal and state agencies, as well utility companies.

The low payback period is highly dependent on the marketing potential of selling Solar Renewable Certificates to electricity generated providers who are under state regulations to contain a certain percentage of their electricity generation derived from renewable energy such as wind and solar.

Solar facilities are encouraged to sell their SRECs on the market (either spot market or through long-term contracts). Utilities may use SRECs for compliance under the state RPS for the year in which they are generated. Utilities may purchase up to 10% more SRECs than they require for compliance and "bank" those surplus SRECs for compliance during the following two years. Any SRECs pricing can range from $300 - $450/MWh and can be sold across state borders to other utility providers looking to purchase SRECs. EMG has selected to use the market value of $300/MWh minus 5% administrative fee in the analysis.

A number of states and corresponding electrical utility supplier are required under regulation to have a certain percentage of its electricity be produced by solar energy. To offset that they allow other utility companies to buy Renewable Energy Credits (REC) credit off their customers and facilities that produce their own solar energy. Typically the national market, the utility market is $400 per MWh to Utility Suppliers for not meeting this standard percentage so these REC credits are sold for $350 per MWH. (1 REC credit = 1 MWH).

State charges these utility companies to meet their state compliance of 0.2% of the entire electricity consumption from solar energy by 2022 (from.005% in 2008 aggregated up to 0.2% by 2022). The REC credits correspond to these percentages as they aggregate each year.

6. Operations and Maintenance Plan

The quality of the maintenance and the operation of the facility's energy systems have a direct effect on its overall energy efficiency. Energy-efficiency needs to be a consideration when implementing facility modifications, equipment replacements, and general corrective actions. The following is a list of activities that should be performed as part of the routine maintenance program for the property.

Building Envelope

- ✓ Ensure that the building envelope has proper caulking and weather stripping.
- ✓ Patch holes in the building envelope with foam insulation and fire rated caulk around combustion vents
- ✓ Inspect building vents semiannually for bird infestation
- ✓ Inspect windows monthly for damaged panes and failed thermal seals
- ✓ Repair and adjust automatic door closing mechanisms as needed.

Heating and Cooling

- ✓ Pilots lights on furnaces and boilers be turned off in summer
- ✓ All preventive maintenance should be performed on all furnaces and boilers, which would include cleaning of burners and heat exchanger tubes.
- ✓ Ensure that the combustion vents exhaust outside the conditioned space and the vent dampers are functional
- ✓ Ensure that the control valves are functioning properly before start of every season
- ✗ Ensure steam traps are functional before start of each heating season
- ✗ Ensure use of chemical treatment for boiler make up water
- ✗ Ensure boiler outside temperature re-set is set to 55F
- ✗ Ensure use of chemical treatment for Colling tower water to prevent corrosion
- ✓ Ensure the duct work in unconditioned space is un-compromised and well insulated
- ✓ Duct cleaning is recommended every 10 years. This should include sealing of ducts using products similar to 'aero-seal'
- ✓ Ensure use of economizer mode is functional and used
- ✓ Ensure that the outside air dampers actuators are operating correctly
- ✓ Ensure air coils in the AHU and FCA's are pressure washed annually
- ✓ Return vents should remain un-obstructed and be located centrally
- ✓ Temperature settings reduced in unoccupied areas and set points seasonally adjusted.
- ✓ Evaporator coils and condenser coils should be regularly cleaned to improve heat transfer
- ✓ Refrigerant pipes should be insulated with a minimum of ¾" thick Elastomeric Rubber Pipe Insulation
- ✓ Ensure refrigerant pressure is maintained in the condensers
- ✓ Change air filters on return vents seasonally. Use only filters with 'Minimum Efficiency Rating Value'(MERV) of 8

Central Domestic Hot Water Heater

- ✓ Never place gas fired water heaters adjacent to return vents so as to prevent flame roll outs
- ✓ Ensure the circulation system is on timer to reduce the losses through re-circulation
- ✓ Ensure all hot water pipes are insulated with fiberglass insulation at all times
- ✓ Replacement water heater should have Energy Factor (EF)>0.9
- ✓ Tank-type water heaters flushed monthly

Lighting Improvements

- ✓ Utilize bi-level lighting controls in stairwells and hallways.
- ✓ Use LED replacement lamps
- ✓ Clean lighting fixture reflective surfaces and translucent covers.
- ✓ Ensure that timers and/or photocells are operating correctly on exterior lighting
- ✓ Use occupancy sensors for offices and other rooms with infrequent occupancy

Existing Equipment and Replacements

- ✓ Ensure that refrigerator and freezer doors close and seal correctly
- ✓ Ensure kitchen and bathroom exhaust outside the building and the internal damper operates properly
- ✓ Ensure that bathroom vents exhaust out
- ✓ Office/ computer equipment either in the “sleep” or “off” mode when not used

7. Appendices

APPENDIX A: Glossary of Terms

APPENDIX B: Mechanical Equipment Inventory

APPENDIX C: Lighting System Schedule

APPENDIX D: ECM Checklist

APPENDIX E: ECM Calculations

APPENDIX F: Solar PV

APPENDIX A:
Glossary of Terms

Glossary of Terms and Acronyms

ECM – Energy Conservation Measures are projects recommended to reduce energy consumption. These can be No/Low cost items implemented as part of routine maintenance or Capital Cost items to be implemented as a capital improvement project.

Initial Investment – The estimated cost of implementing an ECM project. Estimates typically are based on R.S. Means Construction cost data and Industry Standards.

Annual Energy Savings – The reduction in energy consumption attributable to the implementation of a particular ECM. These savings values do not include the interactive effects of other ECMs.

Cost Savings – The expected reduction in utility or energy costs achieved through the corresponding reduction in energy consumption by implementation of an ECM.

Simple Payback Period –The number of years required for the cumulative value of energy or water cost savings less future non-fuel or non-water costs to equal the investment costs of the building energy or water system, without consideration of discount rates.

EUL – Expected Useful Life is the estimated lifespan of a typical piece of equipment based on industry accepted standards.

RUL – Remaining Useful Life is the EUL minus the effective age of the equipment and reflects the estimated number of operating years remaining for the item.

SIR - The savings-to-investment ratio is the ratio of the present value savings to the present value costs of an energy or water conservation measure. The numerator of the ratio is the present value of net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure. It is recommended that energy-efficiency recommendations be based on a calculated SIR, with larger SIRs receiving a higher priority. A project typically is recommended only if the SIR is greater than or equal to 1.0, unless other factors outweigh the financial benefit.

Life Cycle Cost - The sum of the present values of (a) **I**nvestment costs, less salvage values at the end of the study period; (b) Non-fuel operation and maintenance costs: (c) Replacement costs less salvage costs of replaced building systems; and (d) Energy and/or water costs.

Life Cycle Savings – The sum of the estimated annual cost savings over the EUL of the recommended ECM, expressed in present value dollars.

Building Site Energy Use Intensity - The sum of the total site energy use in thousands of Btu per unit of gross building area. Site energy accounts for all energy consumed at the building location only not the energy consumed during generation and transmission of the energy to the site.

Building Source Energy Use Intensity – The sum of the total source energy use in thousands of Btu per unit of gross building area. Source energy is the energy consumed during generation and transmission in supplying the energy to your site.

Building Cost Intensity - This metric is the sum of all energy use costs in dollars per unit of gross building area.

Greenhouse Gas Emissions - Although there are numerous gases that are classified as contributors to the total for Greenhouse Emissions, the scope of this energy audit focuses on carbon dioxide (CO_2). Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement).

APPENDIX B:
Mechanical Equipment Inventory

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Water Heater	A. O. Smith	BTR 200 110	MF040019511	100 GAL, 199 MBH		Utility closet	Pool Building (H)	1
Water Heater	RheemRheem / Ruud	E20A-6-G	RR 1003E00789	20 GAL, 6kW		Mechanical room-F107	Gymnasium and Cafeteria (F/G)	1
Water Heater	State	SSE 30	SM05110696	30 GAL, 6kW		Utility closet	Classrooms, Auditorium and Theatre (J)	1
Water Heater	State Industries, Inc.	SSE 30	SM051107013	30 GAL, 6kW		Custodial-j107	Classrooms, Auditorium and Theatre (J)	1
Water Heater	Rheem / Ruud	G50-98	URNG 0403G02091	50 GAL, 98 MBH		Utility closet	Classrooms, Auditorium and Theatre (J)	1
Water Heater	Maxim	54 P 250A-MX	1103111616	250 GAL, 540 MBH		Mechanical room-G146	Gymnasium and Cafeteria (F/G)	1
Water Heater	Rheem	E50-12-G-1	L0804RR1103E00606	50 GAL, 12 kW		Janitor closet L106	Snack Bar (L)	1
Water Heater	Rheem / Ruud	G50-98	URNG 1103G03079	50 GAL, 98 MBH		Custodial-G105	Gymnasium and Cafeteria (F/G)	1
Water Heater	Rheem / Ruud	EGSP10	RR 0903262156	10 GAL, 2kW		Utility closet	Administration (A)	1
Water Heater	Rheem	GNU100-200	A511717613	100 GAL, 200 MBH		Mechanical room-F123	Gymnasium and Cafeteria (F/G)	1
Water Heater	Maxim	54 P 250A-MX	110311 1617	250 GAL, 540 MBH		Mechanical room-G146	Gymnasium and Cafeteria (F/G)	1
Wall Mounted Heat Pump	No tag/plate found	No tag/plate found	No tag/plate found	2.5 TON		L101	Snack Bar (L)	1
Wall Mounted Heat Pump	No tag/plate found	No tag/plate found	No tag/plate found	2 TON		Interior	Announcer Booth (K)	1
Variable Frequency Drive (VFD), EF-1	Danfoss	Inaccessible	Inaccessible	7.5 hp		Classroom - C102	Classrooms and Library (C)	1
Variable Frequency Drive (VFD)	Danfoss	177U0105	621404Y412	20 HP		Equipment room	Pool Building (H)	1
Packaged Unit (RTU)	Carrier	46HJD005C-H651--	0603G20063	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48AJE025-	0303F12265	525 MBH	425 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48AJE025-	0303F12266	525 MBH	425 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48AJE050	0303F12271	800 MBH	648 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48AJE050-	0303F12278	800 MBH	648 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HGD028AC-611AE	4005G10012	250 MBH	205 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJ D005C-H651--	0403G40088	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJ005C	0503G20374	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJC008-K641--	0703G40388	125 MBH	102 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0503G20372	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0303G40118	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0503G30071	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0503G20371	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0403G30360	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0503G30069	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0303G40113	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651	0503G30074	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651-	0603G10372	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651-	0503G20369	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651-	0403G30357	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651-	0603G20065	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0503G20370	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0503G30072	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G40070	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G40079	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0303G40115	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G30356	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0503G20373	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G30358	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0603G10369	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G40076	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0303G40117	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0503G30073	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0603G10370	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G30361	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G40077	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0303G40116	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0603G10373	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0403G40075	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0603G10374	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0503G30070	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0603G20064	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	48HJD005C-H651--	0303G40114	72 MBH	59 MBH	Roof	Classrooms (B)	1

