Schneider Electric

ENERGY SERVICES AGREEMENT

Guaranteed Energy Performance Contracting Program

This is an Energy Services Contract (this "Contract") by and between Schneider Electric Buildings Americas, Inc. ("ESCO") and the City of Greenville ("Customer"), dated October 18, 2017 (the "Date of Commencement") whereby ESCO agrees to provide and perform the energy conservation measures ("ECMs") set forth in the attached schedules and exhibit(s) which are listed below and incorporated fully herein, subject to the terms and conditions set forth herein:

Schedule A: Scope of Work
Schedule C: Performance Guarantee
Schedule D: Measurement & Verification ("M&V") Plan
Schedule E: Customer Responsibilities for Performance Guarantee
Exhibit A: Performance Assurance Support Services

DEFINITIONS

1. "Actual Savings" is defined as the sum of the total Energy Savings realized using the procedures defined in Schedule D plus all adjustments

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2. "Annual Savings Guarantee" is the amount of Energy Savings guaranteed by ESCO for a twelve (12) month period beginning on the Savings Guarantee Commencement Date and any subsequent twelve (12) month anniversary thereafter.

3. "Change Order" is defined as a written change in the Project executed by both parties.

4. "Contract Documents" consist of this Contract with the terms and conditions set forth herein, the Schedules identified above, other documents listed in the Contract and any mutually agreed upon written modification issued after execution of this Contract. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by ESCO. The Contract Documents are correlative and complimentary, and ESCO'S performance shall be required only to the extent consistent with the Contract Documents.

5. "Date of Commencement" is the date provided above.

6. "Day" as used herein shall mean calendar day unless otherwise specifically designated.

6a. "Energy Savings" is defined as a measured reduction in fuel costs, energy costs, water costs, stormwater fees, other utility costs, or operating costs, including environmental discharge fees, water and sewer maintenance fees, and increased meter accuracy, created from the implementation of the energy conservation measures when compared with an established baseline of previous costs, including captured lost revenues.

7. "Excess Savings" is the amount of Actual Savings in excess of the Performance Guarantee.

8. "Financing Agreement" means the financing arrangement that Customer will utilize to provide the funds to pay the Contract Sum. (See Article 2)

9. "Guarantee Year" is the twelve (12) month period beginning on the Savings Guarantee Commencement Date and each subsequent twelve (12) month anniversary thereafter.

10. "Implementation Contract" means those portions of this Contract that refer to the Project.

11. “Performance Guarantee” is the sum of the Annual Savings Guarantee for each year of the guarantee term as set forth in Schedule C or unless terminated earlier in accordance with the Contract Documents.

12. “Performance Period” is defined as the period beginning on the Savings Guarantee Commencement Date and extending through the time period as defined in the Performance Guarantee.

13. "Project" refers to scope of work, as set forth in Schedule A: Scope of Work, made to facilities of Customer.

14. “Savings Guarantee Commencement Date” means the first day of the first utility billing period following the month in which ESCO has delivered a written Notice to the Customer that it has completed the installation and commissioning and commenced operation of all of the energy conservation measures specified in Schedule A, and the Customer has inspected and accepted said installation and operations as evidenced by a Certificate of Acceptance provided by the Customer.

15. “Acceptance of the Work” Acceptance of the Work shall occur when the ESCO’s performance of the entire scope of the Work is complete, in accordance with the Contract Documents so that the Customer can utilize all the installed ECMs for their intended usage and the Energy Savings Guaranty provided by the ESCO becomes effective and the Customer has inspected and accepted said installation and operation as evidenced by a Certificate of Acceptance provided by the Customer which signifies the Customer’s acceptance on the Customer’s letterhead.

16. “Warranty Period” is as defined in Article 4.3.

17. ”Work" means the services required by the Contract Documents, whether completed or partially completed and, includes all labor, materials, equipment and services provided or to be provided by ESCO to fulfill ESCO'S obligations. The Work may constitute the whole or a part of the Project.

TERMS AND CONDITIONS OF IMPLEMENTATION PORTION OF CONTRACT

ARTICLE 1 – DATE OF COMPLETION

1.1 ESCO will complete the Work within 365 days from Date of Commencement (the "Contract Time"), subject to adjustments of this Contract Time as provided in the Contract Documents.

1.2 ESCO will develop and provide to the Customer at the beginning of project implementation a schedule for completion of each energy conservation measure specified in Schedule A.

ARTICLE 2 – CONTRACT SUM AND PAYMENTS

2.1 The total of all implementation contract payments shall be $2,591,372 (the "Contract Sum"). Construction progress payments shall be made to ESCO monthly based on the percentage completion of items delineated on a "Schedule of Values" completed during the prior month. The Schedule of Values will be developed by ESCO and provided to Customer at the beginning of project implementation. The Schedule of Values will be based upon the project cost less the project mobilization payment.

2.2 The payments shall be taken from an escrow account set up in accordance with Customer's project financing agreement. ESCO may submit "Payment Request Forms" and payments shall be made to ESCO on a monthly basis during construction. Customer shall promptly forward Payment Request Form to the escrow agent requesting payment to ESCO in an amount equal to the value of services rendered since the last interim payment as shown on the Schedule of Values provided during installation. Unless withheld in accordance with Article 2.4, if any payment is over ten (10) days late from the due date stated on the invoice, Customer shall pay to ESCO a 1% late penalty per month and ESCO reserves the right to suspend the Work until payment is made upon seven (7) days prior written notice to Customer and if the Customer does not make the payment within such notice period. The due date stated on the invoice shall be no sooner than thirty (30) days after the Payment Request Form is submitted to the Customer.

2.3 Within ten (10) days of the Date of Commencement, Customer shall make payment to ESCO for expenses incurred to date and project mobilization expenses ("Project Mobilization Payment") in the amount of 10% of the implementation contract payment total of the Contract Sum.

2.4 Payments may be withheld on account of (1) Defective Work not remedied, (2) claims filed by third parties, (3) failure of ESCO to make payments properly to the "Subcontractor(s)" or for labor, materials or equipment, or (4) repeated failure to carry out the Work in accordance with the Contract Documents.

2.5 Construction final payment shall not become due until ESCO has delivered to Customer a complete release of all liens arising out of this Contract covering all labor, materials, and equipment for which a lien could be filed, or a bond satisfactory to Customer to indemnify Customer against such lien.

2.6 Notwithstanding any other provision of this Contract, the Savings Guarantee Commencement Date shall be the earlier of (i) the date of the Acceptance of the Work as evidenced by a Certificate of Acceptance provided by the Customer which signifies the Customer's acceptance on the Customer's letterhead, or (ii) the date which is 365 days after the date of the Date of Commencement so long as (i) ESCO has not breached a material provision of this Contract and, (ii) the Energy Savings Guaranty set forth in Schedule C is in full force and effect. Any compensation payments due to ESCO for project monitoring, energy savings measurement and verification, reporting and maintenance services under this Contract shall begin no earlier than fourteen (14) days after the date of the Savings Guarantee Commencement Date as established herein.

ARTICLE 3 – CUSTOMER

3.1 Except for permits and fees, which are the responsibility of ESCO under the Contract Documents, Customer shall secure and pay for necessary approvals, easements, assessments and charges required for the use or occupancy of permanent structures or permanent changes in facilities.

3.2 If ESCO fails to correct Work that is not in material accordance with the requirements of the Contract Documents ("Defective Work") or repeatedly fails to carry out the Work in accordance with the Contract Documents, Customer, upon seven (7) days prior written notice to ESCO, and if ESCO does not correct or diligently commence to correct such failure within such notice period, may order ESCO to stop the Work, or any portion thereof, until the cause for such order has been eliminated. However, the right of Customer to stop the Work shall not give rise to a duty on the part of Customer to exercise this right for the benefit of ESCO or any other person or entity.

3.3 Customer agrees to repair or replace as necessary any defective existing equipment that is intended to be reused unless such repair or replacement is Work to be performed by ESCO pursuant to this Contract.

3.4 Information under Customer's control shall be furnished by Customer with reasonable promptness as requested by ESCO.

3.5. In addition to other times when Energy Savings accrue pursuant to any other provision of this Contract, Energy Savings will accrue as the Work progresses during the implementation period until the Savings Guarantee Commencement Date. The ESCO will document the completed installation of each ECM by building and/or area and in accordance with Schedule A: Scope of Work. Once that portion of the ECM has been installed, ESCO will provide notification of completion to the Customer. Energy Savings for completed building and/or area will be quantified per appropriate section of Schedule C. The Customer will have access to inspect all construction related activities, equipment, and documentation and witness measurement and verification activities. The ESCO will use the date when Customer receives the notification of completion to calculate the savings that are being achieved from that portion of the ECM ("Interim Period Energy Use Savings").
The Customer agrees that Interim Period Energy Use Savings will be held in reserve and if the date of the Acceptance of the Work is after the date of the Projected Completion Date then the Customer will use those interim savings to pay any project financing debt service then due and payable. In the event Interim Period Energy Use Savings are insufficient to pay the debt service of project financing prior to the date of the Acceptance of the Work, and the delay is attributable to the ESCO, then the ESCO shall provide for the shortfall in funds within 15 days from written notice from the Customer of the amount of shortfall. If completion passes the Projected Acceptance Date, the Projected Acceptance Date shall become the Savings Guarantee Commencement Date. For the purpose of this section 3.5, the Projected Acceptance Date shall be the date which is 365 days after the Commencement Date.

3.6 Customer shall notify ESCO in writing of any or all uses or restrictions in usage of all areas of Customer's facility.

3.7 The foregoing are in addition to any other duties and responsibilities of Customer set forth herein or in any other Contract Documents, including but not limited to those duties and responsibilities set forth in Schedule E.

ARTICLE 4 – ESCO

4.1 ESCO shall supervise and direct the Work, using ESCO'S skill and attention. ESCO shall be solely responsible for and have control over means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

4.2 Unless otherwise provided in the Contract Documents, ESCO shall provide and pay for labor, materials, tools, equipment and machinery necessary for the proper execution and completion of the Work.

4.3 ESCO warrants to Customer for a period of one (1) year from the date of Acceptance of the Work that the materials and equipment manufactured by ESCO will be of good quality and new unless the Contract Documents require or permit otherwise, and further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective by the Customer. ESCO'S warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by or for ESCO, improper or insufficient maintenance, improper operation, or normal wear and tear. ESCO shall repair or replace defective material or equipment and re-perform Work to correct any defect within the Warranty Period at no cost to the Customer. ESCO does not warrant products not manufactured by ESCO, but it will pass on to Customer any manufacturer's warranty to the extent permitted. THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES AND REMEDIES WHETHER STATUTORY, EXPRESS OR IMPIED (INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OR TRADE), AND ESCO WILL NOT BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF CUSTOMER. ESCO'S RESPONSIBILITY IN WARRANTY OR CONTRACT SHALL NOT EXCEED THE CONTRACT PRICE PAID FOR THE SPECIFIC PRODUCT OR SERVICE THAT GIVES RISE TO THE CLAIM EXCLUDING THIRD PARTY CLAIMS FOR PERSONAL INJURY, DEATH OR PROPERTY DAMAGE OR AS MAY BE REQUIRED BY LAW.

4.4 Unless otherwise provided in the Contract Documents, ESCO shall pay sales, consumer, use, and other similar taxes which are legally enacted when bids are received or negotiations concluded, whether or not effective or merely scheduled to go into effect, and shall secure and pay for the building permit and other permits, licenses and inspections necessary for proper execution and completion of the Work.

4.5 ESCO shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work.

4.6 ESCO shall keep the premises and surrounding areas free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, ESCO shall remove from and about Project waste materials, rubbish, ESCO'S tools, equipment, machinery and surplus material.

4.7 ESCO shall provide Customer access to the Work in preparation and progress wherever located.

4.8 ESCO shall pay all royalties and license fees, shall defend suits or claims for infringement or patent rights, and shall hold Customer harmless from loss on account thereof.

4.9 Except to the extent of the negligence or willful misconduct of Customer, or its agents, representatives, employees, officers, directors or assigns, ESCO shall indemnify and hold harmless Customer, and agents and employees thereof from and against all third party claims, damages, losses and expenses, including, but not limited to, reasonable attorney's fees, arising out of or resulting from performance of the Work provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused in whole or in part by negligent acts or omissions of ESCO, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable.

4.10 NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, ESCO SHALL NOT BE LIABLE IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER. The remedies of Customer set forth herein are exclusive where so stated and the total cumulative liability of ESCO with respect to this Contract or anything done in connection therewith, such

as the use of any product covered by or furnished under the Contract, whether in contract, in tort (including negligence or strict liability) or otherwise, shall not exceed the contract price for the specific product, equipment, material or service work performed that gives rise to the claim, excluding third party claims for personal injury, death or property damage or as may be required by law.

4.11 ESCO shall comply with the requirements of North Carolina General Statute 143-128.2.

ARTICLE 5 – SUBCONTRACTS

5.1 A Subcontractor is a person or entity who has a direct contract with ESCO to perform a portion of the Work at the site.

5.2 Unless otherwise stated in the Contract Documents or the bidding requirements ESCO, if requested in writing by Customer, shall furnish in writing to Customer the names of the Subcontractors to whom ESCO plans to award Work. Contracts between ESCO and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to ESCO by the terms of the Contract Documents, and to assume all the obligations and responsibilities which ESCO, by the Contract Documents, assumes toward Customer, and (2) allow to the Subcontractor the benefit of all rights, remedies and redress afforded to ESCO by these Contract Documents.

ARTICLE 6 – CHANGES IN THE WORK

6.1 Customer may request order changes in Work consisting of additions, deletions or modifications, whereby, the Contract Sum and Contract Time shall be adjusted accordingly. Such changes in the Work shall be authorized by written Change Order that shall be mutually agreed to and signed by Customer and ESCO. The parties shall negotiate in good faith and use their best efforts to execute any Change Order, and any Change Order must be fully executed in writing by Customer and ESCO prior to any actual changes being implemented.

6.2 Notwithstanding anything to the contrary contained in the Contract Documents, changes to the Contract Sum and Contract Time shall be changed only by Change Order.

6.3 The cost or credit to Customer from a change in the Work shall be determined by mutual agreement.

6.4 In the event of any suspension or delay due to the acts or omissions of Customer or Customer directives to stop Work for any reason, through no fault of ESCO, the Contract Time for Completion of the Work shall be extended to reflect such period of interruption and the Contract Sum shall be equitably adjusted to recover ESCO'S costs of demobilization, delay and remobilization related to such suspension or delay. ESCO agrees it will cooperate with Customer and mitigate such costs to the extent and efforts commercially reasonable.

ARTICLE 7 – TIME

7.1 The date of completion of the Work is the date the Customer provides the Certificate of Acceptance after the entire scope of Work is complete, in accordance with the Contract Documents.

7.2 If ESCO is delayed at any time in progress of the Work by changes ordered in the Work, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties or any other causes which are beyond the control of ESCO, then the parties hereto agree to execute a Change Order allowing for a mutually agreeable extension of time for performance of ESCO'S Work to cover such delay.

ARTICLE 8 – PAYMENTS AND COMPLETION

8.1 Payments shall be made as provided in Article 2 of the Contract.

8.2 As required by North Carolina General Statute 143-64.17D, it is understood and agreed that this Contract does not constitute a direct or indirect pledge of the taxing power or full faith and credit of the Customer.

ARTICLE 9 – PROTECTION OF PERSONS AND PROPERTY

9.1 ESCO shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. ESCO shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to (1) employees on the Work and other persons who may be affected thereby, (2) the Work and materials and equipment to be incorporated therein, and (3) other property at the site or adjacent thereto.

9.2 ESCO shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons and property and their protection from damage, injury or loss.

9.3 The scope of work or service to be performed by ESCO pursuant to this Contract, and the compensation to be paid to ESCO hereunder for Work or services performed, expressly exclude any Work or service of any nature associated or connected with the identification, abatement, cleanup, control or removal of environmentally hazardous materials beyond what is specifically defined and identified in Schedule A of this Contract. "Hazardous Materials" to include, but not be limited to, asbestos and PCBs discovered in or on the premises. Customer agrees that all duties and obligations in connection with any hazardous materials located in or on the premises, other than those defined in Schedule A, are strictly the responsibility of Customer. Customer warrants and represents to the best of Customer's knowledge there are no hazardous materials in or on the premises which will affect, be affected by, come in contact with, or otherwise impact upon or interfere with the Work to be performed by ESCO pursuant to this Contract.

9.4 Should ESCO become aware or suspect the presence of hazardous materials beyond those to be addressed in Schedule A during performance of its Work under this Contract, ESCO will be authorized to cease Work in the affected area immediately, and will promptly notify Customer of the conditions discovered. Should ESCO stop Work because of the discovery or suspicion of hazardous materials, the time for performance of ESCO'S Work or service will be extended to cover the period required for abatement, cleanup, or removal of the hazardous materials. ESCO will not be held responsible for any claims, damages, costs, or expenses of any kind associated with the period during which ESCO has stopped Work as a result of hazardous materials. If appropriate, ESCO will be entitled to an equitable adjustment of the Contract Sum for any increased costs or other charges incurred by ESCO in connection with the existence of its rights under this paragraph.

9.5 Customer will be responsible for taking all necessary steps to correct, abate, clean up, or control hazardous materials not addressed by ESCO in Schedule A in accordance with all applicable statutes and regulations. Customer specifically agrees, to the extent allowed by state law, to indemnify and to hold ESCO, its officers, agents and employees harmless from and against any and all claims, demands, damages, or causes of action in any way arising out of the release of hazardous materials into the air, soil, or any water system or water course, or any actions taken in connection with same, or any failure to act.

ARTICLE 10 – INSURANCE AND BONDS

10.1 ESCO shall maintain adequate levels and types of insurance coverage appropriate to its business and profession and as may be required by applicable law and the Contract Documents. Such insurance shall be in companies authorized to do business in the jurisdiction in which the Project is located with an A.M. Best's rating of at least A- VII and as a minimum shall include Workers' Compensation and Employer's Liability at statutory limits, Automobile Liability covering all owned, hired and other non-owned vehicles and Commercial General Liability covering public liability, property damage and completed

operations with limits not less than $2,000,000 per occurrence. Certificates of such insurance shall be provided to Customer prior to commencement of the Work.
10.2 ESCO shall provide payment and performance bonds for 100% of the Contract Sum to secure the faithful performance of the Work, compliance with the terms of this Contract and to insure ESCO'S payment obligations to its Subcontractors and suppliers related to the Work. Said bonds shall be subject to the provisions of Article 3 of Chapter 44A of the North Carolina Statutes and shall be in a form acceptable to the Office of the State Treasurer. Notwithstanding any provision to the contrary herein, any payment and performance bonds associated with this Contract guarantee only the performance of the installation portion of the Contract, and shall not be construed to guarantee the performance of: (1) any efficiency or energy savings guarantees, (2) any support or maintenance service agreement, or (3) any other guarantees or warranties with terms beyond one (1) year in duration from the completion of the installation portion of the Contract.

ARTICLE 11 – SUSPENSION OF WORK OR TERMINATION OF THE CONTRACT

11.1 If Customer fails to make payments to ESCO as required in this Contract, unless withheld in accordance with Article 2.4, ESCO may, upon seven (7) days written notice to Customer and if the Customer does not make the payment within such notice period, suspend the Work until payment is made and recover from Customer payment for all Work executed and for any costs incurred to restart the Work.

11.2 If ESCO breaches a material provision of this Contract, Customer, after delivery of written notice and providing ESCO seven (7) days to cure such breach, may make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due ESCO.

11.3 Any remedies provided for in this Article 11 shall not be exclusive of any additional remedies available to a party pursuant to this Contract, in equity or in the law.

ARTICLE 12 – OTHER CONDITIONS OR PROVISIONS

12.1 If any provision of this Contract shall be held to be invalid, illegal, or unenforceable, the validity, legality and enforceability of the remaining provisions shall not be affected or impaired thereby.

12.2 Nothing herein shall be deemed to establish a relationship of principal and agent between ESCO and Customer, or any of their respective agents or employees, and this Contract and the Contract Documents may not be construed as creating any form of legal association or arrangement that would impose liability upon one party for the act or failure to act of the other party.

12.3 This Contract shall be governed by the laws of the state where the Project is located.

12.4 As between Customer and ESCO, any applicable statute of limitation shall commence to run and any alleged cause of action shall be deemed to have accrued (1) not later than the date of Acceptance of the Work for acts or failures to act occurring prior to the relevant date of Acceptance of the Work, or (2) not later than the date of the relevant act or failure to act by either party for acts or failures to act occurring after the date of Acceptance of the Work.

12.5 This Contract sets forth the entire understanding between the parties and supersedes all prior oral or written understandings relating to the subject matter herein. This Contract may not be altered or modified except by a written instrument signed by a duly authorized representative of each party.

IN WITNESS WHEREOF, the Customer and ESCO have executed this Contract, in duplicate originals, as of the day and year first above written.

City of Greenville		Schneider Electric Buildings Americas, Inc.	
By	(Signature)	By	(Signature)
Print Name	Allen M. Thomas	Print Name	Tammy Fulop
Title	Mayor	Title	VP Sales

APPROVED AS TO FORM:

BY: _____
David A. Holec, City Attorney

PRE-AUDIT CERTIFICATION:

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.

BY: _____
Bernita W. Demery, CPA, Director of Financial Services

SCHEDULE A: SCOPE OF WORK

The following ECM matrix is representative of the Schneider Electric proposed Energy Savings Performance Contract. Appendices of the Investment Grade Audit include more detailed information where noted.

City of Greenville - ECM Matrix								
Building Name	**ECM #1 Lighting**	**ECM #2 Controls**	**ECM #3 HVAC Upgrades**	**ECM #4 Water Conservation**	**ECM #5 Building Envelope**	**ECM #6 Chlorine Generator**	**ECM #8 Solar Renewable**	**ECM #10 TAB**
City Hall	Y	Y	Y	Y	N	NC	Y	Y
Municiple Building	N	Y	Y	NC	N	NC	NC	Y
Police-Fire Rescue	Y	Y	NC	Y	N	NC	Y	NC
Parks Maintenance Center	Y	NC	NC	Y	N	NC	NC	NC
5th Street Police Substation	Y	N	NC	N	N	NC	NC	NC
Epps Recreation Center/Thomas Foreman Park	Y	Y	NC	N	N	NC	NC	NC
Guy Smith Stadium	N	NC	NC	Y	NC	NC	NC	NC
Public Works Complex	Y	Y	Y	N	N	NC	NC	Y
South Greenville Recreation Center Building	Y	Y	NC	Y	N	NC	NC	NC
Evans Park Building	Y	N	N	Y	N	NC	NC	NC
Elm Street Recreation Center	Y	Y	NC	Y	N	NC	NC	NC
Jaycee Park Building	Y	Y	N	N	N	NC	NC	Y
Sports Connection	Y	Y	NC	Y	N	NC	NC	NC
Gardner Training Center	Y	N	NC	N	N	NC	NC	NC
H. Boyd Lee Park	Y	Y	NC	NC	N	NC	NC	NC
River Park North	N	Y	NC	NC	NC	NC	NC	NC
Greenfield Terrace	N	Y	NC	NC	NC	NC	NC	NC
Greenville Aquatics and Fitness Center	Y	Y	Y	Y	N	Y	N	Y
Bradford Creek Golf Course	Y	N	NC	NC	N	NC	NC	NC
Legend: Y = Included N = Considered, but Not Included NC = Not Considered								

General ECM Descriptions

General descriptions and design intent are provided in this section only for ECM 1 – Lighting and ECM 4 – Water Conservation Measures due to similar application of these ECMs across the City of Greenville's facilities.

ECM 1 – Lighting

When developing a lighting retrofit strategy for customers, Schneider Electric considered several important factors: energy consumption, functionality, the cost of various technology options, potential energy and cost savings, and the ongoing maintenance costs. Schneider Electric also considers City of Greenville's operating hours, the tasks being performed and the lighting levels required to support those tasks (as recommended by the Illuminating Engineering Society of North America), along with all applicable Federal and State Energy code requirements.

After taking all of these factors into consideration, Schneider Electric develops a preliminary retrofit strategy. Schneider Electric then compares the energy consumption and costs of the proposed lighting system with the existing system to confirm that the retrofit strategy will produce the desired results. This is done by using information provided (existing electric rates and hours of operation) in calculations to confirm that objectives are met. Schneider Electric's primary goal is to design a retrofit strategy that:

- Significantly reduces City of Greenville's energy consumption and costs
- Provides energy consumption and cost savings without compromising lighting quality, performance, functionality, safety, or occupant comfort
- Standardizes products wherever possible in order to reduce inventory and ongoing maintenance costs
- Complies with all Federal and State regulations and codes prescribing the use of energy-efficient lamps and ballasts
- Guarantees environmentally safe recycling or disposal of all items that are removed

The hours of operation for this project are based on observations during the survey process and data collected by loggers. A description of how the logger data was incorporated into the energy model is provided in the Lighting appendix. Additionally, the baseline electrical demand data was referenced to the historical usage data to fine tune hours of operation. This was a team effort, spanning multiple disciplines.

Lighting Design Strategy

Fluorescent

Schneider Electric's design strategy is to standardize on the same type of fluorescent lamp type throughout the buildings included in this project. A proven non-proprietary proven lamp and ballast combination that will provide the greatest performance and energy savings of any of the lighting systems considered was selected. The premium grade electronic ballasts Schneider Electric proposes are of a high-efficiency design, which is a step above the standard grade electronic ballasts more commonly found in low bid construction projects. These ballasts provide a greater level of efficiency over the standard ballast and also incorporate an intelligent voltage capability allowing the ballast to be used on both 120v and 277v applications. The proposed T8 lamps are a premium high lumen, extended life type that again yields better results than the standard grade.

