

# ENERGY SERVICES PROPOSAL

Energy Services Authorization No:  
2018-784 A (1)

City of Stevenson  
Water Meter Replacement & Lighting  
Upgrades at the City Hall and Water  
Treatment Facility



## Table of Contents

SECTION 1: EXECUTIVE SUMMARY .....	1
SECTION 2: FACILITY DATA .....	4
SECTION 3: PROJECT SCOPE OF WORK .....	8
SECTION 4: UTILITY SAVINGS AND VERIFICATION.....	13
SECTION 5: CONSTRUCTION PROCESS.....	31
SECTION 6: PROJECT FINANCIALS .....	34
FIM SUMMARY.....	37
20-YEAR CASH FLOW .....	38
APPENDIX A: LIGHTING SURVEY .....	39
APPENDIX B: WATER METER INVENTORY .....	39
APPENDIX C: WATER METER TESTING RESULTS .....	39
APPENDIX D: BUY AMERICAN PROVISION .....	39
APPENDIX E: DAVIS BACON PROVISION.....	39
APPENDIX F: SAVINGS CALCULATIONS .....	39

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## SECTION 1: EXECUTIVE SUMMARY

This Energy Services Proposal (ESP) documents the findings and proposed improvements identified through an Investment Grade Audit (IGA) performed by Apollo Solutions Group (ASG) as part of the Energy Savings Performance Contract (ESPC) process for the City of Stevenson in Stevenson, WA. The outcome of implementing the proposed facility improvement measures (FIMs) includes:

- The total project cost is \$649,666
- The total Guaranteed Maximum Construction and ESCO FEE cost is \$570,212
- The total Non-Guaranteed Costs, including WA State taxes and DES Fees, is \$79,454
- Utilization of Department Commerce Energy Grant of \$314,633
- Efficiency upgrades of the following systems include:
  - City wide water meter replacements including Automatic Reader Meter reader technology.
  - LED lighting upgrades at the City Hall and Water Treatment Plant
- Standardization and improved reliability of systems.
- Total annual cost savings of \$72,714 for water meter replacements to include projected revenue enhancement of \$45,934 and O&M savings of \$26,780
- Energy cost savings of \$1,038 for LED lighting upgrades
- Improved meter accuracy guarantee no less than 4.18% for a water savings of 292,760 cubic feet per year

ASG has worked with the City of Stevenson's staff, with review and approval from the Washington Department of Enterprise Services ESPC Program, to develop this proposal for implementing the FIMs. The City of Stevenson staff and ASG team collaborated for 8 months in the development of these proposed improvements.

This water retrofit project meets the cost effectiveness criteria of the City of Stevenson.

The implementation phase of the project will begin in the second quarter of 2020 and conclude in the fourth quarter of 2020. ASG proposes to guarantee the meter accuracy resulting in enhanced revenue for the city for a period of three years. The cost of measurement and verification for the first year is included in the price of the project. However, the performance guarantee is only valid when M&V services are provided by ASG. The scope and annual cost of M&V services is presented in Section 4 of this proposal.

This Energy Services Proposal (ESP) documents the findings and proposed improvements identified through an Investment Grade Audit (IGA) performed by Apollo Solutions Group (ASG) as part of the Energy Savings Performance Contract (ESPC) process for the City of Stevenson in Stevenson, WA. The outcome of the Energy Services Proposal will be to implement the proposed facility improvement measures (FIMs).

## ACKNOWLEDGEMENTS

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Apollo Solutions Group would like to thank the City of Stevenson for their cooperation in providing data, access, and assistance in the development of this Energy Services Proposal. Mayor Scott

Anderson, Public Works Director Eric Hansen, City Administrator Leana Johnson, and DES Energy Engineer Lisa Steel

**PROJECT FINANCES & GUARANTEE**

The total cost to implement the FIMs is a guaranteed maximum construction cost itemized in detail in Table 1-1. This price includes the Department of Enterprise Services’ project management fee, and Washington State Sales Tax. The proposed improvements will be funded by third party financing negotiated by The City of Stevenson. Financial details are provided in Section 6 of this ESP.

Table 1-1

<b>OPEN BOOK PROJECT COST SUMMARY</b>	
City of Stevenson	
	TOTAL
<b>CONSTRUCTION COSTS</b>	
Direct Subcontracted Costs	\$346,304
ASG On-Site Services (Supervision, etc.)	\$27,387
Misc. Direct Costs	\$0
<b>SUB-TOTAL CONSTRUCTION COSTS</b>	<b>\$373,691</b>
Performance Bond	\$5,381
<b>TOTAL DIRECT CONSTRUCTION COSTS</b>	<b>\$379,072</b>
<b>ESCO FEES</b>	
Audit Fee	\$49,394
Design Engineering	\$34,630
Construction and Project Administration	\$20,778
Overhead	\$34,630
Profit	\$27,704
<b>TOTAL ESCO FEES</b>	<b>\$167,136</b>
<b>OTHER COSTS</b>	
Project Contingency	\$12,372
Construction Interest	\$0
ASG Year 1 M&V	\$3,763
ASG Year 2 M&V	\$3,876
ASG Year 3 M&V	\$3,993
<b>TOTAL OTHER COSTS</b>	<b>\$24,004</b>
<b>TOTAL GUARANTEED CONSTRUCTION &amp; ESCO COSTS</b>	<b>\$570,212</b>
<b>NON-GUARANTEED COSTS</b>	
Misc. Costs:	\$0
Tax - Construction and Professional Svcs	\$42,954
Washington DES Project Mgmt Fee	\$36,500
<b>TOTAL NON-GUARANTEED COSTS</b>	<b>\$79,454</b>
<b>TOTAL MAXIMUM PROJECT COST</b>	<b>\$649,666</b>

The Total Guaranteed Construction & ESCO Costs are guaranteed to the City of Stevenson. Any cost overruns beyond this price will be borne by ASG. Barring unforeseen changes in conditions or the City of Stevenson-requested changes to scope, there will be no changes in price (change orders) to the City. Construction costs will be documented throughout the project in a transparent, open book pricing methodology.

The cash flow presented in Table 1-2 illustrates the favorable economics of this project. The project will be self-funding and retire the debt from the third-party financing in year 15. A more detailed cash flow is presented in Section 6 of this proposal that shows how different financial components come together to form the cash flow presented in Table 1-2.

Table 1-2

EXECUTIVE CASH FLOW SUMMARY				
PROJECT YEAR	ANNUAL BENEFITS	ANNUAL COSTS	ANNUAL CASH FLOW	ACCUMULATED CASH FLOW
0	\$0	\$0	\$0	\$0
1	\$73,752	\$26,319	\$47,433	\$47,433
2	\$75,965	\$30,195	\$45,770	\$93,203
3	\$78,244	\$30,311	\$47,932	\$141,135
4	\$80,591	\$26,319	\$54,272	\$195,407
5	\$83,009	\$26,319	\$56,690	\$252,097
6	\$85,499	\$26,319	\$59,180	\$311,277
7	\$88,064	\$26,319	\$61,745	\$373,023
8	\$90,706	\$26,319	\$64,387	\$437,410
9	\$93,427	\$26,319	\$67,108	\$504,518
10	\$96,230	\$26,319	\$69,911	\$574,429
11	\$99,117	\$26,319	\$72,798	\$647,227
12	\$102,090	\$26,319	\$75,771	\$722,998
13	\$105,153	\$26,319	\$78,834	\$801,832
14	\$108,307	\$26,319	\$81,989	\$883,821
15	\$111,557	\$26,319	\$85,238	\$969,059
16	\$114,903	\$0	\$114,903	\$1,083,962
17	\$118,350	\$0	\$118,350	\$1,202,313
18	\$121,901	\$0	\$121,901	\$1,324,214
19	\$125,558	\$0	\$125,558	\$1,449,772
20	\$129,325	\$0	\$129,325	\$1,579,096
<b>Total</b>	<b>\$1,981,746</b>	<b>\$402,649</b>	<b>\$1,579,096</b>	

## SECTION 2: FACILITY DATA

The facility data documented in this section of the report was obtained through the site evaluation process. The key task of the Investment Grade Audit, which is a name given to a project phase composed of many tasks, is the site evaluation. This is commonly referred to as the energy audit; although the definition of an energy audit includes many tasks that are not performed on-site. It is a task upon which all other tasks rely - the scope, savings, and construction costs cannot be known without a thorough understanding of the site. ASHRAE writes in its HVAC Applications Handbook:

Energy audits may include the following:

1. Collect and analyze historical energy use and billed water use
2. Study the building, street lighting, and water billing systems, and their operational characteristics
3. Identify potential modifications to reduce energy use and/or cost
4. Identify potential modifications to improve the water billing system
5. Perform an engineering and economic analysis of potential modifications
6. Prepare a rank-ordered list
7. Report results

The work performed by ASG as part of the IGA corresponds to an ASHRAE Level II/III audit; which are defined as:

Level II: ...a more detailed building survey and energy analysis, including a breakdown of energy use in the building, a savings and cost analysis of all practical measures that meet the owner's constraints, and a discussion of any effect on operation and maintenance procedures. It also lists potential capital-intensive improvements...

Level III: This focuses on potential capital-intensive projects identified during Level II and involves more detailed field data gathering and engineering analysis. It provides detailed project cost and savings information with a level of confidence high enough for major capital decisions.

ASHRAE also notes that the levels of energy audits do not have sharp boundaries. They are general categories for identifying the type of information that can be expected and an indication of the level of confidence in the results.

The work performed by ASG specifically as part of the site and system evaluation (usually referred to together as "the audit") falls generally into two categories:

1. Evaluation of the building(s) and systems, and their operational characteristics
2. Identification of potential modifications to reduce energy use or cost

The collection of facility data for this section of the report is performed through this evaluation of the buildings and systems, and their operational characteristics. The potential modifications to reduce energy use or cost are discussed in a different section of the report.