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Packaged Unit (RTU)	Carrier	48HJD005G	0403G30367	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD005G--651--	5005G50432	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD005G--651--	0403G30368	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641	0603G50339	72 MBH	59 MBH	Roof	Administration (A)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641	0703G10082	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641	0603G50336	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641	0703G10081	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641-	0603G50338	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641--	0603G50337	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD006C-H641--	0603G50335	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD006C-J641	0703G40295	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD006C-J641	0703G40296	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD006G-641-	0203G50153	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD006G-641--	4805G30463	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD007---651	Illegible	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD007---651	Illegible	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD007---651	4108G50288	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD007---651	4108G50291	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD007---651	3308G50320	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD007C-H651--	0703G10147	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD007C-H651--	0703G10148	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD008C-K641	0703G50551	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008C-K641-	0703G40387	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008C-K641-	0703G40385	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008C-K641--	0703G50550	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008C-K641--	0703640379	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008G-641--	4305G30797	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD008G-641--	0203G40430	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD008-K641--	0703G50549	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJD012C-K671	0703G20519	180 MBH	147 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJD012C-K671---	0703G20520	180 MBH	147 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD012G-671	0203G30458	180 MBH	147 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD012G-671--	0203G30456	180 MBH	147 MBH	Roof-student dining	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD012G--671	0203G30457	180 MBH	147 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD012G--671-	0203G30459	180 MBH	147 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD014G---601	0203G36471	224 MBH	183 MBH	Roof-student dining	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD014G-661-	0203G30468	224 MBH	183 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJD014G--661-	4605G40813	224 MBH	183 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48HJDO14G--661--	0203G30469	224 MBH	183 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJE004C-H641	2503G20087	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJE004C-H641	0603G50401	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJE004C-H641	0603G20060	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJE004C-H641	0603G20059	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Packaged Unit (RTU)	Carrier	48HJE004C-H641-	4603G50077	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJE004C-H641--	0603G20061	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJE004G-63974	0403G30384	72 MBH	59 MBH	Roof	Classrooms and Library (C)	1
Packaged Unit (RTU)	Carrier	48HJE004G--63974	0403G30383	72 MBH	59 MBH	Roof	Classrooms (B)	1
Packaged Unit (RTU)	Carrier	48HJE004G--641-	0203G40394	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJE004G---641	0203G40393	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Packaged Unit (RTU)	Carrier	48HJE004G-H641--	4905G50529	72 MBH	59 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48TMD025J -611AA	4405U07626	275 MBH	223 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48TMD025J--611AA	4405U07625	275 MBH	223 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	48TMD025J--611AA	4405U07625	275 MBH	223 MBH	Roof	Classrooms, Auditorium and Theatre (J)	1
Packaged Unit (RTU)	Carrier	4CHUD005-H651	0403G30359	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	Illegible	0605G30302	72 MBH	59 MBH	Roof	Classrooms (E)	1
Packaged Unit (RTU)	Carrier	w48HJD0070--651-	0503G30206	72 MBH	59 MBH	Roof	Gymnasium and Cafeteria (F/G)	1
Motor	A. O. Smith			30 HP		Roof-AC-4G	Gymnasium and Cafeteria (F/G)	1
Motor	A. O. Smith			15 HP		Roof-AC-2G	Gymnasium and Cafeteria (F/G)	1
Motor	A. O. Smith	7850008-01-OJ	BX09	15 HP		Roof-AC-1G	Gymnasium and Cafeteria (F/G)	1
Motor	A. O. Smith			30 HP		Roof-AC-3G	Gymnasium and Cafeteria (F/G)	1
Make-Up Air Unit	Modine	No tag/plate found	No tag/plate found	5600 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Make-Up Air Unit	Modine Manufacturing	No tag/plate found	No tag/plate found	2850 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Make-Up Air Unit	Modine Manufacturing	No tag/plate found	No tag/plate found	4000 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Make-Up Air Unit	Modine Manufacturing	No tag/plate found	No tag/plate found	6200 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Gas Pool Heater	Laars	AP2450IN18CCACLW	C04I07272	2,450 MBH	2,009 MBH	Equipment room	Pool Building (H)	1
Exhaust Fan	Penn Ventilator	DX11B	No tag/plate found	800 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	Illegible	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	DX08B	No tag/plate found	400 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Cook	120 ACE 12003B	284S816836-00 0000701	1300 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilation	Illegible	No tag/plate found	1410 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX18BH	No tag/plate found	2190		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	FX18BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	DC11B	No tag/plate found	900 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	DX08B	No tag/plate found	500 CFM		Roof	Classrooms and Library (C)	2
Exhaust Fan	Penn Ventilator	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	Illegible	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX18BH	No tag/plate found	2190 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX18BH	No tag/plate found	2190 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	PennBarry	SX225BHC	G17KZ44160	4500 CFM		Classroom - C102	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	DX08B	No tag/plate found	80		Roof	Classrooms, Auditorium and Theatre (J)	1
Exhaust Fan	Penn Ventilator	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator	FX18BH	No tag/plate found	2190		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	DX11B	No tag/plate found	No tag/plate found		Roof	Classrooms, Auditorium and Theatre (J)	1

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Exhaust Fan	Penn Ventilator	DX11B	No tag/plate found	900 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Loren Cook	120 ACE 120C3B	284S816826-00/0002201	600 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilator	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	FX18BH	No tag/plate found	2190 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilation	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Loren Cook	120 ACE 120C3B	284S816826-00/0002204	600 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Loren Cook	120 AC 120AC3B	2848816826-00/0002202	600 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilation	FX12BH	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Loren Cook	120 ACE 12OCEB	284S816826-00/0002203	600 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Loren Cook	120 ACE 120C3B	284S816826-00/0000702	1300 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilation	Illegible	No tag/plate found	600 CFM		Roof	Classrooms and Library (C)	1
Exhaust Fan	Penn Ventilator Company	FX24BFT	No tag/plate found	4418 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilator Company	FX12BHFT	No tag/plate found	1710 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilator Company	Illegible	Illegible	708 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilator Company	FX24BHFT	No tag/plate found	3000 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan	Penn Ventilator Company	FX24BHFT	No tag/plate found	3182 CFM		Roof	Gymnasium and Cafeteria (F/G)	1
Exhaust Fan				No tag/plate found		Roof	Gymnasium and Cafeteria (F/G)	13
Exhaust Fan	No tag/plate found	DX11B	No tag/plate found	501 - 1000 CFM		Roof	Classrooms, Auditorium and Theatre (J)	1
Ductless Split System	Mitsubishi	PU18EK	Illegible	1.5 TON		Roof	Administration (A)	1
Ductless Split System	Carrier	PU24EK	Illegible	2 TON		Roof	Classrooms, Auditorium and Theatre (J)	1
Ductless Split System	Mitsubishi	PU24EK	Illegible	2 TON		Roof	Classrooms and Library (C)	1
Ductless Split System	Mitsubishi	PU24EK	Illegible	2 TON		Roof	Classrooms (B)	1
Ductless Split System	Mitsubishi	PU24EK	Illegible	2 TON		Roof	Classrooms (B)	1
Ductless Split System	Mitsubishi	PU42EK7	Illegible	3.5 TON		Roof	Gymnasium and Cafeteria (F/G)	1
Ductless Split System	Mitsubishi	PU24EK	29E0 129 4D	2 TON		Roof	Gymnasium and Cafeteria (F/G)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	E119-above ceiling	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E113	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	E103	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E101	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	58MXA100-F-1--20	0803A18454	100 MBH	93 MBH	Classroom E100	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B106	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	B103	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B102	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E105	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E119	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B113	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B109	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E110	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B120	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C100	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E106	Classrooms (E)	1

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B105	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	58MXA100-F-1--20	0803A18451	100 MBH	93 MBH	Classroom E104	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C109	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B104	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	58MXA100-F-1--20	0803A18452	100 MBH	93 MBH	B103	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C120	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C117	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B111	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C102	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B112	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E111	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B100	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C119	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E109	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B110	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	E103	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E112	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom B101	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom E102	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C128	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	100 MBH	93 MBH	Classroom C118	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	40 MBH	37 MBH	Classroom C116	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	60 MBH	56 MBH	Classroom C123	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	60 MBH	56 MBH	Classroom E115	Classrooms (E)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	60 MBH	56 MBH	Classroom C127	Classrooms and Library (C)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	60 MBH	56 MBH	Classroom B115	Classrooms (B)	1
Central Split System Gas Furnace	Carrier	Inaccessible	Inaccessible	80 MBH	74 MBH	Classroom C110	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC036630	1503E04939	3 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18405	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18389	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC036630	1503E04938	3 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18440	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18447	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC048660	1603E19511	4 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC030500	0803E06299	2.5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18403	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18390	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18395	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18397	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18443	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18402	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18432	5 TON		Roof	Classrooms and Library (C)	1