For this project Schneider Electric has selected a **25 -watt** energy saving lamp. The proposed lamp and ballast system will provide the greatest energy savings of the various lamp/ballast options explored, and will additionally allow for improved efficiency on some existing T8 linear fluorescent fixtures with instant start ballasts by relamping them with the latest in T8 technology. This T8 retrofit strategy will allow us to maintain recommended light levels while still providing a reduction in energy usage in all T8 fixtures and still standardize lamp types in City of Greenville's facilities. Fluorescent fixtures with broken lamp

tombstones will have the tombstones replaced at no additional cost. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

In several gymnasiums, Interior HID fixtures have already been replaced with fluorescent high-bay fixtures utilizing energy efficient T5HO fluorescent technology. The advancements in fluorescent technology make these fixtures good alternatives to HID and provide light levels comparable to the existing fixtures with the added benefit of instant on capability.

Incandescent

Schneider Electric's design strategy for the use of incandescent lamps is to eliminate wherever possible. In applications where it is used as a primary source of illumination and sufficient operating hours are present, Schneider Electric will try to replace the existing incandescent fixtures with new fixtures utilizing linear fluorescent or plug-in compact fluorescent lamp fixtures. In areas where incandescent fixtures are the primary light source but have limited operating hours Schneider Electric will replace the incandescent lamps with a self-ballasted screw-in compact fluorescent lamp. Screw-in compact fluorescent lamps not only offer a tremendous energy savings potential when compared with their incandescent counterparts, but also have a significantly longer operating life. In spaces where aesthetics might be compromised or payback criteria prohibits the installation of a new fixture, a screw-in compact fluorescent lamp has been specified as an alternative. Areas where incandescent fixtures are connected to dimmers are assessed on a case-by-case basis.

High Intensity Discharge

Schneider Electric's design strategy for HID (high intensity discharge), including metal halide or high-pressure sodium varies due to the variety of applications. In the case of this project, many exterior HID luminaires were excluded, based their type and application. High-mast sports lighting was excluded, as the detailed analysis required to determine if lower light levels are appropriate falls outside the scope of the current IGA. HID fixtures recessed in grade, bollard lights, recessed step lights, high wattage metal halide floods, low wattage canopy lights, post top lanterns, and most of the tennis court HID lighting were also excluded because it was determined the cost outweighed the savings potential based on the project goals. Induction strategies were also evaluated and deemed inappropriate when considering output requirements, cost, and efficiency. Many building mounted wallpacks and wall mounted HID luminaires in the 100W to 250W range have been proposed to be replaced with LED wallpacks.

Lighting Occupancy Sensors

Occupancy sensors have been proposed in most large group areas or work spaces such as, gymnasiums, cafeterias, multipurpose rooms, classrooms and designated offices. In areas such as gymnasiums that have gone from HID fixtures to fluorescent, fixture-mounted occupancy sensors will be installed where warranted by occupancy data and can be adjusted to provide a shut off delay of up to twenty minutes to eliminate rapid or excessive cycling of lamps. Below is a chart of the different types of sensors used in the design.

Sensor Code Reference	
SENSOR CODE	SENSOR DESCRIPTION
OCC IR-W	Add Low Voltage PIR Occupancy Sensor Wall/Ceiling Mount
OCC IR-HC-F	Add Line Voltage PIR Occupancy Sensor Fixture Mount
PC-C	Add Low Voltage On/Off Surface Mount with Photo Control
OCC WSIR	Add PIR Occupancy Sensor Wall Switch Mount
OCC WSDT	Add Dual Tech Occupancy Sensor Wall Switch Mount
OCC IR-C	Add Low Voltage PIR Occupancy Sensor Ceiling Mount
OCC DT-C	Add Low Voltage Dual Tech Occupancy Sensor Ceiling Mount
OCC HAL-W	Add Low Voltage PIR Occupancy Sensor Wall/Ceiling Mount in Hallway
OCC DT-W	Add Low Voltage Dual Tech Occupancy Sensor Wall/Ceiling Mount
TIMER-WS	ADD TIMER SWITCH, WALL SWITCH MOUNT

Spaces that are proposed to receive occupancy sensors are listed in under the lighting ECM description for each building. Sensor quantities and types are subject to change during the construction phase. Changes in existing conditions, such as space usage or change in occupant behavior, may occur between the investment grade audit and construction phases and may alter the sensor type selection and quantities. It is understood that if occupancy sensors are installed in these proposed spaces that any changes in sensor type or quantity are the responsibility of Schneider Electric and will not result in any additional cost to the project.

Daylight Harvesting

The use of photocells has also been proposed in designated areas at H. Boyd Lee Park where existing ambient light levels provide an opportunity for additional savings.

Gymnasium Lighting

Per the City of Greenville's request, proposed gymnasium lighting retrofits are designed to meet light levels of 50-60 foot-candles.

Other Lighting Considerations

Recycling / Hazardous Waste Disposal

Schneider Electric will provide disposal through a certified and approved hazardous waste recycler for all lamp and ballast waste both hazardous and non-hazardous that is associated with the energy efficient lighting upgrade in the facility. This will eliminate any need for City of Greenville to seek outside lamp/ballast disposal methods for this material. This service is comprehensive and includes the containment drums, lamp shipping packing cartons, waste receptacles, transportation, labor and all on and off site handling to complete the process. A completed document/certificate showing proof of total destruction of all lamp and hazardous ballast waste will be provided back to the City for their records. This total destruction method removes City of Greenville from any potential future liability that could possibly result from improper land filling this type of waste.

Warranty Guarantee

Every lighting system comes with Schneider Electric's personal guarantee of satisfaction. This means that if Schneider Electric has fallen short of achieving City of Greenville's specific request through design or product selection, then Schneider Electric will make it right. Schneider Electric warrants all workmanship for a period of one year from project completion date.

All materials used are from name brand manufacturers and come with a full manufacturer's warranty. These warranties will be transferred to City Of Greenville for their convenience in servicing their facility in the future. Typical manufacturer's warranty periods on equipment are listed below. The "Operation and Maintenance Manual" which is provided to City of Greenville at project completion contains specific warranty information for the materials used on the project.

Linear Fluorescent Lamps	3 years
Linear Fluorescent Ballasts	5 Years
Screw in Compact Fluorescent Lamps	15 months
Retrofitted HID Lamps	6 – 24 Months based on lamp
Retrofitted HID Ballasts	24 Months
LED Exit Signs	5 Years
Light Fixtures	Varies by Manufacturer (Typically 1 year)
Sensors	Varies by Manufacturer (Typically 5 years)

Spare Lamp, Ballast and Sensor Materials

As part of the lighting scope proposal, Schneider Electric will furnish, at no additional cost to City of Greenville, 2% of the total number of installed lamps for shelf stock. Ballast shelf stock will also be furnished for a total of 1% of the total installed number of ballasts on the project. When sensors are part of the design and included in the installation Schneider Electric will also provide shelf stock for a 1% of the total installed number of sensors on the project. Future replacement lamps and ballasts can be purchased at most electrical distributors.

ECM 4 – Water Conservation Measures

Bathroom Fixture Retrofits

Bathroom fixtures offer good water saving opportunities because many of these fixtures can be retrofit to reduce the amount of water consumed per flush (toilets and urinals) or per minute of use (sinks and showers). Reducing sink and shower water usage also saves the thermal energy used to make hot water.

Savings Estimate

Domestic water savings depend on the volume of water used per toilet, shower, or sink use, the number of people using the bathrooms, and the frequency of use. Existing and proposed domestic water consumption has been calculated based on data provided by Greenville, NC, Schneider Electric, and the occupancy assumptions listed in the Appendix.

Thermal energy savings for sink usage is based on the following assumptions: the ratio of hot-to-cold water use, average hot and cold water temperatures, and the domestic hot water heater efficiency.

Water Conservation Design Strategy

Toilet Replacements

Existing high flow toilets will be replaced with new 1.28 gpf toilets. New 1.28 gpf china will be installed where appropriate and existing flushometers will be replaced or retrofit with 1.28 gpf flush valves.

A typical toilet replacement with flush valve upgrade includes the following major components:

- 1.28 gpf in kind china replacement (Zurn or equal)
- New outlet seals and Jonny-bolts, if applicable
- New toilet seats with stainless steel hardware
- New (Zurn or equal) 1.28 gpf flush valve, if applicable
- 10% Stop valve replacement or angle stop repair is anticipated and is included in this scope, based on the types and ages of fixtures noted in the audit. Should a significant amount of stop valves need to be replaced or repaired it will be considered an extra cost.
- 10% flange repair for floor mount toilets is anticipated and is included in this scope. Should a significant amount of flange repair work be required, it will be considered an extra cost.
- Caulking of new china fixtures and any carrier bolt work is excluded.

Toilet Flush Valve Retrofit

Existing 1.6 gpf compatible toilets will have valves retrofit to 1.6 gpf. Toilet china and valve body will remain in place.

A typical toilet flush valve retrofit and maintenance upgrade includes the following major components:

- New 1.6 gpf retrofit kit
- Carrier work, new china, and new valve body are excluded.

Bathroom Sinks

Existing high flow bathroom sink faucets will be retrofit with new, tamper resistant, 0.5 gpm faucet flow restrictors.

Showerheads

Existing high flow showerheads will be replaced with new, tamper resistant, 1.5 gpm showerheads.

Accessibility and ADA Code

Like-for-like fixture upgrades are included in this proposal: existing high-flow, ADA-height toilets will be replaced with low-flow, ADA height-toilets; existing high-flow, standard height toilets will be replaced with low-flow, standard height toilets. Any and all ADA bathroom partitions, grab bars, extensions, sink faucet actuators, piping insulation, or other ADA requirements are hereby excluded from this proposal. H2O

does not take responsibility for any existing or future ADA compliance issues and if required to modify bathrooms or fixtures to meet an ADA code this will be completed for an additional cost.

City Hall

ECM 1 – Lighting Occupancy Sensors

68 lighting occupancy sensors are proposed as part of this ECM.

Lighting Sensors - City Hall					
Reference Number	Room Number	Space	Number of Sensors	Sensor Reduction %	Sensor Type
2	303	OFFICE	1	15%	OCC WSIR
3	307	OFFICE	1	15%	OCC IR-W
10	N/A	BOOTH	1	30%	OCC WSIR
13	N/A	MENS TOILET	1	30%	OCC WSIR
14	N/A	WOMENS TOILET	1	30%	OCC WSIR
15	313	OFFICE	1	15%	OCC IR-W
18	N/A	UPPER LOBBY	1	70%	PC-C
21	N/A	MENS TOILET	1	50%	OCC WSDT
22	N/A	WOMENS TOILET	1	50%	OCC WSDT
24	328	OFFICE	1	15%	OCC IR-W
25	330	OFFICE	1	15%	OCC WSIR
26	329	OFFICE	1	15%	OCC IR-W
27	308	BREAK ROOM OFFICE	1	15%	OCC IR-W
31	N/A	WOMENS TOILET	1	30%	OCC WSDT
32	N/A	MENS TOILET	1	30%	OCC WSDT
36	337	CONFERENCE	1	20%	OCC IR-W
47	247	OFFICE	1	15%	OCC WSIR
48	248	OFFICE	1	15%	OCC WSIR
50	249	OFFICE	1	15%	OCC WSIR
51	250	OFFICE	1	15%	OCC WSIR
52	251	OFFICE	1	15%	OCC WSIR
54	252	OFFICE	1	15%	OCC WSIR
56	233	CONFERENCE	1	15%	OCC WSIR
57	234	OFFICE	1	15%	OCC WSIR
58	255	OFFICE	1	15%	OCC WSIR
59	254	OFFICE	1	15%	OCC WSIR
60	235	OFFICE	1	15%	OCC WSIR
61	236	OFFICE	1	15%	OCC WSIR
62	237	OFFICE	1	15%	OCC WSIR
63	N/A	MENS TOILET	1	50%	OCC WSDT
64	N/A	WOMENS TOILET	1	50%	OCC WSDT
66	203	OFFICE	1	15%	OCC IR-W
68	205	OFFICE	1	15%	OCC IR-W
69	206	OFFICE	1	15%	OCC WSIR
70	209	OFFICE	1	15%	OCC WSIR
73	211	OFFICE	1	15%	OCC WSIR
75	212	OFFICE	1	15%	OCC WSIR
76	213	OFFICE	1	15%	OCC IR-W
79	214	OFFICE	1	15%	OCC WSIR
86	222	CONFERENCE	1	15%	OCC WSIR
87	223	CONFERENCE	1	15%	OCC WSIR
90	125	CONFERENCE	1	15%	OCC WSIR
91	126	CONFERENCE	1	15%	OCC WSIR
92	124	OFFICE	1	15%	OCC WSIR
94	123	OFFICE	1	15%	OCC WSIR
95	121	OFFICE	1	15%	OCC WSIR
96	119	OFFICE	1	15%	OCC WSIR
98	118	OFFICE	1	15%	OCC WSIR
101	114	OFFICE	1	15%	OCC WSIR
102	115	OFFICE	1	15%	OCC WSIR
103	112	OFFICE	1	15%	OCC WSIR
104	111	OFFICE	1	15%	OCC WSIR
105	110	OFFICE	1	15%	OCC WSIR
106	109	OFFICE	1	15%	OCC WSIR
108	108	OFFICE	1	15%	OCC WSIR
109	107	OFFICE	1	15%	OCC WSIR
110	106	OFFICE	1	15%	OCC WSIR
111	105	OFFICE	1	15%	OCC WSIR
112	N/A	MENS TOILET	1	50%	OCC WSDT
113	N/A	WOMENS TOILET	1	50%	OCC WSDT
115	135	OFFICE	1	15%	OCC WSIR
120	142	OFFICE	1	15%	OCC IR-W
121	N/A	MENS TOILET	1	30%	OCC WSIR
122	N/A	WOMENS TOILET	1	30%	OCC WSIR
124	150	KITCHEN	1	25%	OCC IR-W
126	151	OFFICE	1	15%	OCC WSIR
128	154	OFFICE	1	15%	OCC IR-W
129	155	OFFICE	1	15%	OCC WSIR
68 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. The existing systems and issues with the systems are described in detail in Section 3 – Existing Conditions. The intent of the recommendations will allow the city to mandate the removal of the majority of portable heaters in the building.

This project includes:

- The installation of Electrical/Mechanical Scope to add Heating capability into the air handlers. This scope is required and will allow the controls of the building to operate properly.
- The upgrading of the existing controls system, re-commissioning of the building controls, rebalancing of systems and building pressurization - as required, and additional points and programming.

Adding Heating Capability in the three main air handling units:
The installation of heating capability in the air handlers is the most cost effective and practical solution to augmenting the heating capability of the building. Presently the air handlers don't have any means to heat supply air. This means that during the coldest periods of the year the mixture of return air and outside air would drop the supply air temperature lower than what the reheat coils can effectively heat in all circumstances. The result is a limitation of the heating supply air temperature to satisfy comfort.

The existing air handlers have sections that will allow for the installation of electric heating. The requirements are the addition of 30 kW in each of the three main AHUs. (The similarity of the heating requirements is close because the outside air flow requirements for all three are close.)

The scope of work includes the sourcing of the power requirement for the new heaters from the main distribution panel, all wiring and OEM heaters or equivalent, specified to operate at all flow operational points. The heaters should be SCR controlled to provide linear or acceptable stepped control to avoid excessive demand and cycling operation.

This part of the recommendation also includes all controllers, points and programming required to accomplish supply air temperature reset to as high as 65 degrees F. The programming should include all means to accommodate the lowest temperature requirement of the system so all spaces will be satisfied.

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Fan scheduling for AHU 1 and AHU 2. (AHU 3 Scheduling is part of ECM 3)
- Optimum Start Stop for AHU 1 and AHU2 (AHU 3 Scheduling is part of ECM 3)
- Temperature Setback control for AHU 1 and AHU 2 during unoccupied periods.
- Control of system ventilation optimization including scheduling and programmed building pressurization from ventilation-exhaust sequences.
- Scheduling of VAV box minimum settings for occupied and unoccupied periods.
- Control/scheduling of all exhaust fans in the building
- Proper air side economizer control for free cooling
- Humidity control and supply air reset based on humidity and heating requirements for the building.

Controls Scope of Work

- Niagara AX (G3) Framework Upgrade –Implement a full upgrade of the facility's DDC software from the R2 framework to the current version AX framework including providing a one for one replacement of the existing UNC supervisory controller with a current model ENC controller. All programming and graphics work required to facilitate the upgrade shall be included and the user interface shall be upgraded to the most current and advanced offering from the BAS contractor as part of this scope.
- VAV Air Handling Units – Under this scope of work the BAS contractor shall modify the existing programming to include the following control algorithms for the three existing VAV rooftop air handling units: optimum start/stop, supply air CO_2 based demand controlled ventilation (include sensor hardware for AHU-1 and AHU-3 only – DCV is existing on AHU-2), and dynamic load-based supply air temperature reset (in place of outdoor air reset).
- Improved Trending Interface – The BAS contractor shall provide a simplified trending utility through the web based interface for each physical I/O point on the system permitting rapid access to the most relevant trends for a unit directly from its graphics page. In addition, an advanced trending and reporting utility shall be provided via the operator workstation providing the ability to execute a number or pre-made reports, create new custom reports, and create tailored queries of both long-term and short-term trend data.

ECM 3 – HVAC Upgrade

Room 303 is a communications control room located on the third floor. The room is includes electronics equipment that requires sensible cooling 24/7. The room is presently served by RTU – 3, which serves the new addition portion of the building. Because of this one critical room, the RTU needs to operate 24/7. If the room had a small dedicated cooling system the larger RTU could be scheduled, savings substantial energy.

Schneider Electric recommends the installation of a dedicated cooling only system for room 303. The system would operate 24/7 and be capable of satisfying the cooling needs of the room and the electronic systems inside the room. The system would be a min-split system with the condensing unit installed on the roof and the terminal unit/AHU and temperature control installed in the room.

The following is a table with conceptual design information for the new unit:

Air Handling Units - City Hall									
Mark	**Area Served**	**System Type**	**Economizer / Relief**	**DCV**	**Supply CFM**	**TSP**	**OA CFM**	**Nominal Tons**	**Heating Capacity (MBH)**
EMI-1	Room 303	Mini Split	No	No	750	0.5	0.0	2	0

Installation would include power distribution wiring to support the installation of the new unit.

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Status of new mini split system, temperature and operation
- Fan scheduling for AHU 3
- Optimum Start Stop for AHU 3
- Temperature Setback control for AHU 3

In addition, as part of ECM 3 – HVAC Upgrades, a complete air-side test and balance will be performed at City Hall.

ECM 4 – Water Conservation Measures

Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 2.5 gpm showerheads will be replaced with new, 1.5 gpm showerheads; Existing 1.5 gpm showerheads will remain in place. Refer to the table below for retrofit fixture quantities.

Water - Retrofit Fixture Quantities - City Hall				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	-	-	4	4
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

ECM 8 – Solar Photovoltaic Array

A 4.8kW grid tied system will be comprised of Twenty (20) Helios 6T solar modules. The modules will be mounted on a ballasted aluminum frame with an Azimuth of 170 degrees (10 degrees from due south) and tilted at an angle of 36 degrees. Enphase M215 micro inverters will be attached to the modules to convert the DC current to AC. An Envoy Communications Gateway will be installed. This device will connect each module to the internet so that system owners can easily check the status of their solar system using the Envoy's LCD display, or get more detailed information through the Enlighten website. The Helios 6T modulesare guaranteed for 25 years to deliver at least 80%power STC. The Enphase M215 inverter carries a full 25 year warranty,

ECM 10 – Airside Test and Balance

A complete airside test and balance will be performed on the air distribution system for City Hall. Available construction documents will be used to balance airflows to each space and to the units. Supply airflow and return airflows will be balanced to each space. Supply, return, and outside airflows to the units will be balanced per the existing construction documents.

Municipal Building

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. The existing systems and issues with the systems are described in detail in Section 3 – Existing Conditions.

It is important to note that this project scope is interactive with ECM 3 – HVAC Upgrade. If ECM 3 is chosen in the final project, controls for the existing third floor units will be deleted, and the controls scope listed as part of ECM 3 will be installed.

This project includes:

- The upgrading of the existing controls system, re-commissioning of the building controls, rebalancing of systems and building pressurization - as required, and additional points and programming.

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Fan scheduling for all HVAC systems
- Optimum Start Stop for all HVAC systems
- Temperature Setback control for all HVAC systems during unoccupied periods.
- Control of system ventilation optimization including scheduling and programmed building pressurization from ventilation-exhaust sequences for AHU 1, first and second floor.
- AHU 1, Scheduling of VAV box minimum settings for occupied and unoccupied periods.
- Control/scheduling of all exhaust fans in the building
- AHU 1, Proper air side economizer control for free cooling
- Humidity control and supply air reset based on humidity and heating requirements for the building.

Controls Scope of Work

- Niagara AX (G3) Framework Upgrade –Implement a full upgrade of the facility's DDC software from the R2 framework to the current version AX framework including providing a one for one replacement of the existing UNC supervisory controller with a current model ENC controller. All programming and graphics work required to facilitate the upgrade shall be included and the user interface shall be upgraded to the most current and advanced offering from the BAS contractor as part of this scope.
- VAV Air Handling Unit – Under this scope of work the BAS contractor shall modify the existing programming to include the following control algorithms for the existing VAV air handling unit: optimum start/stop, supply air CO_2 based demand controlled ventilation (include sensor hardware), and dynamic load-based supply air temperature reset (in place of outdoor air reset).
- Improved Trending Interface – The BAS contractor shall provide a simplified trending utility through the web based interface for each physical I/O point on the system permitting rapid access to the most relevant trends for a unit directly from its graphics page. In addition, an advanced trending and reporting utility shall be provided via the operator workstation providing the ability to execute a number or pre-made reports, create new custom reports, and create tailored queries of both long-term and short-term trend data.

ECM 3 – HVAC Upgrade

The purpose of this project is to replace the existing systems on the third floor. Work as part of this ECM is based on drawings dated 06/30/2004 that includes the alternate work for the third floor that was not completed as part of the previous building renovation.

This project scope is interactive with ECM 2 – Controls Upgrade. If ECM 3 is chosen in the final project, controls for the existing third floor units will be deleted, and the controls scope listed as part of ECM 3 will be installed.

The municipal building includes three occupied floors. A recent renovation in 2004 remodeled the first and second floors of the building and upgraded the HVAC in those areas. The third floor still has older systems including 4 split systems with electric heat. The systems themselves have no outside air capability and rely on ventilation louvers located on the side of the building and feeding small amounts of outside air into the plenum. This method is almost completely ineffective and adds to the load of the building and comfort issues.

These systems are older and are at the end of their economic life. Schneider Electric recommends the replacement of these systems with a single air handler serving these areas. The new system would be a central packaged VAV air handler with dx cooling and full outside air capability including economizer and relief. The air side of the system would include installation of new duct work to serve 6 zones from the air handler and with a plenum return. The system will be a Variable Air Volume System with electric Reheat. Improvements in the new system include improved air quality for the occupants, better temperature control, reduced maintenance costs and more efficient operation.

Additionally as part of this project the air vents in the side of the building and feeding into the plenum will be sealed and insulated.

The following is a table defining the design concept for the replacement:

New Third Floor System Air Handler - Municipal Building											
					Airside						
Mark	Area Served	Cooling Capacity (MBH)	Location	System Type	Total Air CFM	Outdoor Air CFM	Total Supply SP	Supply Fan HP	Control	Economizer	Return/Relief Fan Motor HP
AHU-2	3rd Floor	280	Roof Mech Room	Split DX, VAV w/Elec Re-heat	7,525	1,500	2.00	10.0	DDC	Yes	TBD

VAV Boxes - Municipal Building			
Mark	Max CFM	Occupied Min CFM	Elec Heat kW
VAV 3-1	860	310	4
VAV 3-2	1,300	460	6
VAV 3-3	975	350	4
VAV 3-4	2,500	880	12
VAV 3-5	1,190	420	5
VAV 3-6	700	250	3

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Fan scheduling for new system

- Optimum Start Stop for new HVAC system
- Temperature Setback control for new HVAC systems during unoccupied periods.
- Control of system ventilation optimization including scheduling and programmed building pressurization from ventilation-exhaust sequences.
- Scheduling of VAV box minimum settings for occupied and unoccupied periods.
- Proper air side economizer control for free cooling
- Humidity control and supply air reset based on humidity and heating requirements for the building.

In addition, as part of ECM 3 – HVAC Upgrades, a complete air-side test and balance will be performed at the Municipal Building.

ECM 10 – Airside Test and Balance

A complete airside test and balance will be performed on the air distribution system for the Municipal Building. Available construction documents will be used to balance airflows to each space and to the units. Supply airflow and return airflows will be balanced to each space. Supply, return, and outside airflows to the units will be balanced per the existing construction documents.