### FACILITY DATA SUMMARY

FACILITY:	Stevenson City Hall
SQUARE FOOTAGE:	4,800 sqft
APPROXIMATE BUILDING AGE:	68 yrs
ASG FACILITY PERFORMANCE RATING:	Average
HOURS OF OPERATION	Mon - Fri 7:30am-5:30pm



### FACILITY USAGE AND OCCUPANCY:

The building encompasses the city hall and administrative offices. The entire building is open offices with an area for conferences. The entire basement is used for storage.

### BUILDING ENVELOPE:

The city hall is a one-story building with a full daylight basement. The building is located at 7121 East Loop Road, Stevenson, WA 98648. The building is a wood structure with dual pane windows, code compliant insulation, and a pitched asphalt shingle roof.

### LIGHTING SYSTEMS:

The lighting upstairs consists of fluorescent drop-in T-8 troffers with some wraps and recessed can lights. Downstairs are wraps, screw in compact fluorescents, and T-12 industrial strip lights.

See Appendix A for lighting survey

### HVAC SYSTEMS & CONTROLS:

The heating system consists of one condensing furnace with a heat pump for heating and cooling. The furnace is a Tempstar smart comfort series unit with a R410a heat pump.

### UTILITIES:

The total electric use for the building was **23,080 kWh** at a total cost of **\$1,909** for the year of **2016**. Electricity (meter 80229956) is purchased from Skamania PUD at an average rate of **\$0.083 per kWh**.


The natural gas use for the building is purchased from Avista but is not part of this project.

**Energy Cost Index**

**\$0.30** per Square Foot/Year (electricity only)



### FACILITY DATA SUMMARY

FACILITY:	Stevenson Water Treatment Plant	
SQUARE FOOTAGE:	2,000 sqft	
APPROXIMATE BUILDING AGE:	40 yrs	
ASG FACILITY PERFORMANCE RATING:	Average	
HOURS OF OPERATION	Mon - Fri 1 hr/day	

### FACILITY USAGE AND OCCUPANCY:

The building encompasses the water treatment systems and pumps for pressurization of the City's water. The building is rarely used except for maintenance or testing of the water.

### BUILDING ENVELOPE:

The water treatment plant is a one-story steel frame pole building with metal roof and siding. The building is located at Ryan Allen Rd, Stevenson, WA 98648.

### LIGHTING SYSTEMS:

The lighting consists of fluorescent 2-lamp industrial shop lights.

See Appendix A for lighting survey

### HVAC SYSTEMS & CONTROLS:

The heating system consists of multiple electric unit heaters to prevent freezing.

The treatment plant consists of controls and 5 pumps:

- 50 hp pump for fire emergencies flow requirements and to help pressurized the upper storage tank.
- (2) 20 hp that lead lag to fill the main storage tank.
- (2) 7.5 hp circulation pumps for the treatment center

### UTILITIES:

The total electric use for the building was **135,600 kWh** at a total cost of **\$10,775** for the year of **2017**. Electricity (meter 13023776) is purchased from Skamania PUD at an average rate of **\$0.079 per kWh**.

The natural gas use for the building is purchased from Avista, but is not part of this project.

**Energy Cost Index**

**\$3.08** per Square Foot/Year (electricity only)

### WATER METER DATA SUMMARY

FACILITY:	Water Meters
SQUARE FOOTAGE:	N/A
APPROXIMATE AGE:	N/A
ASG FACILITY PERFORMANCE RATING:	N/A



### FACILITY USAGE AND OCCUPANCY:

N/A

### BUILDING ENVELOPE:

N/A

### WATER METER SYSTEMS:

According to the City of Stevenson's billing system, there are currently (688) water meters installed. The city's water system serves (569) residential customers and (116) commercial customers. Most of these meters are 5/8" x 3/4" Hersey meters, and others vary in size between 1" to 4". Meters are predominately located in interior locations. Each of these meters is read manually by a meter reader by a City of Stevenson Water Department operator. Tables below summarizes the count of meters by customer types and size:

Row Labels	Count of Service Address
1 1/2" Inside Comm	3
1" Inside Commercial	13
1" Inside Res	2
1" Outside Res	1
2" Inside Commercial	16
3" Inside Commercial	1
3/4" Inside Commercial	80
3/4" Inside Res	520
3/4" Outside Commercial	1
3/4" Outside Res	31
3/4" Senior Inside Res	14
3/4" Senior Outside Res	1
4" Inside Commercial	2
Transient Lodging Base Water Rate (blank)	3
<b>Grand Total</b>	<b>688</b>

Size	Quantity
3/4"	647
1"	16
1 1/2"	3
2"	16
3"	1
4"	2
Transient Lodging Base Water Rate	3
<b>Total</b>	<b>688</b>

### **SECTION 3: PROJECT SCOPE OF WORK**

The City of Stevenson has selected, for development in this Investment Grade Audit, a number of Facility Improvement Measures (FIMs) that were presented by ASG as a result of a Preliminary Energy Assessment. These FIMs generate cost savings, improve the operation of the City, and reduce the loss in water and sewer revenue. This section of the Energy Services Proposal describes each FIM and the scope of work that ASG will implement during construction to achieve the savings.

The scopes of work for each FIM were developed after a site survey as part of the IGA. While every effort has been made to identify failed equipment and problematic building operation during the site survey, there may be additional work identified during design and construction that are not included in the scope of work for each FIM as defined in this section of the proposal. Some of this work could include, but is not limited to, repairing or replacing equipment that is found to be malfunctioning or failed, repairing or replacing equipment that may have been damaged after the site survey, correcting problematic building or system operation, etc. ASG may work with the owner to correct such deficiencies however any work that is not included in the scope of work for each FIM will require a change order and additional compensation.

ASG will pay the L&I fees for this project as well any required permitting fees.

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## FIM-01: LED LIGHTING AT CITY HALL AND WATER TREATMENT PLANT

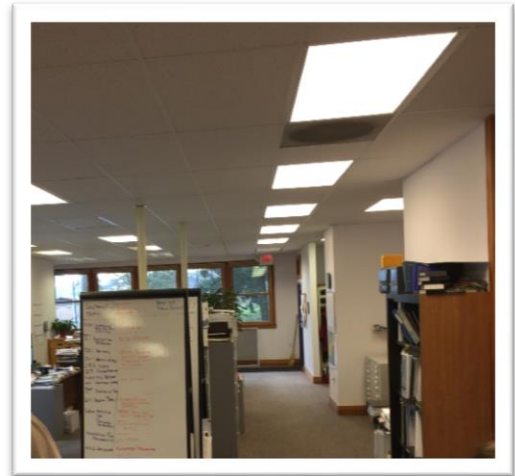
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### *Existing Conditions:*

ASG performed a lighting audit at the water treatment plant and the city hall. The lighting at the water treatment plant consists of fluorescent 2-lamp industrial shop lights. The lighting at the City Hall consists of fluorescent drop-in T-8 troffers with some wraps and recessed can lights in the upstairs. Lights in downstairs are wraps, screw in compact fluorescents, and T-12 industrial strip lights.

### *Proposed Modifications:*

All fixtures will be replaced with new UL-listed LED fixtures with controls for occupancy and daylight sensing according to Appendix A: Lighting Survey.



Breakdown of proposed modifications is as follows:

### *Benefits & Results:*

- The proposed lighting fixtures will reduce electricity usage
- Replacing the complete fixture will reduce the maintenance needs

### *Scope of Work:*

The scope of work for this FIM includes:

- Replacement of UL-listed light fixtures
- Building code upgrades not necessary to complete this scope of work
- Additional occupancy sensors, additional external photo cells and new timers.

Services provided by ESCO:

- Construction management
- Project supervision
- Engineering design review
- M&V as indicated in the FIM-specific M&V plan

Extent of subcontracting:

- Engineering design
- High and low voltage electrical construction

Approved equipment:

- Fixtures by Philips/Advance or approved equal

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## FIM-02: WATER METER REPLACEMENT AND AMR INSTALLATION

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### *Existing Conditions:*

The City of Stevenson currently has (688) water meters recorded in the billing system. Each of these meters are read manually by a City operator. Residential meters are typically ¾" x 1" Hersey meters, installed in interior locations.

The city's billing system was studied to create the existing meter inventory consisting of the following information: meter address, meter size, meter age, and customer type (i.e. Inside Residential, etc.). Meter age information was not recorded in the billing system. Complete meter inventory is included as *Appendix B: Water Meter Inventory*. Meter accuracy testing was performed during the Investment Grade Audit to estimate the revenue recovery expected from the installation of new meters. The result of the test is attached as *Appendix C: Water Meter Accuracy Test Result*.

**Table 2-1: Stevenson Meter Inventory (Count by Service Address)**

Row Labels	Count of Service Address
1 1/2" Inside Comm	3
1" Inside Commercial	13
1" Inside Res	2
1" Outside Res	1
2" Inside Commercial	16
3" Inside Commercial	1
3/4" Inside Commercial	80
3/4" Inside Res	520
3/4" Outside Commercial	1
3/4" Outside Res	31
3/4" Senior Inside Res	14
3/4" Senior Outside Res	1
4" Inside Commercial	2
Transient Lodging Base Water Rate	3
(blank)	
<b>Grand Total</b>	<b>688</b>

### *Proposed Modifications:*

Replace meters listed above with composite meters that are Automated Meter Reading (AMR) enabled to allow drive-by reading and eliminate a need for a City employee to exit the vehicle at each individual meter location.

New meters will be furnished and installed by ASG. Data points will be integrated to the billing system.

**Table 2-2: Stevenson Meter Replacement Style and Quantities**

Item	Description	Qty.
1	flowIQ® 2250 RF; 25 GPM 5/8" x 3/4"; lead-free PPS flow tube	647
2	flowIQ® 2250 RF; 55 GPM 1" x 10.75"; 316 stainless steel flow	16
3	flowIQ® 3250 RF; 120 GPM 1.5" x 13"; 316 stainless steel flow	3
4	flowIQ® 3250 RF; 160 GPM 2" x 17"; 316 stainless steel flow tube	16

*Benefits & Results:*

- The project will complete the meter replacement project within months whereas the current maintenance staff would need years to replace all of the meters in consideration of their other projects/workload.
- New meters will improve the overall meter accuracy to provide revenue recovery for the city.
- New meters will improve the billing equality – currently, some customers are billed more per unit volume than others.
- New meters will meet the no-lead requirement per Safe Drinking Water Act.
- Hot Rod Transmitters will eliminate the meter reading cost by allowing faster, easier meter reading operation.

