

**BRE PROPERTIES, INC., PORTFOLIO ENERGY PROJECTIONS**

**MULTIFAMILY PROPERTIES ON THE WEST COAST**



Prepared for:

**THE MANAGEMENT OF NAVIGANT CONSULTING**

Prepared by:

**ASW ENGINEERING MANAGEMENT**

David M. Wylie, PE

(714) 731-8193

Date:

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## ABBREVIATIONS AND ACRONYMS

ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
LEED	<p>The Leadership in Energy and Environmental Design (LEED®) Green Building Rating System was created by the U.S. Green Building Council (USGBC) to establish a "common standard of measurement" for "green" buildings. LEED® attempts to define a term that is often considered indefinable—sustainability. USGBC members determine those elements that contribute to the sustainability of a building and promote LEED® products and resources as a path to meet sustainable building goals.</p> <p>LEED® certification is based on a point system. The amount of points achieved will determine which level of LEED® certification the project is awarded.</p>
RCx	Retro-commissioning (RCx) is a systematic process for investigating an existing building's operations to identify operational improvements, achieve energy savings, and improve occupant comfort. The process focuses on the operation of mechanical equipment, lighting, and related controls and is intended to optimize how equipment operates as an integrated system
EEM	Energy Efficiency Measures
SA	Screening Audit – identification of potential EEM in a given facility
PEA	Preliminary Energy Assessment – High level identification of "cost-benefits" of selected Energy Efficiency Measures normally presented in a report
AC	Air Conditioning
PTAC	Package Terminal Air Conditioning (window unit)
DHW	Domestic Hot Water
YTP	Years to Payback – equal to implementation cost / energy savings cost per year
HVAC	Heating, Ventilation, and Air Conditioning



## TABLE OF CONTENTS

### Executive Summary

Introduction .....	1
Methodology .....	1
Objective .....	1
Sycamore Valley Apartment PEA Results .....	2
Projected Cost-Benefits .....	2

### Appendix A – General Recommendations

Lighting .....	4
HVAC .....	4
Building Envelope .....	4
Pools .....	5
DHW Heating .....	5
Laundries .....	5
Environmental .....	5
Maintenance .....	6
New Policy Considerations .....	6
Other Things to Consider .....	6

### Appendix B – Sycamore Valley Apartment Complex PEA

Background .....	7
Preliminary Energy Assessment .....	7
Project Information .....	7
Site Plan .....	8
Historic Energy Consumption .....	9
Swimming Pools and Spas Pumps .....	11
Lighting .....	12
Cooling and Heating Systems .....	14
Cooling .....	14
Package Terminal Air Conditioning .....	16
Swimming Pool Covers .....	17

### Appendix C – Miscellaneous Resources for Multifamily Housing

Utility Energy Efficiency Programs .....	19
Southern California Edison Green Home Design Resources .....	20
Build It Green Frequently Used Measures .....	22



## EXECUTIVE SUMMARY

### INTRODUCTION

This report presents the high-level “cost-benefits” associated with selected energy efficiency measures (EEM) in apartment complexes located in specific West Coast regions.

### METHODOLOGY

Navigant Consulting directed ASW Engineering Management (ASW) to perform Screening Audits of five apartment complexes managed by BRE Properties, Inc., in the Southern California territory.

The objectives of the Screening Audit are: (a) identify the type of equipment normally found in these complexes and (b) identify potential energy efficiency measures (EEM) that might be representative across all BRE multifamily properties located in the West Coast of the USA.

After we performed the five Screening Audits and identified the potential EEM at each complex, it was determined that ASW should visit the Sycamore Valley apartment complex and collect detailed information to identify the “cost-benefits” associated with each of the identified EEM. The results of the detailed information audit are presented in this report.

The most common identified EEM are:

1. Reduce the hours of operation of the pump motors serving the swimming pools.
2. Replace the existing pump motors serving the swimming pools with two-speed motors.
3. Replace old lighting with state-of-the-art lighting.
4. Replace old air-cooled package units with efficient equipment in the common areas.
5. Tune up existing AC equipment.
6. Replace old window units with new efficient window units.
7. Reset hot water temperature leaving the boilers
8. Cover the swimming pools when not in use to reduce the heat losses throughout the year.

### OBJECTIVE

The main objective of this report is to present the “cost-benefits” associated with the previously listed EEMS for the Sycamore Valley complex and use the results to project the probable “cost-benefits” in the apartment complexes located in identified territories. From this objective ASW has provided a list of general recommendations for new and existing facilities as Appendix A.

## SYCAMORE VALLEY APARTMENTS PEA RESULTS

Based on the selected EEM, ASW estimated the energy savings and associated retrofit costs. Table-1 lists the results of this effort in addition to the energy savings and retrofit costs per rentable square feet (SF).

**TABLE-1 ENERGY SAVINGS AND RETROFIT COSTS**

EEM	Savgs KWh/Yr	Savgs Therms/Yr	Savgs KWh/Yr/SF	Savgs Therms/Yr/SF	Retrofit Cost	Retrofit Cost/SF	Savgs \$/Yr
Reduce Pool/Spa Hrs	7,251		0.0175		\$ 200	\$ 0.0005	\$ 1,283
Replace Pool Motor	3,357		0.0081		\$ 900	\$ 0.0022	\$ 594
Retrofit Lighting	18,552		0.0449		\$ 13,068	\$ 0.0316	\$ 3,284
Replace Office AC	6,423		0.0155		\$ 6,820	\$ 0.0165	\$ 1,137
Tune Up Office AC	684		0.0017		\$ 150	\$ 0.0004	\$ 121
Replace PTAC	816		0.0020		\$ 2,600	\$ 0.0063	\$ 144
Reset Boiler		2,792		0.0068	\$ 100	\$ 0.0002	\$ 3,295
Pool Covers		3,632		0.0088	\$ 6,000	\$ 0.0145	\$ 4,286
<b>Totals ▶</b>	<b>37,083</b>	<b>6,424</b>			<b>\$ 29,838</b>		<b>\$ 14,144</b>
Cost per kWh = \$	0.177		Cost per Therm = \$	1.18		Rentable SF =	413,616

- See Appendix B for detailed information about the selected EEM.

## PROJECTED COST-BENEFITS

Using the identified “cost-benefits” from the Sycamore Valley apartment complex, ASW pro-rated the results based on the total rentable area amongst all the properties within a given region. Table-2 shows the results of this effort.