Police-Fire Rescue

ECM 1 – Lighting

A total of 517 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Police-Fire Rescue			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Police-Fire Rescue	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (CFL downlights, exterior HID bollards and step lights)	78	0
Police-Fire Rescue	Existing Exit Sign - Retrofit New LED Fixture	3	3
Police-Fire Rescue	Truck Bays: Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay With Sensor	11	11
Police-Fire Rescue	Existing Incandescent track heads - Retrofit Relamp LED Dimmable	15	15
Police-Fire Rescue	Cove, stairs, toilet rooms, lobbies, mechanical: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	63	63
Police-Fire Rescue	Offices, corridors, lobbies, meeting rooms, etc: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	387	387
Police-Fire Rescue	Existing 8', 2-lamp T12 fluorescent – Retrofit relamp reballast linear fluorescent T8 with strip kit.	20	20
Police-Fire Rescue	Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	16	16
Police-Fire Rescue	Existing T8 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	2	2
	TOTALS:	**595**	**517**

In addition, 98 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors – Police-Fire Rescue					
Reference Number	**Room Number**	**Space**	**Number of Sensors**	**Sensor Reduction %**	**Sensor Type**
222	N/A	MENS TOILET	1	30%	OCC WSDT
223	N/A	WOMENS TOILET	1	30%	OCC WSDT
224	N/A	VENDING LOBBY	1	30%	OCC WSIR
226	N/A	MEETING ROOM "A"	1	50%	OCC IR-W
230	N/A	CONFERENCE	1	50%	OCC IR-W
232	N/A	OPEN OFFICE	1	5%	OCC DT-C
233	N/A	OFFICE	1	15%	OCC WSIR
234	N/A	OFFICE	1	15%	OCC WSIR
235	N/A	OFFICE	1	15%	OCC WSIR
236	N/A	OFFICE	1	15%	OCC WSIR
237	N/A	OFFICE	1	15%	OCC WSIR
238	N/A	OFFICE	1	15%	OCC WSIR
239	N/A	OFFICE	1	15%	OCC WSIR
240	N/A	OFFICE	1	15%	OCC WSIR

241	N/A	OFFICE	1	15%	OCC WSIR
242	N/A	OFFICE	1	15%	OCC WSIR
244	N/A	CORRIDOR	1	25%	OCC HAL-W
246	N/A	OFFICE	1	15%	OCC WSIR
248	N/A	OFFICE	1	15%	OCC WSIR
249	N/A	OFFICE	1	15%	OCC WSIR
254	N/A	OFFICE	1	15%	OCC WSIR
256	N/A	CORRIDOR	1	25%	OCC HAL-W
262	N/A	OFFICE	1	15%	OCC WSIR
263	N/A	DAY ROOM	1	20%	OCC IR-W
265	N/A	BREAK ROOM 1	1	50%	OCC DT-W
267	N/A	BREAK ROOM 2	1	50%	OCC DT-W
269	N/A	BREAK ROOM 3	1	50%	OCC DT-W
270	N/A	BREAK ROOM 4	1	50%	OCC DT-W
271	N/A	BREAK ROOM 5	1	50%	OCC DT-W
272	N/A	BREAK ROOM 6	1	50%	OCC DT-W
274	N/A	TOILET	1	40%	OCC DT-C
276	N/A	BREAK ROOM 7	1	50%	OCC DT-W
277	N/A	BREAK ROOM 8	1	50%	OCC DT-W
278	N/A	BREAK ROOM 9	1	50%	OCC DT-W
279	N/A	EXERCISE ROOM	1	20%	OCC IR-W
281	N/A	TOILET	1	40%	OCC DT-C
285	N/A	TOILET	1	40%	OCC DT-C
290	N/A	LAUNDRY AREA	1	20%	TIMER-WS
291	N/A	BOAT ROOM	1	20%	TIMER-WS
295	N/A	BREAK ROOM	1	20%	OCC IR-W
299	N/A	TOILET	1	40%	OCC WSDT
301	N/A	TOILET	1	40%	OCC WSDT
304	N/A	OFFICE	1	15%	OCC WSIR
305	N/A	OFFICE	1	15%	OCC WSIR
306	N/A	OFFICE	1	15%	OCC WSIR
307	N/A	OFFICE	1	15%	OCC WSIR
308	N/A	OFFICE	1	15%	OCC WSIR
309	N/A	OFFICE	1	15%	OCC WSIR
310	N/A	OFFICE	1	15%	OCC WSIR
311	N/A	OFFICE	1	15%	OCC WSIR
312	N/A	OFFICE	1	15%	OCC WSIR
313	N/A	OFFICE	1	15%	OCC WSIR
314	N/A	OFFICE	1	15%	OCC WSIR
315	N/A	OFFICE	1	15%	OCC WSIR
316	N/A	CORRIDOR	2	15%	OCC HAL-W
318	N/A	OFFICE	1	15%	OCC WSIR
319	N/A	OFFICE	1	15%	OCC WSIR
320	N/A	CONFERENCE	1	20%	OCC IR-W
322	N/A	OFFICE	1	15%	OCC WSIR
323	N/A	OFFICE	1	15%	OCC WSIR
324	N/A	OFFICE	1	15%	OCC WSIR
325	N/A	OFFICE	1	15%	OCC WSIR
326	N/A	OFFICE	1	15%	OCC WSIR
327	N/A	OFFICE	1	15%	OCC WSIR
328	N/A	OFFICE	1	15%	OCC WSIR
330	N/A	OFFICE	1	15%	OCC WSIR
331	N/A	OFFICE	1	15%	OCC WSIR
334	N/A	OFFICE	1	15%	OCC IR-W

335	N/A	OFFICE	1	15%	OCC WSIR
336	N/A	OFFICE	1	15%	OCC IR-W
337	N/A	OFFICE	1	15%	OCC WSIR
339	N/A	OPEN OFFICE	2	10%	OCC IR-C
340	N/A	OFFICE	1	15%	OCC WSIR
341	N/A	BREAK ROOM	1	15%	OCC IR-W
343	N/A	OFFICE	1	15%	OCC WSIR
344	N/A	OFFICE	1	15%	OCC WSIR
345	N/A	OFFICE	1	15%	OCC WSIR
346	N/A	OFFICE	1	15%	OCC WSIR
347	N/A	OFFICE	1	15%	OCC WSIR
348	N/A	OFFICE	1	15%	OCC WSIR
349	N/A	OFFICE	1	15%	OCC WSIR
350	N/A	OFFICE	1	15%	OCC WSIR
351	N/A	OFFICE	1	15%	OCC WSIR
352	N/A	OFFICE	1	15%	OCC WSIR
353	N/A	OFFICE	1	15%	OCC WSIR
354	N/A	OFFICE	1	15%	OCC WSIR
355	N/A	OFFICE AREA	2	10%	OCC IR-C
364	N/A	OFFICE	1	15%	OCC IR-W
365	N/A	C PLATOON OFFICE	1	15%	OCC WSIR
366	N/A	SARGEANT OFFICE	1	15%	OCC WSIR
369	N/A	CORRIDOR	1	15%	OCC HAL-W
374	N/A	OFFICE	1	15%	OCC WSIR
375	N/A	OFFICE	1	15%	OCC WSIR
376	N/A	OFFICE	1	15%	OCC WSIR
377	N/A	OFFICE	1	15%	OCC WSIR
98 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. The existing systems and issues with the systems are described above in detail in the facility HVAC description.

This project includes:

- The comprehensive installation of a new building wide controls system and upgrading of the existing controls system, re-commissioning of the building controls, rebalancing of systems and building pressurization - as required, and additional points and programming.

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Fan scheduling for all HVAC systems – (Capability)
- Optimum Start Stop for all HVAC systems – (Capability)

- Installation of DDC controllers and programming for all VAV boxes.
- Temperature Setback control for all applicable areas during unoccupied periods.
- Control of system ventilation optimization including scheduling and programmed building pressurization from ventilation-exhaust sequences.
- Scheduling of VAV box minimum settings for occupied and unoccupied periods.
- Control/scheduling of all exhaust fans in the building
- Proper air side economizer control for free cooling
- Humidity control and supply air reset based on humidity and heating requirements for the building.
- Supervisory control of building boiler systems and pumping
- Control of hot water unit heaters

Controls Scope of Work

Hot Water Plant – Two Weil McLain 88 series cast iron boilers with dedicated circulation (primary) pumps and gas-fired, modulating Cyclonetic burners provide heating and domestic hot water to both the fire and police sections of the facility with a single secondary pump (no redundancy) dedicated to each service. A stand-alone (capillary operated) three-way valve controls temperature to the domestic hot water heat exchanger downstream from the DHW pump. A Trane digital controls package operates the other equipment in the system at present. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required.

VAV Air Handling Units – Two DX VAV Air Handling Units (similar to the other downtown municipal building units) serve the facility – one for the Police section and one for Fire. These systems are operated by the rudimentary Trane controls package at present. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required. The existing ABB supply air fan VFDs are to remain and shall be directly incorporated (via hard-wired interface) to the new BAS.

Fan Powered Terminal Boxes (75) – The aforementioned VAV air handling units serve a total of 75 parallel fan powered VAV boxes with hot water reheats (2-way control valves). Provide, install, program, validate and commission new application specific controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. Existing pop-top hot water valve-actuator assemblies are to remain (valves determined to be non-functional at the time of commissioning shall be addressed within an equipment deficiency report).

Call Center Rooftop Unit – A packaged rooftop unit serves the call center independent of the VAV air handling systems and is operated by a conventional bimetallic thermostat at present. Provide, install, program, validate and commission a Viconics VT7600 communicating thermostat (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Enable/Disable System – Provide, install, program, validate and commission new controls to implement a three zone enable/disable (red-wire) system for 13 unit heaters in the facility. Relays shall be installed and wired to break power to the conventional thermostats operating the equipment during unoccupied hours with space temperature sensors installed so that the zone may be re-enabled to maintain a setback temperature as necessary.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and

commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 4 exhaust fans grouped into 2 control zones.

ECM 4 – Water Conservation Measures

Toilets which are 1.6 gpf capable and are currently equipped with 3.5 gpf valves will have the valves retrofit to 1.6 gpf. Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 2.5 gpm showerheads will be replaced with new, 1.5 gpm showerheads; Existing 1.5 gpm showerheads will remain in place. Refer to the following table for fixture retrofit quantities.

Water - Retrofit Fixture Quantities - Police-Fire Rescue				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	-	22	30	15
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

ECM 8 – Solar Thermal Hot Water System

A solar thermal domestic hot water system was designed for the Police-Fire Rescue facility. This system will augment part of the energy required to create hot water for the building. The system will be comprised of (8) AE-32 collector panels manufactured by Alternate Energy Technologies, a 340 gallon solar preheating tank, and a 250 gallon hot water tank with gas boiler. The solar collectors will have a combined surface area of approximately 255 sq. ft. and an estimated installed collector power of up to 56.556 kBtu/hr. Refer to the Proposed Solar Thermal System Appendix for more system details and collector cut sheets.

Park Maintenance Center

ECM 1 – Lighting

A total of 56 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Park Maintenance Center			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Park Maintenance Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (2-lamp 8' T8 fixtures)	3	0
Park Maintenance Center	Workshops/sheds: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	10	10
Park Maintenance Center	Pump room/vacuum room: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	3	3
Park Maintenance Center	Workshop/ Sheds – strip fixtures: Existing 8' T12 Fluorescent – Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	11	11
Park Maintenance Center	Recycle Shed/Ladder room – industrial strips: Existing 8' T12 Fluorescent – Replace with new industrial strips T8	4	4
Park Maintenance Center	Existing incandescent - Relamp with CFL screw-in	7	7
Park Maintenance Center	Office/welding shop: Existing T8 Fluorescent wraps - Retrofit Relamp Reballast Linear Fluorescent T8	12	12
Park Maintenance Center	Storage: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	2	2
Park Maintenance Center	Exterior yard lighting: Existing High Pressure Sodium HID floods – Retrofit relamp reballast Metal Halide	7	7
	TOTALS:	**59**	**56**

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 4 – Water Conservation Measures

Existing high flow toilets will be replaced with 1.28 gpf fixtures and existing 1.6 gpf toilets will remain in place. Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 2.5 gpm showerheads will be replaced with new, 1.5 gpm showerheads; Existing 1.5 gpm showerheads will remain in place. The following table contains water fixture retrofit quantities.

Water - Retrofit Fixture Quantities - Park Maintenane Center				
	Toilets		**Bathroom Sinks**	**Showerheads**
Existing	**3.5 gpf**	**3.5 gpf**	**2.2 gpm**	**2.5 gpm**
Qty	2	-	3	1
Proposed	**1.28 gpf**	**1.6 gpf**	**0.5 gpm**	**1.5 gpm**

5th Street Police Substation

ECM 1 – Lighting

A total of 21 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - 5th Street Police Substation			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
5th Street Police Substation	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (T8 surface wraps, existing CFL drums, exterior lighting)	22	0
5th Street Police Substation	Toilet rooms/Locker: Existing Incandescent - Retrofit Relamp Compact Fluorescent	17	17
5th Street Police Substation	Storage shed: Existing 8' T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	4	4
	TOTALS:	**43**	**21**

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

Eppes Recreation Center / Thomas Foreman Park

ECM 1 – Lighting

A total of 115 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Eppes Recreation Center / Thomas Foreman Park			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Eppes Recreation Center / Thomas Foreman Park	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (CFL downlights, T5HO highbays)	41	0
Eppes Recreation Center / Thomas Foreman Park	Existing Incandescent - Retrofit Relamp Compact Fluorescent	3	3
Eppes Recreation Center / Thomas Foreman Park	Multiple space types, wrap fixtures: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	65	65
Eppes Recreation Center / Thomas Foreman Park	Office/Kitchen: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	4	4
Eppes Recreation Center / Thomas Foreman Park	Multipurpose room: Existing T12 Fluorescent HO industrials - Retrofit New Linear Fluorescent Fixture T8 (classroom wrap)	12	12
Eppes Recreation Center / Thomas Foreman Park	Toilet rooms/classroom surface mounted fixtures: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	21	21
Eppes Recreation Center / Thomas Foreman Park	Corridor/Toilet room troffers: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	10	10
	TOTALS:	**156**	**115**

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The comprehensive installation of a new set of controls to automate the operation of the building HVAC systems.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Setting and balancing of ventilation damper operation
- Setting operation and setback of building exhaust systems.
- Programming and balancing for controlling and optimizing building pressurization, using existing systems and planned controls, during all modes of operation.

- Supervisory control of building temperature and operational status, on/off.
- Installation of Demand Control Ventilation programming on the gym and multi purpose room systems.

Controls Scope of Work
Gymnasium Roof Top Units – Two DX-cooling, gas-heating packaged roof-top unit s, outfitted with Trane controls serve the main gymnasium. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required. Demand Control Ventilation will be installed on these units.

ulti-Purpose Room Roof Top Unit – A single DX-cooling, gas-heating packaged roof-top unit, outfitted with Trane controls serve the main gymnasium. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required. Demand Ventilation will be installed on this unit.

Forced Air Furnaces – The classrooms and concession stand / lobby office are served by 3 single zone forced air gas-fired furnaces operated by a conventional bimetallic thermostats at present. The recreation room and weight room are served by a twinned forced air gas furnace for heating while the recreation room has a separate split system (DX) cooling only unit. These units are operated by independent thermostats today. Provide, install, program, validate and commission a Viconics VT7600 communicating thermostat (or an equivalent product) to provide control of each unit with a means of interface to the BAS. The recreation center / weight room units shall be operated off of a single thermostat. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 5 exhaust fans grouped into 2 control zones.

PTAC and window air conditioners are excluded from this scope of work.

Guy Smith Stadium

ECM 4 – Water Conservation Measures

Existing 3.5 gpf high flow toilets will be replaced with 1.28 gpf fixtures. Toilets which are 1.6 gpf capable and are currently equipped with 3.5 gpf valves will have the valves retrofit to 1.6 gpf. Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 2.5 gpm showerheads will be replaced with new, 1.5 gpm showerheads; existing 1.5 gpm showerheads will remain in place. The following table contains water fixture retrofit quantities.

Water - Retrofit Fixture Quantities - Guy Smith Stadium				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	10	4	16	4
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

Public Works Complex

ECM 1 –Lighting

A total of 315 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Lighting - Public Works Complex			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Public Works - SHOPS	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	98	0
Public Works - SHOPS	Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay	46	46
Public Works - SHOPS	Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay With Sensor	6	6
Public Works - SHOPS	Existing Incandescent - Retrofit Relamp Compact Fluorescent	2	2
Public Works - SHOPS	Existing T12 Fluorescent - Retrofit New Linear Fluorescent Fixture T8	30	30
Public Works - SHOPS	Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	37	37
Public Works - SHOPS	Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	49	49
Public Works - SHOPS	Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	1	1
PUBLIC WORKS - ADMIN BUILDING	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	19	0
PUBLIC WORKS - ADMIN BUILDING	Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T8	20	20
PUBLIC WORKS - ADMIN BUILDING	Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	8	8
PUBLIC WORKS - ADMIN BUILDING	Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	8	8

PUBLIC WORKS - ADMIN BUILDING	Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	4	4
PUBLIC WORKS - ADMIN BUILDING	Existing T8 Fluorescent - Retrofit Relamp Linear Fluorescent T8	38	38
PUBLIC WORKS - ADMIN BUILDING	Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	66	66
	Totals:	**432**	**315**

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This ECM is interactive with ECM 3 – HVAC Upgrades. The following scope is applicable for both existing and proposed equipment identified in ECM 3. If ECM 3 is chosen for the final project, coordinate control efforts with the installation of replacement units. The unit counts and types, control strategies will remain the same.

This ECM scope includes control measures for all buildings at the Public Works Complex. Control of all non-process air handling units will be provided by Viconics VT7600 communicating thermostats. Unit heaters and electrical baseboard heaters will be controlled by enable/disable (red-wire) systems. Additionally, non-process exhaust fans will be controlled for enable/disable in conjunction with the air handlers serving the same space.

This project includes:

- The installation of a new set of controls to automate the operation of the building HVAC systems.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Setting and balancing of ventilation damper operation
- Review and balance/reset of problem area zones in offices in the rear of the building and IT room. (qty 5- areas)
- Setting operation and setback of building exhaust systems.
- Programming and balancing for controlling and optimizing building pressurization, using existing systems and planned controls, during all modes of operation.
- Supervisory control of building temperature and operational status, on/off.
- Installation of Demand Control Ventilation programming in the assembly area.

Controls Scope of Work
A point of access from the local field controller network to the broader BAS shall be required for each building.

Air Handling Units – A combination of packaged pad mounted units, rooftop units, and split systems serve the various facilities. These are operated by conventional thermostats (primarily bi-metallic, digital non-programmable or programmable) at present. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development. For purposes of this proposal, include 18 units of this type.

Enable/Disable System – Provide, install, program, validate and commission new controls to implement a 4 zone enable/disable (red-wire) system for the 10 unit heaters and the electrical baseboard heaters (typical of 2) in the facility. Relays shall be installed and wired to break power to the conventional thermostats operating the equipment during unoccupied hours with space temperature sensors installed so that the zone may be re-enabled to maintain a setback temperature as necessary.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 7 exhaust fans grouped into 4 control zones.

PTAC units are excluded from scope of work.

ECM 3 – HVAC Upgrade

This ECM is interactive with ECM 2 – Control Upgrades. Use controls systems scope from ECM 2 for new equipment identified in this ECM. If ECM 3 is chosen for the final project, coordinate control efforts with the installation of replacement units. The unit counts and types, control strategies will remain the same.

Public Works Building A

There are ten Rooftop units, “gas packs” installed at Public Works Building A. The four units serving the assembly area are older units the end of their economic lifetimes and the customer has requested the replacement of the units for maintenance reasons.

Schneider Electric recommends the installation of new units for these areas. All units are to be replaced with dx rooftop units with gas heat. Improvements in efficiency include increased efficiency for cooling and heating energy. Improvements to these units will include economizer and demand control ventilation.

The following is a table which shows the conceptual design for the new units:

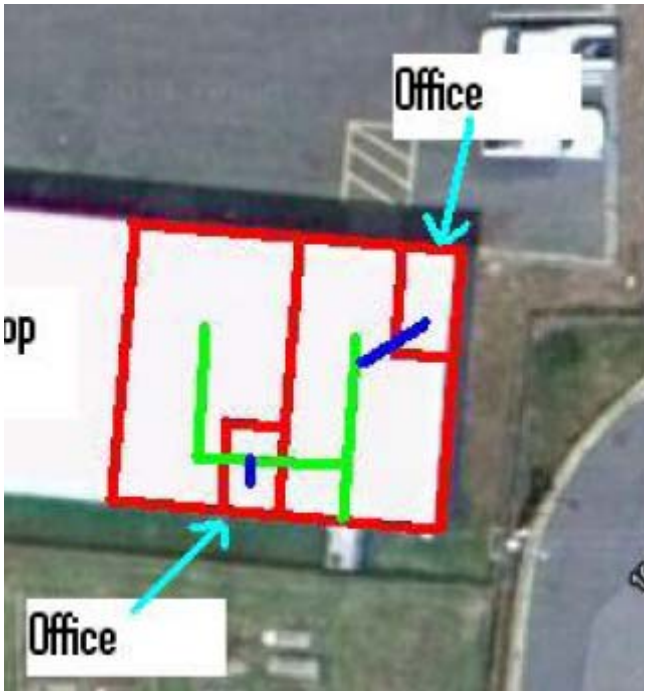
Rooftop Units - Public Works Complex									
Mark	Area Served	System Type	Economizer/ Relief	DCV	Total Air CFM	Outdoor Air CFM	Total Supply SP	Nominal Tons	MBH Output
GPU-7	Building A - Assembly Area	DX Gas Pack	Yes	Yes	4,500	1,125	1.50	10.0	59
GPU-8	Building A - Assembly Area	DX Gas Pack	Yes	Yes	3,000	750	1.50	7.5	59
GPU-9	Building A - Assembly Area	DX Gas Pack	Yes	Yes	4,500	1,125	1.50	10.0	59
GPU-10	Building A-Assembly, RR, Offices	DX Gas Pack	Yes	Yes	1,575	394	1.50	3.5	59

Controls Scope of Work

See ECM 2 – Controls Upgrade. Controls scope of work and intent is identical for the new units.

In addition, as part of ECM 3 – HVAC Upgrades, a complete air-side test and balance will be performed at Public Works, Building A.

Traffic Services
The Traffic Services building is served by a slab mounted packaged gas/electric unit. The unit sits on a concrete pad just outside of the building and has exposed duct that runs vertically up the exterior wall before turning into the space it serves. The unit serves two offices and two storage rooms as indicated in the sketch below.



The office on the south wall of the buildings is also served by a PTAC unit which is currently not working. It is our assumption that the PTAC unit was added to provide additional cooling for the server equipment in this office.

The duct is mounted fairly high in the space and the mounting height exceeds the throw of the diffusers. Because of the layout of the existing ductwork and air distribution system there are comfort issues.

There are future plans to add a mezzanine in the storage rooms of the Traffic Services building.

Schneider Electric recommends replacing the existing packaged gas/electric unit and installing a system to meet the future needs of this building once the mezzanine is added. The existing PTAC unit in the south office will be removed and a new 1 ton PTAC will be added to each of the offices. To eliminate duct losses the existing exterior duct will be removed and the wall will be patched to match existing. A new 2.5 ton split system heat pump will be installed for each of the storage room (typical of 2) and the ductwork will be modified to provide proper air distribution for the mezzanine and existing storage areas. New diffusers will be selected to provide the proper throw and air distribution. A full airside test and balance will be performed on each of the new systems.

South Greenville Recreation Center

ECM 1 – Lighting

A total of 98 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - South Greenville Rec Center Building			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
South Greenville Rec Center Building	Existing Exit Sign - Retrofit New LED Fixture	8	8
South Greenville Rec Center Building	Gymnasium: Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay With Sensor	24	24
South Greenville Rec Center Building	Multiple space types (surface fixtures)/ Weight room (8' strips): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	36	36
South Greenville Rec Center Building	Corridor/Office/Toilet rooms (troffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	20	20
South Greenville Rec Center Building	Toilet rooms/Kitchen: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	4	4
South Greenville Rec Center Building	Exterior soffit: Existing HID surface canopy – Replace with new vandal resistant CFL fixture	6	6
	TOTALS:	**98**	**98**

In addition, 8 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - South Greenville Rec Center Building					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
598	N/A	DAY ROOM	2	20%	OCC IR-C
599	N/A	OFFICE	1	30%	OCC WSIR
600	N/A	CLASSROOM	1	20%	OCC IR-W
605	N/A	OFFICE	1	30%	OCC WSIR
606	N/A	WEIGHT ROOM	1	20%	OCC IR-W
607	N/A	MENS TOILET	1	35%	OCC DT-C
612	N/A	WOMENS TOILET	1	35%	OCC DT-C
8 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort

conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The installation of a new set of communicating programmable thermostats and communications capabilities.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Supervisory control of building temperature and operational status, on/off.

Controls Scope of Work
Air Handling Units – A single split system (DX-cooling, gas-heating) serves the front offices and recreation center. The BAS contractor is to provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Enable/Disable System – Provide, install, program, validate and commission new controls to implement a 2 zone enable/disable (red-wire) system for the gym 2 unit heaters and the electrical baseboard heaters (typical of 2) in the facility. Relays shall be installed and wired to break power to the conventional thermostats operating the equipment during unoccupied hours with space temperature sensors installed so that the zone may be re-enabled to maintain a setback temperature as necessary.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 4 exhaust fans grouped into 2 control zones.

Gym Office PTAC and Weight Room PTAC units are excluded from scope of work.

ECM 4 – Water Conservation Measures

Existing 3.5 gpf high flow toilets will be replaced with 1.28 gpf fixtures and existing 1.6 gpf toilets will remain in place. Toilets which are 1.6 gpf capable and are currently equipped with 3.5 gpf valves will have the valves retrofit to 1.6 gpf. Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. The following table contains the quantities of water fixtures to be retrofitted or replaced as part of this ECM.

Water - Retrofit Fixture Quantities - S Greenville Rec Center				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	3	2	5	-
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

Evans Park Building

ECM 1 – Lighting

A total of 40 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Evans Park Building			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Evans Park Building	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (exterior CFL, exterior landscape, CFL pendants)	58	0
Evans Park Building	Toilet rooms/Lobby (cove): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	15	15
Evans Park Building	Storage/Toilet rooms (surface wraps): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	7	7
Evans Park Building	Toilet room troffers: Existing T8 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	18	18
	TOTALS:	**98**	**40**

In addition, 5 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Evans Park Building					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
618	N/A	LOBBY	1	60%	OCC IR-W
620	N/A	MENS TOILET	1	50%	OCC DT-C
623	N/A	WOMENS TOILET	1	50%	OCC DT-C
629	N/A	STORAGE	1	40%	OCC WSIR
633	N/A	STORAGE	1	40%	OCC WSIR
5 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 4 – Water Conservation Measures

Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 2.5 gpm showerheads will be replaced with new, 1.5 gpm showerheads; Existing 1.5 gpm showerheads will remain in place. The table below shows the quantities of water fixtures to be retrofitted.

Water - Retrofit Fixture Quantities - Evans Park				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	-	-	8	2
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

Elm Street Recreation Center

ECM 1 – Lighting

A total of 41 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Elm Street Recreation Center			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Elm Street Recreation Center	Existing Exit Sign - Retrofit New LED Fixture	3	3
Elm Street Recreation Center	All areas (troffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	26	26
Elm Street Recreation Center	Corridor (troffer): Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	2	2
Elm Street Recreation Center	Toilet rooms/Snack bar/Storage (wraps): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	10	10
	TOTALS:	**41**	**41**

In addition, 4 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Elm Street Recreation Center					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
634	N/A	OPEN ROOM	2	10%	OCC IR-W
636	N/A	MENS TOILET	1	50%	OCC DT-C
638	N/A	WOMENS TOILET	1	50%	OCC DT-C
4 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The installation of a new set of communicating programmable thermostats and communications capabilities.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Supervisory control of building temperature and operational status, on/off.