*Scope of Work:*

The scope of work for this FIM includes:

- Meter installation is defined as removal of existing meter and replace with new meter and communication technology. Installation of new meter gaskets is provided.
- Flush service lines (where possible) after meter installation.
- Coordinate meter installation activities around meter reading schedule.
- Collect meter installation data on tablet.
- Pictures of meter reading and post installation will be collected during time of change out and will be available to the city upon request.
- GPS coordinates accurate within 10' will be collected at time of installation.
- Weekly meter change file will be provided in electronic format suitable for Utility Billing upload.
- Removal of all job-related debris.

The scope of work for this FIM excludes:

- Replacing old or damaged service pipe either from the City-side or customer side.
- Correcting any observed plumbing code violations necessary to complete the scope of work.
- Installation of new valves.
- Re-plumbing settings to accommodate non-standard meter lay lengths or meter couplings.
- Replacement of inaccessible or un-installable water meters.
- Inaccessible or un-installable water meter condition shall be remedied by the City. Inaccessible or un-installable water meter condition includes the following:
  - Locations where there is no operable valve(s) to allow the isolation of the meter.

- Location that have physical obstructions preventing the installation of the meter (water heater, water softener, finished basement, behind locked gate, etc.
- Locations with nonstandard lay length or connections requiring the setting to be re-plumbed.
- Meters where the City's customer prevents ESCO from accessing the meter to perform the change-out ,
- ESCO will service the water meters so long as inaccessible or un-installable water meter condition is remedied by the City prior to the ESCO demobilizing from the project.

Services provided by ESCO:

- Construction management
- Project supervision
- Engineering design review
- M&V as indicated in the FIM-specific M&V plan

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## SECTION 4: UTILITY SAVINGS AND VERIFICATION

The savings from the proposed projects are arrived at through a three step process. The first step in the process is the analysis of utility billing information which establishes the amount and cost of utilities (electricity and natural gas) that are provided to the site. The second step in the process is the analysis of equipment information that establishes where the utility usage is allocated within the facility. It is the changes to this equipment, and its operation, which generate the savings. The third step in the process is integrating the measurement and verification (M&V) plan for each FIM into the IGA. These M&V plans and associated measurements, services, and operations form the basis of validating that savings have been achieved. This section of the Energy Services Proposal describes these three steps and how they come together to form the project guarantee.

The revenue recovery from the water meter replacement and AMR project is arrived at through a three-step process. The first step is the analysis of existing billing data which established the amount of water billed to the customers during the base year. The second step is the analysis of the existing meter accuracy. The revenue recovery is generated based on the meter accuracy improvement, and reduction in water meter reading cost. The third step is integrating the M&V plan for this FIM. The M&V plans and associated measurements, services, and operations form the basis of validating that savings have been achieved. This section of the Energy Services Proposal describes these three steps and how they come together to form the project guarantee.

### Utility Baselines and Rates

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#### *Electricity Baseline and Rates*

Electricity is provided to the City of Stevenson by Skamania PUD under rate “Commercial Rate (Single Phase, no demand meter)” for the City Hall and rate “Large Industrial Rate” (three phase, demand metered) for the water treatment plant. Service is received at secondary distribution voltage and delivery is recorded at a multiple electrical meters throughout the city.



To establish the baseline electricity usage and cost, ASG analyzed the base year of invoices from January 2015 through December 2016 for the following accounts.

- Meter #: 80229956    City Hall
- Meter #: 13023776    Water Treatment Plant

The following Figures and tables show Monthly Electricity Usage kWh and Monthly Electricity Usage, Cost during the Base Year January 2015 - December 2016.



Table 4-1: Water Treatment Plant Monthly Electricity Usage & Cost (kWh) - 2016

<b>WATER TREATMENT PLANT BASELINE ELECTRICAL USE</b>						
Skamania PUD Meter Number(s): 13023776					Schedule(s): Large Industrial Rate	
Address: Ryan-Allen Road						
Month	Beginning Read Day	Ending Read Day	Days in Billing	Usage (kWh)	Demand (kW)	Baseline Cost
December	11/30/2016	12/28/2016	28	9,680	-	\$737
November	10/27/2016	11/29/2016	33	10,240	-	\$721
October	9/28/2016	10/26/2016	28	9,760	-	\$814
September	8/27/2016	9/27/2016	31	17,280	-	\$1,251
August	7/27/2016	8/26/2016	30	16,240	-	\$1,177
July	6/29/2016	7/26/2016	27	14,000	-	\$1,047
June	5/27/2016	6/28/2016	32	15,120	-	\$1,117
May	4/28/2016	5/26/2016	28	11,760	-	\$933
April	3/29/2016	4/27/2016	29	9,600	-	\$682
March	2/27/2016	3/28/2016	30	9,680	-	\$686
February	1/27/2016	2/26/2016	30	9,520	-	\$675
January	12/30/2015	1/26/2016	27	9,760	-	\$689
Total			353	142,640	0	\$10,527

Figure 4-1: Water Treatment Plant Monthly Electricity Usage (kWh) - 2016

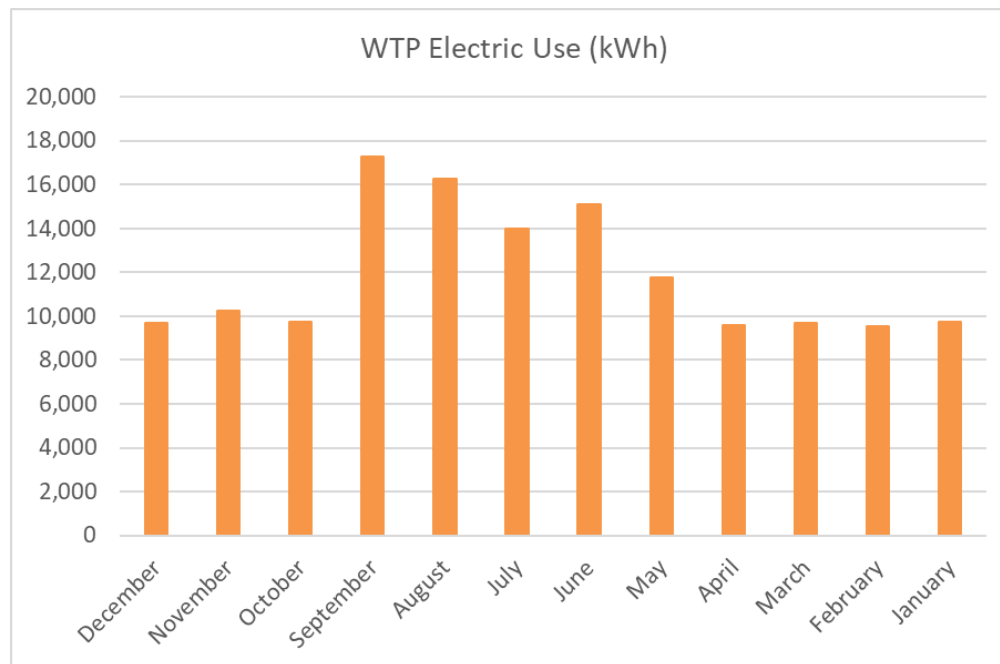
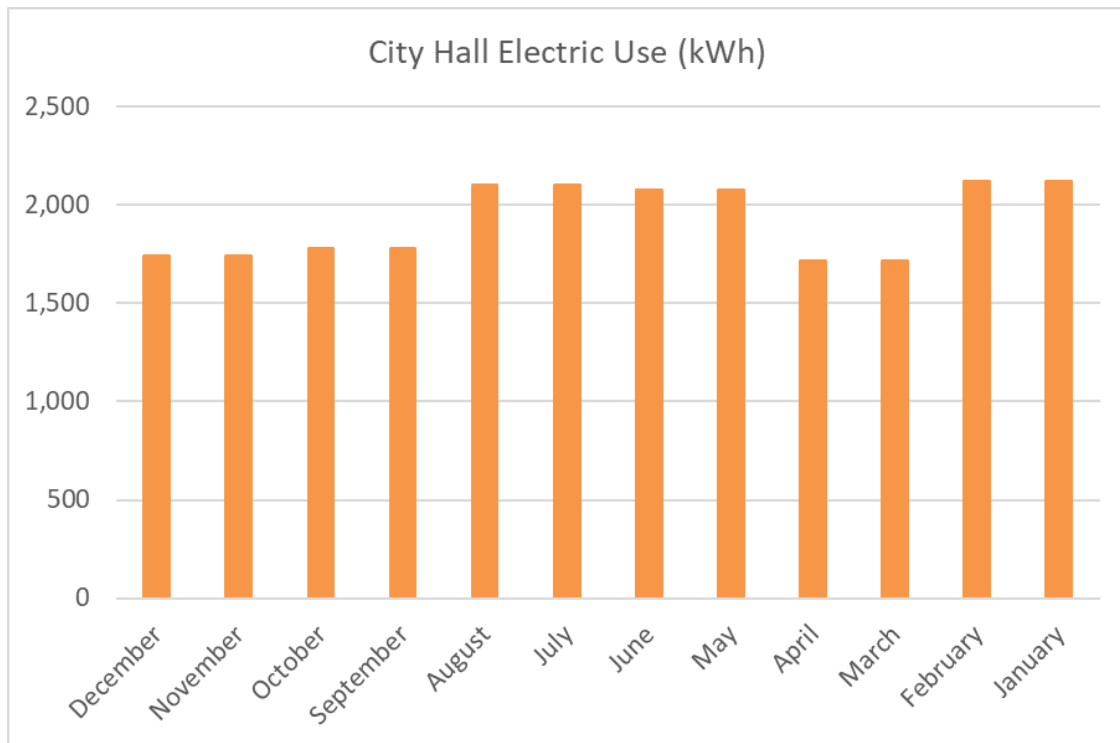