Mechanical Inventory								
System	Make	Model	Serial Number	Input Capacity	Output Capacity	Room Number	Space Served	Quantity
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18439	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18404	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC036630	1503E04940	3 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18457	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18391	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18400	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18451	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	PU24EK	Illegible	2 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18396	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18427	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18429	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKCK060670	1603E18408	5 TON		Roof	Classrooms and Library (C)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18453	5 TON		Roof	Classrooms (B)	1
Central AC System Condensing Unit	Carrier	38CKCO60670	1603E18424	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18394	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E20635	2 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18425	2 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E20637	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E20611	2 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18431	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC036630	1503E04937	3 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18444	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC860670	1603E8393	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Mitsubishi	PU24EK	Illegible	2 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Mitsubishi	PU24EK	Illegible	2 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18422	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18387	5 TON		Roof	Classrooms (E)	1
Central AC System Condensing Unit	Carrier	38CKC060670	1603E18445	5 TON		Roof	Classrooms (E)	1

APPENDIX C:
Lighting System Schedule

								Lamp Details				Fixture Details				Existing Consumption	
Line No.	Building Name	Interior/ Exterior	Floor	Space Type	Room No.	Control Quantity	Existing Control	Technology	Sub-Technology	Lamp Type	Total Lamps	Fixture Type	Fixture Quantity	24x7 Fixture Count	Fixture Height	Annual Hours	Existing Annual kWh
1	Rosemont high school	Interior	1	STORAGE	C129	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	10	703	540
2	Rosemont high school	Interior	1	STORAGE	C123	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	2	0	10	703	540
3	Rosemont high school	Interior	1	StAIRWELL	C128	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	21	2x4 Prism Troffer	3	0	10	2,220	1,492
4	Rosemont high school	Interior	1	JANITORIAL	C107	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	2	0	10	703	45
5	Rosemont high school	Interior	1	HALLWAY	C108	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	2	0	10	2,220	852
6	Rosemont high school	Interior	1	CLASSROOM	C102	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	96	2x4 Prism Troffer	16	0	10	1,480	4,547
7	Rosemont high school	Interior	1	StAIRWELL	C101	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	4	2x4 Prism Troffer	2	0	8	2,220	284
8	Rosemont high school	Interior	1	CLASSROOM	C100	8	Light Switch	Linear Fluorescent	T8	4' 32W T8	180	2x4 Prism Troffer	30	0	10	1,480	8,525
9	Rosemont high school	Interior	1	CLASSROOM	C119	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	336	2x4 Parabolic Troffer	168	0	10	1,480	15,913
10	Rosemont high school	Interior	1	RESTROOM	C110	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	10	2,220	142
11	Rosemont high school	Interior	2	CLASSROOM	C116	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	52	2x4 Prism Troffer	26	0	10	1,480	2,463
12	Rosemont high school	Interior	2	CLASSROOM	C118	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	84	2x4 Prism Troffer	42	0	10	1,480	3,978
13	Rosemont high school	Interior	2	CLASSROOM	C228	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	42	2x4 Prism Troffer	21	0	10	1,480	1,989
14	Rosemont high school	Interior	2	CLASSROOM	C200	12	Light Switch	Linear Fluorescent	T8	4' 32W T8	144	2x4 Prism Troffer	72	0	10	1,480	6,820
15	Rosemont high school	Interior	2	STORAGE	C211	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	10	703	270
16	Rosemont high school	Interior	2	RESTROOM	C229	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	70	2x4 Prism Troffer	35	0	10	2,220	4,973
17	Rosemont high school	Interior	2	RESTROOM	C206	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	60	2x4 Prism Troffer	30	0	10	2,220	4,262
18	Rosemont high school	Interior	2	CONFERENCE ROOM	C210	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	80	2x4 Prism Troffer	40	0	10	2,220	5,683
19	Rosemont high school	Interior	2	CLASSROOM	C220	20	Light Switch	Linear Fluorescent	T8	4' 32W T8	400	2x4 Prism Troffer	200	0	10	1,480	18,944
20	Rosemont high school	Interior	2	CLASSROOM	C 216	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	46	2x4 Prism Troffer	23	0	10	1,480	2,179
21	Rosemont high school	Interior	2	CLASSROOM	C 219	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	80	2x4 Prism Troffer	40	0	10	1,480	3,789
22	Rosemont high school	Interior	2	CLASSROOM	C225	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	10	1,480	1,137
23	Rosemont high school	Interior	2	HALLWAY	C221	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	48	2x4 Prism Troffer	24	0	10	2,220	3,410
24	Rosemont high school	Interior	1	HALLWAY	C121	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	20	2x4 Prism Troffer	10	0	10	2,220	1,421
25	Rosemont high school	Interior	1	CLASSROOM	J128	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	36	2x4 Prism Troffer	12	0	8	1,480	1,705
26	Rosemont high school	Interior	1	CLASSROOM	J127	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	30	2x4 Prism Troffer	10	0	10	1,480	1,421
27	Rosemont high school	Interior	1	HALLWAY	J123	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	8	2x4 Prism Troffer	4	0	10	2,220	568
28	Rosemont high school	Interior	1	AUDITORIUM	J120	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	72	2x4 Prism Troffer	24	0	10	740	1,705
29	Rosemont high school	Interior	1	CLASSROOM	J121	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	18	2x4 Prism Troffer	6	0	10	1,480	852
30	Rosemont high school	Interior	1	STORAGE	J132	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	4	0	10	703	270
31	Rosemont high school	Interior	1	STORAGE	J133	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	4	2x4 Prism Troffer	2	0	10	703	90
32	Rosemont high school	Interior	1	STORAGE	J103	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	8	2x4 Prism Troffer	4	0	10	703	180
33	Rosemont high school	Interior	1	RESTROOM	J 106	3	Light Switch	Linear Fluorescent	T8	4' 32W T8	42	2x4 Prism Troffer	21	0	8	2,220	2,984
34	Rosemont high school	Interior	1	RESTROOM	J109	3	Light Switch	Linear Fluorescent	T8	4' 32W T8	42	2x4 Prism Troffer	21	0	10	2,220	2,984
35	Rosemont high school	Interior	1	HALLWAY	J104	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	10	2,220	142
36	Rosemont high school	Interior	1	CLASSROOM	J112	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	272	2x4 Prism Troffer	136	0	10	1,480	12,882
37	Rosemont high school	Interior	1	CLASSROOM	J116	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	10	2x4 Prism Troffer	5	0	10	1,480	474
38	Rosemont high school	Interior	1	HALLWAY	J116	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	10	2,220	1,705
39	Rosemont high school	Interior	1	JANITORIAL	J	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Parabolic Troffer	1	0	10	703	45
40	Rosemont high school	Interior	1	OPEN OFFICE	E103	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	120	2x4 Prism Troffer	40	0	10	2,220	8,525
41	Rosemont high school	Interior	1	CLASSROOM	C 120	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	84	2x4 Prism Troffer	42	0	10	1,480	3,978
42	Rosemont high school	Interior	2	OPEN OFFICE	E 203	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	468	2x4 Prism Troffer	156	0	10	2,220	33,247
43	Rosemont high school	Interior	2	CLASSROOM	E200	96	Light Switch	Linear Fluorescent	T8	4' 32W T8	2112	2x4 Prism Troffer	1056	0	10	1,480	100,024
44	Rosemont high school	Interior		RESTROOM	E 216	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	10	2x4 Prism Troffer	5	0	10	2,220	710
45	Rosemont high school	Interior	2	OFFICE	E 215	8	Light Switch	Linear Fluorescent	T8	4' 32W T8	90	2x4 Prism Troffer	30	0	10	2,220	6,394
46	Rosemont high school	Interior	2	JANITORIAL	E217	8	Light Switch	Linear Fluorescent	T8	4' 32W T8	32	2x4 Prism Troffer	16	0	10	703	720
47	Rosemont high school	Interior	1	STORAGE	F 101 b	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	4	2x4 Prism Troffer	2	0	10	703	90
48	Rosemont high school	Interior	1	OPEN OFFICE	F101	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	36	2x4 Prism Troffer	12	0	10	2,220	2,557
49	Rosemont high school	Interior	1	OFFICE	F108	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	2	0	10	2,220	426
50	Rosemont high school	Interior	1	MECHANICAL	Building g/f	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	18	2x4 Prism Troffer	6	0	10	740	426
51	Rosemont high school	Interior	1	MECHANICAL	F123	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	4	2x4 Prism Troffer	2	0	10	1,554	199
52	Rosemont high school	Interior	1	JANITORIAL	F109	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	32	2x4 Prism Troffer	16	0	10	703	720
53	Rosemont high school	Interior	1	JANITORIAL	F107	6	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	10	703	270
54	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	110	2x4 Prism Troffer	55	0	8	2,220	7,814
55	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	18	2x4 Prism Troffer	9	0	8	2,220	1,279
56	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	8	2,220	852
57	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	8	2,220	852
58	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	14	2x4 Prism Troffer	7	0	8	2,220	995
59	Rosemont high school	Interior	1	CAFETERIA	F100	0	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	3	0	8	2,220	426