Controls Scope of Work

Air Handling Unit – A DX-cooling split system unit with twinned furnaces serves the offices and community area of the Elm Street Center. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 2 exhaust fans grouped into 1 control zones.

ECM 4 – Water Conservation Measures

Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. The table below contains the quantities of water fixtures to be retrofitted.

Water - Retrofit Fixture Quantities - Elm Street Rec Center				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	-	-	3	-
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

Jaycee Park Building

ECM 1 – Lighting

A total of 156 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Jaycee Park Building			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Jaycee Park Building	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (CFL downlights)	2	0
Jaycee Park Building	Existing Exit Sign - Retrofit New LED Fixture	12	12
Jaycee Park Building	Stage downlights: Existing Incandescent - Retrofit Relamp Compact Fluorescent Dimmable	8	8
Jaycee Park Building	Showcase (3' strips) Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	6	6
Jaycee Park Building	Multiple space types (4-lamp lyin troffers) Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	79	79
Jaycee Park Building	Classrooms (8' T12 industrials) Existing T12 Fluorescent HO - Retrofit New Linear Fluorescent Fixture T8	19	19
Jaycee Park Building	Storage/offices/classroom (3-lamp troffer): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	12	12
Jaycee Park Building	Lobby/Toilet rooms (3-lamp troffers): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	15	15
Jaycee Park Building	Toilet rooms/corridors (troffers): Existing T8 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	5	5
	TOTALS:	**158**	**156**

In addition, 13 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Jaycee Park Building					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
650	201	OFFICE	1	20%	OCC WSIR
651	202	OFFICE	1	20%	OCC WSIR
658	N/A	GIRLS TOILET	1	50%	OCC DT-C
659	N/A	MENS TOILET	1	50%	OCC DT-C
663	120C	OFFICE	1	10%	OCC IR-W
664	N/A	OFFICE	1	20%	OCC WSIR
665	N/A	OFFICE	1	20%	OCC WSIR
666	N/A	OFFICE	1	20%	OCC WSIR
667	N/A	OFFICE	1	20%	OCC WSIR
668	N/A	OFFICE	1	20%	OCC WSIR
681	N/A	OFFICE	1	20%	OCC WSIR
682	N/A	WAR ROOM	1	20%	OCC IR-W
12 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This ECM is interactive with ECM 3 – HVAC Upgrades. The following scope is applicable for both existing and proposed equipment identified in ECM 3. If ECM 3 is chosen for the final project, coordinate control efforts with the installation of replacement units. The unit counts and types, control strategies will remain the same.

This project includes:

- The installation of a new set of controls to automate the operation of the building HVAC systems.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Setting and balancing of ventilation damper operation
- Setting operation and setback of building exhaust systems.
- Programming and balancing for controlling and optimizing building pressurization, using existing systems and planned controls, during all modes of operation.
- Supervisory control of building temperature and operational status, on/off.
- Installation of Demand Control Ventilation programming in the multi-purpose room.

Controls Scope of Work
Air Handling Units –Existing Trane controls for current roof-tops shall be demolished under this scope of work. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 2 exhaust fans grouped into 1 control zones.

ECM 10 – Airside Test and Balance

A complete airside test and balance will be performed on the air distribution system for Jaycee Park. Available construction documents will be used to balance airflows to each space and to the units. Supply airflow and return airflows will be balanced to each space. Supply, return, and outside airflows to the units will be balanced per the existing construction documents.

Sports Connection

ECM 1 – Lighting

A total of 76 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Sports Connection			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Sports Connection	Gym/batting cages: Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay With Sensor (increased light levels)	21	21
Sports Connection	Storage: Existing Incandescent - Retrofit Relamp Compact Fluorescent	1	1
Sports Connection	Mechanical room/Stairs: Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	3	3
Sports Connection	Multiple space types (4-lam ptroffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	36	36
Sports Connection	Janitor's closet/mechanical: Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	2	2
Sports Connection	Upstairs meeting room (low usage): Existing T8 Fluorescent - Retrofit Relamp Linear Fluorescent T8	13	13
	TOTALS:	**76**	**76**

In addition, 3 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Sports Connection					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
692	N/A	STORAGE	1	50%	OCC IR-W
700.1	N/A	MEN'S	1	40%	OCC DT-C
700.11	N/A	WOMENS TOILET	1	40%	OCC DT-C
3 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The installation of a new set of communicating programmable thermostats and communications capabilities.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Setting and balancing of ventilation damper operation
- Setting operation and setback of building exhaust systems.
- Programming and balancing for controlling and optimizing building pressurization, using existing systems and planned controls, during all modes of operation.
- Disable Gym/Batting Cages Exhaust fans during heating.
- Supervisory control of building temperature and operational status, on/off.

Controls Scope of Work

Air Handling Units – Three split system (DX-cooling, gas-fired heat) units serve the front offices, indoor restrooms and community / meeting areas of Sport Connection. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Enable/Disable System – Provide, install, program, validate and commission new controls to implement a 2 zone enable/disable (red-wire) system for the 4 unit heaters serving the batting area and gymnasium in the facility. Relays shall be installed and wired to break power to the conventional thermostats operating the equipment during unoccupied hours with space temperature sensors installed so that the zone may be re-enabled to maintain a setback temperature as necessary.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 3 exhaust fans grouped into 3 control zones.

ECM 4 – Water Conservation Measures

Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. The following table contains the quantities of water fixtures to be retrofitted as part of this ECM.

Water - Retrofit Fixture Quantities - Sports Connection				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	-	-	4	-
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

Gardner Training Center

ECM 1 – Lighting

A total of 46 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Gardner Training Center			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Gardner Training Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (exterior HID)	2	0
Gardner Training Center	Toilet rooms/corridor/exterior (non-dimmed): Existing Incandescent - Retrofit Relamp Compact Fluorescent	11	11
Gardner Training Center	Meeting room (dimmed): Existing Incandescent - Retrofit Relamp Compact Fluorescent Dimmable	10	10
Gardner Training Center	Meeting room/offices (4-lamp troffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	25	25
	TOTALS:	**48**	**46**

In addition, 4 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Gardner Training Center					
Reference Number	Room Number	Floor Number	Sensor Reduction %		Sensor Type
701	N/A	OPEN ROOM	2	30%	OCC IR-W
704	N/A	OFFICE	1	20%	OCC WSIR
705	N/A	OFFICE	1	20%	OCC WSIR
4 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

H. Boyd Lee Park Buildings

ECM 1 – Lighting

A total of 89 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - H. Boyd Lee Park Buildings			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
H. Boyd Lee Park Buildings	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (CFL downlights and surface fixtures, Gym fluorescent highbays, Unused halogen uplights, exterior landscape HID uplights in lobby)	102	0
H. Boyd Lee Park Buildings	Artium (pendant cylinders): Existing Incandescent - Retrofit Relamp Compact Fluorescent	4	4
H. Boyd Lee Park Buildings	Private offices/storage (low use): Existing T8 Fluorescent - Retrofit Relamp Linear Fluorescent T8	30	30
H. Boyd Lee Park Buildings	Toilet rooms/public lobbies and corridors: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	55	55
	TOTALS:	**191**	**89**

In addition, 46 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade. A daylight harvesting photocell is also proposed for the control of the lights in the all glass tower at H. Boyd Lee Park.

Lighting Sensors - H. Boyd Lee Park Buildings					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
718	N/A	GYM	32	10%	OCC IR-HC-F
727	N/A	BOYS TOILET	1	20%	OCC DT-C
730	N/A	GIRLS TOILET	1	20%	OCC DT-C
732	N/A	CORRIDOR	1	30%	OCC HAL-W
733	N/A	OFFICE	1	10%	OCC WSIR
734	N/A	MECH	1	10%	OCC WSIR
735	N/A	OFFICE	1	10%	OCC WSIR
738	N/A	OFFICE	1	10%	OCC WSIR
739	N/A	OFFICE	1	10%	OCC WSIR
740	N/A	OFFICE	1	10%	OCC WSIR
744	N/A	BAY WINDOW AREA	1	40%	PC-C
745	N/A	OUTSIDE TOILET GIRLS	1	20%	OCC DT-C
746	N/A	OUTSIDE TOILET BOYS	1	20%	OCC DT-C
44 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and

to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The comprehensive installation of a new set of controls to automate the operation of the building HVAC systems.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Setting and balancing of ventilation damper operation
- Setting operation and setback of building exhaust systems.
- Programming and balancing for controlling and optimizing building pressurization, using existing systems and planned controls, during all modes of operation.
- Supervisory control of building temperature and operational status, on/off.
- Ensure operation of Demand Control Ventilation programming on the gym systems.

Controls Scope of Work
VVT Air Handling System – A packaged VVT roof-top unit serves, outfitted with Trane controls serves the office and most communal areas of the main facility through 9 VVT zones. The BAS contractor shall provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required.

Gymnasium Air Handling Unit – A gas-fired heating and ventilation unit, outfitted with Trane controls serves gymnasium at present. The BAS contractor shall provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation. The intent is to affect a "brain-swap" of the Trane equipment, reusing wiring and end-devices (including the existing space Carbon Dioxide sensor) where possible but replacing control panels, communications wiring, sensing elements, etc. as required.

Atrium Air Handling Unit – A packaged roof-top unit (DX-cooling, gas-fired heating) serves the atrium and is operated by a digital programmable Trane thermostat. The BAS contractor is to provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope and process fans are excluded from the scope of work. The BAS contractor is to provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 6 exhaust fans grouped into 3 control zones.

River Park North Building

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The installation of a new set of communicating programmable thermostats and communications capabilities.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Supervisory control of building temperature and operational status, on/off.

Controls Scope of Work
Air Handling Units – 5 split system (DX-cooling, electric heating heat pumps) units serve the front offices, auditorium, exhibit spaces and back workroom. The BAS contractor is to provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Infrared Heating in Men's and Woman's restrooms located outside the main building are to have scheduling and set back implemented.

Greenfield Terrace Building

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. Additionally, installation of this ECM will allow for consistency in building comfort conditions settings and allow for some remote status and troubleshooting capabilities.

This project includes:

- The installation of a new set of communicating programmable thermostats and communications capabilities.

Controls Upgrades:
Controls upgrades for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Remote temperature setback control for all applicable areas during unoccupied periods.
- Supervisory control of building temperature and operational status, on/off.

Controls Scope of Work
Air Handling Units – Two packaged units (DX-cooling, gas-fired heating) serve the park facility. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Greenville Aquatics and Fitness Center

ECM 1 – Lighting

A total of 224 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Greenville Aquatics and Fitness Center			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Grenville Aquatics and Fitness Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (8' T8 enclosed and gasketed, Gym T5HO highbays)	42	42
Grenville Aquatics and Fitness Center	Fitness area/Pool: Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay	22	24
Grenville Aquatics and Fitness Center	Showers/Toilet rooms/Corridor: Existing Incandescent - Retrofit Relamp Compact Fluorescent	18	18
Grenville Aquatics and Fitness Center	Storage/Stage/Locker rooms(1 and 2 lamp fixtures): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	39	39
Grenville Aquatics and Fitness Center	Multiple space types (4-lamp troffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	32	32
Grenville Aquatics and Fitness Center	Corridors/Open area(troffers): Existing T12 Fluorescent U Tube - Retrofit Relamp Reballast Linear Fluorescent T8 With Reflector kit	25	25
Grenville Aquatics and Fitness Center	Multiple space types (2 and 4 lamp fixtures): Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	39	39
Grenville Aquatics and Fitness Center	Pump room: Existing T8 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	5	5
	TOTALS:	**222**	**224**

In addition, 9 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Grenville Aquatics and Fitness Center					
Reference Number	Room Number	Floor Number	Number of Sensors	Sensor Reduction %	Sensor Type
790	N/A	OFFICE	1	20	OCC WSIR
791	N/A	OFFICE	1	20	OCC WSIR
792	N/A	OFFICE	1	20	OCC WSIR
793	N/A	OFFICE	1	20	OCC WSIR
798	N/A	FITNESS ROOM	2	15%	OCC IR-W
808	N/A	OFFICE	1	20%	OCC IR-W
809	N/A	WEIGHT ROOM	1	15%	OCC IR-W
828	N/A	PUMP ROOM	1	50%	TIMER-WS
9 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

ECM 2 – Controls Upgrade

The purpose of this ECM is to improve the environmental and comfort issues in the existing building and to save energy. The existing systems and issues with the systems are described above in detail in the facility HVAC description.

This project scope is interactive with ECM 3 – HVAC Upgrade. If ECM 3 is chosen in the final project, controls for the existing third floor units will be deleted, and the controls scope listed as part of ECM 3 will be installed.

This project includes:

- The upgrading of the existing controls system, re-commissioning of the building controls, rebalancing of systems and building pressurization - as required, and additional points and programming.

Controls Upgrades:
Controls upgrades, re-commissioning, and balancing efforts for this Building will allow for proper operation of the following:

- Standard Temperature Settings: 70/74, (Heating/Cooling) Degrees F
- Standardized Set Back Temperatures: 64/80, (Heating/Cooling) Degrees F
- Fan scheduling for all HVAC systems
- Optimum Start Stop for all HVAC systems
- Temperature Setback control for all HVAC systems during unoccupied periods.
- Control of system ventilation optimization including scheduling and programmed building pressurization from ventilation-exhaust sequences.
- Control/scheduling of all exhaust fans in the building
- Full Economizer for the Gym Unit
- Demand Control Ventilation for the Gym

Controls Scope of Work
Gymnasium Air Handling Unit – A built-up air handling unit with hydronic heating, DX cooling, and full economizer with motorized relief dampers, outfitted with Delta controls serves the gymnasium at present. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation, including the implementation of Demand Controlled Ventilation (new Carbon Dioxide sensor required). The intent is to affect a “brain-swap” of the Delta equipment, reusing wiring and end-devices where possible but replacing control panels, communications wiring, sensing elements, etc. as required.

Natatorium Air Handling Unit – A new air handling unit is to be installed under the mechanical scope of work. This system is likely to include air-to-air heat recovery (flat plate) with economizer, a heat pump to simultaneously dehumidify the supply air stream and temper the pool water, and hot water heating. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation.

Air Handling Units – Four packaged roof-top units, operated by conventional bimetallic thermostats, serve the auxiliary rooms of the facility. Provide, install, program, validate and commission Viconics VT7600 communicating thermostats (or an equivalent product) to provide unit control with a means of interface to the BAS. No ancillary or monitoring points (supply air fan status, supply air temperature, etc.) are to be included under this scope item at this phase of development.

Exhaust Air Fans – All non-process related fans (including restroom fans) that exhaust air from the building envelope shall be enabled and disabled according to the occupancy of their associated air handling units. Exhaust fans and/or transfer fans that do not move air outside of the building envelope

and process fans are excluded from the scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement enable / disable control of these exhaust fans. For purposes of this proposal, include 6 exhaust fans grouped into 3 control zones.

ECM 3 – HVAC Upgrade

The dehumidification system serving the pool is an older unit and is beyond its economic lifetime. Replacing the unit will provide a better environment for the pool area and occupants. Additionally, the measure will save heating energy for heating the pool.

The installation of this project includes a replacement of the existing dehumidification unit with two new Desert Aire ND-18 dehumidifiers, installation of heat recovery for heating the pool, and the installation of a pool cover.

The features of the units shall include:

- Integral compressor heat – reheat
- 100% outside Air economizer and relief/exhaust fan
- Remove the duct-mounted reheat coil and provide reheat coils in the new units
- Hot Water Heating for the Pool.
  - Provide Compressor Waste Heat Recovery for heating the pool water.
- Install Pool Cover for use during unoccupied Hours.
- Controls communication to the BAS

The following is the conceptual design for the replacement unit:

Replacement Dehumidification Unit - Greenville Aquatics and Fitness Center									
Mark	**Area Served**	**System Type**	**Economizer/ Relief**	**Manuf. and Model**	**Supply Fan HP**	**Supply CFM**	**Minimum OA CFM**	**Nominal Tons**	**Moisture Removal (lbs/hr)**
Pool-1	Pool Area	Constant Volume	Yes	Desert Aire ND-18	7.5	8,200	1,900	18	108
Pool-2	Pool Area	Constant Volume	Yes	Desert Aire ND-18	7.5	8,200	1,900	18	108

Controls Scope of Work

Natatorium Air Handling Unit – Two new air handling units are to be installed under the mechanical scope of work. Provide, install, program, validate and commission new controllers, sensors, and other end devices (as outlined in the I-O summary) to implement ES provided sequences of operation.

In addition, as part of ECM 3 – HVAC Upgrades, an air-side test and balance will be performed on the new dehumidification system serving the pool area.

As part of this ECM Schneider Electric also proposes to replace the existing pool pump motor with a premium efficiency motor.

ECM 4 – Water Conservation Measures

Existing 3.5 gpf high flow toilets will be replaced with 1.28 gpf fixtures and existing 1.6 gpf toilets will remain in place. Toilets which are 1.6 gpf capable and are currently equipped with 3.5 gpf valves will have the valves retrofit to 1.6 gpf. Existing urinals will remain in place. Existing 2.2 gpm bathroom sink faucets will be retrofit to 0.5 gpm. Existing 1.5 gpm showerheads will remain in place. The table below contains the quantities of water fixtures to be retrofitted or replaced as part of this ECM.

Water - Retrofit Fixture Quantities - Greenville Aquatics and Fitness				
	Toilets		Bathroom Sinks	Showerheads
Existing	3.5 gpf	3.5 gpf	2.2 gpm	2.5 gpm
Qty	5	3	9	-
Proposed	1.28 gpf	1.6 gpf	0.5 gpm	1.5 gpm

ECM 6 – Chlorine Generator

It is recommended as part of this project to install a chlorine generator water treatment system at the Aquatics Center pool. A chlorine generator produces the chlorine necessary to maintain a clean and safe pool by utilizing salt water in place of the traditional chlorine chemical additives. Chlorine generators provide the chlorine so that you don't have to purchase, store, or handle chlorine pool treatment chemicals. While you must still maintain proper water balance and pool chemistry properly, the amount of pool treatment chemicals needed is greatly reduced and savings can be realized by the lower chemical costs required when using a chlorine generator system. Chlorine generators not only reduce the amount of chemicals required for pool treatment, they also provide a better and healthier swimming experience for the pool users.

ECM 10 – Airside Test and Balance

A complete airside test and balance will be performed on the air distribution systems for the Aquatic Center. Available construction documents will be used to balance airflows to each space and to the units. Supply airflow and return airflows will be balanced to each space. Supply, return, and outside airflows to the units will be balanced per the existing construction documents.

Bradford Creek Golf Course

ECM 1 – Lighting

A total of 170 lighting fixtures are to be retrofitted as part of this project. Refer to the table below for the proposed lighting retrofits and quantities:

Proposed Lighting - Bradford Creek Golf Course			
Building Name	**Existing Legend Descriptions**	**Existing Qty**	**Retrofit Qty**
Bradford Creek Golf Course	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed (flame tip sconces & chandeliers, CFL vanity, security lts)	36	0
Bradford Creek Golf Course	Warehouse: Existing High Intensity Discharge - Retrofit New Linear Fluorescent Fixture T5 High-Bay With Sensor	6	6
Bradford Creek Golf Course	Recesed downlights throughout, non-dimmed: Existing Incandescent - Retrofit Relamp Compact Fluorescent	111	111
Bradford Creek Golf Course	Men's vanity light: Existing incandescent – retrofit relamp with CFL screw-in	6	6
Bradford Creek Golf Course	Whole building (troffers/strips): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8	36	36
Bradford Creek Golf Course	Kitchen/Storage/Office (4-lamp troffers): Existing T12 Fluorescent - Retrofit Relamp Reballast Linear Fluorescent T8 Reduce Lamp Qty	11	11
	TOTALS:	**206**	**170**

In addition, 9 lighting occupancy sensors, which are not an integral part of the lighting fixture, are proposed as part of the lighting system upgrade.

Lighting Sensors - Grenville Aquatics and Fitness Center					
Reference Number	Room Number	Floor Number	Sensor Reduction %		Sensor Type
835	N/A	KITCHEN	1	40%	OCC IR-W
846	N/A	STORAGE	1	40%	OCC IR-W
851	N/A	OFFICE	1	30%	OCC WSIR
857	N/A	OFFICE	1	30%	OCC WSDT
858	N/A	BREAK ROOM	1	30%	OCC WSDT
860	N/A	OFFICE	1	30%	OCC WSIR
863	N/A	MOWER SHED	3	30%	OCC IR-HC-F
9 Total Sensors					

Refer to General ECM Descriptions for details about each sensor code.

The Lighting Appendix contains more detailed information regarding annual operating hours, fixture counts, and assumptions.

See the appendix of the Investment Grade Audit Report for system information and calculations.

SCHEDULE C: PERFORMANCE GUARANTEE

The Performance Guarantee provided by ESCO will be as follows:

Year	Total Annual Guaranteed Savings	Cumulative Guaranteed Savings
1	$204,836	$204,836
2	$208,933	$413,769
3	$213,111	$626,880
4	$217,374	$844,254
5	$221,721	$1,065,975
6	$226,156	$1,292,131
7	$230,679	$1,522,810
8	$235,292	$1,758,102
9	$239,998	$1,998,100
10	$244,798	$2,242,898
11	$249,694	$2,492,592
12	$254,688	$2,747,280
13	$259,782	$3,007,062
14	$264,977	$3,272,039
15	$270,277	$3,542,316
Total	$3,542,318	$3,542,316

The procedure used to calculate savings is described in Schedule D M&V Plan.

Guaranteed savings are based on an escalation rate of 2%.

GUARANTEED SAVINGS RECONCILIATION

In the event the Actual Savings are less than the Guaranteed Savings for the corresponding twelve (12) months, ESCO will pay Customer the difference between the Annual Savings Guarantee and the Actual Savings for the corresponding twelve (12) months. ESCO will make payments for any savings shortfall to Customer within thirty (30) days of that year's Savings Reconciliation.

SCHEDULE D: MEASUREMENT AND VERIFICATION PLAN

Service Scope and Payment

ESCO shall provide the Measurement and Verification Services (the "Services") to Customer as set forth in Exhibit A as described below.

Remote Energy Management, Training & Technical Support
Schneider Electric will provide the number of hours of remote energy management support as reflected in Exhibit A, Sections 1 & 2. This time can be used for any of the following activities including scheduling, system adjustment, on demand remote energy management system training or technical support. All Remote Support is client initiated and it is the expectation of Schneider Electric that if a client does not remain on the phone for the duration of the time required to accomplish the task, the customer will accept the time, up to the limit of the hours not used, that the Schneider Electric representative documents as used for that task. If all of the hours are exhausted additional hours can be purchased in ten (10) hour blocks. If additional hours are purchased in any year beyond Year 2 and are not exhausted, those hours will remain available for use until the end of the next project year.

Remote ECM Monitoring
Schneider Electric will remotely access your energy management system on a monthly basis. During each session, the system will be inspected and variables integral to ECM performance will be compared to the contractual agreement. Additionally, Schneider Electric will inspect the system for other areas of malfunction or energy waste and report those findings for Customer review. All findings will be reported and that report delivered to customer electronically. Schneider Electric will notify Customer if remote access is not available. Customer is responsible for restoring remote access and notifying Schneider Electric. Schneider Electric is not responsible for providing the planned service session if remote access is unavailable.

All buildings with remotely accessible controls will be included with Remote Energy Management, Training and Technical Support and Remote ECM Monitoring. Those buildings are listed below.

City Hall
Municipal Building
Police-Fire Rescue
Epps Recreation Center
Public Works Complex
South Greenville Recreation Center
Elm Street Recreation Center
Jaycee Park Building
Sports Connection
H. Boyd Lee Park Building
River Park North
Greenfield Terrace
Greenville Aquatics and Fitness Center

On-Site Visits

Schneider Electric will provide On-Site Energy Consulting consisting of the number of site visits per year as reflected in Exhibit A, Sections 1 and 2. This service will include a site assessment to determine current conditions and identify areas of improvement with ECMs and other areas such as maintenance. Each site visit will be documented in a report indicating the findings and outlining a plan for further improvement. Site visit hours will vary depending upon the needs of that particular visit. Customer is responsible for providing access to all mechanical and electrical equipment and any supervision required by Customer. If customer requests a site visit, site visits must be requested fourteen (14) days or more prior to the requested date. Schneider Electric and Customer will work to schedule a mutually acceptable date for each visit.

All buildings where Option C is applied will be the primary focus of this service with at least an annual assessment of Energy Conservation Measures where Option A and Commissioned and Verified approaches are applied.

Measurement and Verification Reporting

Schneider Electric will perform the measurement & verification as outlined in the M&V plan and will update the Energy Savings and Performance report on a quarterly basis. This can only be completed if utility bills and other necessary information is made available per the contract. Notification of report updates will be sent via email with a link back to the Schneider Electric reporting dashboard to the contacts specified by the Customer. Changes to that contact list can be made at any time. Customer will need to contact Schneider Electric with the new contact list and changes will be made before sending the next email update. If bills and other necessary information are not provided, per the Contract, Schneider Electric will follow the procedure as defined in Schedule E: Customer Responsibilities for Performance Guarantee.

Training

Schneider Electric will provide the number of hours as reflected in Exhibit A, Sections 1 of on-site training and will be conducted during On-Site visits. Schneider Electric and Customer will work to schedule a mutually acceptable date for each visit. Customer will be responsible for providing access to the training location and paying for any fees associated with that location. The training location must include internet and Customer EMS access. Schneider Electric does not impose any restrictions on the number of Customer employees attending training sessions so long as the location will accommodate that number.

Measurement and Verification Reporting and Training will reflect all buildings included in this project.