**TABLE-2 PROJECTED COST-BENEFITS**

Region	Rentable Sq. Ft	Savings kWh/Yr	Savings Therms/Yr	Electric Savings	Electric Retrofit Cost	Gas Savings	Gas Retrofit Cost
San Francisco Bay	2,994,456	268,470	46,508	\$ 47,519	\$ 171,856	\$ 54,879	\$ 44,162
San Diego	3,463,889	310,557	53,799	\$ 54,969	\$ 198,797	\$ 63,483	\$ 51,085
Los Angeles/Orange County	6,919,632	620,384	107,471	\$ 109,808	\$ 397,127	\$ 126,816	\$ 102,051
Sacramento	1,674,070	150,090	26,001	\$ 26,566	\$ 96,077	\$ 30,681	\$ 24,689
Seattle	2,674,611	239,794	41,540	\$ 42,444	\$ 153,500	\$ 49,017	\$ 39,445
Lease-Up Communities	252,504	22,638	3,922	\$ 4,007	\$ 14,492	\$ 4,628	\$ 3,724
Unconsolidated Joint Ventures	2,757,910	247,262	42,834	\$ 43,765	\$ 158,280	\$ 50,544	\$ 40,674
Assets Held for Sale Multi Family Assets	1,049,598	94,102	16,302	\$ 16,656	\$ 60,238	\$ 19,236	\$ 15,479
<b>Totals</b>	<b>21,786,670</b>	<b>1,953,297</b>	<b>338,376</b>	<b>\$ 345,734</b>	<b>\$ 1,250,367</b>	<b>\$ 399,283</b>	<b>\$ 321,309</b>
				<b>Electric - YTP =</b>	<b>3.62</b>	<b>Gas - YTP =</b>	<b>0.80</b>

FIGURE-1 ELECTRIC SAVINGS BY REGION

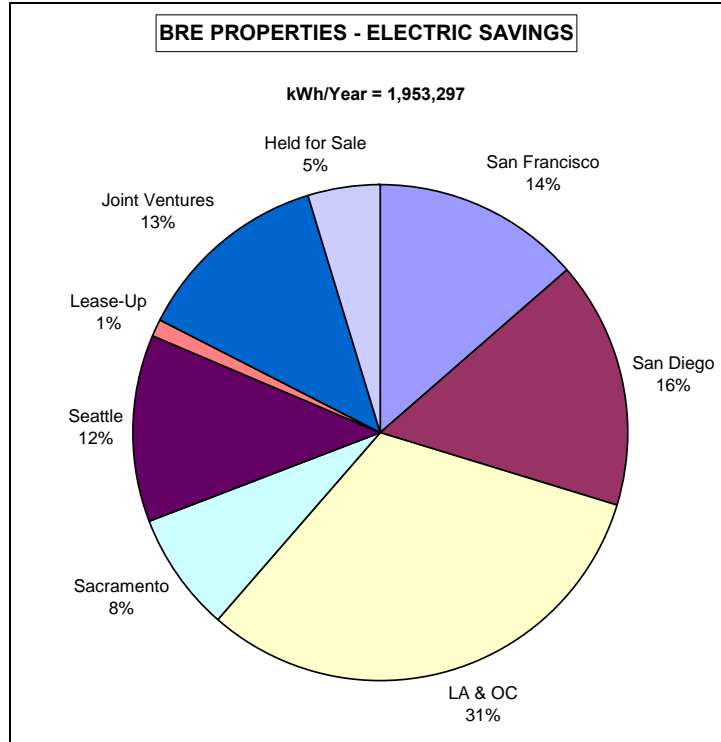
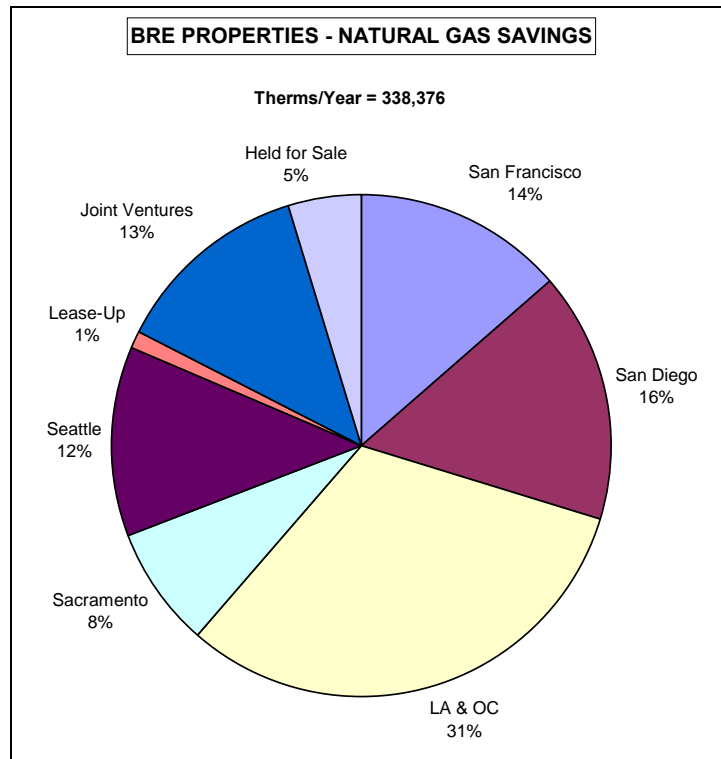


FIGURE-2 NATURAL GAS SAVINGS BY REGION



## APPENDIX A

### BRE PROPERTIES – GENERAL RECOMMENDATIONS FOR NEW AND EXISTING FACILITIES

#### LIGHTING

- Change incandescent lights to Compact Fluorescent Lights (CFLs) – recessed cans, ceiling fans, bathroom globes
- Change 4' T12 fluorescent lights to T8 with electronic ballasts
- Install motion sensors for lighting in areas that can be turned off without risk to safety

#### HVAC

- Replace aging through the wall package terminal AC units (PTAC) with high efficiency units
- Install or replace AC units over 20 years old with units rated >SEER 14
- Perform regularly scheduled tune ups on package units
- Install or replace ceiling fans with Energy Star rated fans
- Install programmable thermostats for common area AC

#### BUILDING ENVELOPE

- Install or replace windows with dual pane, vinyl frame, low-E glass
- Consider photo voltaic systems where feasible
- Install motion sensor controls on vending machines
- Install or upgrade insulation to R-30

## POOLS

- Reduce the operating hours of the swimming pool pumps
- Evaluate installing solar water heaters
- Install pool covers
- Install premium efficiency single speed or 2 speed pool & spa filter motors

## DHW HEATING

- Install low flow showerheads and toilets
- Install shower heads with button that shuts off flow while soaping up
- Replace dishwashers with high efficiency units
- Reduce water temperatures to 120°F
- Install boiler controllers

## LAUNDRIES

- Replace old washers and dryers with high efficiency units
- Evaluate installing solar water heaters

## ENVIRONMENTAL

- Provide recycling containers for glass, paper, plastic, aluminum
- Irrigation system management to prevent over watering and runoff