60	Rosemont high school	Interior	1	CAFETERIA	F110	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	8	2,220	1,705
61	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	60	2x4 Prism Troffer	20	0	8	1,850	3,552
62	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	2	0	8	1,850	355
63	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	3	0	8	1,850	355
64	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	3	0	8	1,850	355
65	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	6	2x4 Prism Troffer	3	0	8	1,850	355
66	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	1,850	118
67	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	1,850	118
68	Rosemont high school	Interior		KITCHEN	F121	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	1,850	118
69	Rosemont high school	Interior		GYMNASIUM	G100	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	192	2x4 Prism Troffer	96	0	8	2,220	13,640
70	Rosemont high school	Exterior		HALLWAY	Exterior	1	Timer	HID	MH	MH175	67	Pole Post Top	67	0	15	3,108	36,441
71	Rosemont high school	Interior	1	LIBRARY	C133	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	60	2x4 Prism Troffer	30	0	8	2,220	4,262
72	Rosemont high school	Interior	1	AUDITORIUM	J131	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	60	2x4 Prism Troffer	30	0	8	740	1,421
73	Rosemont high school	Interior	1	CLASSROOM	J 101	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	40	2x4 Prism Troffer	20	0	8	1,480	1,894
74	Rosemont high school	Interior	2	CLASSROOM	C226	8	Light Switch	Linear Fluorescent	T8	4' 32W T8	48	2x4 Prism Troffer	24	0	8	1,480	2,273
75	Rosemont high school	Interior	1	STORAGE	G111	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	4	2x4 Prism Troffer	2	0	10	703	90
76	Rosemont high school	Interior		GYMNASIUM	G-109	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	98	2x4 Prism Troffer	49	0	8	2,220	6,962
77	Rosemont high school	Interior		STORAGE	G107	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	8	0	8	703	540
78	Rosemont high school	Interior		STORAGE	G108	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	4	0	8	703	270
79	Rosemont high school	Interior		HALLWAY	G- entrance	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	44	2x4 Prism Troffer	22	0	8	2,220	3,126
80	Rosemont high school	Interior		RESTROOM	G restrooms	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	2,220	142
81	Rosemont high school	Interior		GYMNASIUM	G-110	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	69	2x4 Prism Troffer	23	0	8	2,220	4,902
82	Rosemont high school	Interior		GYMNASIUM	G-132	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	90	2x4 Prism Troffer	30	0	8	2,220	6,394
83	Rosemont high school	Interior		LOCKER ROOM	G-136	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	8	2,220	852
84	Rosemont high school	Interior		GYMNASIUM	G-130	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	18	2x4 Prism Troffer	9	0	8	2,220	1,279
85	Rosemont high school	Interior		GYMNASIUM	G-131	2	Light Switch	Linear Fluorescent	T8	4' 32W T8	54	2x4 Prism Troffer	18	0	8	2,220	3,836
86	Rosemont high school	Interior		STORAGE	G-112	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	12	2x4 Prism Troffer	6	0	8	703	270
87	Rosemont high school	Interior		LOCKER ROOM	G129	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	80	2x4 Prism Troffer	40	0	8	2,220	5,683
88	Rosemont high school	Interior		GYMNASIUM	G117	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	2,220	142
89	Rosemont high school	Interior		OFFICE	A136	9	Light Switch	Linear Fluorescent	T8	4' 32W T8	36	2x4 Prism Troffer	18	0	8	2,220	2,557
90	Rosemont high school	Interior		OFFICE	A-confrence	9	Light Switch	Linear Fluorescent	T8	4' 32W T8	162	2x4 Indirect Troffer	81	0	8	2,220	11,508
91	Rosemont high school	Interior		RESTROOM	A restroom	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	2	2x4 Prism Troffer	1	0	8	2,220	142
92	Rosemont high school	Interior		JANITORIAL	A141	7	Light Switch	Linear Fluorescent	T8	4' 32W T8	14	2x4 Indirect Troffer	7	0	8	703	315
94	Rosemont high school	Interior		OFFICE	A-hallwat	4	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	8	2,220	1,705
95	Rosemont high school	Interior		OFFICE	A129	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	30	2x4 Prism Troffer	15	0	8	2,220	2,131
96	Rosemont high school	Interior		OFFICE	A142	5	Light Switch	Linear Fluorescent	T8	4' 32W T8	40	2x4 Prism Troffer	20	0	8	2,220	2,842
97	Rosemont high school	Interior		OFFICE	A127	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	24	2x4 Prism Troffer	12	0	8	2,220	1,705
98	Rosemont high school	Interior		OFFICE	A143	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	30	2x4 Prism Troffer	15	0	8	2,220	2,131
93	Rosemont high school	Interior		CLASSROOM	A-139	1	Light Switch	Linear Fluorescent	T8	4' 32W T8	18	2x4 Prism Troffer	9	0	8	1,480	852
	Totals										7,127		3,281			169,053	420,050

								Fixture Details						Existing Consumption				Proposed- Post Retrofit				
Line No.	Building Name	Interior/ Exterior	Floor	Space Type	Room No.	Existing Control	Control Quantity	Technology	Sub-Technology	Lamp- Fixture	Fixture Quantity	Total Lamps	Fixture Height	Annual Hours	Existing Annual kWh	ECM	ECM Type	Recommended Sensor	LED Lamp Retrofit	Annual Hours of Operation	Proposed Annual kWh	Annual Savings From LED Retrofit
																						kWh
1	Rosemont high school	Interior	1	STORAGE	C129	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	10	703	540	ECM	RB - Replace Bulb	Photo Sensor	4' 17W LED T8	703	287	253
2	Rosemont high school	Interior	1	STORAGE	C123	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	24	10	703	540	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	703	287	253
3	Rosemont high school	Interior	1	StAIRWELL	C128	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	3	21	10	2,220	1,492	ECM	RB - Replace Bulb	Photo Sensor	4' 17W LED T8	2,220	793	699
4	Rosemont high school	Interior	1	JANITORIAL	C107	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	2	10	703	45	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	24	21
5	Rosemont high school	Interior	1	HALLWAY	C108	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	12	10	2,220	852	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	453	400
6	Rosemont high school	Interior	1	CLASSROOM	C102	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	16	96	10	1,480	4,547	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	1,480	2,415	2,131
7	Rosemont high school	Interior	1	StAIRWELL	C101	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	4	8	2,220	284	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	151	133
8	Rosemont high school	Interior	1	CLASSROOM	C100	Light Switch	8	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	180	10	1,480	8,525	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	1,480	4,529	3,996
9	Rosemont high school	Interior	1	CLASSROOM	C119	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Parabolic Troffer	168	336	10	1,480	15,913	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	8,454	7,459
10	Rosemont high school	Interior	1	RESTROOM	C110	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	10	2,220	142	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	75	67
11	Rosemont high school	Interior	2	CLASSROOM	C116	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	26	52	10	1,480	2,463	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	1,308	1,154
12	Rosemont high school	Interior	2	CLASSROOM	C118	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	42	84	10	1,480	3,978	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	2,113	1,865
13	Rosemont high school	Interior	2	CLASSROOM	C228	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	21	42	10	1,480	1,989	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	1,057	932
14	Rosemont high school	Interior	2	CLASSROOM	C200	Light Switch	12	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	72	144	10	1,480	6,820	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	3,623	3,197
15	Rosemont high school	Interior	2	STORAGE	C211	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	10	703	270	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	143	127
16	Rosemont high school	Interior	2	RESTROOM	C229	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	35	70	10	2,220	4,973	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	2,642	2,331
17	Rosemont high school	Interior	2	RESTROOM	C206	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	60	10	2,220	4,262	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	2,264	1,998
18	Rosemont high school	Interior	2	CONFERENCE ROOM	C210	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	40	80	10	2,220	5,683	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	3,019	2,664
19	Rosemont high school	Interior	2	CLASSROOM	C220	Light Switch	20	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	200	400	10	1,480	18,944	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	1,480	10,064	8,880
20	Rosemont high school	Interior	2	CLASSROOM	C 216	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	23	46	10	1,480	2,179	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	1,157	1,021
21	Rosemont high school	Interior	2	CLASSROOM	C 219	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	40	80	10	1,480	3,789	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	1,480	2,013	1,776
22	Rosemont high school	Interior	2	CLASSROOM	C225	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	10	1,480	1,137	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	604	533
23	Rosemont high school	Interior	2	HALLWAY	C221	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	24	48	10	2,220	3,410	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	1,812	1,598
24	Rosemont high school	Interior	1	HALLWAY	C121	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	10	20	10	2,220	1,421	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	755	666
25	Rosemont high school	Interior	1	CLASSROOM	J128	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	36	8	1,480	1,705	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	906	799
26	Rosemont high school	Interior	1	CLASSROOM	J127	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	10	30	10	1,480	1,421	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	755	666
27	Rosemont high school	Interior	1	HALLWAY	J123	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	4	8	10	2,220	568	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	302	266
28	Rosemont high school	Interior	1	AUDITORIUM	J120	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	24	72	10	740	1,705	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	740	906	799
29	Rosemont high school	Interior	1	CLASSROOM	J121	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	18	10	1,480	852	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	453	400
30	Rosemont high school	Interior	1	STORAGE	J132	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	4	12	10	703	270	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	143	127
31	Rosemont high school	Interior	1	STORAGE	J133	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	4	10	703	90	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	48	42
32	Rosemont high school	Interior	1	STORAGE	J103	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	4	8	10	703	180	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	96	84
33	Rosemont high school	Interior	1	RESTROOM	J 106	Light Switch	3	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	21	42	8	2,220	2,984	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	1,585	1,399
34	Rosemont high school	Interior	1	RESTROOM	J109	Light Switch	3	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	21	42	10	2,220	2,984	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	1,585	1,399
35	Rosemont high school	Interior	1	HALLWAY	J104	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	10	2,220	142	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	75	67
36	Rosemont high school	Interior	1	CLASSROOM	J112	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	136	272	10	1,480	12,882	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	6,844	6,038
37	Rosemont high school	Interior	1	CLASSROOM	J116	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	5	10	10	1,480	474	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	252	222
38	Rosemont high school	Interior	1	HALLWAY	J116	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	10	2,220	1,705	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	906	799
39	Rosemont high school	Interior	1	JANITORIAL	J	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Parabolic Troffer	1	2	10	703	45	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	703	24	21
40	Rosemont high school	Interior	1	OPEN OFFICE	E103	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	40	120	10	2,220	8,525	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	4,529	3,996
41	Rosemont high school	Interior	1	CLASSROOM	C 120	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	42	84	10	1,480	3,978	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	1,480	2,113	1,865
42	Rosemont high school	Interior	2	OPEN OFFICE	E 203	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	156	468	10	2,220	33,247	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	17,662	15,584
43	Rosemont high school	Interior	2	CLASSROOM	E200	Light Switch	96	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1056	2112	10	1,480	100,024	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	53,138	46,886
44	Rosemont high school	Interior		RESTROOM	E 216	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	5	10	10	2,220	710	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	377	333
45	Rosemont high school	Interior	2	OFFICE	E 215	Light Switch	8	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	90	10	2,220	6,394	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	3,397	2,997
46	Rosemont high school	Interior	2	JANITORIAL	E217	Light Switch	8	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	16	32	10	703	720	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	382	337
47	Rosemont high school	Interior	1	STORAGE	F 101 b	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	4	10	703	90	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	48	42
48	Rosemont high school	Interior	1	OPEN OFFICE	F101	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	36	10	2,220	2,557	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	1,359	1,199
49	Rosemont high school	Interior	1	OFFICE	F108	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	6	10	2,220	426	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	226	200
50	Rosemont high school	Interior	1	MECHANICAL	Building g/f	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	18	10	740	426	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	740	226	200
51	Rosemont high school	Interior	1	MECHANICAL	F123	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	4	10	1,554	199	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,554	106	93
52	Rosemont high school	Interior	1	JANITORIAL	F109	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	16	32	10	703	720	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	703	382	337
53	Rosemont high school	Interior	1	JANITORIAL	F107	Light Switch	6	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	10	703	270	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	143	127
54	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	55	110	8	2,220	7,814	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	4,151	3,663
55	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	9	18	8	2,220	1,279	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	679	599
56	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	8	2,220	852	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	453	400
57	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	8	2,220	852	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	453	400
58	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	7	14	8	2,220	995	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	528	466
59	Rosemont high school	Interior	1	CAFETERIA	F100	Light Switch	0	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	3	6	8	2,220	426	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	226	200
60	Rosemont high school	Interior	1	CAFETERIA	F110	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	8	2,220	1,705	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	906	799
61	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	20	60	8	1,850	3,552	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	1,887	1,665
62	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	6	8	1,850	355	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	189	167
63	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	3	6	8	1,850	355	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	189	167
64	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	3	6	8	1,850	355	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	189	167
65	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	3	6	8	1,850	355	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	189	167
66	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	1,850	118	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	63	56
67	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	1,850	118	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	63	56
68	Rosemont high school	Interior		KITCHEN	F121	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	1,850	118	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,850	63	56
69	Rosemont high school	Interior		GYMNASIUM	G100	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	96	192	8	2,220	13,640	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	7,246	6,394
70	Rosemont high school	Exterior		HALLWAY	Exterior	Timer	1	HID	MH	MH175; Pole Post Top	67	67	15	3,108	36,441	ECM	RF - Replace Entire Fixture	Ceiling Mounted	54W LED Bulb	3,108	11,245	25,197
71	Rosemont high school	Interior	1	LIBRARY	C133	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	60	8	2,220	4,262	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	2,264	1,998
72	Rosemont high school	Interior	1	AUDITORIUM	J131	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	60	8	740	1,421	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	740	755	666
73	Rosemont high school	Interior	1	CLASSROOM	J 101	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	20	40	8	1,480	1,894	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	1,480	1,006	888
74	Rosemont high school	Interior	2	CLASSROOM	C226	Light Switch	8	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	24	48	8	1,480	2,273	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	1,208	1,066
75	Rosemont high school	Interior	1	STORAGE	G111	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	2	4	10	703	90	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	48	42
76	Rosemont high school	Interior		GYMNASIUM	G-109	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	49	98	8	2,220	6,962	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	3,699	3,263
77	Rosemont high school	Interior		STORAGE	G107	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	8	24	8	703	540	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	703	287	253
78	Rosemont high school	Interior		STORAGE	G108	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	4	12	8	703	270	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	703	143	127
79	Rosemont high school	Interior		HALLWAY	G- entrance	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	22	44	8	2,220	3,126	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	1,661	1,465
80	Rosemont high school	Interior		RESTROOM	G restrooms	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	2,220	142	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	75	67
81	Rosemont high school	Interior		GYMNASIUM	G-110	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	23	69	8	2,220	4,902	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	2,604	2,298
82	Rosemont high school	Interior		GYMNASIUM	G-132	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	30	90	8	2,220	6,394	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	3,397	2,997
83	Rosemont high school	Interior		LOCKER ROOM	G-136	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	8	2,220	852	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	453	400
84	Rosemont high school	Interior		GYMNASIUM	G-130	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	9	18	8	2,220	1,279	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	679	599
85	Rosemont high school	Interior		GYMNASIUM	G-131	Light Switch	2	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	18	54	8	2,220	3,836	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	2,038	1,798