Annual Reconciliation

The Measurement and Verification team will provide an annual presentation of the performance for the prior year. The presentation will include a review of the savings performance and targets, operational parameters and areas for improvement for the following year. A written report will be provided. Additional presentations will be an available as an added service.

Payment
After the end of Year 2 and each subsequent Year thereafter, Customer may either (1) continue with the same level of Services as set forth in Year 3 or (2) change the Services level by selecting one or more of the options as set forth in Exhibit A, Section 2 of this M&V Agreement.

The available Services options may be amended from time to time at the sole discretion of ESCO.

1. The price set forth for Year 1 shall be adjusted upwards annually at a rate of 2% as reflected in Exhibit A and the project cash flow.

2. Payment for each year's M&V Services is due within thirty (30) days of the end of that year's term. ESCO reserves the right to add 1.5% per month to any balance due beyond thirty (30) days of invoice date. Customer acknowledges and understands that all charges are exclusive of any applicable federal, state, or local use, excise, sales taxes or similar fees whether charged to or against ESCO or Customer for the Services. Customer may utilize purchase orders for ease of administration and ordering purposes in implementation of this M&V Agreement (to include: specific products or services, scope of work, quantities, price and delivery terms only), however, no pre-printed, additional, inconsistent or different terms contained or referenced in such purchase order shall have any force or effect, it being the intent of the parties that the terms of this M&V Agreement shall apply.

Access
Services provided under this M&V Agreement will be performed during normal working hours (normal working hours shall mean 8:00 a.m. to 5:00 p.m., local time, Monday through Friday, excluding ESCO holidays) unless specifically stated otherwise in the M&V Agreement. However, ESCO may have the need to access Customer facilities during non- normal working hours and on holidays in order to identify and troubleshoot energy savings issues. Therefore, Customer will provide and permit ESCO reasonable access to Customer's facility and equipment to the extent necessary for ESCO'S personnel to perform the Services. Customer shall also provide access to key personnel to discuss facility operating requirements. ESCO will use commercially reasonable efforts to minimize any disturbance with Customer's operations while providing the Services.

PROJECTED ANNUAL SAVINGS

The Performance Guarantee as established in Schedule C shall consist of savings from multiple scopes of work. The projected savings from each scope of work is presented in the table below.

Option C – Whole Facility

	Electric			Gas	
	kWh	kW	$	Therms	$
City Hall	588,430	-615	$51,766	-	-
Municipal Building	235,261	221	$22,906	-	-
Police, Fire & Rescue	283,651	-64	$25,947	3,976	$3,617
Public Works Complex	108,054	125	$11,542	7,602	$6,835
Jaycee Park	100,241	155	$12,330	3,730	$3,498

Option A – Key Parameter Measurement

	Electric			Gas		Propane		Water	
	kWh	kW	$	Therms	$	gal	$	kgal	$
5th St. Police Substation	2,502	0	$314	-	-	-	-	-	-
Bradford Creek Golf Course	39,252	149	$5,118	-	-	-221	($289)	-	-
City Hall	-	-	-	-	-	-	-	12	$90
Elm Street Recreation Center	9,686	33	$1,187	117	$8	-	-	58	$423
Eppes Recreation Center	21,419	77	$2,463	-301	($287)	-	-	-	-
Evans Park	4,076	4	$505	-39	($39)	-	-	9	$69
Gardener Training	5,713	0	$734	-75	($80)	-	-	-	-
Greenville Aquatics & Fitness Center	57,788	105	$5,774	-1,086	($965)	-	-	545	$3,990
Guy Smith Stadium	24,348	0	3,066	-	-	-	-	626	$4,583
H. Boyd Lee Park Building	13,807	35	$1,549	-122	($106)	-	-	-	-
Park Maintenance Center	10,920	44	$1,352	-88	($58)	-	-	36	$216
Police, Fire & Rescue	-	-	-	-	-	-	-	122	$891
Public Works	35,416	129	$3,806	-	-	-	-	-	-
South Greenville Recreation Center	30,456	103	$3,707	-244	($200)	-	-	67	$492
Sports Connection	9,505	30	$1,065	-3	($1)	-	-	9	$63

Commissioned and Verified Savings

	Electric			Gas	
	kWh	kW	$	Therms	$
City Hall	5,965	0	$551	-	-
Elm Street Recreation Center	776	7	$98	77	$82
Eppes Recreation Center	41,939	-28	$4,229	2,829	$2,796
Greenfield Terrace	5,836	0	$722	-	-
Greenville Aquatics & Fitness Center	63,605	62	$6,132	11,263	$11,082
H. Boyd Lee Park Building	16,404	-20	$1,572	3,208	$2,733
Police, Fire & Rescue	-	-	-	1,183	$1,088
Public Works	36,496	-62	$3,112	-	-
River Park North	34,107	-3	$3,337	-	-
South Greenville Recreation Center	5,192	-12	$640	1,220	$979
Sports Connection	14,491	2	$1,699	977	$970

Operation and Maintenance Savings

Greenville Aquatics & Fitness Center	$3,000	Chlorine Generator Maintenance Savings
Multiple Buildings	$4,677	Lighting Material and Maintenance Savings

The projected savings in the table above are provided for reference only and are not intended to construe a savings guarantee by meter, facility, or energy unit. The savings guarantee is fully defined in Schedule C.

ENERGY, WATER, AND OPERATIONS & MAINTENANCE (O&M) RATE DATA

The cost of energy in any period will be determined by applying the utility provider's rate for that guarantee period to the energy units saved for each fuel type. Should the results of this calculation be less than the amount guaranteed in the table on page 60 a shortfall will be deemed to exist. "Baseline Energy Rates" are shown in the table below. An escalation factor of 2% per year was used to escalate both costs and guaranteed savings from baseline amounts.

Electric Rates

Name of Utility: / **Rate Schedule:**	**GUC** / **ECMG**		
	Charge	**Unit**	**Comments**
Base Charge	$13.33		per Month
Consumption			
Tier 1	$0.12323	per kWh	First 12,500 kWh
Tier 2	$0.09233	per kWh	>12,500 kWh
Demand			
Tier 1	$0.00	per kW	First 35 kW
Tier 2	$4.17	per kW	>35 kW

Name of Utility: / **Rate Schedule:**	**GUC** / **ECSG**		
	Charge	**Unit**	**Comments**
Base Charge	$12.89		per Month
Consumption			
Tier 1	$0.13177	per kWh	First 1,000 kWh
Tier 2	$0.12558	per kWh	Next 5,000 kWh
Tier 3	$0.10700	per kWh	>6,000 kWh

Gas Rate

Name of Utility: / **Rate Schedule:**	**GUC** / **GCCF**		
	Charge	**Unit**	**Comments**
Base Charge	$22.00		per Month
Consumption			
Tier 1	$1.18130	per CCF	First 50 CCF
Tier 2	$1.10760	per CCF	Next 250 CCF
Tier 3	$1.05760	per CCF	Next 200 CCF
Tier 4	$0.90710	per CCF	>500 CCF

Propane Rate

Name of Utility: / **Rate Schedule:**	**Propane**		
	Charge	**Unit**	**Comments**
Consumption	$1.86	per Gal	

Water & Sewer Rates

Name of Utility: / Rate Schedule:	GUC Water		
	Charge	**Unit**	**Comments**
Consumption	$2.71	Per kgal	

Name of Utility: / Rate Schedule:	GUC Sewer		
	Charge	**Unit**	**Comments**
Consumption	$4.93*	Per kgal	
*Volume charge for commercial customers based on 93.5% of monthly water usage			

COMMON ECM ASSUMPTIONS

WEATHER DATA SOURCE

Data for weather compensation adjustments will be actual climate data obtained from the National Weather Service Station at Greenville, NC (PVG). In the event the specified weather station is de-activated, weather data will be collected from the nearest weather station with suitable observations. If the data source becomes unavailable or a superior source is identified, ESCO may select an alternative data source with Customer's approval.

ANNUAL CALENDAR OF EVENTS

Provided below is a table summarizing the annual calendar of events that will be used as a basis in calculations, unless otherwise specified. In the event that there are any changes or deviations to this annual calendar, an appropriate adjustment will be made in accordance with the "Adjustment Schedule" set forth in Schedule E.

Days	Event
1 Day / Yr	New Year's
1 Day / Yr	Martin Luther King Jr. Day
1 Day / Yr	Good Friday
1 Day / Yr	Memorial Day
1 Day / Yr	Independence Day
1 Day / Yr	Labor Day
1 Day / Yr	Veterans Day

Date(s)	Event
2 Days / Yr	Thanksgiving
2 Days / Yr	Christmas

BUILDING OCCUPANCY SCHEDULES

Provided below is a table summarizing the building occupancy schedules used within the calculations, unless otherwise specified. In the event that there are any changes or deviations to this occupancy schedule, an appropriate adjustment will be made in accordance with the Adjustment Schedule set forth in Schedule E.

City Hall Primary Hours of Operation/ Building Occupancy Schedule						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	8 PM	8 AM	8 PM	8 AM	8 PM	8 AM	8 PM	8 AM	6 PM	Closed	Closed	Closed	Closed

Municipal Building **Primary Hours of Operation/ Building Occupancy Schedule**													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

Police-Fire Rescue **Primary Hours of Operation/ Building Occupancy Schedule**													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

Note: Communications Center on 3rd Floor of Police Wing is open 24/7.

Park Maintenance Center **Primary Hours of Operation/ Building Occupancy Schedule**													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
7 AM	4 PM	7 AM	4 PM	7 AM	4 PM	7 AM	4 PM	7 AM	4 PM	Closed	Closed	Closed	Closed

5th Street Police Substation **Primary Hours of Operation/ Building Occupancy Schedule**													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

Eppes Recreation Center/Thomas Foreman Park **Primary Hours of Operation/ Building Occupancy Schedule**													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
11 AM	9 PM	11 AM	9 PM	11 AM	9 PM	11 AM	9 PM	11 AM	7 PM	12 PM	4 PM	Closed	Closed

Guy Smith Stadium **Primary Hours of Operation/ Building Occupancy Schedule**						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
12 PM	9 PM	12 PM	9 PM	12 PM	9 PM	12 PM	9 PM	12 PM	9 PM	10 AM	5 PM	1 PM	5 PM

Note: Guy Smith Stadium is an outdoor stadium with interior offices. This schedule reflects the approximate time the stadium is open for sporting events when they are scheduled. The stadium is not used December, January, or February.

City Warehouse
Primary Hours of Operation/ Building Occupancy Schedule

Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

Public Works Complex: Administrative Building
Primary Hours of Operation/ Building Occupancy Schedule

Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
6 AM	6 PM	6 AM	6 PM	6 AM	6 PM	6 AM	6 PM	6 AM	6 PM	Closed	Closed	Closed	Closed

Public Works Complex: Fleet Maintenance
Primary Hours of Operation/ Building Occupancy Schedule

Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
7 AM	7:30 PM	7 AM	7:30 PM	7 AM	7:30 PM	7 AM	7:30 PM	7 AM	7:30 PM	8AM	5PM	Closed	Closed

Public Works Complex: Traffic Services
Primary Hours of Operation/ Building Occupancy Schedule

Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
7 AM	5 PM	7 AM	5 PM	7 AM	5 PM	7 AM	5 PM	7 AM	5 PM	Closed	Closed	Closed	Closed

Public Works Complex: Streets Division Building and Grounds
Primary Hours of Operation/ Building Occupancy Schedule

Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
6:30 AM	5 PM	6:30 AM	5 PM	6:30 AM	5 PM	6:30 AM	5 PM	6:30 AM	5 PM	Closed	Closed	Closed	Closed

South Greenville Rec Building Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
11 AM	7 PM	11 AM	7 PM	11 AM	7 PM	11 AM	7 PM	11 AM	7 PM	12 PM	4 PM	Closed	Closed

Evans Park Building Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
9 AM	7 PM	9 AM	7 PM	9 AM	7 PM	9 AM	7 PM	9 AM	4 PM	Closed	Closed	Closed	Closed

Elm Street Rec Center Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	10 PM	8 AM	10 PM	8 AM	10 PM	8 AM	10 PM	8 AM	10 PM	8 AM	10 PM	8 AM	10 PM

Jaycee Park Building Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	8 PM	8 AM	8 PM	8 AM	8 PM	8 AM	8 PM	8 AM	5 PM	12 PM	4 PM	Closed	Closed

Sports Connection Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
2 PM	9 PM	2 PM	9 PM	2 PM	9 PM	2 PM	9 PM	2 PM	9 PM	2 PM	5 PM	2 PM	5 PM

Gardner Training Center Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

H. Boyd Lee Park Buildings Primary Building Hours of Operation/Occupancy Schedule						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
12 PM	7 PM	12 PM	7 PM	12 PM	7 PM	12 PM	7 PM	12 PM	7 PM	10 AM	2 PM	Closed	Closed

River Park North Buildings Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
Closed	Closed	9 AM	5 PM	9 AM	5 PM	9 AM	5 PM	9 AM	5 PM	9 AM	5 PM	1 PM	5 PM

Greenfield Terrace Building Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	8 AM	5 PM	Closed	Closed	Closed	Closed

Greenville Aquatics Center Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
5:30 AM	9 PM	5:30 AM	9 PM	5:30 AM	9 PM	5:30 AM	9 PM	5:30 AM	8 PM	8 AM	4 PM	1 PM	6 PM

Note: The Greenville Fitness and Aquatics Center building was simulated in building models as being occupied starting at 5:00 AM M-F because simulation software schedules by whole hour increments only. This is more conservative and has little, if any, negative effect on the simulation.

Bradford Creek Golf Course Primary Building Hours of Operation/Occupancy Schedule													
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
7 AM	10 PM	7 AM	10 PM	7 AM	10 PM	7 AM	10 PM	7 AM	10 PM	7 AM	10 PM	7 AM	10 PM

Note: Bradford Creek Golf Course is used according to a seasonal schedule.

STANDARDS OF SERVICE AND COMFORT

Provided below is a table summarizing the temperature setpoints used within the calculations, unless otherwise specified. Customer agrees to operate the conditioned spaces in the facilities within the temperature ranges scheduled in the table below. In the event that there are any changes or deviations to these standards of service and comfort, an appropriate adjustment will be made in accordance with the Adjustment Schedule set forth in Schedule E.

	Heating	Cooling

Occupied	70°F	74°F
Unoccupied	64°F	79°F

BUILDING OCCUPANCY

Provided below is a table summarizing the building occupancy used within the calculations. In the event that there are any changes or deviations to this occupancy, an appropriate adjustment will be made in accordance with the Adjustment Schedule set forth in Schedule E.

Building	Number of Occupants	
5th Street Police Substation	3	Average
Bradford Creek Golf Course	5	Average
City Hall	200	Average
City Warehouse	1	Peak
Elm Street Recreation Center	35	Peak
Eppes Recreation Center/Thomas Foreman Park	100	Average
Evans Park Building	25	Peak
Gardner Training Center	5	Average
Greenfield Terrace Building	50	Peak
Greenville Aquatics and Fitness Center	100	Average
Guy Smith Stadium	10	Peak
H. Boyd Lee Park Buildings	100	Average
Jaycee Park Building	100	Sqft/Person
Municipal Building	45	Average
Park Maintenance Center	3	Average
Police Fire/Rescue	200	Average
Public Works Complex	75	Peak
River Park North Building	30	Average
South Greenville Recreation Center Building	100	Average
Sports Connection	100	Average

OPTION C – WHOLE FACILITY

A. Overview of M&V Plan, and Savings Calculation
B. Energy Savings Calculations
C. Key Parameters Measurement Strategy
D. Parameter Estimates
E. Cost Savings Calculations
F. Performance Period Validation Activities

A. Overview of M&V Plan, and Savings Calculation

The method of determining energy savings described in this section uses "Option C – Whole Facility (Main Meter Measurement)" as described in the International Measurement and Verification Protocol (IPMVP Volume I, EVO 10000-1:2010). The remainder of this section provides the energy savings calculations, the key parameter measurements that will be conducted, the parameters that will be estimated and those values, and how cost savings will be calculated.

Guaranteed Meters

The following meters will be used to measure actual energy consumption for both the base year and performance periods.

Electric Meters

Meter Name	Account Number	Meter Number	Utility Co.	Rate	Units
City Hall	7503902	116734	GUC	ECMG	kWh, kW
Municipal Building	7519947	119703	GUC	ECMG	kWh, kW
Police-Fire Rescue	5427910	69877	GUC	ECMG	kWh, kW
Public Works Complex (Admin Building)	1425300	120791	GUC	ECMG	kWh, kW
Jaycee Park Building	2499100	42823	GUC	ECMG	kWh, kW

Gas Meters

Meter Name	Customer Number		Utility Co.	Rate	Units
Police-Fire Rescue	5427910	29080	GUC	GCCF	Therms
Public Works Complex	1425900	13909	GUC	GCCF	Therms
Jaycee Park Building	6634701	3021	GUC	GCCF	Therms

Building Summary

The following table lists the buildings that were served by guarantee meters during the base year period.

Bldg No.	Building Name	Net Area (ft^2)	Comments
1	City Hall	46,847	
2	Municipal Building	27,207	
3	Police-Fire Rescue	31,313	
4	Public Works Complex	54,399	Admin Building – 14,854
5	Jaycee Park Building	17,327	

B. Energy Savings Calculations

Provided within this section is an explanation of the calculations that will be used to perform energy savings calculations for this particular ECM.

Overview of Savings Methodology

Energy savings will be measured by comparing the Performance Period's total energy consumption and demand to the total energy consumption and demand for the same area in the base year period by utilizing energy meter data. Base year energy and demand will be adjusted for differences in weather, facility operation and facility modifications to estimate how much energy would have been used in the performance period if the energy conservation measures had not been implemented. The energy saved is the difference between the adjusted base year consumption and the Performance Period consumption. The demand saved is the difference between the adjusted base year demand and the Performance Period demand. This process will be followed for each fuel type involved in the guarantee.

Equations and Analysis of Energy Savings

Savings are calculated as the difference in energy usage from the baseline conditions after adjusting for all necessary changes, and the Performance Period conditions. This is shown in Equation 1 below:

Equation 1 – Energy Consumption Savings

$$E_{save} = E_{Baseline} - E_{Performanc\ e}$$

Where,

E_{save} = Energy savings
$E_{Baseline}$ = Adjusted energy usage of facility equipment pre-implementation
$E_{Performance}$ = Energy usage of facility equipment post-implementation

The baseline is that set of parameters that describes both the energy consumed in the base year and the conditions that caused that consumption to occur. This set of parameters includes utility consumption, facility use information, weather data and other information as may be necessary to describe the base year conditions. In addition, the baseline includes certain mathematical values, calculated by a model, that are used to correlate the base year energy consumption with the factors that caused that consumption and is defined by Equation 2 below:

Equation 2 – Baseline Energy Use

$$E_{Baseline} = \sum_{i=1}^{n} C_D \times T_i + C_H \times HDD_i + C_c \times CDD_i + CO_i + CM_i$$

Where,

n = Number of billing periods in year.
$E_{Baseline}$ = Adjusted baseline period consumption
C_D = A constant representing units of consumption per billing period day
T_i = Number of days in billing period
C_H = A constant representing units of consumption per heating degree day
HDD_i = Heating degree days in the current billing period
C_C = A constant representing units of consumption per cooling degree day
CDD_i = Cooling degree days in the current billing period
CO_i = Offset for the current billing period
CM_i = Other adjustments for the current billing period

Customer agrees to accept modifications to this baseline that are necessary to account for changes in the facilities and their use which may have occurred prior to the execution of this agreement but come to the attention of ESCO after the execution of this agreement. Typical adjustments are provided in detail in Schedule E.

Demand savings are computed similarly to the consumption savings, as shown by Equation 3 below:

Equation 3 – Peak Demand Savings

$$D_{save} = D_{Baseline} - D_{Performanc\ e}$$

Where,

D_{save} = Demand savings
$D_{Baseline}$ = Adjusted energy demand of facility equipment pre-implementation
$D_{Performance}$ = Energy demand of facility equipment post-implementation

Adjusted base year demand is calculated as demonstrated in Equation 4 below:

Equation 4 – Baseline Peak Demand

$$D_{Baseline} = \sum_{i=1}^{n} D_D + D_H \times \frac{HDD_i}{T_i} + D_C \times \frac{CDD_i}{T_i} + DO_i + DM_i$$

Where,

D_D = A constant representing units of demand per billing period
D_H = A constant representing units of demand per heating degree day per day
D_C = A constant representing units of demand per cooling degree day per day
DO_i = Offset for the current billing period
DM_i = Other adjustments for the current billing period

C. Key Parameters Measurement Strategy

Measurement and documentation strategies for each project phase are outline below.

Pre-Implementation Measurements and Documentation

Customer provided ESCO with monthly utility bills and all delivery invoices for the accounts included in Paragraph A for a minimum of twenty-four (24) months worth of historical utility data that is to represent a complete span of two years worth of energy usage. Customer will also provide ESCO with monthly utility bills and all delivery invoices for the accounts included in Paragraph A from the end of that twenty-four (24) month data set through the Savings Guarantee Commencement Date within the timelines specified in Schedule E.

ESCO will collect daily high and low temperature data from the weather station defined in Schedule D, Common ECM Assumptions.

Post-Implementation Measurements and Documentation

No short term verification is performed using this method. All post-implementation measurements are conducting during the Performance Period.

Performance Period Measurements and Documentation

Throughout the Performance Period, Customer will provide ESCO with the monthly utility bills and all delivery invoices for the accounts included in Paragraph A within the timelines specified in Schedule E.

ESCO will collect daily high and low temperature data from the weather station defined in ~~Schedule D~~, Common ECM Assumptions.

D. Parameter Estimates

The parameters defined in the equations outlined in Paragraph B that are estimated are determined through engineering analysis of at least twelve (12) months worth of the pre-implementation measured utility data. This is done to establish the relationship between the weather, billing period length, any other independent factors, and the consumption and demand associated with a particular account. The end result of this analysis is the set of coefficients used in the equations defined in Paragraph B to fully define the baseline for each account. The values are presented below in the Meter Tuning Summary.

Below are definitions of each of the estimated parameters included in Paragraph B;

- The values of C_D and D_D represent the base load consumption and demand of the utility usage of a particular meter and are equivalent to the weather independent energy usage and demand.
- The values of C_H and D_H represent the heating consumption and demand of the utility usage of a particular meter and are equivalent to the weather dependent energy usage and demand. They are associated with a consumption and demand heating balance point specific to that account.
- The values of C_C and D_C represent the cooling consumption and demand of the utility usage of a particular meter and are equivalent to the weather dependent energy usage and demand. They are associated with a consumption and demand cooling balance point specific to that account.
- The billing period values of COi and DOi represent the portion of the energy consumption and demand that cannot be accounted for with the weather independent and weather dependent consumption.

Each of these parameters was determined based on the relationship of the baseline period energy and demand and the independent factors. During the Performance Period they will be used to estimate the energy use and demand that would have occurred if the project had not been performed. To accomplish this, COi and DOi will be pro-rated to the Performance Period billing periods for each account.

The terms CMi and DMi are included in the equations in Paragraph B to account for changes in the Performance Period energy use and demand from the baseline Period energy use and demand on the accounts in Paragraph A for any causes unrelated to the project as defined in Schedule E. The procedures for developing these estimates vary with the specific causes for the adjustments. The requirements for determining these values and any measurements necessary to support these estimates are defined in Schedule E.

Meter Tuning Summary

Project :City of Greenville | Site :City Hall | Area: City Hall

Meter: City Hall Electric | Unit: Qty On-pk (kWh) | Account: 7503902

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	123,840		0	676	1	-1,229	123,840	0.0%
7/1/2010	7/29/2010	29	114,240		0	596	1	4,253	114,240	0.0%
7/30/2010	8/27/2010	29	111,168		0	559	1	2,718	111,168	0.0%
8/28/2010	9/30/2010	34	108,096		0	483	1	-11,918	108,096	0.0%
10/1/2010	10/29/201	29	100,800		41	126	1	7,435	100,800	0.0%
10/30/201	11/30/201	32	109,440		310	10	1	-7,173	109,440	0.0%
12/1/2010	12/30/201	30	154,752		809	0	1	8,710	154,752	0.0%
12/31/201	1/28/2011	29	129,024		690	0	1	-5,564	129,024	0.0%
1/29/2011	2/25/2011	28	107,520		422	12	1	-5,487	107,520	0.0%
2/26/2011	3/28/2011	31	111,744		279	33	1	-667	111,744	0.0%
3/29/2011	4/29/2011	32	123,840		117	139	1	15,622	123,840	0.0%
4/30/2011	5/31/2011	32	97,920		12	269	1	-8,128	97,920	0.0%
Total or Average		**368**	**1,392,384**		**2,680**	**2,903**	**1**	**-1,428**	**1,392,384**	**0.0% ± 0.0%**

City Hall Electric (Account # 7503902): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 2,939.82 x #Days + 71.5490 x HtgDD + 41.5320 x ClgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.791

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point.

ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point.

Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :City Hall | Area: City Hall

Meter: City Hall Electric | Unit: Dmd On-pk (kW) | Account: 7503902

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	223		0	20	1	-6	223	0.0%
7/1/2010	7/29/2010	29	240		0	21	1	11	240	0.0%
7/30/2010	8/27/2010	29	225		0	19	1	-4	225	0.0%
8/28/2010	9/30/2010	34	227		0	14	1	-2	227	0.0%
10/1/2010	10/29/201	29	219		0	4	1	-11	219	0.0%
10/30/201	11/30/201	32	217		5	0	1	-24	217	0.0%
12/1/2010	12/30/201	30	275		22	0	1	-4	275	0.0%
12/31/201	1/28/2011	29	269		19	0	1	-3	269	0.0%
1/29/2011	2/25/2011	28	263		11	0	1	9	263	0.0%
2/26/2011	3/28/2011	31	246		6	1	1	4	246	0.0%
3/29/2011	4/29/2011	32	244		2	4	1	11	244	0.0%
4/30/2011	5/31/2011	32	225		0	8	1	-4	225	0.0%
Total or Average		**368**	**2,873**		**65**	**91**	**1**	**-23**	**2,873**	**0.0% ± 0.0%**

City Hall Electric (Account # 7503902): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kW) = 229.23 + 2.2578 x HDD/day + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.864

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HDD/day=Heating Degree-Days per day calculated for GREENVILLE, NC for a 55.0°F balance point.