## MAINTENANCE

- Periodically clean outdoor condensing unit of AC systems
- Change indoor filters of central AC system or through the wall PTAC
- Change DHW boiler temperatures to 120° or lower, if possible
- Perform routine burner maintenance
- Reset time clocks with yearly time changes
- Make sure photo cells are in proper location, not in shaded areas

## NEW POLICY CONSIDERATIONS

- Specify that all incandescent lights be changed to CFL
- Specify Energy Star for appliances
- Specify new AC SEER requirements; greater than 14 SEER
- Specify high efficiency water heaters >92 AFUE
- Specify 4' fluorescents to be T8 with electronic ballasts
- Require tenant to replace CFLs if removed
- Require pool pumps to have premium efficiency or 2 speed motors

## OTHER THINGS TO CONSIDER

- Investigate utility multifamily programs that may offset entire cost of lighting retrofits
- Offer split incentives to tenants to use energy efficient equipment indoors
- Hold on site energy fairs with utilities
- Provide utility energy efficiency flyers to tenants
- New state programs may cover the cost of solar water heaters for laundries and pools
- Make sure common area meters are on correct rate
- Install condensing boilers for potable water boilers

## APPENDIX B

### SYCAMORE VALLEY APARTMENTS PEA

#### BACKGROUND

This appendix presents the database of the Sycamore Valley Apartments. It was developed to establish the basis for the evaluation of the energy conservation measures listed in the Executive Summary. The database consists of (1) general information about the facility, (2) general layout of the facility, and (3) current equipment. For the purposes of this evaluation, only a selected area of the entire complex was audited in depth as the equipment found in one location is the same as the equipment found in other areas.

#### PRELIMINARY ENERGY ASSESSMENT

The purpose of the PEA is fourfold. First, identify the current and new equipment, their configuration and future operating requirements. Next, identify the system equipment best suited for this application. Then, identify, at a “high-level” the annual energy and implementation costs of the proposed new equipment. Finally, identify the simple payback period of each energy efficiency measure (EMM) and summarize the results for management’s review and final course of action.

While much of the information contained in this PEA report is factual, gathered from our research and previously developed information, assumptions were made to complete the project database. The numbers presented (both costs and benefits) are not to be viewed as exact predictions, but indicative of probable results. In all cases, we have tried to take a conservative approach and portray both the risks and potential benefits. Ultimately, the final implementation will come down to a business decision and no report by itself should be the sole basis for such a decision. We hope, however, that this report provides the necessary information for management’s future course of action.

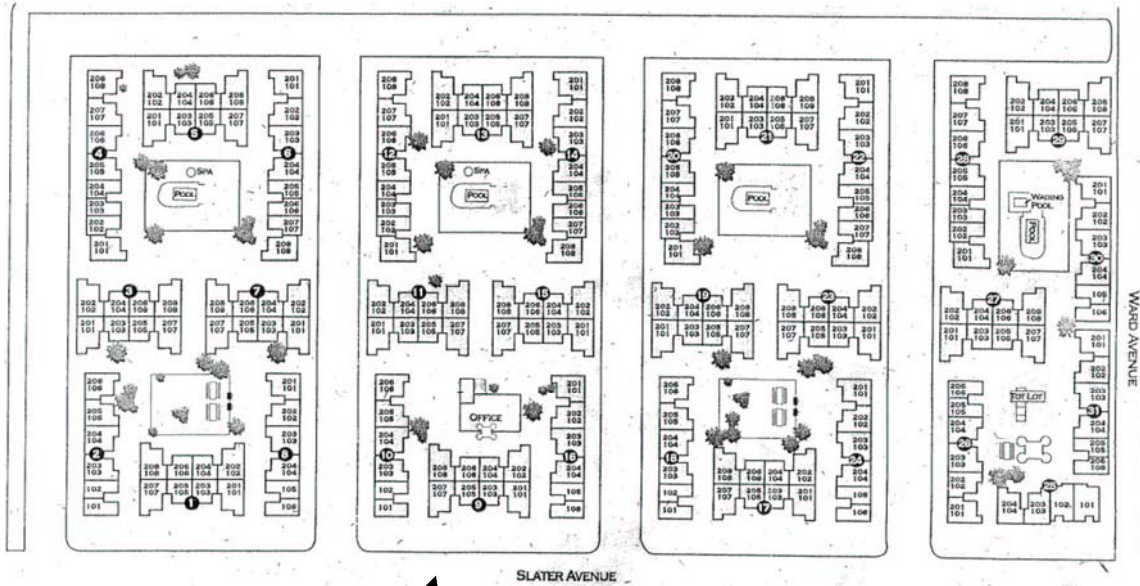
#### PROJECT INFORMATION

Sycamore Valley Apartments is located at 10349 Slater Ave, Fountain Valley, CA. The complex consists of four sections of apartment buildings totaling 440 units. Apartments range in size from 760 square feet to 1,055 square feet. The complex was built in 1969. Each apartment has its own electric meter but gas and water are served by master meters located throughout the complex grounds. Cooling is provided by through-the-wall air conditioning units in the apartments and heating is supplied by gas central furnaces located in each apartment. Hot water is supplied by eight boilers located throughout the complex. There are four pools and spas and eight laundry facilities throughout the complex.

## SITE PLAN

Figure-3 shows the general layout of the Sycamore Valley Apartments complex.

FIGURE-3 SITE PLAN



Since the four sections of this complex are relatively the same, one section, identified as buildings 9 through 16 above, was surveyed and the information gathered was used for this report.

## HISTORIC ENERGY CONSUMPTION

Table-3 shows the electric consumption of the facility during part of 2006 and 2007 for the master meter serving the common areas of the complex.

**TABLE-3 ANNUAL ELECTRICITY CONSUMPTION**

2006-2007	KWH/MO	COST/MO	REMARKS
<b>OCT 06</b>	32,271	\$5,676	
<b>NOV 06</b>	30,706	\$5,657	
<b>DEC 06</b>	30,010	\$5,378	
<b>JAN 07</b>	29,106	\$5,150	
<b>FEB 07</b>	28,327	\$4,913	
<b>MAR 07</b>	26,726	\$4,628	
<b>APR 07</b>	26,346	\$4,552	
<b>MAY 07</b>	30,756	\$5,296	
<b>JUN 07</b>	27,156	\$4,893	
<b>JUL 07</b>	28,871	\$5,245	
<b>AUG 07</b>	30,264	\$5,398	
<b>SEP 07</b>	29,261	\$5,243	
<b>TOTAL</b>	349,800	\$62,029	Av Cost/ kWh = \$.177

Comment-

The average electric cost during this period was \$0.177 per kWh. This amount was used to identify the electric energy savings.