Table 4-2: City Hall Monthly Electricity Usage & Cost (kWh) - 2016

<b>STEVENSON CITY HALL BASELINE ELECTRICAL USE</b>						
Skamania PUD Meter Number(s): 80229956					Schedule(s): Commercial Rate	
Address: 7121 East Loop Road, Stevenson, WA						
Month	Beginning Read Day	Ending Read Day	Days in Billing	Usage (kWh)	Demand (kW)	Baseline Cost
December	10/26/2016	12/27/2016	62	1,740	-	\$146
November	-	-		1,740	-	\$146
October	8/26/2016	10/25/2016	60	1,780	-	\$149
September	-	-		1,780	-	\$149
August	6/28/2016	8/25/2016	58	2,100	-	\$172
July	-	-		2,100	-	\$172
June	4/26/2016	6/27/2016	62	2,080	-	\$170
May	-	-		2,080	-	\$170
April	2/26/2016	4/25/2016	59	1,720	-	\$144
March	-	-		1,720	-	\$144
February	12/29/2015	2/25/2016	58	2,120	-	\$173
January	-	-		2,120	-	\$173
Total			359	23,080	0	\$1,909

Figure 4-2: City Hall Monthly Electricity Usage (kWh) - 2016



The published amounts for the “Commercial Rate (Single Phase, no demand meter)” for the City Hall is listed in Table 4-3

Table 4-3

<b>Commercial Rate (Single Phase, no demand meter)</b>	
<b>Published kWh Usage Range</b>	
Basic Charge	\$22.75/month
Energy Charge	\$0.07610/kWh

The published amounts for the “Large Industrial Rate (three phase, demand metered)” for the water treatment plant is listed in Table 4-4

Table 4-4

<b>Large Industrial Rate (three phase, demand metered)</b>	
<b>Published kWh Usage Range</b>	
Basic Charge	\$108.25/month
Energy Charge	\$0.05330/kWh
<b>kW Charge</b>	
First 35kW	\$0
Demand charge more than 35kW	\$6.2070/kW

The marginal rate per kWh to be applied to the kWh savings were calculated based on the annual total charge and total kWh consumption. This is a blended rate that includes the applicable taxes and fees for both locations and shown in Table 4-6.

Table 4-6: Marginal Electricity Rates to be applied to the kWh Savings

<b>Calculated Electric Blended Rate</b>		
<b>Site(s)</b>	<b>Meter Number(s)</b>	<b>Blended Rate (\$/kWh)</b>
City Hall & Water Treatment Plant	80229956, 13023776	\$0.1137

*Water Meter Billed Consumption Baseline and Rates*

For the water meter replacement and AMR project, metered water volume, billed water volume, and billed sewer volume becomes the basis for the baseline water and sewer revenue to the City of Stevenson. Metered water and billing history data provided by the City were analyzed to define the baseline metered water volume. Table 4-7 displays the total water usage and charges for the years 2015, 2016 and 2017. Table 4-8 lists the base charges for each customer class per the City’s “Water System Plan Update” Report.

Table 4-7

Year	Billed Water Charges (CF)	Billed Water Charges (\$)
2015	10,186,618	\$ 876,330.83
2016	9,996,695	\$ 898,825.74
2017	10,160,008	\$ 861,991.11
<b>Total</b>	<b>30,343,321</b>	<b>\$ 2,637,147.68</b>

Table 4-8

Class	Meter Size	City Limit	2013-Current Base Rate
Residential/Commercial	3/4-inch	Inside	\$ 19.50
Residential/Commercial	3/4-inch	Outside	\$ 28.75
Residential/Commercial	1-inch	Inside	\$ 32.00
Residential/Commercial	1-inch	Outside	\$ 54.50
Residential/Commercial	1.5-inch	Inside	\$ 77.25
Residential/Commercial	1.5-inch	Outside	\$ 111.25
Residential/Commercial	2-inch	Inside	\$ 149.00
Residential/Commercial	2-inch	Outside	\$ 215.25
Residential/Commercial	3-inch	Inside	\$ 267.75
Residential/Commercial	3-inch	Outside	\$ 388.50
Residential/Commercial	4-inch	Inside	\$ 321.25
Residential/Commercial	4-inch	Outside	\$ 467.25
Residential/Commercial	6-inch	Inside	\$ 855.75
Residential/Commercial	6-inch	Outside	\$ 1,239.00
Excess water >400 cu ft	per CF	Inside	\$ 0.039
Excess water >400 cu ft	per CF	Outside	\$ 0.046

The quantity of billed water is different from metered water volume. For residential customers, the first 400 cubic feet of water consumption is included in the monthly charge and not charged. All metered water consumption in excess of 400 CF is charged by volume. In order to calculate the revenue recovery, a blended rate needs to be applied to the billed water quantity.

Sewer charge is based on the estimated sewer volume. For all commercial rate customers, the City of Stevenson estimates that the sewer volume equals the metered water volume. For residential customers, average winter months consumption (December through March) becomes the estimated sewer volume and is charged monthly throughout the next year as sewer charge. The differences in customer usage (residential versus commercial) and charges (high and low volume usage) create wide variations in the billing rates of individual accounts. For the purposes of this project, a blended rate for sewer and water was achieved by sampling the usage and charges of (30) residential ¾” metered accounts as this is for 98% City of Stevenson customers. Table 4-9 summarizes the blended billing rates used for water and sewer charges.

Table 4-9

Billing Rates		
Water	\$	0.0869
Sewer	\$	0.0654

#### *Rate Escalation Projections*

ASG assumes that water and sewer rates will increase at a rate of 3.00% per year over the life of the project. This escalation rate was used to determine the projected cash flow, which was presented for informational purposes only. In the Washington DES ESPC Program, savings are guaranteed only in units of energy and water and not dollars. The actual utility rate increases may vary and therefore change the projected cash flow for the project.

#### WATER METER ACCURACY MEASUREMENT PROCESS

The guaranteed savings associated with this project are based on improved water meter accuracy. In accordance with the M&V plan, ASG has performed meter accuracy tests on existing meters during the IGA and will perform meter accuracy tests on new meters prior to installation. This section of the report describes how the meters were, and will be, tested and how the test results are used to quantify meter accuracy.

Pre-retrofit measurements were performed using a field mounted test bench. Existing meters to be tested were removed from service and installed on the test bench and tested at multiple flow rates. The test flow rates correspond to American Water Works Association (AWWA) testing standards. Sample values for the 5/8”x3/4” meters (which account for approximately 647 of 688 meters), are summarized in Table 4-10. Values used for other meters are included in the attachments.

Table 4-10

Meter Type	Test Flow Rate Classification	Test Flow Rate [GPM]	AWWA Weighting Factor
Positive Displacement & Turbine	Low Flow	0.25	15%
Positive Displacement & Turbine	Intermediate Flow	2	70%
Positive Displacement & Turbine	High Flow	15	15%

For each tested flow rate the meter readout was recorded at the start and end of the test for both the tested meter and the bench test meter. In other words the “start read” and “finish read” were recorded for both the field-installed meters owned by the City of Stevenson and the bench test meter. The values were used to calculate the meter accuracy at the tested flow rate using the following equation:

$$Meter\ Accuracy_{Flow\ Rate} = \frac{(End\ Read_{Field\ Meter}) - (Start\ Read_{Field\ Meter})}{(End\ Read_{Test\ Bench}) - (Start\ Read_{Test\ Bench})}$$

Thus, for the 5/8”x3/4” meters (which account for approximately 647 of 688 meters), there are three meter accuracy values; one at low flow, one at intermediate flow, and one at high flow. These are combined using AWWA weighting factors (see previous table) for the meter type to develop the weighted average accuracy (WAA) for each meter. The AWWA weighting factors are time-weighting factors that provide a standardized assumption about how much time a meter operates in the different flow regimes (low flow, intermediate flow, high flow). The calculation procedure is shown in the following equation.

$$WAA = (MA_{Low\ Flow})(WF_{Low\ Flow}) + (MA_{Int\ Flow})(WF_{Int\ Flow}) + (MA_{High\ Flow})(WF_{High\ Flow})$$

Where:

- WAA = Weighted average accuracy for an individual meter
- MA = Tested meter accuracy at the indicated flow rate
- WF = AWWA time weighting factor

For each group of similar meters the WAA was condensed into a single value using the following equation.

$$WAA_{meter\ size,age} = \frac{\sum WAA_{meter}}{Meter\ Quantity_{meter\ size,age}}$$

This is the value representing meter accuracy that was used with the baseline data to determine, in the baseline year, how much water had actually passed through different meter groups. The testing procedure for new meters will be similar and is described in the M&V plan. Tables 4-11 summarizes the weighted average accuracy for each of the (30) test meters provided by the City.