86	Rosemont high school	Interior		STORAGE	G-112	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	6	12	8	703	270	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	703	143	127
87	Rosemont high school	Interior		LOCKER ROOM	G129	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	40	80	8	2,220	5,683	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	3,019	2,664
88	Rosemont high school	Interior		GYMNASIUM	G117	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	2,220	142	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	75	67
89	Rosemont high school	Interior		OFFICE	A136	Light Switch	9	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	18	36	8	2,220	2,557	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	1,359	1,199
90	Rosemont high school	Interior		OFFICE	A-confrence	Light Switch	9	Linear Fluorescent	T8	4' 32W T8; 2x4 Indirect Troffer	81	162	8	2,220	11,508	ECM	RB - Replace Bulb	Retain Existing Controls	4' 17W LED T8	2,220	6,114	5,395
91	Rosemont high school	Interior		RESTROOM	A restroom	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	1	2	8	2,220	142	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	75	67
92	Rosemont high school	Interior		JANITORIAL	A141	Light Switch	7	Linear Fluorescent	T8	4' 32W T8; 2x4 Indirect Troffer	7	14	8	703	315	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	703	167	148
93	Rosemont high school	Interior		CLASSROOM	A-139	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	9	18	8	1,480	852	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	1,480	453	400
94	Rosemont high school	Interior		OFFICE	A-hallwat	Light Switch	4	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	8	2,220	1,705	ECM	RB - Replace Bulb	Ceiling Mounted	4' 17W LED T8	2,220	906	799
95	Rosemont high school	Interior		OFFICE	A129	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	15	30	8	2,220	2,131	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	1,132	999
96	Rosemont high school	Interior		OFFICE	A142	Light Switch	5	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	20	40	8	2,220	2,842	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	1,510	1,332
97	Rosemont high school	Interior		OFFICE	A127	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	12	24	8	2,220	1,705	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	906	799
98	Rosemont high school	Interior		OFFICE	A143	Light Switch	1	Linear Fluorescent	T8	4' 32W T8; 2x4 Prism Troffer	15	30	8	2,220	2,131	ECM	RB - Replace Bulb	Wall Mounted	4' 17W LED T8	2,220	1,132	999
	Totals											7,127									215,037	205,013

APPENDIX D:
ECM Checklist

NA	In Place	Evaluate	ECM Description
	✓		Add Reflective Coating To Exterior Windows
✓			Replace External Windows
	✓		Upgrade Insulation
	✓		Control External Air Leakage In Commercial Buildings
✓			Install Reflective Insulation Between Radiators And External Wall
		✓	Replace Existing Motors With High Efficiency Motors
		✓	Install On-Demand Ventilation on Air Handlers
✓			Reduce HVAC Hours of Operation
		✓	Install Variable Frequency Drives (VFD)
✓			Install Outside Air Temperature Reset Controls For Hot Water Boilers
✓			Install Chilled Water Reset Control
✓			Install Timers On Exhaust Fans
✓			Install Energy Savers on Vending, Snack Machines
✓			Install Building Energy Management System and Replace Terminal Units
✓			Re-Commission The Building & Its Control Systems
✓			Replace Inefficient Heating Plant
✓			Replace Inefficient Cooling Plant
✓			Replace Existing Air Conditioners with Energy Star Air Conditioners
✓			Replace Unit Electric Heaters with Natural Gas Fired Unit Heaters
✓			Convert From Gas Pilot to Electronic Ignition for Boilers
	✓		Insulate Hot Water Pipes
	✓		Insulate Refrigerant Lines
	✓		Insulate Hot Surfaces And Tanks
	✓		Insulate Air Ducts
✓			Replace Defective Steam Traps
✓			Upgrade Electric Heating System To Heat Pumps
		✓	Replace Inefficient Furnace System
	✓		Replace Rooftop Package Unit
	✓		Install Energy Recovery Wheel on Air Handling Unit
		✓	Replace Existing Water Heater With New Energy Efficient Units
		✓	Replace Incandescent/Halogen Lamps With Energy Efficient Lamps
		✓	Upgrade Inefficient Linear Fluorescent Lamps And Fixtures
	✓		Upgrade EXIT SIGNS With LED EXIT Signs
	✓		Bilevel and Tandem Linear Fluorescent Lighting ECM
		✓	Replace High Intensity Discharge (HID) Lamps With Energy Efficienct Lamps
	✓		Replace Existing Refrigerator(s) With Energy Star Certified Refrigerator(s)
✓			Replace Existing Freezers With High Efficiency Freezers
		✓	Install Low Flow Shower Heads
		✓	Install Low Flow Faucet Aerators
✓			Install Low Flow Restroom Flush Tank Toilets
		✓	Install Low Flow Tankless Restroom Fixtures

APPENDIX E:
ECM Calculations

UIC	Replace Existing Water Heater With New Energy Efficient Units
EAD3	**Location: Throughout**