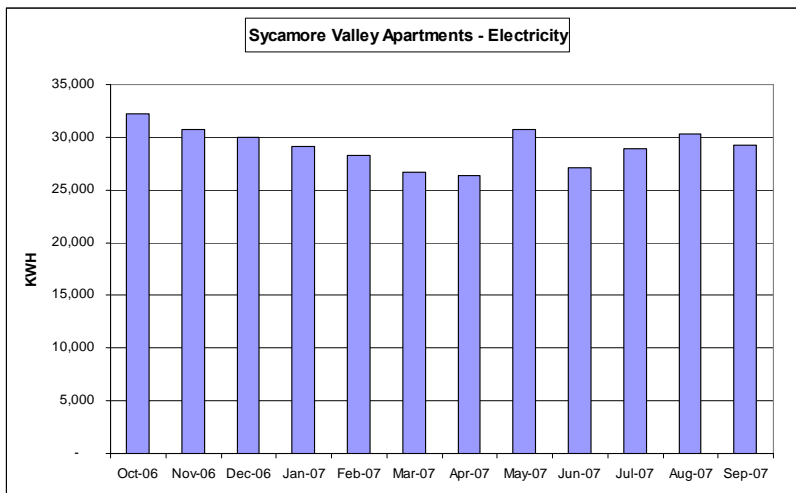


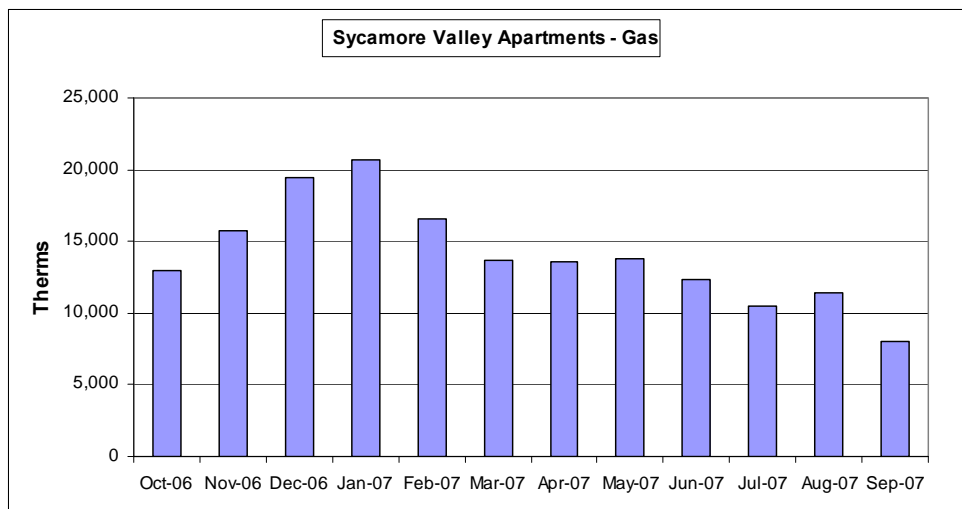
Table-4 shows the gas consumption of the facility during part of 2006 and 2007 for the master meter serving the common areas of the complex.

**TABLE-4 ANNUAL GAS CONSUMPTION**

2006-2007	THERMS/MO	COST/MO	REMARKS
OCT 06	12,996	\$9,327	
NOV 06	15,703	\$13,081	
DEC 06	19,448	\$13,385	
JAN 07	20,712	\$16,735	
FEB 07	15,564	\$18,693	
MAR 07	13,658	\$15,811	
APR 07	13,626	\$16,858	
MAY 07	13,768	\$19,958	
JUN 07	12,360	\$21,995	
JUL 07	10,489	\$21,632	
AUG 07	11,470	\$18,247	
SEP 07	7,989	\$12,578	
TOTAL	167,783	\$198,300	Av Cost/Therm = \$1.18

Comment

The average gas cost during this period was \$1.18 per Therm. This amount was used to identify the natural gas savings.



## SWIMMING POOL AND SPA PUMPS

Although the swimming pools and spas have timers to control filter pumping, the trippers have been removed allowing the pumps to operate 24/7. For health reasons, pumps must be capable of turning over the pool water within 6 hours and continue circulating while the pool is open for swimming. Two options could be considered to reduce pumping energy. Option 1: Replace trippers on time clocks to reduce pumping during pool non-use hours. Option 2: Consider replacing single speed pool motors with 2 speed motors.



20' x 40' pool – not heated



Spa heated



Trippers removed from clocks

Table-5 lists the spa and pool pump information, including current energy consumption, savings and annual cost saving by adding trippers to the time clocks and reducing run time by 12 hours per day and also replacing the pool motor with a 2 speed motor.

**TABLE-5 POOL AND SPA PUMPING**

Option 1: Replace trippers on time clocks

TYPE	HP	EXISTING KWH/YR	FUTURE KWH/YR	KWH/YR SAVINGS	COST SAVINGS/YR	COST	PAYBACK
Pool	1.5	10,877	5,438	5,438	\$963		
Spa	.5	3,626	1,813	1,813	\$321		
Totals		14,503	7,251	7,251	\$1,284	\$200	0.2

Option 2: Replace single speed pool motor and pump with a 2 speed motor

TYPE	EXISTING KWH/YR	FUTURE KWH/YR	KWH/YR SAVINGS	COST SAVINGS/YR	COST	PAYBACK/YR W/REBATE *
2 Speed Pool Motor	10,877	7,520	3,357	\$594	\$900	1.0

\*Assumes a \$300 rebate from the utility for installing a 2 speed motor

## LIGHTING

Common areas, exterior - There are various types of lighting through out the complex. HID fixtures light up drive areas, compact fluorescents are in lamp posts, porches and wall packs and there are some quartz halogen wall mounted fixtures. Garage areas have 2 lamp fluorescent strips consisting of T12 fluorescents.



Garage lights installed incorrectly



Garage fluorescents



Quartz halogen



Lamp post CFL



Wall mount CFL



Area HID fixture

Common areas, interior - Laundry facilities, recreation room kitchen areas and offices have T12 fluorescent lamps as well as incandescent lights. Incandescent lights are in ceiling fans in the fitness center and there are recessed cans in various buildings containing incandescent reflector floods.



Incandescent & fluorescent



Kitchen – recessed cans



Office lights – T12 fluorescent

Apartments, interior - Incandescent lights are found throughout the interior of the apartments. They are located in bathroom vanities, ceiling fans and recessed hallway cans. Kitchens contain T12 fluorescent lamps.



Recessed can - incandescent



Bathroom vanity - incandescent



Ceiling fan - incandescent



Kitchen lights

Table-6 is compiled using information collected at one building of the complex. This information is representative of the remaining three buildings at this location. Figure-4, on the next page, shows a description of lighting fixtures, retrofit recommendations, costs and savings.