Table 4-11 – WAA % Tested Meters

Meter Description	WAA %
Kent #T 14 5/8 x 3/4	77.91%
Hersey 430 #T 10 5/8 x 3/4	101.80%
Hersey 420 #10 5/8 x 3/4	99.52%
Neptune T-10 #T 15 5/8 x 3/4	100.46%
Hersey 420 #2 5/8 x 3/4	95.73%
Precision #T 6 5/8 x 3/4	94.52%
Erico #T 13 5/8 x 3/4	104.37%
Erico #T 13 5/8 x 3/4	100.03%
Precision #8 5/8 x 3/4	100.08%
Neptune T-10 #1 5/8 x 3/4	98.86%
Precision # T 1 5/8 x 3/4	101.80%
Hersey 430 # T 3 5/8 x 3/4	98.70%
Erico #T 4 5/8 x 3/4	21.40%
Precision # T 5 5/8 x 3/4	103.36%
Hersey 420 # T 11 5/8 x 3/4	99.93%
Precision # T 8 5/8 x 3/4	110.70%
Precision # T 9 5/8 x 3/4	99.61%
Hersey 430 #7	0.00%
Erico #2 5/8 x 3/4	104.78%
Precision #6 5/8 x 3/4	114.23%
Hersey 430 #4 5/8x3/4	98.70%
Hersey 430 #5 5/8 x 3/4	99.22%
Erico #7 5/8 x 3/4	84.84%
Hersey 430 #9 5/8 x 3/4	101.07%
Erico #14 5/8 x 3/4	113.62%
Erico #12 5/8 x 3/4	115.65%
Hersey 420 #15 5/8 x 3/4	99.90%
Erico #3 5/8 x 3/4	100.90%
Hersey 430 #11 5/8 x 3/4	102.14%
Erico #13	78.76%

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## Savings Analysis Methodology

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### *Excel Spreadsheet Analysis*

#### Lighting:

Microsoft Excel is used to calculate savings for the lighting FIMs. Excel lends itself well to these measures because the facility data (fixture types, counts, locations, etc.) is easily entered line-by-line on a room-by-room basis during the audit and because the calculations are relatively simple. Variables that are typically stipulated constants during the audit (such as lighting operating hours in different space types) are chosen based on experience with similar facilities and adjusted with respect to the utility bills to arrive at reasonable estimates of baseline electricity usage before calculating savings. The lighting savings used a room by room lighting audit which basically audited and accounted for the type of lighting systems currently in use and the proposed retrofit. The analysis quantified the quantity of fixtures and their respective wattages and the proposed retrofit and their quantity and wattages. The material/Fixture wattage is used for calculating the savings for the lighting FIMs. *The room by room fixture analysis is included in the appendix of this report*



#### Water:

Water Metrics tested each of the sample meters following AWWA meter testing guidelines in regards to the flow rates, volumes, and accuracy, for the size & types of the meters tested. Meters (all 5/8"-3/4" residential units) were installed on an (8) station Ford water meter test bench. Water then flowed from a large holding tank at the designated flow rate for the test, through the meters, and into factory calibrated water meter test tanks. A reading of the actual amount of water that flowed through the meters is taken from the sight gauge of the test tank, and then compared to the readings off the meters on the test bench.

A 10-gal Badger V-1 test tank was used for the low & intermediate flow tests, and a Ford #4 100 gal test tank was used for the high flow tests on each meter. Each of these tanks have a factory calibrated sight tube on the exterior of the tank, which has a factory calibrated scale showing exactly how much water flowed through the meters. It is an analog system, very accurate, and is considered the industry standard for testing 1/2"-2" municipal meters.

This 3rd party independent water meter test lab and the measurement methodology is often used to provide meter verification for regional municipalities when billing disputes arise, or for when their customers are required to verify the accuracy of their deduct meters. Meter verifications/calibrations like this are provided for a large number of private organizations in the region that are required to report their water usage, or discharge, to local/state/federal regulatory agencies.

For the sample meters sent in for testing, failure rates are close to 60% when subjected to AWWA requirements listed below. Please note that local, state, or federal agencies might have different accuracy standards depending on what the meters are being used for. Also, the Public Utility Commission of each state may have different regulations in regards to the accuracy of a meter being



used for billing purposes. For example, the Public Utility Commission of Oregon requires that meters run within +/- 2% accuracy if they are being used for billing purposes.

- AWWA C700 Displacement meter requirements;
  - 98.5%-101.5% accurate for high & intermediate flow tests, and 90%-101% for low flow tests
  - The meters that would fall under these guidelines are the Neptune & Hersey meters
- AWWA C708 Multijet meter requirements
  - 98.5%-101.5% accurate for high & intermediate flow tests, and 90%-103% for low flow tests
  - The meters that would fall under these guidelines are the Precision & Erico meters

Table 4-5 provides a list of the meter test equipment that was used for testing procedures & methodology

Table 4-5

Index	Meter Description	Size
1	Kent #T 14 5/8 x 3/4	0.75
2	Hersey 430 #T 10 5/8 x 3/4	0.75
3	Hersey 420 #10 5/8 x 3/4	0.75
4	Neptune T-10 #T 15 5/8 x 3/4	0.75
5	Hersey 420 #2 5/8 x 3/4	0.75
6	Precision #T 6 5/8 x 3/4	0.75
7	Erico #T 13 5/8 x 3/4	0.75
8	Erico #T 13 5/8 x 3/4	0.75
9	Precision #8 5/8 x 3/4	0.75
10	Neptune T-10 #1 5/8 x 3/4	0.75
11	Precision # T 1 5/8 x 3/4	0.75
12	Hersey 430 # T 3 5/8 x 3/4	0.75
13	Erico #T 4 5/8 x 3/4	0.75
14	Precision # T 5 5/8 x 3/4	0.75
15	Hersey 420 # T 11 5/8 x 3/4	0.75
16	Precision # T 8 5/8 x 3/4	0.75
17	Precision # T 9 5/8 x 3/4	0.75
18	Hersey 430 #7	0.75
19	Erico #2 5/8 x 3/4	0.75
20	Precision #6 5/8 x 3/4	0.75
21	Hersey 430 #4 5/8x3/4	0.75
22	Hersey 430 #5 5/8 x 3/4	0.75
23	Erico #7 5/8 x 3/4	0.75
24	Hersey 430 #9 5/8 x 3/4	0.75
25	Erico #14 5/8 x 3/4	0.75
26	Erico #12 5/8 x 3/4	0.75
27	Hersey 420 #15 5/8 x 3/4	0.75
28	Erico #3 5/8 x 3/4	0.75
29	Hersey 430 #11 5/8 x 3/4	0.75
30	Erico #13	0.75

SAVINGS PARAMETERS			
FIM	FIM DESCRIPTION	BASELINE PARAMETERS	SAVINGS PARAMETERS
1	LED Lighting Upgrades	<ul style="list-style-type: none"> <li>- Room by Room Quantity (qty)</li> <li>- Measure Wattages by Fixture Pre-Retrofit (kW)</li> </ul> <i>Operating Hours are agreed to by the customer and ASG (hr)</i>	<ul style="list-style-type: none"> <li>- Room by Room Quantity (qty)</li> <li>- Measure Wattages by Fixture Post-Retrofit (kW)</li> </ul> <i>Operating hours are agreed to by the customer and ASG (hr)</i>
2	Water Meter Upgrades	- AWWA-approved testing of sample population of water meters to determine pre-installation meter accuracy (%)	- Perform one-time instantaneous water meter accuracy measurements on new meters at the locations that were sampled to establish the baseline (%)

GUARANTEED ENERGY SAVINGS							
FIM	FIM DESCRIPTION	PERCENT GUARANTEE	TOTAL ELECTRICITY SAVINGS (kWh/yr)	GTD ELECTRICITY SAVINGS (kWh/yr)	TOTAL WATER SAVINGS (CF/YR)	GTD WATER SAVINGS (CF/YR)	ENERGY COST SAVINGS
1	LED Lighting Upgrades	95%	9,331	8,864			\$1,038
2	Water Meter Upgrades	80%	-	-	365,950	292,760	\$45,934

## MEASUREMENT & VERIFICATION PLAN(S)

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### *Overview of Energy Savings Guarantee*

The measurement and verification (M&V) methodology for this project is based on the guidance of the *International Performance Measurement and Verification Protocol* (IPMVP). Any deviations from the defined options of this protocol are indicated where applicable. The terms of the *Energy Savings Guarantee* for this project are based on the State of Washington General Conditions for Performance Contracting. The performance of this particular project is evaluated in terms of recovered revenue associated with units of 100 cubic feet (CCF). Although the units of measure are non-energy, ASG retains the use of standards terms of the DES Energy Program.

As defined in the IPMVP, the savings analysis methodology for this project corresponds to the “normalized savings” method of calculating savings. The baseline usage was calculated using the utility data that was made available and adjusted to “normal” conditions as described in Section 4 of the Energy Services Proposal, (Utility Savings and Verification). During the *Guarantee Term*, actions will be taken to measure and verify *Energy Consumption Savings* as described in the M&V plan(s). Per the IPMVP Normalized Savings method, the *Energy Consumption* during the *Guarantee Period* will be normalized to the same conditions as the baseline energy consumption.

The *Verified Energy Savings* will be calculated as the difference between the normalized utility consumption actually incurred in the *Guarantee Period* and the normalized baseline utility consumption. Savings calculations, energy models, assumptions, algorithms, etc. and the value of savings will not be modified after execution of the construction contract except to include any measurements made by ASG as described in the measurement and verification plan(s) set forth in the Energy Services Proposal.

ASG will provide the owner with an M&V report after each *Guarantee Period*. The M&V report will reconcile the *Verified Energy Savings* with the *Guaranteed Energy Savings* in accordance with the M&V plan(s) in the Energy Services Proposal. Actual reductions (for this project, increases) in utility bills may vary from the *Verified Energy Savings* for reasons outside of ASG’s control, such as changes in population, behavior changes, OWNER’s deviations from proposed operating parameters, OWNER-initiated changes in loads, weather variability, OWNER’s deviations from recommended maintenance procedures, etc. For the purposes of calculating any shortfalls or excesses of *Verified Energy Savings* versus *Guaranteed Energy Savings*, the Measurement & Verification Plan will be utilized – not the raw utility bills.

ASG guarantees that the sum total, for all FIMs included in the project, of *Verified Energy Savings* realized during each *Guarantee Period* will equal or exceed the projected *Guaranteed Energy Savings* set forth in the Energy Services Proposal.

In the event that the *Verified Energy Savings* are less than the *Guaranteed Energy Savings*, in units of energy or water as stated in the Energy Services Proposal, ASG shall compensate OWNER with the difference between the value of the *Guaranteed Energy Savings* and the *Verified Energy Savings*. The monetary value of the shortfall will be calculated by ASG by using the lesser of the actual utility rates in effect over the *Guarantee Period* or the escalated utility rates set forth in the Energy Services Proposal. Shortfall compensation shall be in one of the following forms; decided at the option of ASG:

1. Provision of additional services
2. Discount of M&V renewal fee
3. Cash payment
4. Repair, replacement, or adjustment of non-performing equipment or systems

#### *Owner Responsibilities during Each Guarantee Period*

For the Energy Savings Guarantee to be valid, OWNER shall uphold the following responsibilities:

1. Provide written notification to ASG within thirty days if any OWNER-initiated changes are made to facilities included in this project that may alter energy and water usage. Changes include meter replacements, load additions and load reductions. This enables ASG to advise as to whether the changes will impact the guarantee.
2. Provide access to maintenance logs demonstrating that systems affected by this project have been maintained according to the manufacturer's written instructions. This enables ASG to assess whether equipment and systems' performance has been affected by OWNER maintenance procedures.