		Classroom and Auditorium Theatre		*Gymnasium and Cafeteria / Pool*		*Gymnasium and Cafeteria*		*Building F, G & J*	
Step 1	**Existing Water Heater Details**								
	Number of Water Heaters Being Replaced:	2		2		2		2	
	Select Existing Hot Water Heater Fuel	Electric		Natural Gas		Natural Gas		Natural Gas	
	Insert Energy Factor of Existing Water Heater	0.77	EF	0.44	EF	0.44	EF	0.44	EF
	Input Existing Water Heater Input Rating	6.00	kW	199.00	kBtus	540.00	kBtus	98.00	kBtus
	Select One Method For Calculation	Annual Heating Hours		Annual Heating Hours		Annual Heating Hours		Annual Heating Hours	
	Insert Average Annual Hours of Operation	550	hrs	550	hrs	550	hrs	550	hrs
	Annual Water Heater Energy Consumption/Heater	3,300	kWh	1,095	Therms	2,970	Therms	539	Therms
	Total Estimated Annual Energy Consumption For all Heaters	6,600	kWh	2,189	Therms	5,940	Therms	1,078	Therms
	Total Estimated Annual Operating Energy Costs For all Heaters	$845	$	$2,358	$	$6,399	$	$1,161	$
Step 2	**Proposed New Water Heater**								
	Proposed Hot Water Heater Fuel	Electric		Natural Gas		Natural Gas		Natural Gas	
	Capacity of the Proposed New Water Heater	30-Gal,3.5-kW		100-Gal,150-kBtu		600MBH- Boiler		50-Gal,40-kBtu	
	Energy Factor of Proposed Water Heater	0.93	EF	0.95	EF	0.96	EF	0.70	EF
	Proposed Water Heater Input Rating	3.50	kW	150.00	kBtuh	600.00	kBtuh	40.00	kBtuh
	Annual kBtuh Consumption For All The Proposed Water Heaters	18,645	kBtuh	101,385	kBtuh	272,250	kBtuh	67,760	kBtuh
	Estimated Annual Water Heater Fuel Consumption (All Heaters)	5,465	kWh	1,014	Therms	2,723	Therms	678	Therms
	Estimated Total Annual Energy Costs	$699	$	$1,092		$2,933		$730	
Step 3	**Energy & Cost Saving Calculation**								
	Estimated Cost of New Water Heater/Unit	$851	$	$7,760	$	$16,999	$	$1,150	$
	Total Estimated Installation Cost	$2,540	$	$23,164	$	$50,744	$	$3,433	$
	Total Estimated Annual Cost Savings	$145	$	$1,266	$	$3,466	$	$431	$
	Total Annual Cost Savings:	$5,309		Total Initial Investment::		$79,882			
	Simple Pay Back Period	15.05							
	Type of Recommendation	Capital Cost ECM Recommendation							

ECM SUMMARY:

Electric resistance is the most expensive method for heating domestic hot water. A natural gas or propane fired water system provide more units of heat with direct burning of fuel while high wattage draw is required for electric water heaters to create resistance heat. This electric usage can be seen with the increase power demand for the site and the additional kWh consumption. The installation process of the gas/propane fired water heater requires additional measures with tying a gas line or fuel tank to the system along with installing an exhaust gas vent. This process is not a costly retrofit if a current gas line or tank is at the site. The hot water exhaust duct can be tied to the existing gas fired furnaces or boilers for an easy retrofit.

SUMMARY:

Initial Investment: $2,540 Simple Payback: 15.05 yrs

Annual Cost Savings: $145

UIC	Install Low Flow Shower Heads
EAP1	Location: Restrooms and Locker Rooms

Total Number of Shower Heads To Be Replaced		40	
No. of Shower Days/Year		37	
No. of Residents		300	
Estimated Time Per Shower		8.10	Mins
GPM of Existing Shower Head		2.5	GPM
GPM of Proposed Shower Head *	*(Select)*	1.50	GPM

**(Federal Law Requires all new shower heads to have a max flow rate of 2.5 GPM)*

Water & Energy Savings Calculations

Property Location in United States		North Central Localities	
Select Type of Water Heater Fuel	*(Select)*	Natural Gas	
Average Hot Water Discharge Temperature		110.00	°F
Annual Water Savings		90	kGal
Energy Factor of Domesitc Hot Water Heater:		0.44	EF
Equivalent Heating Fuel Energy savings:		102,130	kBtu

Cost Savings Calculations

Equivalent Heating Fuel Savings Natural Gas		1,021	Therms
Water Tariff ($/1000 Gal)	$5.64	$/kGal	
Annual Cost Savings In Form of Water		$507	$$
Annual Energy Savings From Water Heater		$1,100	$$
Estimated Total Annual Cost Savings		$1,607	$$

Estimated Installation Costs

Estimated Total Installation Cost		$1,268	$$
Simple Payback Period		0.79	Years
Type of Recommendation	Capital Cost ECM Recommendation		

ECM EXPLANATION:

By reducing the flow of water coming off the shower heads, savings can be generated in the form of reduced water and sewer costs. Additional savings can be realized via reduction in the demand for hot water. Currently Federal law requires all new shower heads to have a maximum flow rate of 2.5 GPM.

EMG recommends replacing the existing shower heads with new low flow shower heads as mentioned above. The proposed ECM shall also result in an annual energy saving in form of reduction in water heating bills.

Summary:

Initial Investment:	$1,268	Simple Payback:	0.79
Annual Cost Savings:	$1,607		

UIC	Install Variable Frequency Drives (VFD)
EAC4	Location: Gym/ Cafeteria RTU

Cost/kWh: $0.13

Existing Motor

No. of Motors:	2		Are Motors To be Replaced?	Yes
Individual Motor HP:	30	HP	No. of Motors To be Replaced?	2
Existing Motor Effi:	91.00%		Cost of New Motor (Includes Installation)	$3,166
Proposed Motor Effi:	94.10%		Cost For All New Motors:	$6,332
Load Factor:	85%		No. of VFD To Be Installed:	2
Existing Motor Power:	20.90	kW	Cost Per VFD (Excluding Installation):	$3,875
Proposed Motor Power:	20.22	kW	Estimated Labor cost/VFD:	$2,375
Hrs of Operation/Yr:	1200.00	Hrs		

% Load	% hours	Hours	VFD Factor	Full Load kW	Fraction of full load power (kW) with VFD	kW Reduction with VFD	kWh Savings with VFD
0%	0%	-	-	20.90	0.00	20.90	-
10%	1%	12	0.03	20.90	0.61	20.30	244
20%	2%	24	0.07	20.90	1.42	19.49	468
30%	2%	24	0.13	20.90	2.63	18.28	439
40%	5%	60	0.21	20.90	4.25	16.66	1,000
50%	15%	180	0.30	20.90	6.06	14.84	2,671
60%	20%	240	0.41	20.90	8.29	12.62	3,028
70%	25%	300	0.54	20.90	10.92	9.99	2,996
80%	15%	180	0.68	20.90	13.75	7.16	1,288
90%	10%	120	0.83	20.90	16.78	4.13	495
100%	5%	60	1.00	20.90	20.22	0.69	41
Total		**1,200**					**12,670**

Total Installation Cost:	$28,108		Number of Valves To Be Converted From 3 Way to 2	0 ($550/Valve)
Average kW Reduction:	16.02			
Annual kWh Savings Per Motor:	12,670	kWh	Select Type Of Motor Configuration	Stand Alone Motor
Total Savings From All Motors:	25,339	kWh		
Estimated annual cost savings:	$3,243	$$		
Simple Payback:	8.67	years		
Type of Recommendation	Capital Cost ECM Recommendation			

ECM DESCRIPTION

Variable frequency drives (VFD) have the ability to control the frequency and voltage to a motor. The speed of an AC motor depends on frequency and number of poles built into the motor. The number of poles cannot be changed once the motor is manufactured, so the only other way to change the speed is to vary the frequency. The frequency of AC power from a utility cannot be changed. Therefore, the only way to change the frequency of an AC circuit is to 'manufacture' your own AC power.

A VFD does of this by first changing the incoming AC power to DC. This is why changing two of the phases on the line side of a VFD does not change the rotation of the motor. Next, the VFD changes the DC power back into AC, but now the frequency can be easily controlled, as can voltage. This is one way a single phase power source can supply a 3 phase motor. The rate of change in frequency can also be controlled, so a VFD certainly can act as a soft-start.

SUMMARY:

Initial Investment: $28,108 Simple Payback: 8.67

Energy Cost Savings: $3,243

UIC	Install Variable Frequency Drives (VFD)
EAC4	Location: Gym/ Cafeteria RTU

Cost/kWh: $0.13

Existing Motor

No. of Motors:	2		Are Motors To be Replaced?	Yes
Individual Motor HP:	15	HP	No. of Motors To be Replaced?	2
Existing Motor Effi:	91.00%		Cost of New Motor (Includes Installation)	$2,025
Proposed Motor Effi:	93.00%		Cost For All New Motors:	$4,051
Load Factor:	85%		No. of VFD To Be Installed:	2
Existing Motor Power:	10.45	kW	Cost Per VFD (Excluding Installation):	$2,125
Proposed Motor Power:	10.23	kW	Estimated Labor cost/VFD:	$1,685
Hrs of Operation/Yr:	1200.00	Hrs		

% Load	% hours	Hours	VFD Factor	Full Load kW	Fraction of full load power (kW) with VFD	kW Reduction with VFD	kWh Savings with VFD
0%	0%	-	-	10.45	0.00	10.45	-
10%	1%	12	0.03	10.45	0.31	10.15	122
20%	2%	24	0.07	10.45	0.72	9.74	234
30%	2%	24	0.13	10.45	1.33	9.12	219
40%	5%	60	0.21	10.45	2.15	8.30	498
50%	15%	180	0.30	10.45	3.07	7.38	1,329
60%	20%	240	0.41	10.45	4.19	6.26	1,502
70%	25%	300	0.54	10.45	5.52	4.93	1,479
80%	15%	180	0.68	10.45	6.95	3.50	630
90%	10%	120	0.83	10.45	8.49	1.96	236
100%	5%	60	1.00	10.45	10.23	0.22	13
Total		**1,200**					**6,261**

Total Installation Cost:	$17,419	
Average kW Reduction:	7.98	
Annual kWh Savings Per Motor:	6,261	kWh
Total Savings From All Motors:	12,523	kWh
Estimated annual cost savings:	$1,603	$$
Simple Payback:	10.87	years
Type of Recommendation	Capital Cost ECM Recommendation	

Number of Valves To Be Converted From 3 Way to 2: 0 *($550/Valve)*

Select Type Of Motor Configuration: Stand Alone Motor

ECM DESCRIPTION

Variable frequency drives (VFD) have the ability to control the frequency and voltage to a motor. The speed of an AC motor depends on frequency and number of poles built into the motor. The number of poles cannot be changed once the motor is manufactured, so the only other way to change the speed is to vary the frequency. The frequency of AC power from a utility cannot be changed. Therefore, the only way to change the frequency of an AC circuit is to 'manufacture' your own AC power.