Estimated savings for the interior apartment spaces are based on a three hours per day use and 12 hours per night use for exterior lighting.

**TABLE-6 LIGHTING**

	<b>ESTIMATED KWH/YR</b>	<b>ELECTRIC COST/YR</b>	<b>IMPLEMENTATION BUDGET *</b>	<b>PAYBACK/YRS</b>
Present	9,026	\$1,598		
Future	4,388	\$777		
Savings	4,638	\$821	\$3,267	4.0

\*Some utilities offer incentives that can offset the cost of some of the recommended measures for common area and apartment interior lighting.

**FIGURE-4 LIGHTING RETROFIT DESCRIPTION**

LIGHTING DATA COLLECTION/SAVINGS CALCULATIONS																
Site ID:		Customer Name: Sycamore Valley Apartments						Location ID:		Date: 2/4/2008						
Line Item	Location	Weekly Hours	Weeks Per Yr	Existing Equipment					Proposed Equipment					KW Savings		
				LE Fixt Code	Volts	Qty	Fixt	LE Watts/Fixt	Line Item Watts (Total)	0-No AC 1-AC/EC 2-No EC	LE Fixt Code	Qty/Fixt	LE Watts/Fixt	Line Item Watts (Total)	Total watts Saved	KW Saved
1	Laundries	42	52	F42EE	120	2		72	144	0	F42ILL-R	2	52	104	40	0.040
2	Office	56	52	F42EE	120	14		72	1008	2	F42ILL-R	14	52	728	280	0.280
3	Office-fld	56	52	I75/1	120	4		75	300	2	CF/SCRWN	4	15	60	240	0.240
4	Rec room	35	52	I60/1	120	2		60	120	2	CF/SCRWN	2	15	30	90	0.090
5	Rec kitchen-fld	35	52	I75/1	120	3		75	225	2	CF/SCRWN	3	15	45	180	0.180
6	Rec	35	52	F42EE	120	2		72	144	2	CF/SCRWN	2	52	104	40	0.040
7	Rec	35	52	I40/1	120	4		40	160	2	CF/SCRWN	4	15	60	100	0.100
8	Exterior	84	52	I300/1	120	1		300	300	0	HPST0/1	1	95	95	205	0.205
9	Garage	84	52	F42EE	120	6		72	432	0	F42ILL-R	6	52	312	120	0.120
10	Apt vanity	21	52	I60/4	120	1		240	240	2	CF/SCRWN	1	60	60	180	0.180
11	Fan lts	21	52	I60/4	120	1		240	240	2	CF/SCRWN	1	60	60	180	0.180
<b>Total</b>														1658	1655	1.655

Enter Cost/KWh = \$ 0.177

Line item	KW Saved	Weekly Hours	Weeks Per Yr	Annual Hrs	Annual KWh Saved	A/C Savings	Combined KWh Savings	Cost/KWh	Annual Savings	Cost/ Fixture	Total Retro Cost	Payback
1	0.040	42	52	2184	87	0	87	\$ 0.177	\$ 15.46	\$ 45.00	\$ 90.00	5.8
2	0.280	56	52	2912	815	147	962	\$ 0.177	\$ 170.30	\$ 45.00	\$ 630.00	3.7
3	0.240	56	52	2912	699	126	825	\$ 0.177	\$ 145.97	\$ 10.00	\$ 40.00	0.3
4	0.090	35	52	1820	164	29	193	\$ 0.177	\$ 34	\$ 10.00	\$ 20.00	0.6
5	0.180	35	52	1820	328	59	387	\$ 0.177	\$ 68	\$ 10.00	\$ 30.00	0.4
6	0.040	35	52	1820	73	13	86	\$ 0.177	\$ 15	\$ 25.00	\$ 50.00	3.3
7	0.100	35	52	1820	182	33	215	\$ 0.177	\$ 38	\$ 13.00	\$ 52.00	1.4
8	0.205	84	52	4368	895	0	895	\$ 0.177	\$ 158	\$ 175.00	\$ 175.00	1.1
9	0.120	84	52	4368	524	0	524	\$ 0.177	\$ 93	\$ 350.00	\$ 2,100.00	22.6
10	0.180	21	52	1092	197	35	232	\$ 0.177	\$ 41	\$ 40.00	\$ 40.00	1.0
11	0.180	21	52	1092	197	35	232	\$ 0.177	\$ 41	\$ 40.00	\$ 40.00	1.0
<b>Total</b>	<b>1.655</b>				<b>4161</b>	<b>478</b>	<b>4638</b>		<b>\$ 820.95</b>		<b>\$ 3,267.00</b>	<b>4.0</b>

Installed cost = \$ 3,267.00  
Payback 4.0

## COOLING AND HEATING SYSTEMS

Cooling for the individual apartments is provided by through-the-wall air conditioning units, package terminal air conditioners (PTAC). Cooling for the offices and recreation areas is provided by central air conditioning systems.

Heating for the apartments is provided by central gas furnaces located in the apartments.

### COOLING

Table-7 and Table-8 identify potential savings for replacing the office central air-cooled package unit. As central air conditioners are replaced they should be replaced with high SEER rated equipment, greater than 14 SEER. PTAC units, such as those in this complex, should also be replaced with units that exceed Title 20 efficiency standards by 20% and qualify for utility incentives.

It is recommended that tune-ups be performed on the central package units. These services can be performed by outside contractors with incentives paid by the utilities which can offset the cost. Tune ups include checking refrigerant charge, new filters and cleaning condenser coils.



Central AC condenser



Exterior PTAC



Interior PTAC

**TABLE-7 CENTRAL AC REPLACEMENT - OFFICE**

	<b>ESTIMATED KWH/YR</b>	<b>ELECTRIC COST/YR</b>	<b>IMPLEMENTATION BUDGET</b>	<b>PAYBACK/YRS</b>
Present	13,648	\$2,416		
Future	7,225	\$1,279		
Savings	6,423	\$1,137	\$6,820	6.0

**TABLE-8 CENTRAL AC TUNE UP - OFFICE**

	<b>ESTIMATED KWH/YR</b>	<b>ELECTRIC COST/YR</b>	<b>IMPLEMENTATION BUDGET *</b>	<b>PAYBACK/YRS</b>
Present	13,398	\$2,371		
Future	12,728	\$2,253		
Savings	670	\$119	\$0	0

\*Assumes utility incentive offset

### PACKAGE TERMINAL AIR CONDITIONING

At this complex, PTAC units provide cooling for the individual apartments. Filters should be cleaned or replaced on a regular basis and upon replacement, the units should be replaced with units that exceed Title 20 efficiency standards by 20% and thus qualify for utility rebates.