If any of the abovementioned responsibilities are not upheld, OWNER agrees to the following:

1. Excess energy and water usage adversely affecting the Energy Savings Guarantee is a cost initiated by OWNER and not by non-performance of work by ASG. ASG shall not be responsible for the increased utility usage or costs.
2. ASG may adjust baseline period or performance period energy or water usage in accordance with the responsibility that was not upheld. ASG, solely, shall recalculate and adjust the *Verified Energy Savings* or *Guaranteed Energy Savings*.
3. ASG may terminate the *Energy Savings Guarantee* for the *Guarantee Period* in which the change occurred, and OWNER shall agree that the *Verified Energy Savings* have been achieved.

**FIM-01: Lighting Upgrade**

OVERVIEW OF M&V PLAN:

M&V BASIS		DESCRIPTION
<input checked="" type="checkbox"/>	IPMVP / OPTION A	RETROFIT ISOLATION: KEY PARAMETER MEASUREMENT
<input type="checkbox"/>	IPMVP / OPTION B	RETROFIT ISOLATION: ALL PARAMETER MEASUREMENT
<input type="checkbox"/>	IPMVP / OPTION C	WHOLE FACILITY (UTILITY BILL COMPARISON)
<input type="checkbox"/>	IPMVP / OPTION D	CALIBRATED SIMULATION
<input type="checkbox"/>	IPMVP / N/A	OPERATIONAL VERIFICATION
<input type="checkbox"/>	N/A	STIPULATED SAVINGS

The intent of this FIM is to replace existing light fixtures with more efficient fixtures to generate savings through reduced fixture wattage. The general location of the facility/facilities where this FIM and M&V plan are applicable are noted in the following table and detailed in Section 3 of the Energy Services Proposal (Project Scope of Work):

Applicable Facilities	
Facility	Address
City Hall	7121 East Loop Road
Water Treatment Plant	Ryan-Allen Rd

GENERAL DESCRIPTION OF M&V PROCESS:

Prior to the replacement of existing light fixtures, ASG will acquire fixture wattage data for a sample of the fixtures. After the replacement of light fixtures, ASG will acquire fixture wattage data for the new fixtures. The final sample size will be determined by ASG but measurements will be taken from a sampling of fixtures that account for approximately 80% of the total lighting load included in the proposed scope of work. Other non-measured variables will be fixed constants. Measured values will be used to update the calculations of *Energy Consumption Savings* for this FIM.

BASELINE M&V ACTIVITIES:

ASG will perform one-time, pre-installation, instantaneous electrical power measurements on a sample of fixtures using a meter capable of true RMS wattage measurements. Measurements will be performed after allowing fixtures to operate to arrive at their normal operating temperature. The owner, or designated agent, will have the opportunity to witness the baseline M&V activities.

POST-INSTALLATION M&V ACTIVITIES:

ASG will perform one-time, post-installation, instantaneous electrical power measurements on the same fixtures that were sampled to establish baseline values using a meter capable of true RMS wattage measurements. Measurements will be performed after allowing fixtures to operate to arrive at their normal operating temperature. The owner, or designated agent, will have the opportunity to witness the post-installation M&V activities.

#### CALCULATION METHODOLOGY:

For each fixture that is sampled, the average of the data will be calculated from the measurement data. The average of the data will be adjusted to reflect the accuracy of the measurement tool as indicated in the manufacturers' product brochure at the measurement conditions. The adjusted values will be used to update the values for fixture wattage in the savings calculations. The difference between the re-calculated baseline and re-calculated post-retrofit energy consumption, using measured data, will become the *energy consumption savings* for the FIM during guarantee term. Variables in the savings calculations that are non-measured will be fixed constants throughout the *Guarantee Term*.

#### PERFORMANCE PERIOD M&V ACTIVITIES:

ASG will provide a three year post installation survey at the facility to ensure the proper operation of the installed equipment

#### DELIVERABLES:

ASG will provide to the customer a three year post installation report documenting the values used in the model and a reconciliation of *Energy Consumption Savings* as measured to *Energy Consumption Savings* as set forth in this *Energy Services Proposal*.

**FIM-02: Water Meter Replacement and AMR Installation**

OVERVIEW OF M&V PLAN:

M&V BASIS		DESCRIPTION
<input checked="" type="checkbox"/>	IPMVP / OPTION A	RETROFIT ISOLATION: KEY PARAMETER MEASUREMENT
<input type="checkbox"/>	IPMVP / OPTION B	RETROFIT ISOLATION: ALL PARAMETER MEASUREMENT
<input type="checkbox"/>	IPMVP / OPTION C	WHOLE FACILITY (UTILITY BILL COMPARISON)
<input type="checkbox"/>	IPMVP / OPTION D	CALIBRATED SIMULATION
<input type="checkbox"/>	IPMVP / N/A	OPERATIONAL VERIFICATION
<input type="checkbox"/>	N/A	STIPULATED SAVINGS

The intent of this FIM is to replace existing water meters with new composite meters with Hot Rod transmitters to recover revenue through improved meter accuracy and to eliminate the meter reading cost. The location of the water meters are listed in the water meter inventory provided by the City’s billing software.

GENERAL DESCRIPTION OF M&V PROCESS:

During the Investment Grade Audit, ASG performed a water meter accuracy testing for a sample of the water meters. After the replacement, ASG will test the meter accuracy for the same accounts tested during the Investment Grade Audit. Measured values will be used to update the calculations of *Energy Consumption Savings* for this FIM. All other non-measured variables will be stipulated.

BASELINE M&V ACTIVITIES:

ASG performed one-time, pre-replacement, instantaneous meter accuracy measurements on a sample of meters. Meter testing consisted of documenting the existing water meter types, age, and accuracy at high, medium and low flow for each meter tested.

RETROFIT M&V ACTIVITIES:

ASG will perform one-time instantaneous water meter accuracy measurements on new meters at the locations that were sampled to establish the baseline. Measurements will be performed prior to the new meters being installed and will be performed at the location provided by the city. The owner, or designated agent, will have the opportunity to witness the post-installation M&V activities. Billed water and sewer CCF will be stipulated. At the end of the first year, ASG will review billing system reports to confirm sampled meters are functioning properly (ie: no fault codes or significantly faulty readings).

BASELINE ADJUSTMENTS:

Baseline water and sewer CCF identified in this Energy Services Proposal will be used to calculate the recovered CCF throughout the guarantee period(s).

#### CALCULATION METHODOLOGY:

The post-retrofit *Energy Consumption Savings* (revenue recovery) will be calculated based on two factors: 1) post-retrofit measured meter accuracy for meter categories identified in Section 2, 2) baseline billed water and sewer CCF. Adjustments will be made based on water and sewer usage at the City of Stevenson.

The measured accuracy will be used to update the values for post-retrofit CCF. The difference between the baseline CCF in the Energy Services Proposal and post-retrofit CCF using measured data, will become the *Energy Consumption Savings* (revenue recovery) for the FIM during guarantee term. To calculate the monetary revenue recovery, higher of the escalated rate identified in this section, or the actual rate during the guarantee period, will be used.

#### PERFORMANCE PERIOD M&V ACTIVITIES:

There are no ongoing M&V activities required for this FIM. The results of the calculations using data from the one-time M&V activities will be a fixed constant throughout the Guarantee Term.

#### DELIVERABLES:

ASG will provide to the customer a one-time report documenting the type and quantity of meters that were sampled, the results of the measurements, the type and accuracy of the tool used to perform the measurements (already provided to customer), and a reconciliation of *Verified Energy Consumption Savings* (revenue recovery) as measured to *Guaranteed Energy Consumption Savings* (revenue recovery) as set forth in this *Energy Services Proposal*.

#### *Annual M&V Fee*

ASG proposes to guarantee the stipulated energy consumption savings (revenue recovery) resulting from the project for three years.

The cost of measurement and verification for three years is included in the price of the project.



## DEFINITIONS

Guarantee Period	The time period which will be used to calculate Verified Energy Savings for the project. For this project the Guarantee Period will be each twelve-month period during the Guarantee Term starting on the date of the Notice of Commencement of Energy Cost Savings.
Energy Consumption Savings	For each form of energy (including other utilities such as water or sewer usage) during Guarantee Periods within the Guarantee Term, the difference between the Baseline Energy Consumption and the Energy Consumption actually incurred in that Guarantee Period as set forth in the Energy Services Proposal. Energy Consumption Savings are calculated in units of consumption (e.g. kWh, kW demand, therms, gallons, etc.) in a Guarantee Period.
Energy Cost Savings	For each form of energy (including other utilities such as water or sewer usage) for each Guarantee Period during the guarantee term, the Energy Consumption Savings times the cost per unit of consumption for the Guarantee Period, as set forth in the Energy Services Proposal.
Guaranteed Energy Savings	The sum total, for all FIMs included in the project, of Energy Consumption Savings as set forth in the Energy Services Proposal.
Verified Energy Savings	The sum total, for all FIMs included in the project, of Energy Consumption Savings in each Guarantee Period.
Guarantee Term	<p>The period of time during which M&amp;V activities will occur and the energy savings will be guaranteed. If the guarantee term is not extended beyond what is proposed in the Energy Services Proposal then the Guaranteed Energy Savings will be stipulated to be those listed as the Guaranteed Energy Savings as set forth in the Energy Services Proposal.</p> <p>The Guarantee Term will commence on the first day of the month following the date and month of substantial completion, verification and ASG acceptance date of all (the last) project(s) to be implemented and will continue through the duration of the M&amp;V Services under contract, subject to earlier termination as provided in the Energy Services Proposal. Guarantee Term is only effective with M&amp;V contract and ASG receipts for same.</p>
O&M Savings	Operations and Maintenance cost savings. These additional stipulated cost savings are achieved as benefits of the project and are not included in the Guaranteed Energy Savings.
Savings Shortfall	The amount by which the Guaranteed Energy Savings exceed the Verified Energy Savings in a Guarantee Period.
Savings Surplus	The amount by which the Verified Energy Savings exceed the Guaranteed Energy Savings in a Guarantee Period.