CDD/day=Cooling Degree-Days per day calculated for GREENVILLE, NC for a 60.0°F balance point.

Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Municipal Building | Area: Municipal Building

Meter: Municipal Blg Electric | Unit: Qty On-pk (kWh) | Account: 7519947

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	31,440		0	511	1	769	31,440	0.0%
7/1/2010	7/29/2010	29	29,280		0	451	1	2,327	29,280	0.0%
7/30/2010	8/27/2010	29	30,240		0	414	1	3,287	30,240	0.0%
8/28/2010	9/30/2010	34	30,720		0	314	1	-880	30,720	0.0%
10/1/2010	10/29/201	29	25,200		41	53	1	-3,192	25,200	0.0%
10/30/201	11/30/201	32	32,320		310	0	1	-8,419	32,320	0.0%
12/1/2010	12/30/201	30	55,760		809	0	1	-851	55,760	0.0%
12/31/201	1/28/2011	29	50,640		690	0	1	-813	50,640	0.0%
1/29/2011	2/25/2011	28	46,800		422	1	1	5,782	46,800	0.0%
2/26/2011	3/28/2011	31	41,840		279	11	1	3,132	41,840	0.0%
3/29/2011	4/29/2011	32	35,200		117	66	1	1,301	35,200	0.0%
4/30/2011	5/31/2011	32	26,640		12	154	1	-3,510	26,640	0.0%
Total or Average		**368**	**436,080**		**2,680**	**1,975**	**1**	**-1,067**	**436,080**	**0.0% ± 0.0%**

Municipal Blg Electric (Account # 7519947): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 929.41 x #Days + 35.5331 x HtgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.885

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Municipal Building | Area: Municipal Building

Meter: Municipal Blg Electric | Unit: Dmd On-pk (kW) | Account: 7519947

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	99		0	15	1	4	99	0.0%
7/1/2010	7/29/2010	29	101		0	16	1	5	101	0.0%
7/30/2010	8/27/2010	29	94		0	14	1	-2	94	0.0%
8/28/2010	9/30/2010	34	91		0	9	1	-4	91	0.0%
10/1/2010	10/29/201	29	92		0	2	1	-4	92	0.0%
10/30/201	11/30/201	32	99		6	0	1	-4	99	0.0%
12/1/2010	12/30/201	30	106		23	0	1	-16	106	0.0%
12/31/201	1/28/2011	29	116		20	0	1	-3	116	0.0%
1/29/2011	2/25/2011	28	115		12	0	1	6	115	0.0%
2/26/2011	3/28/2011	31	106		6	0	1	3	106	0.0%
3/29/2011	4/29/2011	32	112		2	2	1	14	112	0.0%
4/30/2011	5/31/2011	32	102		0	5	1	6	102	0.0%
Total or Average		**368**	**1,233**		**69**	**63**	**1**	**5**	**1,233**	**0.0% ± 0.0%**

Municipal Blg Electric (Account # 7519947): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kW) = 95.69 + 1.1787 x HDD/day + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.788

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HDD/day=Heating Degree-Days per day calculated for GREENVILLE, NC for a 55.0°F balance point.

Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.

CDD/day=Cooling Degree-Days per day calculated for GREENVILLE, NC for a 65.0°F balance point.

Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Police Fire Rescue | Area: Police Fire Rescue

Meter: PFR Electric | Unit: Qty On-pk (kWh) | Account: 5427910e

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	109,728		0	676	1	-8,556	109,728	0.0%
7/1/2010	7/29/2010	29	103,392		0	596	1	-679	103,392	0.0%
7/30/2010	8/27/2010	29	105,408		0	559	1	3,803	105,408	0.0%
8/28/2010	9/30/2010	34	116,352		1	483	1	8,679	116,352	0.0%
10/1/2010	10/29/201	29	76,320		113	126	1	3,575	76,320	0.0%
10/30/201	11/30/201	32	65,664		460	10	1	-6,010	65,664	0.0%
12/1/2010	12/30/201	30	72,000		959	0	1	5,399	72,000	0.0%
12/31/201	1/28/2011	29	60,192		835	0	1	-4,189	60,192	0.0%
1/29/2011	2/25/2011	28	59,328		551	12	1	-3,632	59,328	0.0%
2/26/2011	3/28/2011	31	73,152		412	33	1	2,165	73,152	0.0%
3/29/2011	4/29/2011	32	86,112		204	139	1	5,807	86,112	0.0%
4/30/2011	5/31/2011	32	82,656		57	269	1	-6,281	82,656	0.0%
Total or Average		**368**	**1,010,304**		**3,592**	**2,903**	**1**	**81**	**1,010,304**	**0.0% ± 0.0%**

PFR Electric (Account # 5427910e): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 2,220.02 x #Days + 66.6513 x ClgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.911

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Police Fire Rescue | Area: Police Fire Rescue

Meter: PFR Electric | Unit: Dmd On-pk (kW) | Account: 5427910e

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	217		0	10	1	-8	217	0.0%
7/1/2010	7/29/2010	29	223		0	11	1	-3	223	0.0%
7/30/2010	8/27/2010	29	237		0	9	1	17	237	0.0%
8/28/2010	9/30/2010	34	179		0	5	1	-14	179	0.0%
10/1/2010	10/29/201	29	18		4	1	1	-153	18	0.0%
10/30/201	11/30/201	32	185		14	0	1	19	185	0.0%
12/1/2010	12/30/201	30	150		32	0	1	-17	150	0.0%
12/31/201	1/28/2011	29	12		29	0	1	-155	12	0.0%
1/29/2011	2/25/2011	28	157		20	0	1	-10	157	0.0%
2/26/2011	3/28/2011	31	179		13	0	1	11	179	0.0%
3/29/2011	4/29/2011	32	174		6	1	1	3	174	0.0%
4/30/2011	5/31/2011	32	202		2	2	1	22	202	0.0%
Total or Average		**368**	**1,933**		**120**	**39**	**1**	**-288**	**1,933**	**0.0% ± 0.0%**

PFR Electric (Account # 5427910e): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kW) = 166.93 + 5.5051 x CDD/day + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.793

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HDD/day=Heating Degree-Days per day calculated for GREENVILLE, NC for a 65.0°F balance point.
CDD/day=Cooling Degree-Days per day calculated for GREENVILLE, NC for a 70.0°F balance point.
Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Police Fire Rescue | Area: Police Fire Rescue

Meter: PFR
Gas | Unit: Qty On-pk (CCF) | Account: 5427910g

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/29/2010	6/30/2010	33	1,263		0	511	1	174	1,263	0.0%
7/1/2010	7/29/2010	29	1,071		0	451	1	114	1,071	0.0%
7/30/2010	8/27/2010	29	967		0	414	1	10	967	0.0%
8/28/2010	9/30/2010	34	1,192		0	314	1	70	1,192	0.0%
10/1/2010	10/29/201	29	1,031		41	53	1	-6	1,031	0.0%
10/30/201	11/30/201	32	1,197		310	0	1	-466	1,197	0.0%
12/1/2010	12/30/201	30	2,753		809	0	1	177	2,753	0.0%
12/31/201	1/28/2011	29	2,358		690	0	1	48	2,358	0.0%
1/29/2011	2/25/2011	28	1,704		422	1	1	-48	1,704	0.0%
2/26/2011	3/28/2011	31	1,393		279	11	1	-177	1,393	0.0%
3/29/2011	4/29/2011	32	1,464		117	66	1	178	1,464	0.0%
4/30/2011	5/31/2011	32	999		12	154	1	-80	999	0.0%
Total or Average		**368**	**17,392**		**2,680**	**1,975**	**1**	**-6**	**17,392**	**0.0% ± 0.0%**

PFR Gas (Account # 5427910g): Tuning Period is 368 days from 5/29/2010 until 5/31/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (CCF) = 33.01 x #Days + 1.9610 x HtgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.915

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Public Works Complex | Area: Public Works Complex

Meter: Public Works Electric | Unit: Qty On-pk (kWh) | Account: 1425300

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
6/10/2010	7/9/2010	30	28,080		0	618	1	-1,507	28,080	0.0%
7/10/2010	8/9/2010	31	29,360		0	653	1	-1,617	29,360	0.0%
8/10/2010	9/9/2010	31	30,840		0	551	1	2,724	30,840	0.0%
9/10/2010	10/8/2010	29	21,560		44	296	1	1,400	21,560	0.0%
10/9/2010	11/8/2010	31	16,320		219	117	1	364	16,320	0.0%
11/9/2010	12/9/2010	31	12,720		587	8	1	-179	12,720	0.0%
12/10/201	1/10/2011	32	11,840		981	0	1	-1,243	11,840	0.0%
1/11/2011	2/8/2011	29	11,720		774	3	1	-207	11,720	0.0%
2/9/2011	3/9/2011	29	13,040		501	19	1	651	13,040	0.0%
3/10/2011	4/8/2011	30	13,040		363	35	1	-207	13,040	0.0%
4/9/2011	5/9/2011	31	16,200		114	146	1	-570	16,200	0.0%
5/10/2011	6/9/2011	31	24,120		10	398	1	282	24,120	0.0%
Total or Average		**365**	**228,840**		**3,593**	**2,844**	**1**	**-109**	**228,840**	**0.0% ± 0.0%**

Public Works Electric (Account # 1425300): Tuning Period is 365 days from 6/10/2010 until 6/9/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 408.84 x #Days + 28.0511 x ClgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.971

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Public Works Complex | Area: Public Works Complex

Meter: Public Works Electric | Unit: Dmd On-pk (kW) | Account: 1425300

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
6/10/2010	7/9/2010	30	95		0	21	1	-5	95	0.0%
7/10/2010	8/9/2010	31	94		0	21	1	-6	94	0.0%
8/10/2010	9/9/2010	31	99		0	18	1	6	99	0.0%
9/10/2010	10/8/2010	29	88		2	10	1	11	88	0.0%
10/9/2010	11/8/2010	31	83		7	4	1	20	83	0.0%
11/9/2010	12/9/2010	31	56		19	0	1	0	56	0.0%
12/10/201	1/10/2011	32	42		31	0	1	-12	42	0.0%
1/11/2011	2/8/2011	29	42		27	0	1	-13	42	0.0%
2/9/2011	3/9/2011	29	54		17	1	1	-2	54	0.0%
3/10/2011	4/8/2011	30	62		12	1	1	4	62	0.0%
4/9/2011	5/9/2011	31	69		4	5	1	4	69	0.0%
5/10/2011	6/9/2011	31	76		0	13	1	-7	76	0.0%
Total or Average		**365**	**860**		**119**	**94**	**1**	**0**	**860**	**0.0% ± 0.0%**

Public Works Electric (Account # 1425300): Tuning Period is 365 days from 6/10/2010 until 6/9/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kW) = 54.88 + 2.1601 x CDD/day + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.779

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HDD/day=Heating Degree-Days per day calculated for GREENVILLE, NC for a 65.0°F balance point.
CDD/day=Cooling Degree-Days per day calculated for GREENVILLE, NC for a 60.0°F balance point.
Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Public Works Complex | Area: Public Works Complex

Meter: Public Works Gas | Unit: Qty On-pk (CCF) | Account: 1425900

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
6/10/2010	7/9/2010	30	30		0	468	1	74	30	0.0%
7/10/2010	8/9/2010	31	30		0	498	1	75	30	0.0%
8/10/2010	9/9/2010	31	10		0	396	1	55	10	0.0%
9/10/2010	10/8/2010	29	149		13	182	1	37	149	0.0%
10/9/2010	11/8/2010	31	537		128	53	1	-1,000	537	0.0%
11/9/2010	12/9/2010	31	3,964		440	0	1	-1,430	3,964	0.0%
12/10/201	1/10/2011	32	9,418		821	0	1	-679	9,418	0.0%
1/11/2011	2/8/2011	29	8,585		631	0	1	826	8,585	0.0%
2/9/2011	3/9/2011	29	5,803		370	5	1	1,271	5,803	0.0%
3/10/2011	4/8/2011	30	3,490		238	10	1	592	3,490	0.0%
4/9/2011	5/9/2011	31	303		37	68	1	-109	303	0.0%
5/10/2011	6/9/2011	31	51		0	253	1	96	51	0.0%
Total or Average		**365**	**32,370**		**2,678**	**1,933**	**1**	**-192**	**32,370**	**0.0% ± 0.0%**

Public Works Gas (Account # 1425900): Tuning Period is 365 days from 6/10/2010 until 6/9/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (CCF) = -1.47 x #Days + 12.3631 x HtgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.955

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 60.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.

ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.

Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Jaycee Park Building | Area: Jaycee Park Building

Meter: Jaycee Park Electric | Unit: Qty On-pk (kWh) | Account: 2499100

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/25/2010	6/24/2010	31	19,080		0	432	1	-324	19,080	0.0%
6/25/2010	7/23/2010	29	19,280		0	451	1	-58	19,280	0.0%
7/24/2010	8/23/2010	31	20,960		0	483	1	265	20,960	0.0%
8/24/2010	9/24/2010	32	17,000		1	304	1	563	17,000	0.0%
9/25/2010	10/25/201	31	10,040		106	71	1	-237	10,040	0.0%
10/26/201	11/23/201	29	8,440		356	32	1	-290	8,440	0.0%
11/24/201	12/22/201	29	9,560		805	0	1	1,627	9,560	0.0%
12/23/201	1/25/2011	34	8,400		1,023	0	1	-900	8,400	0.0%
1/26/2011	2/22/2011	28	8,680		578	1	1	996	8,680	0.0%
2/23/2011	3/23/2011	29	8,160		366	11	1	-39	8,160	0.0%
3/24/2011	4/26/2011	34	8,680		296	51	1	-1,899	8,680	0.0%
4/27/2011	5/25/2011	29	10,120		60	91	1	-117	10,120	0.0%
Total or Average		**366**	**148,400**		**3,591**	**1,927**	**1**	**-413**	**148,400**	**0.0% ± 0.0%**

Jaycee Park Electric (Account # 2499100): Tuning Period is 366 days from 5/25/2010 until 5/25/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 273.54 x #Days + 25.3170 x ClgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.970

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Site :Jaycee Park Building

Project :City of Greenville

Area: Jaycee Park Building

Meter: Jaycee Park Electric

Unit: Dmd On-pk (kW)

Account: 2499100

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/25/2010	6/24/2010	31	71		0	14	1	-4	71	0.0%
6/25/2010	7/23/2010	29	79		0	16	1	0	79	0.0%
7/24/2010	8/23/2010	31	81		0	16	1	2	81	0.0%
8/24/2010	9/24/2010	32	63		0	9	1	0	63	0.0%
9/25/2010	10/25/201	31	55		3	2	1	12	55	0.0%
10/26/201	11/23/201	29	48		12	1	1	8	48	0.0%
11/24/201	12/22/201	29	34		28	0	1	-3	34	0.0%
12/23/201	1/25/2011	34	35		30	0	1	-2	35	0.0%
1/26/2011	2/22/2011	28	31		21	0	1	-6	31	0.0%
2/23/2011	3/23/2011	29	32		13	0	1	-6	32	0.0%
3/24/2011	4/26/2011	34	40		9	1	1	-1	40	0.0%
4/27/2011	5/25/2011	29	44		2	3	1	-1	44	0.0%
Total or Average		**366**	**613**		**118**	**62**	**1**	**-1**	**613**	**0.0% ± 0.0%**

Jaycee Park Electric (Account # 2499100): Tuning Period is 366 days from 5/25/2010 until 5/25/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kW) = 36.61 + 2.7321 x CDD/day + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.917

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HDD/day=Heating Degree-Days per day calculated for GREENVILLE, NC for a 65.0°F balance point.
CDD/day=Cooling Degree-Days per day calculated for GREENVILLE, NC for a 65.0°F balance point.
Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

Meter Tuning Summary

Project :City of Greenville | Site :Jaycee Park Building | Area: Jaycee Park Building

Meter: Jaycee Park Gas | Unit: Qty On-pk (CCF) | Account: 6634701

From	To	# Days	Reading	Incl?	HtgDD	ClgDD	Multiplier	Offset	Baseline	Deviation
5/25/2010	6/24/2010	31	0		0	432	1	62	0	0.0%
6/25/2010	7/23/2010	29	0		0	451	1	58	0	0.0%
7/24/2010	8/23/2010	31	0		0	483	1	62	0	0.0%
8/24/2010	9/24/2010	32	1		1	304	1	64	1	0.0%
9/25/2010	10/25/201	31	61		106	71	1	-70	61	0.0%
10/26/201	11/23/201	29	356		356	32	1	-237	356	0.0%
11/24/201	12/22/201	29	1,379		805	0	1	-35	1,379	0.0%
12/23/201	1/25/2011	34	1,767		1,023	0	1	-35	1,767	0.0%
1/26/2011	2/22/2011	28	1,325		578	1	1	324	1,325	0.0%
2/23/2011	3/23/2011	29	524		366	11	1	-86	524	0.0%
3/24/2011	4/26/2011	34	371		296	51	1	-102	371	0.0%
4/27/2011	5/25/2011	29	25		60	91	1	-26	25	0.0%
Total or Average		**366**	**5,809**		**3,591**	**1,927**	**1**	**-21**	**5,809**	**0.0% ± 0.0%**

Jaycee Park Gas (Account # 6634701): Tuning Period is 366 days from 5/25/2010 until 5/25/2011

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (CCF) = -2.01 x #Days + 1.8295 x HtgDD + Offset

This Baseline Equation has a Net Mean Bias of 0.0% and a Monthly Mean Error of ±0.0%. The underlying regression has a R^2=0.949

Baseline Costs are calculated using Rate Tariff documented in separate attachment

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
HtgDD=Heating Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point. Periods under 0.0°F-days/day are excluded from regression, but are still used in applying the Baseline Equation.
ClgDD=Cooling Degree-Days calculated for GREENVILLE, NC for a 65.0°F balance point.
Offset is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

E. Cost Savings Calculations

Provided below are the methods and equations used to determine the cost savings associated with this particular methodology.

Cost Savings are calculated as the difference between the baseline and Performance Period energy costs using the utility rates as defined in Schedule D, Energy, Water, and O&M Rate Data. The applicable utility rates will be applied to the baseline and Performance Period energy use for the accounts in Paragraph A. Equation 5 will be used to compute the total cost savings for each Guarantee Year.

Equation 5 – Total Cost Savings

$$\$_{save} = \sum_{i=1}^{n}\left[\sum_{k=1}^{q}\left(\$_{Baseline} - \$_{Performance}\right)_k\right]_i$$

Where,

$\$_{save}$ = Guarantee year cost savings
$\$_{Baseline}$ = Billing period k baseline utility cost for account i
$\$_{Performance}$ = Billing period k performance period utility cost for account i
n = Total number of accounts
q = Total number of billing periods for account i

OPTION A – LIGHTING EFFICIENCY AND CONTROLS

A. Overview of M&V Plan, and Savings Calculation
B. Energy Savings Calculations
C. Key Parameter Measurement Strategy
D. Parameter Estimates
E. Cost Savings Calculations
F. Performance Period Validation Activities

A. Overview of M&V Plan, and Savings Calculation

Savings in this section are determined by using an "Option A: Retrofit Isolation – Key Parameter Measurement" approach as described in the International Performance Measurement & Verification Protocol (IPMVP Volume I, EVO 10000-1:2010). The remainder of this section describes the energy savings calculations, key parameter measurements that will be conducted, parameters that will be estimated and those values, and how cost savings will be calculated. The energy and cost savings that are determined using this approach will be the annual savings values used for each year of the Performance Period.

B. Energy Savings Calculations

Provided within this section is an explanation of the calculations that will be used to perform energy savings calculations for this verification method.

Equations and Analysis of Energy Savings

Lighting Energy Savings
The lighting electrical consumption saved for each retrofit is the difference of the pre-retrofit electrical consumption and the post-retrofit electrical consumption. For both the pre-retrofit and post-retrofit lighting configurations, the electrical consumption is the product of the quantity of fixtures, the measured power for that fixture type, the percent of lamps that aren't burned out, and the measured burn hours for that lighting use type. The equation below will be used to determine the lighting electrical consumption savings.

$$A = \sum_{i=1}^{n} \left[\left(B_i \times C_i \times D_i \times \left(100\% - N_i \right) \right) - \left(B_i \times F_i \times G_i \right) \right]$$

Where:
A = Total lighting consumption savings (kWh)
B_i = Quantity of fixtures for retrofit i
C_i = Pre-retrofit power for fixture type i (kW)
D_i = Pre-retrofit runtime for retrofit i (hours)
F_i = Post-retrofit power for fixture type i (kW)
G_i = Post-retrofit runtime for retrofit i (hours)
N_i = Pre-retrofit percent of lamps that are burned out for retrofit i

Peak Demand Savings
The lighting peak demand saved each month for each retrofit is the difference of the pre-retrofit and post-retrofit power. For both the pre-retrofit and post-retrofit lighting configurations, the peak electrical demand is the product of the quantity of fixtures, the measured power for that fixture type, the percent of lamps that aren't burned out, and the stipulated demand diversity factor for those fixtures. The equation below

will be used to determine the lighting peak demand savings.

$$H = \sum_{i=1}^{n} \left[\left(B_i \times C_i \times J_i \times \left(100\% - N_i \right) \right) - \left(B_i \times F_i \times K_i \right) \right]$$

Where:
H = Total lighting peak demand savings (kW)
B_i = Quantity of fixtures for retrofit i
C_i = Pre-retrofit power for fixture type i (kW)
J_i = Pre-retrofit demand diversity factor for retrofit i
F_i = Post-retrofit power for fixture type i (kW)
K_i = Post-retrofit demand diversity factor for retrofit i
N_i = Pre-retrofit percent of lamps that are burned out for retrofit i

Electrical and Natural Gas HVAC Impact
The electrical and natural gas savings (or losses) caused by the changing heat load in the buildings is computed as the product of the applicable kWh/kWh, kW/kW, Therms/kWh, or Gal/kWh factor for each retrofit and the lighting energy/demand savings computed above.

The natural gas losses for the Public Works lighting ECM at buildings B – F will be captured by the Option C gas meter and thus will not be calculated separately.

C. Key Parameter Measurement Strategy

This section outlines the measurements that will be conducted to determine the measured values in the equations provided above in Paragraph B. For this lighting project, the key parameters that will be measured are the power consumption of each fixture type and the burn hours for each occupancy type. Measurement and documentation strategies for each project phase are outlined below.

Pre-Implementation Measurements and Documentation

Power measurements (C_i) will be taken on a sample set of each baseline fixture type in those buildings utilizing Option A for the lighting ECM to determine the average power use for each fixture type. At least eight (8) measurements will be taken for each fixture type (unless fewer exist). Measurements will continue to be taken for a given fixture type until the 90% confidence interval for the true population mean spans no more than 10% above and below the mean of the sample (or until all fixtures have been measured). The mean of this sample set will be treated as the power consumption for that fixture type for all savings calculations. The table below lists each fixture type to be measured, the total quantity of that fixture type, and the minimum amount to be measured prior to removing the fixtures to implement the retrofit.

Fixture Code	Fixture Quantity	Minimum Sample	Connected Load	
			KW	% total KW
1500MH	26	8	42.1	16%
400MH	85	8	38.9	15%
44EE	215	8	31.0	12%
44T5HO	97	8	23.4	9%
250MH	50	8	14.8	6%
24EE	198	8	14.3	5%
250S	44	8	13.0	5%
24T8	159	8	9.4	4%

65	125	8	8.1	3%
	999	**72**	**194.9**	**75%**

The ratio of measured power consumption to estimated will be calculated for the sum of all measured fixture types and that ratio applied to the estimated power consumption for non-measured fixture types. This will be used as the actual pre-retrofit power consumption for that fixture type for all savings calculations.

Lighting loggers and occupancy sensors were utilized to determine the baseline and Performance Period burn hours. The lighting loggers were used to calculate the preliminary baseline burn hours that were used as inputs to the building models. The model results were then extrapolated to determine final baseline hours (D_i). The occupancy sensors determine the necessary operation of the lighting fixtures to meet the lighting needs. Those annual hours are the Performance Period burn hours (G_i). The table in paragraph D below contains the annual baseline and Performance Period burn hours. No additional measurements of burn hours or occupancy will be taken during the Performance Period.

Post-Implementation Measurements and Documentation

Power measurements (F_i) will be taken on a sample set of each Performance Period fixture type to determine the average power use for each fixture type. At least eight (8) measurements will be taken for each fixture type (unless fewer exist). Measurements will continue to be taken for a given fixture type until the 90% confidence interval for the true population mean spans no more than 10% above and below the mean of the sample (or until all fixtures have been measured). The mean of this sample set will be treated as the power consumption for that fixture type for all savings calculations. The preferred locations for measurements for the new retrofit types will be locations where some previous measurement was taken. The number of post-retrofit samples measured is independent from the number of pre-retrofit samples taken. These measurements are taken to determine the average power use of each fixture type, not the reduction of power use in any specific locations. All measurements will be taken using the same equipment and will be calibrated. The table below lists each fixture type to be measured, the total quantity of that fixture type, and the minimum amount to be measured during the post-implementation period.

Fixture Code	Fixture Quantity	Minimum Sample	Connected Load	
			KW	% total KW
L44T5HO	97	8	23.4	22%
LB24HPDL	220	8	13.2	12%
NF29-43HO	64	8	11.6	11%
LB24LP	275	8	10.7	10%
NF28-46HO-OS	27	8	9.8	9%
NF28-44HO-OS	26	8	6.3	6%
SP-LED SHOEBOX-400	38	8	5.5	5%
NF30-44HO	12	8	2.9	3%
	759	**64**	**83.43**	**77%**

The ratio of measured power consumption to estimated will be calculated for the sum of all measured fixture types and that ratio applied to the estimated power consumption for non-measured fixture types. This will be used as the actual post-retrofit power consumption for that fixture type for all savings calculations.

Performance Period Measurements and Documentation

No additional measurements will be taken during the Performance Period of this M&V strategy. Periodic surveys of replacement supplies will be performed.