Table-9 is an estimate for replacing a tenant PTAC unit. This analysis is based on replacing a 1 ton (12,000 BTU) PTAC unit. The electric cost savings would be for the tenant since the apartments are individually metered.

**TABLE-9 PTAC REPLACEMENT**

	<b>ESTIMATED KWH/YR</b>	<b>ELECTRIC COST/YR</b>	<b>IMPLEMENTATION BUDGET*</b>	<b>PAYBACK/YRS</b>
Present	434	\$108		
Future	230	\$57		
Savings	204	\$51	\$650	21.0

\*Utility incentive is available

### DOMESTIC HOT WATER

Eight boilers provide domestic hot water for the complex and are located in rooms adjacent to the buildings. It was noted that the leaving water temperature of the boiler used for this analysis was 151 degrees. Table-10 shows the natural gas savings attributed to lowering the temperature to 130 degrees. Boilers can also be fitted with boiler controls to reduce energy during periods of reduced use.

**TABLE-10 BOILER SAVINGS**

	<b>ESTIMATED THERMS</b>	<b>GAS COST/YR</b>	<b>IMPLEMENTATION BUDGET *</b>	<b>PAYBACK/YRS</b>
Present	6,382	\$7,531		
Future	4,986	\$5,883		
Savings	1,396	\$1,648	\$100	.1

\*Estimated labor

**SWIMMING POOL COVERS**

Although the swimming pool that was surveyed is not heated at this time, Table-11 is presented to show the estimated natural gas (Therms) savings attributed to installing a swimming pool cover to a heated pool of a 20' x 40' size pool found at this site.

**TABLE-11 SWIMMING POOL COVERS**

	<b>ESTIMATED THERMS</b>	<b>GAS COST/YR</b>	<b>IMPLEMENTATION BUDGET</b>	<b>PAYBACK/YRS</b>
Present	6,184	\$7,297		
Future	2,552	\$3,011	\$6,000	1.4
Savings	3,632	\$4,286		

## APPENDIX C

### MISCELLANEOUS RESOURCES FOR MULTIFAMILY HOUSING

2006 – 2008 Multifamily Energy Efficiency Rebate Programs

Southern California Edison Green Home Design & Building Resources

Build It Green Checklist of Frequently Used Measures

## 2006-2008 Multifamily Energy Efficiency Rebate Programs

This table compares rebates from the various California utilities for measures that may be applicable. The highlighted measures were recommended in the Preliminary Energy Assessment survey.

Measure	SCE	SCG	PGE	SDGE
<b>Screw In CFL*</b>	\$4 - \$10		\$8 - \$10	
<b>Ceiling Fans</b>	\$20		\$20	
<b>Interior Hardwired Fluor Fixtures</b>	\$50		\$50	
<b>T8 Fluorescent*</b>	\$32 - \$45		\$32 - \$45	\$34 - \$35
Exterior Hardwired Fluor Fixtures	\$30			
Exit Signs	\$35		\$35	
Occupancy Sensors	\$10		\$10	
Photocells	\$10		\$10	
Timeclocks			\$36	
<b>High Efficiency PTAC</b>	\$100		\$100	
Energy Star Room AC	\$50		\$50	
<b>2 Speed Pool Motor</b>	\$300		\$100	
Variable Speed Motor			\$100	
<b>AC Tune Ups**</b>	\$0			
Refrigerators	\$50			
High Efficiency Dishwashers		\$30 - \$50	\$30 - \$50	
Water Heaters		\$30	\$30	
Central Furnaces		\$200	\$200 - \$300	
Central Water Heater (80 gal)		\$500	\$500	
WH and/or Boiler Controls <29 units		\$750		
WH and/or Boiler Controls >30 units		\$1,500		
High Eff Clothes Washers				
Central System Boilers		\$1,500	\$1,500	
Clothes Washers (in Ldy)			\$150	
Clothes Washers (tenant dwelling)			\$35 - \$75	

\* Contractor programs also available - no cost

\*\* Contractor program available - no cost

SCE - Southern California Edison

SCG - Southern California Gas

PGE - Pacific Gas & Electric

SDGE - San Diego Gas & Electric



## GREEN HOME DESIGN & BUILDING RESOURCES

### GREEN BUILDING MEMBERSHIP ORGANIZATIONS

- U.S. Green Building Council (USGBC) - [www.usgbc.org](http://www.usgbc.org)
- USGBC Northern CA Chapter – [www.usgbc-ncc.org](http://www.usgbc-ncc.org)
- Building Industry Professionals for Environmental Responsibility (BIPER), Northern CA – <http://www.biperusa.biz/>
- Architects/Designers/Planners for Social Responsibility (ADPSR), Northern CA – [www.adpsr-norcal.org](http://www.adpsr-norcal.org)
- Build It Green (BIG) – [www.builditgreen.org](http://www.builditgreen.org)
- Green Affordable Housing Coalition - [www.greenaffordablehousing.org](http://www.greenaffordablehousing.org)
- Sustainable Buildings Industry Council (SBIC) - [www.sbicouncil.org](http://www.sbicouncil.org)

### NEWSLETTERS AND MAGAZINES

- *Environmental Building News* - [www.buildinggreen.com](http://www.buildinggreen.com)
- *Environmental Design & Construction* magazine – <http://www.edcmag.com/>
- *Natural Home* magazine – <http://www.naturalhomemagazine.com/>

### PUBLICATIONS AND PUBLISHERS

- BuildingGreen, Inc. - [www.buildinggreen.com](http://www.buildinggreen.com) – publisher of *EBN* (see above), *GreenSpec* and other green building tools and publications
- Canada Mortgage & Housing Corporation - [www.cmhc.ca](http://www.cmhc.ca)
- Energy & Environmental Building Association - [www.eeba.org](http://www.eeba.org)
- Fine Homebuilding - [www.taunton.com/finehomebuilding/](http://www.taunton.com/finehomebuilding/)
- *The Not So Big House: A Blueprint for the Way We Really Live; The Not So Big House Collection: The Not So Big House and Creating the Not So Big House; Not So Big Solutions for Your Home* – Sarah Susanka
- *The Healthy House* – John Bower; Healthy House Institute
- Many, many more ... available at Builders' Booksources in Berkeley – [www.buildersbooksource.com](http://www.buildersbooksource.com)

### GREEN HOMEBUILDING PROGRAMS

- LEED for Homes – [www.usgbc.org/leed/homes](http://www.usgbc.org/leed/homes)
- Other programs – [www.greenhomeguide.org/](http://www.greenhomeguide.org/) – this page includes links for local and regional green building programs around the U.S.
- San Mateo County – [www.recycleworks.com/greenbuilding/index.html](http://www.recycleworks.com/greenbuilding/index.html)
- GreenPoint Rated Program – [www.builditgreen.org/greenpoint-rated](http://www.builditgreen.org/greenpoint-rated)
- California Green Builder Program – [www.cagreenbuilder.org](http://www.cagreenbuilder.org)