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## SECTION 5: CONSTRUCTION PROCESS

Apollo Solutions Group is able to guarantee the cost of this ESPC project by acting as the general contractor to manage the installation and implementation of the FIMs. The project management approach is site-specific for the City of Stevenson and is described in this section of the Energy Services Proposal.



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### WORKING CONDITIONS AND SITE LOGISTICS

#### *Daily Work Schedules:*

ASG plans for all work to be completed during normal business hours, Monday through Friday 7am to 5pm for most construction activities. Work hours outside of this time may be required for special outages associated with the installation of new water meters in some commercial establishments.

#### *Site Logistics:*

A detailed site logistics plan will be prepared for each Facility Measure in conjunction with the City of Stevenson staff that will include designated parking areas for ASG and associated subcontractors in the vicinity of the work as well as a site laydown area for site trailers and storage. A detailed phasing plan would be created for the water meter replacement efforts that would allow for detailed coordination with the customers and city staff.

#### *Statutory Apprenticeship Requirements:*

Each of the subcontractors working on the project has confirmed that they participate in an apprenticeship program that meets the requirements of the State Prevailing Wage Act per RCW 39.12.021. Workers registered with the WSATC are entitled to the prevailing wage rates for an apprentice of that trade. If the worker is not registered they will be paid the full journey-level wage rate. Additionally, each subcontractor will comply with the requirements of RCW 39.04.320.

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### CONSTRUCTION SEQUENCING

#### FIM- 01 Lighting Upgrade

The scope of work is to retrofit interior lighting at the City Hall and the Water Treatment Plant. This work will occur concurrently with the water meter replacements. This work will require approximately 35 working days.

#### FIM- 02 Water Meter Replacement

The major portion of the water meters within the city will be replaced with new “radio” read equipped meters. Close coordination will be required not only with city personnel but with the individual water customers. Advanced notice will be sent out with the schedule dates for when the

meters will be replaced in each area as well as providing the necessary details on what the customer should expect. The outage for the typical customer should be limited to less than an hour under typical circumstances. This work will require approximately 70 working days.

*Project Schedule:*

A summary project schedule for completing this work is attached. A detailed project schedule will be prepared in cooperation with the City of Stevenson staff to ensure minimal impacts to their operations. This detailed schedule will be used to track progress of the construction activities during the duration of the project. Table 5-1 provides a simplified timeframe for major project milestones.

Table 5-1

<b>Timeline</b>	
Acceptance of Energy Services Proposal	12/2018
Notification of Award	6/2019
Notice to Proceed to Design-Build	1/2020
Substantial Completion of Construction	6/2020
Commencement of Energy Savings	6/2020

*Apollo Solutions Group:*

ASG will provide all required engineering, design review, construction management, on-site supervision, commissioning, and training of facility personnel on new equipment.

*Warranty:*

Work performed as part of this Energy Services Proposal will be provided with a one-year parts and labor warranty starting on the date of beneficial use of the equipment installed.

*Diverse Business Goals:*

ASG has established the following diverse business participation goals for this project in the table below. ASG is a minority owned business. Multiple subcontractors will perform work on this project. The selection has been made based upon their cost, availability and high quality of work. The table below shows the percentages contributed to the State Certification Categories.

State Certification Categories	Percentages from the Amendment to MESA	Percentages for Construction	Percentages for Professional Services
Minority-owned Business	12%	2%	2%
Woman-owned Business	8%	0%	0%
Veteran-owned Business	5%	0%	0%
Small/mini/micro Buisness	5%	0%	0%

## **SECTION 6: PROJECT FINANCIALS**

Apollo Solutions Group has developed, by way of the IGA, the Guaranteed Maximum Construction Cost and Guaranteed Energy Cost Savings for implementing the FIMs described in this Energy Services Proposal. The project cost and project fulfillment of the cost effectiveness criteria is described in this section of the Energy Services Proposal.

### **PROJECT COST**

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As an ESPC project developed through the State of Washington Department of Enterprise (DES) Services process, the cost to the City of Stevenson is presented as a Guaranteed Maximum Construction Cost and as a Total Project Cost. ASG has presented the breakdown of project costs in Table 6-1 according to the State of Washington DES's open book pricing format.

#### *Guaranteed Maximum Construction Cost:*

The Guaranteed Maximum Construction Cost (GMAX) includes the Investment Grade Audit Fee, professional design fees, construction management fees, contingency on the construction cost, and construction material and labor costs – including payment and performance bond.

#### *Total Project Cost:*

The Total Project Cost includes the sales tax on all components plus miscellaneous fees (EG: State of Washington Department of Enterprise Services project management fee), as applicable. These additional costs are not guaranteed by ASG but are included in the Total Project Cost to establish overall project cost effectiveness.

Table 6-1

<b>OPEN BOOK PROJECT COST SUMMARY</b>	
City of Stevenson	
	TOTAL
<b>CONSTRUCTION COSTS</b>	
Direct Subcontracted Costs	\$346,304
ASG On-Site Services (Supervision, etc.)	\$27,387
Misc. Direct Costs	\$0
<b>SUB-TOTAL CONSTRUCTION COSTS</b>	<b>\$373,691</b>
Performance Bond	\$5,381
<b>TOTAL DIRECT CONSTRUCTION COSTS</b>	<b>\$379,072</b>
<b>ESCO FEES</b>	
Audit Fee	\$49,394
Design Engineering	\$34,630
Construction and Project Administration	\$20,778
Overhead	\$34,630
Profit	\$27,704
<b>TOTAL ESCO FEES</b>	<b>\$167,136</b>
<b>OTHER COSTS</b>	
Project Contingency	\$12,372
Construction Interest	\$0
ASG Year 1 M&V	\$3,763
ASG Year 2 M&V	\$3,876
ASG Year 3 M&V	\$3,993
<b>TOTAL OTHER COSTS</b>	<b>\$24,004</b>
<b>TOTAL GUARANTEED CONSTRUCTION &amp; ESCO COSTS</b>	<b>\$570,212</b>
<b>NON-GUARANTEED COSTS</b>	
Misc. Costs:	\$0
Tax - Construction and Professional Svcs	\$42,954
Washington DES Project Mgmt Fee	\$36,500
<b>TOTAL NON-GUARANTEED COSTS</b>	<b>\$79,454</b>
<b>TOTAL MAXIMUM PROJECT COST</b>	<b>\$649,666</b>

## Financials

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### *City of Stevenson Source of Funds*

The proposed improvements will be funded by third party financing, ASG will receive the notice to proceed to design within two weeks of the Energy Services Proposal being accepted by the City of Stevenson and Department of Enterprise Services. Thereafter, construction will proceed and ASG will invoice the City of Stevenson for its costs according to the master services agreement.

### *Utility Rebates & Grant*

The utility incentives are not available for the selected project and are not included in the financials of this project

## ESCO COMPENSATION

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ASG shall be compensated via monthly progress billings paid in accordance with the terms outlined in the State of Washington's Master Energy Services Agreement. The first payment shall include the cost of the ASG audit fee as outlined in the IGA agreement with DES.

## EQUIPMENT TITLE

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After installation and payment, the City of Stevenson will have ownership of all installed equipment.

## FIM SUMMARY

### FACILITY IMPROVEMENT MEASURES SUMMARY

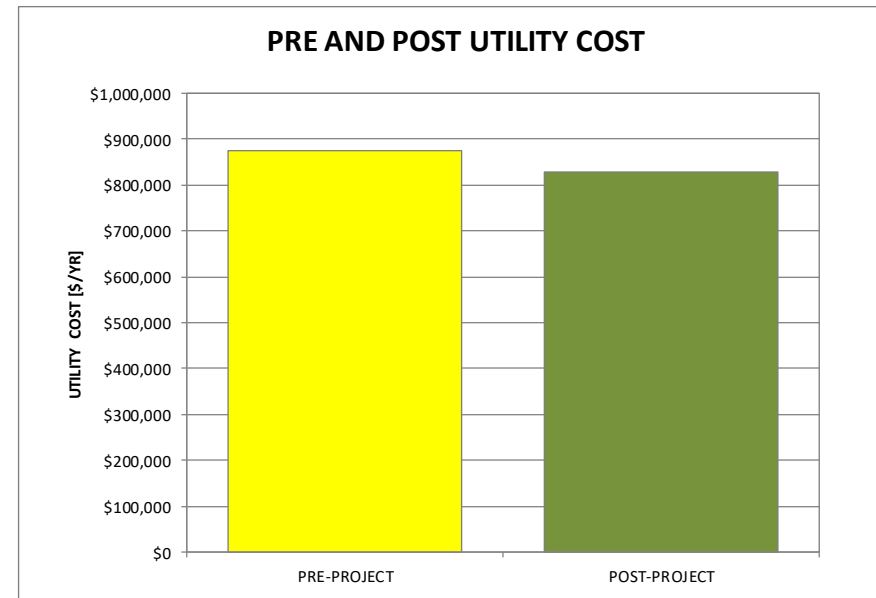
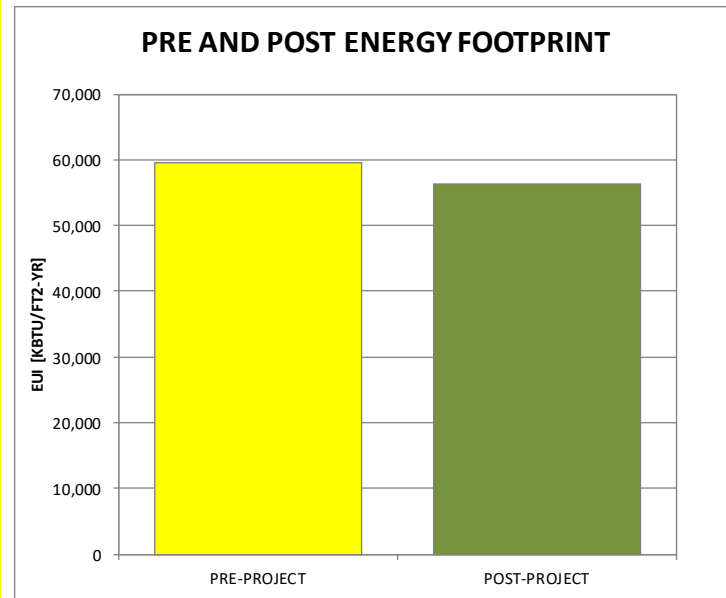
City of Stevenson