D. Parameter Estimates

Of the parameters identified under the equations for energy savings in Section B, several of the parameters are estimates, and will not be measured during any period of the project. Of the variables identified, the parameters that will be estimated for this particular ECM and M&V strategy include: burn hours (for fixtures without occupancy sensors), demand diversity factors, burnout rates, and electrical and natural gas HVAC impact. All estimated parameters are listed below.

Building	Area Description	Fixture Type		Quantity (B_i)		Burn Hours		Demand %		Burnout % (N_i)	KWH/ KWH	KW/ KW	Therms/ KWH	Gal/ KWH
		Pre	Post	Pre	Post	Pre (D_i)	Post (G_i)	Pre (J_i)	Post (K_i)					
5th Street Police	CORRIDOR	60X2	CF13X2	2	2	3,956	3,956	100%	100%	0%	-0.0197	N/A	N/A	N/A
5th Street Police	GARAGE	28SLSE	LB24HP-STP	4	4	1,507	1,507	100%	100%	0%	-0.0197	N/A	N/A	N/A
5th Street Police	LOCKER AREA	60X2	CF13X2	1	1	3,956	3,956	100%	100%	0%	-0.0197	N/A	N/A	N/A
5th Street Police	TOILET	40X4	CF9G25X4	1	1	2,822	2,822	100%	100%	0%	-0.0197	N/A	N/A	N/A
5th Street Police	TOILET	65	CF18R30	1	1	2,822	2,822	100%	100%	0%	-0.0197	N/A	N/A	N/A
5th Street Police	TOILET #2	40X6	CF9G25X6	1	1	2,822	2,822	100%	100%	0%	-0.0197	N/A	N/A	N/A
Bradford Creek	BREAK ROOM	28SLSE	LB24HP-STP	2	2	1,815	1,271	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	CARD ROOM	65	CF18R30	12	12	339	339	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	COPY ROOM	24EE	LB24LP	1	1	837	837	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	CORRIDOR	65	CF18R30	3	3	339	339	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	CORRIDOR	65	CF18R30	3	3	1,359	1,359	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	CORRIDOR	65	CF18R30	3	3	1,359	1,359	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	DINING ROOM	65	CF18R30	22	22	339	339	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	EXTERIOR - BUILDING MOUNTED	250MH	SP-LED WALLPACK-250	7	7	2,091	2,091	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	EXTERIOR - BUILDING MOUNTED LANTERNS	40X4	LED3WX4	6	6	2,091	2,091	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	EXTERIOR - RECESSED IN CANOPY	65	CF18R30	40	40	2,091	2,091	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	KITCHEN	44EE	LB24HPDL	4	4	1,884	1,131	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	MAINT SHED	400MH	NF29-44HO-OS	6	6	1,114	947	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	MECH	24EE	LB24LP	1	1	1,114	1,114	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	MENS TOILET	24EE	LB24LP	2	2	4,077	4,077	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	MENS TOILET	60X6	CF13X6	1	1	4,077	4,077	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	MOWER SHED	28SLSE	LB24HP-STP	15	15	1,114	780	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	OFFICE	24EE	LB24LP	1	1	339	339	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	OFFICE	44EE	LB24LP	2	2	339	237	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	OFFICE	65	CF18R30	5	5	1,815	1,815	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	OFFICE	28SLSE	LB24HP-STP	2	2	1,815	1,271	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	OFFICE	44EE	LB24HPDL	4	4	1,114	780	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	SNACK BAR	65	CF18R30	4	4	1,815	1,815	100%	100%	0%	0.1160	0.2149	N/A	-0.0111

Bradford Creek	STORAGE	44EE	LB24HPDL	2	2	2,363	1,418	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	STORAGE	44EE	LB24HPDL	1	1	2,363	2,363	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	STORAGE	100	CF23	1	1	523	523	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	STORE	65	CF18R30	17	17	1,815	1,815	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	TOILET	24EE	LB24LP	1	1	1,359	1,359	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	TOILET	24EE	LB24LP	1	1	1,359	1,359	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	Unnamed Area	28SLSE	LB24HP-STP	5	5	1,114	1,114	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Bradford Creek	WOMENS TOILET	24EE	LB24LP	3	3	4,077	4,077	100%	100%	0%	0.1160	0.2149	N/A	-0.0111
Elm St Rec Cntr	BOILER ROOM	44EE	LB24HPDL	1	1	810	810	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	CONCESSION STAND	44EE	LB24HPDL	3	3	1,012	1,012	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	CORRIDOR	24UEE	LB22REF	1	1	877	877	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	CORRIDOR	24UEE	LB22REF	1	1	877	877	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	EXTERIOR - PARKING/ROADWAY	250S	SP-LED SHOEBOX-250	7	7	1,350	1,350	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	EXTERIOR - TENNIS	400MH	SP-LED SHOEBOX-400	38	38	304	304	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	MENS TOILET	44EE	LB24HPDL	2	2	1,117	559	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	MENS TOILET	24T8	LB24	2	2	1,117	1,117	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	OFFICE	44EE	LB24HPDL	2	2	1,012	1,012	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	OPEN ROOM	44EE	LB24HPDL	15	15	1,012	911	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	SNACK BAR	24T8	LB24	3	3	1,012	1,012	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	STORAGE	44EE	LB24HPDL	1	1	337	337	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	STORAGE	24T8	LB24	3	3	337	337	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	WOMENS TOILET	44EE	LB24HPDL	2	2	1,117	559	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr	WOMENS TOILET	24T8	LB24	2	2	1,117	1,117	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Elm St Rec Cntr		EXIT PL7	NF1-BATT	3	3	2,956	2,956	100%	100%	0%	0.1612	0.2000	-0.0154	N/A
Epps Rec Cntr	BOILER ROOM	24T8	LB24LP	2	2	2,383	2,383	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	BOYS TOILET	24T8	LB24LP	1	1	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	BOYS TOILET	34T8	LB24LPDL	2	2	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	BOYS TOILET	PL32X2	L2X26TRT	1	1	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CLASSROOM	24EE	LB24LP	3	3	516	516	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CLASSROOM	24EE	LB24LP	6	6	516	516	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CLASSROOM	24EE	LB24LP	4	4	516	516	100%	100%	0%	0.1421	0.1752	-0.0164	N/A

Epps Rec Cntr	CONCESSION	24EE	LB24LP	12	12	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CONCESSION (OUTSIDE)	24EE	LB24LP	8	8	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CORRIDOR	24EE	LB24LP	5	5	2,581	2,581	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CORRIDOR	24EE	LB24LP	1	1	2,581	2,581	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	CORRIDOR	24EE	LB24LP	1	1	2,581	2,581	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	EXTERIOR - BUILDING MOUNTED	100	CF23	2	2	3,971	3,971	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	EXTERIOR - BUILDING MOUNTED	100MH	SP-LED WALLPACK-100	9	9	3,971	3,971	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	GIRLS TOILET	24T8	LB24LP	1	1	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	GIRLS TOILET	34T8	LB24LPDL	3	3	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	GIRLS TOILET	PL32X2	L2X26TRT	1	1	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	GYM	44T5HO	L44T5HO	35	35	3,273	3,273	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	HIGH SCHOOL ROOM	24T8	LB24LP	5	5	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	HIGH SCHOOL ROOM	24T8	LB24LP	3	3	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	HIGH SCHOOL ROOM	24T8	LB24LP	4	4	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	JANITOR CLOSET	24T8	LB24LP	1	1	298	298	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	KITCHEN	44EE	LB24HPDL	2	2	1,787	1,787	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	LOBBY	PL32X2	L2X26TRT	4	4	2,581	2,581	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	MECH	34T8	LB34LP	1	1	2,383	2,383	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	MENS TOILET	24EE	LB24LP	1	1	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	MULTIPURPOSE ROOM	38HOSE	CR84	12	12	2,658	2,658	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	OFFICE	34T8	LB34LP	2	2	310	310	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	OFFICE	44EE	LB24HPDL	2	2	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	REC ROOM	24EE	LB24LP	11	11	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	SNACK BAR	24EE	LB24LP	2	2	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	STORAGE	34T8	LB34LP	1	1	993	993	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	STORAGE	24EE	LB24LP	1	1	993	993	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	STORAGE	60	CF13	1	1	496	496	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	STORAGE	24EE	LB24LP	1	1	993	993	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	WEIGHT ROOM	24EE	LB24LP	7	7	1,533	1,533	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Epps Rec Cntr	WOMENS TOILET	24EE	LB24LP	2	2	3,597	3,597	100%	100%	0%	0.1421	0.1752	-0.0164	N/A

Epps Rec Cntr		34T8	LB24LPDL	5	5	2,581	2,581	100%	100%	0%	0.1421	0.1752	-0.0164	N/A
Evans Park	ABOVE COUNTER	14T8	LB14	3	3	374	374	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	MENS TOILET	24UT8	LB22REF	5	5	1,813	906	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	MENS TOILET	14T8	LB14	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	MENS TOILET	24T8	LB24LP	2	2	1,813	906	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	MENS TOILET	44T8	LB24HPDL	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	STAFF	24T8	LB24	4	4	375	375	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	STORAGE	44T8	LB24DL	2	2	3,740	2,244	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	STORAGE	44T8	LB24DL	1	1	3,740	2,244	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	TOILET	24UT8	LB22REF	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	TOILET	24UT8	LB22REF	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	WOMENS TOILET	24UT8	LB22REF	5	5	1,813	906	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	WOMENS TOILET	14T8	LB14	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	WOMENS TOILET	24T8	LB24LP	2	2	1,813	906	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park	WOMENS TOILET	44T8	LB24HPDL	2	2	1,813	1,813	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Evans Park		24UT8	LB22REF	4	4	374	374	100%	100%	0%	0.1115	3.7323	-0.0221	N/A
Gardner Trn Cntr	CORRIDOR	60	CF13	2	2	2,261	2,261	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	EXTERIOR - BUILDING MOUNTED	100MH	SP-LED WALLPACK-100	2	2	3,478	3,478	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	EXTERIOR - BUILDING MOUNTED	100	CF23	2	2	3,478	3,478	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	OFFICE	44EE	LB24HPDL	4	4	870	696	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	OFFICE	44EE	LB24HPDL	6	6	870	696	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	OPEN ROOM	44EE	LB24HPDL	15	15	870	609	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	STORAGE	100	CF23	1	1	870	870	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	TOILET	100X2	CF23X2	1	1	2,261	2,261	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	TOILET	100	CF23	1	1	2,261	2,261	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	TOILET	100	CF23	1	1	2,261	2,261	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr	TOILET	100	CF23	2	2	2,261	2,261	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Gardner Trn Cntr		65	CF23-DIMR40	10	10	870	609	100%	100%	0%	0.1320	0.1304	-0.0152	N/A
Grenville Aquatics	AEROBICS B	24UEE	LB32REF	12	12	1,196	1,196	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	AEROBICS ROOM	44EE I/O	LB24HPDL	9	9	1,196	1,196	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A

Grenville Aquatics	CORRIDOR	24UEE	LB22REF	12	12	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	CORRIDOR	75	CF18	6	6	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	CORRIDOR	24UEE	LB22REF	1	1	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	CORRIDOR	24T8	LB24LP	6	6	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	CORRIDOR AT LOOKERS	24EE	LB24LP	5	5	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	DAY CARE	44T8	LB44	6	6	2,172	2,172	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	DAY CARE	44T8	LB44	2	2	2,172	2,172	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	EXTERIOR - BUILDING MOUNTED	175MH	SP-LED WALLPACK-100	1	1	3,633	3,633	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	FITNESS ROOM	250MH	NF29-43HO-ARCH	12	12	4,250	3,613	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	GIRLS LOCKER ROOM	24T8	LB24LP	5	5	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	GIRLS LOCKER ROOM	44EE	LB24HPDL	2	2	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	GIRLS LOCKER ROOM	24EE	LB24LP	4	4	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	GYM	44T5HO	L44T5HO	30	30	4,250	4,250	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	LAUNDRY ROOM	24EE	LB24LP	2	2	3,039	3,039	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	MECH	24EE	LB24LP	11	11	2,180	2,180	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	MECH	24T8	LB24LP	9	9	2,180	2,180	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	MENS LOCKER ROOM	24T8	LB24LP	3	3	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	MENS LOCKER ROOM	24EE	LB24LP	1	1	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	MENS LOCKER ROOM	24T8	LB24LP	3	3	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE	LB24HPDL	2	2	3,039	3,039	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE I/O	LB24HPDL	1	1	3,039	-57,734	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE I/O	LB24HPDL	2	2	3,039	-57,734	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE I/O	LB24HPDL	1	1	3,039	-57,734	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE	LB24HPDL	1	1	3,039	-57,734	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics	OFFICE	44EE	LB24HPDL	5	5	3,039	2,431	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A

Grenville Aquatics		POOL	400MH	NF30-44HO	10	12	4,251	4,251	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		POOL	24T8	LB24LP	3	3	4,251	4,251	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		PUMP ROOM	44T8	LB24HPDL	5	5	3,745	1,873	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		SHOWERS BOYS & GIRLS	60	CF13	10	10	4,409	4,409	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STAGE	28SLSE	LB24HP-STP	4	4	3,231	3,231	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STAGE	24EE	LB24LP	7	7	3,231	3,231	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STORAGE	14EE	LB14LP	1	1	908	908	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STORAGE	14EE	LB14LP	1	1	908	908	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STORAGE	14EE	LB14LP	1	1	908	908	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STORAGE	24EE	LB24LP	2	2	908	908	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		STORAGE	24T8	LB24LP	1	1	3,745	3,745	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		TOILET	60X2	CF13X2	1	1	2,361	2,361	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		TOILET	24T8	LB24LP	1	1	3,745	3,745	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
Grenville Aquatics		WEIGHT ROOM	44EE	LB24HPDL	9	9	4,250	3,613	100%	100%	0%	0.0590	-0.0354	-0.0312	N/A
H. Boyd Park	Lee	BAY WINDOW AREA	65	CF18R30	4	4	3,958	2,375	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	BOYS TOILET	24T8	LB24LP	1	1	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	BOYS TOILET	24T8	LB24LP	2	2	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	BOYS TOILET	24T8	LB24LP	3	3	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	CONFERENCE A	34T8 I/O	L34	16	16	3,866	3,866	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	CORRIDOR	24T8	LB24LP	3	3	3,958	3,958	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	CORRIDOR	24T8	LB24LP	7	7	3,958	2,771	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	CORRIDOR AT GYM	24T8	LB24LP	9	9	3,958	3,958	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	GIRLS TOILET	24T8	LB24LP	1	1	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	GIRLS TOILET	24T8	LB24LP	2	2	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Park	Lee	GIRLS TOILET	24T8	LB24LP	4	4	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A

H. Boyd Lee Park	GIRLS TOILET	24T8	LB24LP	5	5	3,351	3,351	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	GYM	44T5HO	L44T5HO	32	32	5,098	4,589	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	LOBBY	24T8	LB24LP	6	6	4,455	4,455	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	MECH	34T8 I/O	L34	2	2	3,093	2,784	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OFFICE	34T8 I/O	L34	2	2	3,866	3,480	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OFFICE	34T8 I/O	L34	2	2	3,866	3,480	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OFFICE	34T8 I/O	L34	2	2	3,866	3,480	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OFFICE	34T8 I/O	L34	2	2	3,866	3,480	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OFFICE	34T8 I/O	L34	4	4	3,866	3,480	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OUTSIDE TOILET BOYS	24T8	LB24LP	4	4	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	OUTSIDE TOILET GIRLS	24T8	LB24LP	4	4	3,351	2,681	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
H. Boyd Lee Park	STORAGE	24T8	LB24LP	4	4	671	671	100%	100%	0%	0.1043	0.2032	-0.0099	N/A
Park Maint.	BREAK BUILDING	28T8	LB44LP-STP	2	2	780	780	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	BREAK BUILDING	28SLSE	LB24HP-STP	2	2	780	780	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	CHAIN SAW SHED	28T8	LB44LP-STP	1	1	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	EXTERIOR - BUILDING MOUNTED FLOODS	500	REMOVE	2	2	1,734	1,734	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	EXTERIOR - BUILDING MOUNTED	250M	SP-LED WALLPACK-250	4	4	1,734	1,734	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	EXTERIOR - POLE MOUNTED FLOODS	400S	HLB320PS	6	6	1,734	1,734	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	LADDER ROOM	28SLSE	NF8-42HP-32	2	2	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	LAWN SHED	44EE	LB24HPDL-32	4	4	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	LUMBER SHED	28SLSE	LB24HP-STP-32	2	2	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	LUMBER SHED	44EE	LB24HPDL-32	1	1	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	OFFICE	44T8	LB44LP	4	4	1,100	1,100	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	OFFICE	44T8	LB44LP	1	1	1,100	1,100	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	PLUMBING ROOM	24EE	LB24LP	2	2	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	RECYCLE SHED	28SLSE	NF8-42HP-32	2	2	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	STORAGE	44T8	LB24DL	2	2	434	434	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	TOILET	60X3	CF13X3	1	1	1,127	1,127	100%	100%	0%	0.0556	0.0235	-0.0222	N/A

Park Maint.	TOILET	60X2	CF13X2	1	1	1,127	1,127	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	UNDO CANOPY	28SLSE	LB24HP-STP-32	1	1	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	VACUUM ROOM	24EE	LB24LP	1	1	1,041	1,041	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	WELDING SHOP	44T8	LB44LP	7	7	1,301	1,301	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	WORK SHOP	28SLEE	LB24HP-STP	6	6	1,301	1,301	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	WORK SHOP	44EE	LB24HPDL	5	5	1,301	1,301	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Park Maint.	WORK SHOP	150	CF42	2	2	1,301	1,301	100%	100%	0%	0.0556	0.0235	-0.0222	N/A
Public Works B-F	B & G MENS TOILET	44EE	LB24HPDL	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	B&G OFFICE	44EE	LB24HPDL	2	2	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	B&G OFFICE	44EE	LB24HPDL	2	2	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	B&G WOMENS TOILET	44EE	LB24HPDL	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	BUILDING & GROUNDS	44EE	LB24HPDL	3	3	2,153	2,153	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	BUILDING & GROUNDS STORAGE	44EE	LB24HPDL	2	2	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	CARPENTER SHOP	250MH	NF29-43HO	3	3	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	CONCRETE ROOM	44EE	LB24HPDL	2	2	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	ENTIRE GARAGE	250S	NF29-43HO	37	37	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	FLEET SUPERVISOR OFFICE	44EE	LB24HPDL	2	2	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	MAINTENANCE CREW	44EE	LB24HPDL	2	2	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	MENS TOILET	24EE	LB24LP	2	2	3,090	3,090	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	MENS TOILET	44EE	LB24HPDL	3	3	3,090	3,090	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	MOWER SHED	24EE	NF9-42LP-32	22	22	1,996	1,996	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	NO SMOKING	44EE	LB24HPDL	2	2	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	OFFICE	44EE	LB24HPDL	3	3	1,204	1,204	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PAINT SHED	24EE	LB24LP-32	2	2	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PAINT SHED	250MH	NF29-43HO	1	1	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PESTICIDE STORAGE	24EE	LB24LP	3	3	2,571	2,571	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING	44EE	LB24HPDL	2	2	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING	44EE	LB24HPDL	5	5	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING KITCHEN	44EE	LB24HPDL	2	2	1,801	1,801	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING OFFICE	24EE	LB24LP	8	8	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING OFFICE	44EE	LB24HPDL	4	4	2,615	2,615	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A

Public Works B-F	PURCHASING STORAGE	250MH	NF29-43HO-OS	6	6	3,199	2,239	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING TOILET	40X4	CF9G25X4	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	PURCHASING TOILET	24UEE	LB22REF	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	ROAD CREW SHED	28SLSE	NF11-82-32	8	8	1,996	1,996	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	SIGN ROOM	24EE	LB24LP	10	10	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	STORM ROOM	44EE	LB24HPDL	2	2	1,916	1,916	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TIRE SHOP	24EE	LB24LP-32	9	9	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TOILET	40X2	CF9G25X2	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TOILET	44EE	LB24HPDL	1	1	2,075	2,075	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TRAFFIC LITE ROOM	250MH	NF29-43HO	5	5	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TRAFFIC LITE ROOM	44EE	LB24HPDL	2	2	1,204	1,204	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	TRUCK MAINT SHOP	44EE	LB24HPDL	6	6	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	WATER PUMP ROOM	24EE	LB24LP	2	2	3,199	3,199	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
Public Works B-F	WOMENS TOILET	22SS	LB22LP	1	1	3,090	3,090	100%	100%	0%	-0.0161	-0.3604	-0.0128	N/A
South Greenville	CLASSROOM	24EE	LB24LP	8	8	1,006	805	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	CORRIDOR	44EE	LB24HPDL	6	6	4,243	4,243	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	DAY ROOM	24EE	LB24LP	16	16	3,094	2,475	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	EXTERIOR - BUILDING MOUNTED	EXIT PL7	NF1-BATT	8	8	4,333	4,333	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	EXTERIOR - POLE MOUNTED	250M	SP-LED SHOEBOX-250	3	3	4,333	4,333	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	GYM	400MH	NF28-44HO-OS	10	10	3,972	3,574	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	GYM	250MH	NF28-44HO-OS	16	16	3,972	3,574	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	KITCHEN	44T8	LB24HPDL	2	2	1,950	1,950	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	MENS TOILET	44EE	LB24HPDL	6	6	4,298	2,793	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	OFFICE	24EE	LB24LP	2	2	3,250	2,275	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	OFFICE	44EE	LB24HPDL	3	3	3,250	2,275	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	POLICE ROOM	24EE	LB24LP	2	2	3,250	3,250	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	STORAGE	24EE	LB24LP	2	2	1,083	1,083	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	STORAGE	24T8	LB24LP	1	1	1,083	1,083	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	TOILET	44T8	LB24HPDL	1	1	4,298	4,298	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	WEIGHT ROOM	28SLSE	LB24HP-STP	6	6	3,094	2,475	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A
South Greenville	WOMENS TOILET	44EE	LB24HPDL	5	5	4,298	2,793	100%	100%	0%	-0.0003	0.0723	-0.0102	N/A

Sports Connection	BASEBALL HITTING AREA	400MH	NF28-46HO-OS	12	15	1,420	1,136	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	CORRIDOR	44EE	LB24HPDL	15	15	1,765	1,765	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	GYM	400MH	NF28-46HO-OS	9	12	1,420	1,136	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	JANITOR CLOSET	24UEE	LB22REF	1	1	508	508	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	MECH	24UEE	LB22REF	1	1	1,218	1,218	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	MECH	28SLSE	LB24HP-STP	1	1	1,218	1,218	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	MECH	28SLSE	LB24HP-STP	1	1	1,218	1,218	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	MEN'S	44EE	LB24HPDL	2	2	1,733	1,040	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	OFFICE	44EE	LB24HPDL	6	6	1,523	1,523	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	OPEN ROOM	44T8	L44	13	13	277	277	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	STAIRS	14EE	LB14	1	1	277	277	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	STORAGE	44EE	LB24HPDL	5	5	588	294	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	STORAGE	65	CF18	1	1	588	588	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	TABLE TENNIS	44EE	LB24HPDL	6	6	1,420	1,420	100%	100%	0%	0.1879	0.1748	-0.0051	N/A
Sports Connection	WOMENS TOILET	44EE	LB24HPDL	2	2	1,733	1,040	100%	100%	0%	0.1879	0.1748	-0.0051	N/A

E. Cost Savings Calculations

Provided below are the methods and equations used to determine the cost savings associated with this particular methodology.

Cost Savings are calculated as the difference between the baseline and Performance Period energy costs using the utility rates as defined in Schedule D, Energy, Water, and O&M Rate Data. The applicable marginal utility rates will be applied to the baseline and Performance Period energy use as determined in Paragraph B.

Total Cost Savings

$$P = \sum_{i=1}^{n} \left(Q_i - R_i \right)$$

Where,

P = Energy Dollars Saved
Q_i = Baseline cost of retrofit i
R_i = Performance period cost of retrofit i
n = Total number of retrofits

OPTION A – WATER

A. Overview of M&V Plan, and Savings Calculation
B. Water Savings Calculations
C. Key Parameter Measurement Strategy
D. Parameter Estimates
E. Cost Savings Calculations

C. Performance Period Validation Activities

A. Overview of M&V Plan, and Savings Calculation

Savings in this section are determined by using an "Option A: Retrofit Isolation – Key Parameter Measurement" approach as described in the International Performance Measurement & Verification Protocol (IPMVP Volume I, EVO 10000-1:2010). The remainder of this section describes the water savings calculations, key parameter measurements that will be conducted, parameters that will be estimated and those values, and how cost savings will be calculated. The water and cost savings that are determined using this approach will be the annual savings values used for each year of the Performance Period.

B. Water Savings Calculations

Provided within this section is an explanation of the calculations that will be used to perform the water savings calculations for this verification method.

Equations and Analysis of Water Savings

Savings are calculated as the difference in water usage from the baseline conditions, and the Performance Period conditions.

For water consumption, the water savings will be determined for each fixture and summed for all fixtures that will be retrofitted using the following formula:

Water Consumption Savings

$$W = \sum_{i=1}^{n} \left[\left(A_i - B_i \right) \times D_i \times C_i \right]_i$$

Where,

W = Water savings (gal)
A_i = Pre-implementation direct water usage of fixture (gal)
B_i = Post-implementation direct water usage of fixture (gal)
C_i = Average use rate per fixture (count (toilets) or minutes (sinks/showers))
D_i = Retrofit quantity
i = Retrofit

Domestic Water Heating Savings

Applicable to sinks and showers only.

$$F = \sum_{i=1}^{n} \left[W_i \times \left(G_i - H_i \right) \times J_i \right]_i$$

Where,

F = Water Heating Energy Savings Due Reduced Flow (Therms or kWh)
J_i = Heating Energy Conversion Factor of Fixture (Therms/gal or kWh/gal)
G_i = Hot Water Temperature for Fixture
H_i = Cold Water Temperature for Fixture

Note: Electric Domestic Water Heating Savings (kWh) will be calculated for the following sites: Guy Smith Stadium. All other sites will include Natural Gas Domestic Water Heating Savings (Therms).