#### RESEARCH & BUILDING SCIENCE

- National Association of Home Builders Research Center - [www.nahbrc.com](http://www.nahbrc.com)
- Canada Mortgage & Housing Corporation - [www.cmhc.ca](http://www.cmhc.ca)
- Building Science Corporation - [www.buildingscience.com](http://www.buildingscience.com)
- 3-D Building Solutions, LLC - [www.3d-buildingsolutions.com](http://www.3d-buildingsolutions.com)
- Southface - [www.southface.org/home/ech/earthcraft\\_home.htm](http://www.southface.org/home/ech/earthcraft_home.htm)

#### GREEN HOMEBUILDING PRODUCTS & PRODUCT INFORMATION

- *GreenSpec Directory*, BuildingGreen, Inc. – [www.buildinggreen.com](http://www.buildinggreen.com)
- Green Building Pages – [www.greenbuildingpages.com/main.html](http://www.greenbuildingpages.com/main.html)
- Oikos – <http://oikos.com/index.lasso>
- Environmentally Certified Wood – [www.ra.org](http://www.ra.org) and [www.fscus.org](http://www.fscus.org)
- Durable design with wood – [www.fpl.fs.fed.us/](http://www.fpl.fs.fed.us/)
- Healthy Building Network – [www.healthybuilding.net](http://www.healthybuilding.net)
- Greenpeace's PVC Alternatives Listing - [www.greenpeace.org.au/pvc](http://www.greenpeace.org.au/pvc)
- Certified Forest Products Council – [www.certifiedwood.com](http://www.certifiedwood.com)
- US Consumer Product Safety Commission – 800.638.CPSC

#### NETWORKING, DIRECTORIES

- The Green Home Guide – [www.greenhomeguide.com](http://www.greenhomeguide.com) – a community-based information and referral network
- Green Sage - [www.greensage.com](http://www.greensage.com)
- Building Concerns - <http://www.buildingconcerns.com>

#### TRAINING RESOURCES

- SCE Energy Centers – <http://www.sce.com/RebatesandSavings/EnergyCenters/>
- SCE's California New Homes Program – [www.sce.com/builder](http://www.sce.com/builder)
- Affordable Comfort, Inc. – <http://www.affordablecomfort.org/home1.html>
- Energy & Environmental Building Association - [www.eeba.org](http://www.eeba.org)
- Sustainable Buildings Industry Council - [www.sbicouncil.org](http://www.sbicouncil.org)
- National Association of Home Builders - [www.nahb.org](http://www.nahb.org)

#### ENERGY & RESOURCE EFFICIENCY

- Energy Star Homes – <http://www.energystarhomesamerica.com/>
- U.S. DOE Solar Energy Technologies Program – <http://www.eere.energy.gov/solar/>
- Building America – [http://www.eere.energy.gov/buildings/building\\_america/](http://www.eere.energy.gov/buildings/building_america/)
- Building Science Corporation – [www.buildingscience.com](http://www.buildingscience.com)
- Southface Energy Institute – [www.southface.org](http://www.southface.org)
- California Home Energy Efficiency Rating Services (CHEERS) – [www.cheers.org](http://www.cheers.org)

**Abbreviated Multifamily Checklist Highlighting Frequently Used Measures**



The GreenPoint Checklist lists various green features incorporated into a multifamily project and is the basis for the GreenPoint Rated program. A project can be considered green if it earns at least 50 points; obtains the following minimum points per category: Community (8), Energy (30), Indoor Air Quality/Health (6), Resources (6), and Water (3); and meet the prerequisites A.3.a (50% construction waste diversion), C.10.a. (Warrantee on shingle roofing) and N.1 (Incorporate GreenPoint checklist in blueprints). Please contact Build It Green for a list of certified GreenPoint Raters if you are interested in pursuing third-party verification.

	Possible Points							Measures Encouraged and Easy to Implement	Measures Frequent in Some Regions
	Total	Community	Energy	Health/IAQ	Resources	Water	Measures Frequently Used		
<b>A: Planning &amp; Design</b>									
<b>1. Infill Sites</b>									
c. Housing Density of 15 Units Per Acre or More (1 pt for every 5 u/a) ENTER NUMBER	10	10					X		
d. Locate Within Existing Community that has Sewer Line & Utilities in Place	1	1					X		
e. Project Redevelops a Brownfield Site or is Designated a Redevelopment Area by a City	1	1					X		
f. Site has Pedestrian Access Within 1/2 Mile to Neighborhood Services: 1) Bank; 2) Place of Worship; 3) Full Scale Grocery/Supermarket; 4) Day Care; 5) Laundry/Cleaners; 6) Fire Station; 7) Hair care; 8) Hardware; 9) Fitness Center/Gym; 10) Library; 11) M									
5 of the Services Listed Above	1	1					X		
g. Proximity to Public Transit Development is Located Within: 1/4 Mile of One Planned or Current Bus Line Stop	1	1					X		
<b>4. Walking &amp; Bicycling</b>									
a. Sidewalks Are Physically Separated from Roadways & Are 5 Feet Wide	1	1					X		
c. Provide Covered & Secure Bicycle Storage for 15% of Residents	1	1					X		
<b>5. Social Gathering Places</b>									
a. Outdoor Gathering Places for Residents (50 sq ft per unit)	1	1					X		
<b>8. Safety and Natural Surveillance</b>									
a. All Main Entrances are Prominent & Visible from the Street	1	1					X		
b. Residence Entries Have Views to Callers (Windows or Double Peep-Holes) & Can Be Seen By Neighbors	1	1					X		
<b>7. Landscaping</b>									
Check here if the landscape area is over 10% of the project site area (cap at 3pts for under 10%)	1				1		X		
b. No plantings are Listed on the Invasive Plant Inventory by the California Invasive Plant Council	1					1	X		
c. C. Specify Drought-tolerant California Natives, Mediterranean or Other Appropriate Species									
d. Create Drought Resistant Soils:									
i. Mulch All Planting Beds to a Depth of 2 Inches or Greater as Per Local Ordinance	1					1	X		
e. Design & Install High-Efficiency Irrigation System									
i. Specify Smart (Weather-Based) Irrigation Controllers	1					1	X		
ii. Specify Drip, Bubblers or Low-Flow Sprinklers for All Non Turf Landscape Areas	1					1	X		X
g. Minimize Turf in Landscape Installed by Builder									
ii. Less Than 33% of All Landscaped Area is Specified as Turf AND All Specified Turf has a Water Requirement Less Than or Equal To Tall Fescue	1					1	X		
<b>8. Building Performance: Exceed Title 24 - Required</b>									
Enter Percent Above Title 24 for Residential and Non-Residential Portions of the Project.									
a. Residences: 2pts for Every 1% Above T24							X		
b. Non-Residential Spaces: 2pts for Every 1% Above T24	≥30		30						
d. Cool Site									
a. At least 30% of the Site Includes Cool Site Techniques	1	1					X		
<b>10. Adaptable Buildings</b>									
a. Include Universal Design Principles in Units 50% of Units	1	1						X	
<b>11. Affordability</b>									
a. A Percentage of Units are Dedicated to Households Making 80% or Less of AMI									
10% of All Units	1	1					X		
30%	1	1					X		
<b>B: Site</b>									
<b>1. Construction &amp; Demolition Waste Management</b>									
a. Divert a Portion of all Construction & Demolition Waste: Required: Divert 50% Divert 65%	0				R		X		
	2				2			X	
<b>2. Construction Material Efficiencies</b>									
a. Lumber is Delivered Pre-Cut from Supplier (80% or More of Total Board Feet)	1				1		X		
<b>3. Construction Indoor Air Quality (IAQ) Management Plan</b>									
a. An IAQ Management Plan is Written & Followed for the Project	2			2				X	
<b>C: Structure</b>									
<b>2. Recycled Flyash in Concrete</b>									
a. Flyash or Slag is Used to Displace a Portion of Portland Cement in Concrete 20%	1				1				X