ROW	FIM ID	FIM DESCRIPTION	PROJECT PRICE	UTILITY INCENTIVES [\$]	TOTAL ANNUAL COST SAVINGS	SIMPLE PAYBACK BEFORE INCENTIVES	MODIFIED PAYBACK AFTER INCENTIVES	ANNUAL ELECTRICITY SAVINGS [KWH/YR]	ANNUAL FUEL 1 SAVINGS	ANNUAL FUEL 2 SAVINGS	ANNUAL WATER SAVINGS [KGAL/YR]	GUARANTEED ANNUAL UTILITY COST SAVINGS [\$/YR]	ANNUAL O&M SAVINGS [\$/YR]	ELIMINATED CO2 [TONS/YR]	ELIMINATED CO2 [CARS/YR]
1	1	Lighting (City Hall & Wastewater Treatment Plant)	\$21,349	\$0	\$1,038	20.6	20.6	8,864	0	0	0	\$1,038	\$0	6	1
2	2	Kamstrup AMR + (Water Metering)	\$628,317	\$0	\$72,714	13.7	8.6	0	0	0	292,760	\$45,934	\$26,780	0	0
			<b>\$649,666</b>	<b>\$0</b>	<b>\$73,752</b>	<b>8.8</b>	<b>8.8</b>	<b>8,864</b>	<b>0</b>	<b>0</b>	<b>292,760</b>	<b>\$46,972</b>	<b>\$26,780</b>	<b>6</b>	<b>1</b>

#### UTILITY SAVINGS SUMMARY FOR ALL FACILITIES INCLUDED IN THE PROJECT

	FLOOR AREA [FT2]	ELECTRICITY USAGE [kWh/yr]	FUEL 1 USAGE [Therm/yr]	FUEL 2 USAGE -	WATER USAGE [CF/yr]	UTILITY COST [\$/YR]	EUI [BTU/FT2-YR]
PRE-PROJECT	9,500	165,720	0	0	10,160,008	\$874,675	59,537
POST-PROJECT	9,500	156,856	0	0	9,867,248	\$827,703	56,352
PERCENT SAVINGS		5.3%	N/A	N/A	2.9%	5.4%	5.3%





## 20-YEAR CASH FLOW

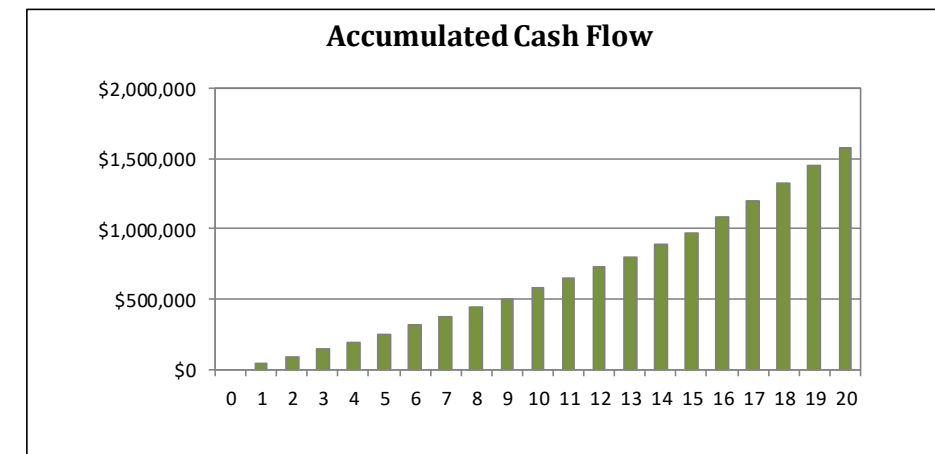
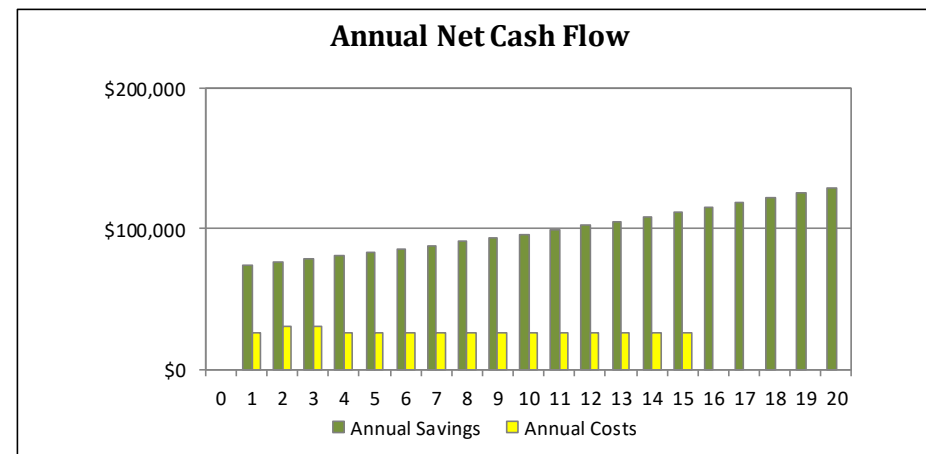
### 20 YEAR CASH FLOW SUMMARY

City of Stevenson  
GMAX



A	B	C	D	E	F=B+C+D+E	G	H	I=G+H	J=F-I	K
PROJECT YEAR	UTILITY SAVINGS	O&M SAVINGS	INCENTIVES	AVOIDED CAPITAL	ANNUAL BENEFITS	ANNUAL PAYMENT	PERFORMANCE ASSURANCE	ANNUAL COSTS	ANNUAL CASH FLOW	ACCUMULATED CASH FLOW
0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
1	\$46,972	\$26,780	\$0	\$0	\$73,752	\$26,319	\$0	\$26,319	\$47,433	\$47,433
2	\$48,381	\$27,583	\$0	\$0	\$75,965	\$26,319	\$3,876	\$30,195	\$45,770	\$93,203
3	\$49,833	\$28,411	\$0	\$0	\$78,244	\$26,319	\$3,993	\$30,311	\$47,932	\$141,135
4	\$51,328	\$29,263	\$0	\$0	\$80,591	\$26,319	\$0	\$26,319	\$54,272	\$195,407
5	\$52,867	\$30,141	\$0	\$0	\$83,009	\$26,319	\$0	\$26,319	\$56,690	\$252,097
6	\$54,454	\$31,045	\$0	\$0	\$85,499	\$26,319	\$0	\$26,319	\$59,180	\$311,277
7	\$56,087	\$31,977	\$0	\$0	\$88,064	\$26,319	\$0	\$26,319	\$61,745	\$373,023
8	\$57,770	\$32,936	\$0	\$0	\$90,706	\$26,319	\$0	\$26,319	\$64,387	\$437,410
9	\$59,503	\$33,924	\$0	\$0	\$93,427	\$26,319	\$0	\$26,319	\$67,108	\$504,518
10	\$61,288	\$34,942	\$0	\$0	\$96,230	\$26,319	\$0	\$26,319	\$69,911	\$574,429
11	\$63,127	\$35,990	\$0	\$0	\$99,117	\$26,319	\$0	\$26,319	\$72,798	\$647,227
12	\$65,020	\$37,070	\$0	\$0	\$102,090	\$26,319	\$0	\$26,319	\$75,771	\$722,998
13	\$66,971	\$38,182	\$0	\$0	\$105,153	\$26,319	\$0	\$26,319	\$78,834	\$801,832
14	\$68,980	\$39,327	\$0	\$0	\$108,307	\$26,319	\$0	\$26,319	\$81,989	\$883,821
15	\$71,049	\$40,507	\$0	\$0	\$111,557	\$26,319	\$0	\$26,319	\$85,238	\$969,059
16	\$73,181	\$41,722	\$0	\$0	\$114,903	\$0	\$0	\$0	\$114,903	\$1,083,962
17	\$75,376	\$42,974	\$0	\$0	\$118,350	\$0	\$0	\$0	\$118,350	\$1,202,313
18	\$77,638	\$44,263	\$0	\$0	\$121,901	\$0	\$0	\$0	\$121,901	\$1,324,214
19	\$79,967	\$45,591	\$0	\$0	\$125,558	\$0	\$0	\$0	\$125,558	\$1,449,772
20	\$82,366	\$46,959	\$0	\$0	\$129,325	\$0	\$0	\$0	\$129,325	\$1,579,096
<b>Total</b>	<b>\$1,262,157</b>	<b>\$719,589</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,981,746</b>	<b>\$394,780</b>	<b>\$7,869</b>	<b>\$402,649</b>	<b>\$1,579,096</b>	

FINANCIAL PERFORMANCE METRICS
PROJECT LIFE: 15 YEARS
PROJECT PRICE: \$649,668
WEIGHTED EQPMT LIFE: 30.00
FINANCED CAPITAL: \$335,035
FINANCE TERM: 15 YEARS
GUARANTEE TERM: 3 YEARS
CAPITAL CONTRIBUTION: \$0
GRANT AWARDS: \$314,633



## **APPENDIX A: LIGHTING SURVEY**

Provided in Digital Format

## **APPENDIX B: WATER METER INVENTORY**

Provided in Digital Format

## **APPENDIX C: WATER METER TESTING RESULTS**

Provided in Digital Format

## **APPENDIX D: BUY AMERICAN PROVISION**

The lighting materials and water meters that are going to be installed in this project will be manufactured in the United States of America.

## **APPENDIX E: DAVIS BACON PROVISION**

All contractors will adhere to Davis Bacon prevailing wages for the labor component in this project.

## **APPENDIX F: WATER SAVINGS CALCULATIONS**

Provided in Digital Format