C. Key Parameter Measurement Strategy

This section outlines the measurements that will be conducted to determine the measured values in the equations provided above in Paragraph B. For this water project, the key parameter that will be measured is the water consumption of each fixture type. Measurement and documentation strategies for each project phase are outlined below.

Pre-Implementation Measurements and Documentation

Water consumption measurements will be taken on a sample set of each baseline fixture type to determine the average water use for each fixture type (A_i). At least eight (8) measurements will be taken for each fixture type (unless fewer exist). Measurements will continue to be taken for a given fixture type until the 80% confidence interval for the true population mean spans no more than 20% above and below the mean of the sample (or until all fixtures have been measured). The mean of this sample set will be treated as the water consumption for that fixture type for all savings calculations. The table below lists each fixture type to be measured, the total quantity of that fixture type, and the minimum amount to be measured prior to removing the fixtures to implement the retrofit.

Fixture Code	Total Fixtures	Minimum Sample
2.2 GPM High Flow Sink	82	8
2.5 GPM High Flow Shower	26	8
3.5 GPF High Flow Toilet	42	8
3.5 GPF Intermediate Flow Toilet	6	6

Post-Implementation Measurements and Documentation

Water consumption measurements will be taken on a sample set of each Performance Period fixture type to determine the average water use for each fixture type (B_i). At least eight (8) measurements will be taken for each fixture type (unless fewer exist). Measurements will continue to be taken for a given fixture type until the 80% confidence interval for the true population mean spans no more than 20% above and below the mean of the sample (or until all fixtures have been measured). The mean of this sample set will be treated as the water consumption for that fixture type for all savings calculations. The preferred locations for measurements for the new retrofit types will be locations where some previous measurement was taken. The number of post-retrofit samples measured is independent from the number of pre-retrofit samples taken. These measurements are taken to determine the average water use of each fixture type, not the reduction of water use in any specific locations. All measurements will be taken using the same equipment and will be calibrated. The table below lists each fixture type to be measured, the total quantity of that fixture type, and the minimum amount to be measured during the post-implementation period.

Fixture Code	Total Fixtures	Minimum Sample
0.5 GPM High Flow Sink	82	8

1.5 GPM High Flow Shower	26	8
1.6 GPF High Flow Toilet	42	8
1.6 GPF Intermediate Flow Toilet	6	6

Performance Period Measurements and Documentation

No additional measurements will be taken during the Performance Period of this M&V strategy.

D. Parameter Estimates

Of the parameters identified under the equations for water savings in Section B, several of the parameters are estimates, and will not be measured during any period of the project. Of the variables identified, the parameters that will be estimated for this particular ECM and M&V strategy include: Flushes (toilets, urinals, etc.) per year, minutes (faucets, etc.) per year, and heating energy conversion factor. All estimated parameters are listed below.

Site	Fixture Type	Quantity (D_i)	Annual Uses (C_i)	Pre-Retrofit Fixture	Post-Retrofit Fixture	Heating Energy Conversion Factor (J_i)		Hot Water Temp (G_i)	Cold Water Temp (H_i)
						kWh/kgal	Therms/kgal		
City Hall	Sink	4	6,505	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
City Hall	Shower	4	1,213	2.5 GPM High Flow Shower	1.5 GPM High Flow Shower	N/A	0.098118	110	60
Police-Fire Rescue	Toilet	22	39,270	3.5 GPF High Flow Toilet	1.6 GPF High Flow Toilet	N/A	N/A	N/A	N/A
Police-Fire Rescue	Sink	30	23,925	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Police-Fire Rescue	Shower	15	6,388	2.5 GPM High Flow Shower	1.5 GPM High Flow Shower	N/A	0.098118	110	60
Park Maintenance Center	Toilet	2	13,442	3.5 GPF High Flow Toilet	1.6 GPF High Flow Toilet	N/A	N/A	N/A	N/A
Park Maintenance Center	Sink	3	3,413	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Park Maintenance Center	Shower	1	0	2.5 GPM High Flow Shower	1.5 GPM High Flow Shower	N/A	0.098118	110	60
Guy Smith Stadium	Toilet	10	143,783	3.5 GPF High Flow Toilet	1.6 GPF High Flow Toilet	N/A	N/A	N/A	N/A
Guy Smith Stadium	Toilet	4	57,513	3.5 GPF Intermediate Flow Toilet	1.6 GPF Intermediate Flow Toilet	N/A	N/A	N/A	N/A
Guy Smith Stadium	Sink	16	115,027	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	2.731881	N/A	105	60
Guy Smith Stadium	Shower	4	2,113	2.5 GPM High Flow Shower	1.5 GPM High Flow Shower	2.875664	N/A	110	60
South Greenville Rec Cntr	Toilet	3	14,711	3.5 GPF High Flow Toilet	1.6 GPF High Flow Toilet	N/A	N/A	N/A	N/A
South Greenville Rec Cntr	Toilet	2	9,807	3.5 GPF Intermediate Flow Toilet	1.6 GPF Intermediate Flow Toilet	N/A	N/A	N/A	N/A
South Greenville Rec Cntr	Sink	5	9,357	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Elm Street Recreation Center	Sink	3	33,998	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Evans Park Building	Sink	8	5,145	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Evans Park Building	Shower	2	732	2.5 GPM High Flow Shower	1.5 GPM High Flow Shower	N/A	0.098118	110	60
Sports Connection	Sink	4	5,097	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60
Greenville Aquatics	Toilet	5	125,794	3.5 GPF High Flow Toilet	1.6 GPF High Flow Toilet	N/A	N/A	N/A	N/A
Greenville Aquatics	Sink	9	85,316	2.2 GPM High Flow Sink	0.5 GPM High Flow Sink	N/A	0.093212	105	60

E. Cost Savings Calculations

Provided below are the methods and equations used to determine the cost savings associated with this particular methodology.

Cost Savings are calculated as the difference between the baseline and Performance Period energy costs using the utility rates as defined in Schedule D, Energy, Water, and O&M Rate Data. The applicable marginal utility rates will be applied to the baseline and Performance Period energy use as determined in Paragraph B.

Total Cost Savings

$$P = \sum_{i=1}^{n} \left(Q_i - R_i \right)$$

Where,

P = Energy Dollars Saved
Q_i = Baseline cost of retrofit i
R_i = Performance period cost of retrofit i
n = Total number of retrofits

COMMISSIONED AND VERIFIED SAVINGS

A. Overview of M&V Plan, and Savings Calculation
B. Annual Commissioned and Verified Savings
C. Performance Period Validation Activities

A. Overview of M&V Plan, and Savings Calculation

The process of using measurement to reliably determine actual savings is an integral part of an on-going energy management program. The expense of performing these measurements to more certainly know the savings must be balance with the gain in savings certainty to avoid negating the financial benefit from the savings. Where there is little doubt about the magnitude of the savings, verification of the potential to achieve savings will be performed. The Section C outlines the verification and confirmation of steps of the energy and operational savings included in Section B. The savings capacity has been calculated during the project development phase. The steps in Section C will be used to confirm the savings capacity exists post-construction. Customer will perform the necessary actions to maintain the ECMs and savings as detailed in Schedule E

B. Annual Commissioned and Verified Savings

Utility Cost Savings

Savings values below are based on energy simulation as detailed in the Utility Baseline Analysis (Section 4) and Energy Conservation Measures (Section 5). Savings capacity will be verified by documentation in O&M Manual (including Warranty documentation) and the Project Commissioning Plan (Section 7). Once successfully commissioned the associated annual savings in the table below for each measure will be claimed as achieved. If all or part of the ECM cannot be implemented and successfully commissioned, the savings associated with the missing portion will be calculated as an Adjustment (per Schedule E) and removed from the claimed savings. After successful commissioning and/or any adjustment to savings due to actual ECM non-performance, any variation between actual and expected performance of the completed ECM will be considered to be caused by variables outside the control of ESCO and Customer and/or non-compliance with Schedule E Customer Responsibilities. Performance Period Validation will be conducted in an effort to help ensure continued performance as per ECM intent. Performance Period Validation will be conducted as an M&V service included in Remote ECM Monitoring and On-site visits, as elected by the client. Savings for each Guarantee Year after the Savings Guarantee Commencement Date will be escalated at a rate of 2% per year. .

	Solar PV	Solar Thermal	Controls	Mechanical
	$	$	$	$
City Hall	$551	-	-	-
Police, Fire & Rescue	-	$1,088	-	-
Epps Recreation Center	-	-	$7,025	-
South Greenville Recreation Center	-	-	$1,619	-
Elm Street Recreation Center	-	-	$180	-
Sports Connection	-	-	$2,669	-
H. Boyd Lee Park Building	-	-	$4,305	-
River Park North	-	-	$3,337	-
Greenville Aquatics & Fitness Center	-	-	$6,618	$10,596
Public Works	-	-	$3,113	-
Greenfield Terrace	-	-	$722	-

Operation and Maintenance Savings

Greenville Aquatics & Fitness Center	$3,000	Chlorine Generator Maintenance Savings
Multiple Buildings	$4,677	Lighting Material and Maintenance Savings

C. Performance Period Validation Activities

Controls

The activities in this section apply to the following locations - Epps Recreation Center/Thomas Foreman Park, Public Works Complex, South Greenville Recreation Center, Elm Street Recreation Center, Sports Connection, H. Boyd Lee Parks Building, Greenville Aquatics and Fitness Center.

Key ECM Objectives – HVAC and Ex Fan runtime reduction, improved temperature control for Standard Temperature Settings, Ventilation reduction through DCV for specific units, Ventilation reduction through improved Ex Fan control

Primary Variables Involved – Actual vs. Contract schedules and Standard Temperature Setpoints, OA volume or CO2 vs. design at varying demands, OA damper operations vs. control variable at varying demands, Actual vs. Occupied Ex fan operations

Performance Period Validation – Remote monitoring and reporting of trend data & observed operations, on-site review where necessary based on remote observations and related customer feedback.
These activities are intended to reflect specific actions related to Remote ECM Monitoring service, under M&V Service Scope and Payment, for this particular ECM at the listed buildings.

The activities in this section apply to the following locations – River Park North, Greenfield Terrace Building.

Key ECM Objectives – HVAC runtime reduction, improved temperature control for standard temperature settings

Primary Variables Involved – Actual vs. Contract Schedules and standard temperature setpoints

Performance Period Validation – Remote monitoring and reporting of trend data and observed operations, on-site review where necessary based on remote observations and related customer feedback
These activities are intended to reflect specific actions related to Remote ECM Monitoring service, under M&V Service Scope and Payment, for this particular ECM at the listed buildings.

HVAC Upgrade

The activities in this section apply to the following locations – Greenville Aquatics and Fitness Center

Key ECM Objectives – Improved pool area environment, improved supplemental pool heating efficiency

Primary Variables Involved – Pool water temperature setpoint, space temperature setpoint, space

relative humidity setpoint

Performance Period Validation – Remote monitoring and reporting of trend data and observed operations, on-site review where necessary based on remote observations and related customer feedback
These activities are intended to reflect specific actions related to Remote ECM Monitoring service, under M&V Service Scope and Payment, for this particular ECM at the listed buildings.

Solar PV

The activities in this section apply to the following locations – City Hall

Key ECM Objectives – Provide supplemental electrical power to existing building electrical service

Primary Variables Involved – Actual vs Standard Test Conditions, solar energy available

Performance Period Validation – Actual metered production reporting

Solar Thermal

The activities in this section apply to the following locations – Police-Fire Rescue

Key ECM Objectives – Provide supplemental heating to existing domestic hw system

Primary Variables Involved – Actual vs Standard Test Conditions, solar energy available

Performance Period Validation – Remote monitoring & reporting of trend data

These activities are intended to reflect specific actions related to Remote ECM Monitoring service, under M&V Service Scope and Payment, for this particular ECM at the listed buildings.

Operation and Maintenance Savings

Chlorine Generator Maintenance Savings is based on Customer reported Chlorine Generator Maintenance costs. Savings capacity will be verified by documentation in O&M Manual (including Warranty documentation) and the Project Commissioning Plan (Section 7). Once ECM is confirmed fully functional post-construction as per design intent, the annual savings in Section B will be achieved and continue to be achieved each year given compliance with Schedule E Customer Responsibilities.

Lighting Material and Maintenance Savings is based on details include in Operational Savings (Section 6). Savings capacity will be verified by documentation in O&M Manual (including Warranty documentation). Once the ECM is confirmed fully functional post-construction as per design intent, the annual savings in Section B will be achieved and continue to be achieved each year given compliance with Schedule E Customer Responsibilities.

Schedule E: Customer Responsibilities For performance guarantee

General Responsibilities

Customer acknowledges and agrees that proper maintenance is essential to any energy conservation program. Therefore, Customer agrees to undertake the following responsibilities:

Customer agrees to: (1) provide, or cause its suppliers to provide, periodic utility invoices to ESCO within ten (10) days of receipt, (2) execute all Customer responsibilities as outlined herein, and (3) provide to ESCO reasonable access to all Customer facilities and information necessary for ESCO to perform its responsibilities. Access will include, but is not limited to, the following items:

- All buildings listed within this Contract
- All buildings served by the meters listed within this Contract
- All mechanical equipment rooms in the buildings listed within this Contract
- All temperature control and energy management systems which control part or all of any of the buildings listed within this Contract
- Personnel with responsibility for operating and/or managing any of the buildings listed within this Contract
- Monthly utility invoices and billing history for all of the meters listed within this Contract
- Construction documents, equipment inventories, and other documents that may be helpful in evaluating a cause for adjustment as listed within this Contract
- Any data from meters or sub-meters relevant to M&V associated with this Contract

Customer will solely be responsible for providing communications and/or network interface to all buildings for operation and PASS support.

Customer will perform daily facilities monitoring and promptly review any alarm summaries.

Customer will designate a “Primary Operator” of the system. The Primary Operator is defined as the individual who will be trained by ESCO during the installation period and will be responsible for daily operation and maintenance of the equipment and systems necessary to achieve the Performance Guarantee. Customer will notify ESCO within five (5) days after the departure or termination of the Primary Operator. Within ten (10) days of the departure of the current Primary Operator, Customer will designate a new Primary Operator and shall provide ESCO access to train the new Primary Operator. ESCO shall train a new Primary Operator at the sole expense of Customer on a time and materials basis.

Maintenance Responsibilities

Customer agrees to use its best efforts to maintain the ECMs in original operating condition (“Original Operating Condition”) with allowance for normal wear and tear. If an ECM is operating at any state other than the Original Operating Condition as defined above (“Failed ECM”), Customer agrees to (1) repair or replace the ECM immediately, and (2) contact a PASS representative at 1-800-274-5551 option 4, within 24 hours of such event. ESCO reserves the right to adjust the amount of Performance Guarantee associated with the Failed ECM for the duration of the failure in the Annual Savings Guarantee.

Customer will agree to maintain all parts of the Project site(s) where the ECM(s) reside including but not limited to components, equipment, machinery, energy management systems, structure of the facility(s), computer hardware, network and IT systems, either existing or newly installed. Customer must comply with the general maintenance requirements specified by equipment manufacturers and the maintenance

tasking guidelines included in the operating and maintenance manual. Customer will be responsible to provide to ESCO documentation that proper maintenance has been performed at ESCO'S request within fifteen (15) days of written request.

Notwithstanding anything to the contrary contained herein, all ECM(s) must be maintained in proper working condition in all cases where the performance of said ECM(s) affects or could affect the ability to achieve, measure or verify the Annual Savings Guarantee. Should Customer refuse to perform the required maintenance as required in this Contract, ESCO and Customer shall agree to one of the following means of recourse: (1) ESCO will adjust the Performance Guarantee associated with that ECM pursuant to Schedule E, or (2) ESCO may terminate this Performance Guarantee and any and all obligations and liabilities of ESCO associated therewith upon fifteen (15) days written notice.

Adjustment Responsibilities

In addition to the responsibilities of Customer set forth in this Schedule, Customer also agrees to undertake the responsibilities set forth in the Adjustment Schedule as necessary. Changes to Customer's facilities which interfere with the ability to achieve, measure, or verify the savings performance of the installed ECMs must be accounted for in the determination of savings. Customer is responsible for communicating these changes and taking the lead in evaluating their impact. ESCO is a partner in the impact evaluation process, but may require additional fees to evaluate the impact of significant changes which are above the threshold limits defined in the Adjustment Schedule below.

Adjustment Schedule

Below is the procedure for accounting for non-routine adjustments for any of the utility meters included in Schedule D. A non-routine adjustment is required for any change outside of those explicitly defined in Schedule D that will impact the energy use or the verified savings under this Contract. It is Customer's responsibility to notify ESCO of any changes that may necessitate a non-routine baseline adjustment and to perform the required non-routine baseline adjustment steps identified below at Customer's sole expense.

Assumed Savings Procedure Adjustment

The savings guarantee for all affected meters is void until the condition which necessitated using the Assumed Savings Procedure has been remedied. This may be remedied either by removing the change which did not get evaluated in accordance with the non-routine baseline adjustment responsibilities, or by fulfilling the requirements of the non-routine baseline adjustment responsibilities.

Estimated Savings Procedure Adjustment

At ESCO'S sole discretion, ESCO will estimate the impact of the change using computerized building simulations, manual calculations, or other generally accepted estimating procedures and may ignore any changes which fall below the threshold limit.

Customer Required Non-Routine Baseline Adjustment Responsibilities

If the required non-routine baseline adjustment steps are not performed, and the change is greater than the threshold limit, savings will be determined with the Assumed Savings Procedure Adjustment, as defined below. Actual Savings will be determined using the Assumed Savings Procedure Adjustment for all billing periods until the required non-routine baseline adjustment steps have been completed, or until the change which necessitated the non-routine baseline adjustment is no longer in place. If Customer fails to notify ESCO of a change necessitating a non-routine baseline adjustment or fails to provide details of the change, savings will be determined with the Assumed Savings Procedure Adjustment.

If the required non-routine baseline adjustment steps are not performed, and the change is less than the threshold limit, savings will be determined with the "Estimated Savings Procedure Adjustment". Actual Savings will be determined using the Estimated Savings Procedure Adjustment for all billing periods until the required non-routine baseline adjustment steps have been completed, or until the change which necessitated the non-routine baseline adjustment is no longer in place.

Adjustments 5 – 8 in the list below require the use of a calibrated computer simulation. As part of the investment grade audit, ESCO created computer simulations of the facilities for use in estimating the achievable energy savings. ESCO will retain these simulations to assist Customer in fulfilling the adjustment responsibilities. Once informed of the necessity to use the computer simulations, ESCO will provide Customer an estimated cost for this service. The complexity of the simulation activity will be used to determine this cost, which may be $0 for very simple simulation modifications. Customer is not required to use ESCO's services related to the computer simulations. If Customer elects to perform simulations on their own or hires a third party to perform those simulations, ESCO will provide the output and assumptions of the model but not the modeling software itself. If the customer is to be responsible for determining what effect a change has on consumption they need to be able to refer back to the initial baseline determination.

1. Addition of New Building or New Energy User

- All utility services to the building or new energy user (which may include items such as decorative fountains, exterior lighting, parking decks, outdoor pools, electric vehicle charging stations, etc.) which affect the energy use of any meter included in Schedule D must be sub-metered at Customer's expense.
- Threshold limit: the smallest of 2% of the connected load on any affected meter, 10% of the area served by any affected meter as defined in Schedule D, or 20,000 ft^2.

2. Addition to Existing Building

- All utility services to the addition which affect the energy use of any meter included in Schedule D must be sub-metered at Customer's expense.
- Threshold limit: the lesser of 10% of the area served by any affected meter, as defined in Schedule D or 20,000 ft^2.

3. Renovation / Modification to Existing Building or Utility Service

- All utility services for the affected portion of the building must be sub-metered before and after the change until the effect on the energy consumption has been determined at Customer's expense.
- Threshold limit: the lesser of 10% of the area served by any affected meter, as defined in Schedule D or 20,000 ft^2.

4. Demolition / Abandonment of Existing Building or Utility Service

- All utility services for the affected buildings must be sub-metered before and after the change until the effect on the energy consumption has been determined at Customer's expense.
- Threshold limit: the lesser of 10% of the area served by any affected meter, as defined in Schedule D or 20,000 ft^2.

5. Change in Occupancy

- Customer must perform, or cause to be performed, at Customer's expense, a calibrated computer simulation to account for the change. If the impact computed by the simulation is greater than 20% of the projected savings on the meter, the "Assumed Savings Procedure" listed above will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: 5% of the total occupant count in the base year.

6. Change in Schedule

- Customer must perform, or cause to be performed, at Customer's expense, a calibrated computer simulation to account for the change. If the impact computed by the simulation is greater than 20% of the projected savings on the meter, the Assumed Savings Procedure will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: 5% of the total scheduled hours for the meter as defined in Schedule D.

7. Change in Set-points

- Customer must perform, or cause to be performed, at Customer's expense, a calibrated computer simulation to account for the change. If the impact computed by the simulation is greater than 20% of the projected savings on the meter, the Assumed Savings Procedure will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: An average of 0.5° from the set-points defined in Schedule D.

8. Change in Operational Calendar

- Customer must perform, or cause to be performed, at Customer's expense, a calibrated computer simulation to account for the change. If the impact computed by the simulation is greater than 20% of the projected savings on the meter, the Assumed Savings Procedure will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: 5% of the total scheduled hours for the meter as defined in Schedule D.

9. Change in Plug Load

- Customer must perform, or cause to be performed, at Customer's expense, a simulation of energy impact to account for the change. If the computed impact is greater than 20% of the projected savings on the meter, the Assumed Savings Procedure will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: 1% of the base year peak 15-minute average kW for the affected meter.

10. Customer Initiated ECMs

- Customer must develop and execute an M&V plan at Customer's expense, which has been reviewed and approved by ESCO, to evaluate the impact of the change. If the impact determined by the M&V plan is greater than 20% of the projected savings on the meter, the Assumed Savings Procedure will be followed. In no event will the adjusted savings be reported as less than the savings achieved in the preceding project year.
- Threshold limit: 2% of the projected savings on any affected meter.

11. Missing Bills

- Customer is required to provide ESCO with utility bills for meters defined in Schedule D within ten (10) days of receipt of each bill or provide ESCO direct access to retrieve the utility bills electronically. If utility bills are not received by ESCO within sixty (60) days of the end of the service date, the Assumed Savings Procedure will be used.

12. Failure to Operate ECMs According to Operational and Design Intent

- Customer agrees to operate the ECMs according to the Operational and Design Intent of the ECMs. Failure to do so will necessitate a baseline adjustment using the Assumed Savings Procedure.

13. Failure to Perform Project Specific Customer Responsibilities

- Customer agrees to perform the project specific Customer responsibilities as defined in Schedule E. Failure to do so will necessitate a baseline adjustment using the Assumed Savings Procedure.

14. Other Causes

- Any change that impacts the energy use on the meters defined in Schedule D that does not fit into any of the other categories may still require a non-routine baseline adjustment. Customer will notify ESCO before any change is made so that an agreeable adjustment strategy can be determined. If no agreeable adjustment method can be reached, the Assumed Savings Procedure will be used.

15. Ventilation Air Adjustment

- An adjustment for the added ventilation air will be included. The values in the table below will be modified for weather impact and used with the baseline equations specified in the Meter Tuning in Schedule D to calculate the adjusted baseline period consumption and demand.

Ventilation Air Adjustment										
	City Hall Electric		Municipal Building		Public Works Admin Electric & Gas			Jaycee Park Building Electric & Gas		
	KWH	KW	KWH	kW	KWH	KW	Therms	KWH	KW	Therms
Jan	6,024	3	5,772	13	1,863	4	232	5,762	5	972
Feb	4,528	4	4,591	18	1,702	4	179	5,210	5	793
Mar	2,455	7	4,574	20	1,867	4	218	5,954	5	787
Apr	1,386	2	904	20	2,037	3	69	5,625	4	279
May	1,257	3	207	1	2,435	3	27	4,900	1	141
Jun	3,534	9	211	2	2,624	3	1	9,857	16	0
Jul	4,769	8	660	0	3,135	1	0	12,823	19	0
Aug	5,191	13	329	1	2,768	1	2	10,883	15	0
Sep	2,158	4	60	3	2,341	4	9	7,836	18	1
Oct	1,045	2	690	1	2,220	2	56	4,923	2	236
Nov	2,074	2	1,514	28	2,106	4	103	5,669	2	350
Dec	5,395	5	4,138	23	1,954	4	195	6,034	5	718

EXHIBIT A: MEASUREMENT AND VERIFICATION SUPPORT SERVICES

Section 1 – Services during Year 1 and 2

ESCO shall provide the Measurement and Verification Services (the "Services") defined below to Customer during the Yr 1 and Yr 2 as defined in Schedule D.

	Year 1	Year 2
Remote Energy Management, Training & Technical Support		
Hours	20	20
Remote ECM Monitoring and Reporting		
Reporting Frequency	Monthly	Monthly
Measurement and Verification Reporting		
Reporting Frequency	Quarterly	Quarterly
On-Site Visits		
# of projected visits included	4	2
Training		
Training Total Hrs	24	16
Training Hr Blocks (Sessions/Hrs)	4/6	4/4

Section 2 – Services After year 2

	Year 3
Remote Energy Management, Training & Technical Support	
Hours	Not Included / Client Option
Remote ECM Monitoring and Reporting	
Reporting Frequency	Not Included / Client Option
Measurement and Verification Reporting	
Reporting Frequency	Quarterly
On-Site Visits	
# of projected visits included	1
Training	
Training Total Hrs	Not Included / Client Option
Training Hr Blocks (Sessions/Hrs)	Not Included / Client Option

The service options made available by ESCO in Yr 3 through Yr 15 shall be dictated by the ESCO.

The annual cost of Measurement and Verification Services for the term of the contract are defined below:

Year	Cost
1	$13,272
2	$13,537
3	$13,808
4	$14,084
5	$14,366
6	$14,653
7	$14,946
8	$15,245
9	$15,550
10	$15,861
11	$16,178
12	$16,502
13	$16,832
14	$17,169
15	$17,512