Abbreviated Multifamily Checklist Highlighting Frequently Used Measures



	Total	Possible Points							Measures Encouraged and Easy to Implement	Measures Frequent in Some Regions
		Community	Energy	Health/IAQ	Resources	Water	Measures Frequently Used			
<b>4. Engineered Lumber or Steel Studs, Joists, Headers &amp; Beams</b>										
a. 90% or More of All Floor & Ceiling Joists	1			1			X			
<b>5. Optimal Value Engineering Framing</b>										
b. Door & Window Headers Sized for Load	1			1				X		
<b>9. Insulation</b>										
a. All Ceiling, Wall & Floor Insulation is 01350 Certified OR Contains No Added Formaldehyde	1			1			X			
<b>10. Durable Roofing Options</b>										
a. Required: All Shingle Roofing Carries a 3-Year Subcontractor Guarantee & 20-Year Manufacturer	0				R		X			
b. All Sloped Roofing Materials Carry a 40-Year Manufacturer Warranty	1			1			X			
<b>11. Moisture Shedding &amp; Mold Avoidance</b>										
b. ENERGY STAR Bathroom Fans in All Bathrooms, Exhausted to the Outdoors & Equipped with Controls	1			1			X			
c. A Minimum of 80% of Kitchen Range Hoods Are Vented to the Exterior	1			1			X			
<b>D. Systems</b>										
<b>4. Air Conditioning with Advanced Refrigerants</b>										
a. Install Air Conditioning with Non-HCFC Refrigerants	1	1					X			
<b>5. Advanced Ventilation Practices</b>										
Perform the Following Practices in Residences:										
a. Infiltration Testing by a C-HERS Rater for Envelope Sealing & Reduced Infiltration	2		2						X	
<b>6. Garage Ventilation</b>										
a. Garage Ventilation Fans Are Controlled by Carbon Monoxide Sensors (Passive Ventilation Does Not Count)	1			1			X			
<b>8. Light Pollution Reduction</b>										
a. Exterior Luminaires Emit No Light Above Horizontal OR Are Dark Sky certified	1	1						X		
<b>11. ENERGY STAR® Appliances</b>										
a. Install ENERGY STAR Refrigerators in All Locations	1		1				X			
b. Install ENERGY STAR Dishwashers in All Locations	1		1				X			
Residential-grade Dishwashers Use No More than 6.5 Gallons Per Cycle	2		1			1	X			
c. Install ENERGY STAR Clothes Washers in All Locations	2		1			2	X			
<b>12. Central Laundry</b>										
a. Central Laundry Facilities Are Provided for All Occupants	1			1					X	
<b>13. Water-Efficient Fixtures</b>										
a. All Showerheads Use 2.0 Gallons Per Minute (gpm) or Less	2		1			1		X		
b. High-Efficiency Toilets Use 1.28 gpf or Less or Are Dual Flush (up to 4 points total) in All Residences	4					4		X		
d. Flow Limiters Or Flow Control Valves Are Installed on All Faucets (up to 4 points total)										
Residences: Kitchen - 2.0 gpm or less	2		1			1		X		
Residences: Bathroom Faucets- 1.5 gpm or less	2		1			1		X		
<b>E. Finishes &amp; Furnishings</b>										
<b>2. Entryways</b>										
b. Permanent Walk-Off Systems Are Provided at All Main Entrances & in Common Areas	1			1			X			
<b>3. Recycling &amp; Waste Collection</b>										
a. Residences: Provide Built-In Recycling Center In Each Unit	2			2				X		
<b>4. Low/No-VOC Paints &amp; Coatings</b>										
a. Low-VOC Interior Paints (<50 gpl VOCs (Flat) and <150 gpl VOCs (Non-Flat)) (up to 1 point) in All Residences:	1			1			X			
<b>6. Low-VOC Construction Adhesives</b>										
a. Use Low-VOC Construction Adhesives (<70 gpl VOCs) for All Interior Adhesives	1			1			X			
<b>7. Environmentally Preferable Materials for Interior Finish (Up to 5 points Total)</b>										
Use Environmentally Preferable Materials for Interior Finish: A) FSC-Certified Wood, B) Reclaimed Lumber, C) Rapidly Renewable D) Recycled-Content or E) Finger-Jointed										
a. Residences: At Least 50% of Each Material (1 pt each):										
ii. Interior Trim	1			1			X			
<b>12. Furniture &amp; Outdoor Play Structures</b>										
b. Environmentally Preferable Exterior Site Furnishings	1			1			X			
<b>13. Vandalism Deterrence</b>										
a. Project Includes Vandalism Resistant Finishes and Strategies	1	1						X		
<b>F. Other</b>										
<b>1. Incorporate GreenPoint Checklist in Blueprints</b>										
Required: Incorporate GreenPoint Checklist in Blueprints	0	R					X			
<b>2. Operations &amp; Maintenance Manuals</b>										
a. Provide O&M Manual to Building Maintenance Staff	1		1					X		
<b>TOTAL OF "Frequently Used Measures"</b>		24	34	6	7	7	78	21	5	
<b>MINIMUM POINTS REQUIRED FROM EACH CATEGORY</b>	50	6	30	5	6	3				