A VFD does of this by first changing the incoming AC power to DC. This is why changing two of the phases on the line side of a VFD does not change the rotation of the motor. Next, the VFD changes the DC power back into AC, but now the frequency can be easily controlled, as can voltage. This is one way a single phase power source can supply a 3 phase motor. The rate of change in frequency can also be controlled, so a VFD certainly can act as a soft-start.

SUMMARY:

Initial Investment: $17,419 Simple Payback: 10.87

Energy Cost Savings: $1,603

UIC	Install On-Demand Ventilation on Air Handlers
EAC1	Location: Rooftop Package units (25-50 Tons) - Gymnasium

ENTER EXISTING CONDITION

Estimated Facility Sq.Ft Under Consideration:	67050	Sq.ft	No. of Sensors To Be Installed (One/AHU)	4	Qty
Outside Air Intake CFM (Cubic Feet/Min):	12069.00	CFM	Estimated Savings From On-Demand Ventilation	15%	CFM

WINTER			SUMMER		
Select Type of Heating Fuel: Natural Gas (Select)			Is The Building Cooled? Yes (Select)		
Estimated Annual Heating Plant Efficiency *(COP in Case of Heat Pumps Only Max 4.5)*	75.00	%	Estimated Annual Cooling Plant Efficiency (EER)	8.00	EER
Annual Heating Degree Days(HDD):	2,963		Annual Cooling Degree Days(CDD):	1,407	
Estimated Annual Energy Consumed For Heating Outside Air During Winter	926,911	kbtu/Yr	Estimated Annual Energy Consumed For Cooling Outside Air During Summer	440,150	kbtu/Yr
Estimated Annual Input Heating Energy Savings By Use of On-Demand Ventilation System	185,382	kbtu/Yr	Estimated Annual Input Cooling Energy Savings By Use of On-Demand Ventilation System	8,253	kbtu/Yr
Estimated Intake Annual Heating Fuel Savings:	1,854	Therms	Estimated Annual Intake Cooling Fuel Savings:	1,032	kWh
Cost/Unit of Heating Fuel:	$1.08	$/Therm	Cost/Unit For Electricity	$0.13	$$
Estimated Annual Heating Cost Savings	$1,997	$$	Estimated Annual Cooling Cost Savings	$132	$$

COST ANALYSIS

Estimated Annual O&M Savings	$106.45	$$	Estimated Installation Cost (Including Labor)	$1,816	$$
Total Estimated Annual Cost Savings	$2,236	$$	Total Estimated Installation Cost	$7,264	$$
Simple Pay Back Period	3.25	Yrs	*Type of Recommendation*	Capital Cost ECM Recommendation	

ECM DESCRIPTION:

Some buildings are ventilated at a rate in excess of the recommended values. To reduce the energy consumed by the ventilation system, the ventilation rates should be lowered, unless typically high levels of pollutants are being generated. (If human carcinogens or other harmful contaminants are suspected to be present in the occupied space, other relevant standards or guidelines, such as OSHA or NIH, must supersede the listed values.) For spaces with transient or variable occupancy, the quantity of outdoor air should be adjusted by use of dampers, multi-speed ventilation fans, or by duty cycling the system. When contaminants independent of the occupants are generated in the space, the supply of outdoor air should lead occupancy so that acceptable conditions are attained before occupants return. On the other hand, if contaminants are generated solely by the occupants, the supply of outdoor air may lag occupancy. Such control over the ventilation rate can be achieved by installing on demand ventilation system on air-handling units that senses the amount of carbon di-oxide in the return air and modulates the external air flow based on it. In case the CO_2 levels are low, which means the occupancy level in the facility is below normal, hence there doesn't exist, a need to bring in fresh air. This indirectly reduces the load on the air handling unit as it decreases the amount of energy required to condition the outside air. Conversely on detecting a high level of pollutants and carbon di-oxide residue in the return air, the sensor shall modulate to increase the intake of outside air, for compensating the impure air.

SUMMARY:

Initial Investment:	$7,264	Simple Payback (Yrs)	3.25
Energy Cost Savings:	$2,236		

UIC	Install Low Flow Faucet Aerators
EAP2-b	**Location**: Restrooms and Classrooms

Property Type:	Commercial	Estimated No. of Operational Weeks	37
		Number of Occupied Days/Week (Max 7)	5

KITCHEN FAUCETS			BATHROOM FAUCETS		
Number of Occupants Affected By Retrofit	1,500		Number of Occupants Affected by Retrofit	1,500	
Do You Want To Replace Kitchen Faucets Aerators	Yes	*(Select)*	Do You Want To Replace Bathroom Faucets Aerators	Yes	*(Select)*
Total Number of Faucet Aerators To Be Replaced	9		Total Number of Faucet Aerators To Be Replaced	28	
Total Number of Faucets To Be Replaced:	0		Total Number of Faucets To Be Replaced:	0	
GPM of Existing Faucet Aerators	2.2	GPM	GPM of Existing Faucet Aerators	2.2	GPM
GPM of Proposed Faucet Aerator	1.5	GPM	GPM of Proposed Faucet Aerator	0.5	GPM
Estimated Number of Uses Per Day	0.5		Estimated Number of Uses Per Day	0.5	

Annual Water Savings From Installing Low Flow Aerators: 31.97 kGal

WATER & ENERGY SAVING CALCULATION			COST SAVING CALCULATION		
Select Type of Water Heater Fuel:	Natural Gas	(Select)	Property Location in United States	North Central Localities	
Energy Factor of Domestic Hot Water Heater:	0.44	EF	Heating Fuel Tariff	$1.08	$/Therm
Hot Water Discharge Temperature at Faucet	110.00	°F	Water Tariff ($/1000 Gal)	$5.64	$/kGal
Equivalent Heating Fuel Savings: *Savings Discounted by 15% to Account For Cold Water Use*	309	Therms	Annual Cost Savings In Form of Water	$180	$
Annual Water Savings	31.97	kGal	Annual Energy Savings From Water Heater	$333	$

COST BENEFIT ANALYSIS				
Estimated Total Annual Cost Savings	$513	$$	Estimated Total Installation Cost	$564 $$
Simple Payback Period	1.10	Years	*Type of Recommendation*	No/Low Cost ECM Recommendation

ECM EXPLANATION:

By reducing the flow of water coming from the restroom faucets, aerators can generate energy savings at low cost and with easy installation. The savings generated would be in the form of reduced water and sewer costs and at the same time aerators would save energy by reducing the demand for hot water. The average faucet has a flow rate of about 2 to 4 GPM. Adding a screw-in faucet aerator reduces the flow to 0.5 to 1.5 GPM in the bathroom and 2.2 GPM in the kitchen. In addition to saving energy and water, the "foamier" water that comes from faucet aerators wets objects better than water from a faucet with no aerator, which tends to bounce off the object rather than thoroughly wetting it.

EMG recommends replacing the proposed faucet aerators with new low flow aerators as mentioned above. The proposed ECM shall also result in an annual energy saving in form of reduction in water heating bills.

Summary:

Initial Investment: $564 Estimated Annual Cost Savings: $513 Simple Payback Period (Yrs): 1.10

UIC	Install Low Flow Tankless Restroom Fixtures
EAP4	Location: Restrooms

ECM FOR DETERMINING WATER SAVINGS IN COMMERCIAL PROPERTIES

Number of Males	750	
Number of Females	750	
Number of Occupied Days Per Week (Max 7)	5	
Number of Occupied Weeks/Year (Max 52)	37	
Number of Urinals To Be Retrofitted	45	
Number of Water Closets To Be Retrofitted	87	
No. of Water Closets With Separate Flush Tank *(Typical Residential Type)*	0	
Estimated Restroom Usage/Individual/Day *Default is 4 Uses/Day For Residential/Office*	2	(Select)

Urinal Water Savings

Do you Want To Make Any Changes To The Urinals?	No	
Estimated Existing Use of Urinal/Day/Man	80%	
Existing Gallons Per Flush Ratings For Urinal Flushes	1.00	GPF
Proposed Urinal	0.125 GPF -Wall Mount	
GPF of Proposed Urinal Flush Valve** ***(1992 EpACT Energy Act Mandates 1.0GPF Max on Urinals)*	0.125	GPF
Estimated Annual Water Savings From Urinal	0.00	kGal

Water Closet Water Savings

Tankless Water Closets

Do The Water Closet Need To Be Retrofitted?	*(Select)* Yes	
Existing Gallons Per Flush Ratings For Water Closet Flushes	1.60	GPF
Are The Existing Water Closet Being Replaced? *(If No; Then Only The Flush Valve Would Be Replaced With Dual Flush Retrofit Kit)*	*(Select)* No	
No. of Tankless Water Closets	87	
GPF of Proposed Dual Flush- Water Closet Valve* **(Federal Law Requires All Flushes Not To Exceed 1.6 GPF)*	*Solid Waste (20%)* 1.60 GPF *Liquid Waste (80%)* 0.48 GPF	
Estimated Annual Water Savings From Male Users	248.64	kGal
Estimated Annual Water Savings From Female Users	248.64	kGal
Total Water Savings From Water Closets	497.28	kGal

Water & Cost Saving Calculations

Water Savings Calculation

Water Savings By The Use of Low Flow Water Closet Flush Valves/Yr	497.28	kgal
Water Savings By The Use of Low Flow Urinal Flush Valves/ Yr	0.00	kgal
Total Annual Water Savings in kgal	497.28	kgal

Cost Savings Calculations

Enter Water Tariff Rate ($/1000Gal)	$5.64	$$
Estimated Cost Savings From Water	$2,805	$$

Estimated Cost of Retrofit

Cost For Replacing Existing Urinal Fixture With A Low Flow Fixture	$0 *(Includes Labor)*	$$
Cost For Replacing Existing Flush Valves With Low Flow - Dual Flush Valves ($80 Per Unit) *(Up For Liquid Waste And Down For Solid Waste)*	$53,857 *(Includes Labor)*	$$
Estimated Total Cost For Retrofit	$53,857	$$
Simple Pay Back Period	19.20	Yrs
Type of Recommendation	Capital Cost ECM Recommendation	

ECM EXPLANATION:

The highest water utilization at any home/office occurs in the restrooms. It is estimated that on an average a normal human being uses the restroom at least four times a day. Keeping with the global water conservation objectives, federal law prohibits use of any new water closet flushes over 1.6 GPF. At the same time the '1992 EpACT' mandates all new Urinals to have a maximum 1.0 GPF flush valves on urinals.

EMG recommends replacing all urinals above 1.0 GPF with a new 0.5 GPF or lesser urinals. At the same time EMG also recommends replacing all the water closets having a GPF rating of 1.6 and over with low flow water closet fixtures equipped with dual flush valves.

In case the property doesn't wish to replace the entire water closet fixtures, EMG recommends retrofitting all the tankless water closet flush fixtures with new dual flush fixtures that would result in a 30% water savings per flush for liquid wastes, while retaining the same flush rate for solid wastes.

SUMMARY:

Initial Investment:	$53,857	Simple Payback Period:	19.20 Yrs
Annual Cost Savings:	$2,805		

UIC	Replace Inefficient Furnace and Air Conditioning System
EAH12-A	Location: Throughout

Estimated Annual Cooling Hours:	976	Hrs	Estimated Annual Heating Hours:	1,464	Hrs
Are The Condensing Units Being Replaced	Yes		Replace Furnace? Yes	Heating Fuel: Natural Gas	
Existing Cooling System			**Existing Heating System**		
No. of Cooling Plants To Be Replaced:	43		No. of Furnaces To Be Replaced:	43	
Input the Btu/Hr of the air conditioner:	60,000		Input the MBH Rating of the Furnace:	100	MBH
Input Existing EER of the Air Conditioner:	9.00		Input Existing AFUE for the Furnace:	75%	%
Estimated Current Annual Energy Consumption For Cooling: *(For All Units)*	279,787	kWh	Estimated Annual Current Energy Consumption For Heating: *(For All Units)*	62,952	Therms
Proposed Cooling System			**Proposed Heating System**		
Input the Btu/Hr of the Proposed Air Conditioner:	60,000	Btuh	Proposed Furnace:	Gas Fired -100MBH	
Input EER of the Proposed Air Conditioner:	10.50		Input AFUE for the Proposed Furnace:	95%	
Estimated Annual Energy Consumption With New AC's *(For One Unit)*	5,577	kWh	Estimated Annual Energy Consumption With New Furnace *(For One Unit)*	1,156	Therms
Energy & Cost Savings From New Cooling System			**Energy & Cost Savings From New Heating System**		
Estimated Annual Energy Savings From New Cooling System: *(Total)*	39,970	kWh	Estimated Annual Energy Consumptions From New Heating System: *(Total)*	49,699	Therms
Average Electric Rate:	$0.13	$/kWh	Average Heating Fuel Cost For New Furnace:	$1.08	$/Therm
Estimated Annual Cost Savings From Cooling:	$5,115		Estimated Annual Cost Savings From Heating:	$14,277	$$
Estimated Cost of New Condensing Unit: *(Material + Installation+Labor)*	$191,350		Estimated Cost of New Furnace Unit: *(Material + Installation+Labor)*	$1,814	$$
Estimated Cost of New Evaporator Coils In Furnace: *(Material + Installation+Labor)*	$49,235		Estimated Total Cost of New Furnace Unit: *(Material + Installation+Labor)*	$78,000	$$

Total Estimated Installed Cost For A New Air Conditioning System Setup + New High Efficiency Furnace : *(Includes Location Factor)*	$475,509	$$			
Estimated Total Energy Cost Savings From New HVAC System:	$19,392	$$	Estimated O&M Savings: $582	Total Annual Savings:	$19,974 $$
Estimated Simple Pay Back Period:	23.81	Years			
Type of Recommendation	Capital Cost ECM Recommendation				

UIC	**Upgrade Building Lighting to LED and Install Automatic Lighting Controls**
EAL10	**Location: Building Interior and Exterior**

	No. of ECMs	No. of Fixtures	No. of Lamps	KWh Saved	Energy Cost Saving	O & M Savings
Upgrade Lighting to LED	98	3,281	7,127	205,013	$26,237.50	$7,999.82

Existing Technology	**Sub-Technology**	No. of ECMs	No. of Fixtures	No. of Lamps	KWh Saved	Energy Cost Saving	O & M Savings
CFL	CFL - 2 Pin	0	0	0	0	$0	$0
CFL	CFL - 4 Pin	0	0	0	0	$0	$0
CFL	CFL - Screw-in	0	0	0	0	$0	$0
Circiline	T9	0	0	0	0	$0	$0
Incan/H/MR	H	0	0	0	0	$0	$0
Incan/H/MR	Incan	0	0	0	0	$0	$0
Incan/H/MR	MR	0	0	0	0	$0	$0
HID	HPS	0	0	0	0	$0	$0
HID	MH	1	67	67	25,197	$3,225	$1,824
HID	MV	0	0	0	0	$0	$0
HID	QL	0	0	0	0	$0	$0
Linear Fluorescent	T8	97	3,214	3,214	179,817	$23,013	$6,176
Linear Fluorescent	T12	0	0	0	0	$0	$0
Linear Fluorescent	T8 U	0	0	0	0	$0	$0
Linear Fluorescent	T12 U	0	0	0	0	$0	$0
Linear Fluorescent	T5	0	0	0	0	$0	$0
Linear Fluorescent	T6	0	0	0	0	$0	$0
Linear Fluorescent	T10	0	0	0	0	$0	$0

Proposed Controls	**No. of Controls**		**No. of Controls**
Photo Sensor	3	Ceiling Mounted	80
Wall Mounted	232		

Initial Investment		**Equipment Rentals**	
Material Cost	$53,721.00	Scissor Lift 26' - Interior Spaces	$0.00
Labor Cost	$112,930.73	Bucket Truck - Exterior Spaces	$0.00
Local Electric Rate:	$0.13 $/kWh	Estimated Annual Energy Savings:	205,013
Hourly Labor Rate For Electrician:	$82.45	Estimated Annual Energy Cost Savings:	$26,238
Budgeted Initial Investment:	$166,652	Estimated Annual O&M Cost Savings:	$8,000
Estimated Return on Investment:	4.87 Years	Estimated Annual Cost Savings:	$34,237
(Including O&M Savings)			

APPENDIX F:
Solar PV

UIC	Install Fixed Tilt Solar Photovoltaic System
EAR-2	Details: Rosemont High School

Select State: Northern California **Electric Rate:** $0.13 $/KWH Annual Electric Consumption: 2,145,690 KWh

Roof No.	Description	Number of Roofs	DC System Size Per Roof	PV System Sizing For All Roofs	Estimated Number of 315 Watt PV Panels:	Total Estimated Annual Electricity Generated/ Roof	Total Estimated Electricity Generated (All Roofs)	Total Cost Savings	Installation Cost: ($3.5/Watt)	Simple Pay Back Period without Incentives	One Time Potential Utility or State Incentives	One Time Potential Federal Incentives	Annual Potential Incentives and Rebates		Simple Pay Back Period with All Incentives
			kW	kW		kWh	kWh			Yrs		Dept. of Treasury Renewable Grant (30%)	Federal REPI Incentive	Solar Renewable Certificates (SRECS)-(~$0/MWH)	Years
												30%	$0.02	$0	
1	Building 1	1	20.60	21	65	31,102	31,102	$3,980	$72,100	18.1	$0	$21,630	$684	$0	11.0
2	Building 2	1	29	29	90	43,029	43,029	$5,507	$99,750	18.1	$0	$29,925	$947	$0	11.0
3	Building 3	1	19	19	62	29,290	29,290	$3,749	$67,900	18.1	$0	$20,370	$644	$0	11.0
4	Building 4	1	175	175	555	264,065	264,065	$33,795	$612,150	18.1	$0	$183,645	$5,809	$0	11.0
5	Building 5	1	96	96	305	145,243	145,243	$18,588	$336,700	18.1	$0	$101,010	$3,195	$0	11.0
6	Building 6	1	24	24	75	35,480	35,480	$4,541	$82,250	18.1	$0	$24,675	$781	$0	11.0
7	Building 7	1	31	31	98	46,653	46,653	$5,971	$108,150	18.1	$0	$32,445	$1,026	$0	11.0
8	Building 8	1	14	14	43	20,382	20,382	$2,608	$47,250	18.1	$0	$14,175	$448	$0	11.0
		8		**408**	**1,294**	**615,244.0**	**615,244**	**$78,739**	**$1,426,250**	**18.11**	**$0**	**$427,875**	**$13,535**	**$0**	**10.96**

Solar Rooftop Photovoltaic Analysis		
Total Number of Roofs	8	
Estimated Number of Panels	1,294	
Estimated KW Rating	408	KW
Potential Annual KWh Produced	615,244	KWh
% of Current Electricity Load	28.7%	

Financial Analysis		
Investment Cost	$1,426,250	
Estimated Energy Cost Savings	$78,739	
Potential Rebates	$427,875	
Potential Annual Incentives	$13,535	
Payback without Incentives	18.1	years
Incentive Payback but without SRECS	11.0	years
Payback with All Incentives	11.0	years